RFID - Issues related to Internet and Regulation

A brief look at ONS and DNS, and Internet of Things

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EPCGlobal Architecture

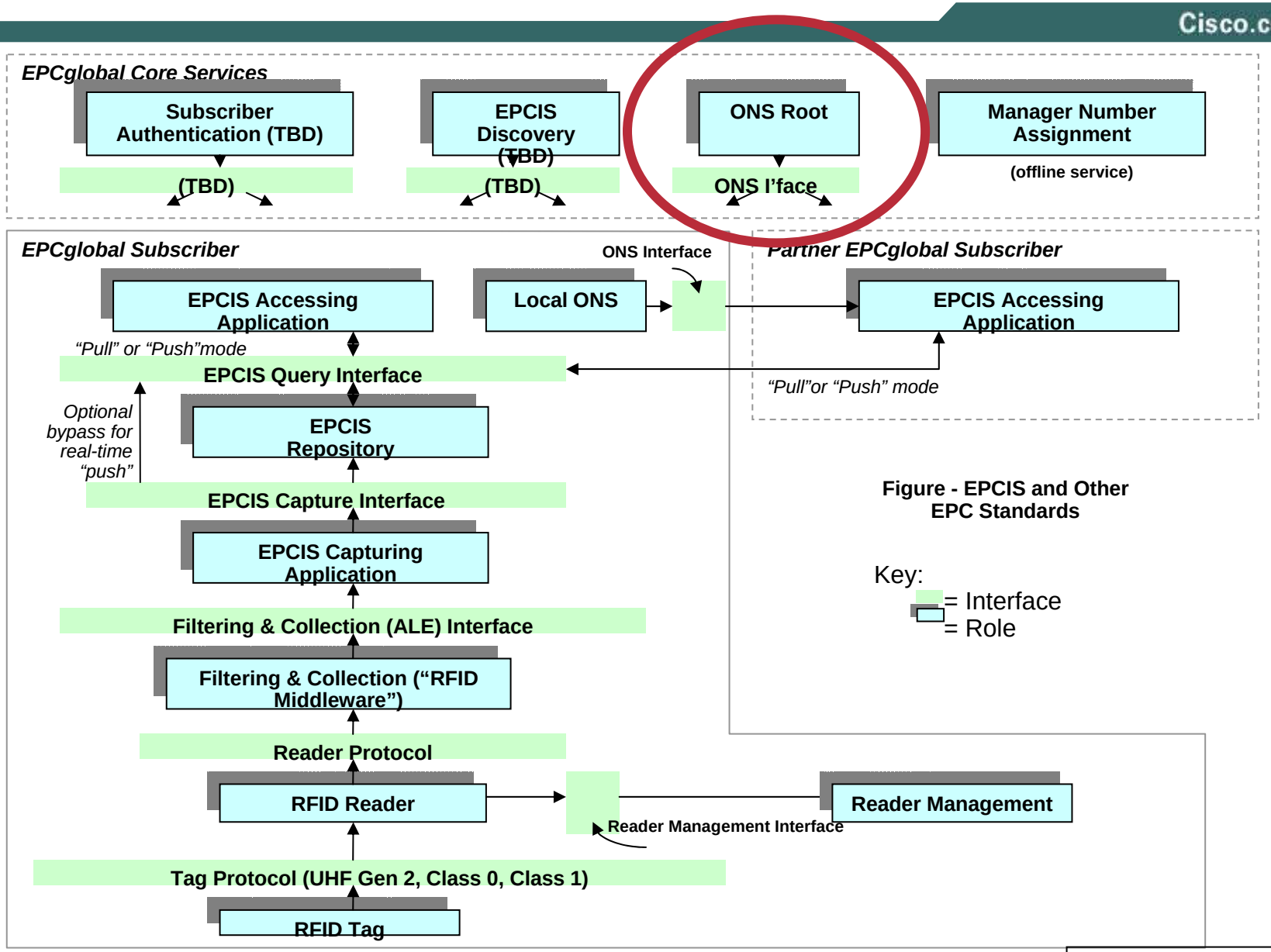


Figure - EPCIS and Other EPC Standards

Key:
= Interface
= Role

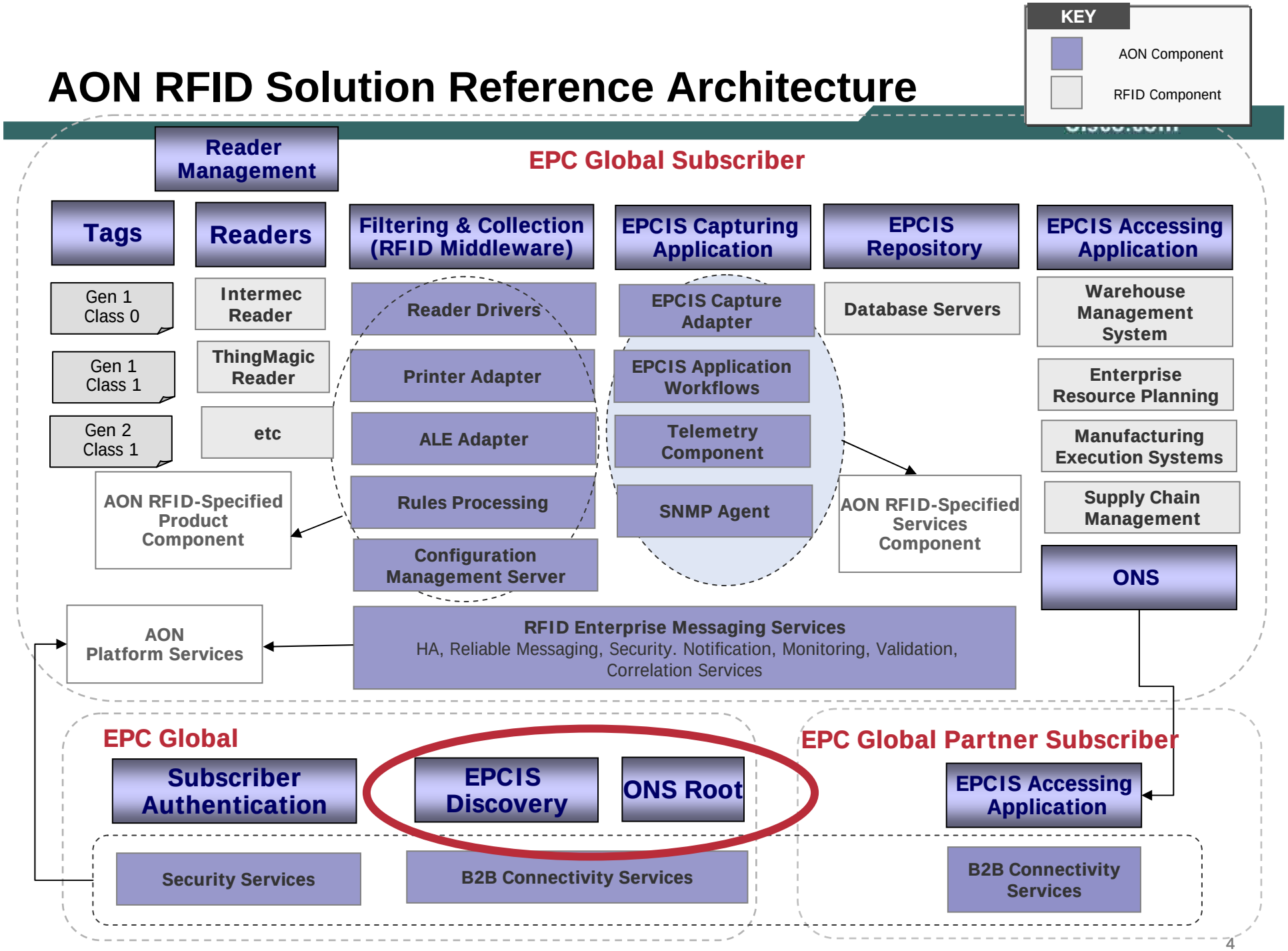
Source : EPCIS Version 1.0 Specs

What is the problem?

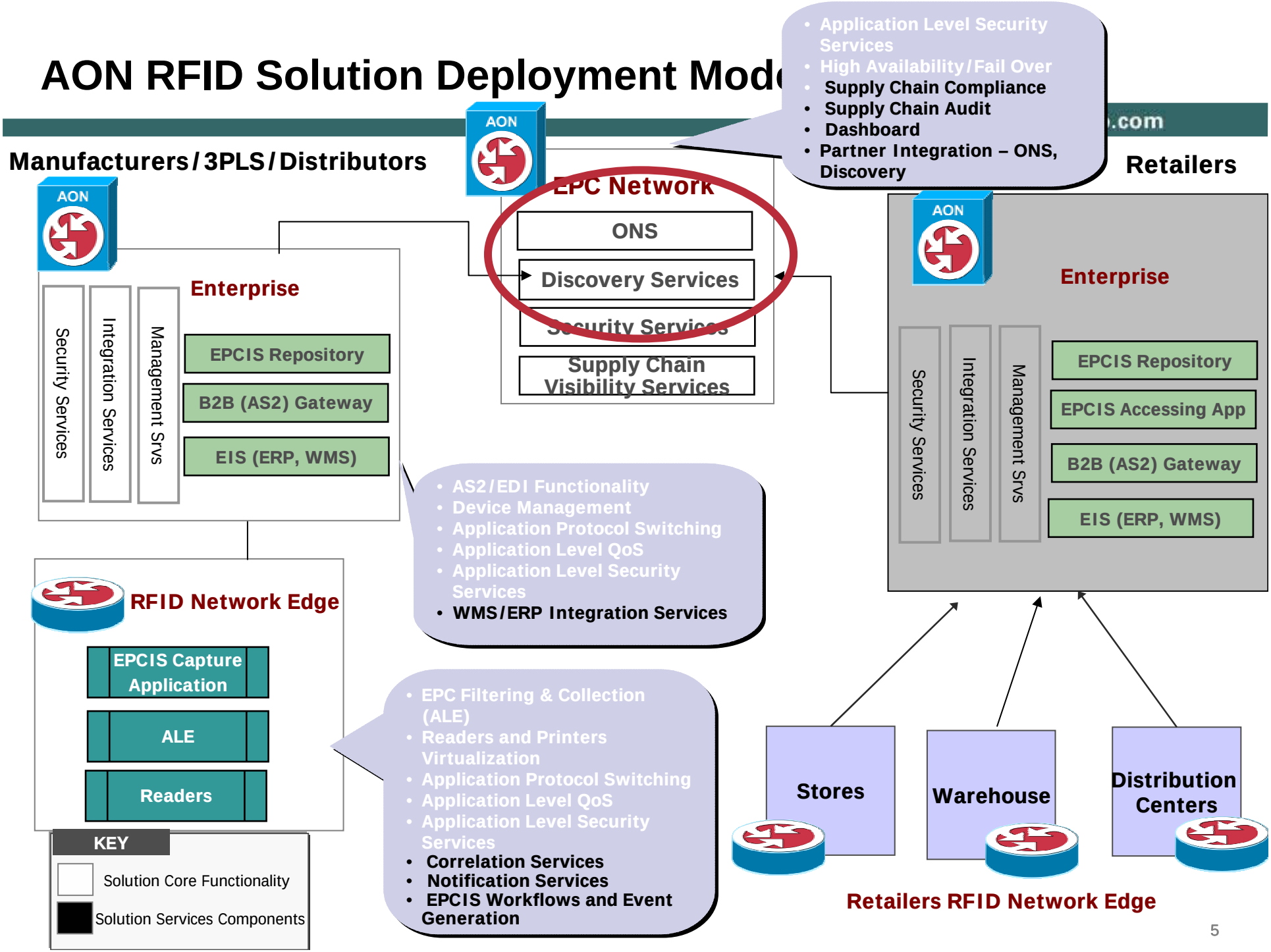
- ONS uses the DNS as a distributed global database for discovery of the EPCIS directory given an RFID (globally unique) number
- What is happening is called “query routing”
- On the Internet, this is a known technology which have known problems
- Note though that this is the preferred mechanism for “finding things”, so there is nothing wrong with the design

  The only problem is that many scenarios are described in a little bit too naïve way - important policy issues are missing

AON RFID Solution Reference Architecture



AON RFID Solution Deployment Mode



This is what DNS is

- The primary purpose is to translate domain names to IP addresses
- DNS is implemented as a distributed database, with distributed administration (and responsibility)
- A “domain name” consists of a string of tokens separated by “.”
- Information is logically grouped in “zones” that are stored on hosts, where one zone can be on multiple hosts, and one host can hold information on multiple zones
- The DNS holds two major types of information:
  1. The actual data being available
  2. Structural information for DNS itself
- Example of a domain name:

  www.cisco.com

This is what the DNS is for

- **Translation of domain name to IPv4 address**

  www.example.com to 192.168.1.10

- **Translation of domain name to IPv6 address**

  www.example.com to 2001:1670:b87:4:207:e9ff:fe1b:5c09

- **Lookup of mail server given mail domain**

  example.com to mail.example.com

- **Translation of IPv4 address to domain name**

  10.1.168.192.in-addr.arpa to www.example.com

- **Lookup host and port for services**

  _sip._tcp.example.com to sip.example.com:5060

- **Lookup of service given domain name**

  example.com to _sip._tcp.example.com

- **Lookup of URL's given E.164 number**

  +46-417-12345 to sip:joe@example.com

- **Lookup of EDCIS given RFID**

  10 000 00000000000000 00000000000000011000 00000000000000000110010000 to http://epc-is.example.com/epc-wsdl.xml

In detail…

- **Take RFID**

  10 000 00000000000000 00000000000000011000 00000000000000110010000

- **Turn into URN**

  urn:epc:id:sgtin:0614141.000024.400

- **Issue DNS query**

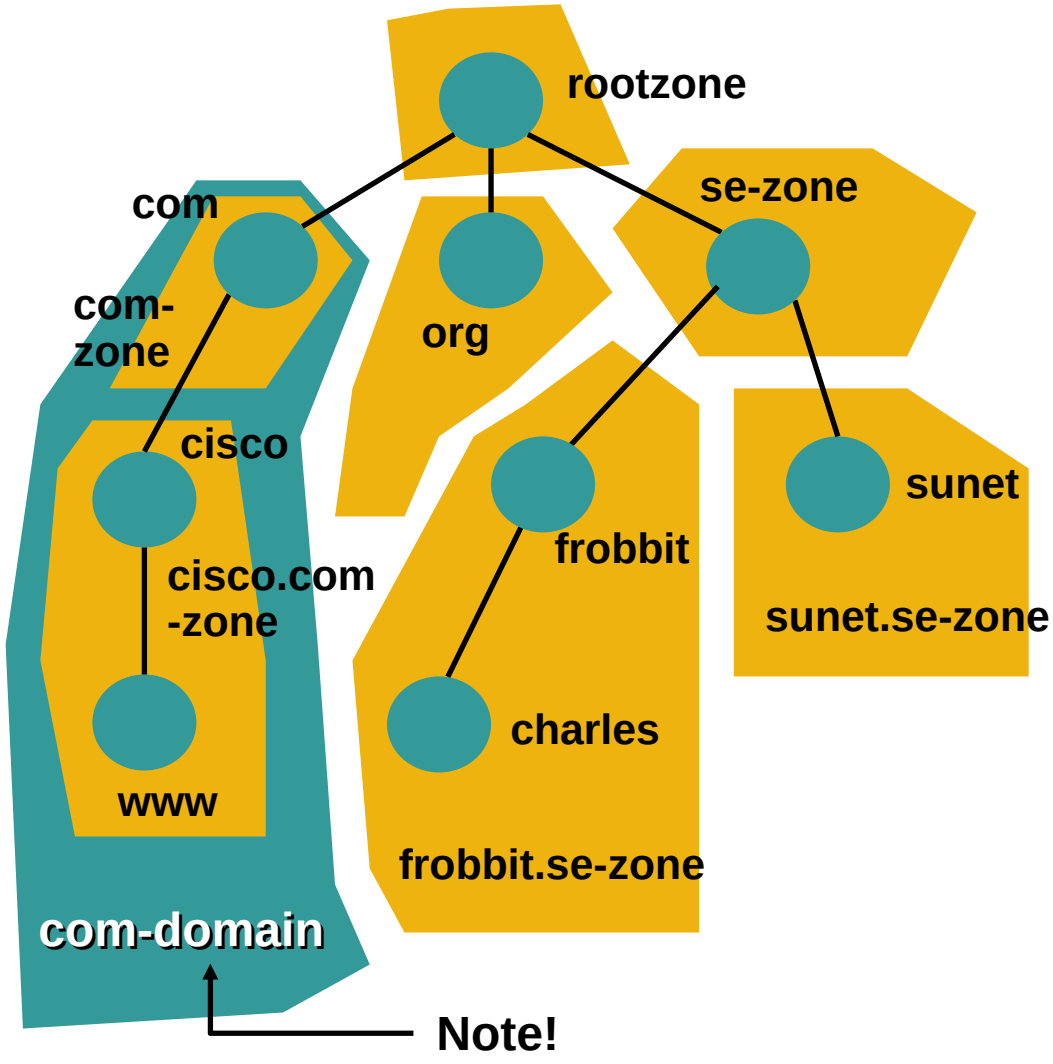
  NAPTR for 000024.0614141.sgtin.id.onsepc.com?

- **Get back data that make it possible to create URL**

  http://epc-is.example.com/epc-wsdl.xml

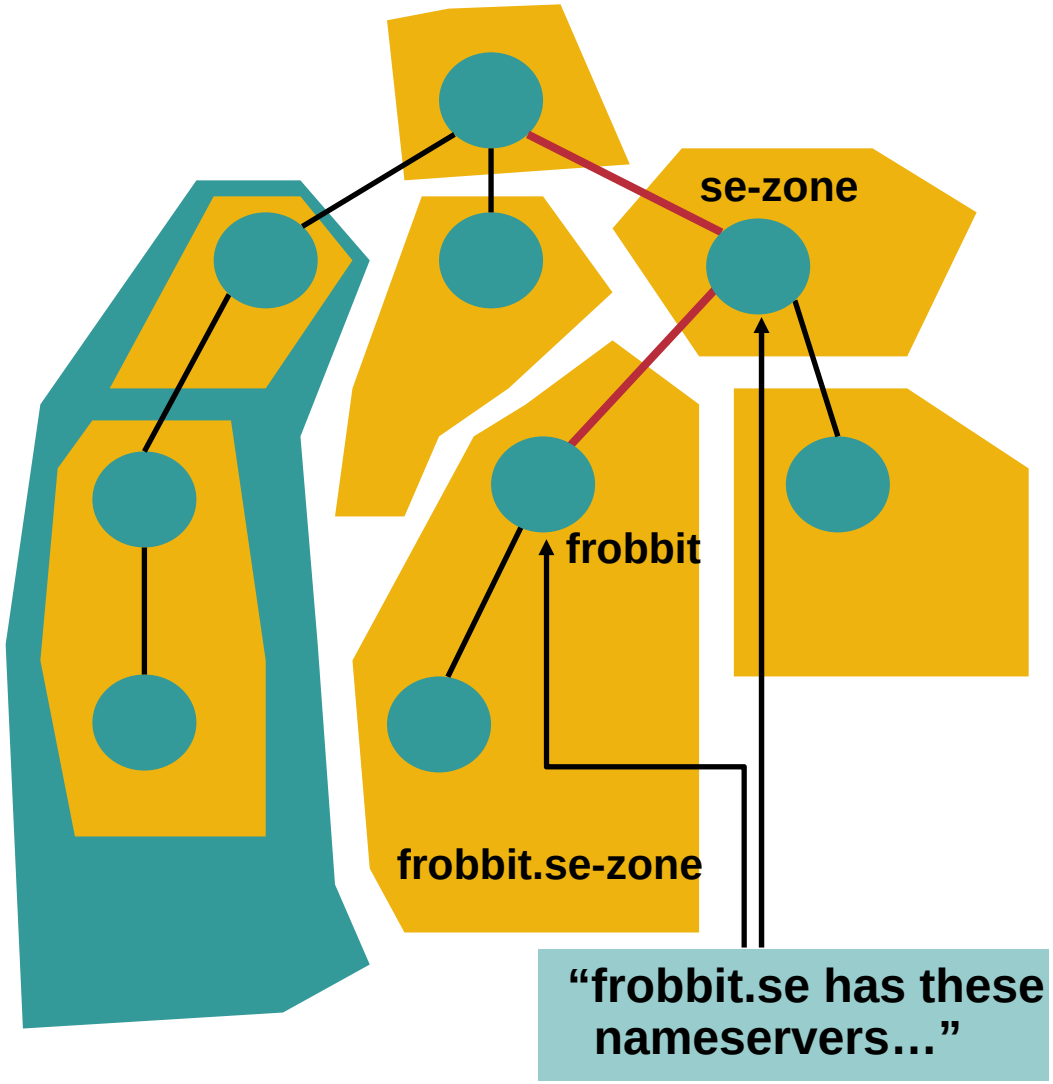
Domains and Zones

- **Nodes/tokens are grouped in “zones”**
  - **Each zone is an administrative unit**
  - **Each node can be the start of a new zone, but it doesn’t have to be**
  - **A node which is the start of a new zone is called a “delegation point”**
- **All nodes below a node are included in the same “domain”**



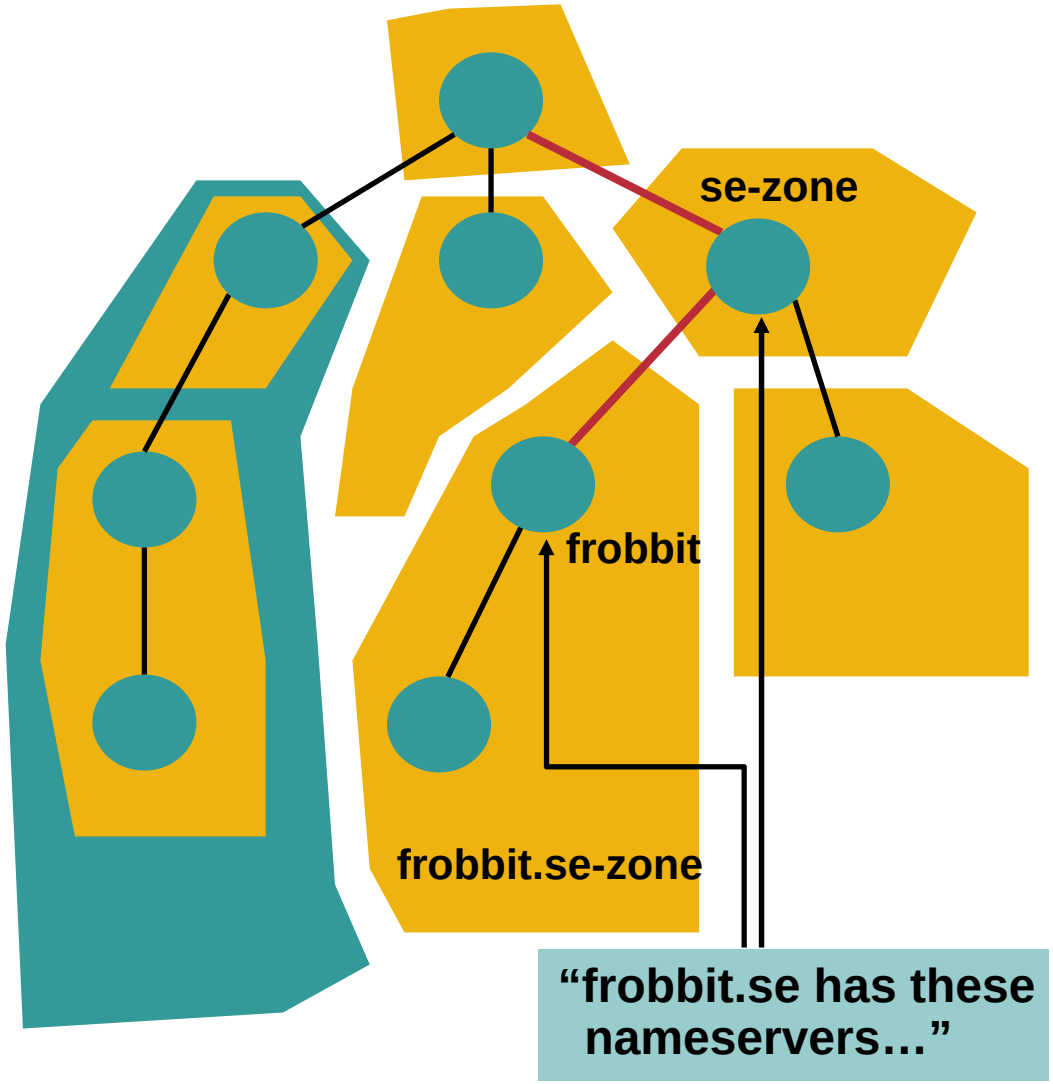
Resolvers and Queries

- We have clients which issue queries to servers
  - Those are called “resolvers”
- Goal with DNS is to make sure resolvers find right server to send the query to
  - Information in “parent” zone on where nameservers are for “child” zone



Resolvers and Queries

- **If the parent and child have different view on nameservers, there is something wrong**
  - **The information in parent zone has priority (child is authoritative)**
  - **Resolvers only find child via information at parent zone, so the parent still have control (resolver might not find any authoritative server for child zone)**



DNS in detail…

- Take domain name, and send query to root server

  Query NAPTR for 000024.0614141.sgtin.id.onsepc.com

- Get back referral to nameserver for com
- Reissue query, and get back referral to onsepc.com

  Get back referral again, and repeat…

- Finally get back pointer to nameserver for 0614141.sgtin.id.onsepc.com

- If you run an EPCIS, you might run a local ONS server, but, more importantly, someone know you run it for a specific (series of) RFID's

Connecting ONS to DNS

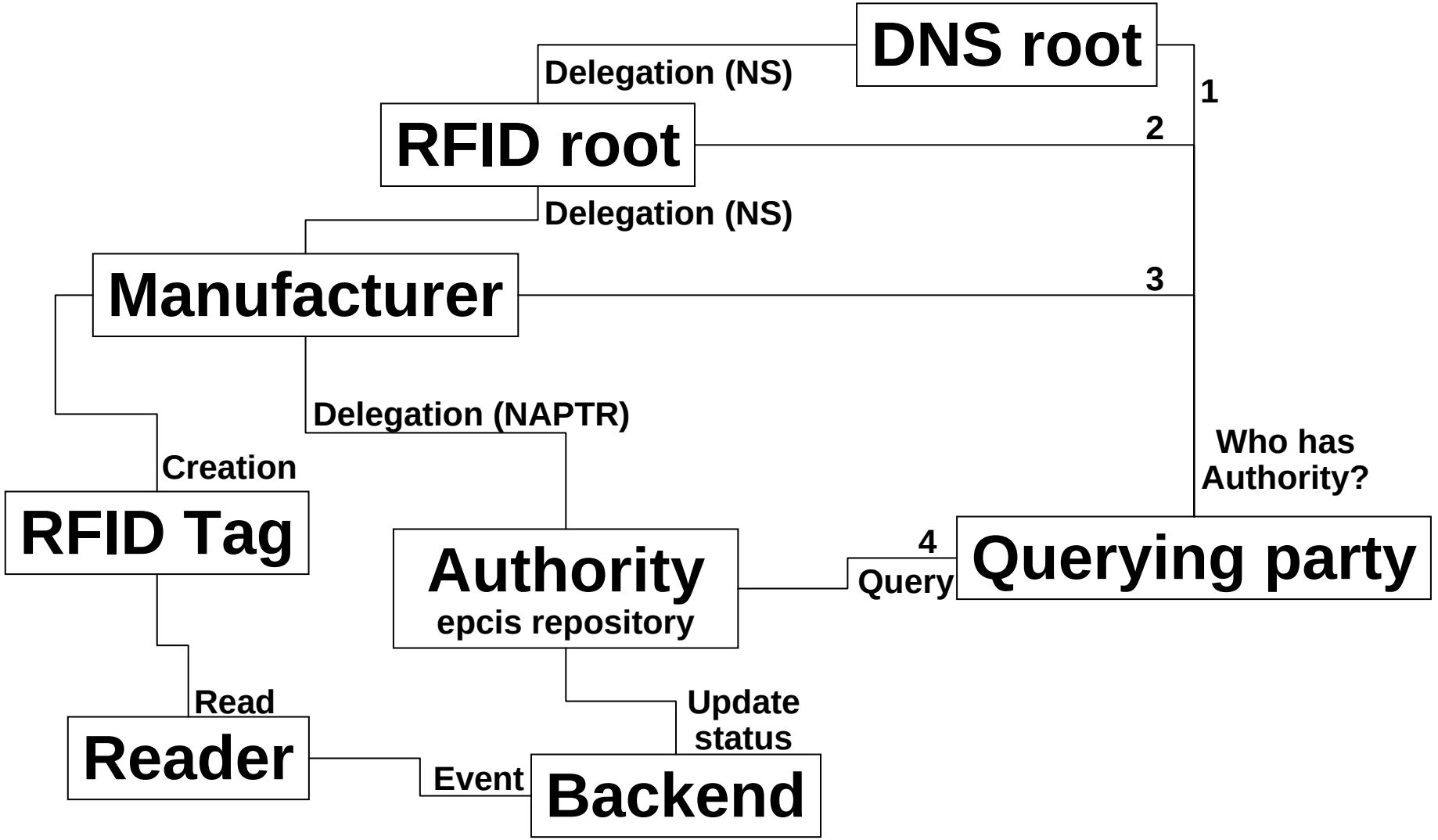
- If one doesn't know explicitly what ONS server to query, you have to use global DNS
- Someone run a DNS server which know who runs ONS for what RFID's
- If the responsibility for the RFID moves from one EPC that either have to be recorded in the local ONS, or moved from one local ONS to another

  If it is moved from one ONS to another, then that fact have to be registered in the parent ONS server

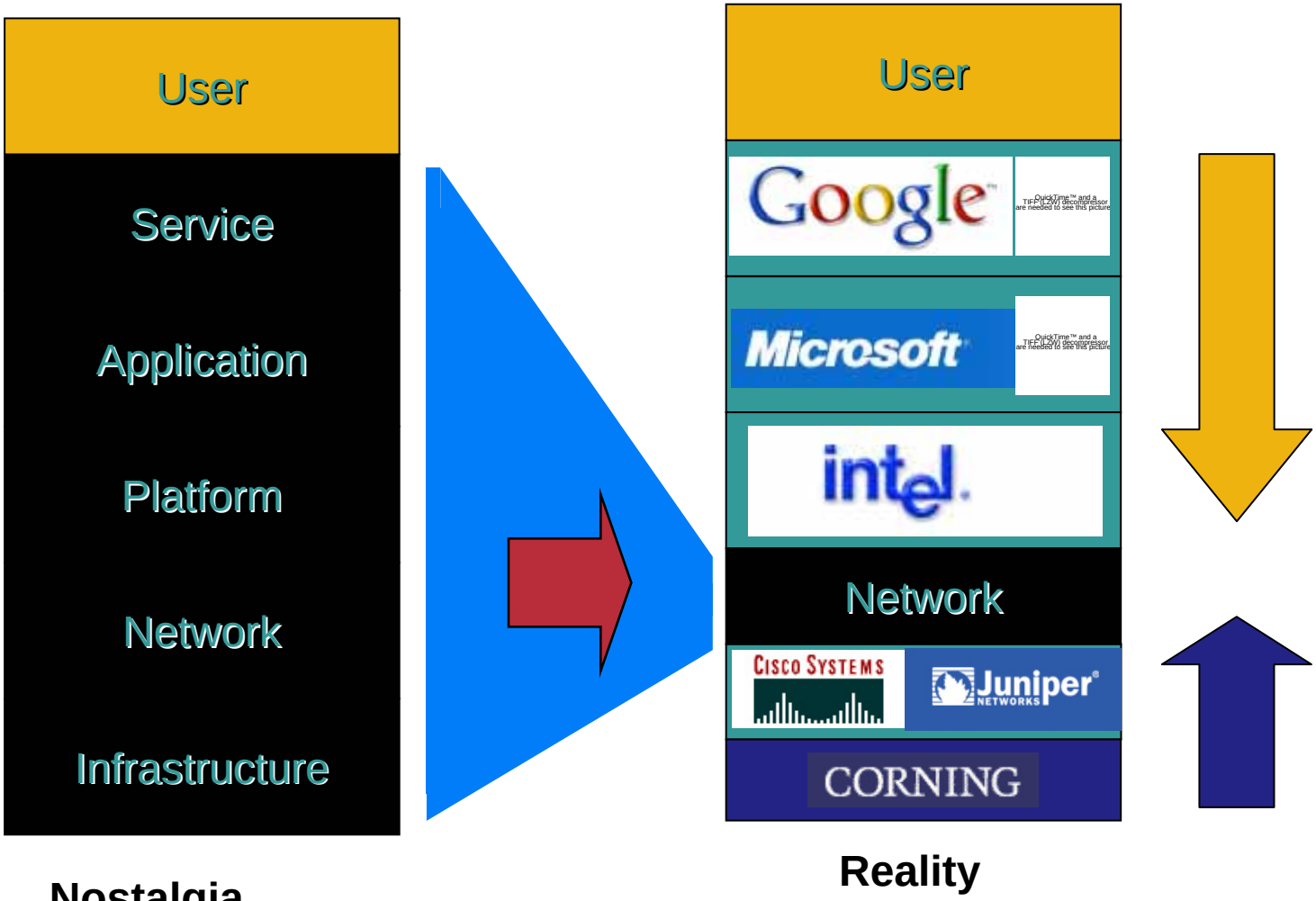
Experiences from (normal) DNS

- **Managing a root in DNS is a monopoly**
  - **We can only have one authoritative org. per domain**
- **Managing a root in DNS give power**
  - **You set the price for registrations, and control the quality**
- **Public policy interests are troublesome to manage**
  - **WSIS process show this is hard**
- **Moving authority of records require redelegation**
  - **Only one authoritative org. per domain**
- **Redelegation require authorization**
  - **Otherwise it is possible to “steal” control**

DNS and ONS


DNS root
Delegation (NS)
RFID root
Delegation (NS)
Manufacturer
Delegation (NAPTR)
Creation
RFID Tag
Authority
epcis repository
Read
Reader
Event
Backend
Update status
1
2
3
4
Query
Who has Authority?
Querying party

Internet of things / Convergence?



Nostalgia

Reality

Conclusion

- **Geoff Houston says:**

  The Internet's major leverage was always cheaper price and lowest common denominator service profiles in the network

  Arming networks with complex quality and service manipulation capabilities is a business lose

  Arming networks with adequate bandwidth is a superior strategy

- **The end node is no longer under control of the network provider, and neither are the services**
- **Network providers might use RFID as (yet another) application they want to control, instead of seeing it as yet another end to end solution using their network**
- **There is a risk that the good architecture chosen for RFID tag resolution will face same problems as DNS, without learning from the DNS discussions**