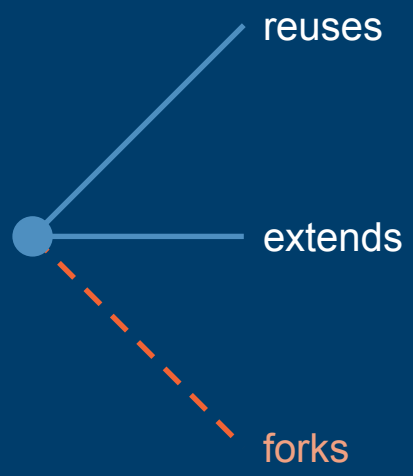
W3C / GS1 WORKSHOP · E-COMMERCE FOR HUMANS AND AI AGENTS

Ecommerce AI Agents - Ontology and Vocabularies for Protocols and Standards

Mapping interoperability and Trust



Paola Di Maio
ESL Labs · Chair, W3C AI Knowledge Representation Community Group

Zurich · 8 September 2026 ·

ABOUT ME

Where I am speaking from

- Analyst, Executive Training, Technical Communication — knowledge representation, structured analysis and specification, systems design, analysis and management
- Followed GoodRelations from Martin Hepp's first deployment
- Current focus: mapping the agentic AI landscape, trust and reliability using KR

“No protocol to sell you.”

Why ecommerce?

There is an element of ecommerce in **every** online transaction /purchase.

Transactions are straightforward standard for trading since the beginning of history, just taking place online

Universal, good place to model evaluate and test AI agent behavior and develop standards

Why ontology and vocabularies?

- Explicit, shared **knowledge representation of** a domain **necessary for trust and reliability**
- Human and machine readable —
- Different types: from flat term lists to formal ontologies
- Without shared terms, agents guess — and every guess fails silently
- **Interoperability is decided at the vocabulary layer**

WORLD MODELS: DEFINING TERMS, CONCEPTS.

ENTITIES RELATIONS THAT SHAPE REALITY

SHARED TERMS
agents agree

DIVERGENT TERMS
agents guess

NO TERMS
agents fail

RELEVANCE TO THE AGENDA

Six themes — one question under each

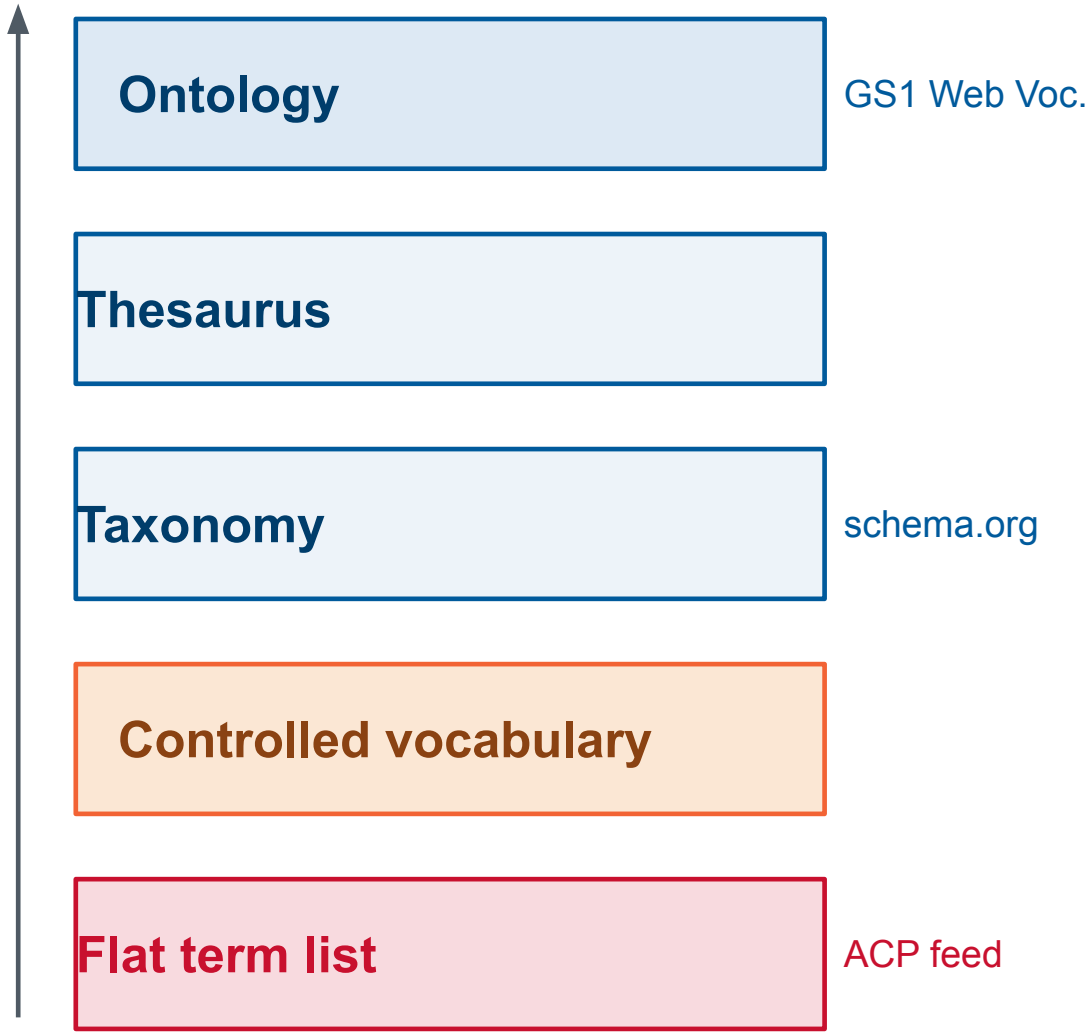
Theme	What the workshop covers	The vocabulary question
Agent-commerce protocols	UCP (Universal Commerce Protocol) ACP (Agentic Commerce Protocol)	**Which vocabulary do they carry?**
Product data & Digital Link	GTIN, resolvers, packaging, DPP	**Already resolvable**
Agent identity & trust	Delegation, credentials, resolution	**No shared mandate vocabulary**
Discovery & semantics	Well-known URIs, structured data	**Crosswalk exists, unmaintained**
Accessibility & modality	Non-visual and multimodal shopping	**No property for the spoken form**
Liability & regulation	Who is responsible when an agent buys	**Declaration is a legal artefact**

Every theme has a vocabulary layer

TYPES

From term lists to formal ontologies

- Term list → controlled vocabulary → taxonomy
- Thesaurus — broader, narrower, exactMatch
- Ontology — classes, properties, formal inference
- schema.org has the hierarchy but declines the axioms
- **Higher rungs buy alignment, validation and inference**



DEFINITIONS

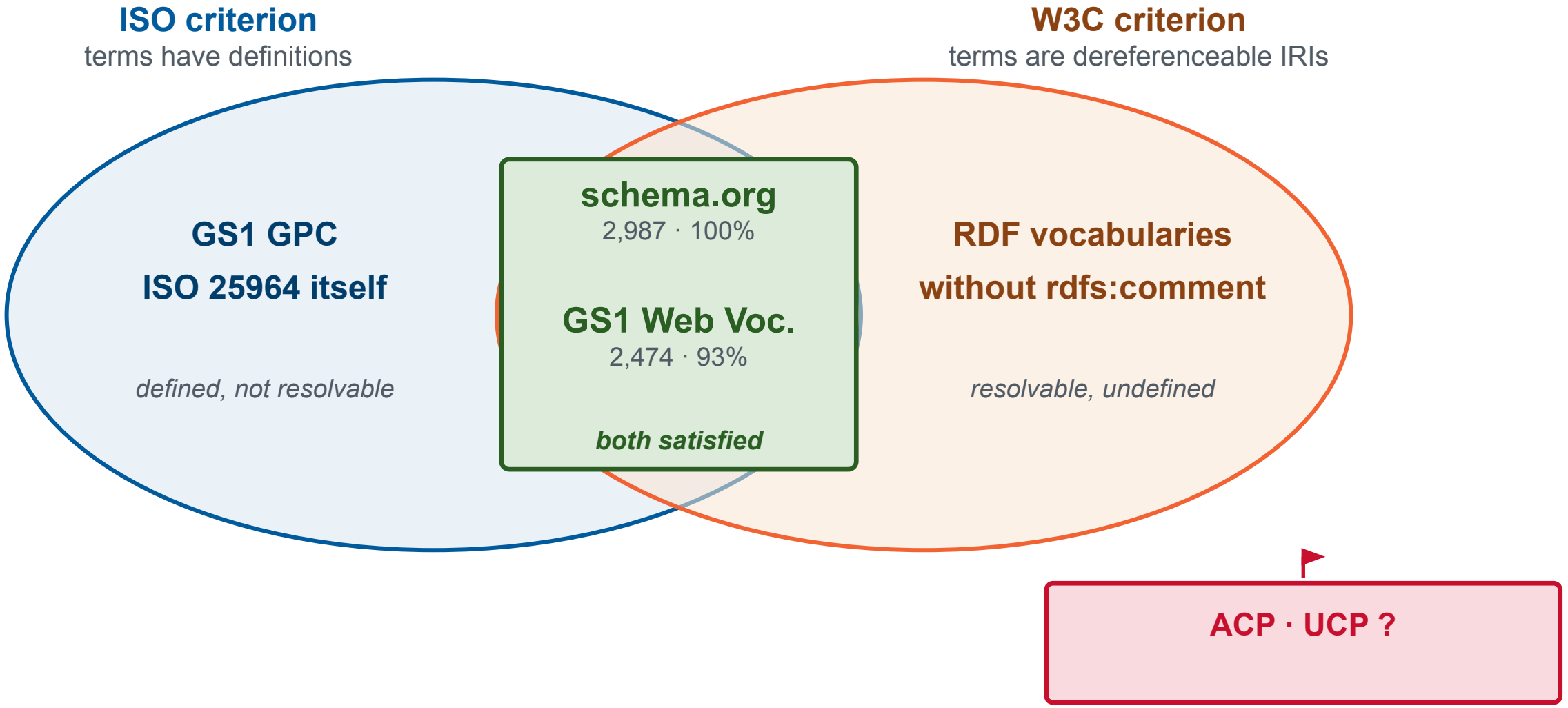
Two traditions define “vocabulary” differently

	ISO (TC 37, TC 46)	W3C
A vocabulary is	a terminological dictionary — designations WITH definitions	a collection of IRIs for use in RDF graphs
Meaning comes from	the definition, written for a human	the IRI owner's defining document
Alignment instrument	ISO 25964-2 mapping	SKOS mapping properties
Access	**paywalled**	**free, royalty-free**

Neither is wrong — and the open web vocabularies satisfy both.

THE GAP

Definitions, serialization, and something in between



EXAMPLES

What a defined, resolvable term looks like

schema:Action schema.org

```
schema:Action a rdfs:Class ;
    rdfs:label "Action" ;
    rdfs:comment "An action performed
        by a direct agent…" ;
    rdfs:subClassOf schema:Thing .
```

gs1:Product GS1 Web Vocabulary

```
gs1:Product a rdfs:Class ;
    rdfs:label "Product"@en ;
    rdfs:comment "Any item upon which
        there is a need to retrieve
        pre-defined information…"@en ;
    skos:exactMatch schema:Product .
```

Both carry an IRI, a label and a definition. (IRI Internationalized Resource Identifier, extends URI)

GS1 publishes 55 such links to schema.org

“Serialization”: five definitions, none neutral

- Every definition is bound to one data model — none is neutral
- W3C Ser. 3.1: an XDM instance into a sequence of octets
- ISO titles it syntax or encoding rules — never serialization
- **GS1: assigning a serial number to each individual instance**

In this room the word already means serial numbers.

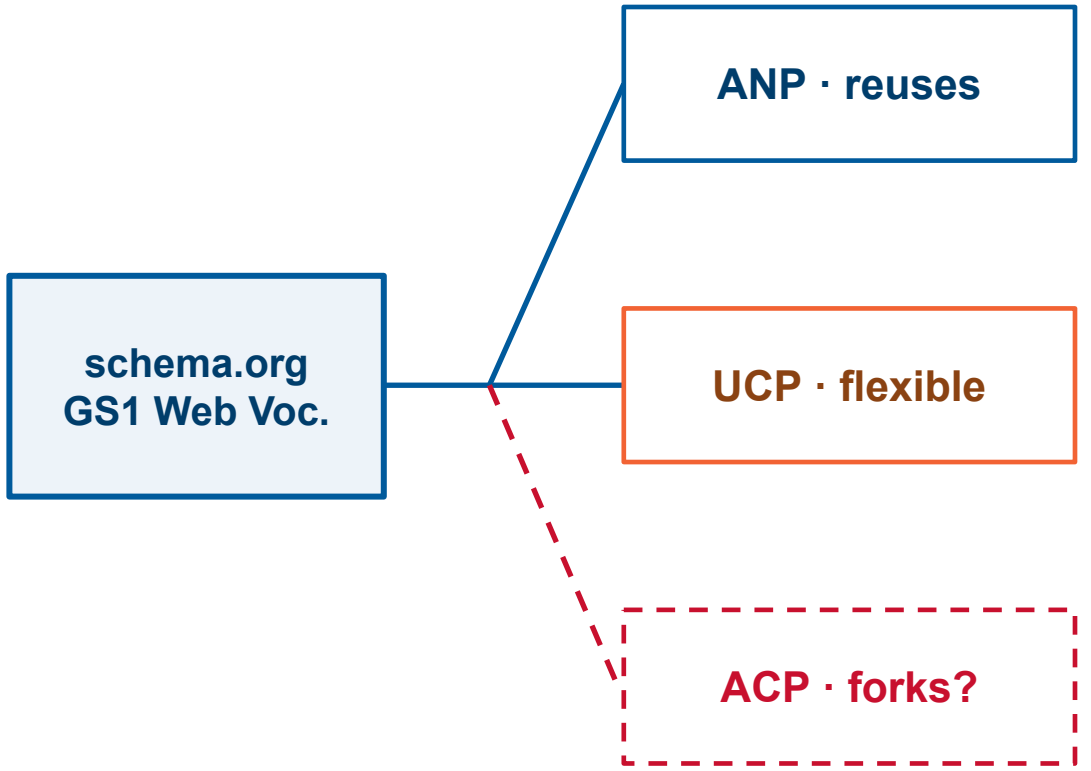
one word — five bound definitions

W3C Ser. 3.1	XDM instance → octets
RDF 1.1	concrete syntax for a graph
ASN.1 / X.690	abstract → transfer syntax
RFC 9651	algorithm for HTTP fields
GS1	serial number per unit

THE CLAIM

Building on what already exists ?

- A mature, open, interlinked e-commerce vocabulary stack already exists
- Agent-commerce protocols partly reuse it, partly fork from it
- No maintained crosswalk binds the new schemas back to the old
- **The gap is a vocabulary /representation/model of agent interaction**



WHY THESE THREE

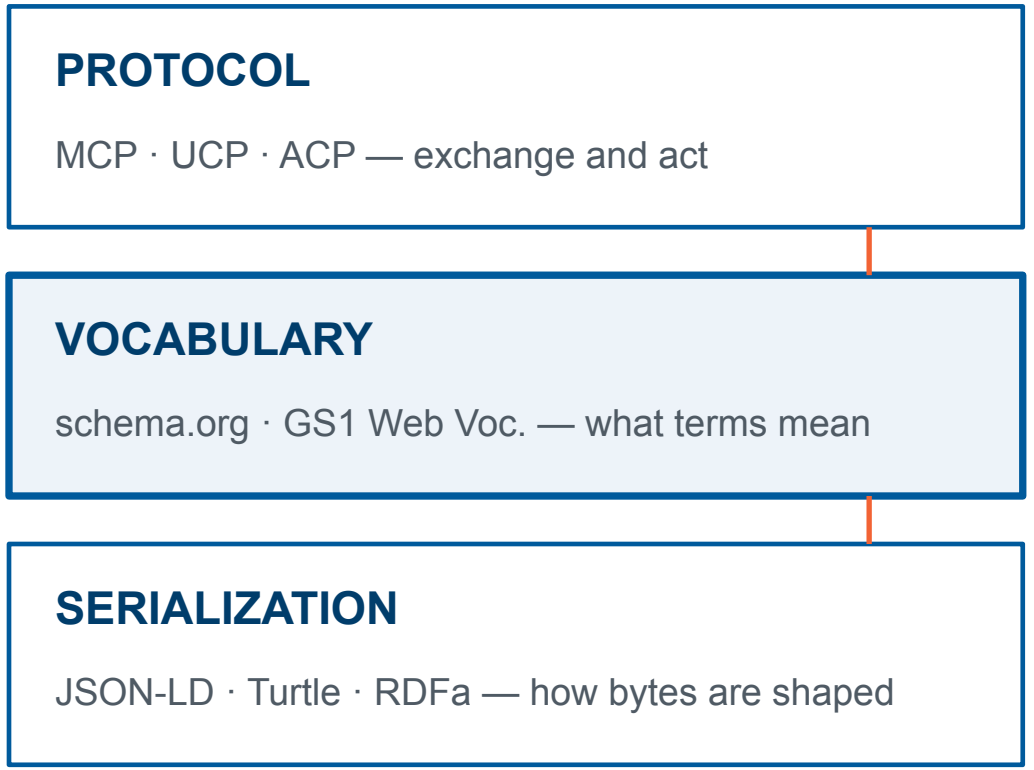
Protocols now sit between the shopper and the merchant

Protocol	What it does in a purchase	Why it matters here
UCP **Google / Shopify**	Merchant publishes a catalogue and capability profile at a well-known URL. The agent comes to the shop.	**Vocabulary-flexible — can carry schema.org**
ACP **OpenAI / Stripe**	Merchant sends a product feed to the assistant for discovery. Checkout returned to the merchant in March 2026.	**Own flat feed — no link back**
ANP **Open source**	Not a shop protocol. Agents describe and find each other using DIDs and JSON-LD, then pay.	**Already built on schema.org + DIDs**

Two reach the merchant from opposite directions; the third never touches the shop. Only one already speaks the open vocabulary.

Three layers

- Serialization — how bytes are shaped: JSON-LD, Turtle, RDFa
- Vocabulary — what terms mean: schema.org, GS1 Web Voc.
- Protocol — how parties exchange and act: MCP, UCP, ACP



COVERAGE

What ISO covers

Concern	ISO	Free route
Terms + definitions	ISO 1087:2019	OBP terms preview
Thesaurus / controlled vocab	ISO 25964-1:2011	SKOS (free W3C Rec)
Mapping between vocabularies	ISO 25964-2:2013	SKOS (free W3C Rec)
Top-level ontology	ISO/IEC 21838-1/-2/-3	BFO-2020, DOLCE OWL
Abstract vs transfer syntax	ISO/IEC 8824 / 8825	ITU-T X.680 / X.690
The term “serialization”	**“syntax” / “encoding rules”**	**no neutral definition**

The tradition that insists on definitions is the one whose definitions you cannot read.

THE INVENTORY

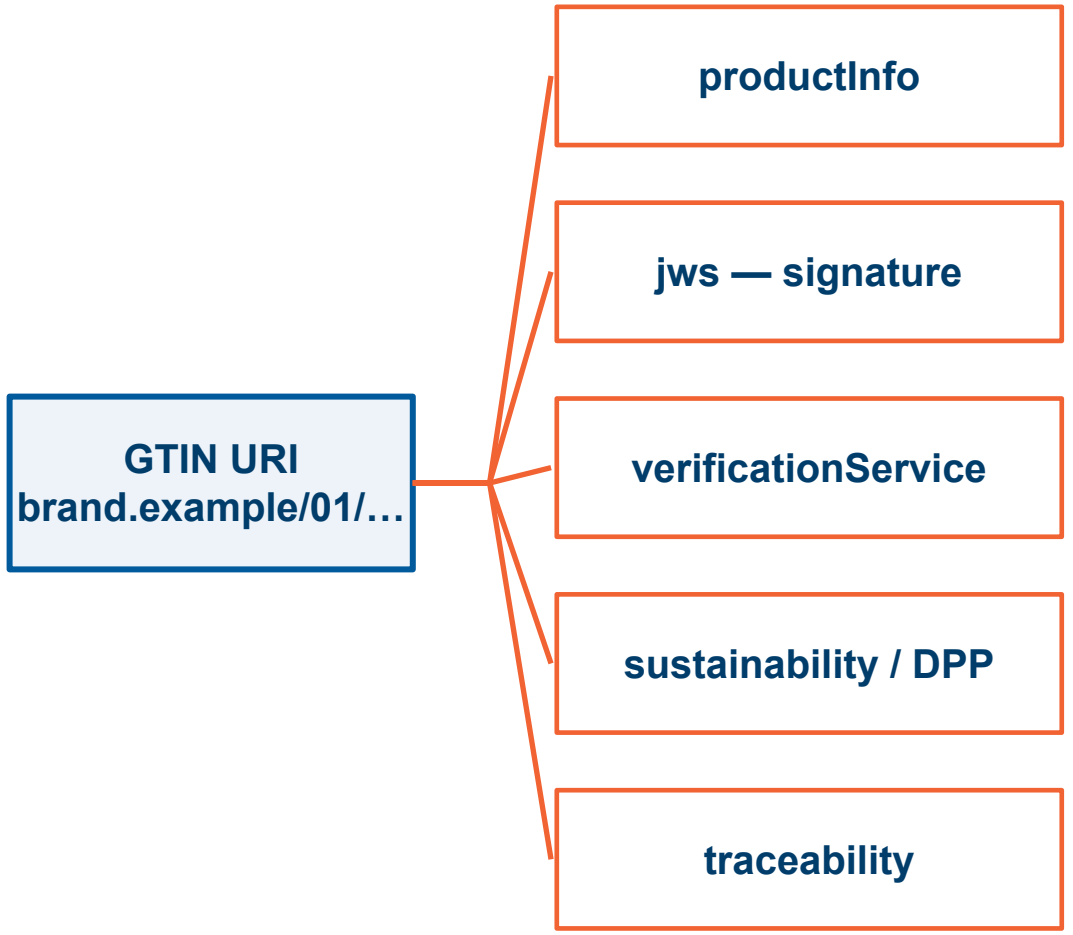
Comparative inventory of open vocabularies

Vocabulary	Custodian	Kind	Agentic readiness
schema.org Product / Offer	schema.org	Taxonomy + typed properties	**Deployed at web scale**
GoodRelations	Absorbed 2012	Ontology	**Now = schema.org**
GS1 Web Vocabulary	GS1	Ontology (OWL)	**Mapped to schema.org**
GS1 Digital Link	GS1	Identifier + links	**Partial trust layer**
UN/CEFACT	UNECE	Controlled vocab	**JSON-LD published**

Order, shipping and payment vocabulary already exists — UN/CEFACT's Buy-Ship-Pay model, free and published as JSON-LD.

Schema.org, GoodRelations, Digital Link

- GoodRelations fully absorbed into schema.org, November 2012
- schema.org's Offer model IS GoodRelations — not a neighbour
- GS1 Web Vocabulary: first large-scale external extension
- Digital Link: canonical URI on the brand's own domain



Building on Paula Rivero (14:20) and Jenny Stanley (14:40).

BASELINE

What the open stack already delivers

✓ Product identity, offer, price, availability, seller	schema:Product · schema:Offer · gtin
✓ Global identifier resolution, no bilateral integration	GS1 Digital Link · Resolver standard
✓ Signatures and verification endpoints	gs1:jws · gs1:verificationService
✓ Linked Data: dereferenceable, mergeable, extensible	JSON-LD 1.1 · RDF 1.1 Concepts
✓ Published on the merchant's own domain	Digital Link canonical URI

NEW ENTRANTS

What the agent protocols introduce

Protocol	Vocabulary posture	Data model	Relation
ACP	Own flat product feed	**tree, not graph**	**Forks**
UCP	Capability profiles, /.well-known	depends on payload	**Flexible**
ANP	JSON-LD, schema.org graphs	graph	**Reuses**
A2A Agent Cards	Agent capability, not product	document	**Orthogonal**
MCP / WebMCP	Transport and tool invocation	—	**Vocabulary-agnostic?**

Two JSON-LD feeds merge into one graph. Two flat feeds do not.

ALIGNMENT

Where they align, where they diverge

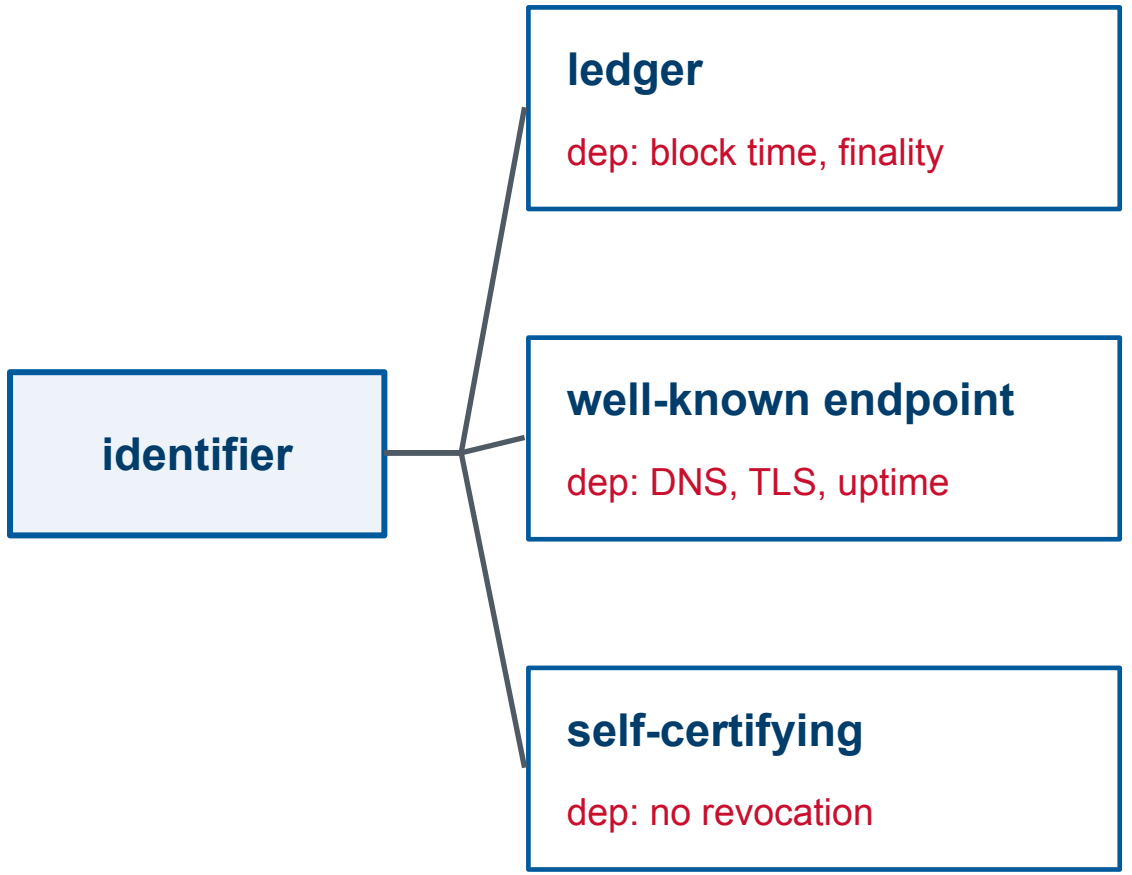
Concern	ACP	UCP	ANP	Aligned?
Product identity	own id field	flexible	schema.org	partial
Offer / price	own feed field	flexible	schema.org	partial
Availability	own enum	flexible	schema.org	no
Seller identity	out of scope	capability profile	out of scope	no
Capability declaration	implicit	/.well-known	Agent Card	no
Delegated mandate	— none —	— none —	— none —	absent

Divergence concentrates exactly where trust and agency begin.

Resolution dependency

https://github.com/w3c-cg/aikr/blob/main/trust/kroftrust.md

- Term-level alignment succeeds; behavioural alignment then fails
- A mapping says nothing about where the document is fetched from
- Ledger, well-known endpoint, self-certifying — all “conformant”
- **Same ask as the last slide: declare the resolution path**



Sven Böckelmann — Trusted Resolution — makes a complementary argument

THE GAP

Nobody declares what their terms denote

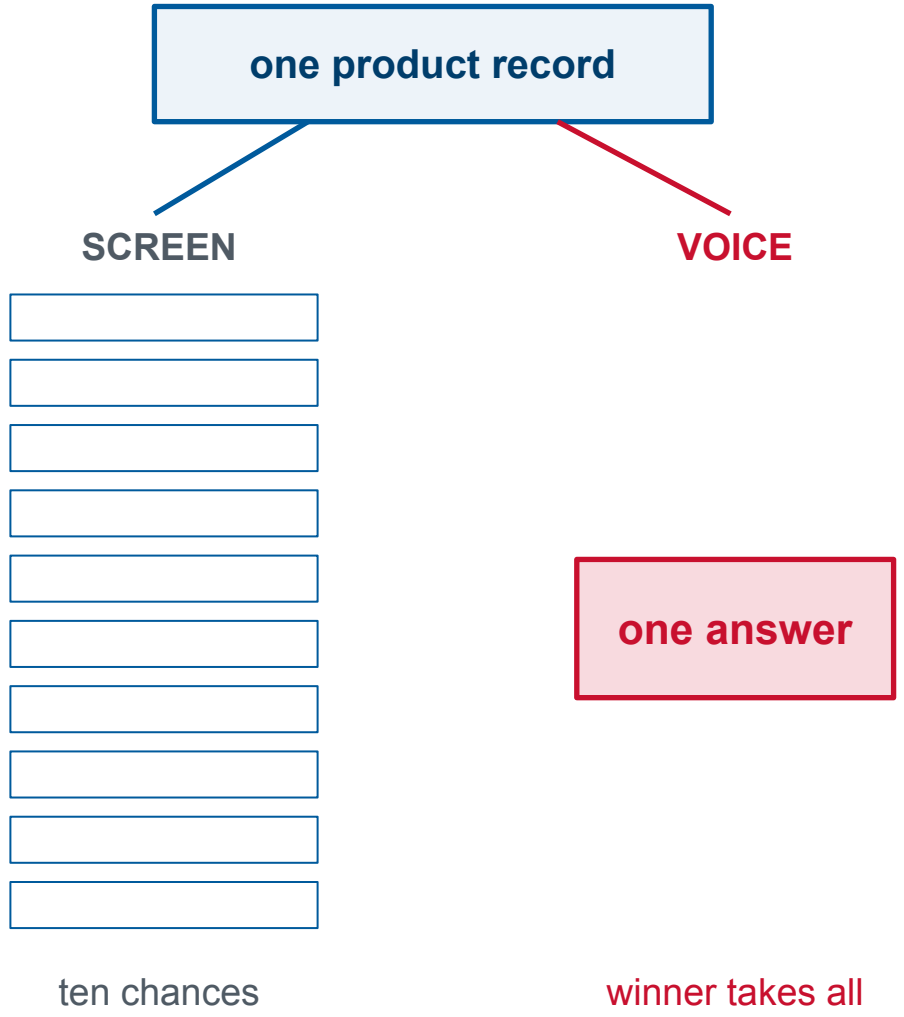
Ontic category	In commerce
Independent entity	the product, the merchant, the agent
Information object	the product record, feed entry, agent card
Role	seller, buyer, principal, delegate
Disposition / capability	what the agent can do
Commitment / relator	offer, mandate, contract
Event / process	the purchase, the delivery
Quality / value	price, weight, availability

Voice e-commerce agents

- Assistant-led shopping already deployed at scale — Alexa, Siri, Gemini
- No page, no layout: selection runs on structured data alone
- No standard way to express how a product or brand is spoken
- **One spoken answer representation**

W3C Workshop on Smart Voice Agents, report March 2026 → Voice Interaction CG

Léonie Watson (10:20) on non-visual shopping



OVER TO YOU

Five questions for the workshop

1. Should agent-facing product data be REQUIRED to reference an open vocabulary?
2. Who maintains the crosswalk — GS1, W3C, a joint liaison, or nobody?
3. Do we need a declaration mechanism for resolution path and grounding?
4. Does voice commerce need its own profile — starting with spoken form?
5. Is “serialization” worth mapping?

Takeaways

Mind the gaps *agentic ai protocols and standards are still in the making

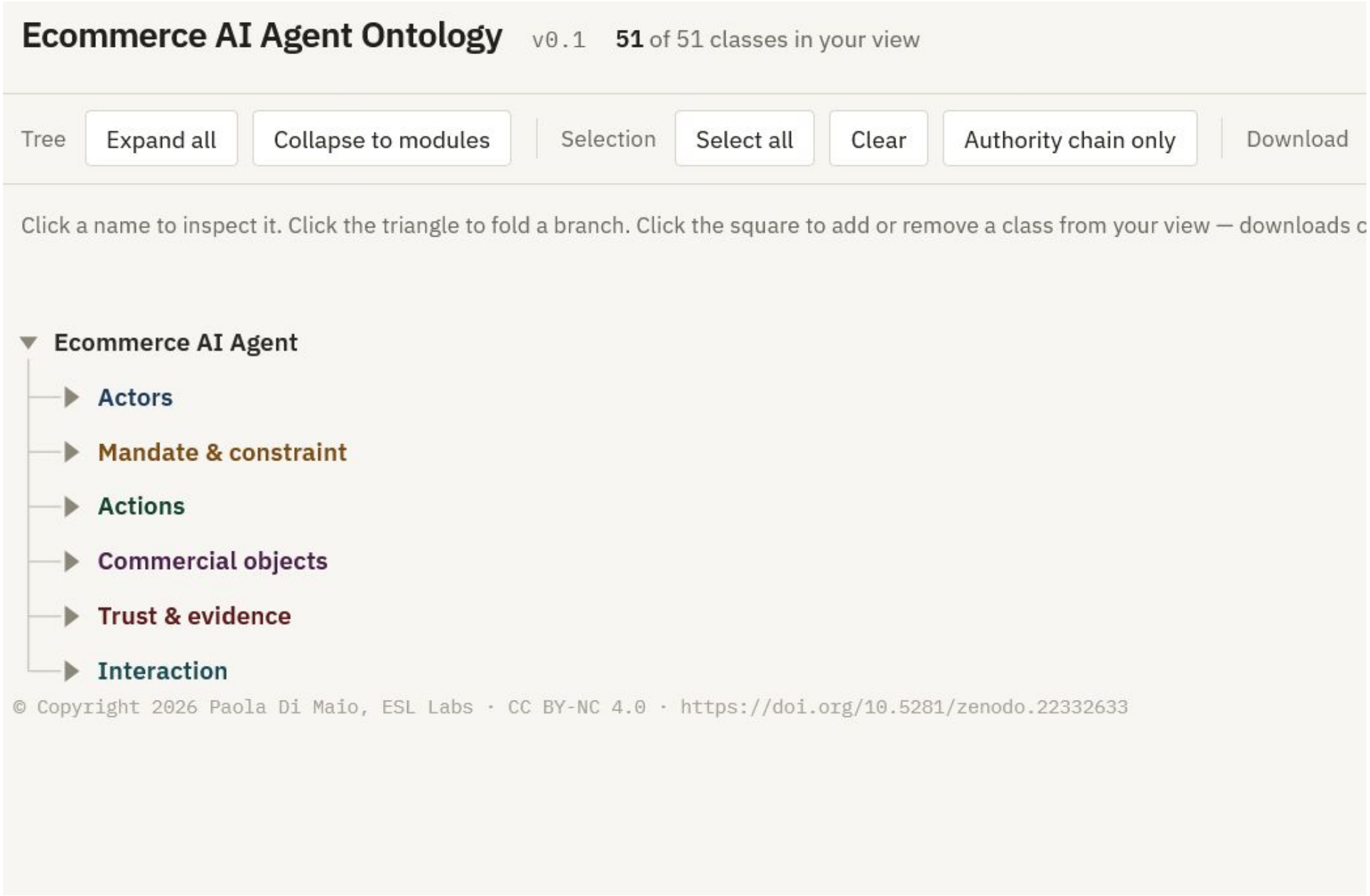
Design robust real **world models** domain, models, task models, risk models

Continue to invest in building **human capacity** and upskilled management expertise, because powerful AI is fragile and cannot be relied upon without oversight

Mitigate risks of falling out of synch

Adopt Ontology Engineering and Knowledge Representation

https://ecommerce-agent-ontology-tree-1.vercel.app/



ANNEX D

Sources and how to engage

- Ecommerce AI Agent Ontology *beta
  https://ecommerce-agent-ontology-tree-1.vercel.app/

- Technical Notes — Open standard vocabularies for e-commerce and the agentic interoperability gap https://w3c-cg.github.io/aikr/
- W3C AI Knowledge Representation CG — w3.org/community/aikr/
- AIAO — ontology for agentic AI: 8 dimensions, 32 classes (Figshare)
- Voice: W3C Workshop on Smart Voice Agents, report March 2026

THANK YOU GET IN TOUCH Paola Di Maio · ORCID 0000-0003-0770-3713

ANNEX A

Vocabulary inventory

Artefact	Type	Custodian	Key terms	Mapping
JSON-LD 1.1	Serialization	W3C Rec	@context, @id, @type	carrier for all below
schema.org	Taxonomy + typed properties	schema.org community	Product, Offer, price, gtin	reference vocabulary
GoodRelations	Ontology	Hepp → schema.org 2012	BusinessEntity, Offering	absorbed 2012
GS1 Web Vocabulary	Ontology (OWL)	GS1	TradeItem, brand, netContent	55 skos:exactMatch links
GS1 Digital Link	URI + link types	GS1	productInfo, jws, DPP	resolves to schema.org / GS1
UN/CEFACT BSP	Reference data model	UNECE	Order, DespatchAdvice, Invoice	JSON-LD at vocabulary.uncefact.org
UN/CEFACT UNTP	Verifiable credentials	UNECE	DPP, conformity credential	W3C VC + JSON-LD
SKOS	Instrument	W3C Rec	broader, exactMatch, closeMatch	the mapping instrument
SHACL	Instrument	W3C Rec	node/property shapes	unused in e-commerce
ISO 1087:2019	Terminology standard	ISO/TC 37/SC 1	vocabulary, designation	different tradition
ISO 25964-1/-2	Thesaurus + mapping	ISO/TC 46/SC 9	controlled vocabulary	crosswalk precedent
ISO/IEC 21838	Top-level ontology	ISO/IEC JTC 1	BFO-2020, DOLCE	grounding declaration

TO FINALISE — replace with the Technical Note table before publication.

Annex — not presented

ANNEX B

Gap analysis — agentic use cases

#	Agentic use case	Open stack provides	Missing
1	Discover a product from a spoken query	Product, Offer as JSON-LD	spoken-form property
2	Compare offers across merchants	Offer, price, currency	comparability profile
3	Resolve identity to authoritative source	GTIN, Digital Link	declared resolution path
4	Verify who may speak for a product	jws, verificationService	authority-to-speak semantics
5	Check the agent's delegated mandate	—	mandate vocabulary
6	Confirm price at moment of action	priceValidUntil	freshness guarantee
7	Weigh fulfilment before shortlisting	shippingDetails	uneven publication
8	Record which agent acted	PROV-O available	no adopted profile
9	Validate a record before publishing	SHACL available	no agreed shapes
10	Hand a conversation to another agent	—	handoff vocabulary