

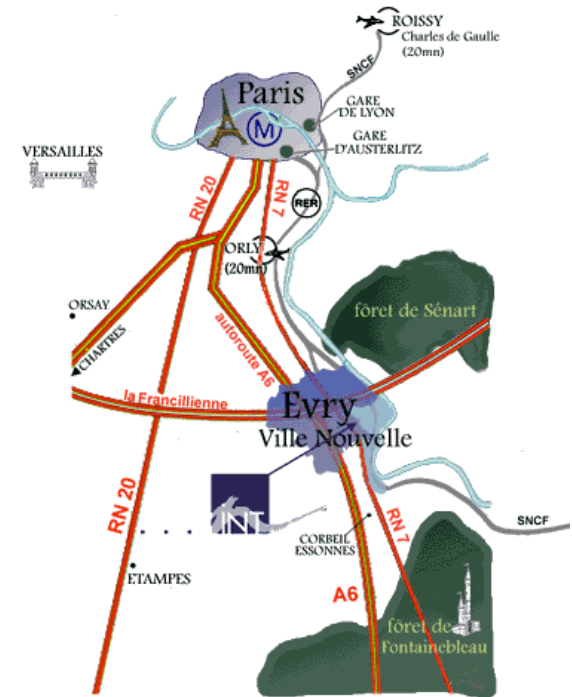
Applications and Services for Wireless Networks Workshop ASWN 2003

Beyond 3G Perspective
by

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- 1) What services and applications need to be supported in future cellular and wireless networks, including PANs, LANs, MANs?
- 2) What are some of the practical scenarios envisioned for mobile ad-hoc networks?
- 3) Are IP based, best-effort services sufficient or do we need better QoS support in future wireless networks environments?
- 4) Is security across different wireless network technologies needed? Can it be achieved?
- 5) Will future wireless/cellular networks evolve as stand-alone networks?
- 6) Will a seamless integration of wireless networks and services ever happen?



Objectives

- Provide Open Infrastructures
 - Provide flexibility, ease service creation and control
 - Achieve context and ambient awareness
 - Network Cooperation and Interoperability
 - Open Service Infrastructures
 - Open Programmable networks
 - Include : All actors, roles, business models
- Provide support for WPAN and Personal services
 - PAN formation, connectivity
 - Edge Technologies

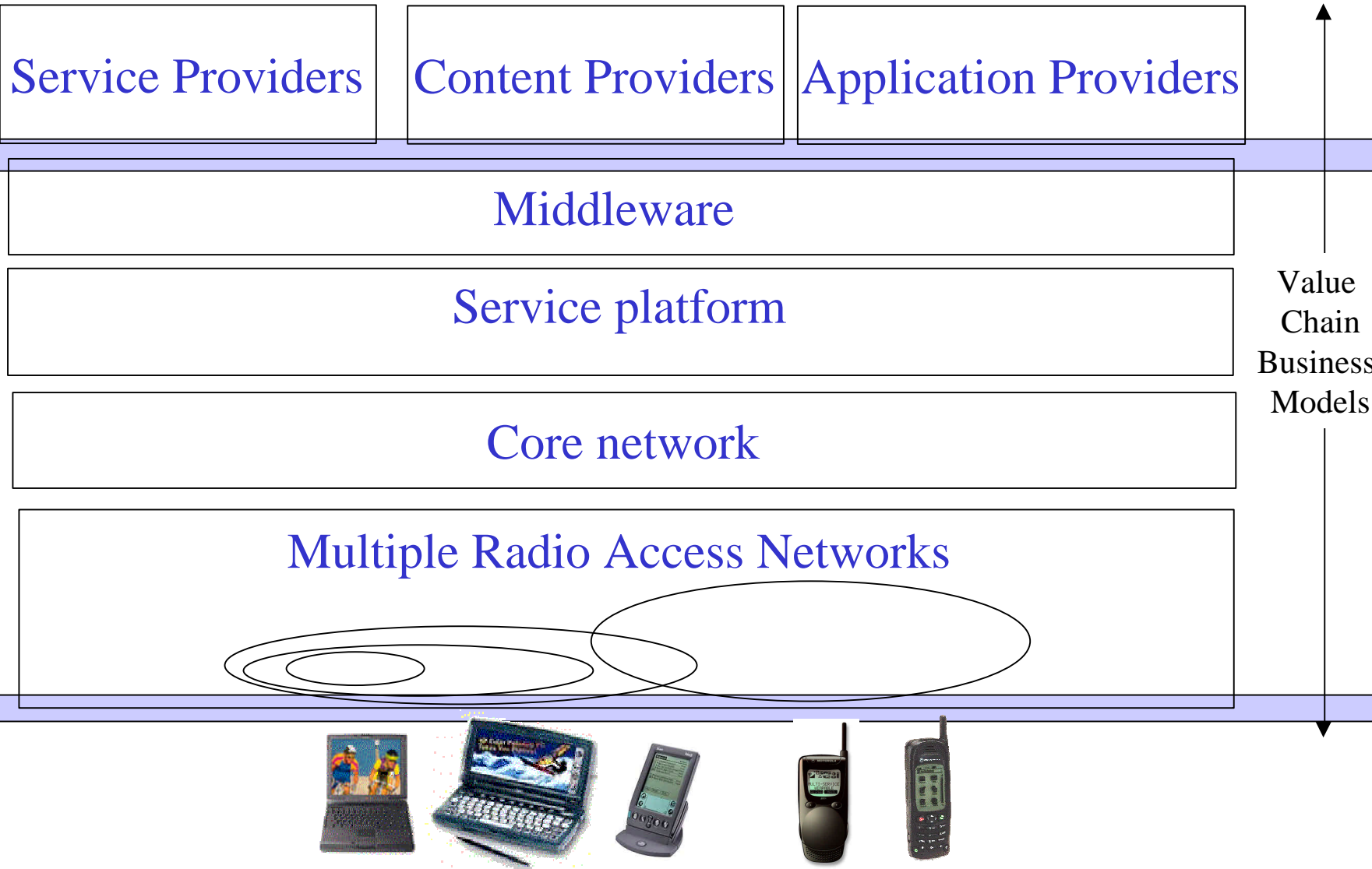


Requirements

- **Required architectural framework**
 - Open service enablers, open and standardized APIs
 - Component based middleware
 - Service and content adaptation, content distribution
 - Cooperative networks infrastructures
- **Constraints**
 - Actors, Roles
 - Business models
 - Privacy and Trust, security infrastructure
 - SLA/negotiation



Context





Seamless services across technologies

- LR-WPAN IEEE 802.family GSM UMTS FDD/TDD
- MR-WPAN GPRS Cdma2000
- WPAN EDGE
- WLAN IS 136
- Cellular IS 95

LR-WPAN
MR-WPAN WPAN



WLAN

Cellular

- Use best technology based on context and ambient conditions
- Dynamics in the connectivity



- **WPAN**

- **High data rate WPAN** 802.15.3 is suitable for multimedia applications that require high QoS
- **Medium rate WPAN** 802.15.1/Bluetooth handle a variety of tasks ranging from cell phone to PDA communications. Voice application QoS level
- **Low rate WPAN** 802.15.4 serves industrial, residential, medical, agricultural, automotive applications with low power consumption. Relaxed requirements in terms of latency and QoS
 - Low data rate
 - Very low power consumption (battery operation of months to years)

- **Ease access to remote devices and components**



- **Autonomous Infrastructures**
 - Discover
 - Configure
 - Adapt
- **Cooperative networks**
 - Gather
 - Federate
 - Share
- **Open Framework**
 - Provide capabilities
 - Allow controlled access



Take advantage

- **Making best use of the existing technologies and the heterogeneous networks aspect of wireless**
- **Peering the access technologies and designing configurable radios is key to this cooperative network concept**
- **Are new air interfaces really needed?**
 - Maybe if target is 100 Mbps or more in long term
 - If the cooperative, configurable and adaptable aspects of networks are not developed there is no point in pursuing new air interface work
 - Advances in radio technologies more useful
 - Diversity, MIMO, Space-Time approaches
 - Good link status predictors to achieve adaptation
 - Improving system capacity by integrating
 - CAC, Differentiation, Rate adaptation, Fair resource sharing and scheduling
 - Application adaptation (context and ambient aware applications)



This raises a wealth of other questions and problems to solve

- Inter domain mobility and inter working between the RAN segments
- Service continuity when moving from one access technology to the next
 - Flow control at the boundaries and QoS harmonization
- Security issues (AAA and interactions with the service platform)
- Flow and data Synchronization issues
- Revisited Planning and dimensioning
 - Extra signaling and information exchange in the cooperative framework
 - This extra data should be included in the planning process
 - Same story for end-to-end QoS. Mapping is easy but consuming only what is right over each segment from the QoS budget is harder to achieve
 -

Reference models and architectures needed



- **Design cooperative networks**
 - Applications and service layer
 - Connectivity layer
 - Access layer
- **Not a simple matter**
 - Do not forget 3G and legacy networks
 - Cooperation supposed to occur at all levels in the architecture
- **Definition of reference architectures to enable cooperation**
 - Common building blocks or components (unbundling → scalability / economies of scale). Reuse blocks to build applications, services, networks
 - Networks should adapt and “adapt to each other”
- **Requirements**
 - APIs, reference points and interfaces need to be defined and specified for common usage

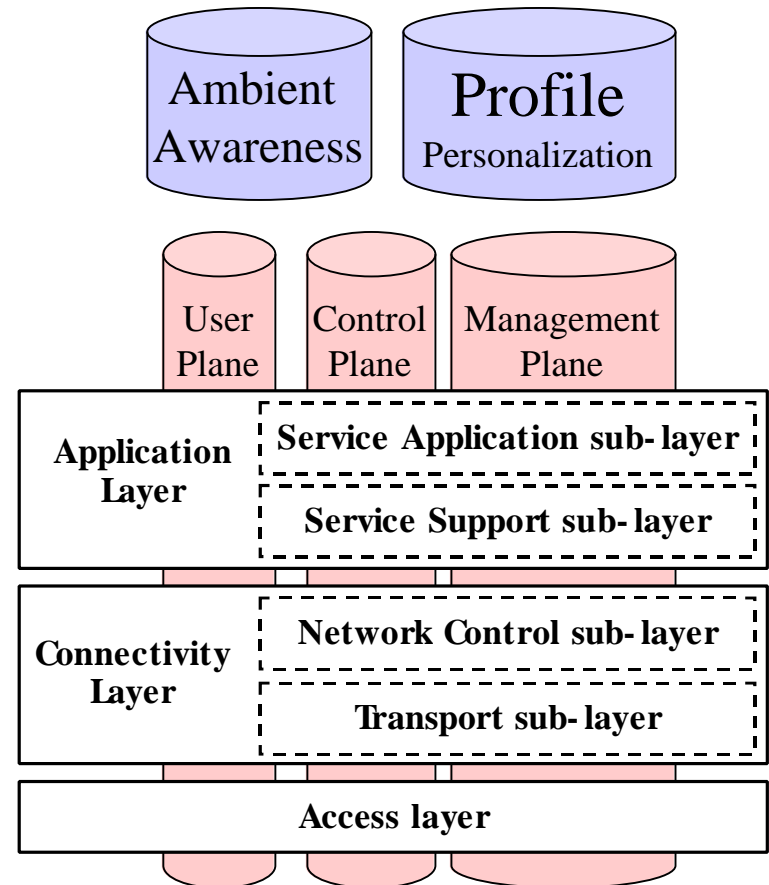


- **Introduce awareness in reference architecture**
 - Ambient Awareness
 - Context Awareness
- **Need for updates and adaptation**
 - Data bases, Profiles, Adaptation

Some architectures currently suggested within WWRF

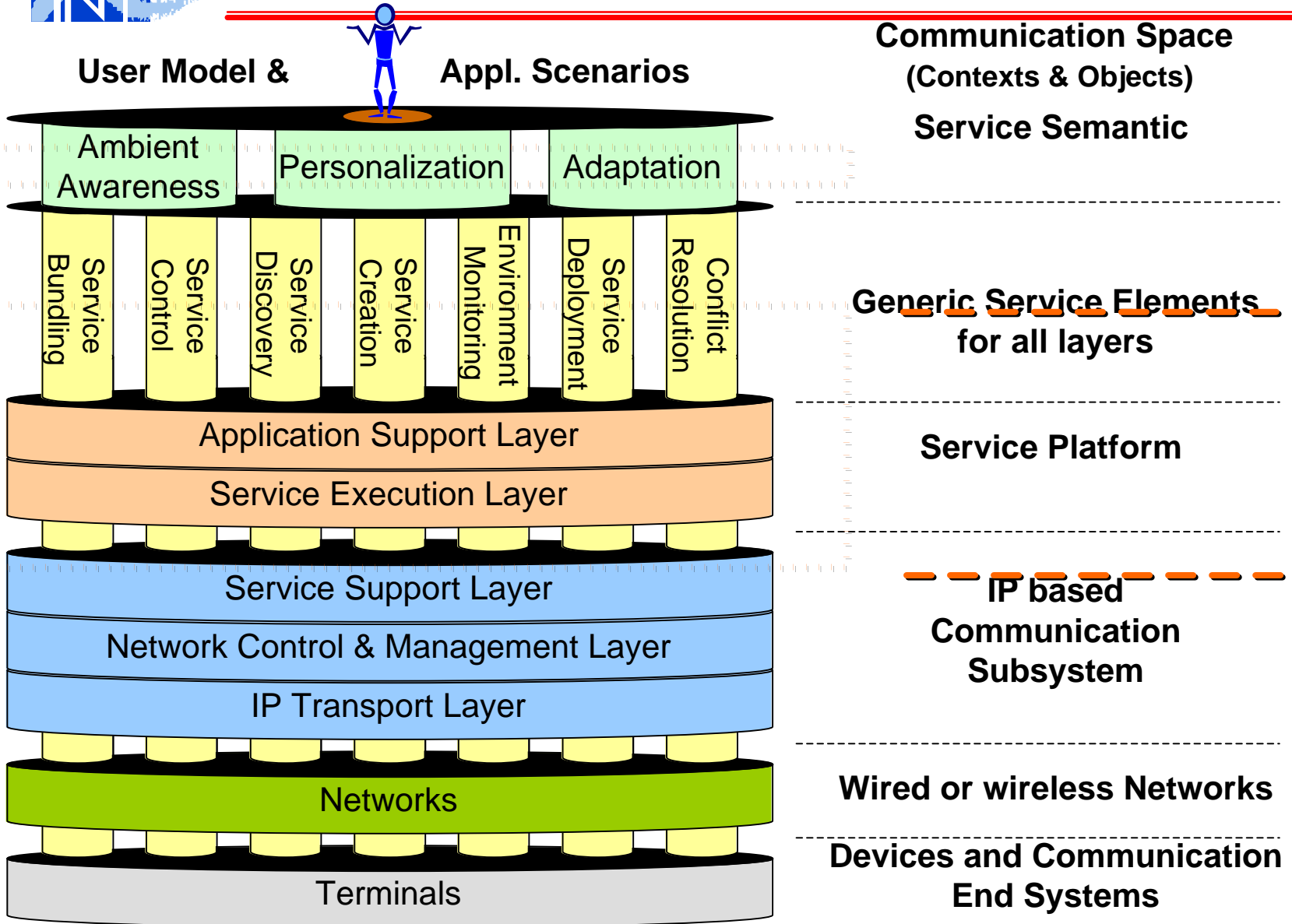
Can run across all layers

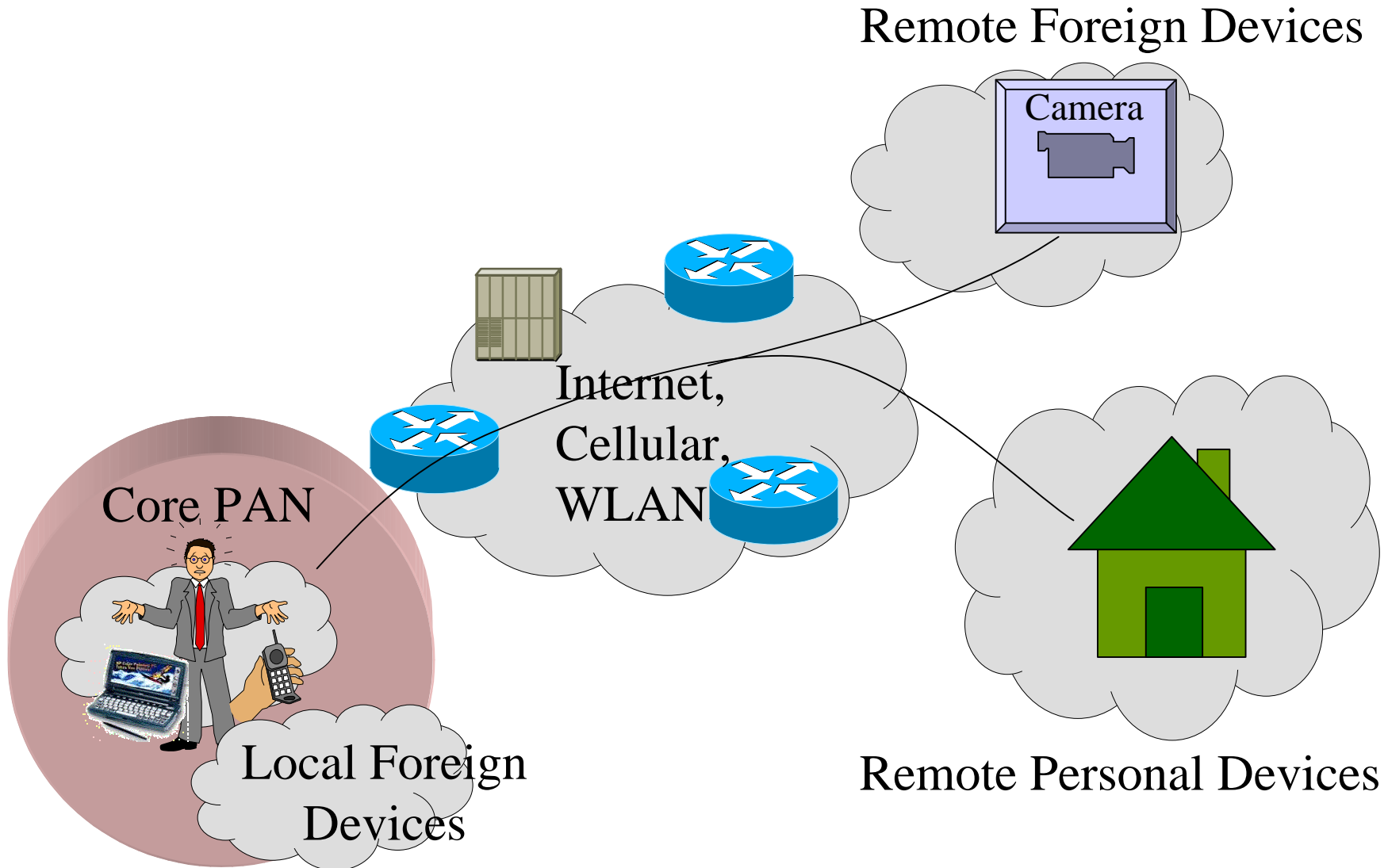
- Service bundling and control
- Applications, service & network discovery
- Environment discovery and monitoring
- Conflict resolution
- Service deployment





WG2 Reference model of WWRF







- **PAN Architecture**
- **Network and interworking issues for PAN**
 - PAN to Infrastructure Interfaces
 - Establishment of Dynamic VPNs
 - Fast forwarding Engines at Edge routers, Open programmable routers (intelligent agents and active nodes)
 - Separation of routing, control and QoS management in routers
- **Resource and service discovery**
- **Self organization**
- **Mobility management, addressing and routing**
 - Very dynamically changing composition and connectivity of a PAN may require more than the present solutions for distributed environments and computing
 - Power, storage, display, computing capabilities differ from device to device