Standards on Future Network:
Research Trends on Future Network

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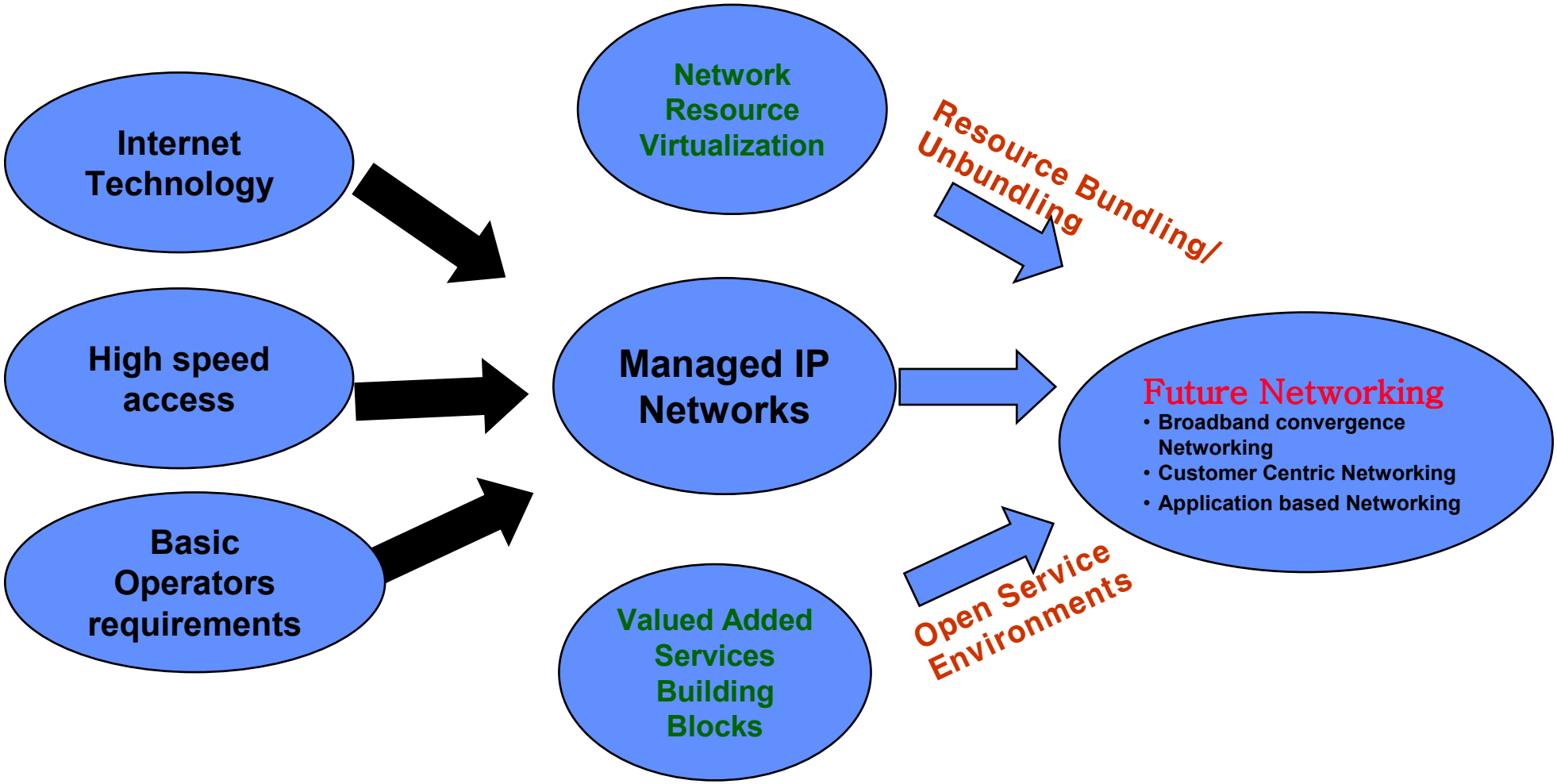
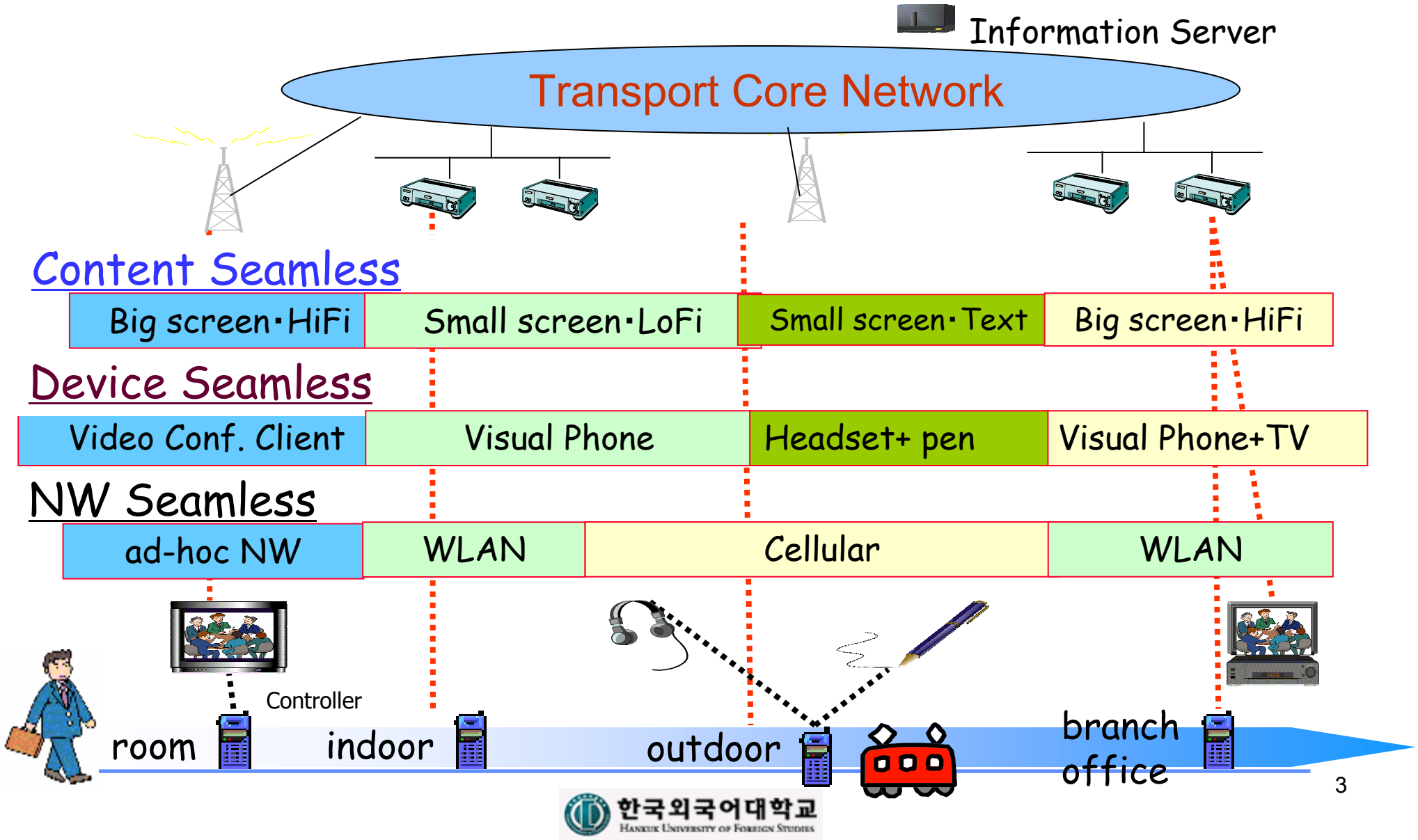
Towards Future Networking



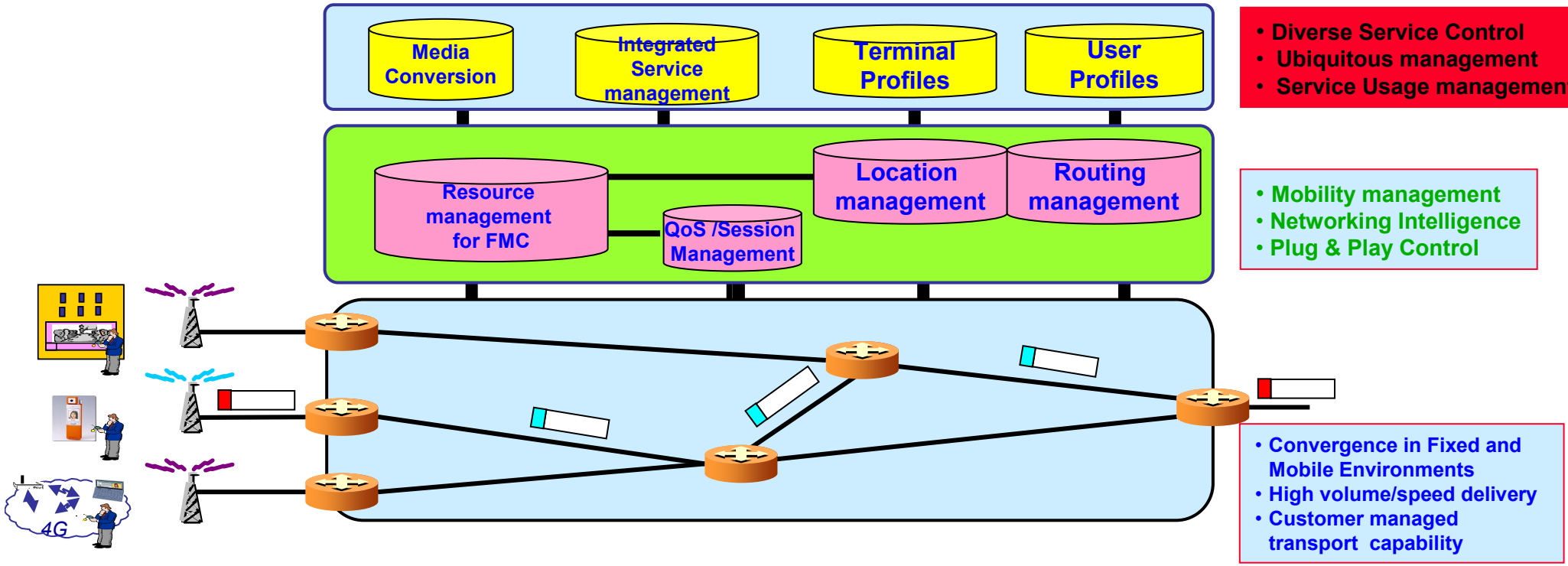
Broadband Service Continuity:

Seamless Service Support



Example: Managements for Fixed and Mobile Convergence

- Network Engineering for Convergence in Wired/Wireless and Broadcast
- Service Engineering for Convergence in Wired/Wireless and Broadcast
- Integrated Management for Resource, Charging and Policy

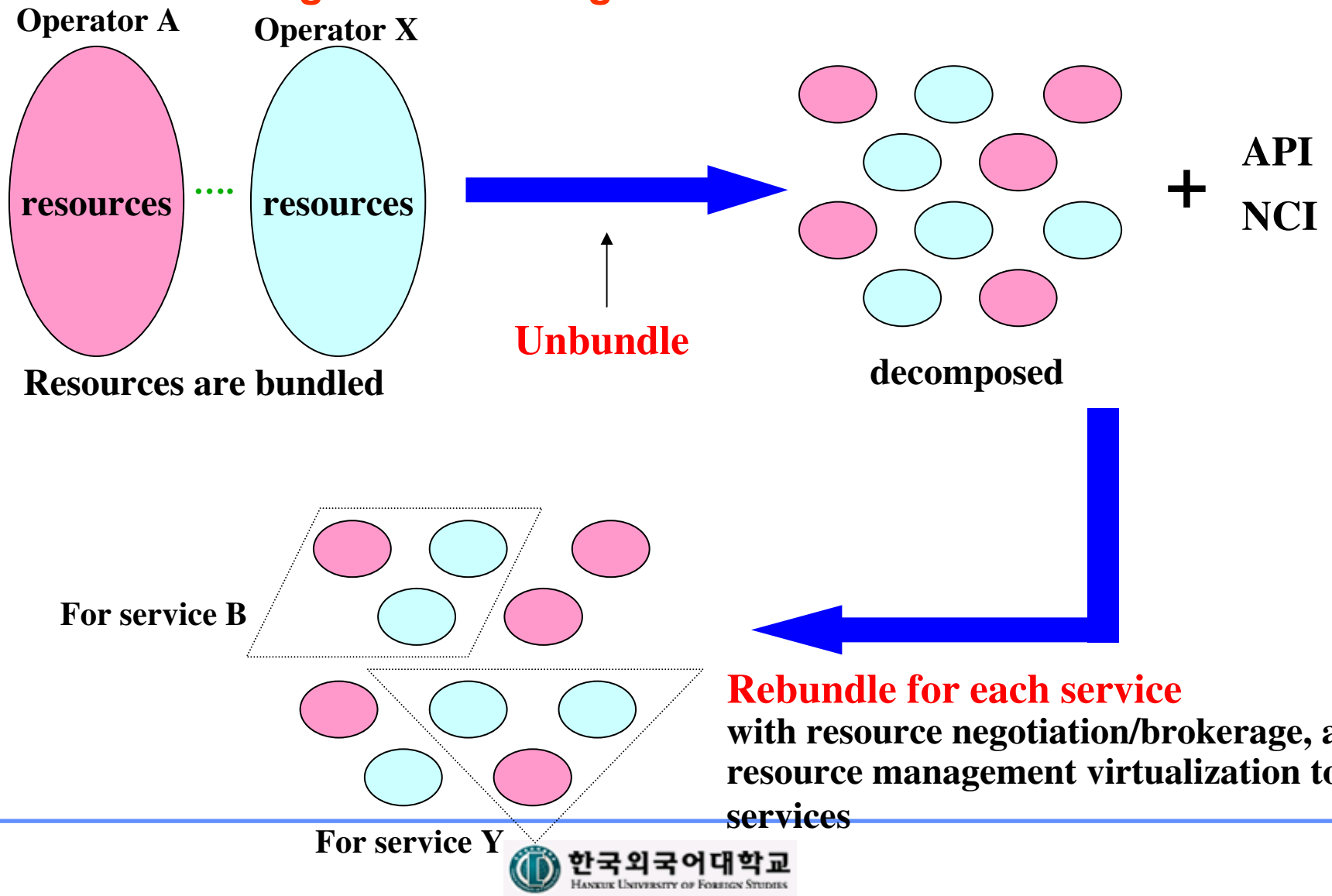


- Diverse Service Control
- Ubiquitous management
- Service Usage management

- Mobility management
- Networking Intelligence
- Plug & Play Control

- Convergence in Fixed and Mobile Environments
- High volume/speed delivery
- Customer managed transport capability

New Transition:
Network Resource Bundling/Unbundling
from Unbundling to Rebundling for Network Resources Virtualization



Customer Premises Network (CPN) with Intelligent Networking

Design Principles

1. From best-effort to high-quality support in response to individual service requirements
2. Seamless service continuity in mobile and muti-network/carrier environments
3. End-to-end enhanced robustness and security in an open network environment

Networking for Intelligent CPN Application platform

- enabling on-demand network resource allocation between different operators
- providing robust & secure capability adapted to individual services

Ubiquitous Platform Provisioning

(1) Application-Network Collaboration

- Dynamic network resource management and allocation as requested by individual applications
  - ▪Load balancing and dynamic routing control
  - ▪Common API(Application Programming Interface) for accepting application requests and network control interface for network resource management

(2) Network-Network Collaboration

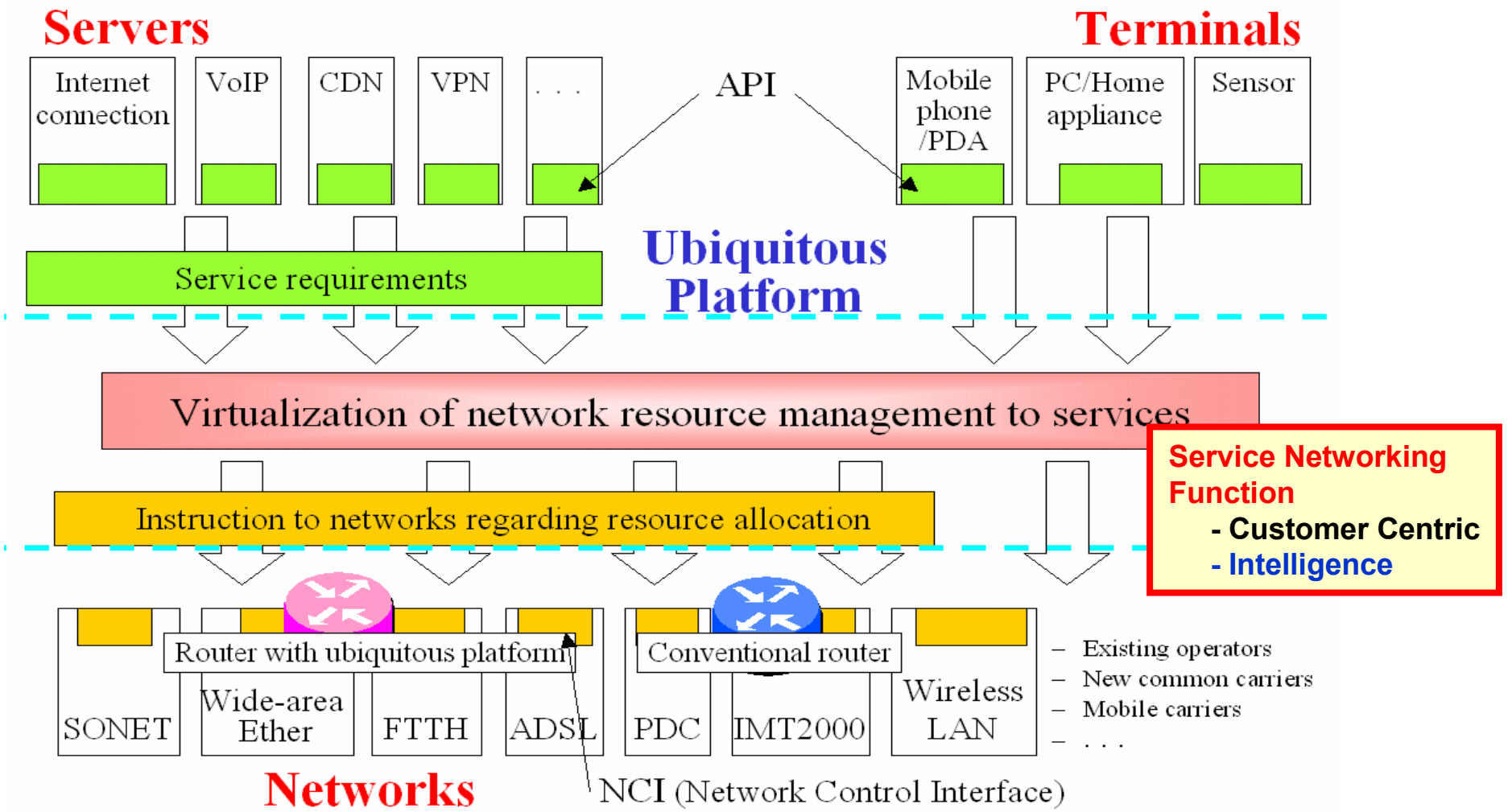
- Seamless interoperability between different operators
  - ▪Roaming: service portability, common authentication (single sign-on), etc.
  - ▪Media handover: low latency handover, audio & video quality assurance
- End-to-end network control
  - ▪GMPLS/MPLS, NNI/UNI

(3) Network Traceability: Security Provision

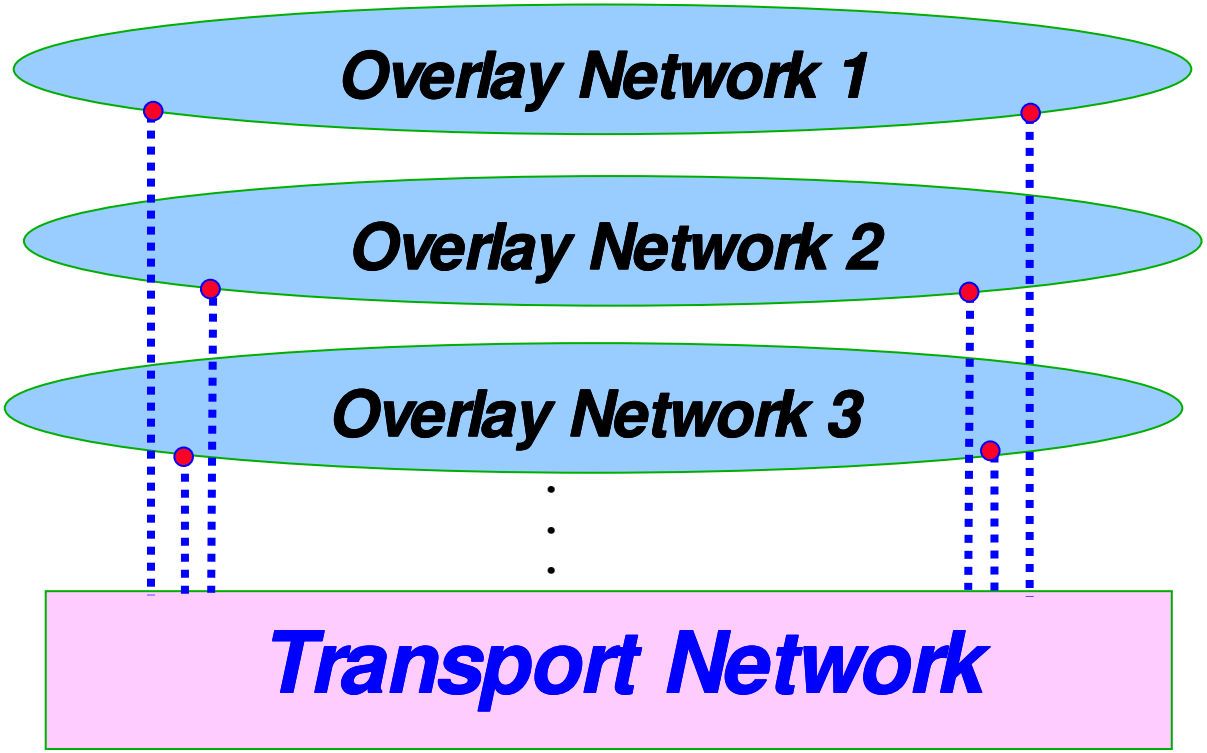
- End-to-end traceability
  - ▪Enhancing robustness against cyber attacks and system faults through TCP session management

Application-Network Collaboration

Allowing to select best-effort or guarantee on-demand for each service



Research Works: Overlay Networks



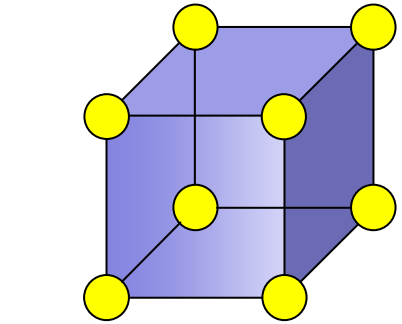
Applications of Overlay Network

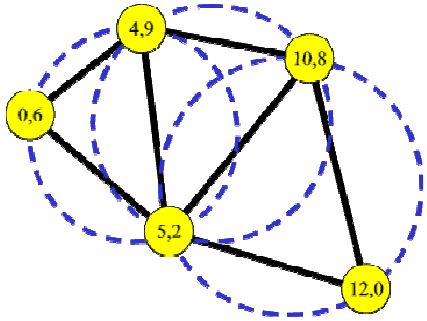
- ***TCP overlay Network***

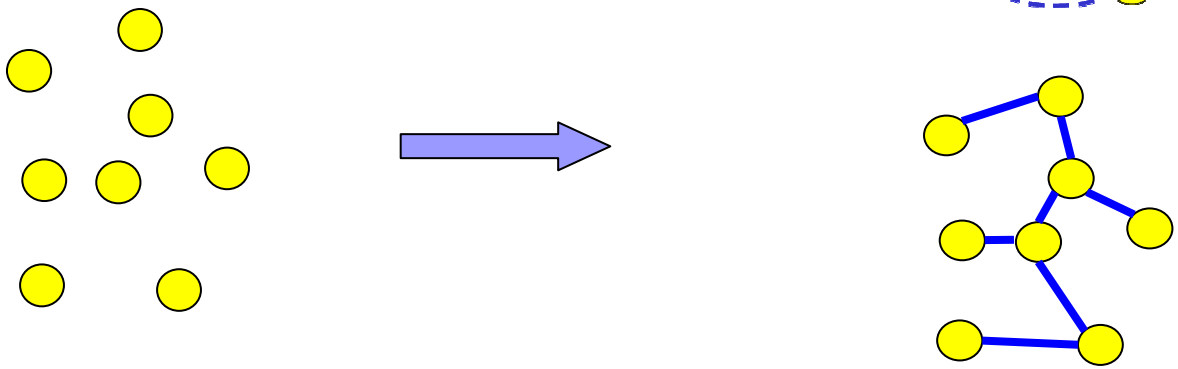
- ***Session overlay Network:***
  - ***controlled at TCP relay node***
  - ***TCP session is spllited and relayed***
  - ***Use for***
    - ***. TCP shaper,***
    - ***. security (e.g., DDoS),***
    - ***. measurement and management***
  - ***Various QoS overlay network***

Example: Dynamic Configuration in Peer Networks

- Applications self-organize to form a given overlay topology
- Data is forwarded along the edges of the overlay topology

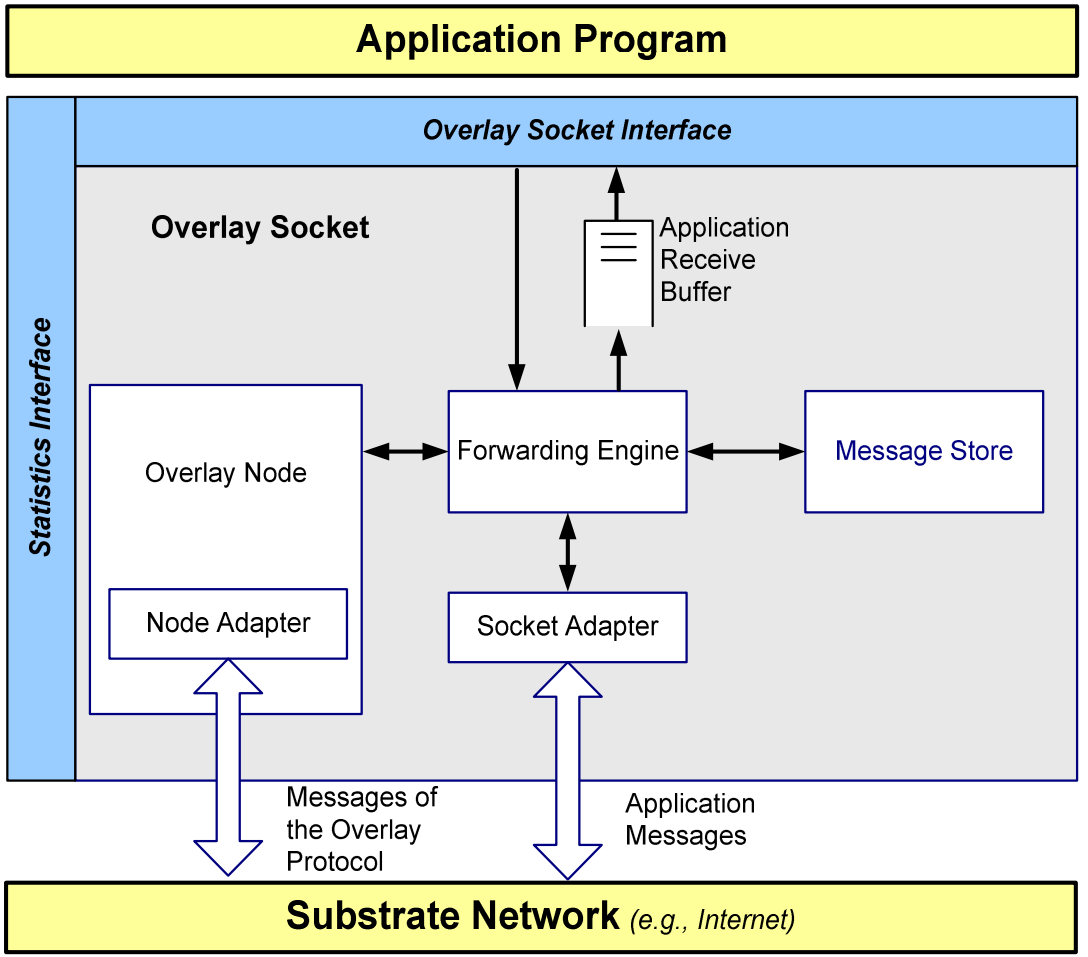






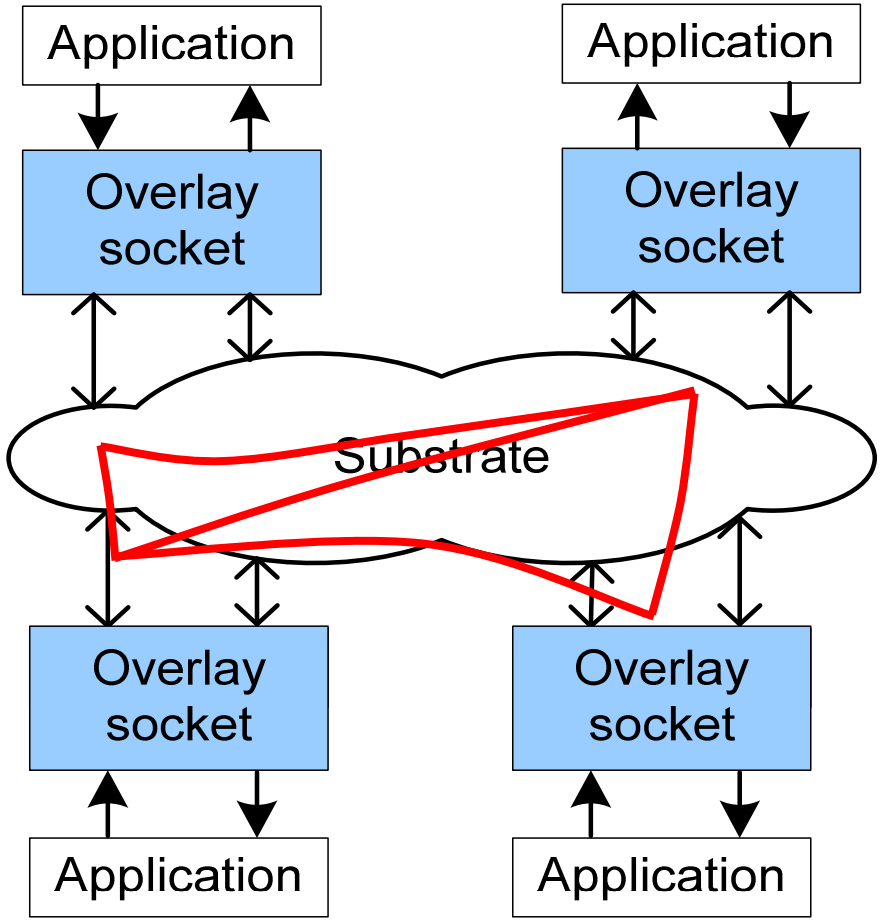
Application based Overlay Sockets

- **Socket-based API**
- **Supports different semantics for transport of data**
- **Supports different overlay topologies**
- **Supports different protocols in substrate network (UDP unicast, UDP multicast, TCP, or SSH tunnels)**

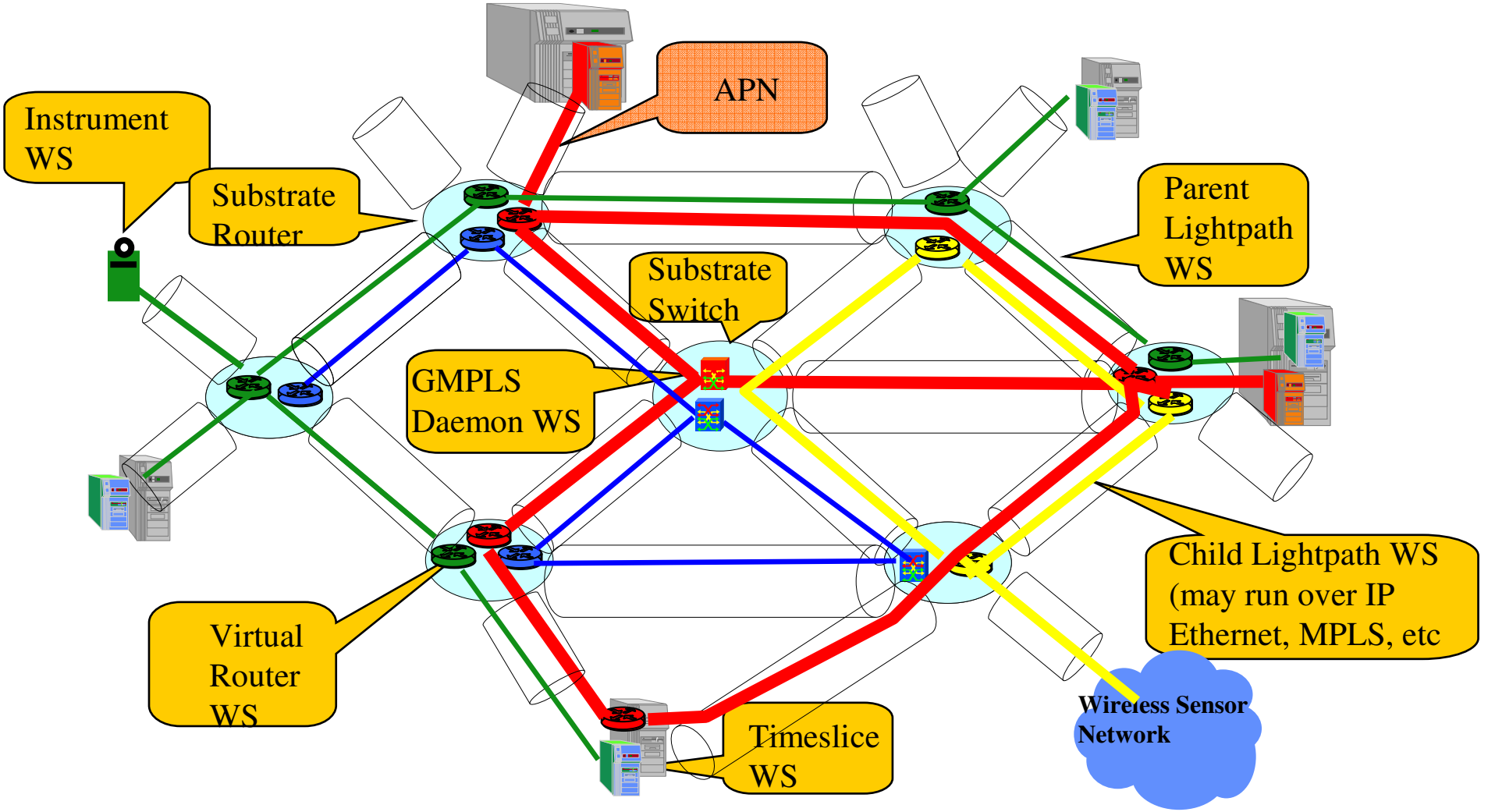


Case Study : HyperCast overlay sockets

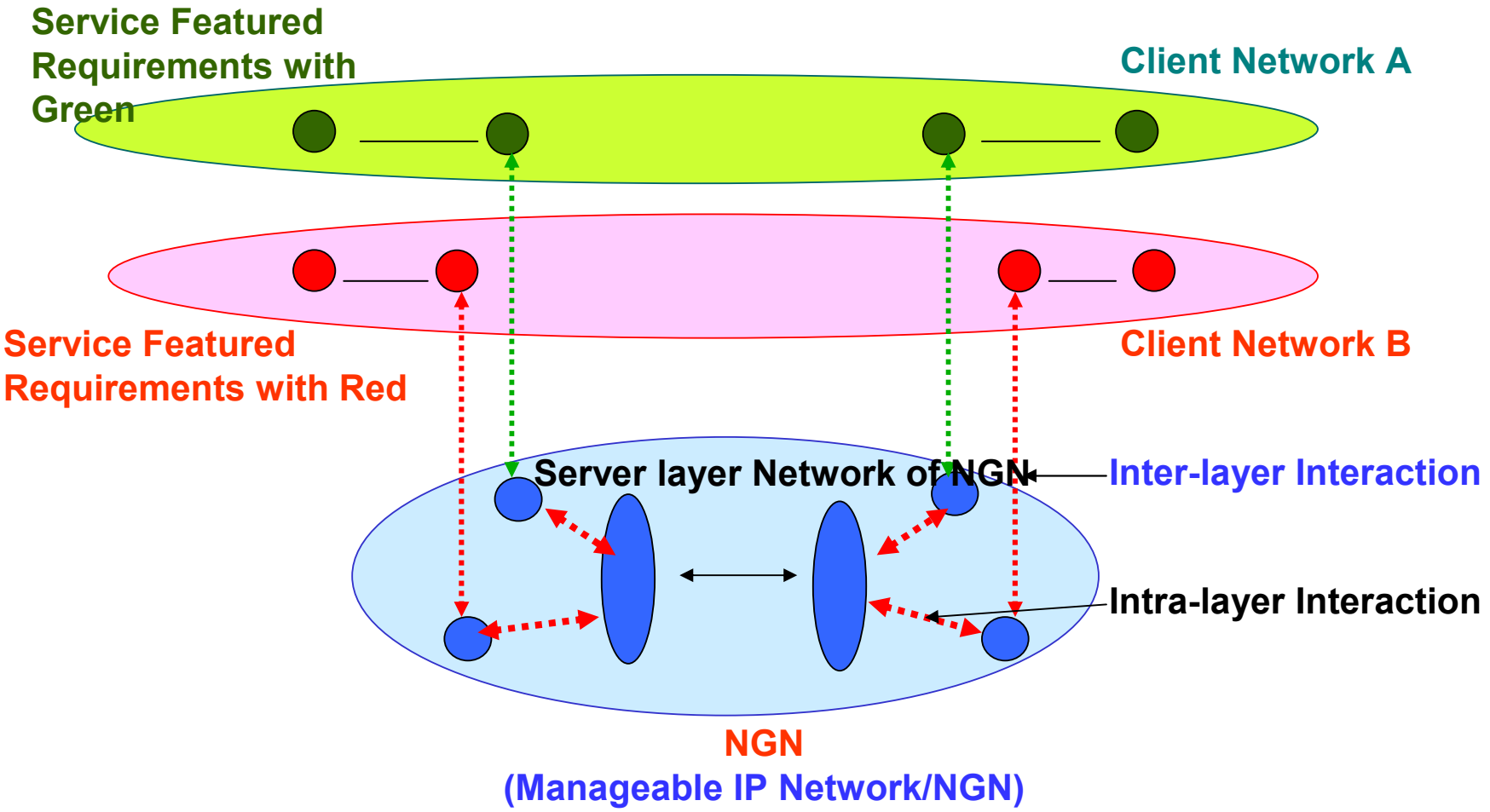
- **In HyperCast, each overlay node is represented by an overlay socket**
- **Application programs create overlay sockets, and send/receive data through the socket**
- **Each overlay socket has two connections to the substrate:**
  - *Control:* Establish and maintain the topology
  - *Data:* Exchange application data
- **A overlay network is a collection of overlay sockets**



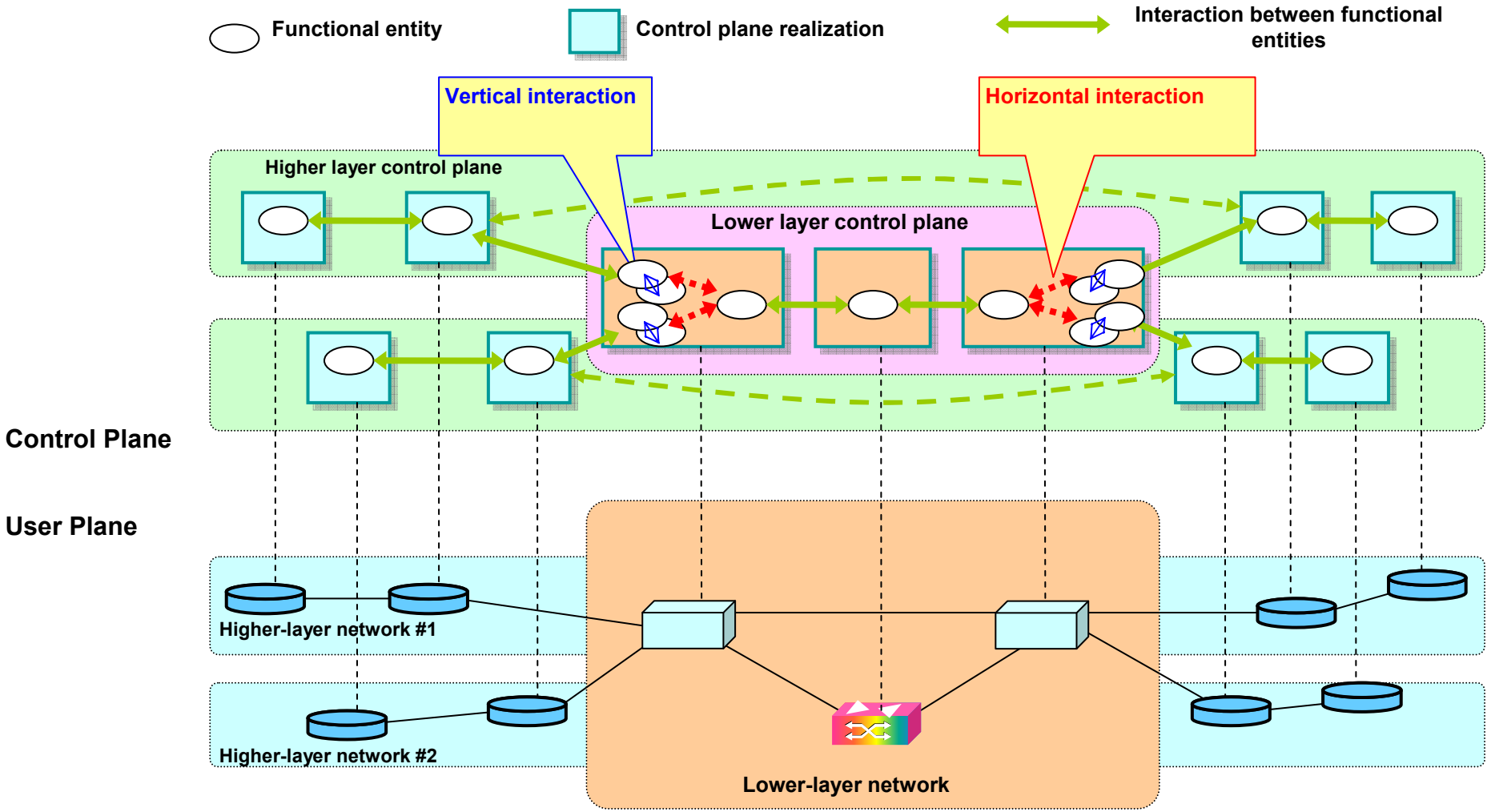
Example in UCLP: GENI + SOA



Standards Works: Client-Server Networking in NGN (1)



Standards Works: Client-Server Networking in NGN (2)



IPTV Application Level Multicast:

- **Application level IPTV multicast includes Service Control Functions, IPTV Application Functions, and IPTV Service User Profiles**
  - IPTV Service Control Functions: session control, session membership management and service user profile management at the service level
  - IPTV Application Gateway Function: registration, authentication, and authorization at the service level
  - IPTV Service User Profile functions

IPTV Overlay Multicast Control:

- IP multicast : not deployed in Core Network, but

  in Local Network and CPN

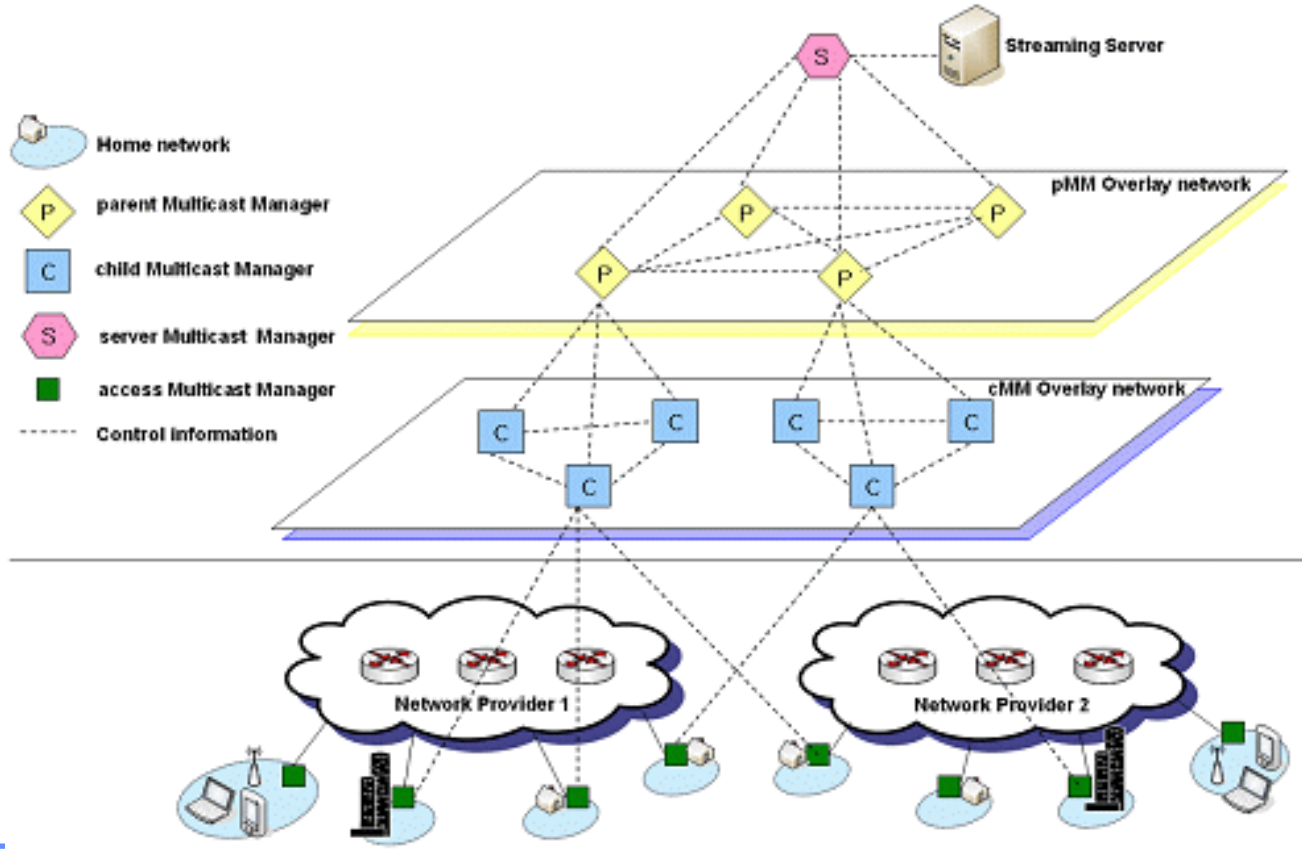
- Alternative multicast delivery approach for 3rd Party IPTV ISP

- Multicast Deployment through Legacy unicast and multicast function:

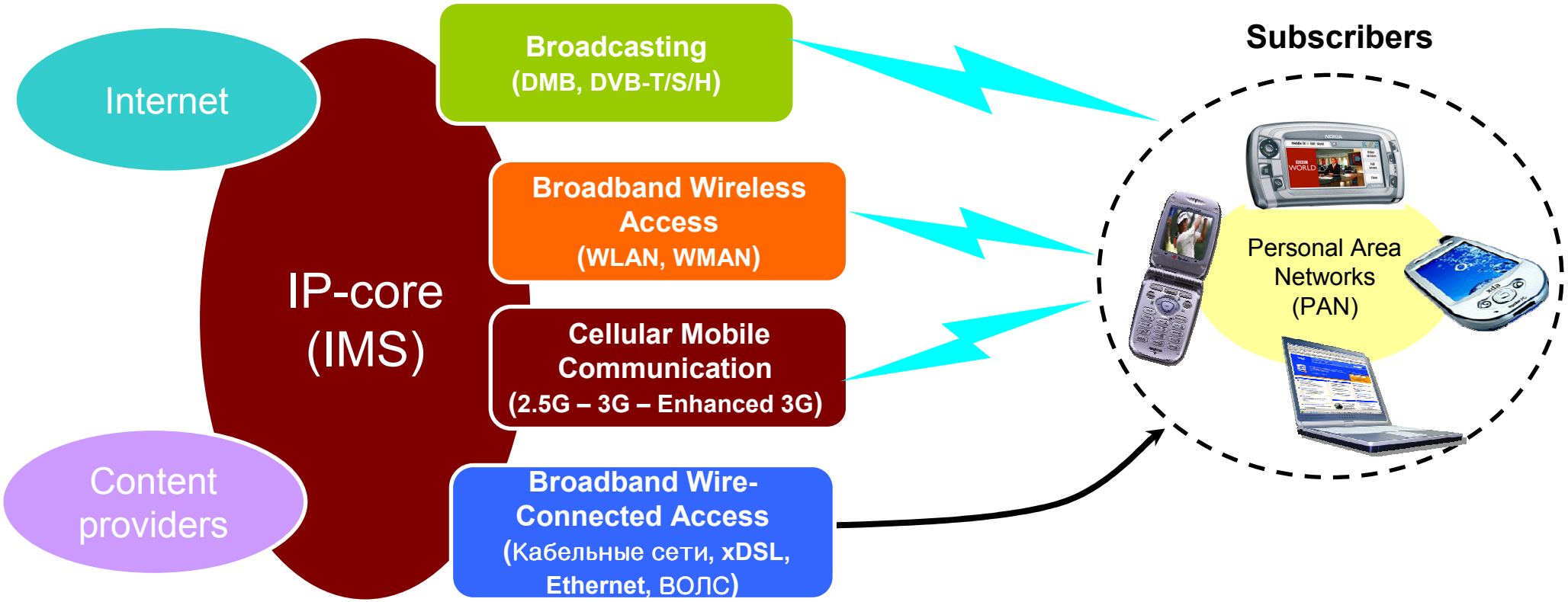
➔ One of IPTV Multicast Mechanisms

Architectural Configuration of Overlay IPTV Multicast

- **Hierarchical Architecture for Overlay IPTV Service Multicast Control**



Networks convergence



- Different technologies capabilities combination: mobile and fixed communication, Internet and broadcasting
- Ability to choose the access method

Discussions: Standards Activities

- Future Network Infrastructure
- Evolution to Multi-network Service
- Edge-based Intelligence
- Customer Centric Network:
  e.g., VPN in NGN mobile Environments
- Mics……..