

Keep the release train. Fix the boundaries.

Modular monolith vs microservices for an 18-engineer B2B commerce platform.

DOCUMENT CONTROL

STATUS	Proposed decision
CONFIDENCE	Provisional
HORIZON	12 months
CASE	Fictional demonstration

01 / EXECUTIVE DECISION

Approve a bounded modular-monolith pilot.

Preserve one release train while enforcing module APIs, data ownership, durable downstream processing and measurable gates.

RECOMMENDATION / OPTION B

Fund an 8 engineer-week pilot. Do not fund broad service extraction yet.

The demonstrated constraint is change coupling. Independent operations, hard isolation and per-domain scale remain unproven.

71 weighted score / 100

K01-K05

4 wks pilot envelope

A02

4 verification gates

G01-G04

DECISION IMPLICATION

Authorize the pilot only. Re-score if hard isolation or independent-release demand becomes mandatory.

Growth has exposed coordination cost before infrastructure limits.

Decision scope: architecture direction for the next 12 months; no production telemetry or source repository was supplied.

S01

TEAM + DELIVERY

18 engineers / 3 squads / 4-6 releases per week.

S02

CHANGE COUPLING

38 cross-domain package dependencies and an 18-minute pipeline.

S03

DATA PRESSURE

240 shared tables; reporting I/O may contend with checkout.

S04

LOAD ENVELOPE

600 peak RPS and 5K CCU; neither proves domain-specific scale.

DECISION IMPLICATION

The investment question is how to reduce change coupling without buying distributed-system cost before it is justified.

03 / DECISION DRIVERS

Five criteria make the trade-off challengeable.

Weights are declared judgment inputs. Scores are ordinal preferences, not success probabilities.

ID	CRITERION	WEIGHT	DECISION QUESTION
K01	Delivery improvement	30%	Reduce regression and coordination scope
K02	Operational simplicity	25%	Avoid platform load the team cannot sustain
K03	Release autonomy	20%	Enable accountable independent change where needed
K04	Migration safety	15%	Preserve rollback and limit coexistence risk
K05	Independent scale	10%	Isolate only demonstrated pressure paths

DECISION IMPLICATION

Weights favor near-term delivery and operational simplicity; sensitivity explicitly tests a future autonomy-heavy scenario.

04 / STAKEHOLDERS AND CONCERNS

Each reader gets a view that answers a specific question.

Stakeholder-to-concern mapping follows the ISO 42010 viewpoint mindset without claiming certification.

STAKEHOLDER	CONCERN	QUESTION	PRIMARY VIEW
CEO	Funding	What is approved, capped and reversible?	P02 / P28
CTO	Direction	Why this option and what changes it?	P16-P19
Engineering lead	Boundaries	What dependencies and ownership rules apply?	P21-P23
SRE	Failure	Where can runtime and deployment fail?	P09 / P25
Security	Trust	What crosses a boundary and how is it controlled?	P26
Delivery team	Execution	What must pass before expansion or release?	P27 / P34

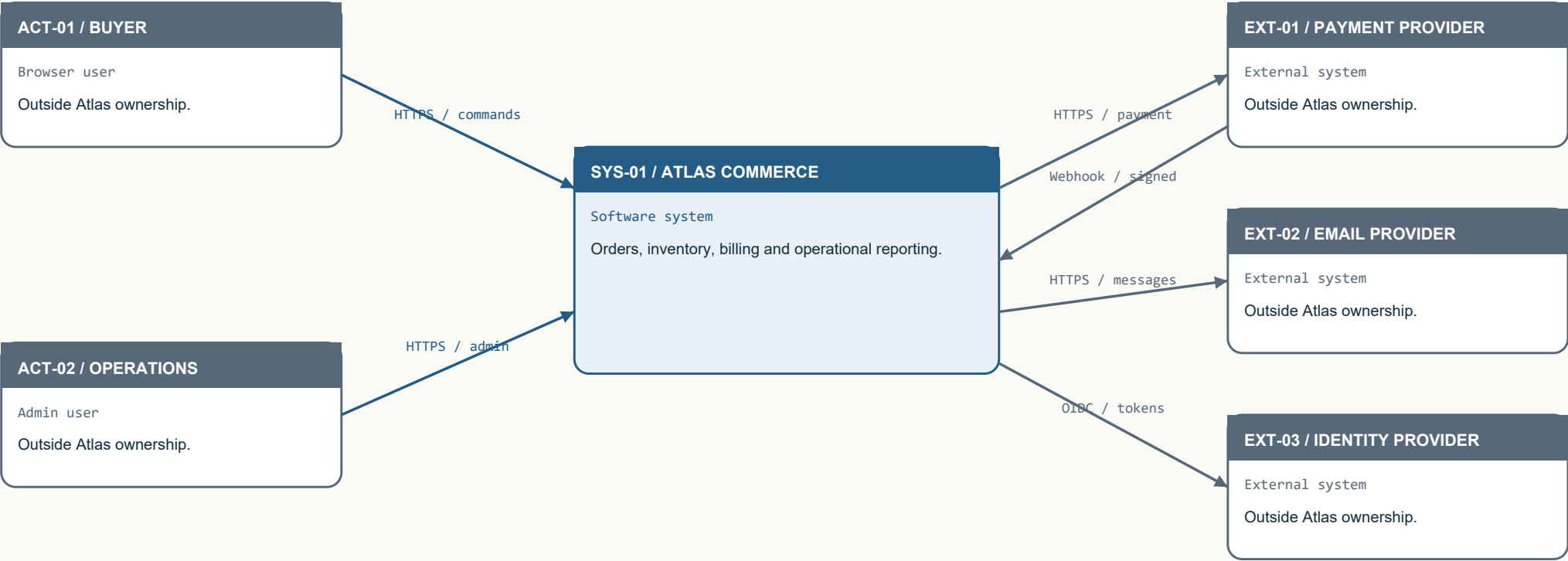
DECISION IMPLICATION

A single giant diagram would hide concerns; the dossier separates logical, runtime, deployment, data, security and transition views.

05 / SYSTEM CONTEXT

Atlas sits between four user groups and three external services.

System context / scope and directed interactions. No containers, modules or deployment zones are shown here.

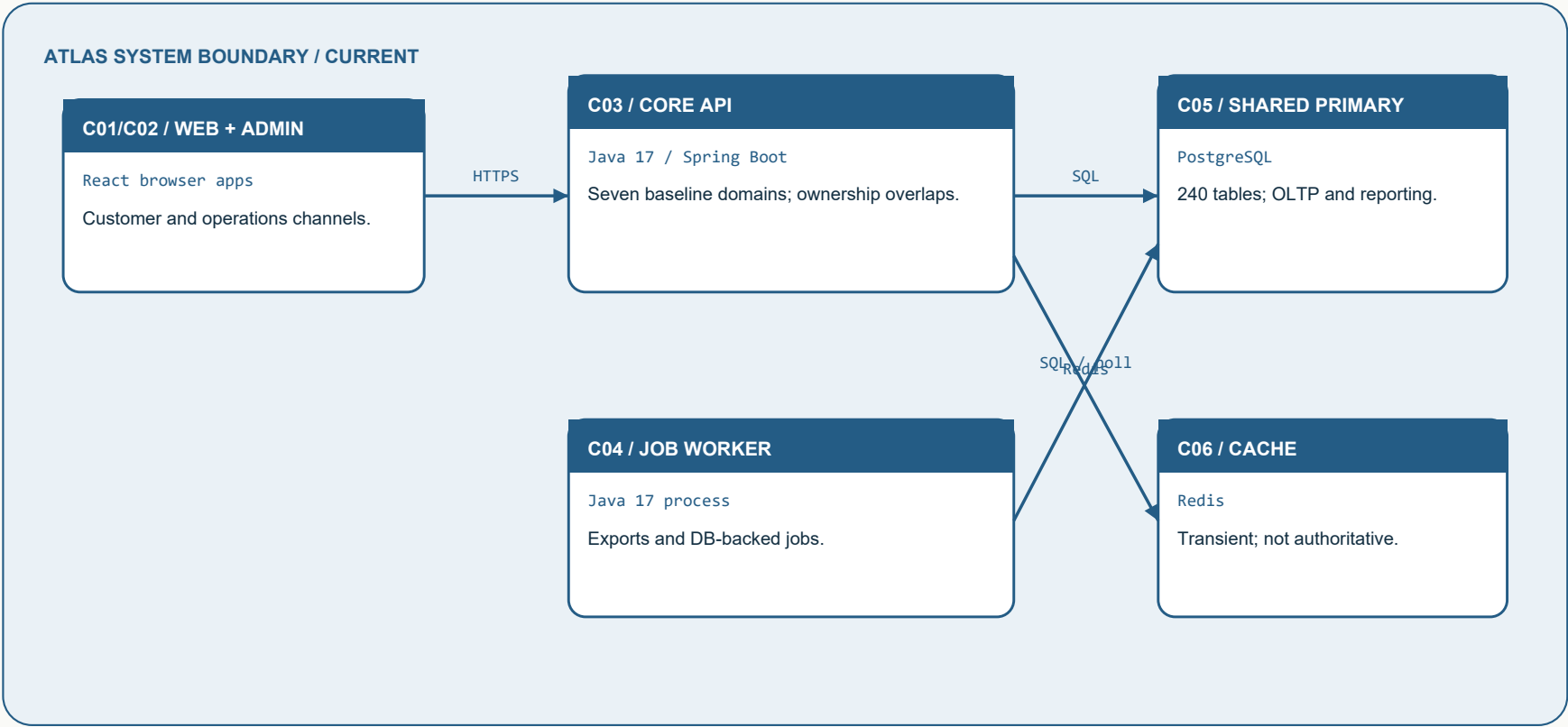


DECISION IMPLICATION

External boundaries are stable regardless of monolith or services; the decision concerns internal change and operating boundaries.

Two runtime roles share one primary data failure domain.

Current C4 container view. Solid lines are synchronous calls or SQL; dashed lines indicate durable polling.

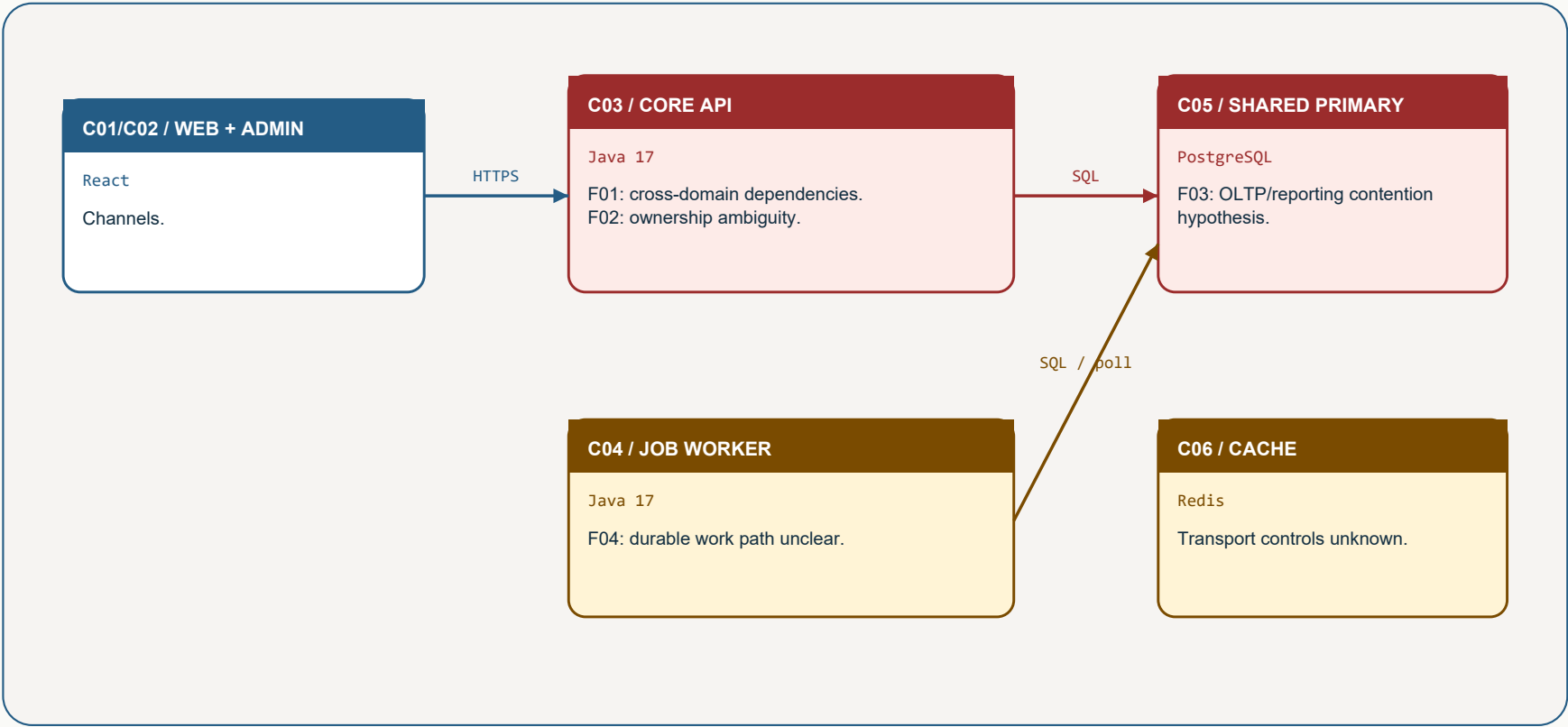


DECISION IMPLICATION

One release train is not one process: API and worker are separate runtime roles governed by the same release.

The topology stays fixed while the evidence marks pressure points.

Current-state overlay. Findings annotate the same container geometry as page 07.



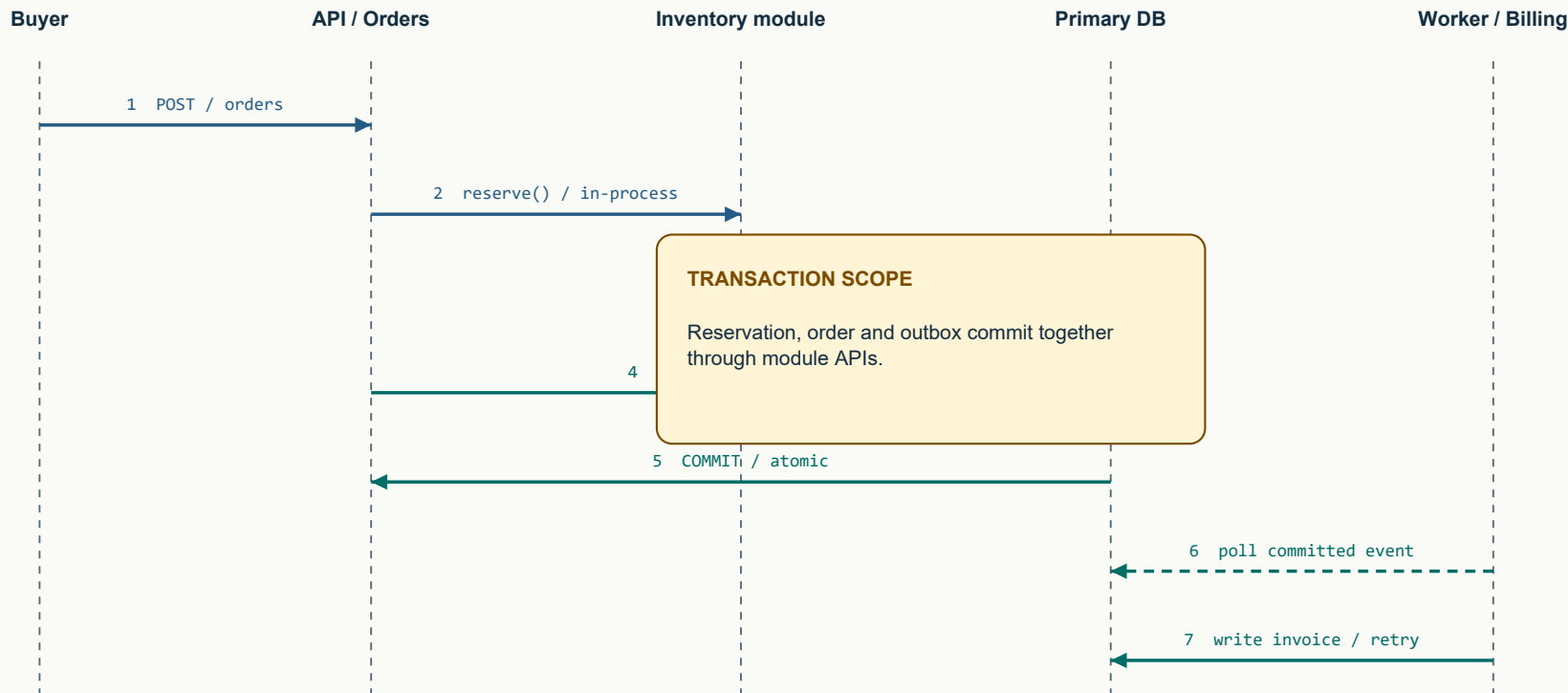
DECISION IMPLICATION

The strongest evidence supports boundary work; the database pressure case remains conditional on query attribution.

08 / CRITICAL RUNTIME

Checkout needs one atomic write and explicit failure behavior.

Current runtime view. Lifelines identify process, module and store responsibilities.

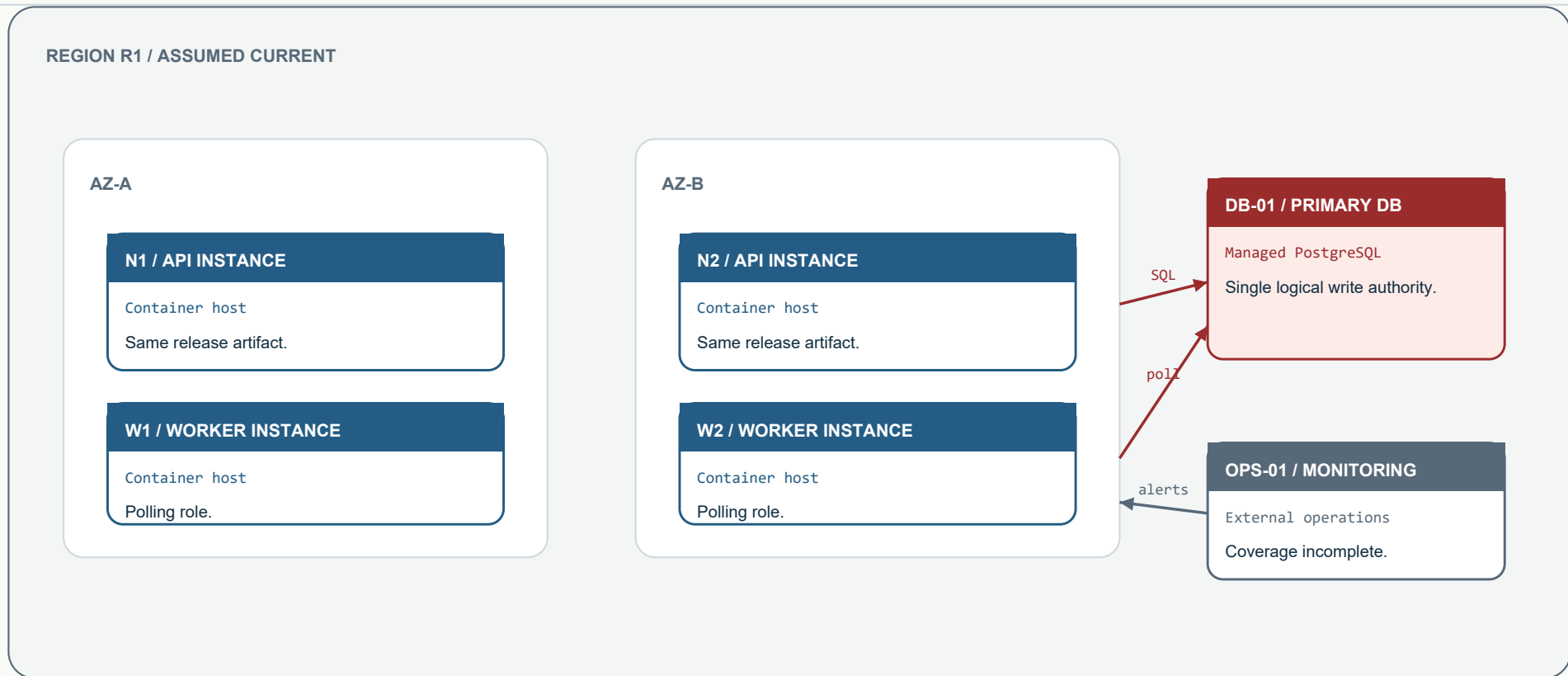
**DECISION IMPLICATION**

Crash before commit persists nothing. After commit, downstream work is at-least-once and requires idempotent effects.

09 / CURRENT DEPLOYMENT

Availability is concentrated in one regional data plane.

Deployment and failure-domain view. Counts and zones are scenario assumptions requiring client confirmation.

**DECISION IMPLICATION**

Replica count does not remove the shared database and release failure domains; target changes must map every runtime store.

10 / EVIDENCE AND CONFIDENCE

Measured-looking precision is not evidence without provenance.

Every number below is a fictional scenario input. Real engagements attach source location, window, method and limitations.

ID	INPUT	LIMITATION	CONFIDENCE	DECISION EFFECT
S01	18 engineers; 4-6 releases/week	No delivery export	MEDIUM	D01
S02	38 dependencies; 18-min pipeline	No raw graph or CI timings	MEDIUM	D01
S03	Reporting I/O spikes; 240 tables	No query attribution	LOW	D03
S04	600 RPS; 5K CCU; 3x forecast	No load profile	LOW	D01/D03
U01	Hard isolation obligations	Not supplied	UNKNOWN	May override
U03	Event retention and bootstrap	Not specified	UNKNOWN	D03

DECISION IMPLICATION Recommendation confidence remains provisional until dependency, trace, query and isolation evidence is collected.

Three findings explain the decision; one remains a hypothesis.

Findings link source inputs to a mechanism and a decision consequence.

F01

Change coupling

Cross-domain dependencies plausibly expand regression and coordination scope.

SOURCES S01 / S02

EFFECT D01

F02

Workload contention

Reporting may compete with checkout on one store; attribution is missing.

SOURCES S03 / U02

EFFECT D03 conditional

F03

Operations not justified

Independent domain operations are not required by supplied inputs.

SOURCES S01 / S04 / U01

EFFECT Reject broad C

DECISION IMPLICATION

Distribution would not directly solve F01 and could make diagnosis harder before boundaries and observability mature.

Strengthen current monolith makes a different operating commitment.

Option baseline includes implementation scope, obligations, disqualifiers and exit path.

OPTION A

Strengthen current monolith

Fails to resolve demonstrated coupling

VALUE

What it buys

Lowest transition cost

COST

What it adds

Keeps existing data and ownership ambiguity

FIT

Use when

Use only if roadmap pressure prevents a bounded pilot

EXIT

Reversal path

Normal refactor

DECISION IMPLICATION

Keep as a fallback, not the funded direction.

Modular monolith makes a different operating commitment.

Option baseline includes implementation scope, obligations, disqualifiers and exit path.

OPTION B

Modular monolith

Recommended as a capped pilot

VALUE

What it buys

Improves change boundaries inside one release train

COST

What it adds

Requires disciplined APIs, ownership and CI gates

FIT

Use when

Use when delivery coupling matters before distributed operations

EXIT

Reversal path

Selective extraction

DECISION IMPLICATION

Fund only the bounded pilot and verification gates.

Broad microservices migration makes a different operating commitment.

Option baseline includes implementation scope, obligations, disqualifiers and exit path.

OPTION C

Broad microservices migration

Disqualified for current evidence

VALUE

What it buys

Maximizes independent deployment and scale

COST

What it adds

Adds network, consistency, platform and migration load

FIT

Use when

Use only with proven autonomy, isolation or scale demand

EXIT

Reversal path

Contract and data consolidation

DECISION IMPLICATION

Reopen only when a compulsory constraint or sensitivity threshold is crossed.

13 / WEIGHTED DECISION MATRIX

Option B leads under the declared 12-month priorities.

Formula: $\text{sum}(\text{weight} \times \text{score} / 5)$. Anchors and rationale live with each criterion.

CRITERION	WEIGHT %	A / CURRENT	B / MODULAR	C / SERVICES
Delivery improvement	30	2	4	2
Operational simplicity	25	5	4	2
Release autonomy	20	2	3	5
Migration safety	15	5	3	1
Independent scale	10	2	3	5
WEIGHTED TOTAL	100	64	B / 71 PREFERRED BASE CASE	55

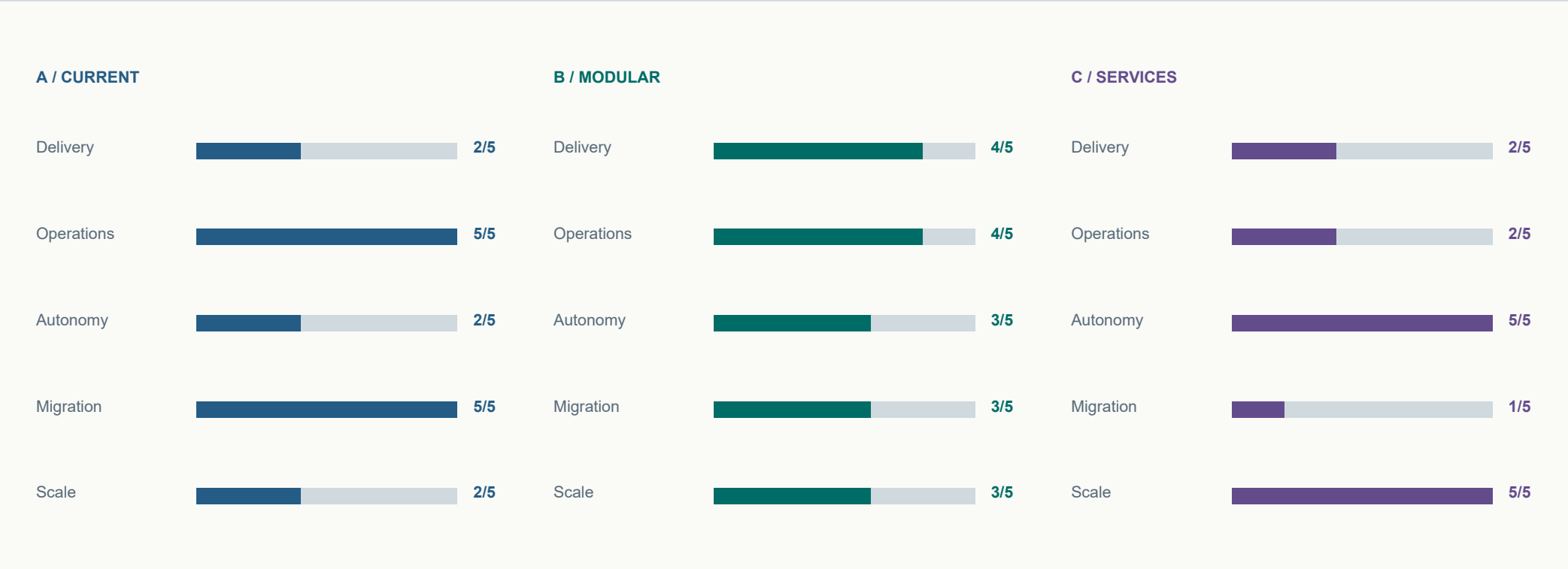
DECISION IMPLICATION

A mandatory hard-isolation constraint overrides the total. At 45% autonomy weight, C narrowly leads in sensitivity testing.

14 / TRADE-OFF PROFILE

Option B buys most boundary value without most distribution cost.

Relative profile derived from the same 1-5 rubric; higher is more favorable.



DECISION IMPLICATION

The recommendation sacrifices maximum autonomy today to preserve operational capacity and migration safety.

15 / REVERSIBILITY AND LOCK-IN

Reversibility changes by stage, not by label alone.

Exit cost includes code structure, data history, consumer contracts and operating model.

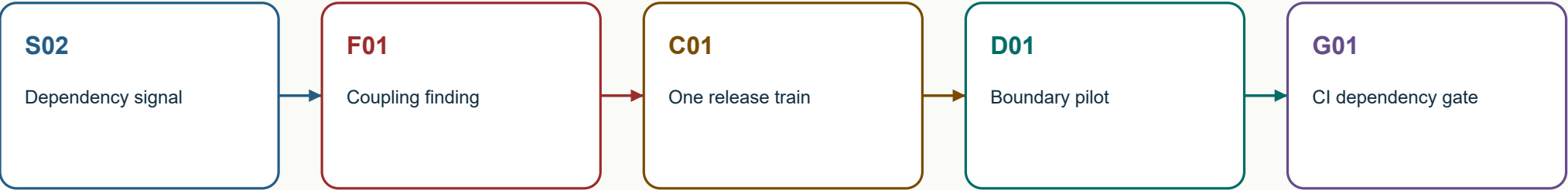
COMMITMENT	LOCK-IN	REVERSAL ACTION	RESIDUAL COST
Boundary rules	Low	Remove tests and interfaces	Loses gained control
Internal outbox	Medium	Retire after consumers drain	Retain audit/history decision
Reporting projection	Medium	Switch reader to OLTP	Freshness and rebuild remain
External services	High	Merge contracts, data and ops	Historical event and client compatibility

DECISION IMPLICATION

Pilot module boundaries first; delay external contracts and independent data histories until operating need is demonstrated.

Evidence, constraints and reversibility converge on a pilot.

Decision logic is explicit so the CTO can challenge the recommendation without reverse-engineering prose.



COUNTERARGUMENT

Traffic may grow 10x

Growth alone does not prove independent domain deployment.

RESPONSE

Recommendation unchanged

Preserve an extraction path and collect domain-specific evidence.

REOPEN

Two triggers or one mandate

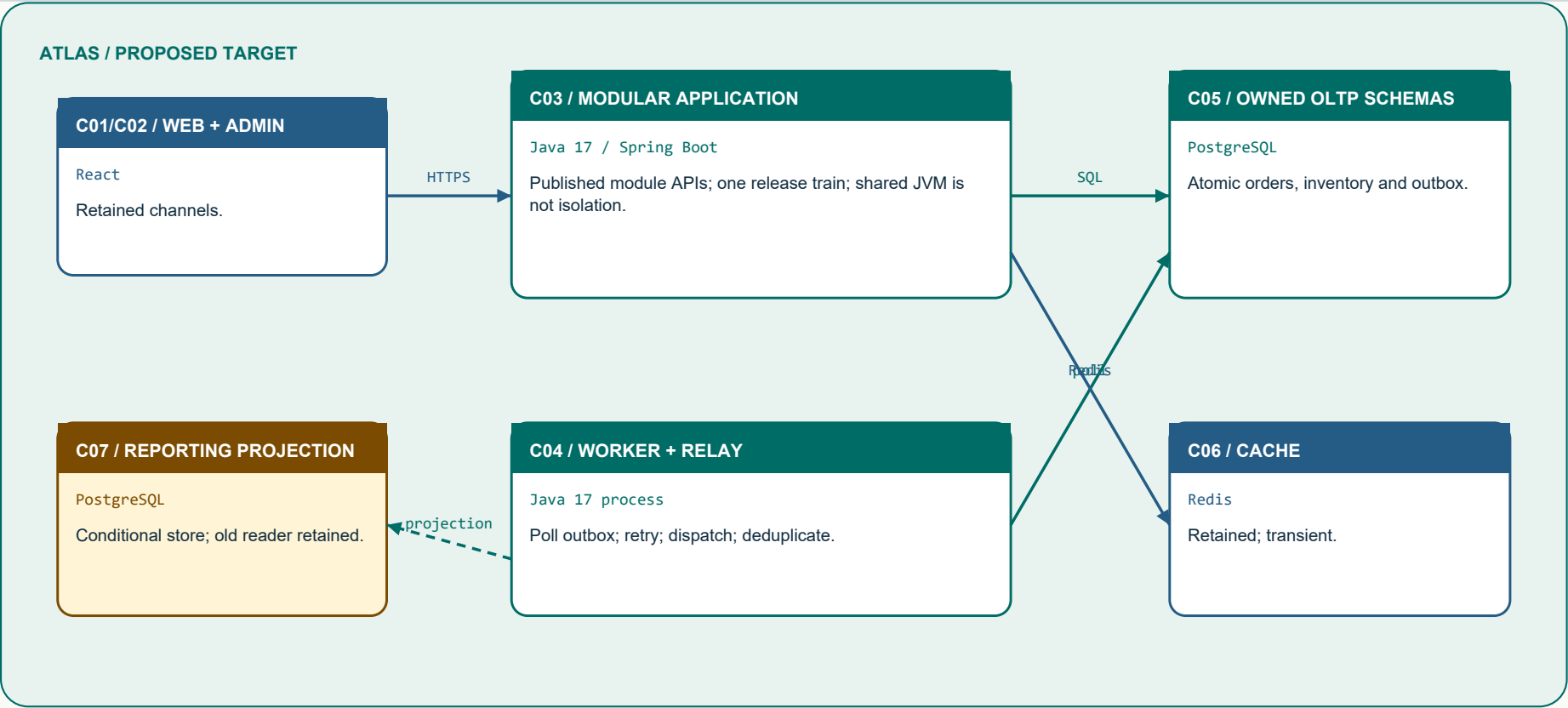
Hard isolation overrides; autonomy and scale are re-scored.

DECISION IMPLICATION

The decision is a reversible learning investment with predeclared stop and change conditions.

Add enforceable boundaries and one conditional reporting store.

Proposed C4 container view. Blue is retained; teal is target; amber remains conditional.



DECISION IMPLICATION C07 is introduced only after attribution supports D03; every runtime store is mapped again in deployment.

Six modules define responsibility inside the application boundary.

Component view. Each module publishes an interface and owns writes; no service boundary is implied.

M01 / CUSTOMERS

In-process module

Owns: organizations, accounts
Publishes: CustomerDirectory
Owner: proposed team mapping

M02 / ORDERS

In-process module

Owns: orders, items, outbox
Publishes: OrderCommands
Owner: proposed team mapping

M03 / INVENTORY

In-process module

Owns: stock, reservations, outbox
Publishes: Reservation API
Owner: proposed team mapping

M04 / BILLING

In-process module

Owns: invoices, processed_events
Publishes: OrderPlaced consumer
Owner: proposed team mapping

M05 / REPORTING

In-process module

Owns: projection, dedup keys
Publishes: Read API
Owner: proposed team mapping

M06 / PLATFORM

In-process module

Owns: no business tables
Publishes: Auth, relay, telemetry
Owner: proposed team mapping

DECISION IMPLICATION Logical ownership is enforced through module APIs and tests; shared credentials do not create a security boundary.

One writer per table makes responsibility inspectable.

Write authority, rebuild source and retention must be explicit before extraction.

TABLE / SCHEMA	WRITE OWNER	ALLOWED ACCESS	RECOVERY / RETENTION
customers.organizations	Customers	CustomerDirectory	OLTP source
orders.orders / items	Orders	OrderCommands	OLTP source
orders.outbox	Orders	Worker poll only	7-day assumed retention
inventory.stock / reservations	Inventory	Reservation API	OLTP source
billing.invoices	Billing	Event consumer	Financial record
reporting.order_projection	Reporting	Projection consumer	Rebuild: snapshot + catch-up

DECISION IMPLICATION

Schema names communicate ownership; database permissions and tests provide enforcement where feasible.

Every cross-boundary relationship has delivery semantics.

Contract register complements diagrams when full labels would obstruct routing.

ID	ROUTE	CONTRACT	MODE	FAILURE RULE
R01	Orders -> Customers	CustomerDirectory.requireActive	sync / in-process	timeout not applicable
R02	Orders -> Inventory	reserve(order_id, lines)	sync / same transaction	rollback together
R03	Orders -> Billing	OrderPlaced.v1	async / at-least-once	dedup tenant+event
R04	Orders -> Reporting	OrderPlaced.v1	async / ordered per aggregate	version check
R05	Payment -> API	payment.webhook.v1	HTTPS / signed	replay protected

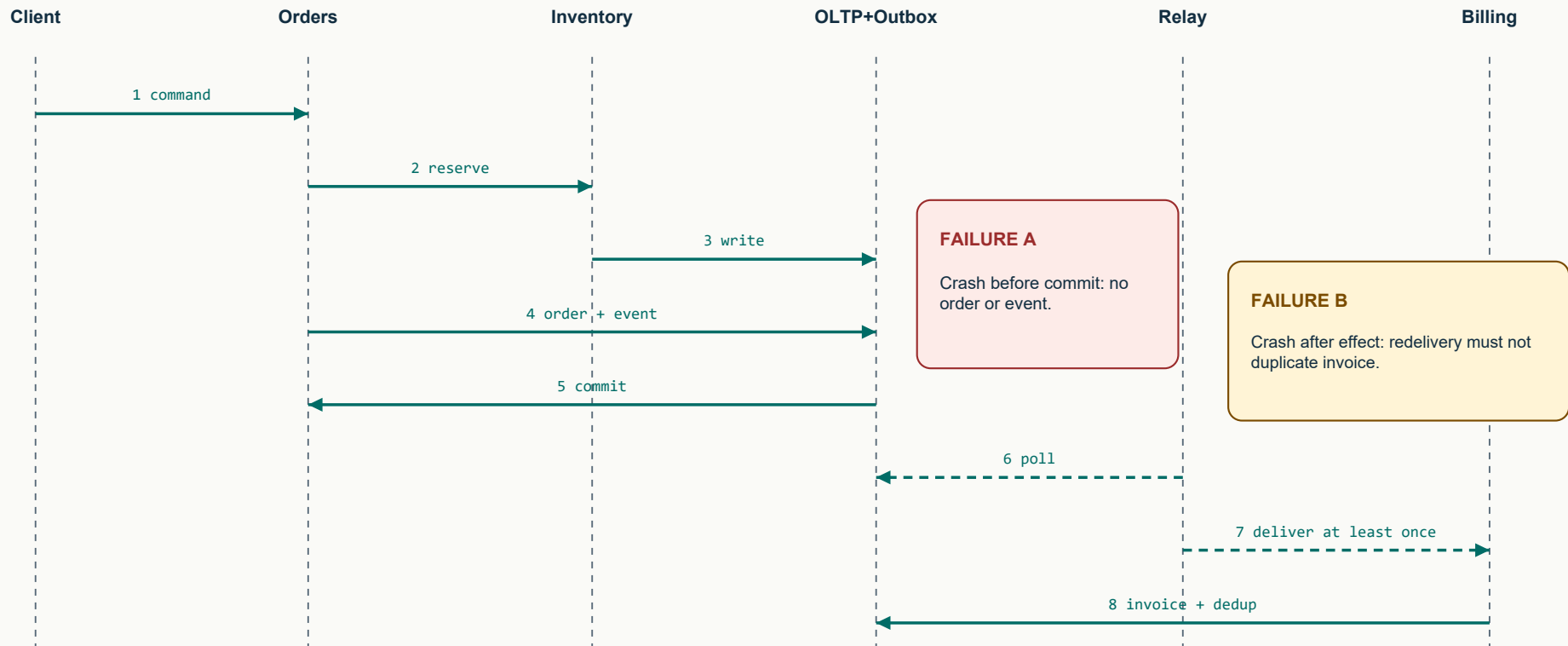
DECISION IMPLICATION

An event name without version, delivery, ordering and deduplication rules is not an implementation-ready contract.

21 / TARGET RUNTIME

Commit, deliver and deduplicate are separate proof obligations.

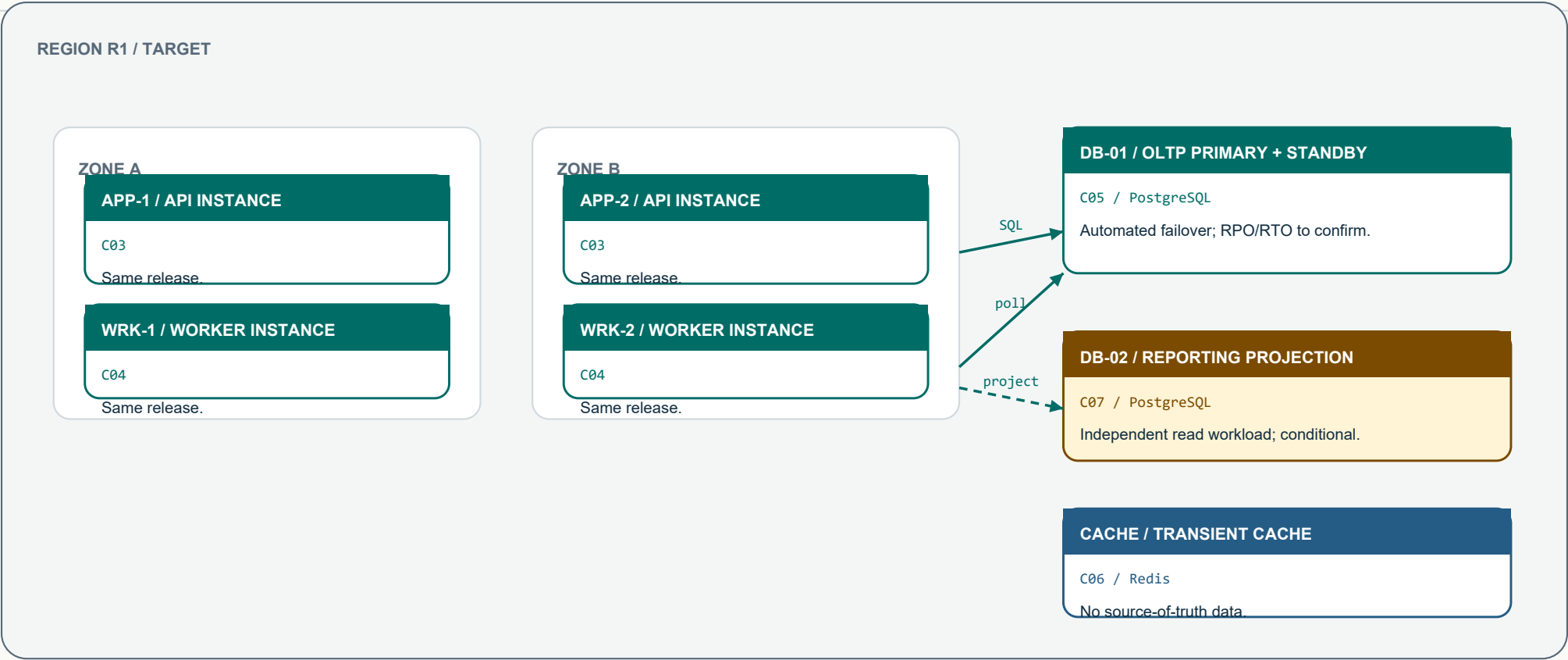
Target sequence includes crash and duplicate-delivery alternatives.

**DECISION IMPLICATION**

G03 passes only when a deliberate crash and duplicate delivery produce one financial effect.

The target maps every runtime role and store to a failure domain.

Proposed deployment; vendor-neutral. Exact region, subnet and service choices require client constraints.



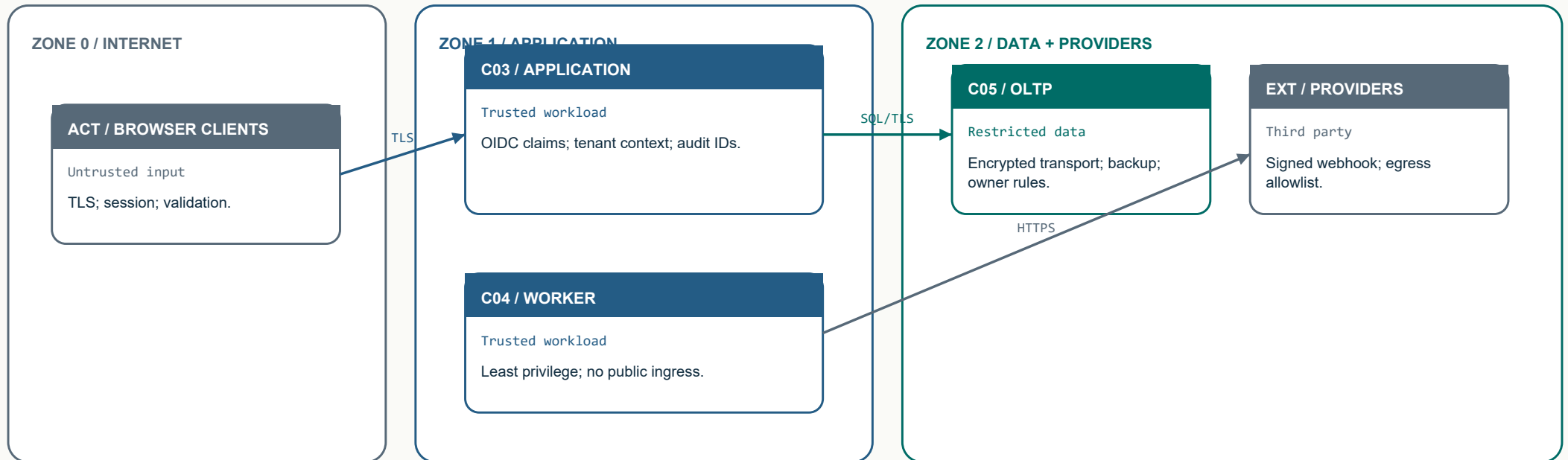
DECISION IMPLICATION

One release artifact can run API and worker roles; failure domains and release autonomy remain distinct concepts.

23 / SECURITY VIEWPOINT

Trust changes at the edge, provider and data boundaries.

Security view identifies trust zones, identity propagation and controls; it is not a penetration test.

**DECISION IMPLICATION**

U01 remains open: hard tenant or regulatory isolation could override the modular-monolith recommendation.

Rules turn the target diagram into enforceable constraints.

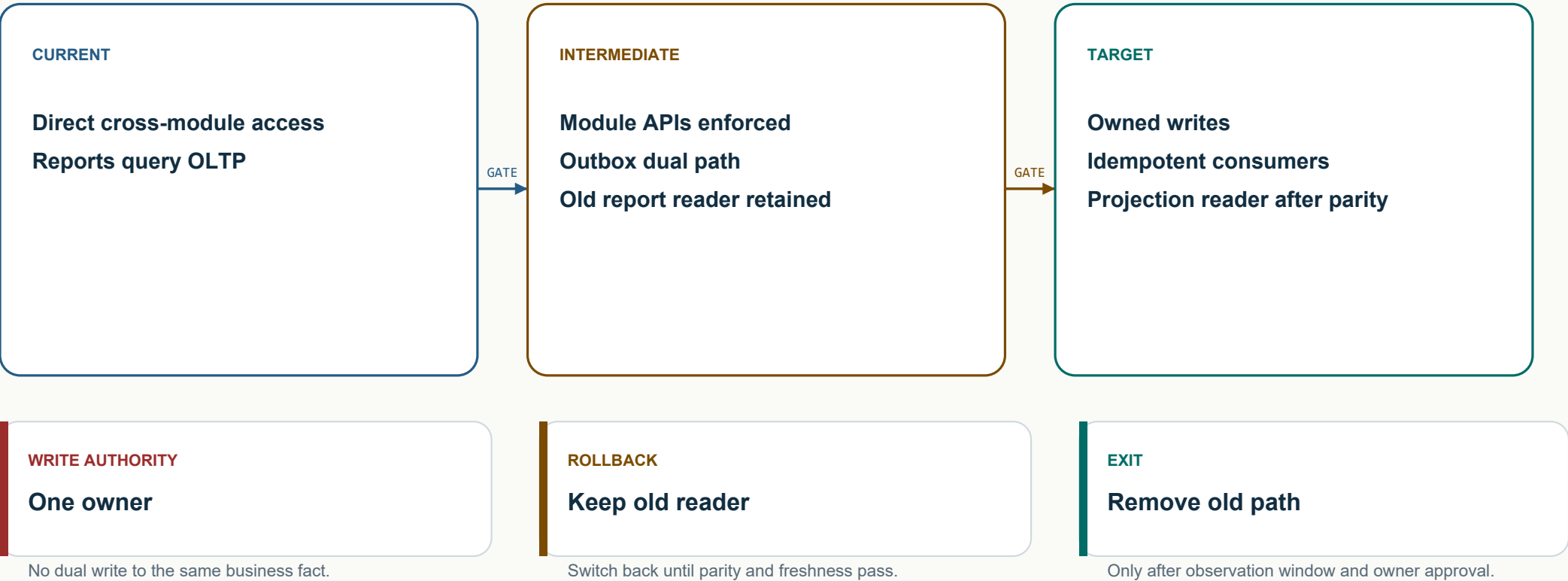
Each rule names implementation, evidence and failure behavior. File existence alone is not enforcement.

RULE	OBLIGATION	EVIDENCE	EXPECTED FAILURE
AC-01	No cross-module repository imports	Static dependency test	Reject invalid fixture
AC-02	Only owner writes module tables	Architecture test + permissions	Fail on foreign write
AC-03	Cross-module sync uses declared API	Architecture test	Fail on internal-package access
AC-04	Events are versioned and idempotent	Contract + duplicate test	Fail duplicate effect
AC-05	Service extraction requires ADR	Review gate	Hold without operating need

DECISION IMPLICATION G01 includes a negative fixture so a passing pipeline proves the rule can detect the prohibited dependency.

Move through a coexistence state with one write authority.

Transition view separates current, intermediate and target states; rollback remains valid until the reader switch.

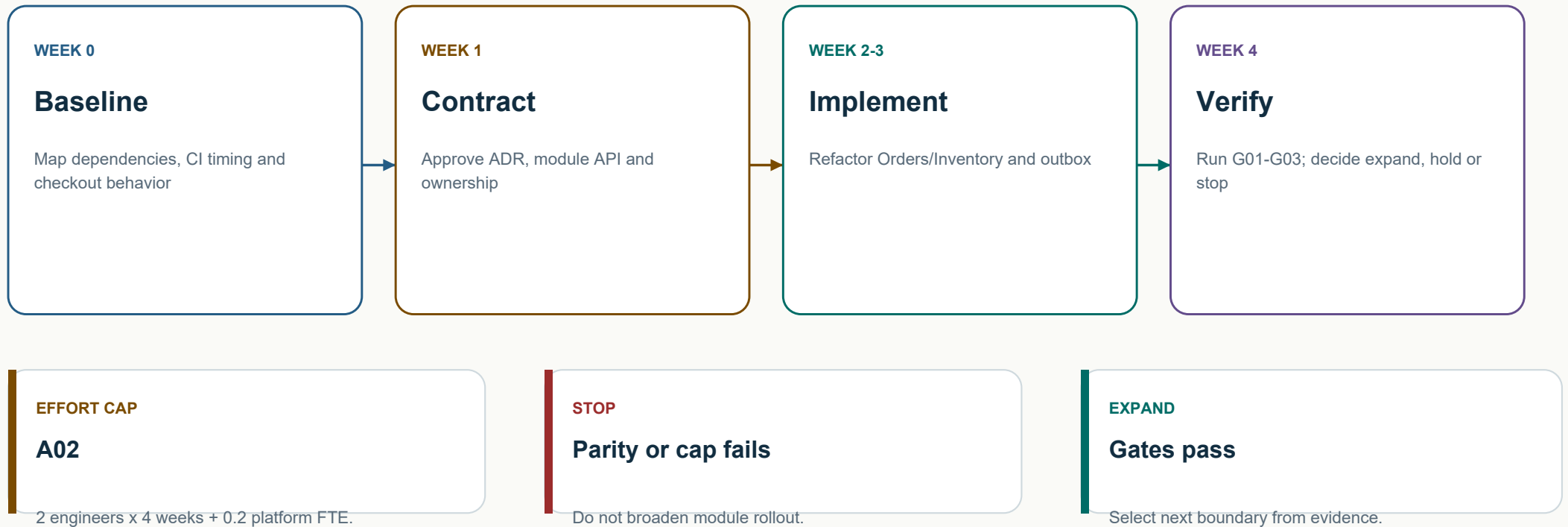


DECISION IMPLICATION Rollback becomes harder after consumers build history; record the no-return point explicitly.

26 / PILOT ROADMAP

Four weeks prove the boundary before broader investment.

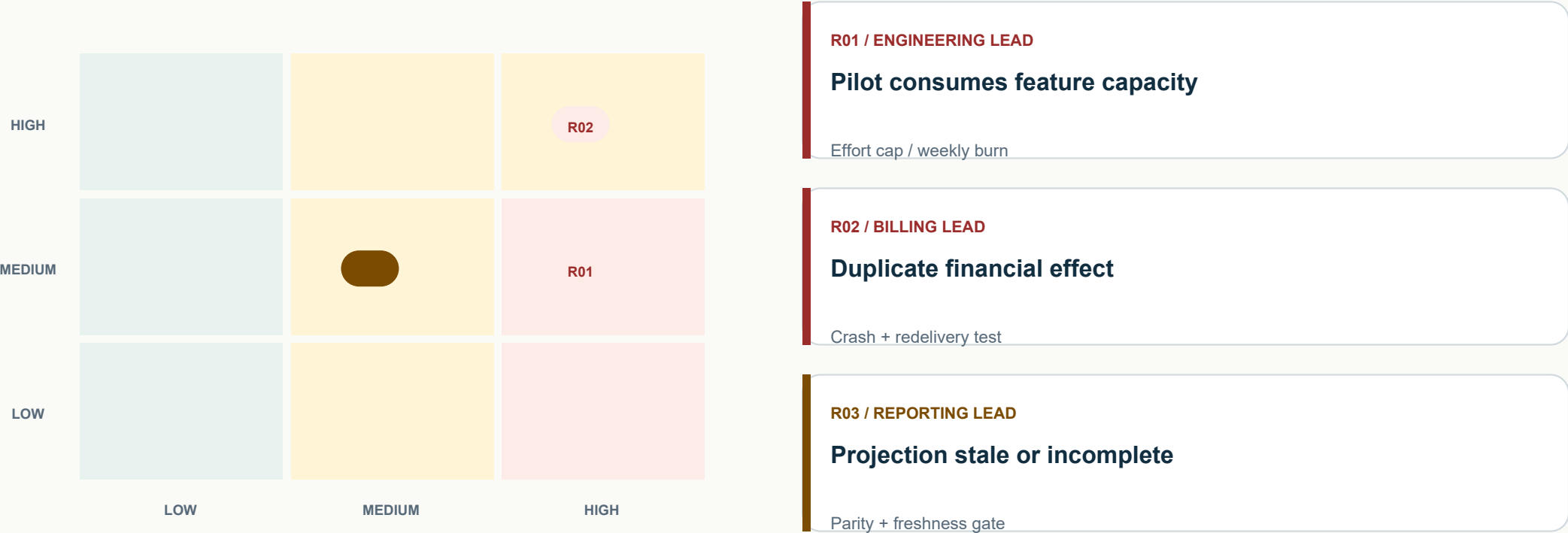
Dates beyond the pilot remain uncommitted. Expansion depends on evidence, not calendar completion.

**DECISION IMPLICATION**

This is a learning investment with a bounded loss, not a 90-day transformation promise.

Three material risks have owners and verification paths.

Likelihood is provisional; impact and placement must be confirmed with accountable owners.



DECISION IMPLICATION No risk closes because a document exists; each mitigation ends in observable evidence.

28 / CHANGE-MY-MIND CONDITIONS

One mandatory constraint or two material triggers reopen the decision.

Re-score instead of defending last year's architecture.

IMMEDIATE OVERRIDE

- Hard regulatory or tenant isolation is mandatory.
- A domain requires materially different availability.
- Teams need independent release authority.

TWO-TRIGGER REVIEW

- A domain has a stable boundary and separate scale profile.
- Distributed tracing, SLOs and on-call are mature.
- Pilot gates fail under the shared release model.

DECISION IMPLICATION

Traffic growth by itself is evidence to measure, not an automatic instruction to distribute the system.

ADR-001 records both the choice and its limits.

Status: Proposed. Decider: client CTO. Confirmation requires acceptance of assumptions and pilot envelope.

ADR FIELD	RECORDED VALUE
Context	Change coupling is supported; independent operations are not.
Decision	Pilot enforceable modules in one release train; conditional report projection.
Alternatives	Strengthen current monolith; broad service migration.
Consequences	Better ownership; new outbox/projection obligations; no hard isolation.
Change conditions	Mandatory isolation or two material autonomy/scale/operations triggers.
Confirmation	Client CTO accepts A01-A05, G01-G04 and effort cap A02.
DECISION IMPLICATION	The ADR is repository-ready and links directly to scorecard, risks, gates and change conditions.

The approved decision becomes a constrained execution map.

The pack reduces interpretation drift; it does not guarantee autonomous implementation correctness.

REPOSITORY MAP

```
AGENTS.md
+-- ARCHITECTURE.md
+-- product/SPEC.md
+-- decisions/ADR-001.md
+-- plans/implementation-plan.md
+-- tasks/task-graph.md
+-- quality/architecture-policy.json
+-- quality/definition-of-done.md
+-- tests/golden-tests.md
```

GATE	OBLIGATION	REQUIRED EVIDENCE
G01	Dependency rule	Static check + negative fixture
G02	Checkout parity	Golden tests + fixed load
G03	Idempotency	Crash + redelivery test
G04	Projection	Parity + freshness <=60s assumed

DECISION IMPLICATION

Human approval remains mandatory for destructive migration, architecture change and production release.

Every recommendation terminates in evidence or an explicit unknown.

Closeout view for executive review and implementation handoff.

INPUT	FINDING	DECISION	GATE	COMPLETION EVIDENCE
S02	F01	D01	G01/G02	Dependency output + golden tests
S03/U02	F02	D03 conditional	G04	Query attribution + parity/freshness
S01/S04/U01	F03	Reject broad C	Change rule	Isolation/autonomy evidence
A02/R01	Pilot envelope	Bound loss	Weekly cap	Effort record + owner decision

NEXT ACCOUNTABLE DECISION

After Gate 04: expand the modular pattern, hold for remediation, or reopen the architecture based on newly collected evidence.

DECISION IMPLICATION

Recommendation: approve the pilot, preserve the rollback path and fund broader change only after the gates earn it.