From materials and processes to computable SKU contracts

A manufacturing vocabulary, specification and MCP integration brief

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This release turns historical manufacturing knowledge into addressable data, SKU definition templates and a working read-only MCP module. Local protocol and boundary checks passed. Production integration, provider binding and physical delivery require separate acceptance.

Release object	Count and meaning
Discovery vocabulary	20 material categories, 8 navigation groups, 296 process entries and 5 production-organization modes.
SKU definition templates	316 templates: 20 material categories plus 296 process entries. Their sku_id fields remain null.
Illustrative specifications	4 example_only candidate SKU records connected into a declared example route.
Running interfaces	4 MCP tools and 4 allowlisted catalog resources.
Commercial and execution state	0 verified orderable SKUs. No production registration, machine execution, stock reservation, payment or accepted physical delivery.

The work relationship

Material and process concepts lead to explicit specifications and revisions, input/output interfaces, bound local capabilities, scoped Work, delivery evidence, independent acceptance and new reusable resources.

This keeps the established HSIMC roles of Reality SKU, Capability, Authority, Runtime and Evidence. A SKU identifies the promised specification. Stock, machine capacity, operational authority and an offer are separate, time-bounded records.

What deployable means here

The package provides catalogs, structured contracts, an executable module, test receipts and a Registry projection draft for review and integration preparation. The draft has not been imported. A reachable website, callable MCP endpoint, qualified physical process and accepted delivery are four separate outcomes.

Evidence: [D1] packaged data; [D2] actual-catalog smoke receipt; [D3] local boundary-test receipt.

01 / A source-bounded manufacturing vocabulary

The uploaded manufacturing-process PDF is a research notebook created on 2020-06-28 and updated on 2022-01-06. It has 16 pages; the last is blank. Material categories occur on pages 3-4, processes and selection criteria on pages 2-11, and repeated manufacturer-directory entries on pages 11-15. [S1]

Material entries	Source categories
1-5	Plastics, metals, wood, paper, natural textiles
6-10	Synthetic textiles, leather, fibers, glass, chemicals
11-15	Composites, minerals, stone, concrete, plaster
16-20	Ceramics, rubber, foams, semiconductor materials, rare-earth materials

These 20 categories overlap. Foam describes cellular morphology, fiber describes form, semiconductor describes a functional class, and rare earths identify an element group. A single material may belong to several facets. A purchasing specification must identify its actual composition, grade and form.

Process group	Count	Process group	Count
CA Casting	16	IC Imaging, marking, coating	15
MO Moulding / consolidation	19	FR Forming	79
MA Machining / removal	58	JO Joining / assembly	82
AM Additive manufacturing	9	OT Other source processes	18

The 296 entries comprise 30 process families, 259 process concepts and 7 composite workflows. They are source-derived navigation records, not 296 qualified shop-floor capabilities. The five organization modes are repetitive, discrete, job shop, continuous process and batch process manufacturing. [D1]

Corrections preserve provenance

Turning, rolling, joining and reaming were translated as operations. Brazing and soldering, and metal extrusion and plastic extrusion, have separate identities. Mills, factories, industries and product classes are kept apart from process concepts. There are 32 additional directory facets and 20 unresolved term groups.

Page 2 contains a five-type diagram and a six-type diagram adding Additive. The import records this visual difference while separating organization modes from process types. All 664 source lines, 78 repeated-line groups and term mappings remain in the audit archive; historical personal paths are excluded from public data.

02 / The objects behind a usable SKU

Object	Question answered	State in this release
Taxonomy concept	What material or process class is this?	Discovery concepts such as MAT-METAL and PROC-LASER-ENGRAVING.
SKU specification	What is promised, at which revision, and how is it accepted?	Explicit unit, input/output, specification and provenance; four examples.
Physical item or lot	Which actual object or batch, where and when?	Item, lot, quantity, location and observation references remain unbound.
Capability binding	Which provider/runtime can perform the transformation?	A declaration is separate from a machine, provider and operating conditions.
Offer	Who offers what quantity, price, lead time and validity?	Commercial terms remain unknown.
Work	Who authorizes whom to perform which scoped task?	Proposals only; canonical_work_id remains null.
Evidence	What was observed or delivered?	Source-content evidence is separate from physical-process evidence.
Acceptance	Who accepts which result against which criteria?	A separate accountable decision, never inferred from completion.

One specification may support several providers

A stable SKU can be implemented by different providers at different places, on different equipment, under different capacity windows and offers. A change in stock or price should not silently rewrite the specification. A later revision must not replace the revision referenced by an earlier Work record.

Continuity needs explicit references

Computation retains object IDs, specification revisions and a catalog digest. Work, lots, evidence and acceptance retain their own identities and links. MCP can process independent requests while durable business state remains in the established HSIMC objects. [M1]

Defining an output SKU describes an intended result. Produced and accepted new Reality can be recorded only after actual execution, traceable delivery and independent acceptance.

Model basis: release specifications, integration review and the published Registry relationships. [D1][D4][W2]

03 / A minimum comparable manufacturing contract

The 316 templates list what must still be defined. The responsible parties must freeze an actual specification with a revision and digest. Unknown fields remain unknown; a complete-looking record must not substitute for material, capacity or authority evidence.

Contract area	Information that must be explicit
Identity and rights	SKU ID, specification owner, revision, source, drawing/program rights, permitted use and public/private scope.
Material	Composition or grade, standard and edition, condition/temper, form, surface, substitution policy and lot traceability.
Geometry and quantity	Dimensions, datums, tolerances and drawing revision; separate quantity and unit. kg, piece, m and accepted_piece are not interchangeable.
Transformation	Input state, output state, operation scope, program/artwork revision, tooling, consumables and pre/post-processing.
Local dependencies	Provider, runtime, machine, fixture, operator, environment, available material and a current capacity window.
Quality and acceptance	Measurement method, suitable instruments, sampling, defect limits, acceptance owner and rework/rejection terms.
Evidence and continuity	Item/lot/work references, operator/verifier/device/time, content digests, retention and exceptions.
Jurisdiction and economics	Delivery place, consumption jurisdiction, required document languages, evidence, offer validity, currency, billing unit and terms.

Readiness is a set of states

The examples separately retain specification, provider, material, capacity, evidence, authority, acceptance and commercial status. All four are SPEC_DEFINED_UNBOUND, with orderable=false and execution_allowed=false. A match in one field cannot verify the other dimensions.

An interface comparison has a precise limit

The composer recursively compares declared material references, state, unit, dimensions, tolerances and surface requirements. Equal values return DECLARED_MATCH_UNVERIFIED; differences or missing counterparts are reported separately. It does not infer unit conversion, process feasibility, material balance or yield. [D2]

A target of 100 accepted pieces does not imply that 100 blanks suffice. Trials, yield, scrap, rework and packaging still require planning. Unknown costs remain null/UNKNOWN rather than zero.

04 / Example SKUs: material and engraving service

The alloy, dimensions, tolerances, quantity and acceptance rules below are proposed only to demonstrate the contract. The source PDF supplies none of these values and verifies no associated stock, provider or laser process.

A. Material specification

SKU-EX-MAT-AL-PLATE-001

Field	Illustrative setting
Type / revision	material_spec / 1.0.0; example_only=true.
Material / form	Requested aluminium alloy 6061, temper T6; flat_blank. Standard edition and material certificate are unconfirmed.
Geometry	100 x 60 x 1 mm. Length/width tolerance +/-0.2 mm; thickness tolerance +/-0.1 mm.
Surface / unit	Uncoated and deburred; piece; substitution_allowed=false.
Output / evidence	State blank. Requires grade/temper certificate, dimensional measurement, surface confirmation and lot traceability.

B. Laser-text service specification

SKU-EX-SVC-LASER-TEXT-001

Field	Illustrative setting
Type / input	process_service_spec; PROC-LASER-ENGRAVING; receives A's complete declared interface.
Operation scope	Centered 60 x 20 mm region; text HSIMC DEMO; approved artwork digest remains null.
Dependencies	Laser recipe, equipment and cycle time are unknown. Requires a compatibility trial, fixture, local operator and confirmed environment.
Output / unit	engraved_pending_inspection; service measurement unit accepted_piece.
Acceptance	Exact approved text in the agreed region; contrast, defect limits and first-article criteria still require agreement.

Defining a service interface is useful before a provider is bound. Actual performance on the specified material requires local trials, a qualified procedure and first-article results. No laser power, speed or machine-control instruction is generated here.

Complete machine-readable records: data/skus.json. [D1]

05 / Example SKUs: inspection and intended output

C. Inspection specification

SKU-EX-QA-PLATE-001

Field	Illustrative setting
Type / input	inspection_spec; receives engraved_pending_inspection.
Scope	Dimensional and visual marking checks; expected text HSIMC DEMO; 100% inspection is the demonstration plan.
Report fields	Item ID, measured dimensions, text match, defects, instrument ID, operator ID, timestamp and evidence digest.
Conditions / output	Method revision, measurement suitability, verifier and contrast/defect limits remain unresolved. Output is inspected_pending_acceptance.

D. Intended-output specification

SKU-EX-OUT-PLATE-TEXT-001

Field	Illustrative setting
Type / target	output_spec; 100 accepted plates is a demonstration target, not an order.
BOM / BOP	One A per net output; process sequence B then C. Yield and gross input requirement remain null.
Delivery	Physical item/lot reference, inspection report, evidence digests and an independent acceptance decision. Packaging and delivery details are undefined.
State	Still inspected_pending_acceptance; acceptance_state=NOT_PERFORMED.

What the actual local composition returned

A to B to C to D creates three route edges. Each compared 11 declared leaf fields and returned DECLARED_MATCH_UNVERIFIED. The tool generated 51 proposals for resolving missing conditions. They are proposal_only records; no canonical Work was created. [D2]

The request retains the intended net output of 100 pieces. Input/yield planning is not implemented. Provider, runtime, equipment, supervisor, authority and offer remain unbound. An inspection report is measurement evidence; independent acceptance is still a separate accountable decision.

The immediate collaboration value is an explicit list of what is missing next. Accepted proposals can later enter the established Work system with an owner, scope, deadline and evidence requirements.

06 / Four MCP tools and local verification

Tool	Implemented responsibility
manufacturing_search	Search allowlisted catalogs by query/kind; report counts and truncation.
manufacturing_get	Retrieve one exact ID with status, provenance and catalog snapshot digest.
manufacturing_assess_readiness	List unverified SKU conditions and proposed resolution work. Caller optimism never becomes verified evidence.
manufacturing_compose	Compare an ordered list of unique SKU IDs; return route edges, declared interface results, gaps and proposals.

The four logical resources share hsimc://manufacturing/catalog/ with suffixes materials, processes, manufacturing-modes and skus. They are MCP resource identifiers, not published website addresses. Arbitrary files, network URLs and the source audit archive are outside the read allowlist. [D5][M3]

Declared protocol scope

The module implements an independent-request subset of MCP 2026-07-28: server/discover, tool listing/calling and resource listing/reading. Each request supplies explicit protocol and client-capability metadata. Stdio and loopback HTTP were exercised. HTTP binds locally by default. Full official SDK interoperability certification has not been performed. [D3][D5][M1-M3]

Observed check	Result and limit
Catalog and schema	20 materials / 296 processes / 5 modes / 4 examples. Four tool input/output payloads validated.
Protocol calls	11 stdio requests passed; four real tools discovered.
Boundary tests	16 passed, covering metadata, invalid inputs, read-only behavior, non-escalating claims, Host/Origin checks and health boundaries.
Production / delivery	production_deployment_verified=false; registration_in_existing_hsimc_verified=false; accepted_delivery=false.

LOCAL_READ_ONLY_MODULE_READY proves that the standalone process loaded its local catalog. It does not prove a public MCP deployment or a qualified factory. See runtime/README.md for running instructions and review/ and tests/ for the actual receipts.

07 / Connection to the existing HSIMC six layers

These are HSIMC work-and-value relationships, not six MCP protocol layers. Manufacturing first supplies addressable objects to L02, composition and gap computation to L03, and provenance/versioned resources for reuse in L05. [D4][W1-W2]

Layer	Existing relationship and proposed connection
L01	Calling identity & authority scope: reference existing principals and scoped authority. Public reading creates no manufacturing permission.
L02	Tools & Resources bindings: material/process vocabulary, SKU versions and separately accepted read-only MCP bindings.
L03	Intent to composition plan: proposed routes, dependency references and missing-condition work proposals.
L04	Runtime & real-world execution: actual provider, machine, material lot, fixture, operator and current capacity. Unbound here.
L05	New Resources & reusable Tools: reusable specifications/tools and separately evidenced accepted outputs.
L06	Usage metering & contribution returns: later observed calls, work, offers and contribution evidence. No assumed revenue.

Reuse the published Registry relationships

Vocabulary and specifications map to resources/resource_versions/source_links. Implementation uses capability_bindings; current supply uses availability_refs; offers use listings; proposals use work_proposals; actual artifacts and acceptance use artifact_refs/acceptance_refs. The current projection is UNBOUND_PROJECTION_DRAFT, importable=false and applied=false. [D4][W2]

Preserve the observed public Registry baseline

The reviewed /capabilities/api/status reported READ_ONLY_SYNTHETIC_SNAPSHOT, PUBLIC_REGISTRY_BETA and CLIENT_EXPORT_ONLY. executionEnabled, identityConnected, publicMcpEnabled, nativeWorkWriter and paymentsEnabled were false. Local success of an independent module does not change these meanings. This response does not describe every other HSIMC endpoint. [W1]

The six-language portal interface shares stable IDs. Engineering terms currently retain English and Chinese; all-language engineering review is pending. Full historical source text and personal paths stay in the audit archive rather than the public projection.

08 / Acceptance at the first real node

Step	Required result
1. Freeze the specification	Choose one actual object/service. Agree grade, drawings, geometry, tolerances, quantity/unit, data rights and acceptance revision.
2. Bind the site	Record provider, runtime, equipment, material lot, fixture, operator, measurement system, current capacity and evidence timestamps.
3. Verify MCP integration	Read the actual endpoint through the existing gateway and scope. Recheck discovery, tools, resources, error paths and non-mutation boundaries.
4. Accept scoped Work	Use the established Work writer for accepted proposals. Confirm action, accountable people, deadlines, reservation, spending limits and exceptions.
5. Run first-article trials	Qualify the local procedure and criteria. Record parameters, measurements, yield, time, failures and rework.
6. Accept and reuse	Accept or reject against the frozen criteria; link delivery evidence, new resources, measured costs and a reusable capability revision.

Measure economic value after actual work: material and setup costs, operating time, inspection, scrap, rework, transport and coordination. Retain units, currency, time and source. Prices, costs, yield, lead time and revenue remain unknown in this release; unknown is not zero.

Sources and traceable release files

[S1] User-supplied manufacturing-process PDF: p.1 history/modes; p.2 diagrams; pp.3-4 materials; pp.5-11 processes; pp.11-15 directory. This historical notebook is not evidence of current stock, capacity or supplier qualification.

`SHA256: c632d1c9481bc567cc241dd99bcda001`
`29cfaf87c1cc8190de6f9081ebb3c2bb`

[D1] data/ catalogs, 316 templates and four examples; [D2] review/runtime-smoke.json; [D3] tests/runtime-test-receipt.json; [D4] integration/README.md and review/integration-review.md; [D5] runtime/README.md.

[W1] https://hsimc.tech/capabilities/api/status
[W2] https://hsimc.tech/capabilities/data/schema.sql

[M1] https://modelcontextprotocol.io/specification/2026-07-28/basic
[M2] https://modelcontextprotocol.io/specification/2026-07-28/server/tools
[M3] https://modelcontextprotocol.io/specification/2026-07-28/server/resources

Online status is a read-only observation from this review and may change. Source taxonomy, proposed contracts, example parameters and actual test receipts remain distinguishable. Public deployment and physical manufacturing need their own subsequent acceptance records.