



A Distributed Architecture for a Ubiquitous RFID Sensing Network

Damith C. Ranasinghe, Kin S. Leong, Mun L. Ng, Daniel W. Engels and Peter H. Cole



Good news



No pages full of algebra..

03/07/13

Auto-ID Lab Adelaide

2

What I hope to convey

- ◆ A simple description of the interface based model and the associated implementations
- ◆ Exploration of the data flows
- ◆ A sense of excitement
 - Synergies to be gained from research activity in RFID and sensor networks.

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◆ “A networked physical world”

◆ A world where...

...physical objects communicate in real time all the time

...the Internet extends into everyday objects

...everything is connected

...environmental awareness provided by sensors

Requirements ?

◆ What do you need to merge objects,
information and people?

...smart scalable networking for the physical world

...intelligent infrastructure



System building blocks



- ◆ RFID components
 - Tags – electronic RFID tags
 - Interrogators - networked tag readers

- ◆ EPC – Electronic Product Code provides unique identifier

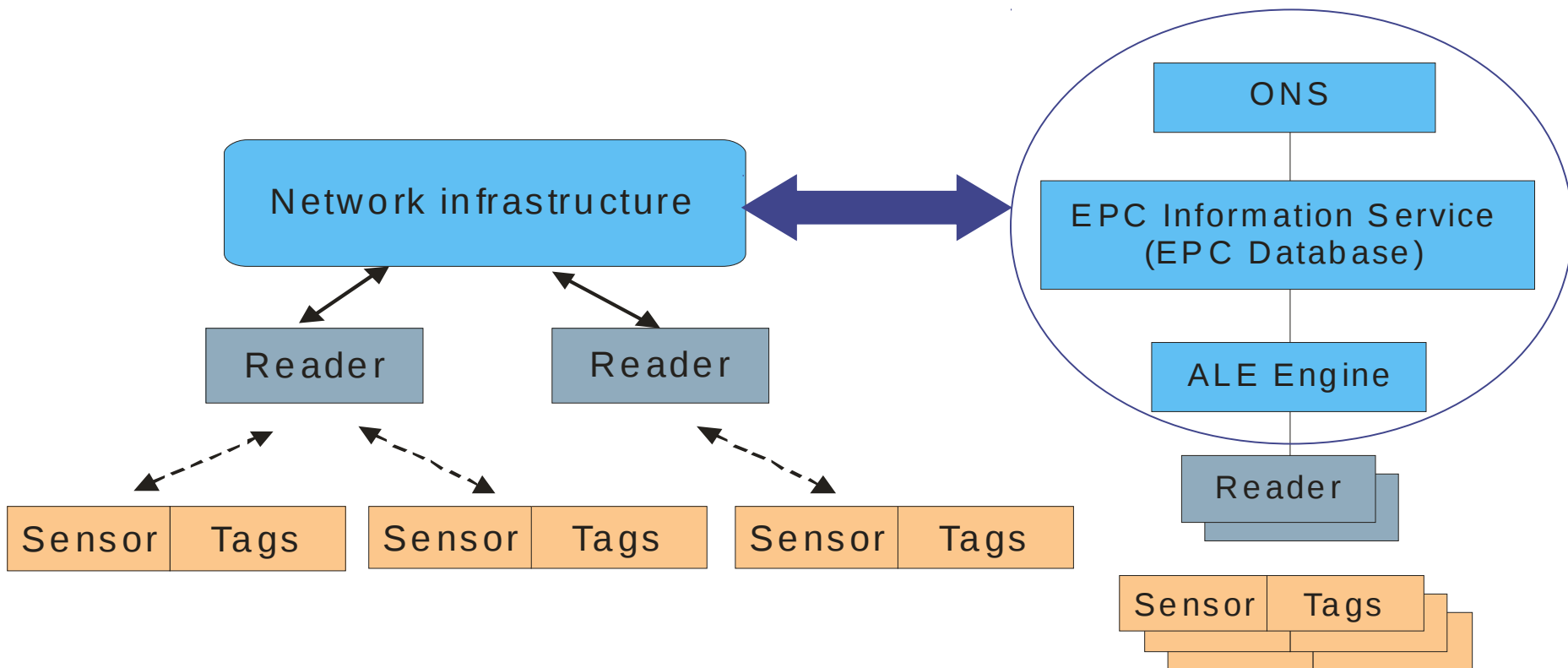
- ◆ ONS – Object Name Service locating EPC related data

- ◆ ALE – Application Level Engine for handling events

- ◆ EPCIS – EPC information service for accessing EPC related data

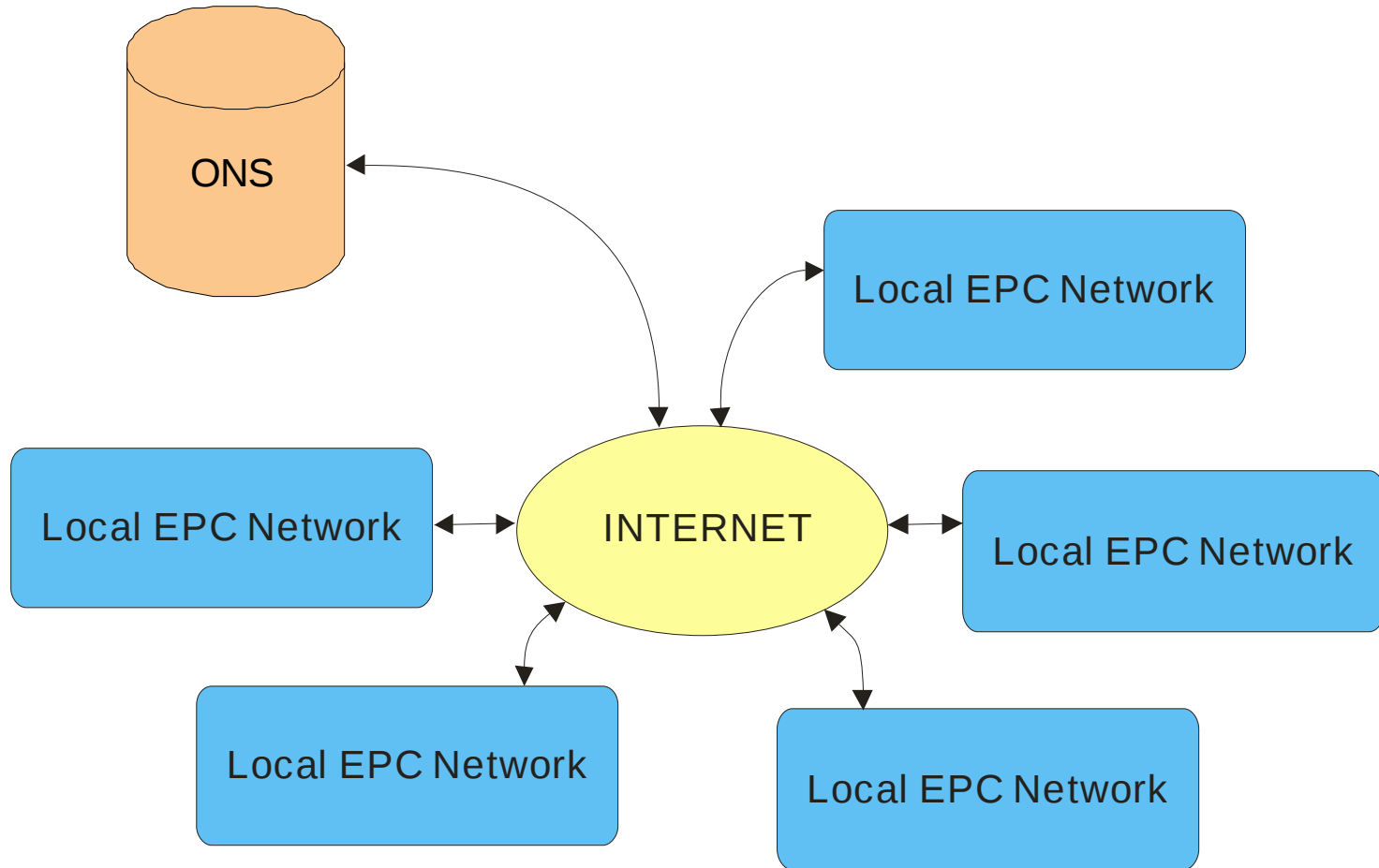
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Local EPC Network



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Wide Area EPC Network



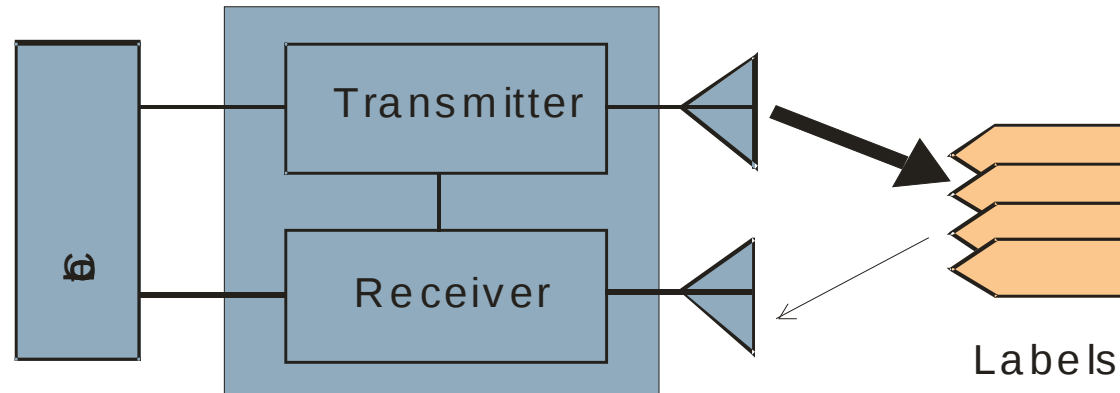
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RFID Components

◆ Electronic tags

◆ RFID readers

- Transmitter
- Receiver
- Controller
- A ubiquitous reader network will allow continuous tracking and identification of physical objects.



◆ Electronic Product Code

- Unique object identifier

MSB

LSB

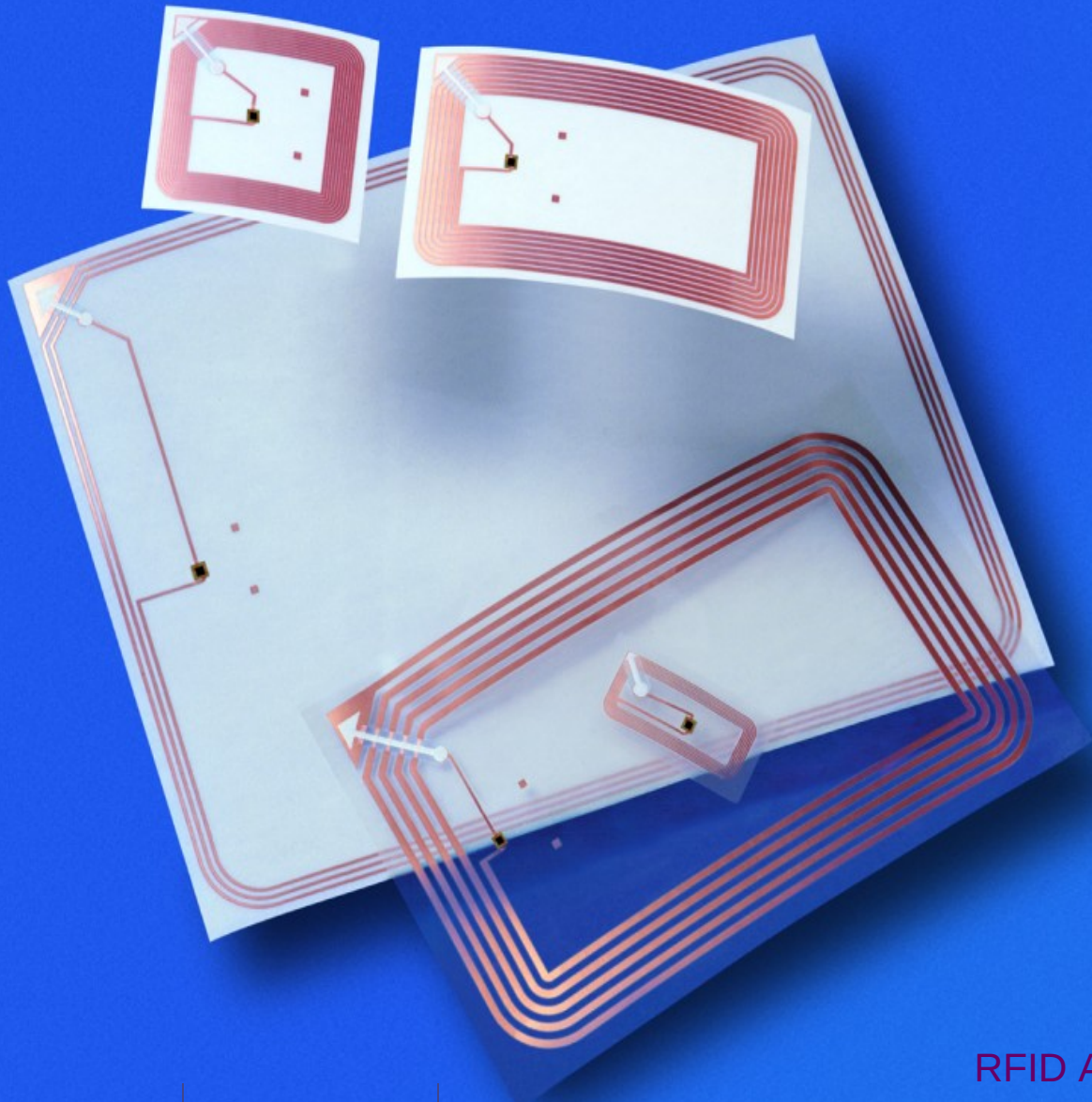
Header

General
Manager
Number

Object
Class

Serial
Number

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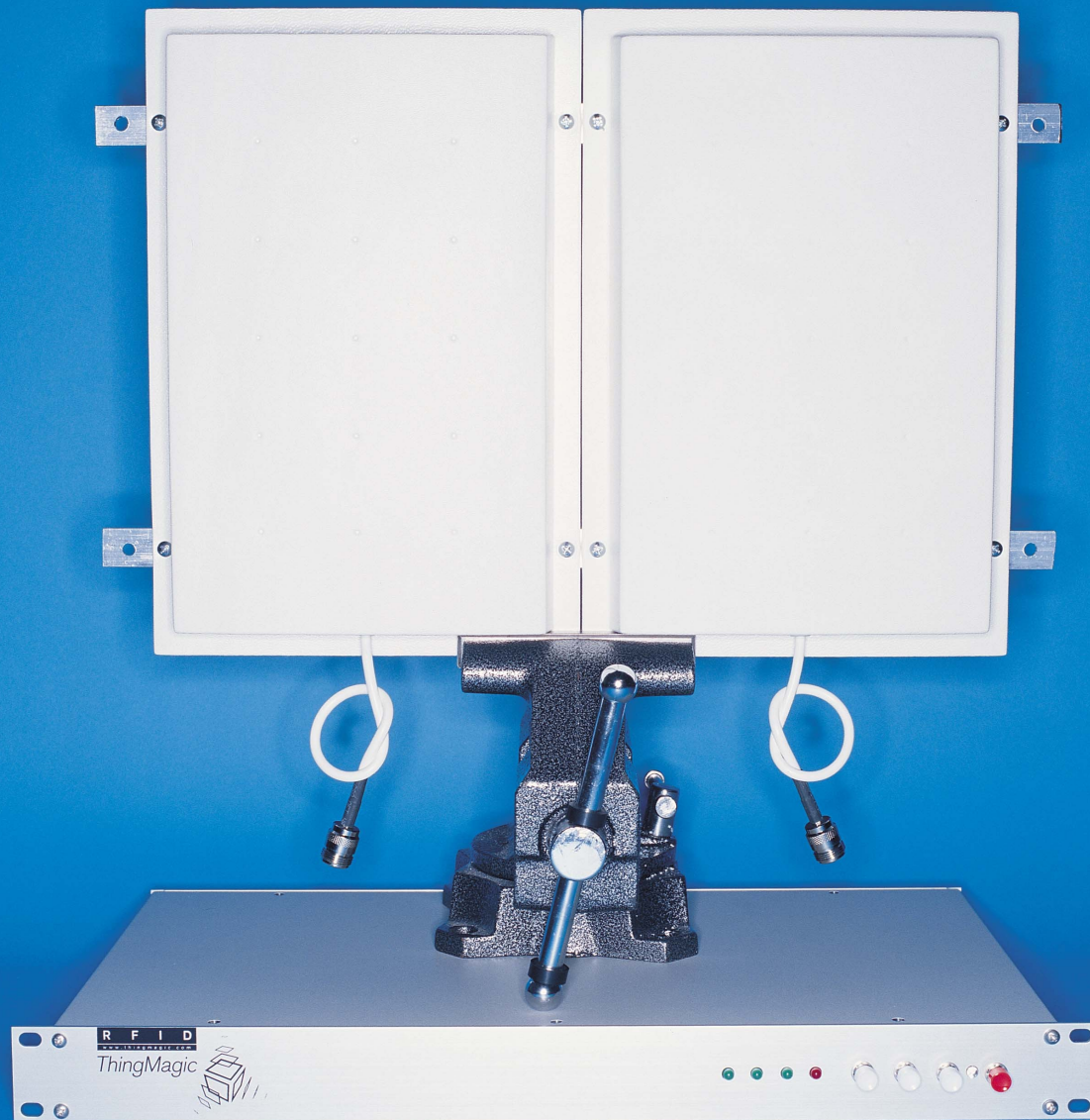
RFID Adhesive Tags

4 cm



An RFID Reader

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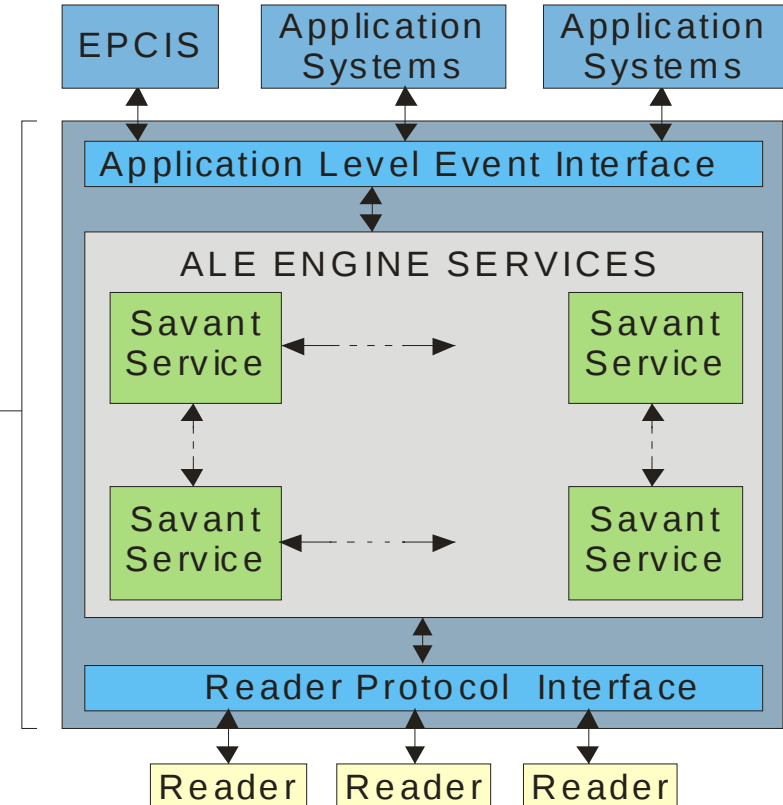
◆ Middleware system

- Interface between readers and application systems

◆ Functions

- Filtering
- Aggregation
- Event Capture
 - ◆ Time stamp
 - ◆ Location
 - ◆ Object id
 - ◆ Sensor data

ALE Engine



Data Encapsulation

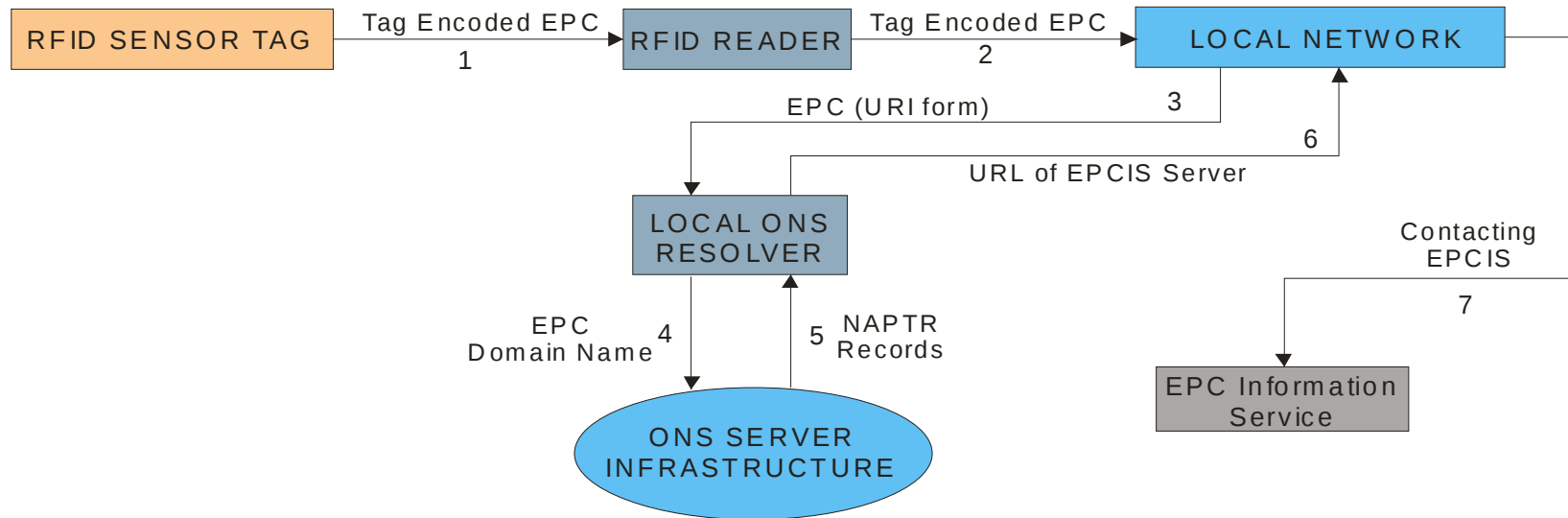
◆ EPC

- Only a reference to information

◆ Method for transfer of captured information

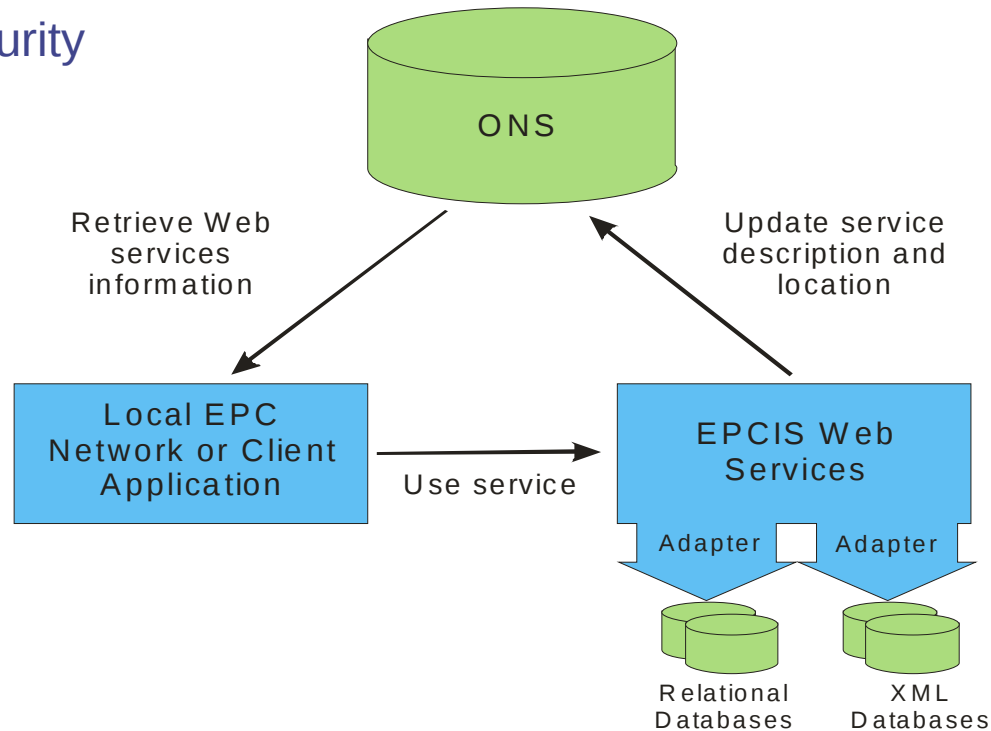
- ◆ Captured information encapsulated in a XML object
- ◆ `EPCSpec` and `EPCReports`
- ◆ Defined by an XML schema
 - Rigid
 - Simple
 - Use long descriptive tags
 - Provide a universal body for encapsulation
- ◆ Provide extensions to accommodate
 - Sensor data,
 - Manufacture specific data or
 - User or object specific data

- ◆ Similar to DNS
 - Function like a reverse phone directory



◆ Gateway or interpreter between

- Information requests
- Databases
- Easily implemented and modelled using existing technology
 - ◆ Web services
 - ◆ WS-Security
 - ◆ SOAP
 - ◆ WSDL
 - ◆ XML



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- ◆ The EPC Network is still a concept under constant development
 - Realization of a “Networked Physical World”.
 - Establishment of intelligent infrastructure
 - Development of standards
- ◆ The EPC Network is a ubiquitous network
 - Leveraging the internet to link local EPC networks
 - ◆ A network of ONS and local EPC Information services.
- ◆ The functionality
 - Provide the linkages between all physical objects with RFID tags
 - The management of the vast volume of data generated by readers
 - The provision of a universal format for describing objects and captured data over the internet for access by remote services
- ◆ Applications
 - Supply chain management as an item identification network
 - Home and manufacturing automation
 - RFID sensor networks for monitoring physical conditions (eg: temperature), product tamper detection, toxic chemical detection, etc.