



The Impact of Network Identification Technology on DNS

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Development of network identification technology

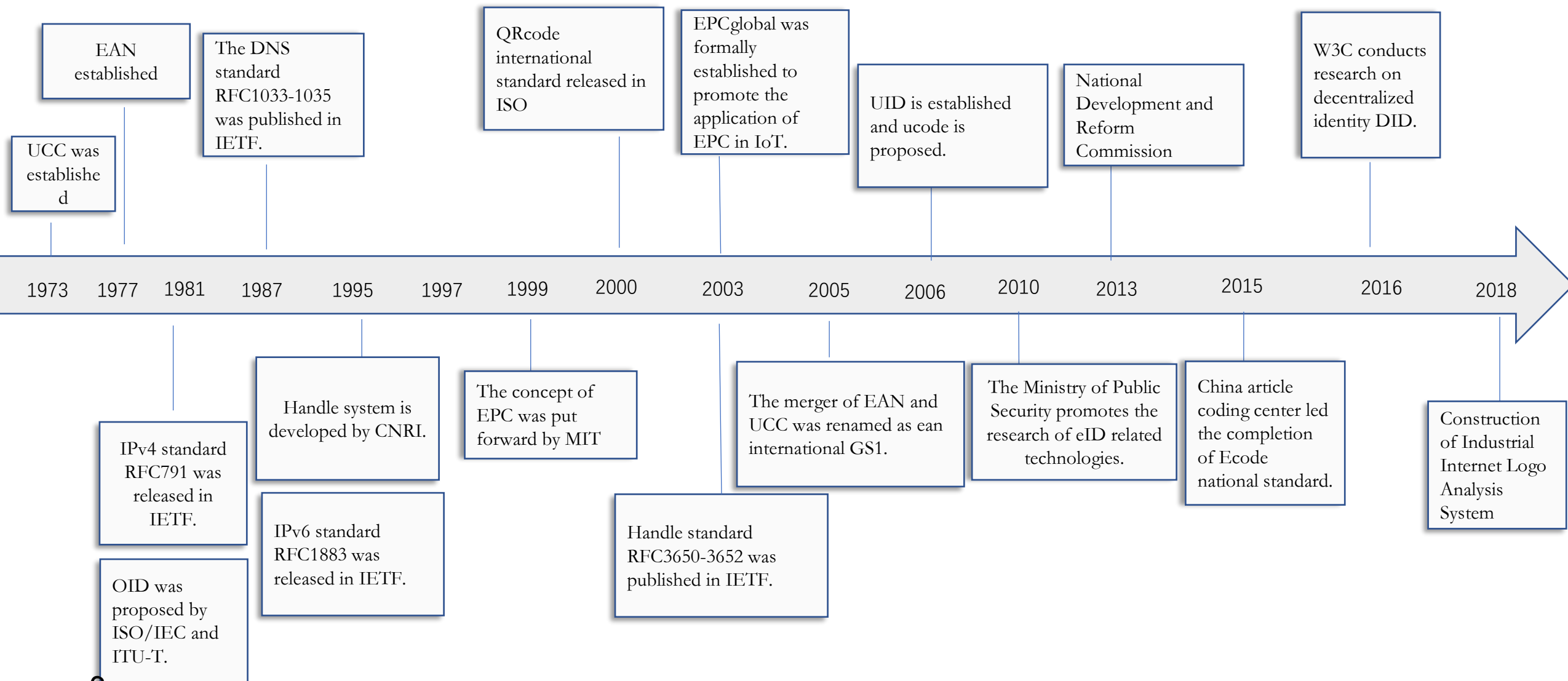
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Development Course Of Network Identification

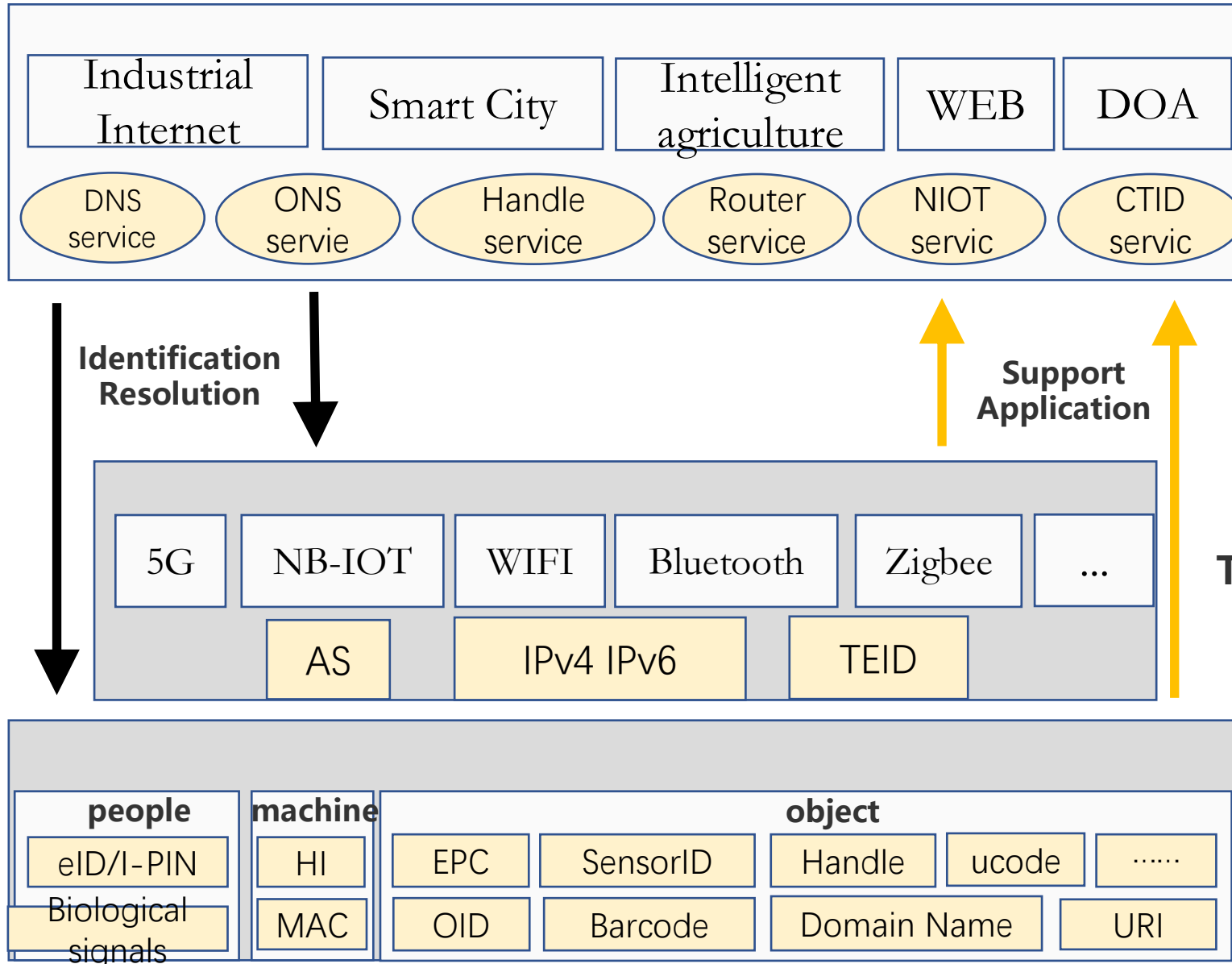


1

Status Of Network Identification



I E T F®



New technology

Blockchain

Edge/Fog Computing

ICN

SDN

AI

.....

Traditional identification technology

EPP

HIP

DNSSEC/DANE

RPKI

RFID

.....

Domain Name Identification Resolution

The global domain name service system operates stably.

- The technology and organization are complete, and IETF promotes the publication of nearly 300 core technical standards. In 1983, Paul Mockapetris established DNS (RFC 882/883, which was later replaced by RFC1034/1035), and then IETF formulated a series of rfc's to supplement it, including the expansion of security protocols such as DNSSEC and DANE.
- By June 2023, there were 1719 root servers and mirrors in the world, and the daily analysis volume exceeded 100 billion times; There are more than 300 national and regional top-level domains (ccTLD) and more than 1,200 generic top-level domains (gTLD) in the world.



advantaged

- ✓ Namespace can be expanded to support the huge demand of Internet of Things logo.
- ✓ Extensive infrastructure (registration service, recursion at all levels and authoritative resolution service)
- ✓ The protocol has complete functions, high standardization and open source.
- ✓ It has been running for more than 30 years, accompanying and supporting the vigorous development of the global Internet.

VS

disadvantaged

- ❑ High degree of centralization (centralized unilateral management mechanism)
- ❑ The system is huge, and its expansion may affect the existing basic services.

1

Handle Identification Resolution

◆ Handle System was first proposed by Dr. Robert Kahn, the father of the Internet, in CNRI. The main application scenario of Handle is Digital Object Identification (DOI), which was approved in 2010. To provide a wide range of identification and retrieval services for documents and digital multimedia objects for ISO international standards.

RFC3650	<i>Handle System Overview</i>	CNRI
RFC3651	<i>Handle System Namespace and Service Definition</i>	CNRI
RFC3652	<i>Handle System Protocol (ver 2.1) Specification</i>	CNRI
ISO26324	<i>Information and Documentation—Digital Object Identifier System</i>	ISO

International Standard

Encoding format: <NamingAuthority> "/" <LocalName>

■ Handle System has a hierarchical service model. The top layer of the system is composed of global Handle registry (GHR), and the bottom layer is composed of local Handle service (LHS).

advantaged

- ✓ Adopt parallel roots, support distributed multilateral management mechanism, (fair and equal)
- ✓ Namespace can support the huge demand for Internet of Things logo.

VS

disadvantaged

- ❑ The main application of Handle is DOI (Digital Object Identifier, Digital Publishing, etc.), and the standardization degree is relatively lower than that of DNS, EPC, OID and other logos.
- ❑ The existing security mechanism needs to be further improved, and there will be problems such as parsing error or untrustworthy parsing.
- ❑ Part of the MPA operation and maintenance of Handle is based on closed software, which is less open.
- ❑ Only the root node adopts a multi-root peer-to-peer structure, and the secondary nodes still belong to a hierarchical structure and are easily controlled.

1

EPC Identification Resolution

- EPC(Electronic Product Code) is a coding system, which is based on the bar coding system of the global unified identification system, and has made some extensions to this bar coding system to realize the identification of single products.
- EPCglobal network is a framework that can realize rapid automatic identification and information sharing of goods in supply chain.

Electronic Product Code (EPC) type 1: 96-bits

EPC Type	Manufacturer	Product Type	Unique Item
01	1234567	891011	001122DBC

Header 8-bits	EPC Manager 28-bits	Object Class 24-bits	Serial Number 36-bits
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256 Combinations possible	268,435,456 Combinations possible	16,777,216 Combinations possible	68,719,476,736 Combinations possible
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79,228,162,514,264,337,593,543,950,336
(or 7.9×10^{28}) unique identities

International application situation

Global ONS service is operated by VeriSign under the entrustment of EPCglobal Network. At present, there are 14 data centers to provide ONS search service, and 7 ONS service centers have been established, which together constitute the global international electronic product code access network. Based on this system, enterprises can exchange supply chain information with any enterprise in the network.

China application situation

On April 22nd, 2004, EPCglobal China was established. Ean international awarded China Article Coding Center as the sole representative of EPCglobal in China, responsible for the registration, management and implementation of EPCglobal in China.

The resolution service of EPC code (ONS system) completely depends on the Internet DNS domain name system. The root server node of the ONS identification resolution system refers to the node that manages and maintains the EPC code top-level prefix and provides resolution services. In fact, it is the secondary domain of the Internet DNS domain name system. For example, Verizon, an American enterprise, is responsible for operating the top-level node "onsepc.com" of the US ONS identification resolution system

advantaged

- ✓ Namespace (EPC code 96 bits) can support the huge demand of Internet of Things logo.
- ✓ The resolution service of EPC code (ONS system) is compatible with DNS, the main Internet name service.
- ✓ It has been widely used in the whole network field.

disadvantaged

- ❑ The protocol and functions need to be further improved, such as the design of peer root.
- ❑ Inherited the shortcomings of DNS

VS

OID Identification Resolution

01 basic concepts:

OID is an identification mechanism jointly proposed by ISO/IEC and ITU International Standards Organization, which is used to give unambiguous and unique names to any type of objects, concepts or "things" in the world. Once named, the name is valid for life.

01

02

02 coding structure:

Tree structure is adopted, and different levels are separated by ".", and the number of layers is unlimited. When identifying an object, the identifier is a string composed of nodes on all paths from root to leaf in sequence.

OID

04 technical advantages:

A globally unique logo conforming to international standards and specifications (uniformly distributed by CNOID).

04

03

03 Registered organization:

In 2006, China established the National OID Registration Center, which is affiliated to China Institute of Electronic Technology Standardization, and is responsible for the management of OID branches of "China under ISO Branch" and "China under ISO-ITU Joint Branch" and the domestic OID distribution.

advantaged

- ✓ DNS based on the current Internet main name service
- ✓ It has been widely used in the fields of Internet of Things, such as information security, medical and health care, and network management.

VS

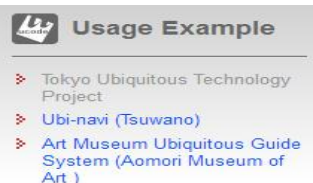
disadvantaged

- ❑ At present, the OID root registration system is maintained by France Telecom, and the root analysis node (oid-res.org) is maintained by South Korea. Participating countries are responsible for the distribution and analysis of OIDs under branches (China: 1.2.156), and their participation in root management needs to be further strengthened.

Other Identification Resolution

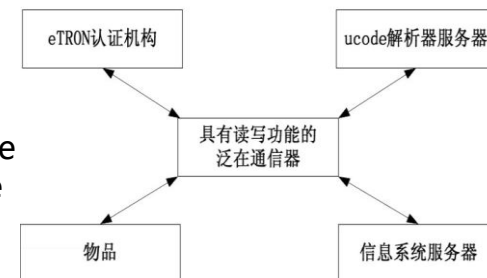
uID/ucode

UID/ucode was proposed and promoted by the University of Tokyo, Japan, and its application is mainly in Japan.



UCode uses 128 bits to record information, providing a 340×1036 encoding space, and can be further expanded to 256, 384, or 512 bits in units of 128 bits

UID architecture



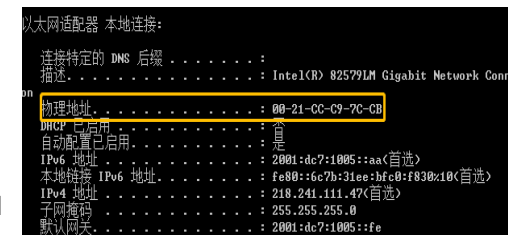
MAC

MAC(Media Access Control) address is used to define the location of network devices in the local area network, and belongs to the logo used to identify the device address inside the local area network. The address is solidified in the ROM of the adapter when it leaves the factory. The MAC address, like the ID number on our ID card, is globally unique.

01 : 00 : 5e : 00 : 00 : 05

The first 24 bits are assigned by the registration authority RA of IEEE, which is called the organization unique identifier OUI.

The remaining 24 bits are assigned by the adapter manufacturer who purchased OUI, and are called extended identifiers.



Biological characteristics

BIOMETRICS technology refers to the technology of personal identification by using the inherent physiological markers (fingerprint, iris, face, DNA, etc.) or behavioral markers (gait, keystroke habits, etc.) of the human body through the computer.

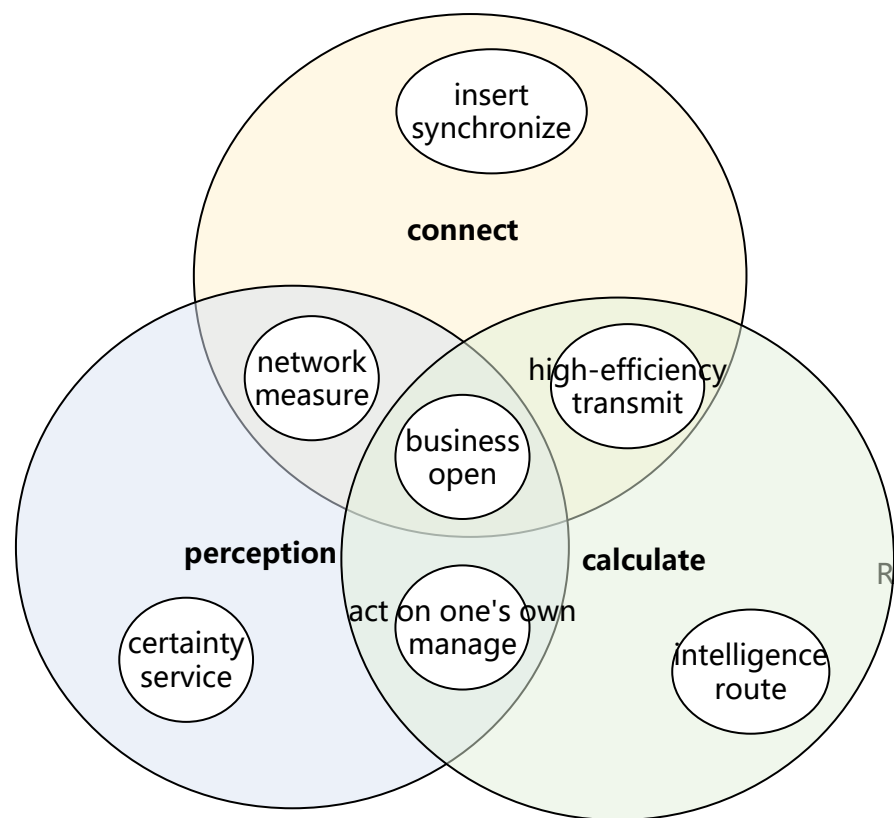
Bar code (identification carrier) (Barcode/Qrcode)



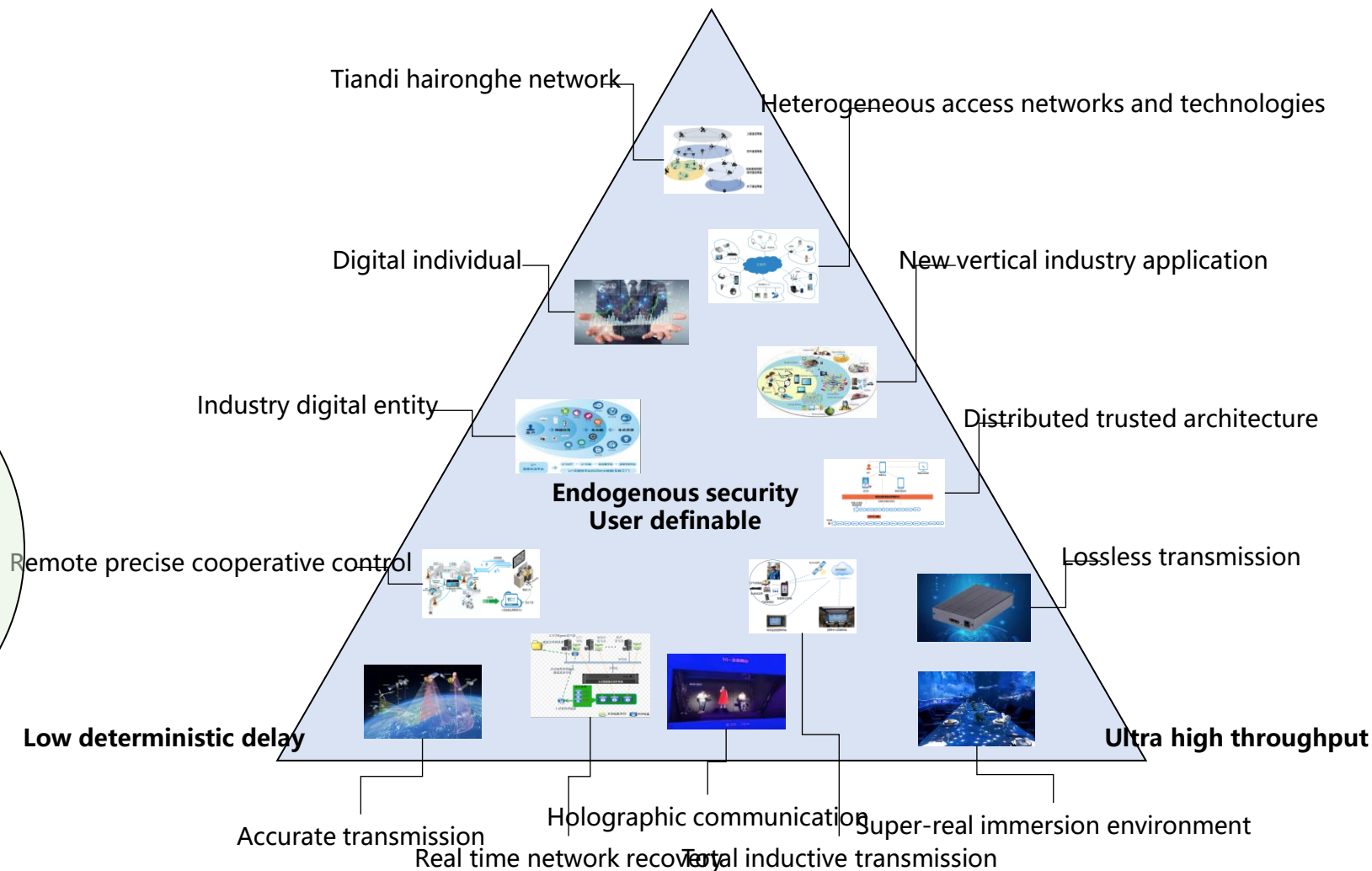
Bar code is an optical, machine-readable data representation that describes object information, and it has unique identification. At present, there are many bar codes with different coding systems, which can be divided into one-dimensional bar codes and two-dimensional bar codes according to their dimensions.



Future Network Demand

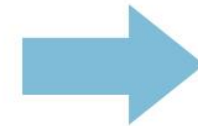


internet of things
(Connecting various heterogeneous networks and communication subjects)





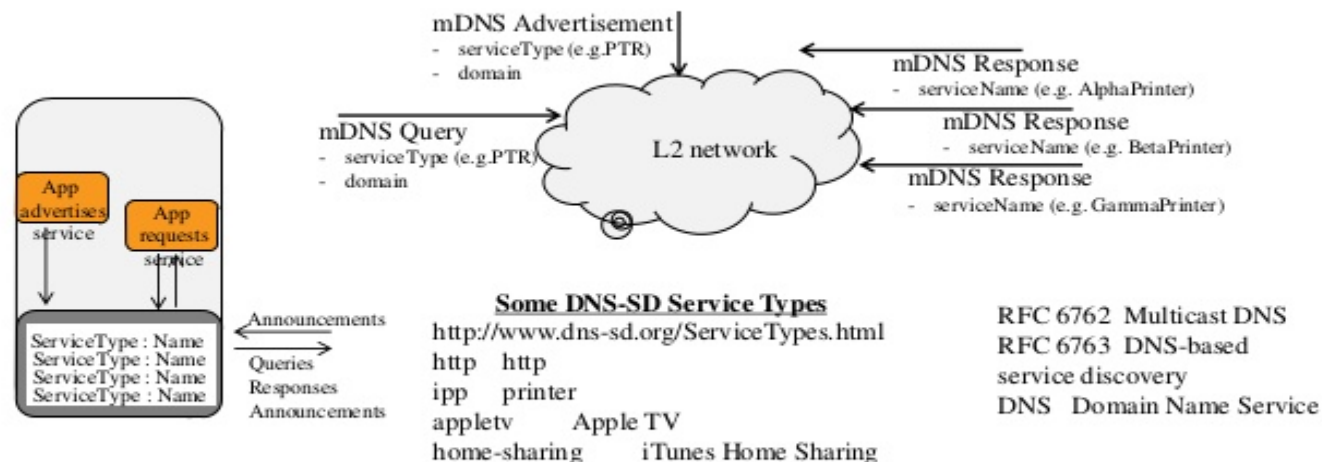
Identification Service Demand of Ubiquitous Network in the Future



Is DNS Ready for the Future Ubiquitous IoT?

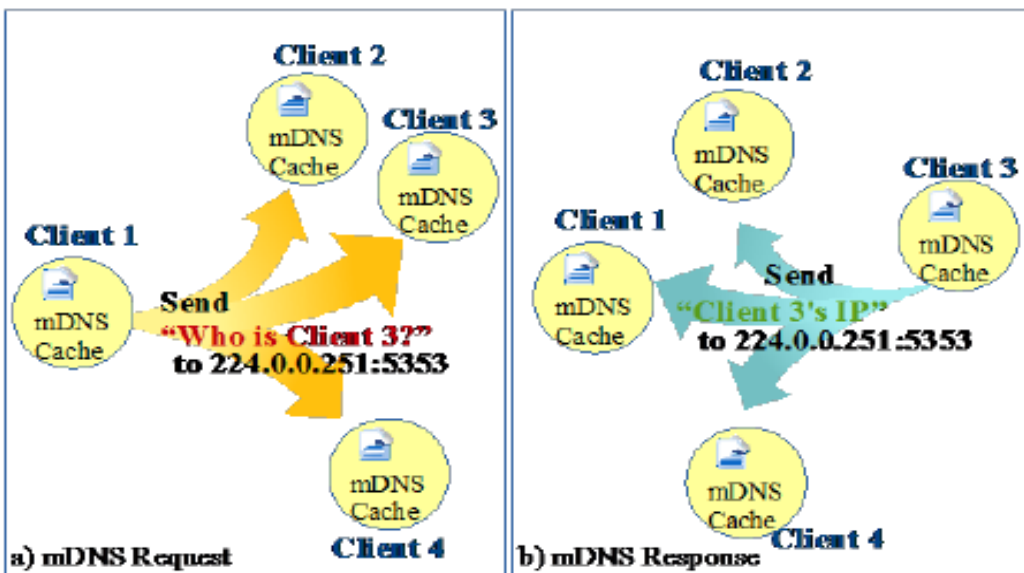
Authoritative vs. Recursive DNS

mDNS and DNS-SD



When a new service instance starts, it advertises the service to a multicast address with serviceType and serviceName. Listening devices add the service to their cached list.
 When an app requests a service by serviceType queries the OS-cached list for optional mDNS Query for the serviceType.
 When an app wants to use a service, mDNS Queries resolve the chosen serviceName to a hostName and IP address + port

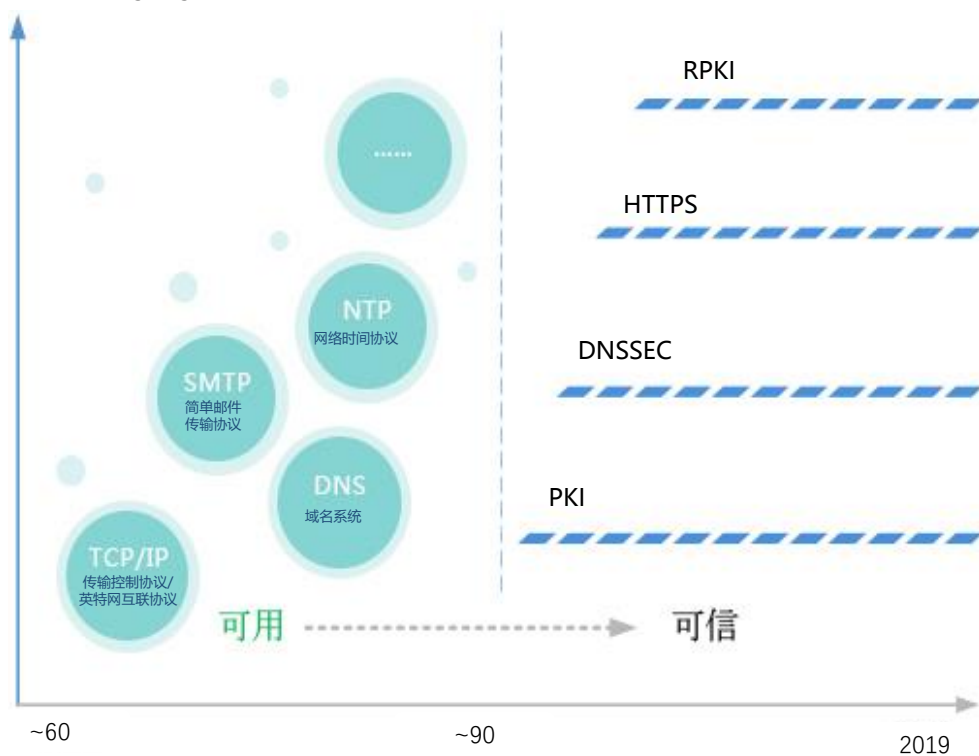
How to work in a cross-link scenario?



Opportunities and challenges

Blockchain: Constructing a New Security Foundation of Identity Service

IETF continues to promote the construction of Internet security system based on PKI!



namecoin blockstack



How to be compatible with current business logic and service system
How to find the balance point of decentralization

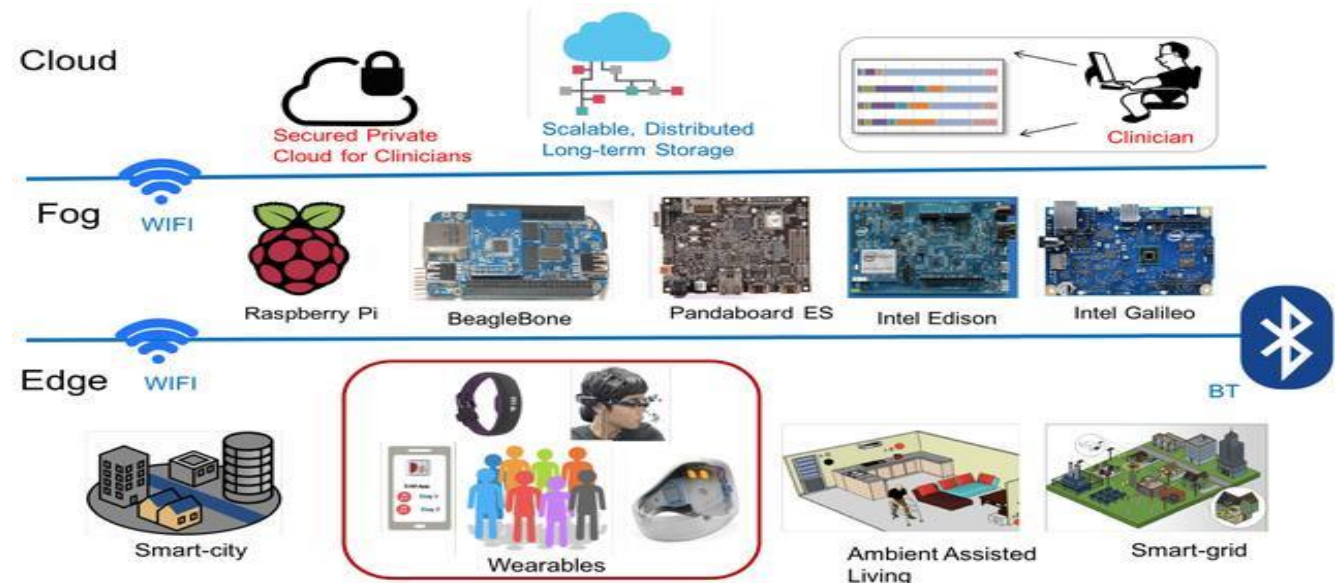


High deployment requirements and complicated management process.

Conflict with the current concept of global Internet governance

3 Opportunities and challenges DNS as the Solution in the Internet of things Era?

- From the Identification itself, DNS namespace can be expanded to support the huge demand for Internet of Everything Identification
- From the protocol, it has a complete protocol system, and it still needs application-driven protocol extension.
- From the facilities, a global, large-scale and service-oriented operation and maintenance management infrastructure has been built.





Thank You Very Much !

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