

A New Architecture for Heterogeneous Networking

Glenford Mapp
Fatema Shaikh
Jon Crowcroft
David Cottingham
Aisha Elsafty
Edson Moreira
Renata Vanni
Wayne Butcher

A Vision for the Future

- The Internet is experiencing great expansion in terms of the number of devices accessing information
- Most of these devices are mobile
- New major trend because lots of wireless networks being deployed
 - 3G/HSDPA, WLAN (802.11n), WiMax, Ultrawideband

Network Evolution

- Internet is evolving into two distinct parts
 - Core Network
 - Super-fast main core and fast access networks
 - Use of optical switches and MPLS, ATM
 - Peripheral Networks
 - Will be dominated by wireless technology.
- These systems are very different in terms of latency, bandwidth, error characteristics, etc.

Already happening but for different reasons

- Security
 - Wide spread use of NAT
 - Splits the world into global IP addresses to get data across the public Internet and private IP addresses on the local network
- Wireless Infrastructure
 - Base-stations, wireless routers
 - Splits the world into wireless LAN or cell and wired core

Need to rethink several things..

- How we do end-to-end
 - IP Model of having global addresses does not fit well with the new reality
 - Security, mobility difficult as I have to get a new IP address when I move
- It's not just about data transport anymore
 - Vertical Handover
 - QoS – especially in LANs
 - Seamless operation – no fiddling!
 - Support real-time applications

Need to also rethink on a network management level

- Mobile systems currently managed in a vertical fashion. Operators build the network infrastructure, run the network, lock in customers.
 - Deep pockets, more niche players needed,
 - no regional/local value added services
 - People will pay for those services

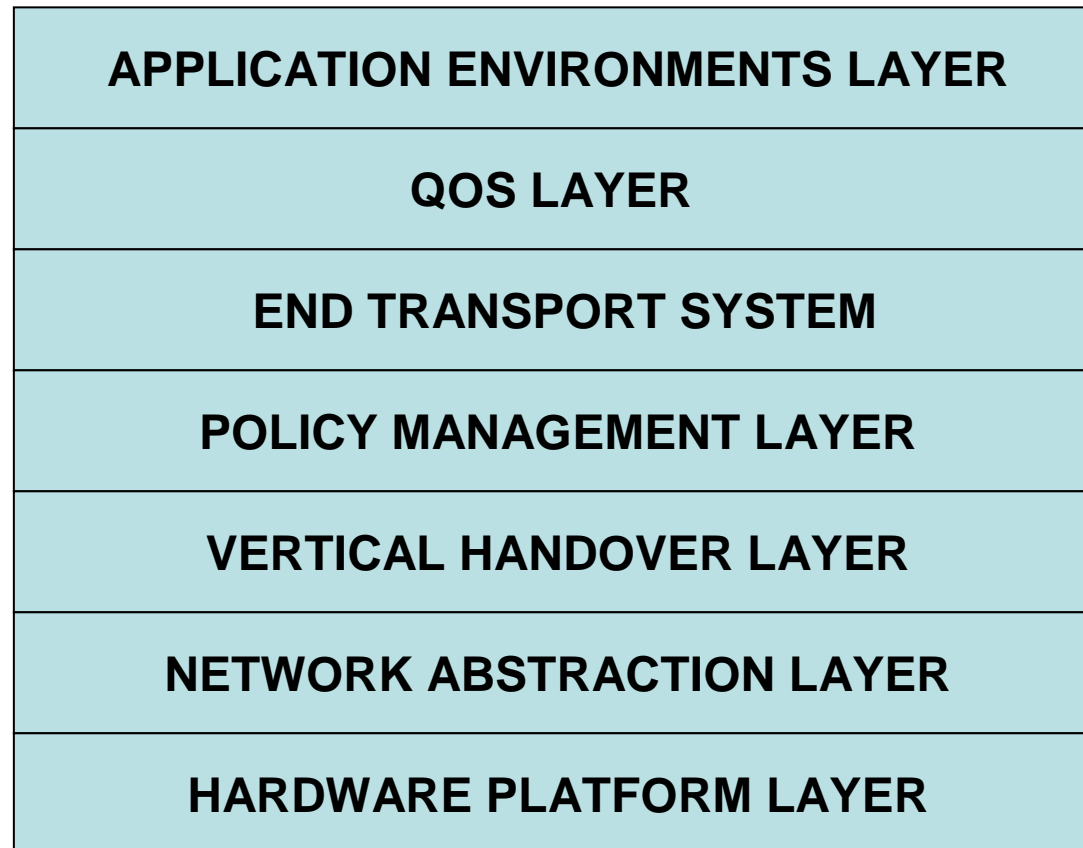
New Developments

- Open Handset Alliance (OHA)
 - Open software platform for mobile phones
 - Led by Google
 - Android – kernel based on Linux
- Verizon
 - Allowing third-party phones to connect to their cellular network
- Could deploy something new

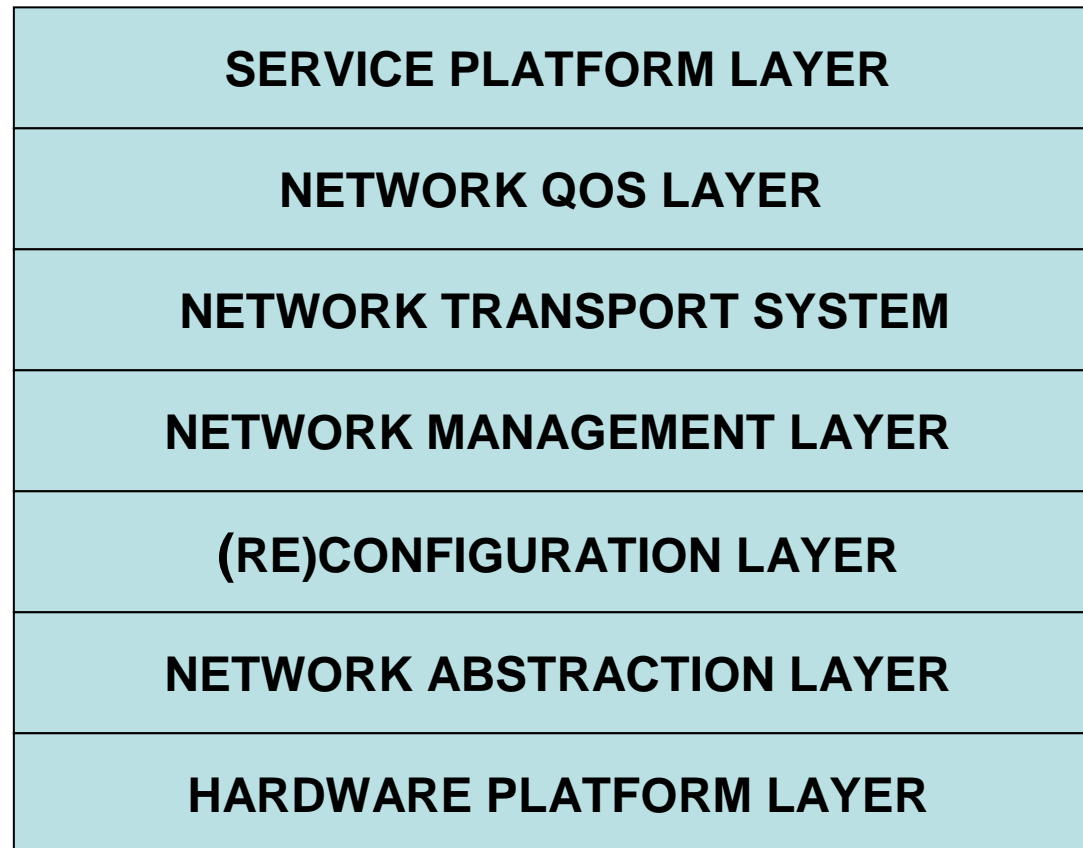
Need a new Framework to do this rethinking

- Turns out that we need two frameworks
 - One for the Peripheral Framework
 - One for the Core Framework
- Peripheral Framework
 - Handles wireless network infrastructure
 - Vertical Handover, QoS, Application Environments
- Core Framework
 - Handles core networking issues
 - Supports the peripheral network, network and resource management, service platforms

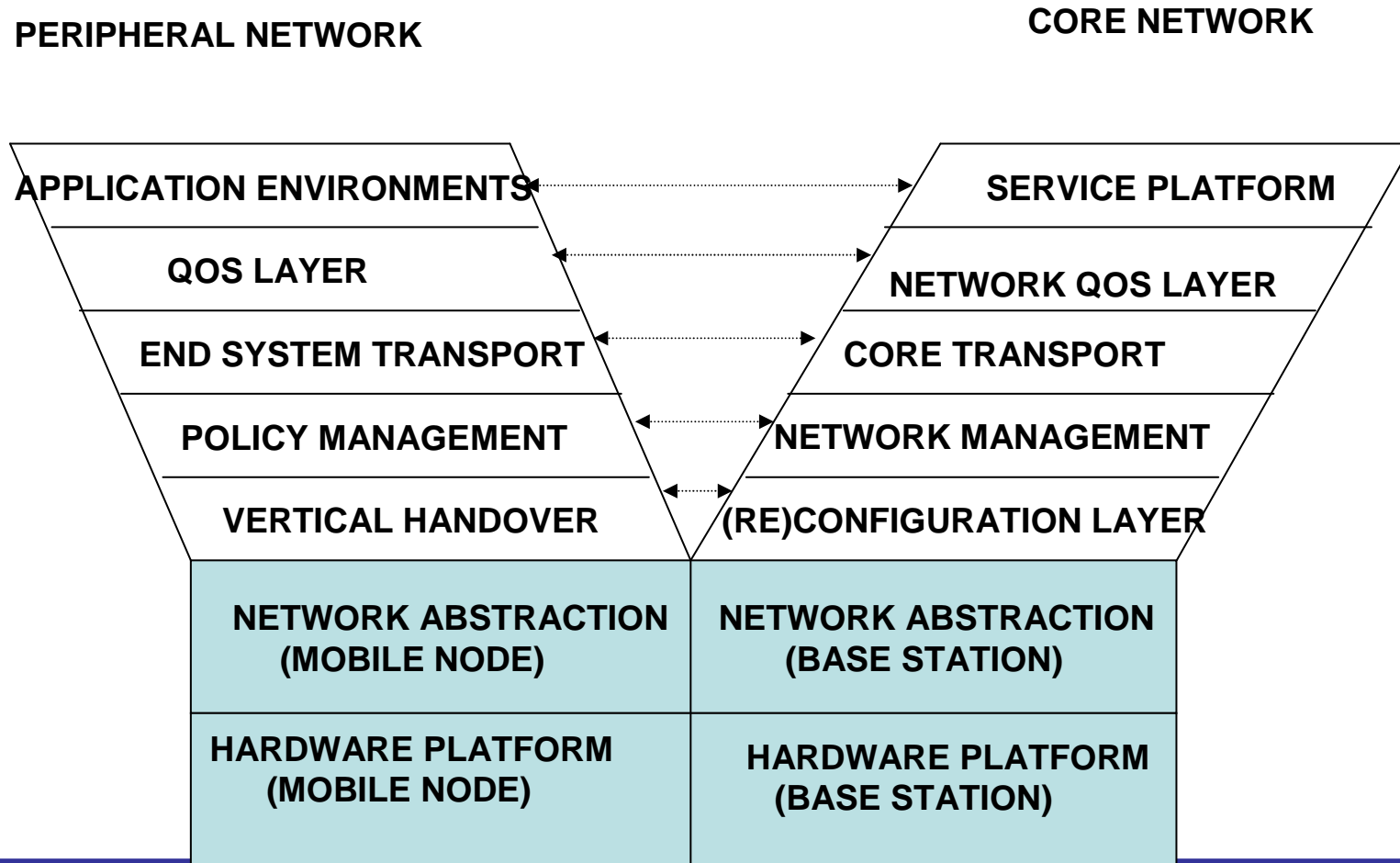
The Peripheral Framework



The Core Framework



The Y-Comm Framework



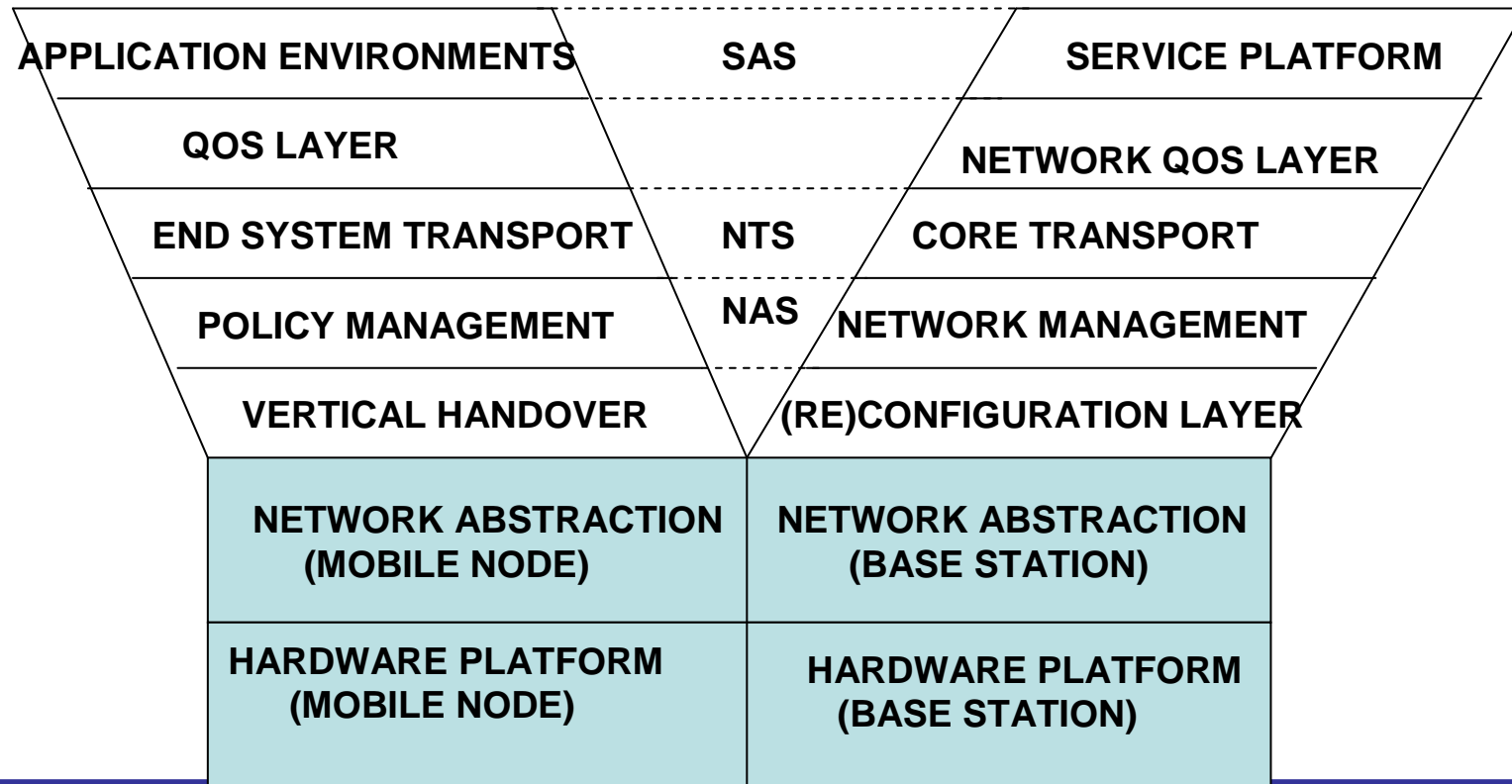
Security in Y-Comm

- Defines 3 levels or types of security
- NAS – Network Architecture Security
 - Associated with an architecture
 - Access to wireless networking infrastructure
- NTS – Network Transport Security
 - Transport data over the infrastructure
- SAS – Service and Application Security
 - Access control, authentication of clients as well as operator of services

The Y-Comm Framework showing its Security Levels

PERIPHERAL NETWORK

CORE NETWORK



Realizing Y-Comm

- Really too big to be done by one person or one group
- Building a global research network to study Y-Comm
- Not trying to implement everything
 - Using the effort and experience of others
 - A number of IEEE Working Groups
 - 802.21, 802.22

Group so far..

- University of Cambridge
 - Proactive knowledge- based policy mechanisms for handover
 - Network issues
 - Tinkering with IP for Peripheral Networks
 - QoS-aware middleware services
- Middlesex University
 - Mathematical modelling of vertical handover (TBVH)
 - Transport protocol issues in Peripheral networks

Group so far

- University of Sao Paulo
 - Ontological services for vertical handover
 - Semantic mobile services
- University of Trinidad and Tobago (UTT)
 - Service management for vertical handover
 - Rapid prototyping of systems

Come Join us!

- URL for Y-Comm White Papers
 - <http://www.cl.cam.ac.uk/research/dtg/?userid=gem11>
- Contact me by email:
 - g.mapp@mdx.ac.uk