

User Presence Detection in SmartRoom using Innorange Footfall Sensor

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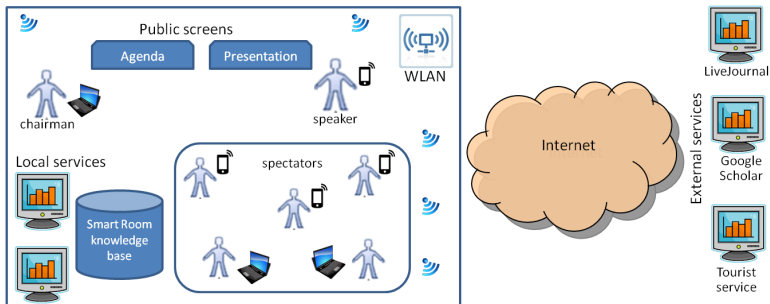


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User Presence: Scenarios

SmartRoom provides a set of digital services to many participants

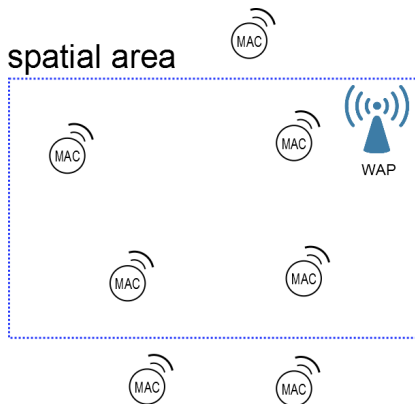


- S_1 : User arrival to the room (spatial physical area)
- S_2 : User waits for beginning of the main activity
- S_3 : User joins and leaves during the main activity
- S_4 : Activity statistics



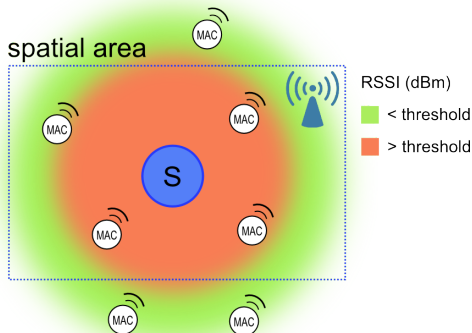
Human participation

- End-users have personal computers and mobile devices
- User devices are connected to SmartRoom WLAN
- Mapping: MAC \leftrightarrow user



Passive Radio Detection using RSSI

- Received Signal Strength Indication
- Estimate RSSI threshold (rough estimation)
- Low implementation cost
- Accuracy is satisfactory for typical instances of scenarios S_1 – S_4

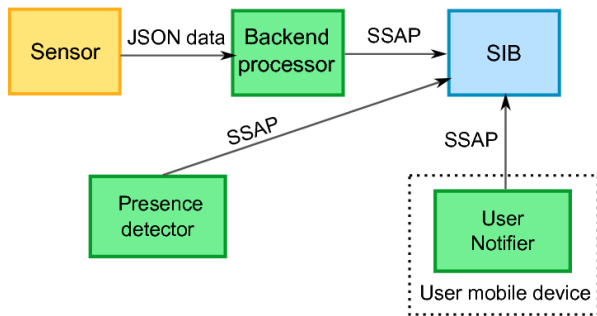


Innorange sensor: Footfall Technology

- Based on the methods of passive radio detection
- Detects presence of WLAN and BT capable devices
- Custom OpenWRT-based software
- Choosing Wi-Fi wireless channels



Architecture



- The sensor sends its measurements: MAC address, RSSI value and timestamp
- Backend processor:
 - ▶ HTTP endpoint to receive presence data from sensor
 - ▶ Presence information processing and store to SIB



Presence Detector KP

Name	Last seen	Degree of presence
Person 1	1 min	Full
Person 2	2 min	Full
Person 3	35 sec	Physical
Person 4	50 sec	Virtual
Person 5	1 min	Full

- The KP detects presence information change (enter and last seen timestamps)
- Determines the degree of a user's presence (e.g. absent or full)
- Publishes data in the SIB for other services and **User Notifier**



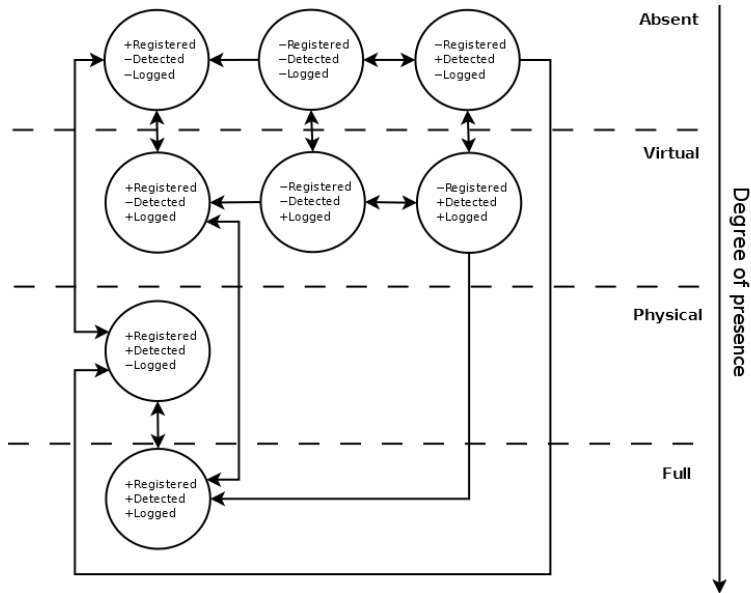
Degree of presence

- User of the SmartRoom system has **3** basic triggers:
 - 1 **Registered**: User registered in the system by registration service or client
 - 2 **Logged**: User logged in the system with the client
 - 3 **Detected**: User detected in the system by using Innorange sensor
- The user may be in different states at the same time
- Combinations of states determine differently the **degree of presence**

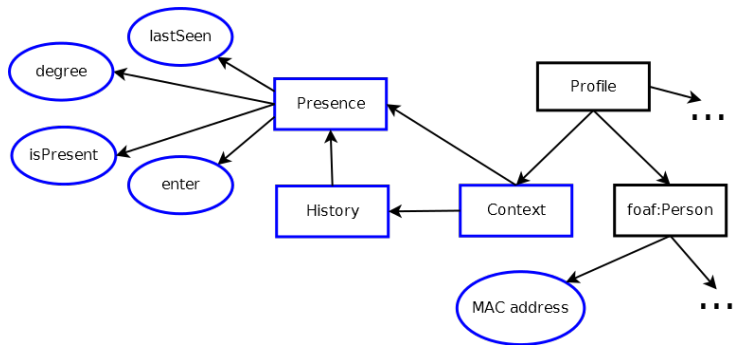
User state



Degree of presence



Expansion of the SmartRoom Ontology



Triples example:

<Presence – uuid, enter, 1362052175>

<Presence – uuid, isPresent, True>

<Presence – uuid, lastSeen, 1362052175>

<Presence – uuid, degree, Full>



Integration of Footfall Sensor into SmartRoom

- Room with floor area of $13 \times 7 \text{ m}^2$
- Sensor is mounted the center of the room
- Personalized devices on different mobile platforms: Symbian, Android and Windows Phone
- RSSI threshold is -35
- **Source code:** `http://sourceforge.net/projects/smartroom/services/presence-service`

