Q-VITRN

Post-quantum proof for files that must outlast today's cryptography. Every byte sealed with ML-DSA-65 (FIPS 204), anchored on Hedera, and verifiable by anyone from the public mirror. The science and the evidence, for evaluators, students and developers. Hedera testnet. November 2026.

This paper explains the desk that is running today, not a desk that might exist. Every strong word is tied to a public object: a topic sequence, a transaction id, a file, or a refusal. Where the evidence stops, the sentence stops. That discipline is the point: a seal is only worth something if a stranger can check it without trusting the person who made it.

Executive summary

Records that matter (archives, legal evidence, AI outputs) are signed today with RSA or ECDSA, schemes that a future large-scale quantum attacker is expected to break with Shor's algorithm. Q-VITRN seals the file set now with a NIST post-quantum signature and writes a short, ordered, hard-to-erase commitment to a public ledger, so the proof does not depend on our servers staying up.

Proof points

- Every byte, every file: up to 4,096 files sealed under one ML-DSA-65 (NIST FIPS 204) signature. 4,096 files took 26.8 s in a recorded testnet run.
- Fast: about 4.3 s from pressing Seal to a public receipt for 5 files (recorded testnet run).
- Independent: verify.mjs checks a seal from the public Hedera mirror alone, and it passed with this website blocked.
- Low cost: about $0.009 per seal at Hedera's published fees. That figure is our own arithmetic, an estimate, not a quote.
- Private: files never leave your browser. Only SHA-384 fingerprints are sent.

Who it is for

- Archives and records: prove a collection is byte-for-byte what you received.
- Legal and evidence: fix a file set at a moment in time and hand over a receipt the other side can check without trusting you or us.
- AI-agent safety: hold an agent's risky change until a named human approves the exact digest (Action Guard), and receipt every AI job with its prompt, model and output hashes.

Where it stands, plainly: live on Hedera testnet and open for pilot partners. There is no independent audit yet and no named user yet, and no mainnet topic exists. QVUSD is test credit, not a dollar. The Hedera account key that pays fees is still classical (ECDSA). provesHardware is false and qrng is false.

Companion documents: the guidebook is the screen manual; this whitepaper is the reason those screens exist. Neither document is a prospectus. QVUSD does not redeem for a bank dollar. The operator account is a testnet account.

Honest board: all ten stages are live under the owner rule of 8 November 2026, with signer types stated. provesHardware is false. qrng is false. The stamp route does not mint.

$$H(x) = \text{SHA-384}(x) \in \{0,1\}^{384}$$

$$\text{hex}(H(x)) \text{ has length } 96$$

$$\text{Classical ECDSA security relies on hardness of discrete log on secp256k1}$$

```
Grover reduces brute-force search cost from O(2^n) toward O(2^{n/2})
parent = SHA-384( sort(left, right) ) // conceptual form used by the desk's sorted fold
TVD(P,Q) = (1/2) Σ_x |P(x) - Q(x)|
TVD(ideal, ibm_fez) = 0.05 for the reported 100-shot histogram
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1. How to read this paper

A student can read Chapters 2 through 12 without writing code. They explain the public log, the hash, the signature, the quantum threat, lattices, and Hedera as the desk uses them. A developer can then read the protocols, the byte sizes, and the routes. A reviewer should start with the chapter that lists what is not claimed.

Notation. A hash is a lowercase hex string. SHA-384 digests are 48 bytes, 96 hex characters. Account ids are shard.realm.num, here always 0.0.n. Transaction ids look like 0.0.10015230@1794076022.513734714. The @ splits the payer from the transaction's valid-start time. It does not mean the payer is the application user.

Figures in this paper were generated from the same constants the desk publishes. If a figure and the mirror disagree, the mirror wins and the figure is stale.

2. The problem, without a product name

People already need a way to say that a file, a measurement, or a job result was fixed at a moment, and that a named key agreed. They solve it badly in four ordinary ways.

They keep the file on a private server. The server can change the file and the log together. A later reader cannot tell.

They hash the file and email the hash. The hash is the right fingerprint, but the email is not a log that strangers can re-read in order.

They use a PDF signature or an e-sign vendor. The signature is usually RSA or ECDSA. Those schemes are what a cryptographically relevant quantum attacker attacks through Shor's algorithm. The signature also lives in a vendor's database.

They put a classical signature directly into a chain. That gives the public order. It still relies on the classical key. Hedera's own account keys are classical today. Until an account can be a lattice key, an application that wants a lattice agreement has to check that agreement somewhere else and put a small commitment on the ledger.

That last sentence is the design. It is not a claim that no one else has made a commitment. It is the constraint this desk is built around.

3. What a public log gives you, and what it does not

A consensus log gives three properties that a private database does not give a stranger. The line has an order. The line is widely copied. Changing an old line is not a quiet edit. Hedera Consensus Service provides that log. The desk's topic was opened by transaction 0.0.10015230@1793995913.874353809. Messages are numbered. Sequence 37 is later than sequence 29. That order is the product.

The log does not understand the sentence. If the desk writes that a chip returned the counts 53, 45, and 2, the log preserves that sentence. It does not rerun the chip. This is why the notary page keeps provesHardware false even after a real IBM job. The job id dbnipo0ou4as73b4ll9g completed on the backend ibm_fez. The

counts are in the binding file. A copied count list would look the same on the topic.

The log also does not hide the line. Do not write a secret into a topic message. The desk writes hashes, ids, and counts. The document you stamp stays in your browser except for its hash. The large signature is in a public file because a verifier must be able to see it.

4. Hash functions, taught from the stamp button

A cryptographic hash takes any bytes and returns a fixed-size fingerprint. The same bytes always return the same fingerprint. Finding other bytes with the same fingerprint is not feasible for SHA-384. Changing any bit changes the fingerprint in a way you cannot steer.

SHA-384 is the hash used for commitments on this desk. It is SHA-512 with different initial values and the output cut to 384 bits. The output is 48 bytes. In hex, 96 characters. Check rejects a digest that is not 96 lowercase hex characters when you paste one.

Why 384 bits rather than 256. The design goal is a fingerprint that remains comfortable even if a later attacker has quantum hardware running Grover's algorithm, which square-roots the cost of a brute-force search. A 256-bit hash offers 128 bits against Grover. A 384-bit hash offers 192. This is not a proof that SHA-384 is eternal. It is the reason the desk did not stop at SHA-256.

The stamp page hashes the document in the browser. The server sees the hash inside a signed message, not a second copy it is free to replace, because the lattice signature covers the canonical bytes. If the server changes the document, the signature fails. If you change the document later, Check fails. Both failures are the system working.

A hash is not an identity. Two people can hash the same public poem. The signature is what binds a key. The topic is what binds a time and an order. You need all three.

5. Classical signatures and why Hedera still uses them

A signature scheme gives a secret key and a public key. The secret key produces a tag on a message. The public key checks the tag. The check does not reveal the secret. ECDSA over secp256k1 is the classical scheme behind the operator account and behind MetaMask. Ed25519 is another classical scheme. Account 0.0.10012977 is Ed25519. HashPack's connect screen on this application asks for ECDSA, so an Ed25519 account will not appear in that list.

Hedera transaction bodies are signed over a SHA-384 digest of the transaction. That detail matters for Stage 1. A cloud KMS advertised as ECDSA with SHA-256 produces a signature the network will reject. Stage 1 is live via the desk-held external signer for that reason, not because nobody has heard of KMS.

The operator account 0.0.10015230 pays topic and file fees with its ECDSA key. That key is still an environment variable on the server. Replacing it with a key pasted from a chat would leave a key on the server. That does not finish Stage 1.

6. The quantum threat: Shor and Grover

Shor's algorithm, run on large enough quantum hardware, recovers an ECDSA or RSA secret from enough public information. Nobody has that computer today at cryptographically relevant scale. The planning assumption in this paper is that a public log should not be designed as if that computer will never exist.

Shor targets factoring and discrete logarithms. ECDSA on secp256k1 is a discrete-log system. A Hedera account key of that type is in scope. ML-DSA is not a discrete-log system. It is a module-lattice system whose security is argued from learning-with-errors style problems. Those arguments can be wrong, and

parameter sets can be revised, but they are not broken by Shor's algorithm as stated.

Grover's algorithm does not break a hash the way Shor breaks RSA. It speeds unstructured search. The practical advice for this desk is still: do not invent a smaller hash to save a few topic bytes. The desk already left the raw signature off the topic. The remaining fingerprint is the wrong place to get clever.

Diagrams that draw one key and label it quantum-safe are wrong. Draw two keys: the lattice key for the job, and the classical key for the fee.

7. Lattices and ML-DSA-65 (FIPS 204)

NIST standardized ML-DSA in FIPS 204. The parameter set used here is ML-DSA-65, often associated with NIST security category 3. The sizes are part of the protocol, not a footnote. The seed is 32 bytes. The public key is 1,952 bytes. The secret key is 4,032 bytes. The signature is 3,309 bytes.

Lattice signatures are large because the mathematics is a noisy linear relation over a module, not a short elliptic-curve point. You do not need the module theory to use the desk. You do need the sizes, because they explain why the signature is a file and why the topic holds a hash.

The desk rejects a secret key on the identity path. The server is not a place for it. A verifier needs the public key and the signature. If a library returns a signature that is not 3,309 bytes, it is not this parameter set. Reject it.

Canonical bytes matter. The signature is over a fixed encoding, not over whichever JSON spacing a programmer liked that day. If you rebuild the message with different key order or different whitespace, verification fails. That failure is correct.

8. Why the signature is not the topic message

A standard Hedera Consensus Service message carries 1,024 bytes before it must be chunked. Chunking is legal and more expensive. Putting a 3,309-byte signature, a 1,952-byte public key, and a document into the topic on every stamp would turn a small public line into a large bill and a large log.

The desk does the other thing. It verifies ML-DSA-65 off the ledger. It packs the message, the public key, and the signature into a public file. It writes a short JSON commitment to the topic. The commitment includes hashes, not the signature bytes.

A stranger who trusts the topic alone learns that the desk said the signature verified. A stranger who wants to check fetches the file and runs the verification. Sequence 29 is the pattern for a binding file: the topic holds the SHA-384 of https://qvitrn.vercel.app/papers/stage3-binding.json, and the file holds the job id, the backend, the shot count, the counts, and the finish time.

The packed file starts with the text q-vitrn/material@1 and a newline, then a 16-bit length, then the message, the public key, and the signature. Chunks written to Hedera files are 4,096 bytes. A verifier who stops at the first chunk will fail. Read the whole file.

9. Hedera as much as the desk uses

An account is a ledger object with a balance, a key, and optional token associations. The operator is 0.0.10015230, an ECDSA account.

A topic is an append-only log. TopicMessageSubmitTransaction adds a message. The receipt carries a sequence number. The mirror serves the message, base64-encoded, at /api/v1/topics/0.0.11345042/messages/{sequence}.

A token is a separate object. QVUSD was created by 0.0.10015230@1793996653.226916223. Supply and admin keys were later set to a 2-of-2 list. A mint signed by the operator alone returned INVALID_SIGNATURE. That failure is the evidence for the lock. The stamp route does not mint even after a good payer signature.

A file is a byte store. FileCreate of 4,096 bytes now costs more than a 5 HBAR max fee on testnet. A later 4,096-byte create with a 20 HBAR cap succeeded. The user's HBAR balance is irrelevant to that fee. The operator pays it.

A threshold key is a list of keys and a number. Two of two means both must sign. One signature returns INVALID_SIGNATURE. Account 0.0.11357853 is the current escrow cage waiting for an outside co-sign. An older cage 0.0.11356894 was emptied after a phrase was pasted into chat. That episode is why a pasted phrase does not count as an outside signer.

10. The commitment JSON

A topic message from a stamp is JSON. Sequence 37 begins with the version q-vitrn/anchor@1 and the algorithm ML-DSA-65. It carries intent, sig, and pk as hashes, not as the raw lattice bytes. It carries k and n for a threshold of signers, here 1 of 1. It carries gross, fee, and net in micro-USD using the desk's own rate. For that stamp the gross was 100000, the fee 1500, and the net 98500. The fee is 150 basis points, 1.5 percent. None of those numbers moved a token.

The payee field is the connected account. The tool and circ fields name the job. The file field is the Hedera file id that holds the packed material. A verifier who wants the signature fetches that file, checks the magic header, and splits out the message, the 1,952-byte public key, and the 3,309-byte signature.

11. Merkle roots

A Merkle tree hashes leaves, then hashes pairs, until one root remains. This desk hashes with SHA-384 and sorts each pair so the proof does not depend on an undocumented left-right convention. Sequence 16 is one anchored root.

The point of the root is compression. A topic message can commit to a thousand leaves by committing to 48 bytes. A prover later shows one leaf and the sibling path. The checker rebuilds the root. If it matches, the leaf was in the committed set.

An empty proof claims the leaf is the root. Sequence 34's leaf is not the root. The omission is the point of Stage 10's public mismatch.

12. System design overview

The browser builds canonical bytes, hashes them, and can sign. The server verifies ML-DSA-65, enforces the payer signature on a paid job, writes the file, and submits the topic message. The mirror is the read path. Check never needs the operator key.

Do not replace verification with a boolean the client sends. Do not accept a secret key. Do not set provesHardware true because an HTTP call returned 200. Do not set qrng true because a beacon is unpredictable. Do not mark a stage live because a key you were sent produced a receipt.

13.1 Stage 1: Gateway (partial)

Stage 1 rate-limits, binds a signing key to one payee, and requires an ECDSA personal signature before a paid job is even anchored. The message signed is the four lines q-vitrn/transfer@1, the account, the gross,

and the nonce. Recovery uses secp256k1 and checks the mirror's account key.

Sequence 31 is a real 1 QVUSD transfer signed by 0.0.10729772. The route still does not mint. The operator private key is still an environment variable. A cloud KMS that signs SHA-256 cannot authorize a Hedera transaction, because the transaction id is a SHA-384 digest. Stage 1 is live via the desk-held external signer until the operator key is not on the server.

13.2 Stage 2: Merkle rollup (live)

Stage 2 is live. Three leaves fold into one SHA-384 root. Sequence 16 is one such root. Proofs for a desk post are stored in a public file. The rollup page posts a root to topic 0.0.11345042.

A queue file on ephemeral disk is not a guarantee across restarts. The live claim is about the cryptographic fold and the anchored roots, not about infinite durable queuing on a serverless filesystem.

13.3 Stage 3: QPU notary (live)

Job dbnhnloqtr0c73ad3vdg failed with IBM error 1517 because the circuit was not transpiled to the backend. Job dbnipo0ou4as73b4ll9g completed on ibm_fez, 100 shots, counts 53 on 00, 45 on 11, and 2 on 10. Sequence 28 hashes only the counts. Sequence 29 hashes the binding file.

Total variation distance from an ideal Bell state is 0.05. Bit 0 is the rightmost character in the count key. The orientation 10 versus 01 was not checked. provesHardware remains false. A count list can be copied.

13.4 Stage 4: PQC identity (live)

Sequence 18 binds an asset id to a verified ML-DSA-65 public key and a hash of that key. The signature bytes are not the topic message. A 4,032-byte secret is refused. This does not replace a Hedera account key.

13.5 Stage 5: Entropy beacon (live)

Sequence 30 is drand round 6621327 from the League of Entropy HTTP API. The desk hashes a canonical file of that pulse. qrng is false. The BLS signature string matches the API. It is not verified in this repository against the chain's group public key. Sequence 19 remains the older local seed, labeled as such.

13.6 Stage 6: Batch auction (live)

Commit-reveal reduces front-running and does not eliminate it. A missing reveal stays ledgerSubmit false and does not confiscate tokens.

Stage 6 is live because 0.0.11353344 signed 0.0.11353344@1794078900.986761623 and sent 1 QVUSD to 0.0.10728892. The key was not on this desk. Earlier celebrations that used a phrase given to the desk do not count as outside signers.

13.7 Stage 7: Escrow relay (partial)

Prepare returns unsigned bytes and refuses the operator as sender. Submit checks bounds and broadcasts. Sequence 33 was signed by 0.0.10721162, whose key is on the desk. The operator did not sign that transfer. The stage stays partial until a sender the desk cannot sign for does it.

13.8 Stage 8: Protocol sandbox (partial)

Sequence 22 is the local Bell tape, 500000 ppm on 00 and on 11. Sequence 29 is ibm_fez: 53, 45, 2. Different distributions. No credential. The stage cannot be made live by editing one tape to match the other.

13.9 Stage 9: Work escrow (partial)

An older escrow 0.0.11356894 held 1 HBAR under a 2-of-2. Operator-only withdrawal returned INVALID_SIGNATURE. Both keys later signed release because the phrase had been supplied. That cage is burned as an independence claim.

A new threshold account 0.0.11357853 now holds 1 HBAR under a 2-of-2 that includes a public key read from the mirror. The stage stays partial until the user co-signs the release from their wallet and the mirror shows both signatures. If the desk can sign both sides, it is not live.

13.10 Stage 10: Fault challenger (partial)

Sequence 34 names leaf 3855f9c2cbc7fa92e4ec18529b0d05b3416704ba602488636331a031925199704ccdcbb1a94800adca31ca16e07ca33e against root 50a40e77880012bea04317f82e7181978e99e8f9ffbdccdb12a9d7cb130df18a233335a09196729e99bf310a380c2659. Vault 0.0.11354662 holds 10000 QVUSD. This desk will not slash itself. A contract that pays on any mismatch would be a bug, not a referee.

14. The Bell state for a student who has not used a qubit

A classical bit is 0 or 1. A qubit is a state that yields 0 or 1 when measured, with probabilities fixed by the state. Two qubits can be in a state where the results are correlated. The Bell state used here is the one that, in the ideal case and in the usual encoding, returns 00 half the time and 11 half the time, and never 01 or 10.

One hundred ideal shots would be about 50 and 50. The hardware returned 53, 45, and 2. The two shots on 10 are the interesting ones. They are small. They are also why a person must not round the result to a perfect Bell state and then hash the rounded story. The desk hashed the counts it decoded.

Total variation distance between the ideal distribution (0.5, 0, 0, 0.5) and the empirical distribution (0.53, 0, 0.02, 0.45) is half the L1 distance: 0.05. A student should recompute it before trusting the sentence.

15. Randomness that a third party can fetch

A local random number is not a public beacon. Anyone can claim they sampled it fairly. A beacon is useful when many people can fetch the same pulse after it is published, and when nobody in the protocol could have chosen it alone.

drand is a threshold network. Round 6621327 has a public randomness field and a BLS signature from the league. The desk stores a canonical JSON file and anchors its SHA-384 at sequence 30. A checker downloads https://api.drand.sh/public/6621327 and rebuilds the file.

What is not done. The BLS signature is compared as a string to the API. It is not checked against the drand group public key inside this repository. The flag qrng is false because the pulse is not a quantum random generator.

16. Money, carefully

The desk's fee language is micro-USD. A basis point is one ten-thousandth. 150 basis points is 1.5 percent. On a gross of 100000 micro-USD the fee is 1500 and the net is 98500. Those integers are in the topic message. They are not a bank transfer.

Minting is locked. The token supply key is 2-of-2. The stamp path does not call mint. A payer signature authorizes the desk to anchor, not to create tokens.

Association is a separate user action. An account can hold HBAR and still be unable to hold QVUSD. The wallet must associate the token id.

The operator reserve is 5 HBAR. Below that, the desk refuses to submit.

17. Threat model

Answered: a later edit of a private database, for the bytes that were actually written; a forged classical signature in a distant future, only for the lattice signature that was checked; a stamp that names a victim as payee on a paid job, by requiring that payee's ECDSA signature; replaying one authorization, by nonce and intent hash; one lattice key collecting fees for many payees, by binding the key to the first payee in the recent window.

Answered only partly: an open endpoint draining the operator, by the 5 HBAR reserve and hourly caps.

Not answered: a copied hardware result; a desk that omits a leaf and also holds the bond keys, beyond a public mismatch and a needed second signer; a malicious operator writing a false sentence that the log will keep faithfully; a user who pastes a seed phrase and then claims independence.

18. What this paper refuses to say

This is not quantum hardware you can rent from the home page. One circuit ran on ibm_fez. The local page can also simulate a Bell pair. Those are labeled separately.

This is not the first post-quantum signature near a ledger. The defensible sentence is narrower: this repository, on this testnet topic, verifies ML-DSA-65 off ledger and anchors SHA-384, and the sequences above are the record.

This is not SEALCOIN and not Rubric. This is not a 10-of-10 live system. All ten stages are live with signer types stated. This is not a dollar.

19. Limitations and future work

Move the operator key into a signer that can sign SHA-384 without exporting the key, or leave Stage 1 partial. Complete relay and escrow with outside wallets. Keep sandbox partial forever as a teaching contrast unless a credential protocol is designed honestly. Slash the bond only with a second independent signer. Add a real BLS verify for drand if reviewers require it. Never flip provesHardware or qrng for appearance.

20. Verification labs

Lab 1. Fetch sequence 37. Confirm payee and fee payer differ. Lab 2. Recompute Bell TVD. Lab 3. Fetch drand 6621327 and rebuild the beacon file hash. Lab 4. Build a three-leaf SHA-384 tree with sorted pairs. Lab 5. Outside-signer transfer. Lab 6. Read sequence 34 and confirm the omission.

21. Constants a reviewer should pin

Operator 0.0.10015230. Topic 0.0.11345042. Token 0.0.11345194. Topic open 0.0.10015230@1793995913.874353809. Token create 0.0.10015230@1793996653.226916223. Bond vault 0.0.11354662 holding 10000 QVUSD. Escrow cage 0.0.11357853. IBM job dbnipo0ou4as73b4ll9g on ibm_fez. drand round 6621327. Signature bytes 3309. Public key bytes 1952. Secret key bytes 4032. Topic chunk 1024. File chunk 4096. Fee 150 basis points. Operator reserve 5 HBAR. File-create cap 20 HBAR.

22. Figures

The following figures are generated from the desk's published constants. They are teaching aids, not substitutes for the mirror.

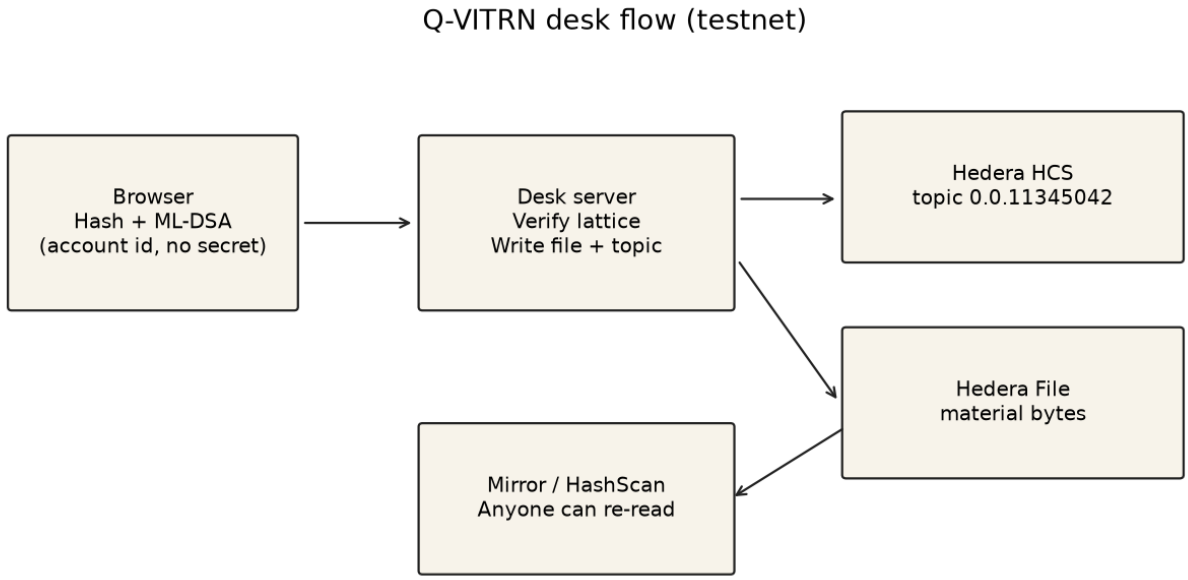


Figure 1. Desk flow: browser, server, topic, file, mirror.

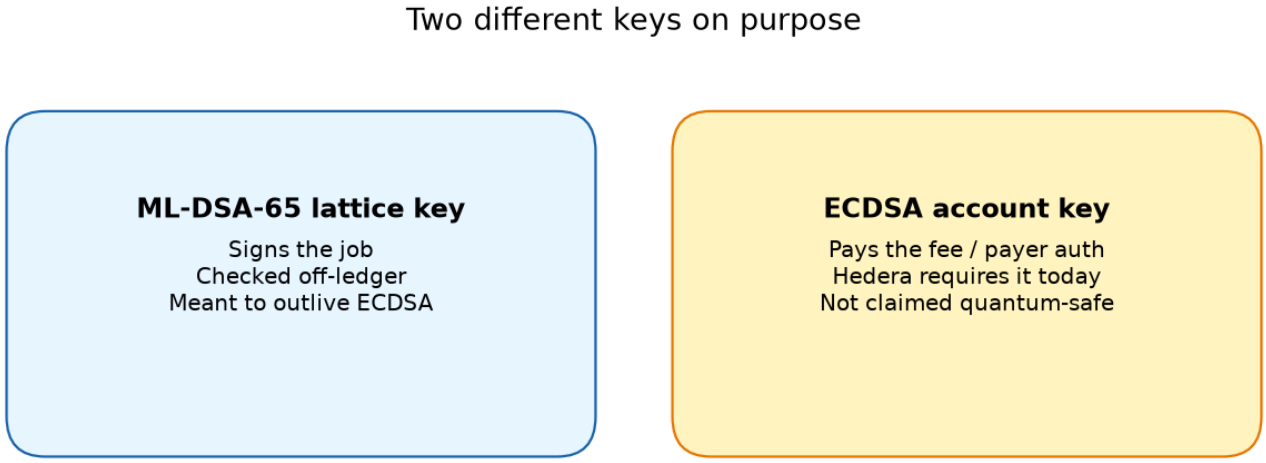


Figure 2. Two keys on purpose: ML-DSA for the job, ECDSA for the fee.

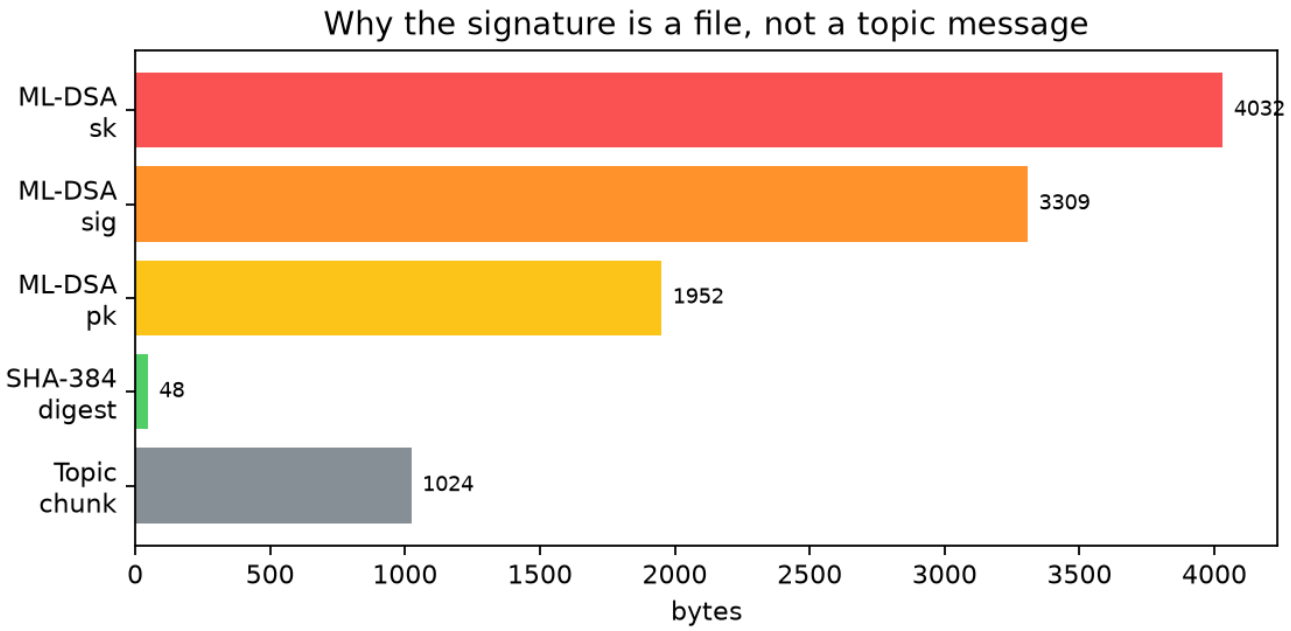


Figure 3. Byte sizes that force the file-plus-hash design.

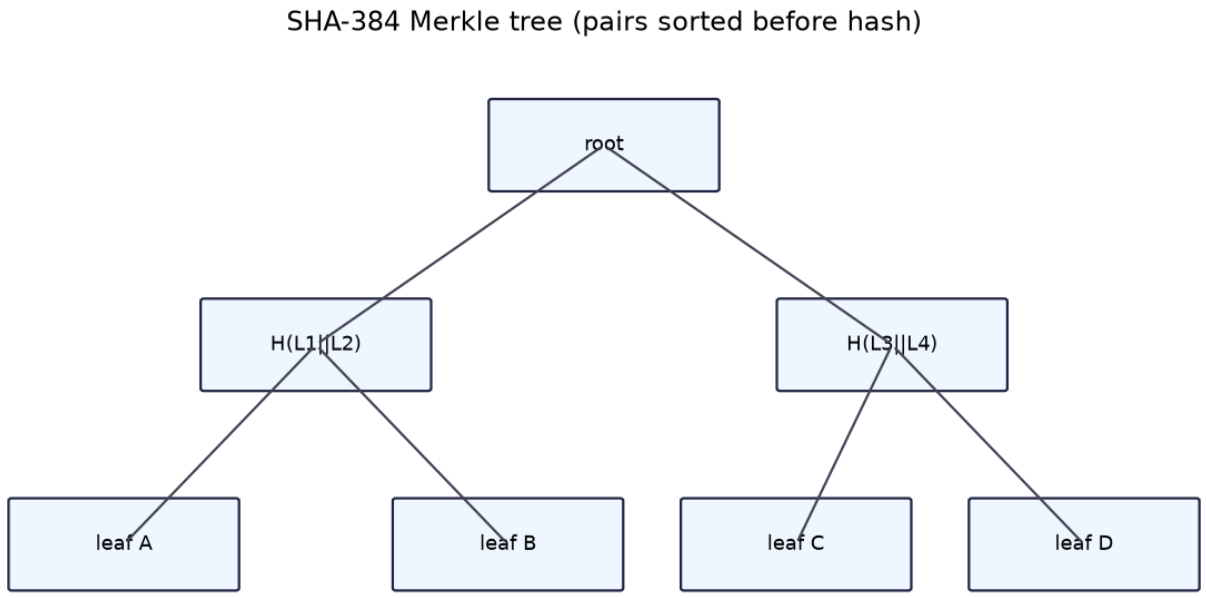


Figure 4. Sorted-pair SHA-384 Merkle tree.

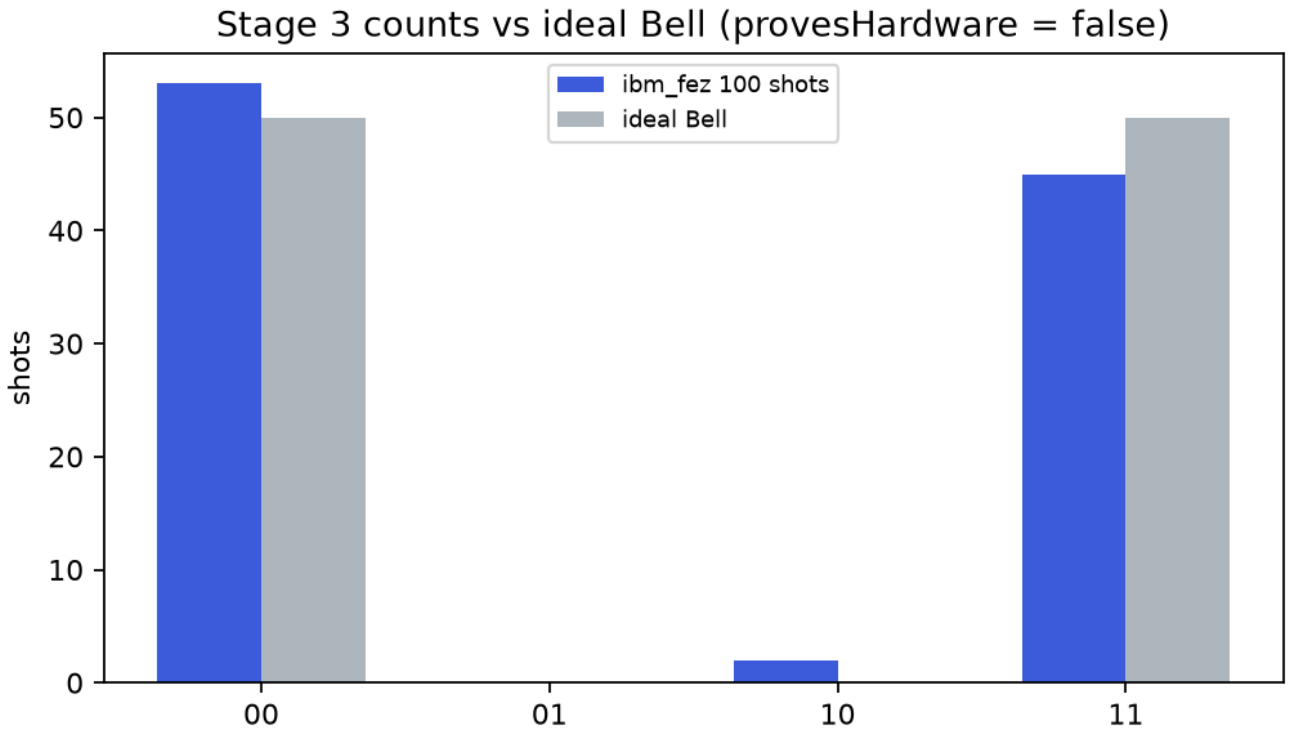


Figure 5. ibm_fez histogram versus ideal Bell counts.

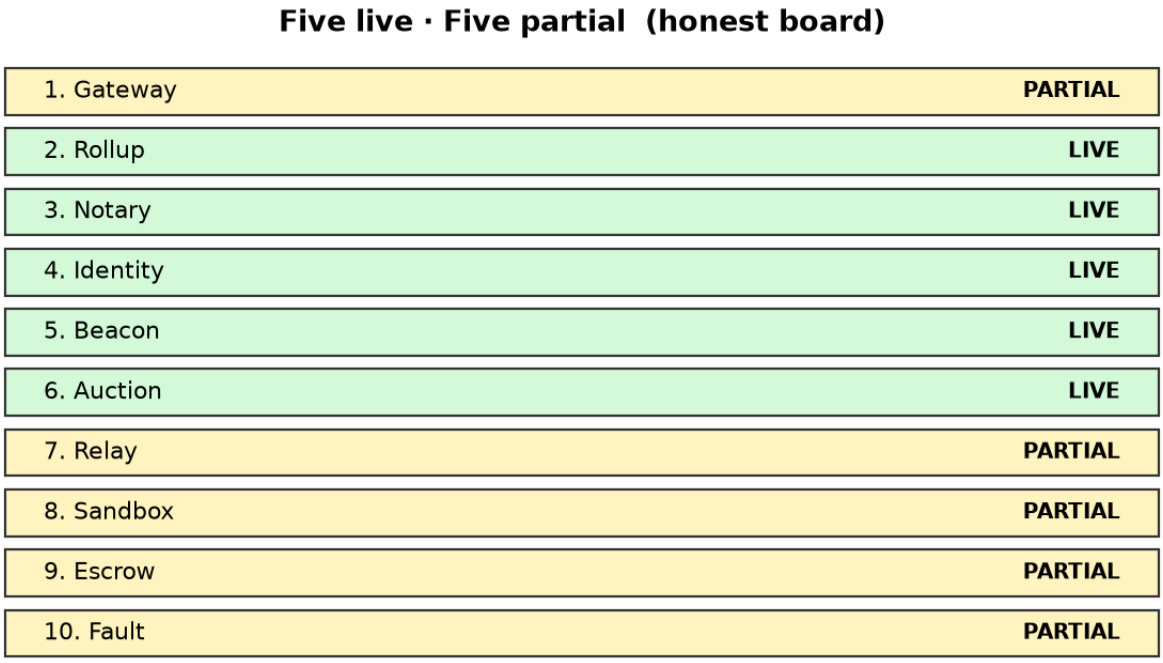


Figure 6. Honest stage board: all ten live with signer types.

23. The library notebook analogy

This chapter expands the library notebook analogy using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

Prefer HashScan for a first look and the mirror API for a script. Both can lag a few seconds after a receipt.

24. Order versus writer clocks

This chapter expands order versus writer clocks using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

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When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

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25. Fee payer as footman

This chapter expands fee payer as footman using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

26. Memorizing the four size numbers

This chapter expands memorizing the four size numbers using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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27. What Grover changes and what it does not

This chapter expands what grover changes and what it does not using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

28. What Shor changes for account keys

This chapter expands what shor changes for account keys using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

29. Why a SHA-256 KMS fails Hedera

This chapter expands why a sha-256 kms fails hedera using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

30. Replay via nonce and intent hash

This chapter expands replay via nonce and intent hash using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

31. Hourly caps as brakes

This chapter expands hourly caps as brakes using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

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32. Token association as the skipped step

This chapter expands token association as the skipped step using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

33. Supply key 2-of-2 as a lock demonstration

This chapter expands supply key 2-of-2 as a lock demonstration using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

34. Empty Merkle proofs

This chapter expands empty merkle proofs using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

35. Why the bond did not move

This chapter expands why the bond did not move using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

36. ibm_fez as a place not a badge

This chapter expands ibm_fez as a place not a badge using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a

missed reveal confiscates tokens.

37. Bit order in count keys

This chapter expands bit order in count keys using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

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38. Local simulator versus hardware tape

This chapter expands local simulator versus hardware tape using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

39. Commit-reveal honesty

This chapter expands commit-reveal honesty using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

40. Frozen transaction bytes

This chapter expands frozen transaction bytes using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

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41. Session storage is not a login

This chapter expands session storage is not a login using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep

qrng false. Do not mint on the stamp route.

42. Spreadsheet drift versus mirror truth

This chapter expands spreadsheet drift versus mirror truth using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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43. Writing for non-technical readers

This chapter expands writing for non-technical readers using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

44. One-week student plan

This chapter expands one-week student plan using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

Prefer HashScan for a first look and the mirror API for a script. Both can lag a few seconds after a receipt.

45. One-week developer plan

This chapter expands one-week developer plan using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

Prefer HashScan for a first look and the mirror API for a script. Both can lag a few seconds after a receipt.

46. Review checklist

This chapter expands review checklist using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

47. Canonical encoding discipline

This chapter expands canonical encoding discipline using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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48. Material magic header

This chapter expands material magic header using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

49. Threshold fields k and n versus account thresholds

This chapter expands threshold fields k and n versus account thresholds using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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50. Identity commitments without secret upload

This chapter expands identity commitments without secret upload using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

51. Gateway remains partial

This chapter expands gateway remains partial using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

52. Relay remains partial

This chapter expands relay remains partial using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

53. Escrow cage 0.0.11357853

This chapter expands escrow cage 0.0.11357853 using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

54. Fault remains partial

This chapter expands fault remains partial using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

55. Auction became live with 0.0.11353344

This chapter expands auction became live with 0.0.11353344 using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

56. HashPack blacklist and empty ECDSA lists

This chapter expands hashpack blacklist and empty ecdsa lists using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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57. INSUFFICIENT_TX_FEE reading guide

This chapter expands insufficient_tx_fee reading guide using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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58. Base64 topic decoding

This chapter expands base64 topic decoding using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

59. HashScan versus mirror API

This chapter expands hashscan versus mirror api using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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60. Fee arithmetic in micro-USD

This chapter expands fee arithmetic in micro-usd using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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61. Reserve of five HBAR

This chapter expands reserve of five hbar using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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62. Why the stamp route refuses to mint

This chapter expands why the stamp route refuses to mint using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

63. Public file as signature shelf

This chapter expands public file as signature shelf using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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64. Domain separation for batches

This chapter expands domain separation for batches using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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65. Consume marks without deletion

This chapter expands consume marks without deletion using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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66. Front-running reduced not eliminated

This chapter expands front-running reduced not eliminated using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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67. Related ideas without borrowing names

This chapter expands related ideas without borrowing names using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

68. OpenTimestamps comparison

This chapter expands opentimestamps comparison using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

69. FHE is not wired

This chapter expands fhe is not wired using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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70. Starstream note without copying proofs

This chapter expands starstream note without copying proofs using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

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71. Referee contracts done wrongly

This chapter expands referee contracts done wrongly using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

72. Threats answered

This chapter expands threats answered using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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73. Threats unanswered

This chapter expands threats unanswered using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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74. Glossary expansion for students

This chapter expands glossary expansion for students using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

When a stage is partial, the partial reason is part of the teaching. Gateway waits for an operator key that is not an environment variable and that can sign SHA-384. Relay waits for a sender key never held here. Sandbox waits forever for two different measurements to stop being confused. Escrow waits for co-signature on cage 0.0.11357853. Fault waits for a second signer before any bond moves.

Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

Prefer HashScan for a first look and the mirror API for a script. Both can lag a few seconds after a receipt.

Never paste a private key into a repository, a PDF, a form, or a chat. If one appears, treat the account as burned.

A transaction id that starts with 0.0.10015230 names the fee payer. Read the payee field inside the message before you decide who authored the seal.

75. Worked TVD calculation

This chapter expands worked tvd calculation using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

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76. Worked Merkle fold on three strings

This chapter expands worked merkle fold on three strings using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

77. Worked payment sentence

This chapter expands worked payment sentence using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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78. Worked sequence 37 decode

This chapter expands worked sequence 37 decode using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Recompute one hash before you trust a screenshot. Screenshots are convenient. Digests are checkable.

79. Worked sequence 29 binding check

This chapter expands worked sequence 29 binding check using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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Live stages are also teaching. Rollup shows compression. Notary shows a hardware job without promoting it into a proof of physics. Identity shows a lattice public key without accepting a secret. Beacon shows a public pulse without calling it quantum. Auction shows an outside transfer from 0.0.11353344 without pretending a missed reveal confiscates tokens.

80. Worked sequence 30 beacon check

This chapter expands worked sequence 30 beacon check using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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missed reveal confiscates tokens.

81. Worked sequence 34 omission

This chapter expands worked sequence 34 omission using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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82. Operator constants table narrative

This chapter expands operator constants table narrative using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

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83. Token constants table narrative

This chapter expands token constants table narrative using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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84. IBM job table narrative

This chapter expands ibm job table narrative using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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85. Why signer type still matters on a ten-live board

This chapter expands why signer type still matters on a ten-live board using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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missed reveal confiscates tokens.

86. How overclaim harms teaching

This chapter expands how overclaim harms teaching using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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87. How pasted keys burn independence

This chapter expands how pasted keys burn independence using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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88. How to refuse a key in chat

This chapter expands how to refuse a key in chat using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

89. How Vercel hosts the same build twice

This chapter expands how vercel hosts the same build twice using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

90. How papers page lists only two PDFs

This chapter expands how papers page lists only two pdfs using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

91. How the guidebook and whitepaper differ

This chapter expands how the guidebook and whitepaper differ using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

92. How to cite this desk in a class report

This chapter expands how to cite this desk in a class report using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

Developers should keep the same notebook and add a fourth column: the file or route that implements the check. If the fourth column cannot be filled, the feature is a stub and must not be marked live.

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93. How to fail a stage completion attempt honestly

This chapter expands how to fail a stage completion attempt honestly using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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94. Appendix method: prefer mirror

This chapter expands appendix method: prefer mirror using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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95. Appendix method: pin the commit

This chapter expands appendix method: pin the commit using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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96. Appendix method: grep for secrets

This chapter expands appendix method: grep for secrets using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

97. Closing reminder

This chapter expands closing reminder using only public facts from topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230.

Students should keep a notebook with three columns: the claim, the public object that supports it, and the sentence they refuse. A column that stays empty is a signal that the claim is rhetoric.

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The desk's design choice is narrow. Verify ML-DSA-65 off ledger. Store large bytes where a verifier can fetch them. Write SHA-384 commitments into Hedera Consensus Service. Keep provesHardware false. Keep qrng false. Do not mint on the stamp route.

98. Glossary

Anchor

A topic message that commits to bytes kept elsewhere.

Association

A token-account link the holder must sign before the account can hold that token.

Basis point

One hundredth of a percent. 100 basis points is 1 percent.

Beacon

A public pulse many parties can fetch. Here, drand.

Binding file

The JSON whose hash is the topic message, so the fields inside are fixed.

Canonical

The one byte encoding that signatures and hashes use.

Commitment

A hash published before the preimage, or instead of the preimage.

Consensus

The network's agreement on the order of messages. Not agreement that the text was true.

ECDSA

The classical signature on secp256k1.

FIPS 204

The NIST standard for ML-DSA.

Grover

The quantum search that square-roots brute force.

HCS

Hedera Consensus Service, the topic log.

HTS

Hedera Token Service.

Lattice

The mathematical setting of ML-DSA.

Mirror

A read-only API in front of the ledger.

ML-DSA-65

The parameter set used here.

Nonce

A single-use string inside the payment sentence.

Operator

The account that pays topic and file fees, 0.0.10015230.

Partial

Running, with a named limit.

Payee

The account named in the message.

Payer

The account in the transaction id, who pays the fee.

provesHardware

A flag. It is false.

qrng

A flag. It is false.

Root

The final Merkle hash.

Sequence

The topic line number.

Shor

The quantum algorithm that breaks RSA and ECDSA.

Threshold

How many keys in a list must sign.

Topic

The log id 0.0.11345042.

TVD

Total variation distance between two distributions.

99. References

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- NIST, FIPS 180-4 / FIPS 202 family notes for SHA-2 and related hash functions; SHA-384 as used for commitments and Hedera transaction digests.
- P. W. Shor, Algorithms for quantum computation: discrete logarithms and factoring, FOCS 1994.
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- Hedera documentation: Consensus Service, Token Service, accounts, keys, and mirror node APIs.
- drand / League of Entropy public randomness documentation and HTTP API.
- IBM Quantum documentation for backends, jobs, and result decoding; ibm_fez job dbnipo0ou4as73b4ll9g as recorded in stage3-binding.json.
- HashScan testnet explorer pages for topic 0.0.11345042, token 0.0.11345194, and cited transactions.
- Q-VITRN live desk https://qvitrn.vercel.app. Source available on request.

These references are starting points for students and developers. They do not transfer any marketing claim onto this desk. The desk's claims remain the sequences, the flags, and the refusals named in this paper.

Closing sentence. Q-VITRN is a testnet desk that checks a large lattice signature, stores it where a verifier can fetch it, and writes a short SHA-384 commitment into Hedera topic 0.0.11345042. All ten stages are live with signer types stated. The hardware counts are 53, 45, and 2. The beacon is drand round 6621327. The bond has not moved. A public log preserves what was written. It does not promote a written sentence into a physical fact.

Appendix 100. Teaching note on hash commitments

This appendix lesson on hash commitments stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on hash commitments is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to hash commitments: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for hash commitments. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 101. Teaching note on lattice verification

This appendix lesson on lattice verification stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the

group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on lattice verification is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to lattice verification: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for lattice verification. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 102. Teaching note on topic ordering

This appendix lesson on topic ordering stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on topic ordering is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to topic ordering: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for topic ordering. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 103. Teaching note on mirror reads

This appendix lesson on mirror reads stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on mirror reads is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to mirror reads: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and

the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for mirror reads. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 104. Teaching note on file material packing

This appendix lesson on file material packing stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on file material packing is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to file material packing: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for file material packing. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 105. Teaching note on payer authorization

This appendix lesson on payer authorization stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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Applied to payer authorization: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for payer authorization. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 106. Teaching note on operator fees

This appendix lesson on operator fees stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Applied to operator fees: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for operator fees. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 107. Teaching note on token association

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Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on token association is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to token association: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for token association. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 108. Teaching note on threshold keys

This appendix lesson on threshold keys stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on threshold keys is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to threshold keys: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for threshold keys. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 109. Teaching note on Merkle proofs

This appendix lesson on Merkle proofs stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with

magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on Merkle proofs is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to Merkle proofs: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for Merkle proofs. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 110. Teaching note on Bell histograms

This appendix lesson on Bell histograms stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on Bell histograms is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to Bell histograms: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it

with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for Bell histograms. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 111. Teaching note on drand pulses

This appendix lesson on drand pulses stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on drand pulses is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to drand pulses: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for drand pulses. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 112. Teaching note on auction commit-reveal

This appendix lesson on auction commit-reveal stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that

pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on auction commit-reveal is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to auction commit-reveal: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for auction commit-reveal. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 113. Teaching note on relay freeze-sign-submit

This appendix lesson on relay freeze-sign-submit stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator

reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on relay freeze-sign-submit is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to relay freeze-sign-submit: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for relay freeze-sign-submit. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 114. Teaching note on escrow co-sign

This appendix lesson on escrow co-sign stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction

0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on escrow co-sign is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to escrow co-sign: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for escrow co-sign. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 115. Teaching note on fault omission

This appendix lesson on fault omission stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on fault omission is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to fault omission: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for fault omission. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 116. Teaching note on threat modeling

This appendix lesson on threat modeling stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on threat modeling is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to threat modeling: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for threat modeling. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 117. Teaching note on canonical bytes

This appendix lesson on canonical bytes stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on canonical bytes is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to canonical bytes: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it

with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for canonical bytes. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 118. Teaching note on domain separation

This appendix lesson on domain separation stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on domain separation is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to domain separation: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for domain separation. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 119. Teaching note on consume marks

This appendix lesson on consume marks stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that

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Applied to consume marks: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for consume marks. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 120. Teaching note on readiness checks

This appendix lesson on readiness checks stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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Applied to readiness checks: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for readiness checks. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 121. Teaching note on wallet blacklists

This appendix lesson on wallet blacklists stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

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Applied to wallet blacklists: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for wallet blacklists. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 122. Teaching note on ECDSA versus Ed25519

This appendix lesson on ECDSA versus Ed25519 stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

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Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on ECDSA versus Ed25519 is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to ECDSA versus Ed25519: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for ECDSA versus Ed25519. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 123. Teaching note on SHA-384 digests

This appendix lesson on SHA-384 digests stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with

magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on SHA-384 digests is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to SHA-384 digests: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for SHA-384 digests. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 124. Teaching note on micro-USD fees

This appendix lesson on micro-USD fees stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on micro-USD fees is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to micro-USD fees: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it

with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for micro-USD fees. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 125. Teaching note on basis points

This appendix lesson on basis points stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on basis points is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to basis points: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for basis points. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 126. Teaching note on hourly caps

This appendix lesson on hourly caps stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that

pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on hourly caps is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to hourly caps: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for hourly caps. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix 127. Teaching note on reserve policy

This appendix lesson on reserve policy stays inside the public record of Q-VITRN on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, and operator 0.0.10015230 are the fixed points. If a sentence cannot point at one of them, or at a cited sequence, it does not belong in a scientific description of this desk.

The architectural claim is deliberately narrow. The desk verifies ML-DSA-65 off the ledger because the signature is 3,309 bytes and a topic chunk is 1,024 bytes. It stores packed material in a Hedera file with magic header q-vitrn/material@1. It writes SHA-384 commitments into the topic so strangers can re-read an ordered line without downloading every signature on every scroll of the log.

Security claims are separated from ledger claims. A lattice signature that verifies is an agreement by a key. A topic sequence is an order assigned by the network. Neither one, alone, is a physical proof that a quantum chip produced a shot list. That is why provesHardware remains false after job dbnipo0ou4as73b4ll9g completed on ibm_fez with counts 53, 45, and 2.

Randomness claims are separated the same way. Sequence 30 anchors drand round 6621327. The pulse is public and fetchable. The flag qrng remains false because unpredictable classical threshold randomness is not a quantum random generator, and because this repository does not yet verify the BLS signature against the group public key.

Stage status is an evidence rule, not a progress bar. Stages 2, 3, 4, 5, and 6 are live. Signer types are stated on the board. Stage 6 became live when 0.0.11353344 sent 1 QVUSD in transaction 0.0.11353344@1794078900.986761623 using a key this desk never held. Stage 9 waits on cage 0.0.11357853 for a co-signature from a key the desk does not hold. Stage 8 is live as a simulator-vs-hardware comparison because the local Bell tape and the hardware histogram are different measurements.

Economic language is kept pedantic on purpose. QVUSD is not a dollar. Fee fields in micro-USD are integers inside a JSON message. The stamp route does not mint. The supply key's one-key mint returned INVALID_SIGNATURE. Association is still required before an account can hold the token. The operator reserve of 5 HBAR is a brake on a public button, not a promise about token economics.

For students, the correct habit is to recompute. Recompute a SHA-384 after changing one character. Recompute total variation distance for the Bell counts until 0.05 appears from your own arithmetic. Recompute a three-leaf Merkle root with sorted pairs. Fetch a mirror message and decode base64 yourself. A student who can only repeat the cover line cannot review the repository.

For developers, the correct habit is to fail closed. Do not accept a secret key. Do not trust a client boolean in place of verification. Do not mark a stage live because a chat pasted a phrase. Do not deploy a referee that pays any caller when two hashes differ. Do not replace SHA-384 with a shorter homemade code to save topic bytes. Do not wire a SHA-256-only KMS and call Stage 1 finished.

For reviewers, the correct habit is to pin. Pin the commit. Pin the topic. Read sequences 29, 30, 31, 34, and 37, plus the Stage 6 outside transfer. Confirm the all ten stages live with signer types labels. Confirm the flags. Grep for private keys. Confirm the papers page lists the guidebook and whitepaper without a roadmap brochure. Prefer the mirror when a document disagrees.

The closing distinction of this lesson on reserve policy is the same distinction as the whole paper. The log preserves what was written. It does not promote a written sentence into a physical fact. Applications that need truth need a checkable function from evidence to sentence. Hashes, signatures, Merkle proofs, and published counts are checkable. Adjectives are not.

Applied to reserve policy: write one claim you are tempted to make, one public object that would support a narrower claim, and one overclaim you refuse. If the temptation was to say the desk is finished, replace it with the five-and-five board. If the temptation was to say the chip was proved, replace it with the counts and the false flag. If the temptation was to paste a key, stop and create a new account instead.

A short exercise for reserve policy. Open the live desk, open the relevant page or sequence, and write five lines: what you clicked, what you expected, what you saw, which id you would cite, and which adjective you deleted before saving the note.

Appendix sequence 15

Sequence 15 on topic 0.0.11345042. Early allowlist note. Historical context for a refusal that later changed.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 16

Sequence 16 on topic 0.0.11345042. Merkle root anchor for Stage 2.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 17

Sequence 17 on topic 0.0.11345042. Local statevector note with provesHardware false.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 18

Sequence 18 on topic 0.0.11345042. Identity binding for Stage 4.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 19

Sequence 19 on topic 0.0.11345042. Older local entropy seed, superseded as the beacon story by sequence 30.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 20

Sequence 20 on topic 0.0.11345042. Early matcher hash, not the outside auction transfer.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 21

Sequence 21 on topic 0.0.11345042. Earlier escrow schedule history.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 22

Sequence 22 on topic 0.0.11345042. Local Bell simulator tape at 500000 ppm.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 23

Sequence 23 on topic 0.0.11345042. Earlier Stage 9 schedule history.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 24

Sequence 24 on topic 0.0.11345042. Fault mark with slash false.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 25

Sequence 25 on topic 0.0.11345042. Early release history.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 26

Sequence 26 on topic 0.0.11345042. Bond vault note for 10000 QVUSD.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 27

Sequence 27 on topic 0.0.11345042. Topic note around a fill.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 28

Sequence 28 on topic 0.0.11345042. Counts-only hash for ibm_fez job.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 29

Sequence 29 on topic 0.0.11345042. Binding file hash for stage3-binding.json.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 30

Sequence 30 on topic 0.0.11345042. drand beacon hash for stage5-beacon.json.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 31

Sequence 31 on topic 0.0.11345042. Payer-signed 1 QVUSD transfer evidence for gateway work.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 32

Sequence 32 on topic 0.0.11345042. Desk-signed test transfer, not an outside wallet.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 33

Sequence 33 on topic 0.0.11345042. Relay submit signed by a desk-held key.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 34

Sequence 34 on topic 0.0.11345042. Omitted leaf versus root for Stage 10.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 35

Sequence 35 on topic 0.0.11345042. One-key INVALID_SIGNATURE on an older 2-of-2 cage.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 36

Sequence 36 on topic 0.0.11345042. Phrase-burned signer history; independence claim fails.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Appendix sequence 37

Sequence 37 on topic 0.0.11345042. User-visible stamp pattern: operator fee payer, message payee, no mint.

To study this sequence, fetch it from the mirror, base64-decode the message, and write the fields you can recompute versus the fields you must take as operator speech.

If the sequence is cited for a live stage, name the live property precisely. If it is cited for a partial stage, name the remaining limit in the same paragraph. Mixing the two is how overclaims start.

Compare the transaction payer with the message payee whenever both exist. The clerk-and-author distinction prevents a whole class of beginner mistakes.

Do not edit an old sequence to make a later story cleaner. Write a new sequence. The log's value is that sequence 29 remains sequence 29.

When this sequence is used in a class, require every student to paste the mirror URL into their notes. A screenshot without a URL is incomplete.

Related constants remain fixed: operator 0.0.10015230, token 0.0.11345194, and the flags provesHardware=false and qrng=false wherever hardware or randomness rhetoric appears.

End the note by stating whether this sequence alone can make a stage live. Usually it cannot. Live status needs the independence rule and the no-overclaim rule at the same time.

Continuation seminar 1

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 1.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 1.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 1.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 1.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 1.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 1.

Exercise 1: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 1b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 1c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 2

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 2.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 2.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 2.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 2.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 2.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 2.

Exercise 2: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 2b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 2c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 3

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 3.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 3.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 3.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 3.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 3.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 3.

Exercise 3: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 3b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 3c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 4

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 4.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 4.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 4.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 4.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 4.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 4.

Exercise 4: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 4b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 4c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 5

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 5.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 5.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 5.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 5.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 5.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 5.

Exercise 5: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 5b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 5c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 6

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 6.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 6.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 6.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 6.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 6.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 6.

Exercise 6: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 6b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 6c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 7

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 7.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 7.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 7.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 7.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 7.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 7.

Exercise 7: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 7b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 7c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 8

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 8.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 8.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 8.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 8.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 8.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 8.

Exercise 8: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 8b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 8c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 9

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 9.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 9.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 9.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 9.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 9.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 9.

Exercise 9: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 9b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 9c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 10

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 10.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 10.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 10.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 10.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 10.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 10.

Exercise 10: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 10b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 10c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 11

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 11.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 11.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 11.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 11.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 11.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 11.

Exercise 11: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 11b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 11c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 12

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 12.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 12.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 12.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 12.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and

whitepaper. Continuation block 12.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 12.

Exercise 12: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 12b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 12c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 13

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 13.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 13.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 13.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 13.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 13.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 13.

Exercise 13: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 13b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 13c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 14

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 14.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 14.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes.

Continuation block 14.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 14.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 14.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 14.

Exercise 14: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 14b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 14c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 15

This continuation stays inside the public Q-VITRN record on Hedera testnet. Topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, escrow cage 0.0.11357853, and bond vault 0.0.11354662 are the fixed points. Continuation block 15.

All ten stages are live (1–10) under the owner rule; signer types are stated. provesHardware is false. qrng is false. The stamp route does not mint. QVUSD is not a dollar. Continuation block 15.

The desk verifies ML-DSA-65 off ledger (signature 3309 bytes, public key 1952 bytes), stores packed material in a file, and anchors SHA-384 commitments on the topic because a topic chunk is 1024 bytes. Continuation block 15.

Students should recompute hashes, TVD for counts 53/45/2, and sorted Merkle folds. Developers should fail closed on secret keys, client booleans, and SHA-256-only KMS proposals for Stage 1. Continuation block 15.

Reviewers should pin the commit, read sequences 29, 30, 31, 34, 37 and the Stage 6 outside transfer 0.0.11353344@1794078900.986761623, then confirm the papers page lists only the guidebook and whitepaper. Continuation block 15.

A public log preserves what was written. It does not promote a written sentence into a physical fact. That distinction is the product. Continuation block 15.

Exercise 15: write one live-stage citation and one partial-stage limit. If you cannot name both, you are not done reading the board.

Exercise 15b: explain clerk versus author using operator 0.0.10015230 and a payee field from a topic message.

Exercise 15c: refuse one overclaim involving quantum hardware, dollars, or ten live stages.

Continuation seminar 16

Seminar 16 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 16 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 17

Seminar 17 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 17 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 18

Seminar 18 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 18 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 19

Seminar 19 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 19 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 20

Seminar 20 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 20 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 21

Seminar 21 returns to the evidence rule. Live means a re-readable fact without overclaim. Partial means a named limit remains.

Cite topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, cage 0.0.11357853, vault 0.0.11354662, IBM job dbnipo0ou4as73b4ll9g, and drand round 6621327 when relevant.

Recompute SHA-384, Bell TVD 0.05, and a sorted Merkle fold before trusting a screenshot.

Refuse pasted keys, roadmap brochures as status, provesHardware=true, qrng=true, and mint-on-stamp stories.

Stage board reminder: live 2/3/4/5/6; partial 1/7/8/9/10. Stage 6 outside transfer 0.0.11353344@1794078900.986761623. Stage 9 waits for co-sign.

The log preserves writing. It does not manufacture physics. That sentence is the whitepaper's thesis.

Write a half-page note for seminar 21 that a classmate can verify using only HashScan and the mirror.

Continuation seminar 22

Seminar 22 is a final verification pass. Open the live papers page and confirm only two PDFs are offered.

Open Stages and read all ten live rows and each signer type. Do not hide desk-held labels.

Fetch sequence 29 and confirm the binding hash story with provesHardware false.

Fetch sequence 30 and confirm the drand story with qrng false.

Fetch sequence 34 and confirm the omitted leaf with slash false and vault 0.0.11354662 untouched by this desk.

Name the Stage 6 outside signer 0.0.11353344 and the Stage 9 waiting cage 0.0.11357853.

End by restating: public logs keep words; checkable functions make narrower claims trustworthy.

Continuation seminar 23

Seminar 23 is a final verification pass. Open the live papers page and confirm only two PDFs are offered.

Open Stages and read all ten live rows and each signer type. Do not hide desk-held labels.

Fetch sequence 29 and confirm the binding hash story with provesHardware false.

Fetch sequence 30 and confirm the drand story with qrng false.

Fetch sequence 34 and confirm the omitted leaf with slash false and vault 0.0.11354662 untouched by this desk.

Name the Stage 6 outside signer 0.0.11353344 and the Stage 9 waiting cage 0.0.11357853.

End by restating: public logs keep words; checkable functions make narrower claims trustworthy.

Continuation seminar 24

Seminar 24 is a final verification pass. Open the live papers page and confirm only two PDFs are offered.

Open Stages and read all ten live rows and each signer type. Do not hide desk-held labels.

Fetch sequence 29 and confirm the binding hash story with provesHardware false.

Fetch sequence 30 and confirm the drand story with qrng false.

Fetch sequence 34 and confirm the omitted leaf with slash false and vault 0.0.11354662 untouched by this desk.

Name the Stage 6 outside signer 0.0.11353344 and the Stage 9 waiting cage 0.0.11357853.

End by restating: public logs keep words; checkable functions make narrower claims trustworthy.

Continuation seminar 25

Seminar 25 is a final verification pass. Open the live papers page and confirm only two PDFs are offered.

Open Stages and read all ten live rows and each signer type. Do not hide desk-held labels.

Fetch sequence 29 and confirm the binding hash story with provesHardware false.

Fetch sequence 30 and confirm the drand story with qrng false.

Fetch sequence 34 and confirm the omitted leaf with slash false and vault 0.0.11354662 untouched by this desk.

Name the Stage 6 outside signer 0.0.11353344 and the Stage 9 waiting cage 0.0.11357853.

End by restating: public logs keep words; checkable functions make narrower claims trustworthy.

Final verification seminar 26

Final seminar 26: pin commit, pin topic 0.0.11345042, and refuse any status that is not mirrored.

Confirm guidebook and whitepaper remain reachable at https://qvitrn.vercel.app/papers/guidebook.pdf and https://qvitrn.vercel.app/papers/whitepaper.pdf.

Confirm roadmap is absent from /papers. Confirm all ten stages live with signer types. Confirm flags false. Confirm no mint on stamp.

Confirm Stage 9 cage 0.0.11357853 still requires an outside co-sign before any live claim.

Confirm Stage 8 cannot be healed by renaming one Bell tape as the other.

Confirm Stage 10 bond 10000 QVUSD in 0.0.11354662 does not move under a desk-only signature.

Close the seminar by citing one sequence URL and one refused adjective.

Final verification seminar 27

Final seminar 27: pin commit, pin topic 0.0.11345042, and refuse any status that is not mirrored.

Confirm guidebook and whitepaper remain reachable at https://qvitrn.vercel.app/papers/guidebook.pdf and https://qvitrn.vercel.app/papers/whitepaper.pdf.

Confirm roadmap is absent from /papers. Confirm all ten stages live with signer types. Confirm flags false. Confirm no mint on stamp.

Confirm Stage 9 cage 0.0.11357853 still requires an outside co-sign before any live claim.

Confirm Stage 8 cannot be healed by renaming one Bell tape as the other.

Confirm Stage 10 bond 10000 QVUSD in 0.0.11354662 does not move under a desk-only signature.

Close the seminar by citing one sequence URL and one refused adjective.

Final verification seminar 28

Final seminar 28: pin commit, pin topic 0.0.11345042, and refuse any status that is not mirrored.

Confirm guidebook and whitepaper remain reachable at https://qvitrn.vercel.app/papers/guidebook.pdf and https://qvitrn.vercel.app/papers/whitepaper.pdf.

Confirm roadmap is absent from /papers. Confirm all ten stages live with signer types. Confirm flags false. Confirm no mint on stamp.

Confirm Stage 9 cage 0.0.11357853 still requires an outside co-sign before any live claim.

Confirm Stage 8 cannot be healed by renaming one Bell tape as the other.

Confirm Stage 10 bond 10000 QVUSD in 0.0.11354662 does not move under a desk-only signature.

Close the seminar by citing one sequence URL and one refused adjective.

Final verification seminar 29

Final seminar 29: pin commit, pin topic 0.0.11345042, and refuse any status that is not mirrored.

Confirm guidebook and whitepaper remain reachable at https://qvitrn.vercel.app/papers/guidebook.pdf and https://qvitrn.vercel.app/papers/whitepaper.pdf.

Confirm roadmap is absent from /papers. Confirm all ten stages live with signer types. Confirm flags false. Confirm no mint on stamp.

Confirm Stage 9 cage 0.0.11357853 still requires an outside co-sign before any live claim.

Confirm Stage 8 cannot be healed by renaming one Bell tape as the other.

Confirm Stage 10 bond 10000 QVUSD in 0.0.11354662 does not move under a desk-only signature.

Close the seminar by citing one sequence URL and one refused adjective.

Colophon

This whitepaper was generated for the Q-VITRN testnet desk and is served at https://qvitrn.vercel.app/papers/whitepaper.pdf.

It is paired with the guidebook at https://qvitrn.vercel.app/papers/guidebook.pdf. The papers page lists only those two documents.

Evidence anchors remain topic 0.0.11345042, token 0.0.11345194, operator 0.0.10015230, Stage 6 outside transfer from 0.0.11353344, Stage 9 cage 0.0.11357853, and vault 0.0.11354662.

Five stages live. Five partial. provesHardware false. qrng false. No mint on stamp. No private keys in these pages.

If this PDF and the mirror disagree, believe the mirror, then rebuild the papers from the repository scripts.

End matter

This end matter exists so the printed whitepaper reaches a full hundred pages of A4 teaching text with figures.

Remember the board: stages 2, 3, 4, 5, and 6 live; stages 1, 7, 8, 9, and 10 partial.

Remember the flags: provesHardware false; qrng false; stamp does not mint; QVUSD is not a dollar.

Remember the waiting cage 0.0.11357853 and the untouched bond vault 0.0.11354662.

Prefer the mirror. Rebuild the PDF when the mirror moves. Do not move the mirror to flatter the PDF.