Active Badges using CORBA

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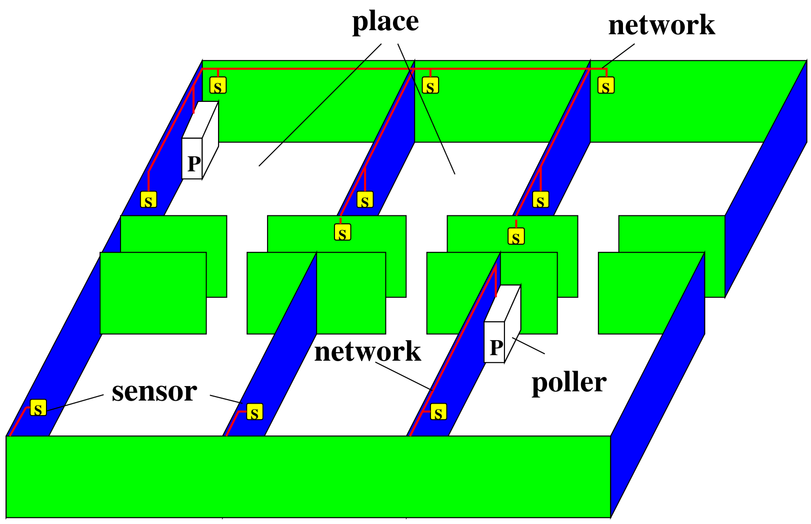
Overview

- What is the Active Badge System (ABS)?
- The existing ABS software.
- Requirements for the new software.
- An architecture of the CORBA-based ABS core.

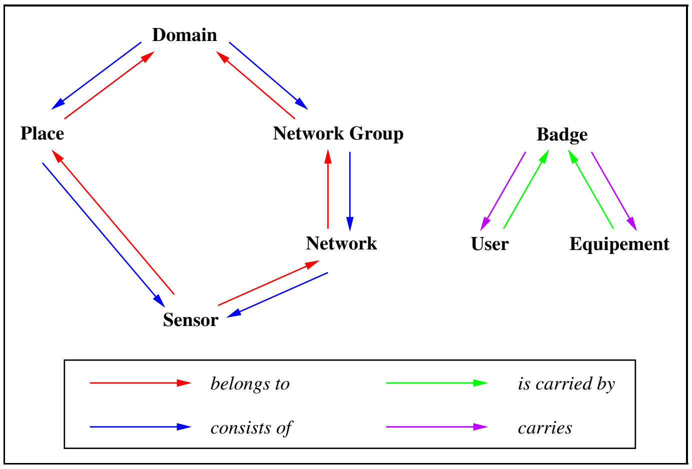
Active Badge System

- People and equipment location service
  - has been developed at Olivetti Research Laboratory in Cambridge since 1987.
- A starting point for building an intelligent office environment
  - personalization
  - The SPIRIT project (ORL)

ABS Infrastructure Components



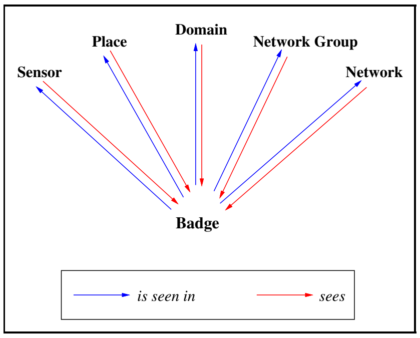
Static Relationships



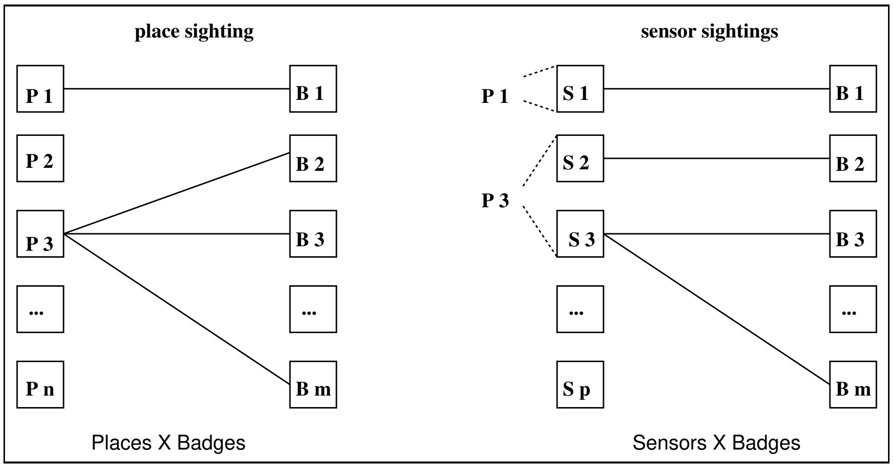
Dynamic Relationships – Sighting

Attributes of the sighting relationship:

- What is seen (user, piece of equipment)
- What can see (badge, network, network group, place, domain)
- Quality
- Update time



Dynamic Relationships – Sighting (example)



Characteristics of the existing Active Badge Software

Properties:

- Monolithic structure
  The system consists of few heavy-weight objects providing coarse-grain interfaces.
- Low-level protocol details disclosed to user applications

Consequences:

- Difficult reconfiguration and management;
- Difficult further development;
- Few variants of distribution;
- Centralized processing, limited scalability;
- Data passed by value – high risk of data inconsistency;
- Heavy-weight and sophisticated user interfaces.

Today's Software Technology

- Component-oriented (componentware, legoware)

  Modern applications are build of components – small, self-contained, extended, and interoperable pieces of software providing well-specified interfaces.

- Standardized

  Common Object Request Broker Architecture (CORBA) –
  a standard for distributed objects to interoperate in a heterogeneous client/server environment.

  - ORB – an object bus
  - CORBA services and facilities

- Three-tiered architecture:

  1. System level objects
  2. Business objects
  3. Light-weight user interfaces (Java, WWW)

New Active Badge Software – Requirements

- Many light-weight objects with well-defined interfaces, large granularity.

  - A number of possible system configuration and distribution variants
  - Passing data by references
  - Easy software evolution (by replacing object implementations)

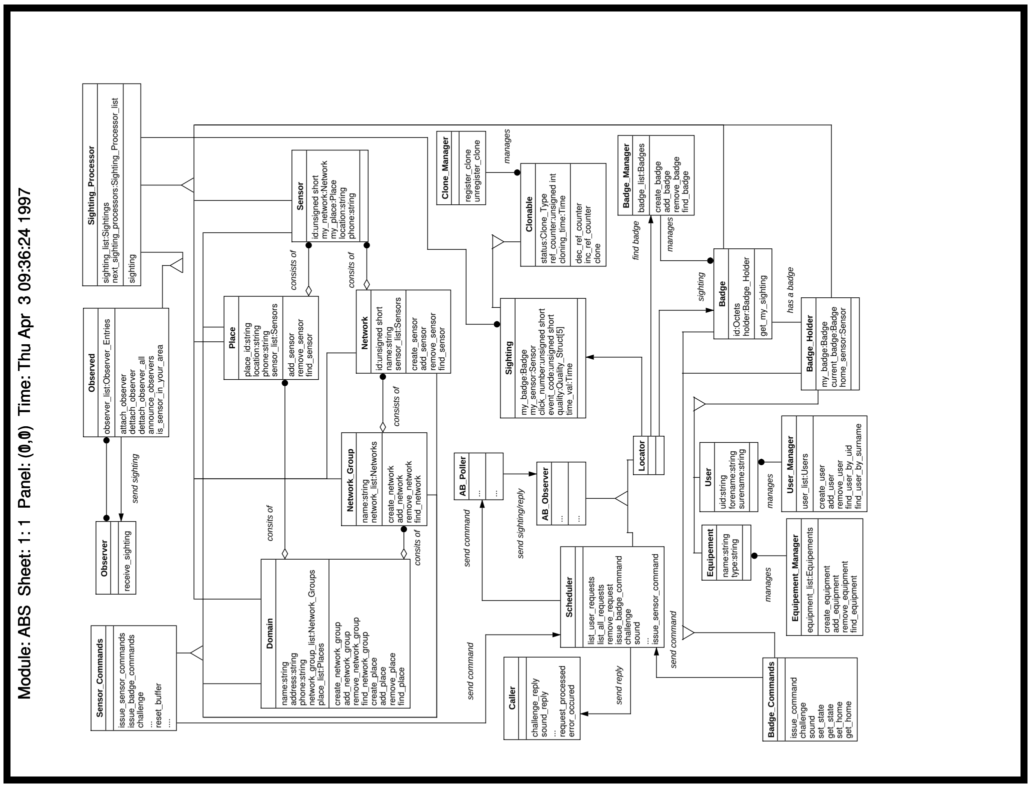
- Low-level protocols hidden in the lowest layer of the system.

New Active Badge Software – Requirements (cont.)

- Three-tiered architecture.
  1. Core (system level objects)
  2. Business Objects (provide many various services:...)
  3. User interfaces (light-weight, Java, WWW)
- Provides location information of different granularity (supports all types of sighting relationship)

ABS Core

- Management of static relationships
  - Objects representing badges, users, equipment, sensors, networks, network groups, places, domains.
  - Each static relationship is supported by a dedicated object manager (operations: create, add, update, remove).
- Management of dynamic relationships
  - Sighting objects.
  - Locator – responsible for dynamic updating of sighting relationships.
- Providing location information to the upper layers
  - The Observer design pattern.
- Providing interfaces for execution of sensor and badge commands.
  - Scheduler, Badge_Commands, and Sensor_Commands interfaces.



Future Directions

- *Wonder Room*
  - Customized environment
  - Personalization of home appliances (light, air conditioning, TV sets, VCRs)
  - Using infra-red interfaces
  - Problem: long response time of badges and sensors
- Enhanced sensor
  - A sensor integrated with a poller
  - Sensor + mini (embedded) PC + CORBA interface
  - Using LAN to connect enhanced sensors