Leveraging Product Codes for Internet Commerce

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Table of Contents

Executive Summary

Product codes (e.g., UPCs, EANs, ISBNs, etc.) could serve as a valuable *lingua franca* for referencing objects in commerce on the Internet, but have been neither widely nor effectively used thus far. Their potential impact on Internet commerce could be significant, since it could unlock proprietary "information about things" and enable more federated or decentralized applications. Reducing consumer confusion by increasing product information availability, accuracy and currency should benefit smaller retailers, including "brick and mortar" stores.

The federated architecture announced last year for resolving the Electronic Product Codes (EPCs) introduced for Radio-Frequency Identification (RFID) suggests an elegant solution to the problem of making product codes more broadly useable: a two-level hierarchical structure and an information service to publish information about products.

If this EPC adoption depends on RFID adoption, though, it probably won't increase the utility of legacy product codes to Internet commerce for years. Simpler solutions to make legacy product codes useful in an analogous fashion would be both timely and valuable.

A Registry complementary to the Object Naming Service (ONS) planned for RFID — but specifically mapping the *previous* generation of product codes — would jump-start the use of product codes as unique identifiers in Internet commerce. In the long run, it would be subsumed by the ONS itself, but would play a valuable role now as a means to rapidly facilitate conversion of product codes to useful handles on the Internet.

The white paper outlines the challenge of creating such a Registry and associated open-source product information-publishing tools, with estimates of the effort required.[1]

[1] Note: Throughout this white paper, the Universal Product Code (UPC) will be used to represent the earlier generation of product codes. Despite its name, it is not universal, but has similar counterparts, e.g., the European Article Number (EAN) used predominately outside of North America, and collectively all have been subsumed under a 14-character Global Trade Identification Number (GTIN). What is true for UPCs in this analysis extends to the other codes that collectively make up the class of codes spanned by the GTIN.

1. The World as It is Today

Consumer product description has been heavily skewed toward major on-line retailers, distorting the e-commerce landscape. The reasons for this are several, including retailers' greater attention to end consumers, and manufacturer/retailer tensions, but a significant contributing factor is a lack of standards and knowledge of sources. Smaller retailers unable to make investments in acquiring and presenting product information on the scale of an Amazon (as one of the best examples of major on-line consumer product retailers) find assembling presentable content from the hodge-podge of available bits and pieces daunting.

Finding information on products, and opportunities to purchase them, depends heavily on:

- some availability of information from manufacturers;
- a relatively small set of content-rich retailers;
- many, many more "content-poor" retailers, especially smaller brick & mortar retailers, which have effectively *no* Internet-accessible content;
- Internet search engines, either generic (such as Google) or specific to retail (such as Dulance, or Google's Froogle catalog search service).

Consumer product search, whether by search engine (Google claims that some 28% of Google searches are for product names, with another 9% on brand names[2]), or shopping site or meta-site, is haphazard and unscientific. It also leaves consumers dependent on intermediaries with potential bias; while Google's current plan may be "to do no evil," reliance on dominant intermediaries poses risks.

[2] Beal, Andy, "Google Execs Spill the Beans!," Search Engine News, Sept. 29, 2004, http://www.searchenginelowdown.com/2004/09/google-exec-spills-beans.html

2. Product Codes: A Lever Lacking a Fulcrum

The Universal Product Code (UPC) was introduced in 1974, originally in the grocery sector, and adopted widely for retail and supply chain transaction management. A new consortium of interested parties has now created an expansion of UPC-like codes, to allow for identifying instantiations of items (and not just their broad classes), and suitable for use in RFIDs. The consortium that produced the Electronic Product Code (EPC) again involves key players in consumer goods commerce (major manufacturers, retailers, and supply-chain implementers), but also includes the U.S. Department of Defense, one of the world's largest logistics customers.

A critical feature both generations of codes share is the codes' separability into two parts: a part designating the code's owner, and assigned directly or indirectly by some root authority; and a part assigned by the code owner itself. In the case of the UPC, or other code subsumed under GTIN, the portion then assigned by the owner defines an object at the class level (e.g., all 12 oz. cans of Coke Classic). In the case of the EPC, an additional field allows the owner to both define a class, and an instantiation (e.g., can #2,248,236 out of the set of all 12 oz. cans of Coke Classic).

Whereas in the past, organizations like the Uniform Code Council (responsible for the UPC) issued the first part, they neither mandated nor implemented any scheme to make that a useful pointer, in and of itself. The critical difference in the creation of the Electronic Product Code is the definition of an Object Naming System (ONS) as an Internet-based information service to map authoritative code assignments: every EPC Manager Number issued will have a mapping in the ONS, vectoring inquiries to a destination of its owner's choosing. Due to legacy compatibility interests, the ONS *could* be a critical development for the utility of the previous generation of product codes, but may not become that any time soon, without some assistance.

Without such an asset—a fulcrum for leveraging their power as unique identifiers—product codes have been less-effectively used as keys in a number of proprietary and/or comparatively closed catalogs and registries. There has been some relative success by catalog clearinghouses focused on supply-chain transactions, though their value appears to be declining. And there were a series of dramatic failures during the "dot-com bubble" of ventures attempting to serve as consumer-oriented product content services.

3. Product-code-keyed Clearinghouses in Supply Chain: Aging Information Silos in a Federating World

The market solution to the need to more efficiently exchange product-code-keyed information was the creation of "information silos."

Several parties developed product-code-keyed information catalogs, in response to a need to simplify exchanges between trading partners, e.g., major retailers (such as Federated and Dayton Hudson, now Target) and their suppliers. This allowed retailers to mandate that their suppliers provide product information to a clearinghouse; across the industry, it reduces a many-to-many tangle to a simpler many-to-one, one-to-many fan-in and out. QRS (now being acquired by Inovis) and GXS (formerly GEIS, and now owned by Francisco Partners) each maintain product catalogs with in the range of 100 million product records on behalf of several thousand manufacturers, for several thousand supply chain partners.

The Uniform Code Council (UCC) subsequently launched UCCnet as an industry-wide information hub; to some extent it both competes and collaborates with QRS and GXS. Like them, it also serves as a content pool, with manufacturers uploading product content, to make it accessible to other UCCnet subscribers. UCCnet's membership is also similar, numbering on the order of 2,800 in March of 2004.[3] (It should be noted that not all of those members would be manufacturers, and that several hundred thousand UPC prefixes have been assigned by the UCC, suggesting that UCCnet penetration among all companies with product codes may be less than a few percent, though membership would include most or all of the largest consumer goods manufacturers.)

While these clearinghouses have served important roles in a "pre-Internet" landscape (both QRS and what is now GXS coming into being in the mid-1980s), they may have passed their peak. They are in the process of being integrated into a more federated collection of services, first with the creation of UCCnet, and the subsequent launch of the Global Data Synchronization Network (GDSN) and the GS1 Global Registry.

The ONS (as discussed below) may trigger an even more precipitous decline, or at least produce a shift in their business models.

[3] Whiting, Rick, "Home Depot Pushes Adoption of UCCnet," InformationWeek, Mar. 8, 2004, http://www.informationweek.com/story/showArticle.jhtml?articleID=18300089

4. Product-code-keyed Internet Plays: Failures on a Silo Model

During the "dot-com" boom, approximately a half dozen ventures were launched on the premise that end consumers should be able to reference product and other information through bar code scanning.[4] Some added proprietary bar coding schemes to the existing UPC and other commercial bar code formats, intended to allow for code publishing (e.g., in magazines or newspapers) to link print to Web-based content. All were based on proprietary ownership of data pools, and/or sets of links.

All have either failed outright, or shifted to different business models.

The two principal problems for all of the ventures were a lack of end-consumer interest in bar code scanning, and a failure to achieve network effects in compiling proprietary pools of product information/retailer links. The code-scanning ventures were also hostile to brick and mortar retailers: the latter were abused as free showrooms for cheaper vendors with an Internet-only presence.

The world did not need a proprietary intermediary for consumer-oriented product information, with or without the hassle of end-user bar code scanning. Again, the federated model described by the EPC network suggests a better solution.[5]

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[4] Companies in this space included DigitalConvergence, Barpoint, IQorder, Airclic. DigitalConvergence might be most notable, as the company that delivered more than a million ":CueCat" bar code scanners, through partner Radio Shack, and to subscribers of a number of high-tech and business-oriented publications.

[5] End-user code reading will undoubtedly grow; cell phone manufacturers have already announced plans to offer phones with embedded RFID readers, and applications that read 2-D codes via camera phones have been developed. But the primary uses of a better means to resolve codes to product-descriptive content would likely be "behind the scenes," e.g., an on-line retailer fetching product descriptions to automatically construct a Web site.

5. RFID's ONS as a Fulcrum

In 1999 a consortium of major corporations concerned primarily with consumer packaged goods established, under the MIT Auto-ID Center, an effort to develop technologies, strategies and policies for the deployment of RFID in commerce. This work led to the codification of standards and strategies to implement an Electronic Product Code (EPC). In September 2003, that effort was transformed into EPCglobal, Inc., a joint venture of the Uniform Code Council (UCC) and EAN International, and a set of standards officially announced. In January of 2004, EPCglobal awarded VeriSign a contract to implement and run the Object Naming Service (ONS) portion of its proposed global, commercial RFID infrastructure (the EPC Network). The ONS will be hugely important to the use of product codes in commerce.

Some issues of importance:

- The EPC will be somewhat forward/backward compatible with the previous generation of product codes—manufacturers will base the EPCs they assign to existing products on the UPCs they tag them with today, and will still assign UPC (or GTIN) bar codes to new products, given the continuing importance of bar code scanning in commerce;

- EPC and the technology of RFID are separable issues: even if RFID turns out to be a bust, e.g., item-level RFID tagging turns out to be infeasible or cost-ineffective, assigning unique and standardized IDs to instances of items will be useful and likely will be widely adopted;

- The ONS is something both novel, and powerful; while conceived to implement EPC RFID tag transactions, its architecture also has an important relevance to product codes more generally.

The planned EPC Network is federated: the companies which create information about tagged objects will also maintain and provide it to others, rather than having to pool it in some centralized repository. At the center, however, is a form of root registry, the ONS.

The ONS is patterned directly on the Internet's Domain Name System (DNS), the utility that maps domain names to underlying Internet Protocol addresses, i.e., human-readable names to machine-manageable numeric network addresses.

A simpler analogy for the ONS, and its place in the EPC Network, would be that it's used like a form of bare-bones library card catalog might be used to organize a library, with a single record for each and every book publisher, with each publisher then responsible for answering queries about its particular books. Instead of a complete index to every book in the library (a centralized pool model), the only answer one gets out of the ONS is, "That company published this book; go over there and ask them directly." Product codes, like book ISBNs, are very simple numbers, and the job that the ONS will perform is a fairly simple function. In the EPC Network,

each manufacturer (or some service provider delegated the job) will run an EPC Information Service (EPC-IS) to catch the queries referred to it via the ONS. (see Appendix B for additional discussion of the EPC Network.)

6. Some Implications of Product-code-enabled Commerce

6.1 Amazon Web Services as Proof of Concept for Product-code-keyed Content

Online retailer Amazon launched a Web services applications programming interface (API) in July 2002. Amazon has chartered the ASIN (Amazon Standard Identification Number) as a proprietary extension of GTINs, i.e., encompassing (and originally based on) UPCs, but also allowing for Amazon-originated unique identifiers for restaurants (for reviews) and other products and services. Affiliates of Amazon can reference product content, through the Web services API, keyed by ASIN.

At the Web 2.0 conference in October, Amazon CEO Jeff Bezos claimed that Amazon has 64,000 developers making use of the Web services API; uses would include creating Amazon-affiliated stores, pulling product descriptive content or reviews from Amazon for presentation as the affiliates' own.

Amazon could be said to serve as a proof of the concept of consumer-oriented, product code-keyed content accessible via Web services, though Amazon's is a proprietary model (with Amazon as the fulcrum).

6.2 What Product-code-enabled Commerce Could Be

The point of enabling Internet commerce via use of product codes as unique identifiers is *not* end-consumer awareness of product codes; while end-consumer use of portable, digital technologies (e.g., cell phones that can capture scannable codes, or RFID) will continue to rise, it seems likely that this will remain a niche or novelty activity for some long time. The point is use of product codes as linking identifiers, *behind* consumer-facing applications.

Such applications could range from retailer-neutral sites and services (e.g., providing product reviews), "meta-retailers," like Dulance or NexTag, or specific retailers.

Product-code-keyed content could be from primary sources, e.g., manufacturers' authoritative production descriptions, or 3rd-party content, such as product reviews and evaluations.

Changes we would expect to see wrought by making product-related content more readily addressable by product code would include:

- A lowering of the bar to acquiring and manipulating product-descriptive content by retailers, lessening the advantage held by major e-tailers;
- A lowering of the bar to publishing product-related content by 3rd parties, encouraging broader participation by smaller and more independent sources;

- Significant implications for any party—including traditional brick and mortar retailers—who understand their inventory by product codes.

6.3 "Everyone an Amazon"

Rendering product and related information referenceable through product codes could significantly lower the bar for currently content-poor retailers to create content-rich Web sites. It's important to note that authoritative product content is only one aspect of "what makes Amazon Amazon." But depending on how pervasively product codes as content handles becomes (e.g., useful as hooks not just to 1st order authoritative content from manufacturers, but also to sources of critical commentary, or into alternative retailers) one could see major content-rich retailers like Amazon challenged across the spectrum of what they offer to support their selling.

6.4 Disintermediation of Code-keyed Services

Content-rich sites like Amazon.com hang a variety of enhancements off of each offered product, e.g., product reviews, affinity recommendations ("customers who bought this also bought that") and sample tracks for albums. Were product codes more widely employed, across the spectrum of potential retailers, one could expect to see markets for associated content and services similarly expanded. For example, a customer today can author a product review on the Amazon site; it is effectively a contribution to the Amazon customer community. Alternatively, if product codes were widely used as canonical handles, a reviewer might syndicate such a review, allowing any of many, many more sellers to employ it as a tool to elicit customer interest.

Amazon's recommendations feature could readily be matched by other retailers, with information from other sources, e.g., credit card issues, consortia of smaller stores, or market research firms. (To take decentralization to the extreme, one could imagine consumers' own browsers could be in a position to swap such information in return for consideration, e.g., reporting shopping-cart clusterings in return for discounts, coupons, micropayments, etc.)

Alternatively, a destination site like Epinions.com could, via a Web services API, more readily open itself up to affiliate use; any retailer which knew and managed its product content by product code could make use of such interfaces to fetch such 3rd-party product commentary and reviews as a customer.

6.5 Selling Decoupled from Content

The future architecture of product-code-keyed content could allow even brick and mortar stores to be "Internet-accessible."

How it might happen:

- Consumers (really, sites, agents and applications working on their behalf) will know products by their codes;
- Product search will evolve to a code-driven process;
- Expressing inventory and opportunity: pairs of product code and price, associated with the store's physical coordinates and/or its means and price to ship products, renders any retailer an Internet retailer.

We should expect that this advanced stage of the "Internetification of retail" to be messy and ugly in its early stages, but there's no reason to expect that it couldn't or shouldn't happen.

It would not abolish other means for differentiation, e.g., concentrating on ease of service, support, or affiliation with other interests (my bookstore of choice is the one with my favorite coffee shop attached), but would hammer down the variables of price and availability.

While various parties may currently have an interest in objects *not* being easily identified, universally (e.g., to frustrate product comparison from alternate sources), widespread use of product codes should produce network effects, where the cost of not participating overcomes any benefit of being "different."

7. But… When?

We believe that EPCglobal's ONS/EPC-IS architecture will be adopted at a very slow pace, especially given potential problems of data confidentiality. (This seems to be evident in the mandate-driven early deployments—there's less risk in implementing RFID if any intercorporate exchange of information is confined to established VAN channels.)

If registration in the ONS only follows upon issuance of an EPC manager number, which in turn depends on a decision to adopt and deploy RFID in intercorporate applications, population of the ONS could proceed at a snail's pace. Given the ability to manage EPC transactions *without* the ONS (e.g., knowing one's trading partners explicitly, and engaging in point-to-point exchanges), it could effectively be ignored by many parties. The DOD mandate for RFID tagging by 2005, for example, does not require use of the EPC network at all, but specifies use of existing EDI systems.[6]

By contrast, hundreds of thousands of companies have been assigned GTINs (UPCs, EANs, etc.). Many will *eventually* claim corresponding EPC Manager Numbers, and many may eventually be registered in the ONS.

[6] Roberti, Mark, "DOD Releases Final RFID Policy," RFID Journal, Aug. 9, 2004, http://www.rfidjournal.com/article/view/1080

8. Concept: An OpenONS and OpenCIS

What the Internet could use right now is an ONS-like resource, chartered to map the *previous* generation's product codes. The name "OpenONS" would suggest that:

- participation in it would be as open as possible, e.g., inviting registration by any incumbent GTIN owner at no cost, to encourage network effects; and
- it would attempt to maximize "hooks" for new applications.

To complement the OpenONS, we also propose an open-source Code Information Service (OpenCIS), analogous to other portions of the EPC Network.

8.1 OpenONS as a "Complementary Alternative"

The OpenONS would behave very much like the ONS commissioned from VeriSign by EPCglobal, with a few significant differences. Most importantly, the OpenONS would register associations for GTINs. The assumption is that the purpose of the OpenONS and OpenCIS is to facilitate sharing of information at the class level—information common to any copy of a particular good; there is no reason to require an EPC manager number as "price of admission."

By nature, an OpenONS would be both small, and highly static. Its function is merely to map code prefixes to Internet addresses, and on the order of only a few hundred thousand such mappings.

8.2 OpenCIS (Open-source Code Information Service) analogous to the EPC-IS

The OpenCIS would behave like the local ONS and EPC-IS pieces of the EPC Network (see Appendix B): it would cache inquiries referred to it by the OpenONS, and return information keyed to specific GTINs or EPCs, at a class level. If distributed as open source, it could be extended and enhanced more easily, e.g., to integrate with legacy data sources. Its primary purpose is to help jumpstart the market for class-level product descriptive information as a free resource. Code owners could host it themselves, or delegate the task to a service provider (as is also envisioned for EPC-IS in the EPC Network model).

The two pieces—an OpenONS and a reference model for an OpenCIS—are proposed as necessary and sufficient to encourage manufacturers/publishers to provide product-descriptive information for dissemination to a broad variety of parties. The OpenCIS would also support 3rd-party sources for product information, i.e., allow any party that wishes to critique or otherwise describe products to do so, in a fashion suited to syndication, and other forms of dissemination, using their own OpenCIS implementation. (This proposal does not prescribe how such 3rd-party sources could be found; in the EPC world, this is a function of such services as

VeriSign's EPC Discovery Services. We believe that various parties would conceive and launch analogous services to complement the OpenONS/OpenCIS architecture.)

An OpenONS could certainly be seen as a complementary, nonconfrontational effort to advance the application of product codes in commerce; there is no evidence that any of the codes-to-content ventures launched in the dot-com boom were perceived by the Uniform Code Council (which has authority over the UPCs those ventures mapped) as undermining their authority, or abusing the code standards or assignments. (Arguably, a project as described should be of less concern than the potential distortion introduced by large retail players insinuating proprietary extensions of those "authorized" codes in commerce.)

Working without the active support of EPCglobal and/or other code authorities would significantly increase the resources required, e.g., in reaching and subscribing code owners in the OpenONS. Collaboration with EPCglobal and other code authorities (such as its parents, which would really be the authorities for GTINs) would be ideal, both in establishing legitimacy, and bootstrapping off of existing means to authenticate participants. The idea of rendering GTINs more useful in Internet commerce, and "lighting a fire under the ONS," speeding the adoption of such a federated architecture, might even be sufficiently appealing to EPCglobal as to cause a rethinking of basic strategy, and a realignment of the ONS and its use to embrace the legacy codes more directly.

Constructing an OpenONS would be simple, given that it is little more than a mapping function to convert codes to URIs, and with a ceiling on the order of a half million associations (and probably requiring only several tens of thousands of associations to encompass the vast majority of codes in active use). *Populating* the OpenONS is more the challenge, both in promoting it as a useful piece of Internet infrastructure, and actually subscribing registrants.

About the Author

Ross Stapleton-Gray, Ph.D., CISSP, is an information technology and policy analyst, with interests in issues around unique identifiers, security, surveillance and privacy. He served six years as an intelligence analyst and planning officer at the Central Intelligence Agency and Intelligence Community Management Staff, and has held positions with the American Petroleum Institute, two information security start-ups, and the University of California Office of the President. He has taught as an adjunct professor at three universities, with courses on information age issues, and the transformation of national security as a consequence of information technology. He lives in Albany, California with his wife and two daughters.

9. Appendix A - Product Codes

Global Trade Item Number (GTIN) and Electronic Product Code (EPC)

The GTIN is an ID number of up to 14 decimal digits, encompassing several other product code schemes (most importantly the UPC and EAN), and used to define objects in commerce to the class level, i.e., all instantiations of a given specific product have the same GTIN.

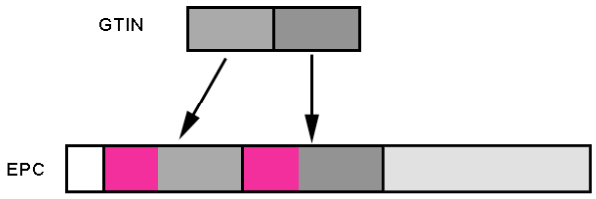
According to EAN International, partnered with the Uniform Code Council (UCC) in managing the EAN.UCC system of codes:

"One of the main concepts of the EAN.UCC system is that any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain can be allocated a unique identification number – the Global Trade Item Number, or GTIN for short."

Additional explanation is provided by the EAN on its Web site:
http://www.ean-int.org/products.html

The EPC was created as part of an effort to standardize RFID for commerce, and does two things: preserves (i.e., overarches them as a superset) legacy codes like the GTIN, and extends those codes by adding an additional serial number field. EPCs could differentiate two items with identical GTINs, but otherwise differing, e.g., having been manufactured on different dates at different plants, etc.

Greatly simplifying the two code types (i.e., ignoring various lesser-encountered formats to focus on those expected to be most significant in consumer goods commerce) to focus on key features and the size of the namespaces defined by the codes, GTINs and EPCs look like this:



This graphic shows a rough relative size between GTINs, and the EPC: GTINs are two fields, one indicating manufacturer, and one indicating item. The EPC has four fields, being the two GTIN fields, with a small field in front (indicating what format EPC this is) and a long field at the end (the unique serial number field). As noted in the graphic, while both GTINs and EPCs have those two fields in common, the EPC allocates considerably more space for each.

10. Appendix B - The EPC Network

The EPC Network, as defined by EPCglobal, is a federated system. Its root is the Object Naming Service (ONS), a system akin to the Internet's Domain Name Service (DNS) to map EPC Manager Numbers to their owners. Each participant in the EPC Network who has been assigned an EPC Manager Number registers a destination in the ONS, corresponding to that number; anyone who encounters an RFID bearing an EPC Manager Number then has the means to look up that authoritative source for information on the tagged item.

The ultimate target of a query vectored through the ONS is an EPC Information Service (EPC-IS), though there may be an additional transition through a Local ONS. For example, ABC Corporation's record for its EPC Manager Number in the ONS leads to a Local ONS managed by ABC itself, which in turn sends the query on to an appropriate EPC-IS. (It might be the case that separate business units at ABC run their own EPC-IS resources; the Local ONS would then act as a kind of traffic cop to direct queries to the appropriate resource).

EPC-IS resources will in turn draw upon legacy information services and databases for the information they provide; the EPC-IS is the outermost edge of the EPC Network (where it meets the information assets of corporations), and the outermost edge of the corporation (where the company stages information to outside parties).

Third parties and supply chain partners may also provide EPC-keyed information via EPC-IS implementations. In these cases, though, they won't be pointed to by the ONS, but by other search services. One example would be the EPC Discovery Services offered by VeriSign: each entity that encounters a given RFID and notes its EPC value can register the EPC with the EPC Discovery Service, signaling "I have had custody of this EPC; I have transactional information for it." The EPC Discovery Service would only record claims of interaction, and would merely refer queries on a given EPC to the appropriate parties.

Additional detail on the EPC Network and its function is available from EPCglobal, Inc. (http://archive.epcglobalinc.org/abouttthetech_idiotsguide.asp) and from VeriSign, which manages the ONS (http://www.verisign.com/products-services/naming-and-directory-services/directory-services/epc-network-services/page_001193.html).

11. Appendix C - Glossary

ASIN - Amazon Standard Identification Number - a unique product identifier employed by Amazon.com, originally stemming from UPCs and ISBNs, but with proprietary assignments, including for intangibles, e.g., restaurants for associating reviews.

Bar Code - an optically-scannable rendering of a numeric code, most often encountered (in the US) as the machine-scannable version of the UPC. "Bar code" is not a synonym for UPC, but UPCs can be rendered as bar codes. (Similarly, the Electronic Product Code, or EPC, is not synonymous with RFID, though it was conceived to allow product codes to more effectively utilize RFID.

EAN - European Article Number (see http://www.ean-int.org/products.html)

EPC - Electronic Product Code - A new generation of product codes, the most prominent being a 96-bit digital identifier, that allows for determining an organization (as identified by the "EPC Manager Number"), its associated products (a class identifier) and unique instantiations (a unique serial). EPCs are intended for use in RFID tags, though are also a serialized expansion of the previous generation of product codes.

EPC Network - see Appendix B

EPC-IS - An element of EPCglobal's envisioned EPC Network

EPCglobal, Inc. - Joint venture established in September 2003 by the UCC and EAN International, to shepherd the standards and facilitate deployment of the EPC.

GDSN - Global Data Synchronization Network

GTIN - Global Trade Item Number (see http://www.ean-int.org/products.html)

GXS - Global eXchange Services, Inc. - Formerly GEIS, a division of General Electric, and now majority owned by Francisco Partners, with QRS, one of the two major corporate providers of product-code-keyed supply chain-oriented content.

ISBN - International Standard Book Number - a 10-digit code (decimal, with an alphanumeric checksum) used to identify books in commerce; there is a simple formula to express ISBNs as so-called Bookland EANs (see EAN).

Local ONS - Local Object Naming Service - An element of EPCglobal's envisioned EPC Network.

ONS - Object Naming Service - A service mapping EPC Manager Numbers to destinations of the assignees' choosing.

OpenCIS - a registry, analogous to the Object Naming Service (ONS) specified by EPCglobal, but used in routing GTIN code prefixes.

OpenONS - a content-publishing tool, analogous to the EPC-IS and Local ONS portions of the EPC Network specified by EPCglobal.

QRS - (Originally from Quick Response Services, Inc.) - A public company (NasdaqNM: QRSI), currently being acquired by Inovis, and headquartered in Richmond, CA. QRS is one of two (with GXS) major providers of product-code-mapped catalog services.

RFID - Radio-Frequency Identification.

UCC - The Uniform Code Council (http://www.uc-council.org)

UCCnet - An information registry constructed by the UCC.

UPC - Universal Product Code (see http://www.ean-int.org/products.html)

VeriSign - a public company, awarded a contract to construct and operate the Object Naming Service specified by EPCglobal for the EPC Network.