

Ubiquitous network

-Next generation context aware network -

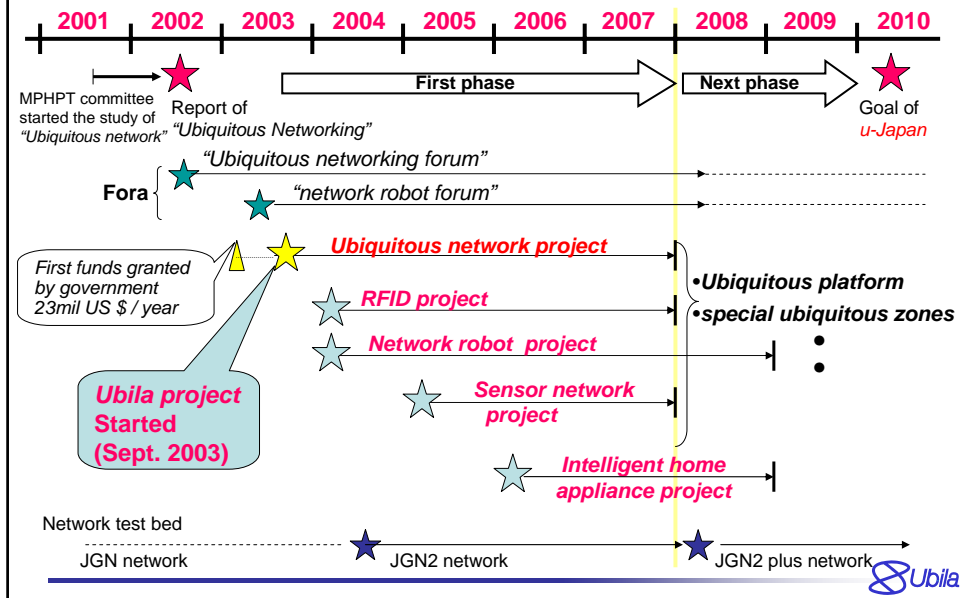
5 March, 2008
Masayoshi Ohashi
KDDI R&D Laboratories

2008 EU-Japan Cooperation Forum on ICT Research - Tokyo - Mita Kaigisho - March 4-5, 2008

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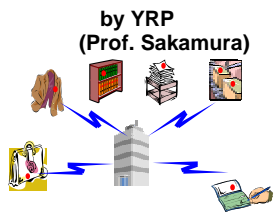
Roadmap of Ubiquitous network projects in Japan



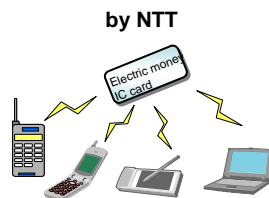
Ubiquitous Network R&D Project (2003 – 2007)

The MIC promotes the research and development project to establish the key technologies for Ubiquitous networks and contributes to the realization of a Ubiquitous network society.

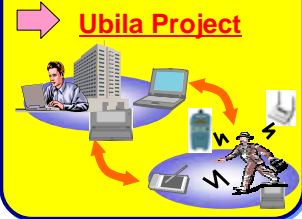
Microchip networking technology



Ubiquitous network authentication and agent technology



Ubiquitous network control and management technology



Ubiquitous Networking R&D Project (*Ubila Project*)

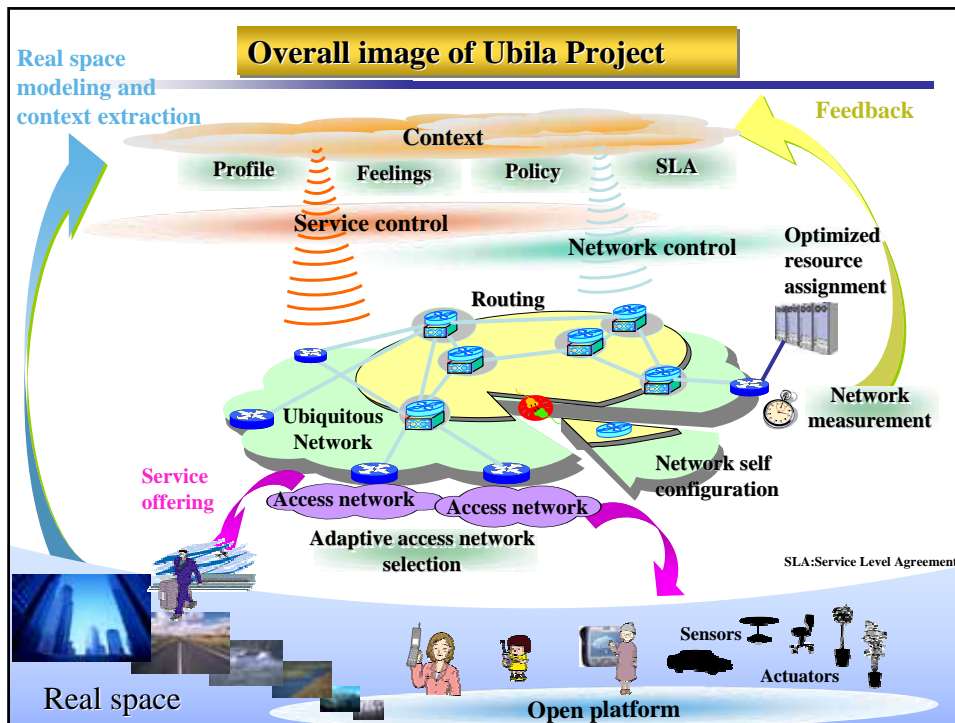
- Name: **Ubiquitous network control and management** (*Ubila Project*)
- Period: 2003 – 2007
- Funds: About 30M\$ for 5years
- Members: KDDI (Leader), Univ. of Tokyo, Keio Univ., Kyusyu Inst. of Tech., NEC, Fujitsu and KDDI R&D Labs.
- Objectives: to realize core technical enablers for ubiquitous network and services, including core network, access network, ubiquitous appliances and sensors.
- Key concepts: “**User centric**” and “**Context awareness**”



Ubila Subprojects and member organization

- **Network measurements**
(Kyusyu Institute of Technology and KDDI R&D Labs.)
- **Network self configuration** (KDDI R&D Labs.)
- **Network service control** (NEC)
- **Network routing and control**
(Fujitsu and Kyusyu Institute of Technology)
- **Access open platform**
(University of Tokyo and Keio University)
- **Profile management** (KDDI R&D Labs.)
- **Adaptive service control** (Fujitsu)





Possible technical components

- Generic context awareness over the ubiquitous network
 - Understanding a user's situations and offering best services and applications to a user
(Generic ubiquitous services for users)
 - Monitoring situations and behaviors of core network and making appropriate control and management to it.
(Network context awareness)
 - Provide the best radio access network available considering resource availability and a user's situation (not explicitly stated here, however this is a kind of Cognitive radio approach)

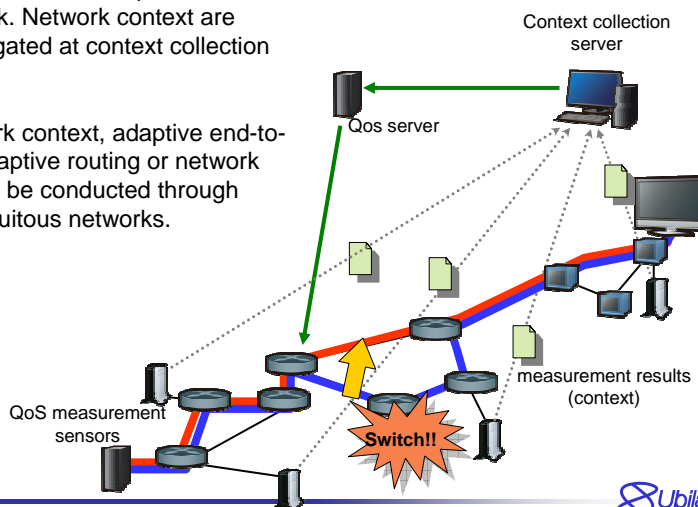
Some of the research outputs on Ubila Project



Network control and management

Ubiquitous network can be controlled based on a so called **network context**. It is captured by measurement sensors which are placed various places in the network. Network context are collected and aggregated at context collection server.

Based on the network context, adaptive end-to-end QoS control, adaptive routing or network resource control can be conducted through collaboration of ubiquitous networks.



Earthquake monitoring



Application of wireless sensor networks

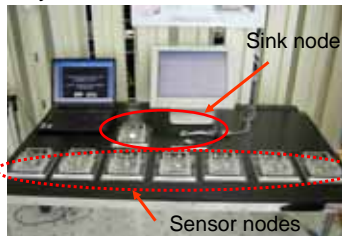
- 100 Hz sampling measurement without data loss
- Time synchronization within 1 msec



Acceleration sensor board (KAJIMA corp.)

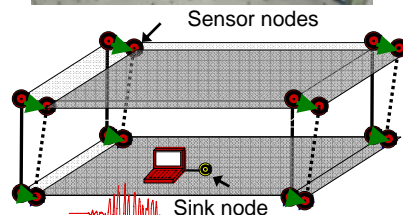


Radio module (Morikawa Laboratory, University of Tokyo)



Sink node

Sensor nodes



Sink node

Evaluating safety of space by high density monitoring with distributed sensors



Environment monitoring by ubiquitous sensors



Monitoring heat island phenomenon with small, cheap sensors

- Microclimate observation by densely placed sensors
- Interactive and real-time monitoring

Field trials in Shinjuku Imperial Gardens

- Measurement was conducted for two weeks in June and May, 2007.
- It is found that Shinjuku Imperial Gardens still be a relatively cool zone and provide cooler breezes to the surroundings.

uPart wireless device



Observation by cellular phone



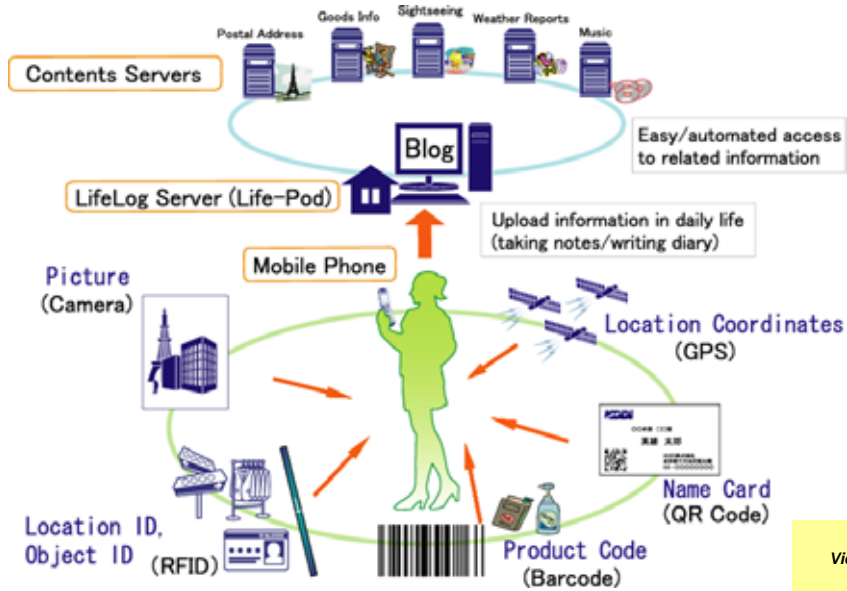
Comparison between Shinjuku Imperial Gardens and Shinjuku Ward Office (Kabuki town)



Measured Temperatures



A future lifestyle : LifeLog with Mobile Phone



Example of a Lifelog record

Example 1 (Blog mode)

Each record is stored and can be shown in a blog mode with a location data, photo, comments and related target data.

Identified address using GPS

Comments

Identified information about a target object obtained from a barcode

Name: milk tea
 1st classification: food
 2nd classification: drink
 3rd classification: refreshment
 4th classification: tea
 Manufacturer: ito-en

Example2
(map mode)

All records are shown in a map and the target record is mashed up

Ubila

Major contributions and achievements of Ubila Project

- Lead a number of international / domestic conferences
 - UCS2003, UCS2004, UCS2006, UCS2007
 - Ubicomp2005 (Tokyo)
 - UNS2004 - 2007
- The number of Papers published; 163 (as of Aug. 2007)
- The number of Technical reports; 517 (as of Aug. 2007)
- Establishment of Ubiquitous Smart Spaces
- Study of Ubiquitous Network Architecture and contributions to ITU-T on NGN2 requirements

Smart Spaces of Ubila

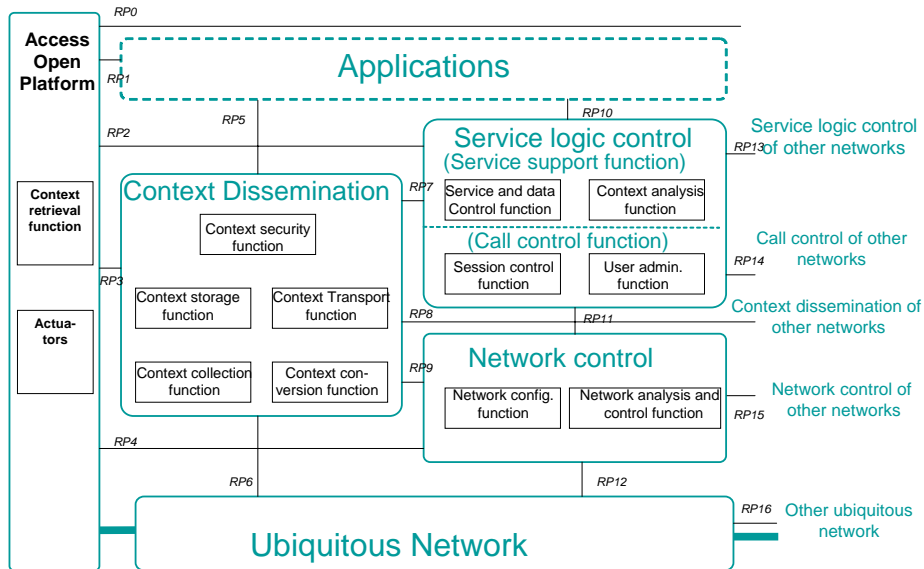
2005 - 2007





Network architecture and Contributions to ITU-T

Proposed ubiquitous network architecture



Contributions to ITU-T

- Based on the research activities on context awareness, Fujitsu, NEC and KDDI proposed to ITU-T SG13 to incorporate “context awareness” as a next generation NGN(NGN release 2) requirements.
- In Jan. 2008 SG13 meeting in Seoul, it was agreed to incorporate this requirement to “Y.NGN-R2-Reqts” and is expected to be approved in the Nov. meeting.



- **Making of Videos**

- as one way of Service Prototyping

1. **Small stories in 2008 (2003)**

2. **Aura (2007)**



“Small stories in 2008”



Collaborations at academia



-Academic collaboration between EU and Japan - SPMS (Workshop on Next Generation Service Platforms for Future Mobile Systems)

- SPMSs were held as one of workshops of the international conference "SAINT" 
- SPMS is a workshop for discussing service platforms for B3G basically, but it is closely related to ubiquitous networking and services.
- History
 - 1st SPMS: SAINT2005 (Trento, Italy, Jan. 2005)
 - 2nd SPMS: SAINT2006 (Phoenix, Arizona, USA, Jan. 2006)
 - 3rd SPMS: SAINT2007 (Hiroshima, Japan, Jan. 2007)
 - 4th SPMS: SAINT2008 (Turku, Finland, July 2008)
- Organizers are representatives of WWRF and mITF
- Original organizers:
 - Stefan Arbanowski, Fraunhofer FOKUS } WWRF
 - Wolfgang Kellerer, DoCoMo Euro-Labs } WWRF
 - Masayoshi Ohashi, KDDI } mITF
 - Mitsuru Uesugi, Panasonic } mITF
- Major topics
 - personalization, context awareness,
 - simple & seamless application access,
 - mobile service platform, P2P, ontology, etc.



1st SPMS at Trento Italy

Conclusions

- *Ubila project* has been aggressively conducting R&D activities to realize a number of technical enablers for ubiquitous network.
- The project took many opportunities to show its outcome; e.g., exhibitions, symposiums, running smart spaces and making videos.
- Contribution to ITU-T was made to incorporate “context awareness” to the NGN2 requirement.
- It would be desirable if EU and Japan exchange and share such R&D experiences for the realization of ubiquitous network.



Thank you