

How to Build a Governed Marketplace for Infrastructure Capacity

If you run finite physical capacity (port berths, charging stations, warehouse slots, airspace corridors, spectrum, compute) and want to let credentialed parties trade access to it without a single cloud operator holding the trust, this guide describes an architectural approach for doing it. The approach is disclosed in U.S. Provisional Application No. 64/049,409 as the Governed Marketplace inventive step. This is a design you implement yourself, not a shipping library.

What You Are Building

You have a finite, physical resource that other parties want timed access to. It might be berths at a port, charging stalls in a depot, slots in a warehouse dock, a corridor of airspace, a block of radio spectrum, or metered compute. Multiple parties want to reserve it, use it, and pay for it, and you want that trade to happen without everyone having to trust a single platform operator to hold the identities, the settlement, the reputation, and the audit trail.

The naive version of this is a booking API with a central database. The problem the searcher usually has is one layer deeper: they want allocation to be provably tied to who is eligible, provably grounded in the physical world (the party is actually at the berth,

actually holds the spectrum license, actually showed up in the reservation window), and provably reconstructable after the fact by every party to the trade and by a regulator, without any of those guarantees living inside one operator's private ledger.

This guide describes an architecture for that, drawn from the Governed Marketplace inventive step disclosed in U.S. Provisional Application No. 64/049,409. In that disclosure, a marketplace is treated as a configurable primitive over a shared governance chain, and "capacity exchange" is one parameterization of it: place-governing agents offer capability-envelope allocations, and reservations settle as paired observations between credentialed parties.

Why the Obvious Approaches Fall Short

The centralized booking platform works, and for many businesses it is the right call. Its structural cost is that the operator becomes the trust root. Identities are platform-specific accounts, so a party's history lives in one silo and does not travel. The transaction log is internal and is not independently reconstructable by the two parties who actually transacted, or by a regulator, except through the operator. And if the operator is retired or replaced, the transaction history is bound up with the platform and does not cleanly survive. The disclosure calls these out directly as properties of prior centralized marketplace platforms.

Blockchain settlement removes the single operator but substitutes global consensus. Every participant has to agree on shared state, and finality arrives at block-commit granularity with minutes-scale latency. For a berth a vessel occupies for twenty minutes, or a spectrum grant measured in seconds, that global-agreement overhead is a poor fit. The disclosure contrasts its settlement against exactly this: consensus-based finality versus observation-granularity settlement among specific named parties.

Plain public-key infrastructure and credential systems solve authentication but not allocation semantics. PKI can tell you a message is signed by a valid key. It does not, on its own, tell you the signer is the authority that governs this berth, that the counterparty was physically present in the reservation window, or that this trade should be admitted given the current state of the resource. Those are the gaps this architecture closes, and it closes them by composing credentialing, proximity, and admissibility rather than by inventing a new signature scheme.

The Architecture

The disclosed approach rests on a five-property governance chain that every mutation in the system passes through. As stated in the filing, the five properties are: (a) authority-credentialed observation, where each observation carries a credentialed source identity evaluated through an authority taxonomy; (b) evidential weighting in a shared observation store, where observations are weighted by authority, sensing-modality reliability, and inter-source consistency; (c) composite admissibility evaluation across cognitive domain fields, where every mutation is checked against dispositional, integrity, confidence, and capability fields before admission; (d) governed execution, where an action requires admissibility approval; and (e) lineage-recorded provenance, where every observation, evaluation, and action is deterministically linked. The chain is recursive: the output of any component re-enters the chain, so a settlement record is itself a credentialed, weighted, lineage-linked observation.

On top of that chain, the marketplace is a single commodity-class-agnostic primitive. The disclosure describes it as composed of a commodity schema registrar, a participant admission mechanism that admits credentialed contributors and consumers, a discovery interface, a matching engine driven by governance-policy rules, a pricing mechanism (fixed-price, auction, negotiated, dynamic, or parametric), a licensing framework defining permitted use, retention, aggregation, and redistribution, a reputation-quality signal, settlement integration, a dispute-escalation path, a regulatory-audit interface producing audit-ready lineage, and a marketplace-lineage

recorder that writes every schema registration, admission, offer, match, transaction, and dispute into the governance chain. Capacity is not a different system; it is this primitive parameterized. The filing names "capacity exchange wherein place-governing agents offer capability-envelope allocations including port berths, charging stations, warehouse slots, airspace corridors, parking stalls, runway operations, and ferry slips," and separately a spectrum-and-RF-access instance where spectrum-holding authorities offer usage rights under temporal-scope credentials.

Two further primitives carry the load specific to your problem.

The first is the capability envelope. The disclosure describes a place-level capability envelope that characterizes the structural capability of a bounded region of the environment independent of any unit presently in it, alongside a unit-level envelope for the party seeking access, and a composite envelope that fuses the two into an admissibility input. Each capability dimension carries not just a value but a value-confidence uncertainty quantification, and the envelope is emitted as a governed, authority-credentialed, lineage-recorded observation rather than a bare resource report. This is what "the berth can take a vessel of this class right now" looks like as a credentialed, checkable claim rather than a database row. The place-level envelope is what bounds allocation: capacity is a governed observation of the place, not an unconstrained counter.

The second is matched-pair settlement, which is how a reservation actually clears. The disclosure describes settlement as a pair of governed observations from two credentialed parties within a governance-policy-defined spatial and temporal window. For capacity reservation specifically, the filing states: the first observation is the place-governing agent's reservation grant, and the second observation is the reserving unit's acceptance. A spatial-proximity evaluator verifies the observations fall inside the allowed spatial window, a temporal-proximity evaluator verifies the second observation arrives inside the allowed temporal window, a per-party authority evaluator checks each party's credential, a composite admissibility evaluator admits the pair, and a

cryptographic binding mechanism produces a non-repudiable settlement artifact recorded in the lineage. This is where allocation is cryptographically tied to eligibility and physically grounded: a party that is not credentialed, not present in the window, or not admissible does not produce a valid pair, and therefore does not get the allocation.

Where three or more parties are involved (an auction across bidders, a quorum, a coalition, a coordination among a place authority plus a regulator plus an operator), the disclosure extends this to an N-party coordination settlement primitive that generalizes the pair to role-differentiated attestations from N parties with a governance-policy-defined outcome function, a weighted-participation mechanism for authority-tier weighting, and a Byzantine-robust mechanism tolerating a policy-defined fraction of adversarial or failed participants. Auctions are named as one of its coordination patterns.

Abuse-bounding in this architecture is structural rather than bolted on. The disclosure describes Sybil resistance achieved through the continuity-preserving identity construction and reputation track-record requirements rather than through consensus gas fees, and it describes cross-authority resistance so that a single-authority compromise does not confer cross-authority Sybil capacity. Because every offer, match, and settlement is authority-credentialed, evidentially weighted, admissibility-checked, and lineage-recorded, a flood of bogus reservations from uncredentialed or low-reputation parties does not pass admission, and the record of what happened is reconstructable by the transacting parties and by credentialed regulators without asking any operator's permission.

How to Approach the Build

You are implementing an architecture, not installing a package. A workable order of construction follows the dependency order of the disclosed primitives.

1. **Model the governance chain first.** Before any marketplace logic, define how an observation in your system carries an authority credential, how it is weighted, how it is admissibility-checked, and how lineage is linked. Everything downstream is an observation on this chain, including the settlement records themselves. Do not shortcut this into "just sign the payload"; the credential must be evaluable against an authority taxonomy, not merely verifiable as a signature.
2. **Define the authority taxonomy for your domain.** Decide which authorities govern which resources. For berths, the port authority; for spectrum, the spectrum-holding authority; for a depot, the depot operator. The taxonomy is what lets an admission check ask "is this party the authority that governs this resource" rather than only "is this signature valid."
3. **Implement the place-level capability envelope for your resource.** Emit the current capacity of each place as a governed observation with per-dimension confidence. This is your source of truth for what can be allocated, and it is what bounds allocation. An illustrative, non-normative interface sketch (you implement the real one):

```
// ILLUSTRATIVE ONLY - faithful to the disclosed shape, not a shipping API
PlaceCapabilityObservation {
  placeId, authorityCredential,
  dimensions: [{ id, type, value, valueConfidence }], // e.g. berth-class
  temporalScope, lineageRef
}
```

4. **Register the commodity schema and parameterize the marketplace instance.** Configure the one primitive for your commodity class: the capacity schema, the pricing form (fixed, auction, negotiated, dynamic, or parametric), and the licensing terms for use, retention, and redistribution. Per the disclosure, this is a policy configuration, not a new codebase per commodity.

5. **Wire admission, discovery, and matching.** Admit only credentialed contributors and consumers. Let consumers discover offers, and match offers to interests through your governance-policy matching rules. Keep matching policy-driven so you can change it without touching the settlement path.
6. **Implement matched-pair settlement for reservation.** For each reservation, the place authority emits the grant observation and the reserving party emits the acceptance observation. Enforce the spatial window, the temporal window, per-party authority, and composite admissibility before you bind the pair. Bind it cryptographically and record it in the lineage. Handle the failure paths the disclosure names: timeout, non-acceptance, and failed fulfillment, with rollback.
7. **Add N-party settlement only where you actually need it.** If your allocation is an auction or a multi-authority approval, adopt the N-party primitive with role-differentiated attestations and a defined outcome function. If every trade is bilateral, you do not need this yet.
8. **Expose the regulatory-audit interface.** Because lineage is chain-recorded, produce audit-ready records reconstructable by both parties and by credentialed regulators. This is a first-class deliverable in the disclosure, not an afterthought.

Throughout, treat abuse-bounding as a property you get from doing the above correctly (credentialing plus reputation plus admissibility plus lineage), and verify it by trying to allocate as an uncredentialed, out-of-window, or low-reputation party and confirming no valid pair forms.

What This Does Not Give You

This is an architecture, not a drop-in library. There is no package to install and nothing that "just works" out of the box; you implement every primitive above yourself, against your own cryptography, transport, and storage choices. The disclosure is deliberately technology-neutral, which means it does not hand you a wire format, a specific signature scheme, a database schema, or tuned window sizes; those are yours to design.

Nothing here is benchmarked or productized. The filing does not state latency figures, throughput numbers, or security proofs, and this guide claims none. Where you read "observation-granularity settlement," that is a described property of the design contrasted against consensus finality, not a measured result you should quote to stakeholders.

The approach also assumes its own preconditions. Settlement is grounded in spatial and temporal proximity windows, so it fits resources where physical or credentialed presence in a window is meaningful (a vessel at a berth, a unit in a reservation window, a licensee using granted spectrum). It is a weaker fit for purely abstract resources with no presence semantics. And the abuse-bounding is structural, not magical: it depends on your authority taxonomy being sound and your reputation and credential issuance being governed well. A poorly governed credential authority undermines the whole chain, and no architecture fixes that for you.

Disclosure Scope

The architectural approach described here, including the governed marketplace primitive, the capacity-exchange parameterization, the place-level capability envelope, and matched-pair and N-party settlement, is disclosed in U.S. Provisional Application No. 64/049,409. This guide is educational. It explains how one might approach building such a system from the disclosed architecture; it is not a warranty, not a specification of a shipping product, and not an offer of software, an SDK, or a downloadable implementation. Any system you build from these ideas is your own implementation, and you are responsible for its correctness, security, and regulatory compliance.

No platform operator. Governance-chain lineage replaces the trusted intermediary.

Provisional application

PRIMARY TECHNICAL DISCLOSURE

- [Governed Marketplace: Platform-Less Trust Through Governance-Chain Lineage \(/articles/governed-marketplace-platform-less-trust-through-governance-chain-lineage\)](/articles/governed-marketplace-platform-less-trust-through-governance-chain-lineage).

SECONDARY TECHNICAL

- [No-Platform-Operator Marketplace \(/articles/governed-marketplace/no-platform-operator\)](/articles/governed-marketplace/no-platform-operator).
- [Governance Chain as Trust Substrate \(/articles/governed-marketplace/governance-chain-trust-substrate\)](/articles/governed-marketplace/governance-chain-trust-substrate).
- [Commodity Class Plurality \(/articles/governed-marketplace/commodity-class-plurality\)](/articles/governed-marketplace/commodity-class-plurality).
- [Regulatory-Audit-Native Marketplace \(/articles/governed-marketplace/regulatory-audit-native\)](/articles/governed-marketplace/regulatory-audit-native).
- [Cross-Marketplace Composition \(/articles/governed-marketplace/cross-marketplace-composition\)](/articles/governed-marketplace/cross-marketplace-composition).
- [Spectrum Exchange Marketplace Embodiment \(/articles/governed-marketplace/spectrum-exchange\)](/articles/governed-marketplace/spectrum-exchange).
- [Capacity Allocation Marketplace \(/articles/governed-marketplace/capacity-allocation\)](/articles/governed-marketplace/capacity-allocation).
- [Port Berth Allocation Marketplace \(/articles/governed-marketplace/port-berth-marketplace\)](/articles/governed-marketplace/port-berth-marketplace).
- [Charging Station Capacity Marketplace \(/articles/governed-marketplace/charging-station-marketplace\)](/articles/governed-marketplace/charging-station-marketplace).
- [Runway Slot Allocation Marketplace \(/articles/governed-marketplace/runway-slot-marketplace\)](/articles/governed-marketplace/runway-slot-marketplace).

APPLICATIONS · GENERAL

- [Parametric Insurance Settlement on Credentialed Trigger Observations: A Governed Risk-Coverage Marketplace \(/articles/governed-marketplace/parametric-insurance\)](/articles/governed-marketplace/parametric-insurance).
- [Infrastructure Capacity Marketplace: Trading Grid, Runway, Rail, and Berth Capacity Without a Central Operator \(/articles/governed-marketplace/infrastructure-capacity-marketplace\)](/articles/governed-marketplace/infrastructure-capacity-marketplace).
- [Slot Allocation Markets for Runways, Berths, and Track Time \(/articles/governed-marketplace/infrastructure-slot-allocation\)](/articles/governed-marketplace/infrastructure-slot-allocation).
- [A Credentialed Spectrum Marketplace for Primary Auctions, Secondary Trading, and Dynamic Sharing \(/articles/governed-marketplace/spectrum-marketplace-ecosystem\)](/articles/governed-marketplace/spectrum-marketplace-ecosystem).
- [Distributed Compute Marketplace: Bilateral GPU Settlement Without a Platform Operator \(/articles/governed-marketplace/compute-marketplace-distributed\)](/articles/governed-marketplace/compute-marketplace-distributed).
- [Data Rights Marketplace for the EU Data Act and Data Governance Act: Neutral, Pair-Settled Personal-Data Exchange \(/articles/governed-marketplace/data-rights-marketplace\)](/articles/governed-marketplace/data-rights-marketplace).

- [IoT Data Monetization Without Platform Capture: A Governed Data Marketplace for the EU Data Act \(/articles/governed-marketplace/iot-data-monetization\)](/articles/governed-marketplace/iot-data-monetization).
- [Cross-Registry REC and Guarantee of Origin Settlement Without a Central Platform Operator \(/articles/governed-marketplace/renewable-energy-attribute-credits\)](/articles/governed-marketplace/renewable-energy-attribute-credits).
- [Water Rights Trading Platform Without a Central Operator: A Governed Marketplace for Western and Murray-Darling Basins \(/articles/governed-marketplace/water-rights-marketplace\)](/articles/governed-marketplace/water-rights-marketplace).
- [CBRS SAS Coordination and PAL Leasing Without a Central Operator: A Governed-Marketplace Architecture \(/articles/governed-marketplace/fcc-cbrs-saas\)](/articles/governed-marketplace/fcc-cbrs-saas).

APPLICATIONS · SPECIFIC

- [CME Globex vs a Governed Marketplace With No Privileged Operator \(/articles/governed-marketplace/cme-globex-marketplace\)](/articles/governed-marketplace/cme-globex-marketplace).
- [Federated Wireless CBRS vs a Governed Spectrum Marketplace \(/articles/governed-marketplace/federated-wireless-cbrs\)](/articles/governed-marketplace/federated-wireless-cbrs).
- [ICE Alternative: Governed Marketplace Beyond Per-Venue Exchange Integration \(/articles/governed-marketplace/ice-exchange-platform\)](/articles/governed-marketplace/ice-exchange-platform).
- [AWS Data Exchange vs a Governed Marketplace Substrate \(/articles/governed-marketplace/aws-data-exchange-marketplace\)](/articles/governed-marketplace/aws-data-exchange-marketplace).
- [Blockchain Marketplace Alternative: Governed Marketplace Beyond DEX and NFT Platforms \(/articles/governed-marketplace/blockchain-platforms-marketplace\)](/articles/governed-marketplace/blockchain-platforms-marketplace).
- [GridX Alternative: Governed Energy Marketplace Beyond Operator-Mediated DER Orchestration \(/articles/governed-marketplace/gridx-energy\)](/articles/governed-marketplace/gridx-energy).
- [CME Globex vs a Governed Marketplace: Composing Cleared and Bilateral Trades \(/articles/governed-marketplace/openexchange-cme\)](/articles/governed-marketplace/openexchange-cme).
- [Snowflake Marketplace Alternative: Cross-Platform Governed Exchange \(/articles/governed-marketplace/snowflake-marketplace\)](/articles/governed-marketplace/snowflake-marketplace).

[Governed Marketplace overview → \(/governed-marketplace\)](/governed-marketplace)