Mobility and Media

How mobile computing is evolving at HP

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Technologies that support mobility and targeted application spaces

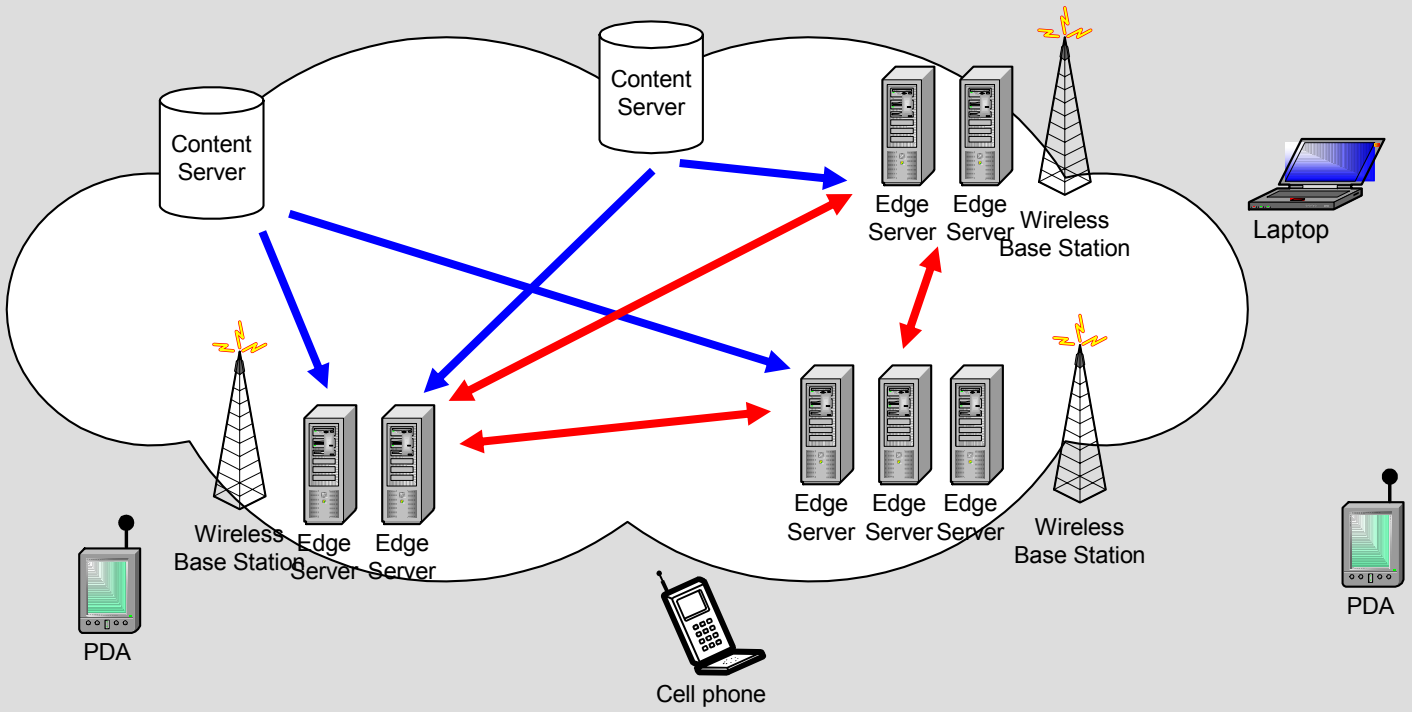
- Content delivery
  - Dealing with mobile infrastructure (the infrastructure and the clients are mobile).
  - Connectivity heterogeneity
  - Exploiting new messaging methods and standards
- Real support for sensing in applications
  - Manageable/zero-configuration location measurement
  - Low user impact ID management
- Virtual spaces and aggregation management
  - Using work from persistent social spaces/web presence
  - Network technologies to support aggregation of devices

Mobile Streaming Media Project

- *Goal*
- Design a mobile streaming media infrastructure that delivers compelling next-generation media services to mobile clients
- *Research Topics*
  - Streaming media: *Making media friendly to networks*
  - Networking: *Making networks friendly to media*
  - Client/Server architecture: *Optimizations for media & networks*

- *Testbed Prototype*
  - Mobile streaming media CDN system design
  - Edge server prototype with streaming and caching functionality
- *API & System Design*
  - Define an open standard for a Mobile Streaming Media CDN

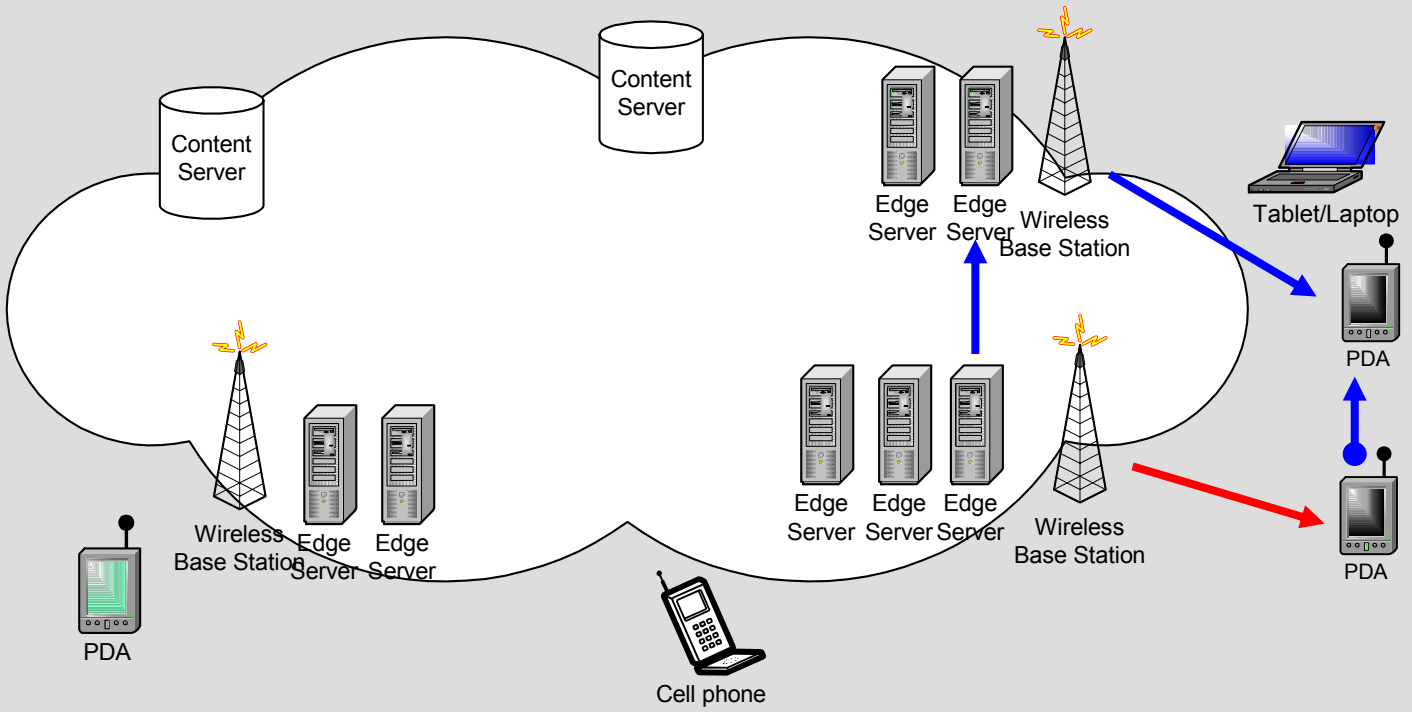
MSM-CDN: Content distribution



1. Content Distribution

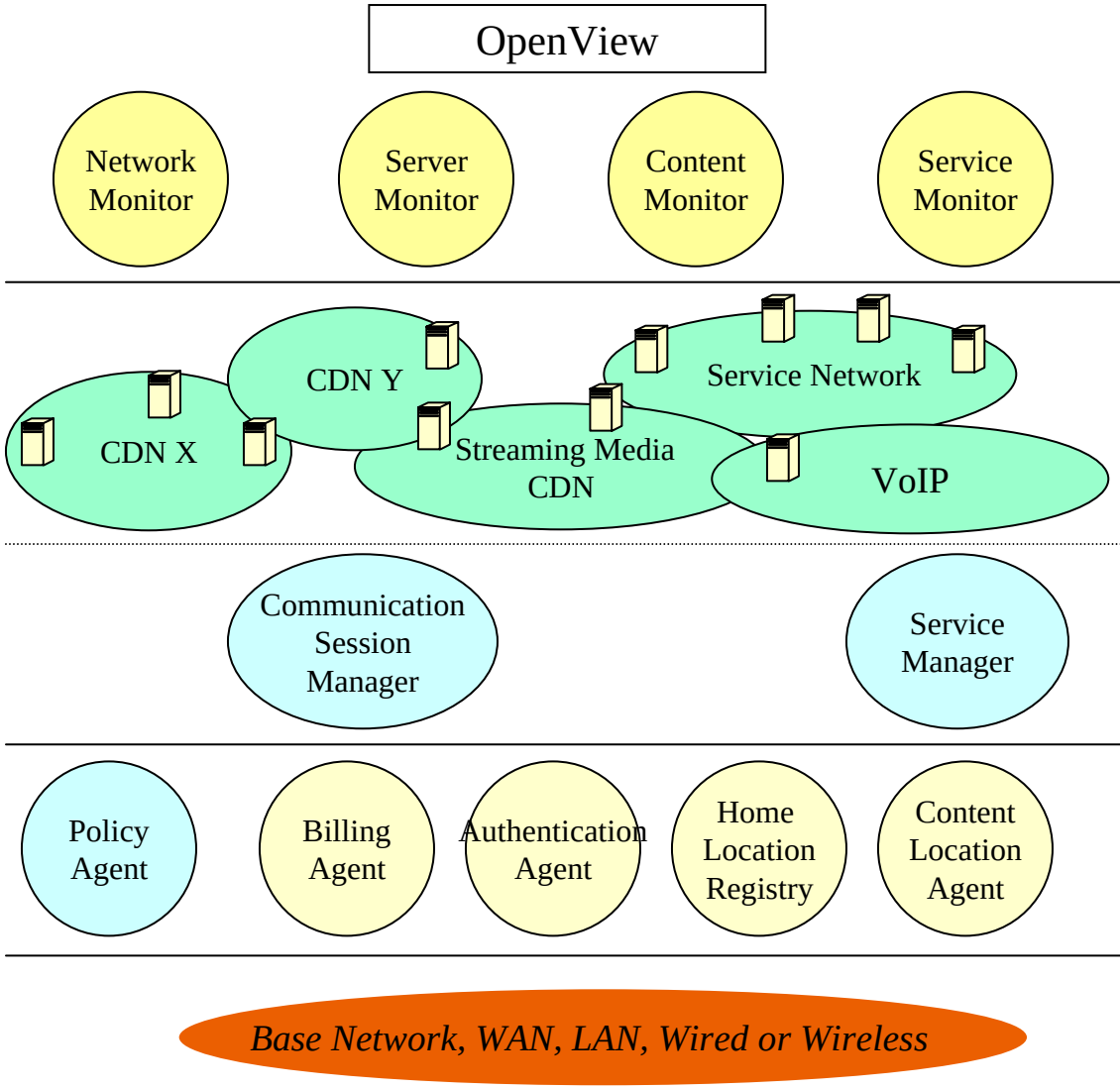
2. Content Redistribution

MSM-CDN: Streaming and handoffs



1. Network-adaptive streaming
2. Handoffs triggered by client movement

Network Overlay Architecture



Monitors
- Passive
- Collect info
- Coarse timescale
- For NW admins

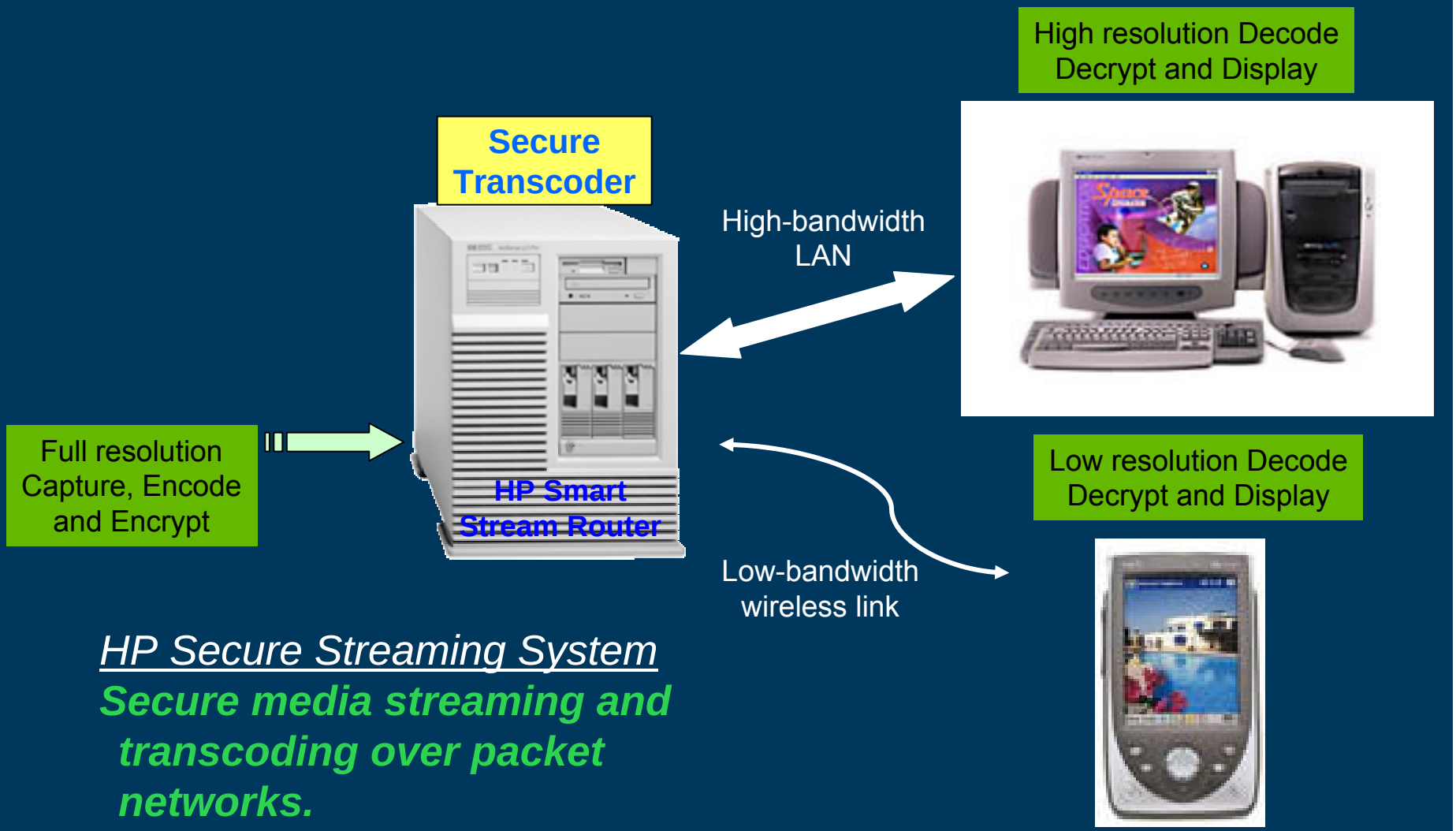
Virtual Overlay Subsystems
- Application services
- Value-added services

Managerial NW Services
- Coordination

Elementary NW Services
- Dynamic
- Decision making
- Fine timescale

Base Network
- IP, Best-effort
- QoS

Secure Delivery and Transcoding of Compressed Video Streams



HP Secure Streaming System

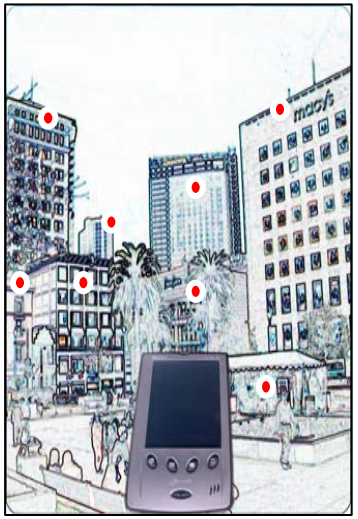
Secure media streaming and transcoding over packet networks.

Sentient Environments Project

- *Goal*
- *End-to-end technologies for transforming conventional spaces into more efficient, self-managed sentient environments, with a degree of autonomous protection and regulation*
- *Research Topics*
  - GeoVisualization: M*anagement though sensor data visualization*
  - Asset Management: *Using location and object ID*
  - Infrastructure Mobility support: *Zero configuration deployment*
- *Testbed Prototype*
  - Websigns
  - Smart Locus
- *API & System Design*
  - Define an open API for sensing, management and visualization

Websign

Hyperlinks from a physical location to the web



“what is available at this location”

Infrastructure

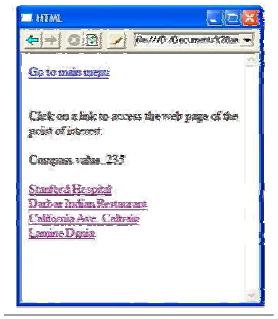
- **wireless connection links the client to the service infrastructure**

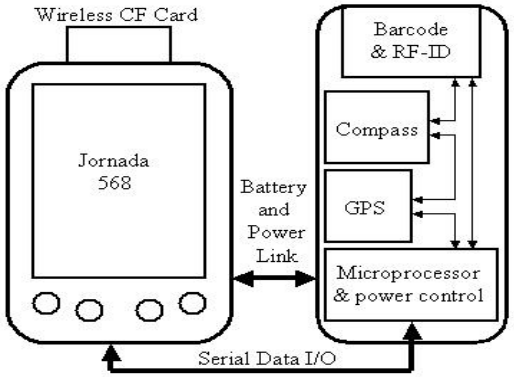
- **client downloads a set of virtual beacons from a websign server. these highlight the services at the users location**

- **pda expansion pack implementations**

- **contains circuitry for:**
  - **location (gps)**
  - **orientation (compass)**
  - **tagged object reads (barcode and rfid)**

- **power management for optimum client battery life. expansion pack matches the pda’s power state**





Websign II: a mobile client for location based services
geoff lyon, mehrban jam, cyril brignone, salil pradhan
ubicomp 2002, sweden, september 29 - october 1, 2002

Websign: hyperlinks from a physical location to the web
salil pradhan, cyril brignone, jun-hong cui, alan mcreynolds, and mark smith
IEEE computer special issue on location-based computing, august, 2001

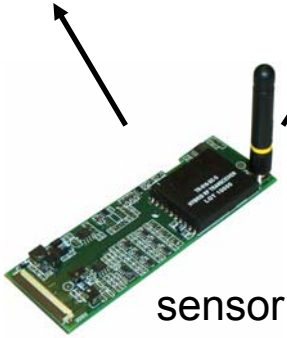
Websign: a looking glass for e-services
cyril brignone, salil pradhan, john grundback, alan mcreynolds, mark smith, and jun-hong cui
3rd ieee wetice workshop on knowledge media networking, mit, june 2001

Smart Locus

Self-assembling wireless network of nodes capable of distributed autonomous localization

infrastructure locus

mobile locus



sensor board

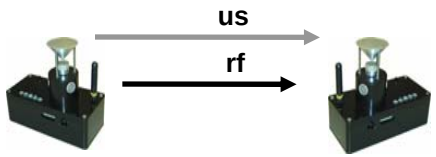
Prototype v.1 (november 2002)

- basic localization algorithms implemented
- accuracy of 1cm over 12m achieved!

Next steps

- improve scalability and robustness against localization grid drift
- ranging using ultra wide band
- paper (in process)

Step 1. determining the range between two nodes

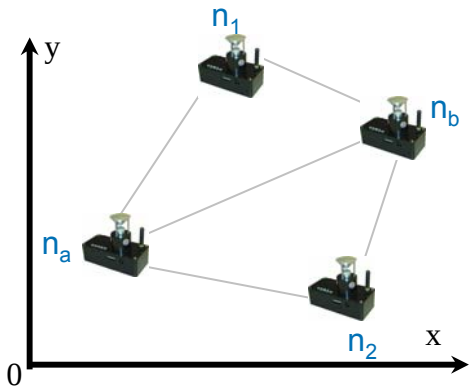


rf_{speed} = 908 000 x $ultrasound_{speed}$

time difference of arrival

between the 2 signals → distance

Step 2. evolve local positioning grid



after the few master nodes are initialized, a basic coordinate system is created

Step 3. basic coordinate system is percolated thought the wireless network via multi-hop routing

Sub-PDA Appliance Systems

- Devices intended to transact events on your behalf.
- Wireless vertical appliances that use sensors and media.
- New connectivity model that maps services with events.
- Used to form federations with other devices allowing them to exploit sensors and data:
- Current Focus areas:
  - ID management
  - Personalization
  - Privacy management

Web interactive Watch
Security / ID management token

Biometric enabled wearable token.
Applications with information portals, access and security infrastructure.

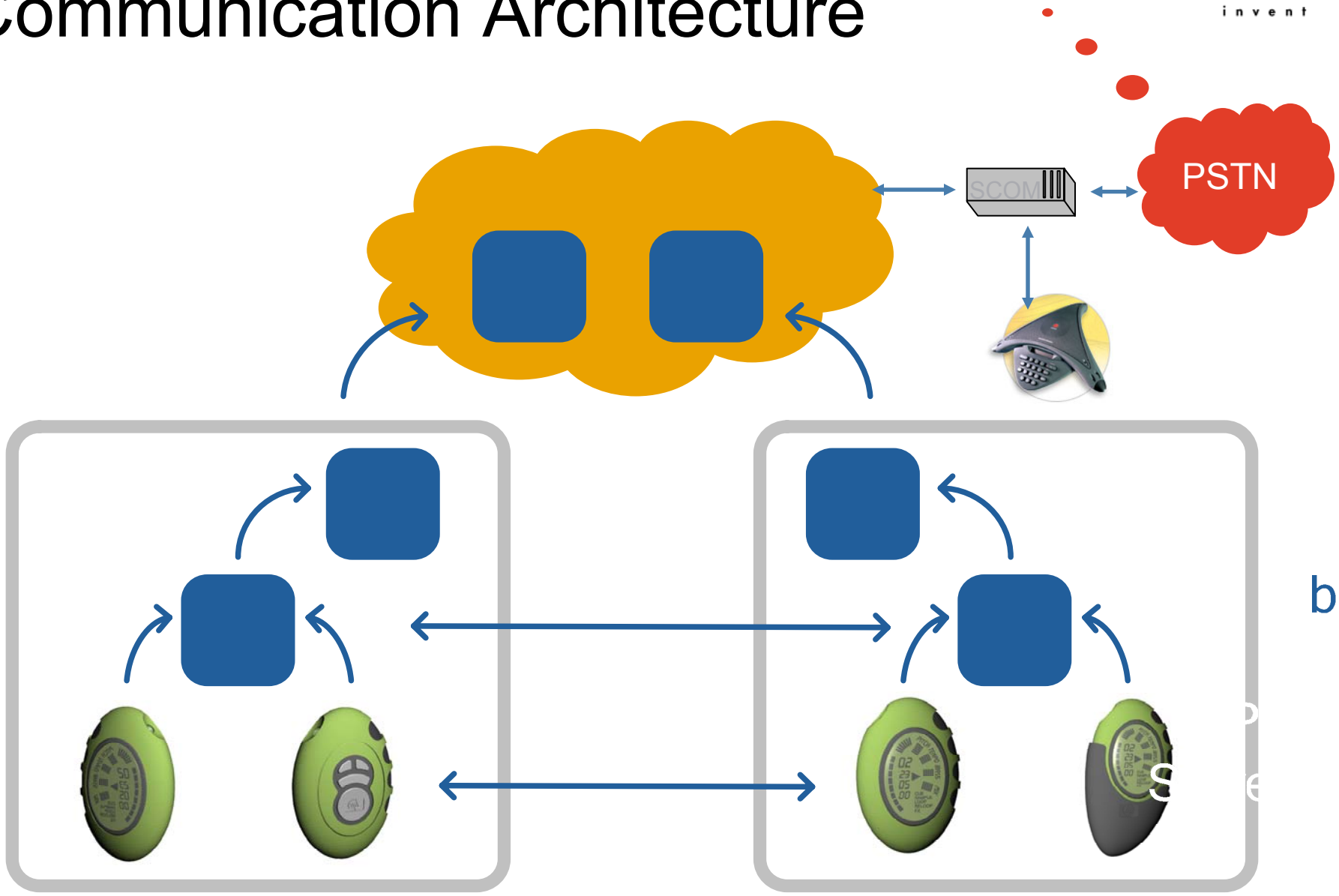
Federated Appliances
PAN-LAN-WAN

when connected
- redirect I/O
- smart sync

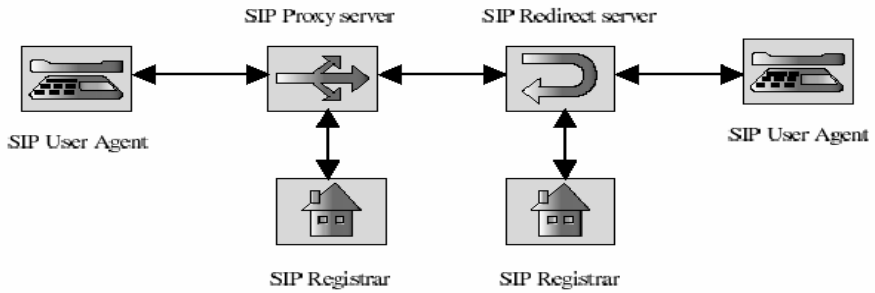
when disconnected
- compensate

Interlayer technologies Support device aggregation

Communication Architecture

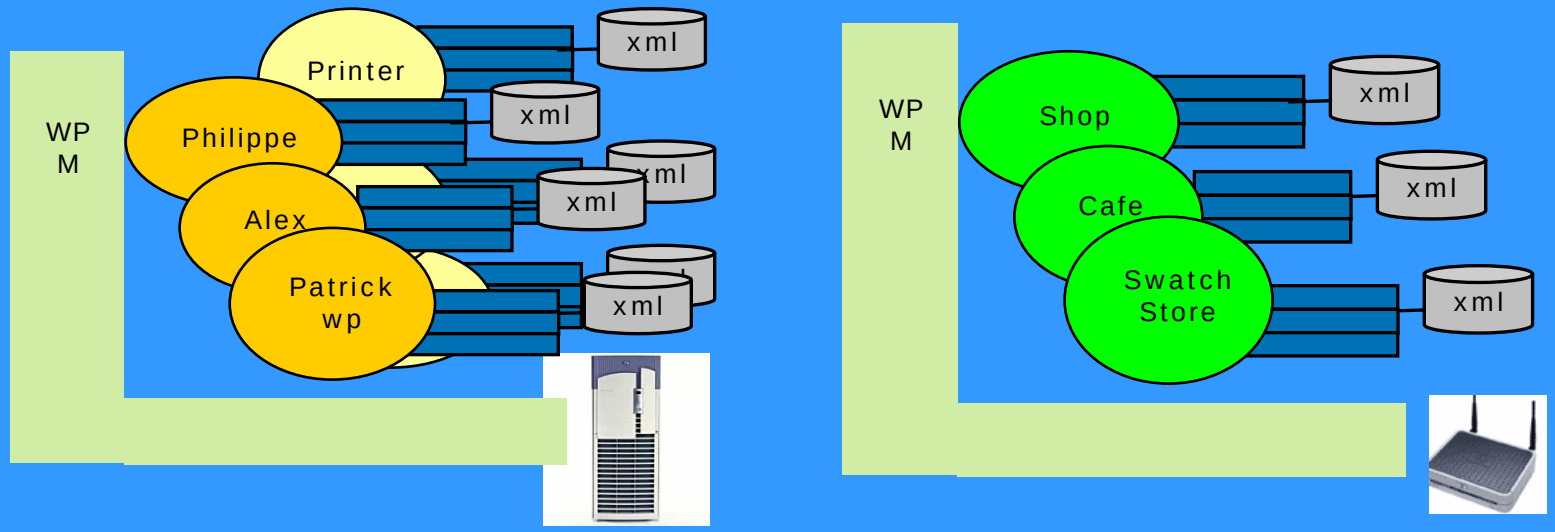


Session Management using SIP



- *Application Session Management*
- SIP is an IETF proposed standard for session management in arbitrary topologies
- *For anything that can use the net*
- Although often associated with voice over IP telephony, SIP is well suited for establishing multimedia sessions among multiple rich media clients, not just voice terminals
- *Orthogonal session interface*
- SIP was invented to make the initiation of multimedia sessions simple, light-weight, giving end-points the responsibility to negotiate the session parameters
- *Wide support, including Microsoft*
- SIP can be used with other IETF protocols to build a complete multimedia architecture (e.g. RTP, RTSP, SDP)

Persistent Virtual Spaces: Web Presence Manager

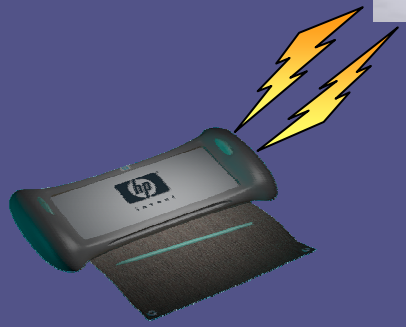


- A platform for deployment/management of web presences.
- Discovery and retention of people, places, and things and the resolution to their associated web presence.
- Allows continued interaction with those people, places and things even after they are physically gone.
- Used with Swatch to create persistent social spaces.
- How about persistent classroom / study group spaces?

Extended Access Technology

Mobile Hotspot Server

Communication and session management
- •WAN (2.5G, 3G)
- •WLAN (802.11)
- •PAN (Bluetooth)



Information, entertainment and communication passenger devices.
Internal and external telematic and maintenance devices.

Builds on the Mobile Streaming Media and all the other projects.

Project goals

- Connection Diversity. Users need interoperability support that spans WAN, LAN and PAN.
- Storage Services. Small personal devices like watches and smart phones have next to no storage of their own. Provide plenty of storage for personal media that *moves with their owner*.
- Media, communication and messaging services. The most wanted features. Can provide security, media processing (ie transcoding), game support and other applications the small personal devices can't do.
- Manageable. these devices can be supported remotely.

Personal server

WAN, LAN and PAN wireless is built in

Would a tablet PC be a reasonable platform for this?

Other aspects of this project:

- These devices can find and synchronize each other. A user can have more than one, and they are all kept current. Remember, these things are very wireless.
- As they become deployed in cars, they can form large, ad hoc computing fabrics. A mobile UDC.
- Platform for future, HP managed services and applications. Emerging interactive gaming or bidirectional media processing are good examples.

A few other mobility application spaces of particular interest

- Mobility support for WLAN
  - Example: Inter-Access Point Protocol (IAPP) for mobility across WLAN microcells
- Aggregation management
  - Ontologies, extensible knowledge sharing
  - Emerging personal device ideas like the business suits
  - Virtual spaces
- Teleconferencing that focuses on artifact sharing.
  - Objects, documents, watching things work, systems…
- Applications that support instant messaging models
  - Using WLAN infrastructure
  - SIP, P2P, others
  - Using advanced media

invent