

How to Build a Spectrum or Compute Marketplace Without a Central Clearing Cloud

You want to let holders of a resource such as spectrum, compute, capacity, or credits sell access to consumers, but every design pushes you toward a single cloud clearing house that becomes the trust bottleneck, the outage risk, and the audit black box. This guide describes an architecture for a marketplace where each allocation is cryptographically tied to the seller's authority and the buyer's eligibility, settled directly between the two parties, and bounded against abuse without a central arbiter. The approach is disclosed in U.S. Provisional Application No. 64/049,409 as the Governed Marketplace inventive step; it is an architecture you build, not a shipping library.

What You Are Building

You have a resource that many parties want to buy and sell in small increments: blocks of radio spectrum under a temporal license, spare GPU time, warehouse slots, storage capacity, energy, or a credit that stands in for any of these. You want a marketplace where a holder can offer the resource, a consumer can discover and acquire it, and the two settle a transaction, all while a regulator or the parties themselves can later reconstruct exactly what happened.

The instinct is to build a central clearing cloud: one service that holds every account, matches every offer, records every trade, and settles every payment. That service is the thing you are trying to avoid. This guide describes an architecture in which the trust, matching, and settlement live in the exchanged records themselves, so no single operator has to sit in the middle of every transaction. It is drawn from the Governed Marketplace inventive step disclosed in U.S. Provisional Application No. 64/049,409.

Why the Obvious Approaches Fall Short

The centralized platform is the default because it is the easiest to reason about. One operator runs the order book, holds custody of funds or credits, and is the single source of truth for who owns what. It works, and it is how most real marketplaces run. Its limits are structural rather than a matter of poor engineering. As the disclosure describes prior centralized marketplaces, the platform operator has to mediate trust, identity, settlement, and dispute resolution using its own internal records; contributors and consumers each hold a platform specific account, producing per platform identity silos; the transaction log is internal and not independently reconstructable by the transacting parties; and if the platform is retired or replaced, its transaction history is not preserved outside it. For spectrum or compute specifically, that operator also becomes a single point of outage and a single point of regulatory exposure.

Blockchain settlement is the other common reach. It removes the single operator by replacing it with distributed consensus, but the disclosure notes that consensus based settlement finalizes at block commit granularity with minutes scale latency, which does not match a resource allocation that must be granted and metered in the moment. And a public ledger still does not, by itself, answer the question that matters most for a regulated resource: was this seller actually entitled to allocate this, and was this buyer eligible to receive it? A generic token transfer proves a balance moved. It does not prove coverage or eligibility.

The structural gap in both approaches is the same. Neither natively binds an allocation to the credential that makes it legitimate, and neither gives you a settlement record that a regulator can audit without trusting the platform that produced it.

The Architecture

The disclosed architecture treats the marketplace as a first class primitive that exchanges governance credentialed commodities between credentialed contributors and consumers without requiring a third party platform operator to mediate trust, identity, settlement, dispute resolution, or reputation. The trust substrate is not a platform database. It is a governance chain: every offer, match, and transaction is recorded as a credentialed, lineage bearing record. Several mechanisms compose to make this work.

Authority credentialed offers. Every observation emitted into the mesh, including a marketplace offer, carries an authority credential. Per the disclosure, that credential encodes at minimum an issuing authority identifier, a scope specification of that authority's scope, a temporal validity specification, a device binding attestation, and a cryptographic attestation. This is what ties an allocation to entitlement. A spectrum offer is emitted by a spectrum holding authority under a temporal scope credential, so the offer itself carries the proof that the seller is entitled to allocate that band for that window. The disclosure lists a spectrum and RF access marketplace where spectrum holding authorities offer usage rights under temporal scope credentials, and a compute and storage marketplace where providers offer capacity with usage metered settlement, as parameterizations of the same primitive.

Eligibility gated participation. Consumers are admitted through a participant admission mechanism, and offers are routed and admitted according to the consuming party's authority credentials. The disclosed authority taxonomy is a hierarchical trust structure where each level maps to a behavioral response, an evidential weight, and a mutation

admission rule. In marketplace terms, this is how you express who may acquire what: eligibility is a credential the consumer holds, evaluated against the offer's scope, rather than a row in a platform's permissions table.

Peer to peer settlement, not a clearing house. Instead of a central settler, the marketplace uses the matched pair settlement primitive as its settlement substrate. A transaction is a pair of governance credentialed observations, one from each party, the first representing an offer, tender, or commitment and the second representing acceptance or fulfillment. The pair is admitted only if it falls inside a governance policy defined spatial window and temporal window, each party's authority credential verifies, and a composite admissibility evaluator accepts the pair. The result is a cryptographically bound settlement artifact supporting non repudiation. Per the disclosure this settles directly between transacting parties, without a third party intermediary, without centralized consensus, and without pre negotiated session state, producing observation granularity settlement rather than block commit granularity. Recognition rules are configurable per transaction type: content matching on a resource identifier, a cryptographic handshake where the second observation answers a challenge in the first, or a derivation chain where the second observation must cryptographically derive from the first.

Auditability without a trusted operator. Every schema registration, participant admission, offer, discovery, match, transaction, dispute, and audit event is written into the governance chain lineage field. The disclosure contrasts this with platform internal logs that are not externally reconstructable, and provides a regulatory audit support interface that produces audit ready lineage records reconstructable by contributing parties, consuming parties, and credentialed regulators. Crucially, because the history lives in the governance chain rather than in one operator's service, it survives that operator being retired or replaced.

Bounding against abuse. The architecture constrains authority abuse through credential scope and, in the related preemption context, through an explicit budget enforcer: the disclosure describes a budget mechanism that limits the rate at which an authority may issue directives within a governance policy defined temporal window, configurable per authority, per authority level, per geographic scope, and per class, where exhaustion suspends further admissions for the remainder of the window and the suspension is recorded in the lineage. The pattern to carry into your marketplace is the same shape: rate and temporal bounds on how much a credentialed party can allocate or claim in a window, enforced at admission and recorded, plus temporal scope credentials that expire so a stale allocation cannot be replayed. The spatial and temporal windows on settlement also bound abuse directly, since a matched pair is rejected if the parties are not co located and co timed within policy, and every window violation is recorded with the measured and required windows.

How to Approach the Build

You are implementing this yourself; the disclosure describes the architecture, not a package you install. A reasonable order of work:

1. Define your commodity schema and authority taxonomy first. Decide what one unit of your resource is (a spectrum block over a band and interval, a metered compute quantum, a capacity slot) and who is entitled to allocate and to consume it. The taxonomy is a governance policy choice, not a code change; the same primitive is meant to be parameterized per commodity class.
2. Specify the credential format. Every offer and every acceptance must carry an authority credential with an issuing authority, a scope, a temporal validity, a device or party binding, and a cryptographic attestation. The disclosure is deliberately agnostic about the specific cryptographic primitive, so choose a signature or attestation scheme you can operate and rotate. An illustrative offer sketch, faithful to the disclosed fields and not a working API:

```
Offer {  
  authority_credential: { issuer, scope, temporal_validity, party_binding  
  commodity: { schema_id, resource_id, quantity, price_terms }  
  lineage_ref  
}
```

3. Write the matched pair recognition rule for your transaction type. Pick which of the disclosed rule forms apply: content matching on the resource identifier, a cryptographic handshake, a derivation chain, or a composite. Define the spatial window and temporal window that a valid pair must satisfy, and the rejection consequences when it does not.
4. Implement settlement as artifact production, not as a balance update in a central store. On a valid pair, produce the cryptographically bound settlement artifact over both signed observations plus the spatial and temporal attestations, and write the full event into lineage. Downstream consumers and regulators verify the artifact rather than trusting your service.
5. Add the abuse bounds. Attach temporal scope to allocations so they expire, and enforce per authority, per scope, per window budgets at admission, recording exhaustion and suspension in lineage. This is what stops a credentialed but misbehaving party from flooding allocations.
6. Layer discovery, pricing, negotiation, and disputes last. The disclosure includes a discovery interface, a pricing mechanism spanning fixed, auction, negotiated, dynamic, and parametric forms, a bounded round counter offer and negotiation mechanism, and a dispute escalation mechanism. Treat these as configurable modules over the credential and settlement core, not as prerequisites.

What This Does Not Give You

This is an architecture, not a drop in library. There is no SDK to install and no benchmark to cite; the disclosure describes structure and mechanism, and it is silent on throughput, latency figures, and cost, so do not expect performance numbers here. You implement the credential system, the mesh transport that carries offers and observations, the matched pair evaluator, and the lineage store yourself, and you own the operational hard parts: credential issuance and revocation, key rotation, clock and location assurance for the spatial and temporal windows, and the reliability of the mesh that carries records between parties.

The approach also assumes the two sides of a settlement can meet inside the disclosed spatial and temporal windows, which grounds a transaction in physical co presence. That is a strength for spectrum and physical capacity, where co location is meaningful, and a poor fit for exchanges that are purely abstract with no spatial or temporal proximity to anchor. It presumes a working authority taxonomy exists and that credentials mean something; if you cannot issue and revoke credentials that participants trust, the model has nothing to bind an allocation to. And peer to peer settlement removes a central operator but not the need to define, staff, and honor dispute resolution among credentialed authorities.

Disclosure Scope

The architecture described in this guide, including the governed marketplace primitive, authority credentialed offers and eligibility gated participation, matched pair peer to peer settlement with spatial and temporal windows, governance chain lineage for audit, and budget and temporal scope bounds against abuse, is disclosed in U.S. Provisional Application No. 64/049,409. This guide is educational. It teaches how to approach building such a system from the disclosed architecture; it is not a product, not a warranty, and not an offer of software. Any implementation, and its fitness for a given regulatory or operational context, is the reader's own responsibility.

Governed Marketplace (</governed-marketplace>) [All 40 steps → \(/inventive-steps\)](/inventive-steps)

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)