Challenges in Ubiquitous Computing and Networking Management

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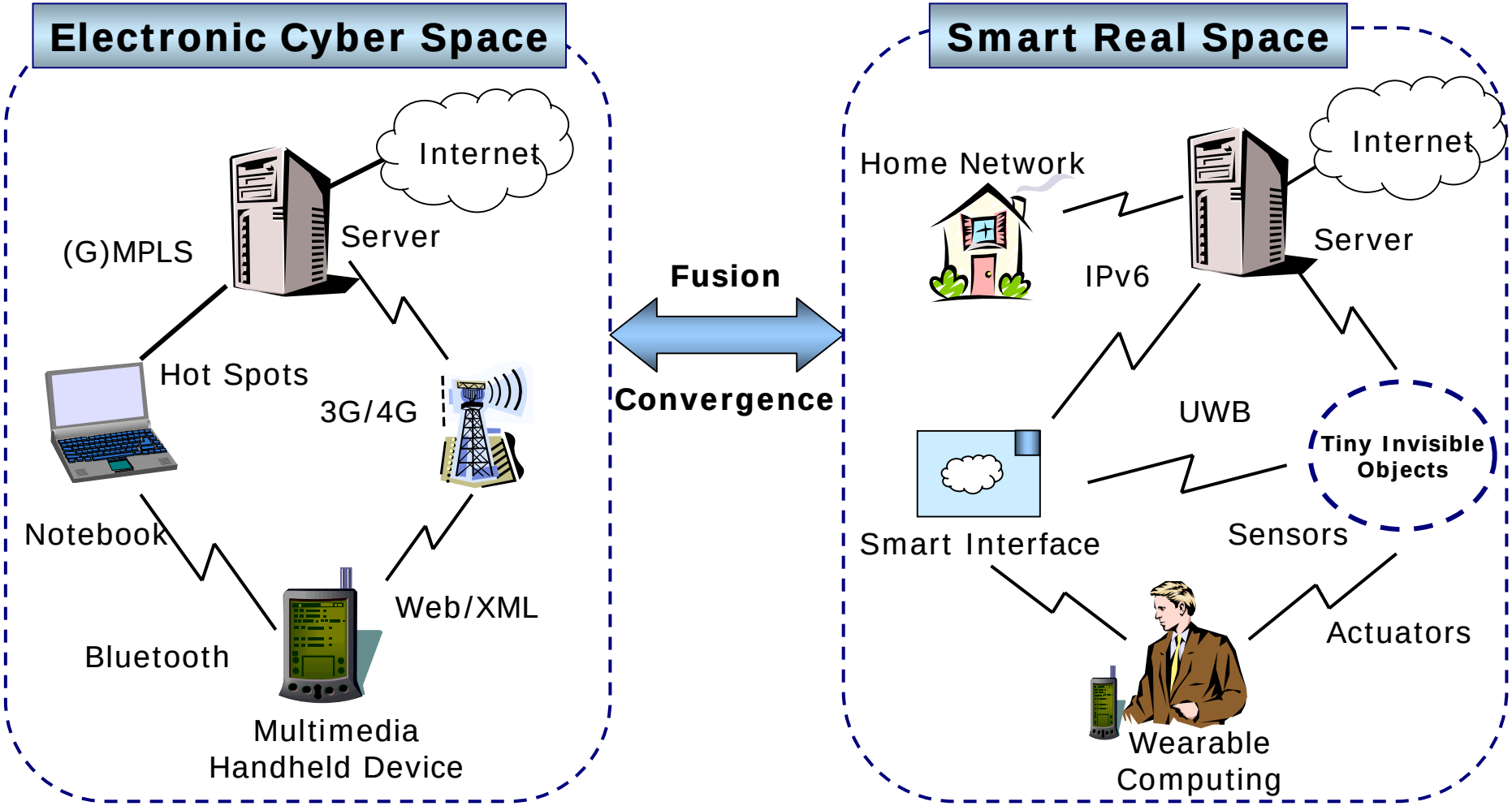
Ubiquitous Computing & Networking Environment



Features of Cyber Space and Smart Real Space

Electronic Cyber Space	Smart Real Space
■ Any (time, where, format) ■ Client/Server Computing, P2P ■ (G)MPLS, Broadband Access Network ■ B3G/4G, NGN, Post PC, IPv4/v6, XML ■ Converging Networks ■ Communication/Banking, Comm./(Music/TV Broadcasting), e-commerce/government, …	■ Any (device, object)+ ■ Proactive & Embedded Computing ■ Sensors, MEMS, Wearable Computing, IPv6(+), Near Field Communication (UWB, ..) ■ Ad-hoc networks, Home networking ■ Telematics/Telemetry, u-commerce/government /university/library

Current Issues in Ubiquitous Computing and Networking

- Current Technical Issues
  - Low Power Intelligent Tiny Chip and Sensors
  - Ubiquitous Interface
  - Near-field Communication (UWB, ..), IPv6
  - Protection of Privacy and Security Management
  - Intelligent Personalization

- Non-Technical Issues
  - Laws and Regulation
  - Sociological Impact

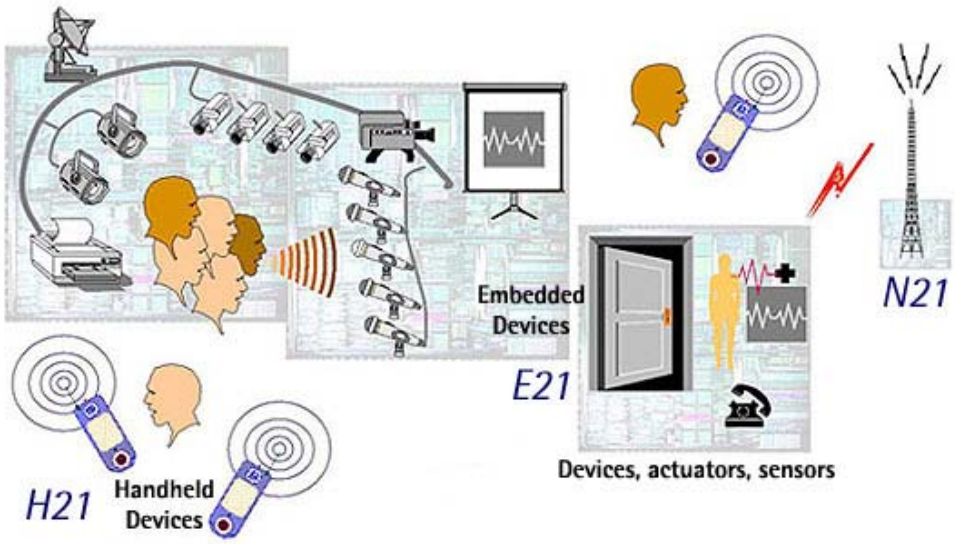
Research Projects

- America
  - MIT's Auto-ID and Oxigen, Berkeley's Smart Dust, NIST's Smart Space
  - MS's EasyLiving, HP's CoolTown
- Europe
  - Disappearing Computing Initiative: Smart Its & others
  - Ambience Intelligence
- Japan
  - u-Network, TRON project (Univ. of Tokyo)
  - Japan's UNF (Ubiquitous Networking Forum)

u-Korea

- MIC's u-Sensor Network (2003)
  - Development of Key Technologies in Wireless Personal Area Network, UWB (~hundred Mbps), Electronic Tag (RFID), Intelligent Wireless Sensor Network
  - Ubiquitous Home Network and Commodity Circulation Network
- MOST's 21c Ut Frontier Project (2003)
  - Basic Key Technology in Ubiquitous Networking
- Others from Industries (Samsung, LG, etc)

MIT's Oxygen



- Computing service available like Oxygen
- Computing access using human centered interface such as natural language and vision

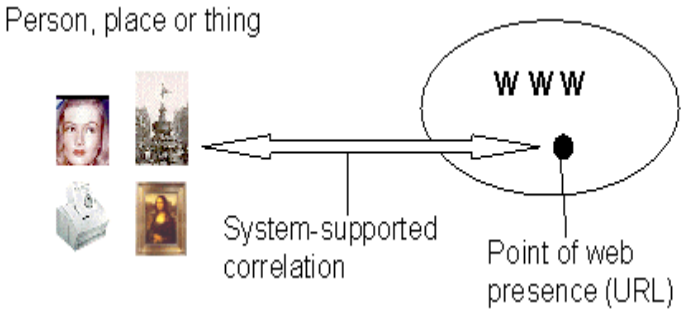
- Computational devices (E21s), embedded in homes, offices, and cars sense
- Handheld devices (H21s) enables to communicate and compute, anywhere
- Dynamic, self-configuring networks (N21s) help machines to locate each other as well as the people, services, and resources we want to reach
- Software that adapts to changes in the environment or in user requirements (O2s) help us to do what we want when we want to do it

Other Projects

- Berkeley's Smart Dust Project

  - 1 mm^3 silicon mote (floatable in the air)
  - Autonomous sensing
  - Wireless communication platform
  - Energy, Military, Commodity

- HP's Cooltown Project



  - Real World Wide Web
  - Person, place or thing existing on the Web space, communicating each other
  - Education, Medicare, ITS, Fire and Safety Service

Common Characteristics of Ubiquitous Computing and Networking

- Invisibility
  - Invisible Intelligent Devices
  - Wearable Computing Devices
  - RFID, Sensors, Smart Card, Information Artifacts, and Tiny Smart Device
- Context-Awareness and Adaptation
  - Autonomous Sensing, Environment Adaptation, Cooperation
  - Real-Time and Proactive
  - Adapting to Device Type, Time, Location, Temperature, Weather, etc
- Network and Mobility
  - Mobility Management (Micro/Pico)
  - Wireless NFC (UWB, RF Interface, Bluetooth, etc)
  - IPv6 and Others (Non-IP, Consumable IP)

Management of Ubiquitous Computing and Networking

- Invisibility Management
  - Ubiquitous Interface Management
  - Configurability Management (Massiveness management, others)
  - Anonymousness Management
- Surrounding Context Management
  - Sensing Capability, Adaptation, Autonomy, Cooperation Management
  - Personalization Management
  - Location-Awareness Management (Tracking, Positioning, and Control)
  - Real-Time, Proactive and Environmental Adaptive Control
- Ubiquitous Wireless Network and Service Management
  - Wireless Network Management (FCAPS)
  - Mobility Management (MIPv6, Micro/Pico/Nano ..)
  - Service Registration, Discovery and Maintenance (OSGi)
  - Extensibility Management (Network/Service)
  - Application of Ubiquitous Technology to Network Management
- Privacy and Security Management
- Fusion Management
  - Interoperability, Integration and Convergence Management
  - Content Management (Information Loss and Mismatch)
  - Scalability Management (Massive Objects)

Conclusion

- Ubiquitous computing and networking are characterized by invisibility, proactive context-awareness/adaptation, and near field network /mobility.
- It requires a new paradigm of management among others, such as ubiquitous interface management, context management, fusion management, privacy/security management, and FCAPS.
- Standards, laws, sociological impact and other environment factors need to be addressed accordingly.

Reference

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