



Building Radio frequency IDentification solutions for the Global Environment

WP2: Serial Level Lookup Service

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Outline

- About BRIDGE
- WP2 Positioning in BRIDGE project
- Work Package Motivation, Goals and partners
- Major Achievements / Deliverables
- Conclusions



About BRIDGE FP6 IP

- **BRIDGE** (Building Radio Frequency IDentification for the Global Environment) is a European Union funded 3-year Integrated Project addressing ways to resolve the barriers to the implementation of RFID and EPCglobal technologies in Europe
- The project consists of a series of business, technical development and horizontal activities
 - **Technical R&D program** in various aspects of RFID hardware, software, network and security
 - **Seven Business work packages** have been set up to identify the opportunities, establish the business cases and perform trials and implementations in various sectors including
 - anti-counterfeiting - Textile - products in service
 - Pharmaceuticals - Manufacturing - retail non-food items
 - re-usable assets
 - A series of **horizontal activities** will provide training and dissemination services, enabling the adoption of the technology on a large scale in Europe for the sectors addressed by BRIDGE and beyond.





WP2 Positioning in BRIDGE project

Horizontal
Activities

WP13: Dissemination & Adoption Tools

WP12: Training Platform, Courseware & Certification

Business
Development
Clusters

WP5: Anti-Counterfeiting

WP6: Drug Pedigree

WP7: SCM European
Textile

WP8: Manufacturing

WP9: Reusable Asset
Management

WP10: Products in Service

WP11: Non-Food Item-Level

WP4: Security

WP3: Serial-Level Supply Chain Control

WP2: Serial-Level Lookup Service

WP1: Hardware Development

Technical
Development
Clusters





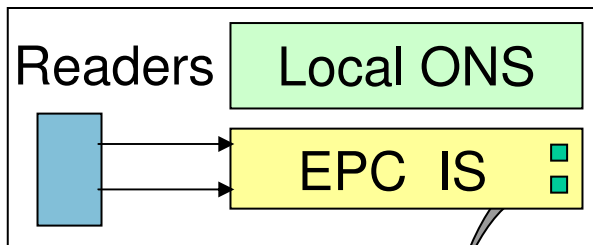
Motivation of WP2 activities

- At the time the project was defined, EPCglobal was offering a ratified standard for accessing to manufacturing information of a product, i.e ONS
- However, there was not possibility of retrieving item-level information
- Serial-level lookup services or Discovery Services were envisaged as the last layer in the EPCglobal architecture
- Also, there were conceived as a complement to another on development standard, i.e EPCIS



What are Discovery Services?

MANUFACTURERS



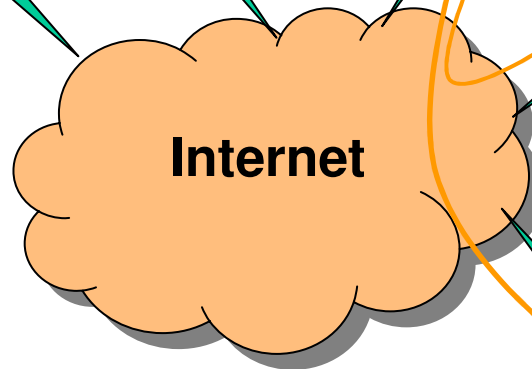
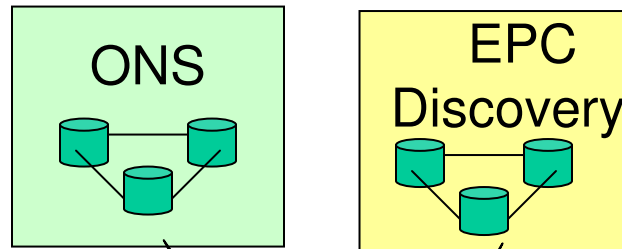
Lemon marmalade



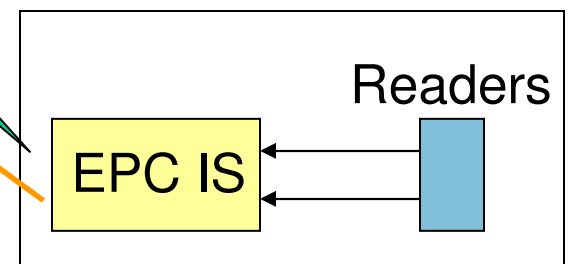
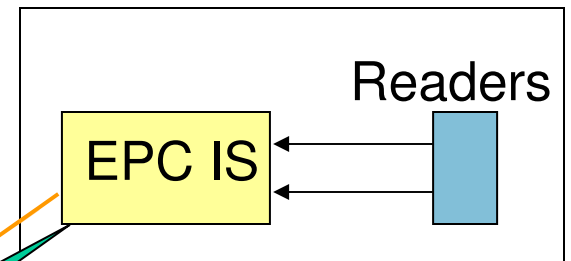
EPC

- Ingredients
- Processing type
- M.D: 2006-07-06
- E.D: 2008-01-06
- Maximum 23° C

SERVICES



SUPPLY CHAIN COMPANIES

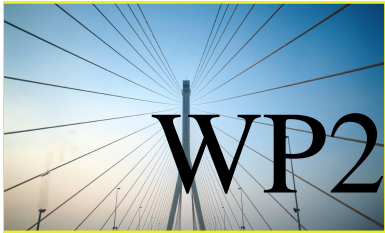




WP2 Goals

Research on Serial Level Lookup Services (i.e., Discovery Services (DS))

- Extract requirements from RFID community
- Develop a high level design for DS
- Study developments by others (companies, R&D groups, etc.)
- Implement a prototype
- Contribute to standardization, essential for future interoperability of Discovery Services
- Research on needs for integration with current IT systems
- Disseminate the value of RFID technology



Objective and Partners

Main objective: Definition and deployment of a prototype of the serial-level lookup service to provide track and trace information about a given EPC

Months: M1 to M18 (June 2006 – December 2007)

Leader:



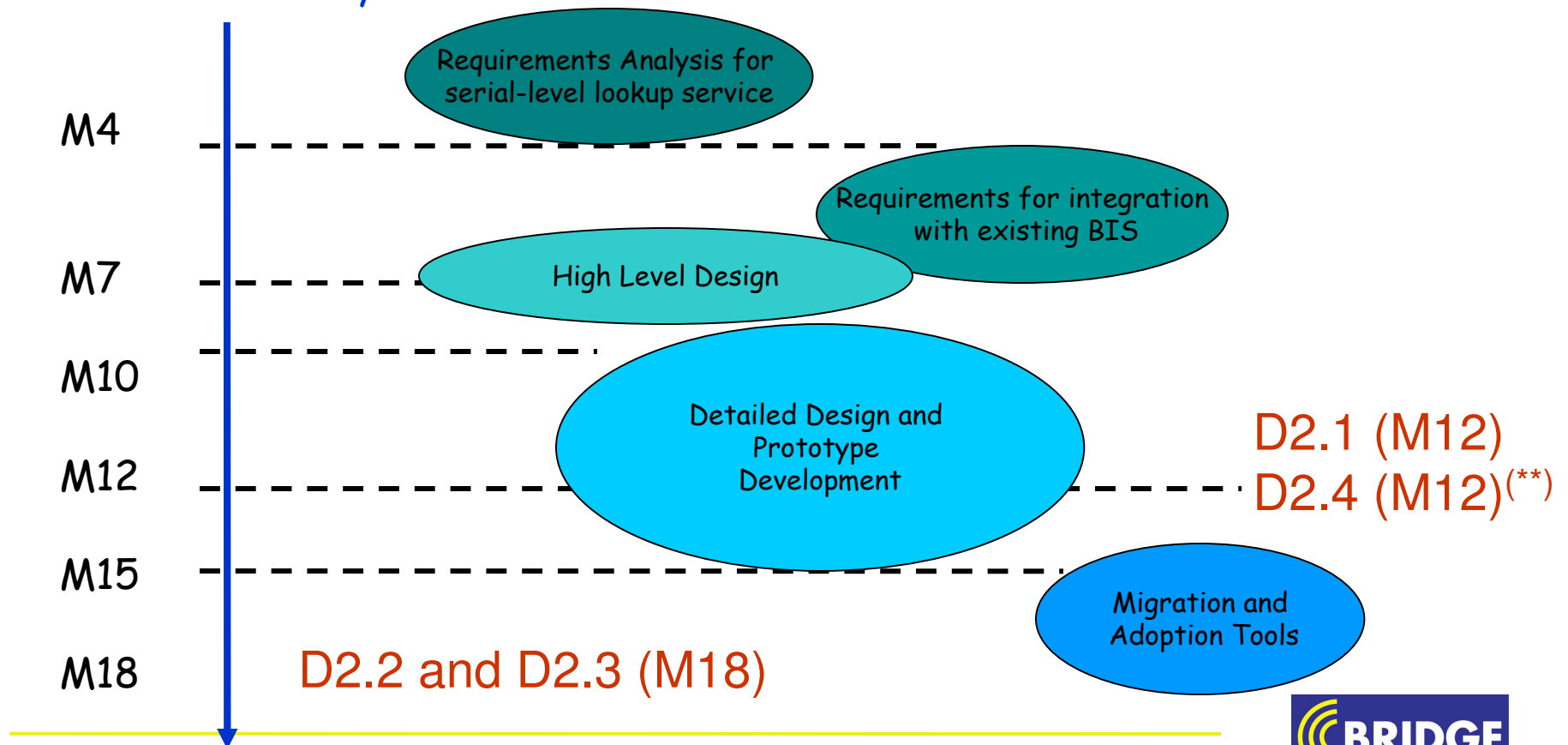
Partners:





WP2 Description of Work

WP2 Kick-Off July 2006



(*) Business Information Systems

(**) Not anticipated in first version of DoW





Requirements Analysis

- Task objective: Requirements Analysis for serial-level lookup services
- Main activities:
 - Web-based survey
 - Interviews to end users
 - Collection of requirements
 - Contribution to D2.1 (section A)
- Task Leader



- Task Contributors





Requirements Analysis

Task Results

- Main conclusion: Discovery Services are not yet a well known concept among RFID users, perhaps because few current RFID pilot activities are attempting serial-level track and trace across complex supply chains involving multiple companies.
- Security and Privacy within the supply chain is essential as sensitive information about volumes and flows of products is involved.
- As a result of the Requirements extraction process, our design for Discovery Services only provides pointers to sources of information (such as EPCIS), rather than replicating detailed product information.



Requirements Analysis

Task Results

- Need for standardized query and publishing interfaces across different providers of Discovery Services
- In many situations, objects are aggregated to others. Therefore it is considered necessary for Discovery Services to support Aggregation/Disaggregation events
- Respondents to questionnaire suggest it is desirable for Discovery Services to supporting standing queries
- Formal list of requirements is documented in D2.1 (public document available in www.bridge-project.eu)



Integration Requirements

- Task Objective: Requirements for integration with existing Business Information Systems (BIS)
- Main Activities:
 - Personal Interviews to end-users and experts on integration with BIS, e.g., ERP, CRM
 - Contribution to D2.1 (section B)

- Task Leader:



- Task Contributors





Integration Requirements

Task Results

- Interviews performed with RFID solution experts and end users companies
- Contribution, from an integration perspective, to the list of requirements for the Discovery Services
- Main conclusion is that serial level information is today not widely used. Therefore companies do not identify the need for Discovery Services nor is it in their short term integration plans.

(*) **ERP**: Enterprise Resource Planning
CRM: Customer Relationship Management





Integration Requirements

Task Results

- First step is to consider EPCIS in the IT architecture.
Possible scenario:
 - EPCIS interface integrated into existing BIS (likely ERP)
 - Discovery Services will be fed with EPCIS information events
- Interviewees highlighted the importance of addressing security/privacy issues in DS.
 - Ensure Data Integrity
 - Define Data Access Control Policies



Deliverable D2.1

“Requirements document on serial-level lookup service for various industries”

- Content
 - Introduction
 - Section A: “Report on Questionnaire on Requirements for Serial Level Lookup and Supply Chain Control“
 - Section B: “Requirements for the Integration of Serial-level Lookup Services with Existing Business Information Systems. Report on Performed Interviews“
 - Section C: “Report: Formal List of Requirements for Discovery Services”



Deliverable D2.1

Conclusion:

- Make the deliverable public to enable sharing with external interested parties and contribution to standards development activities.
- List of requirements shall be revised in the future when companies become more aware of the potential use of serial level information
- Study of discovery service scenarios was in the scope of High Level Design Task and therefore some requirements have been extracted from D2.4



High-level Design

- Task Objective: High level design for Discovery Services: Data model and Interfaces
- Main Activities
 - Interfaces Design
 - Users: Client Query Application
 - Information providers: Publisher (EPC IS)
 - Peers: others DS
 - DS Models Comparison
 - Data Model Design

- Task Leader



- Contributors





High-level Design

Conclusions

- Design model selected
 - Synchronous response to queries
 - Functionality does not rely on availability of external components (e.g. EPCIS)
- Security/Privacy link to WP4 - develop in WP4, task 4.5
 - Policy framework with policies that can be defined by providers of information and agreed with users
- Results (D2.4) opened the possibility for WP2 to exchange information with standardization organizations and other companies working on Discovery Services



Deliverable D2.4

“High-level Design for Discovery Services”

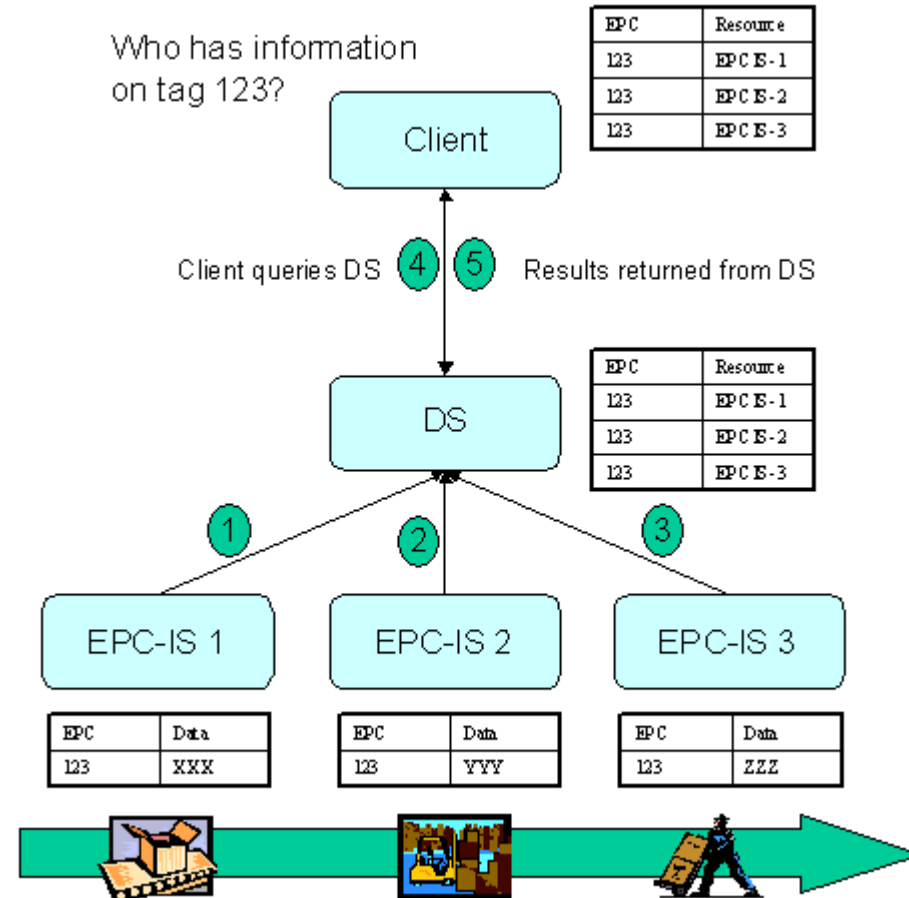
- Contents
 - Introduction
 - Section A: “High-level Design“
 - Section B: “Analysis of Discovery Service Models for RFID“
 - Section C: “Scalability of Different Approaches”



Deliverable D2.4

Conclusion:

- Prototype should be a reference implementation of the design
- Prototype should implement the defined capabilities
- D2.4 has been contributed to EPCglobal and IETF working groups





Discovery Service Prototype

- Task objective: Serial Level Lookup Service Prototype
- Task Leader



- Task Contributors



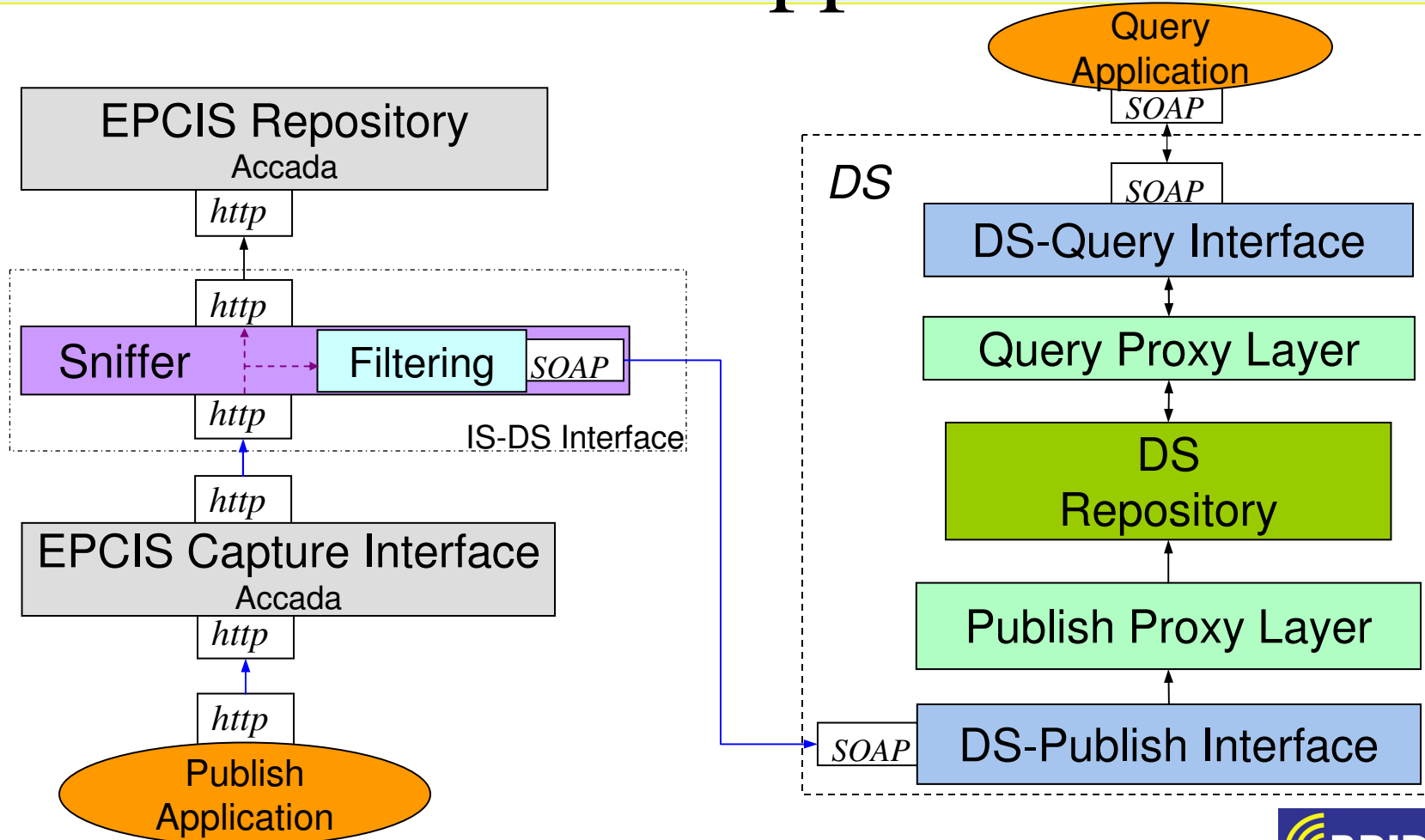


Discovery Service Prototype

- Main activities:
 - Detailed Design of the prototype
 - Deployment of ACCADA EPCIS
 - Development and Implementation of IS-DS interface
 - Implementation of Data Storage component based on LDAP
 - Implementation of Publisher and Query interfaces
 - Implementation of Standing Queries Subsystem
 - Development and implementation of Publisher and Query app



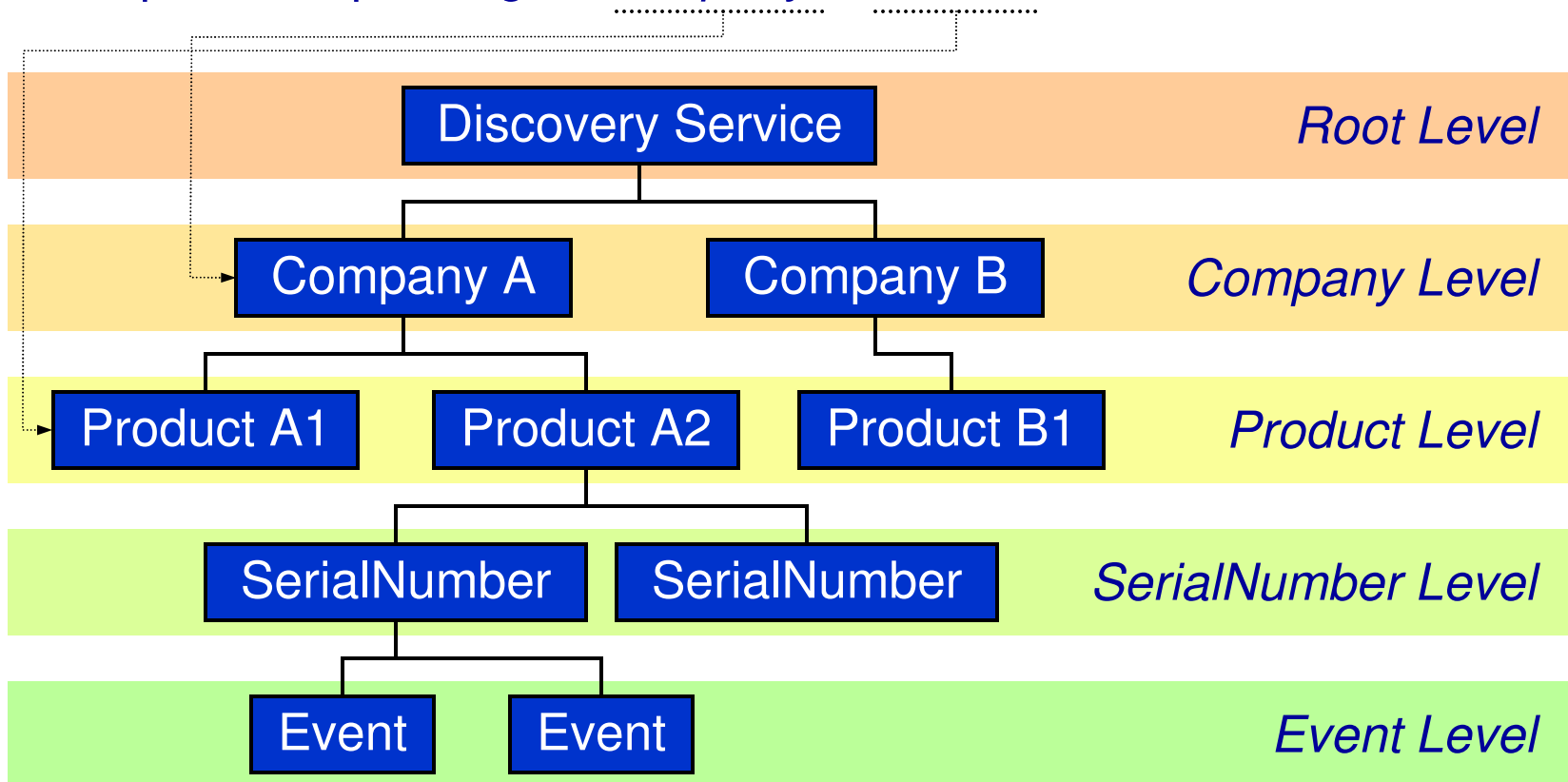
Prototype Architecture & Demo Applications





Database Structure

Example: `urn:epc:id:sgtin:CompanyA.Product1.SerialNumber`





Publish application

This field contains the URL of the IS-DS Interface

Event Time is the moment when the event took time

Publish Demo

AT4 WIRELESS

Capture Interface URL

Show Debug Window

Event Type

Object Event | Aggregation Event | Transaction Event | Quantity Event

Event Time ? Hours Minutes Seconds

EPCs

Action

Business Step

Disposition

Read Point

Business Locat.

Business Trans. ID Type



Publish application

There are 4 types of events: Object event, Aggregation event, Transaction event and Quantity event

In the Object event, the EPCs related with it are inserted here

Publish Demo

AT4 WIRELESS

Capture Interface URL

Show Debug Window

Event Type

Object Event | Aggregation Event | Transaction Event | Quantity Event

Event Time ? Hours Minutes Seconds

EPCs

Action

Business Step

Disposition

Read Point

Business Locat.

Business Trans. ID Type



Publish application

In this case, the event is an Aggregation event

Parent is the object the childs are associated with

Childs are the EPCs associated with the parent

Publish Demo

AT4 WIRELESS

Capture Interface URL Add Default

Show Debug Window

Event Type Aggregation Event

Object Event Aggregation Event Transaction Event Quantity Event

Event Time via 07/06/2007 ? Hours 10 Minutes 22 Seconds 19

Parent Obj. Add Default

Child EPCs Add Default

Action ADD

Business Step

Disposition

Read Point

Business Locat.

Business Trans. ID Type

Publish



Query application

EPC pattern

*Search type:
Any
Aggregation
Non aggregation*

Filter parameters

Query Filter

Query Demo

AT4 WIRELESS

EPC Pattern: urn:epc:id:sgtin:1234.*

Search Type: Match Any_EPC

Record Type: Party

Action: VOID

Event Time >= vie 07/06/2007 ? Hours: 13 Minutes: 7 Seconds: 7

Event Time < vie 07/06/2007 ? Hours: 13 Minutes: 7 Seconds: 7

Record Time >= vie 07/06/2007 ? Hours: 13 Minutes: 7 Seconds: 7

Record Time < vie 07/06/2007 ? Hours: 13 Minutes: 7 Seconds: 7

bizStep:

Disposition:

OrderBy: VOID

Order Direction: VOID

Record Count Limit:

Send Query



Discovery Service Prototype

Conclusions

- Storage component could manage millions of records
- IS-DS interface allows integration to Accada (open source EPCIS implementation)
- DS is implemented according to the proposed interfaces (yet to be formally standardized)
- Demo applications ready to test DS prototype performance



Deliverable D2.2

Part A: “Working prototype of serial-level lookup service”

- Contents
 - Description of Resources of Information models DS Prototype
 - Description of Query-Relay model DS Prototype
 - DS Test Plan
 - Comparison with other Discovery Services

Part B: Prototype code contributed as LGPL



Migration and Adoption Tools

- Task objective: guidelines for adopting EPC/RFID technology
- Main activities:
 - Task concentrates on giving practical advice for organizations that already have decided to adopt RFID and Electronic Product Codes.
 - Relationships between Electronic Data Interchange (EDI) and the Electronic Product Code

- Task Leader



- Task Contributors





Deliverable D2.3

“Integration of Serial-level Data into Existing Business Information Systems”

Contents:

- Guidelines for EPC/RFID adoption projects
- Relationship between EPC/RFID and Electronic Data Interchange (EDI)
- Integration of item-level data into business information systems
- Case of Study: RFID adoption in food manufacturer





General Conclusions of WP2

Applications based on Discovery Services could provide following benefits:

- Traceability of individual items, not only shipments (i.e. saving time and money locating possible faulty products already distributed - i.e. selective recalls)
- Track and trace throughout the lifecycle of products, not only up to the point of sale
- Detailed information about all movements along supply chains
- Detection of potential counterfeiting
- New services for customers



General Conclusions of WP2

- Four public deliverables available in www.bridge-project.eu
 - D2.1 Requirements
 - D2.2 Prototype
 - D2.3 Integration of Serial-level Data into Existing Business Information Systems
 - D2.4 High Level Design
- WP2 is contributing with a LGPL prototype. Core functionality of DS will be hosted by AT4 wireless along BRIDGE timeframe
- WP3 will work on specific T&T applications using WP2 prototype in the BRIDGE framework
- WP4 will complete the security framework and will implement it providing a new version of DS prototype



Any Questions?

Thanks for your attention!



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