

One Instrument, Many User Classes

The big-picture case for portable provenance graphs as civic, educational, economic, institutional and international infrastructure

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Executive determination

The decisive shift is from credentials that assert a result to artifacts that carry the provenance of how the result was formed.

Modern systems of education, employment, defence, trade and public administration depend on compressed assertions. Certificates assert attainment. References assert character or competence. licences assert permission. compliance documents assert conformity. Each is portable, but the record that makes the assertion trustworthy usually remains elsewhere, fragmented across institutions and expensive to reconstruct.

A temporal provenance graph changes the unit of exchange. It carries ordered events, typed evidence, declared relationships, cumulative state, authorship and correction within the artifact itself. The recipient does not receive only the conclusion. The recipient receives a governed route to the conclusion.

The underlying architecture is one instrument serving many target user classes. The common authoring, validation, registry, rendering and release machinery remains stable. A user class loads the grammar, taxonomy, prompts, evidence rules and permissions appropriate to the graph class being created or reviewed. Each emitted artifact carries its own semantic definitions and remains independently readable.

This is not a proposal for a universal dossier, a central identity score or one taxonomy imposed across society. It is a federated provenance architecture: one instrument, multiple semantically isolated profiles, multiple classes of user and independently governed artifacts capable of selective disclosure.

1. From terminal credentials to provenance-bearing artifacts

A terminal credential compresses a developmental history into a short institutional statement. That compression was useful when storage, transmission and verification were costly. In the present information environment, it increasingly creates a secondary forensic burden. The recipient must determine whether the issuer was authorised, whether the document is authentic, what standard applied, how the result was produced and whether the claimed capability remains current.

A provenance-bearing artifact makes those questions native to the record. Its evidential attachments, temporal structure, authorship states, profile version and relationship grammar travel with it. Verification becomes inspection of a declared structure rather than reconstruction of an absent history.

Compressed credential	Information retained	Information usually lost
Examination certificate	Issuer, subject, grade and date	Learning path, feedback, revision, transfer, supports and durability
Curriculum vitae	Selected roles and claimed skills	Evidence of formation, judgment, correction, contribution and context
Professional licence	Current permission or status	Continuing formation, supervised practice, incidents, remediation and review
Security or suitability decision	Threshold outcome	Relevant developmental evidence, assessment route and change over time
Trade or compliance certificate	Conformity assertion	Source, custody, inspection, corrective action and responsible authority

2. The operative architecture

2.1 One common instrument

The instrument supplies the stable structural layer: temporal nodes, compound events, typed evidence, authored jumps, ordered CHIP/ID stacks, cumulative state, validation, graph registration, rendering and release. The canonical artifact is not a decorative report generated from a hidden record. Its ordered and typed structure is itself the record form.

2.2 Target user classes

There are no generic 'target users'. There are target user classes. A user class defines who may perform which operation, under what competence assumptions, with what evidential duties and within what scope.

User class	Defined function
Author class	Creates nodes, attaches evidence, declares relations and submits the artifact to validation.

Contributor class	Adds bounded observations, assessments, feedback or source material without controlling the whole artifact.
Reviewer class	Traverses the artifact, tests evidence and records findings within a declared review scope.
Institutional decision class	Uses a bounded graph view for admissions, recruitment, deployment, accreditation, procurement or another authorised decision.
Registry and audit class	Validates profile integrity, signatures, versions and interoperability without acquiring ownership of the underlying graph.
Subject class	Inspects, exports, contests and selectively discloses the provenance record concerning the subject.

2.3 Loadable semantic profiles

A grammar profile supplies the active taxonomy, CHIP/ID meanings, strand or seed registry, field states, prompts and validation rules. Profiles are semantically isolated. Loading one profile activates its declared meanings; unloading removes them before another graph class is opened.

The educational profile demonstrates the model concretely. It retains the common graph structure while replacing forensic semantics with formation, challenge and correction, connection, development, support and access, and demonstrated capability. Its strand registry encodes learner-owned capability threads, and its validation rules prohibit deficit labelling, require evidence for capability claims and preserve earlier profile meanings after version changes.

2.4 Graph classes and independent artifacts

A graph class combines a user class, active semantic profile, evidence regime, permissions, validation rules and disclosure policy. The resulting artifact remains separate from other graphs. A registry may locate, compare or authenticate artifacts without merging them into one central record or acquiring interpretive sovereignty over them.

3. The larger proposition

The instrument makes provenance portable across domains without making the person, organisation or product centrally owned.

The larger significance is not confined to accountability or education. The common capability is temporal self-description under declared evidence and grammar. Any domain in which trust depends on how a state was formed can use the instrument.

- A learner can carry the provenance of capability formation rather than only a final grade.
- A professional can carry evidence of formation, supervised practice, correction and continuing competence.
- An organisation can carry the provenance of decisions, projects, controls and institutional learning.
- A product can carry source, custody, inspection, transformation and compliance history.
- A transaction can carry authority, negotiation, approval, variation and performance provenance.
- A public body can carry an auditable record of how jurisdiction, evidence and decision changed through time.

4. Education: capability formation as the primary record

The educational profile shows why the graph is a stronger educational artifact than a certificate alone. An examination is one event within a developmental sequence. It may show performance under specified conditions, but it does not preserve how the learner acquired, corrected, transferred and stabilised the relevant capability.

A student journey graph can preserve first exposure, prior readiness, feedback, barriers, support, practice recurrence, transfer, consolidation, learner agency and capability confirmation. Evidence remains attached through drafts, observations, assessments, practical work and later tests.

The result is not merely a richer portfolio. It is a provenance-bearing educational record capable of supporting admissions, transition, apprenticeship, professional formation and lifelong learning without forcing each recipient to reconstruct the learner's history from certificates and references.

5. Defence, security and public-service intake

Recruitment into defence and other public-service roles requires assessment of capacities that terminal credentials represent poorly: adaptability, technical learning, disciplined judgment, teamwork, communication, ethical reasoning, response to feedback and performance under changing conditions.

A consent-governed provenance graph could refine intake by allowing the institution to inspect relevant developmental sequences rather than relying mainly on grades, self-report and one-time testing. The recruiting institution could then author a separate assessment graph under its own profile, preserving observed exercises, aptitude findings, training interventions and progression.

- Role matching can use demonstrated formation and transfer rather than qualification titles alone.
- Training systems can distinguish lack of aptitude from a correctable barrier or context mismatch.
- Specialist capability can be identified from recurring evidence across different tasks.
- Reassignment can be based on documented fit rather than treating one failed placement as general incapacity.
- Transition to civilian employment can export a bounded, civilian-readable artifact of demonstrated capability.

The architecture should not merge educational, recruitment, welfare and service records into one total profile. Each remains an independently governed artifact with purpose-limited views and explicit authority for contribution and access.

6. Business and organisational use

6.1 Recruitment and selection

Recruitment can move from assertion-heavy screening toward evidence-led questioning. A candidate may disclose a bounded graph view showing how relevant capability developed, where it was tested, how errors were corrected and whether the skill transferred into new contexts.

6.2 Professional development

Organisations can preserve formation across training, mentoring, projects, incidents, remediation and role change. Promotion and deployment can be supported by longitudinal evidence rather than recent visibility, manager memory or static competency matrices.

6.3 Project and decision provenance

Projects can carry their own graph classes. Decisions, evidence, authority, assumptions, reviews, changes and outcomes remain connected. Handover becomes traversal of an authored record rather than reconstruction from email and document repositories.

6.4 Corporate assurance

Boards and regulators can inspect how compliance, risk and control states were formed. The artifact can distinguish a terminal assurance statement from the operational evidence that supports it.

7. International exchange and trade

7.1 Qualification and capability exchange

International mobility currently depends on equivalence tables and institutional reputation. A provenance graph can accompany the credential with the standards, evidence types, assessment events, supports and capability states represented. The receiving body can inspect declared semantics rather than translating only the terminal label.

7.2 Product and supply-chain provenance

A product graph can preserve origin, materials, manufacture, inspection, custody, certification, corrective action and responsible authority. Each participant contributes within a defined user class. The finished artifact carries the route behind the conformity claim.

7.3 Contract and transaction provenance

Complex transactions can preserve authority, approvals, negotiation states, version changes, obligations and performance evidence. This reduces ambiguity about which actor had capacity, which document governed and how the final representation was formed.

8. Institutional and public administration

Public administration benefits from the same distinction between assertion and formation. A decision graph can preserve the evidence received, classifications applied, jurisdiction invoked, contrary material considered, review steps and later corrections.

This allows institutions to evaluate not only whether procedure occurred, but whether the correct object, authority and evidential path survived institutional transit. The graph is therefore useful for administration, not only retrospective accountability.

9. Economic value: reducing the cost of trust

The economic significance lies in reduced verification friction. Weak credentials externalise the cost of provenance reconstruction to every later recipient. A portable graph allows that provenance to be authored once, maintained through time and selectively reused.

- Admissions teams can inspect formation rather than infer it from incomparable grades.
- Employers can verify selected capability paths without reconstructing an entire career.
- Professional bodies can review continuing competence as a temporal state rather than an annual declaration.
- Recruiters can compare relevant developmental evidence without imposing ever more one-time tests.
- Trade partners can inspect custody and compliance histories without relying only on terminal certificates.
- Individuals retain durable evidence when issuing institutions close, merge or lose records.

The graph does not eliminate judgment. It improves the quality and provenance of the material on which judgment is exercised.

10. Semantic interoperability without semantic collapse

A common instrument does not require one universal vocabulary. Interoperability is achieved through declared profiles, embedded definitions, version control and bounded mappings between graph classes.

An educational marker must not silently become a recruitment risk label. A support dependency must not become a permanent deficit. A professional incident must not be exported outside its authorised purpose merely because the graph can technically carry it.

Cross-profile exchange therefore requires explicit translation rules. The recipient should know which meanings are native, which are mapped and which cannot lawfully or accurately be transferred.

11. Governance requirements

Control	Requirement
Profile declaration	Every artifact identifies the active grammar, taxonomy and version.
Semantic isolation	Profile definitions are unloaded before another graph class is opened or authored.
Typed authorship	Subject statements, professional assessments, observations and automated outputs remain distinguishable.

Purpose limitation	A graph or graph view may be used only for its declared purpose.
Selective disclosure	Recipients receive only the nodes, fields and evidence necessary for the authorised decision.
Subject participation	The subject can inspect, contest, append disagreement and export relevant records.
Correction with provenance	Errors are corrected without silently rewriting the historical state.
No universal score	Multidimensional formation must not be collapsed into a single social or employability ranking.
Role-based access	User classes determine contribution, review, decision and audit authority.
Version preservation	Earlier nodes retain the meanings embedded at the time of authorship.
Independent validation	High-stakes profiles and mappings are subject to external audit and bias testing.
Federated custody	Registries authenticate and locate artifacts without owning or merging the underlying records.

12. Failure modes and dual-use risk

A provenance architecture can increase agency and lawful trust, but it can also intensify surveillance and exclusion if its semantics, access and use are not constrained.

- Central aggregation can turn independent artifacts into a totalising dossier.
- Opaque profile mapping can convert context-dependent evidence into permanent labels.
- Automated ranking can erase the multidimensional record the graph was intended to preserve.
- Compulsory disclosure can transform a portable benefit into an employment or citizenship barrier.
- Hostile or manipulative actors can seed apparently valid sequences or exploit known institutional thresholds.
- Grammar drift can change the meaning of earlier records while preserving the appearance of continuity.

The defensive answer is not to abandon provenance. It is to govern the grammar, user classes, contribution authority, profile mappings and disclosure boundaries as rigorously as the underlying evidence.

13. Implementation pathway

Stage	Action	Purpose
1	Stabilise the common core	Version the shared node, evidence, jump, stack, state, registry and release rules.
2	Validate user classes	Define competence, permissions, duties and liability for each class of operator.
3	Lock domain profiles	Pilot existing and new semantic sets against real artifacts before version 1.0 release.
4	Embed profile provenance	Ensure every emitted artifact carries the definitions needed for independent reading.
5	Create selective-view protocols	Allow bounded proofs and graph views without disclosing the whole record.
6	Establish signature and identity standards	Authenticate contributors, institutions, artifacts and version histories.
7	Pilot high-value domains	Begin with education, apprenticeship, professional formation, voluntary recruitment and supply-chain provenance.
8	Measure value and harm	Evaluate decision quality, verification cost, mobility, user agency, bias and unintended reuse.
9	Create federated governance	Separate standard-setting, software operation, artifact custody, institutional participation and dispute resolution.
10	Develop international mappings	Support cross-border exchange without erasing local standards or profile meanings.

14. Consolidated finding

One instrument can support many classes of user because the transferable object is the grammar-bearing provenance architecture, not one fixed taxonomy or one institutional purpose.

The educational profile demonstrates that a complete semantic set can be loaded into the common instrument while preserving the underlying temporal and evidential structure. The same architectural model can support further graph classes without importing educational or forensic meanings into them.

The larger opportunity is a federated infrastructure in which people, institutions, products and transactions carry selected provenance with them. Trust becomes less dependent on terminal institutional assertions and less costly to reconstruct.

The larger danger is that the same architecture could be centralised, scored or repurposed into a system of permanent classification. The design must therefore preserve independent artifacts, semantic isolation, bounded user classes, selective disclosure and contestable authorship.

The historical certificate made trust portable by compressing provenance. The temporal graph makes provenance itself portable.

Source architecture

This paper synthesises the common temporal-graph methodology, the exemplar-to-factory architecture, the implemented authoring and rendering environment, the user-class model, the complete educational grammar profile and its loader/unloader adapter, and the wider applications to education, recruitment, professional formation, public administration, business and international exchange.