

## Why DNS should be the naming service for Internet of Things?

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The Internet naming convention is based on the domain concept [RFC 819]. The naming service (i.e. the DNS) for realizing the Internet naming convention is assumed to be application independent [RFC 819]. Even though the Internet evolved with a scale that was not even dreamed of at the time of RFC 819, the naming service and the Internet naming convention remains the basic infrastructure for resolving information in the Internet.

With the advent of IoT (Internet of Things), there are different naming conventions, which will need a naming service for look up and service discovery in the Internet. Let's take for example an extended packaging use-case, wherein IoT enables a consumer to have additional information about the product he/she intends to buy through their mobile phones. It is enough for a buyer to scan the *barcode* (wherein there are different naming convention such as 'Universal Product Code', 'European Article Numbering System') of the product using an application in one's smart phone, and the application will connect him/her to a content (such as a website) in the Internet which has additional information than it is currently available in the product's package.

The naming conventions for the IoT range from EUI-48, EUI-64 for MAC addresses to 'Digital Object Identifiers' for electronic content to 'Electronic Product Code' for RFID (Radio Frequency Identification). One possible way for solving the issue of heterogeneity in naming conventions is for a standardization organization to develop a global/unique naming convention, and ask all the stakeholders in the IoT domain either existing or new to use it. With the standardization of protocols such as IPv6 and with the benefits of a large addressing space, it is a possibility.

But in reality, experiences in working with stakeholders in the supply chain industry (who use RFID and barcode) we do feel that it will be nearly impossible to have one global naming convention for all the "things". Industries like consumer, automobile, defense have been using their own proprietary naming conventions for a long time. Migrating to one global naming convention for identifying 'things', will impact their infrastructure considerably and does not seem to be a feasible solution. Imagine asking Walmart and Carrefour to use IPv6 instead of barcodes for labelling a product.

A feasible alternative will be to let the different sectors in the IoT use their existing naming conventions, but to evolve the naming service (i.e. the DNS). Leveraging DNS for other uses started with ENUM (Electronic Number Mapping) for telephone numbers, and for IoT; there exists already overlay mechanisms services such as 'Object Naming Service' and 'Object Directory Service', which uses the DNS infrastructure to resolve the IoT identifiers (using the existing naming conventions) to its related digital information in the Internet.

Even though there are multiple naming conventions in IoT, most of them have certain common features: they are allocated hierarchically, control is decentralized and the nature of allocation makes sure that there is no duplicity. These features described previously are similar to the domain name allocation and management, and thus, naming conventions used in IoT could leverage the DNS infrastructure and software for allocation and resolution.

There have been multiple efforts to develop a clean slate naming service for the Internet. Such efforts have either suited a particular use-case or have been only useful for research purposes, rather than as a feasible alternate for the DNS in real world. Our assertion is that research should focus on evolving DNS to be used seamlessly by the legacy and new naming conventions in the IoT. This talk will present three examples (barcode, RFID for supply chain industry, MAC addresses for sensor devices and IATA for airline industry) on how DNS could be used for look up and service discovery in the Internet.