A Distributed Architecture for a Ubiquitous RFID Sensing Network

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Good news

No pages full of algebra..
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.
Vision

“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
Local EPC Network

Network infrastructure

Reader

Reader

Sensor | Tags
---|---
Sensor | Tags
Sensor | Tags

EPC Information Service (EPC Database)

ONS

ALE Engine

Reader

Sensor | Tags
---|---
Wide Area EPC Network
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

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RFID Adhesive Tags

4 cm
An RFID Reader
Middleware system
- Interface between readers and application systems

Functions
- Filtering
- Aggregation
- Event Capture
  - Time stamp
  - Location
  - Object id
  - Sensor data
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
Object Name Service (ONS)

- Similar to DNS
  - Function like a reverse phone directory
**EPCIS**

- **Gateway or interpreter between**
  - Information requests
  - Databases
  - Easily implemented and modelled using existing technology
    - Web services
    - WS-Security
    - SOAP
    - WSDL
    - XML

Diagram:

- ONS
- Retrieve Web services information
- Update service description and location
- Use service
- Local EPC Network or Client Application
- EPCIS Web Services
  - Adapter
  - Relational Databases
  - XML Databases
Summary

- 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.