PTPGE Technical Note No. 1

Content-Addressed Identity for Configured Goods

Author: Patrik Knutsson — PTPGE · Periodic Table of Print & Graphic Elements

License: CC BY 4.0 · **Permanent home:** ptpge.org · **DOI:** 10.5281/zenodo.21451593 (archived copy)

Status: v1.0 · published 2026-07-20 · corrections are versioned, never silent

Abstract

Commerce identifies goods by **allocated** identifiers: a GTIN or SKU is issued first, and the product is referred to afterwards. Configured, made-to-order goods break this model — their variant spaces are combinatorial and cannot be pre-registered. This note defines a complementary identity class for such goods: **content-addressed identity**, in which the identifier is *derived from the resolved configuration itself* by canonical serialization and hashing. It documents a running reference construction for the print domain (`ptpge-cfs/1`), its verifiability surfaces (hash, QR, printed mark), and its public, dated record. The construction is domain-independent; the vocabulary is the only domain-specific part.

1 · The problem: an identity class is missing

Allocated identifiers presume enumerable catalogues. A made-to-order printed product — format × pages × substrate × finishing × colour — easily exceeds a million valid variants of a single product class; no registry can enumerate them, and in practice every seller invents SKU strings that bake the configuration into the identity in a private grammar. The consequences become acute in agent-mediated commerce: without a stable identifier, a configured item cannot be resolved *exactly* — only as a seller's unverifiable “best match”. Cross-vendor comparison (“is this the same artifact?”), deduplication and verifiable reorder all inherit that ambiguity. Current agent-commerce catalogue schemas exhibit the gap directly: identifier-less configured goods have no path to an exact, client-verifiable match.

The industry's convergence on shared machine-readable language is now visible at every layer — demand-side (agentic commerce), commerce-to-production integration, and the shop floor (“a common data language that presses, prepress systems and shop-floor software can actually share”) — yet none of these layers addresses the identity of the configured product itself.

2 · Definition

A **content-addressed identity** for a configured good is a fixed-length identifier computed as

```
id = H( canonical( configuration ) )
```

where `canonical` is a deterministic, total serialization of the *resolved* configuration (product class plus all variable bindings, expressed against a shared open vocabulary), and `H` is a cryptographic hash. Required properties: **(a) deterministic** — same configuration, same identity, from any implementation; **(b) vendor-independent** — no party assigns it, so no party controls it; **(c) client-verifiable** — any holder of the configuration can recompute and check it; **(d) registry-free** — nothing is issued, nothing runs out. Equivalence of two offers becomes a computation, not an assertion.

3 · Reference construction: ptpge-cfs/1

Tokens. Product classes, variables and values are open-vocabulary URIs (`https://ptpge.org/v1/…`); tokens are paths relative to that base. Charset `a-z 0-9 . / -` — separator characters cannot occur, so no escaping exists in the grammar.

Statements. `variable=value`, with surface scoping (`variable@surface=value`), unordered multi-values sorted and joined with `+`, order-significant stacks joined with `>` (order-significance is declared by the vocabulary term, not the sender).

Profiles. `spec` (the manufacturable artifact — excludes the commercial cluster) and `offer` (includes it). The profile is part of the serialized prefix, so the two can never collide.

Canonical form. Statements sorted bytewise on the left-hand side; numbers minimal (integers bare, no trailing zeros, no exponent); units never serialized (implied by the variable). Algorithm and version prefix the string: `ptpge-cfs/1:<profile>;product=<token>;…`

Hash. SHA-256 over the UTF-8 canonical string, lowercase hex.

Worked example (real, reproducible). The reference brochure — accordion fold, 8 panels, A5, 170 gsm paper, CMYK outside / black inside, matte lamination + spot-UV (ordered stack) outside:

```
ptpge-cfs/1:spec;product=ordering/products/brochures;variables/configuration/format=printing/configurations/formats/a-series/a5;variables/configuration/page-count=8;variables/configuration/setup-model=printing/configurations/setup-models/folded-sheet/accordion-fold;variables/features/color-mode@inside=printing/features/colors/black;variables/features/color-mode@outside=printing/features/colors/cmyk;variables/features/surface-finish@outside=printing/features/surface-finish/lamination/matte>printing/features/embellishments/spot-uv-varnish;variables/substrate/substrate-type=printing/substrates/sheet-materials/paper;variables/substrate/substrate-weight=170

spec  : f2e377cbb004c4e628180d877f8b1e008a7055e5d699140ecb8f3bf0a73f5df1
offer : ad112a406169f743a1f6d9089b34bdc27ae681e280a689a658d56108a24ab600
```

Any reader can verify the spec hash with one line:

```
printf '%s' '<canonical string>' | shasum -a 256
```

The canonical string is a single line with no line breaks; a copyable form is served in the `canonical` *field of* `ptpge.org/f/<hash>.json`*.*

Two vendors with different internal SKUs and different order minimums, describing this artifact independently against the open vocabulary, derive the **same** fingerprint — equivalence is established without either vendor's cooperation.

4 · Verifiability surfaces

One identity, three carriers: the **hash** for systems; a **QR** carrying the resolver URL for cameras; and a **printed mark** (`ptpge-mark/3`) — a deterministic, human-recognisable drawing derived from the same hash, machine-verifiable from print down to 10 mm via template matching against the public register. The mark can be recognised and verified, never decoded — the QR carries the data. Every registered fingerprint resolves at a **permanent page** (`ptpge.org/f/<hash>`) that never moves and is never retired; when the pre-release vocabulary taxonomy was reconciled in July 2026, the superseded reference vectors were *retained* as resolvable historical pages — the stability discipline is itself part of the public record.

5 · Properties and limits

Claims are not configuration. Price, lead time and declared sustainability figures (e.g. a per-order CO_2e value) are vendor claims *about* an offer; they are excluded from canonicalization, exactly so that the identity stays vendor-independent. Claims reference the identity; they do not constitute it. (A buyer's *requirement* — e.g. “carbon documentation per ISO 14067” — is a configuration binding and fingerprints normally.)

Stability semantics. Tokens inherit vocabulary URI stability; fingerprints over pre-approved (proposed) terms may break on rename and are treated as stable only from approved status. Algorithm changes bump the version (`ptpge-cfs/2`), never silently.

Not a replacement. Where goods *are* enumerable, allocated identifiers work and interoperate widely; content-addressed identity is the complement for the configured remainder — and can carry allocated identifiers as bindings where they exist.

Hash security. SHA-256 preimage/collision hardness is inherited; the identifier is 64 hex characters, with a 16-character display-only short form that must never be used as a key.

6 · Generalization

Nothing in §2–§4 is specific to print except the vocabulary. Any domain of configured goods — furniture, windows, prescription optics, built-to-order electronics, packaging — can instantiate the same pattern: an open vocabulary of product classes, variables and values; a canonical serialization; a hash; a resolver. The print instance demonstrates that the pattern carries to physical verification (the printed mark) and to commerce-protocol transport (the fingerprint

rides in existing catalogue metadata fields without protocol changes). A shared, product-neutral primitive with per-domain vocabularies is the natural end state.

7 · Public record (priority chain)

The 2026 identity construction is the machine layer of a vocabulary line that has been public since 2023. Its two-sided design — a production-side and an ordering-side branch over one shared vocabulary, built out stepwise during 2024 and named the “two-sided lens view” on the vocabulary's public introduction — is directly visible in today's canonical form: in the worked example above, the product class is an ordering-side token (`ordering/products/…`) while the values it binds are production-side tokens (`printing/…`).

Date	Artifact
2023	Predecessor vocabulary public: *PTOGF — Periodic Table of Graphic Formats* (trademark-registered), presented at the INKISH NON-Event; deck archived at ptpge.org/presentations
2024	PTPGE public on ptpge.org, every step dated in the public changelog (ptpge.org/changelog): v1.0 first public release 2024-06-23; off-drupa presentation, self-stamped “VER. 040724” on the table (archived at /presentations); ordering-side groups Geography + Knowledge 2024-08-18 (the two-sided lens); interactive Maps 2024-09-30; v2.0 launch 2024-11-14
2025-01	Independent third-party record: INKISH video interview *Organizing Print* presents the v2 taxonomy (published 2025-01-03)
2026-06	ptpge-cfs/1 specification published (canonicalization + profiles)
2026-06→07	Public resolver live: permanent pages under ptpge.org/f/
2026-07-15	ptpge-mark/3 adopted; catalogue re-minted; reference scanner public (ptpge.org/scan)
2026-07-16	Taxonomy reconciliation; historical vectors retained (never-retire discipline)
2026-07-18	Sustainability-proof vocabulary release (carbon accounting, DPP anchor, proof-approval)
2026-07-20	This note (v1.0); archived copy: DOI 10.5281/zenodo.21451593

References

1. PTPGE, *Configuration Fingerprint Specification* (ptpge-cfs/1), ptpge.org.
2. PTPGE public resolver and reference vectors, ptpge.org/f/.
3. PTPGE reference scanner, ptpge.org/scan.
4. B. Zipper, *Agentic Print — Print becomes infrastructure* (v1), zipcon, July 2026.
5. Atomyx (Matteryx BV), *The Integration Gap*, July 2026.
6. Durst Group, majority stake in CoCoCo Platform (Triple C Labs) — press release, July 2026 (JDF/JMF production data fabric, Kyveris stack).
7. PTPGE public changelog — dated release record since 2024, ptpge.org/changelog.
8. PTPGE presentations archive (PTOGF deck, 2023 · off-drupa deck, 2024), ptpge.org/presentations.
9. INKISH, *Organizing Print* — video interview, published January 2025.