Wireless Deployment with IPv6

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IPv6 is the Evolution, and the only Solution
Discussion

- Mobile Communications Industry Objectives
- Internet and Current Wireline IP Evolution
- Wireless Evolution
- Mobile IPv6 Evolution
- The Future: Wireless and Wireline Integrated
- Impact on the Mobile Communications Industry
Mobile Communications Industry Objectives

- Make a Profit
- Provide as many pervasive services as possible to as many users as possible
- Reduce operational costs when it will not disrupt services to users.
- Use the Internet as a multimedia highway to provide services and reach as many users as possible.
- Develop/Design a plan to move the current Wireline, Wireless, and Telephony systems to the Next Generation Networking capabilities (e.g. IPv6, Mobile IPv6)

Lets take a look at the Current Internet first
Internet Access Points Architecture

End User Wireline

Access Points

Internet Edge and Core

Internet Services

SS7 IP Gateway

End User Telephony

Wireless IP Gateway

End User Wireless

Workstation

Access Points

Access Points

End User Telephony
Internet Characterization Today

- Virtual Private Networks
  - Tunnels
  - Private Addresses
  - Secure at Edge or Access Only
- Network Address Translation (NAT) Required
- End-2-End Model is Lost
- Try getting a Globally Routable IPv4 Address in Europe or Asia; or a set of them for your business !!!
- These are not optimal conditions for the evolution of the Internet
Growth of wireless and broadband Internet

- 300 Million Subscribers
- 200 Million Users
- 1 Billion Subscribers
- 1 Billion Users

1998:
- Server-based Applications
- Switched Networks

2005:
- WIRELESS & Broadband Internet

Source: Cisco Systems
Internet engineers are working on it !!!

- The Next Generation Internet Protocol is IPv6 and will restore the End-2-End model of the Internet
- 2.5G and 3G Wireless requires the End-2-End model as it moves its use model to the Internet.
- Mobile IPv6 computing will revolutionize the Internet as the WEB did in the 90’s.
- So lets discuss how this will happen!!!

*Lets use Wireless to depict the evolution*
3G Wireless Architecture Currently

- Radio Access Network Services
- HLR/ VLR Subscriber, Policy, AAA, and Security Services
- Voice, Video, and Gaming Services
- Other Provider Services
- Server Content and Gateway Services

Diagrams show:
- Control Plane
- User Plane
- Internet Plane
WLAN Internet Mobile IPv6 Network

Mobile IPv6 Home Agent and AAA Server

AP and AAA Context

IPv6 WLAN Local or Regional Mobility Manager, Router, and AAA

Correspondent Nodes and Services and AAA Client

Mobile IPv6 Stations Voice and Data Roaming

Mobile IPv6 Stations Voice and Data Roaming
Benefits of IPv6 WLAN Internet

- Creates competition and integration point to 3G methods
- Why not do voice over 802.11b or add multihoming capability to Mobile Stations (e.g. 802.11 & GSM/GPRS)
- Less stuff to manage WLAN is simple
- New market for Providers (e.g. Internet Café, Gaming Rooms, Student Library Search)
- WLAN can be secured more easily
- No license games and frills just the Internet please!!!
End-2-End IPv6 Mobile Wireless Services

- **Cell Base Stations**
- **802.11 AP's**
- **Local Mobility Manager, Router, and AAA**
- **Regional Mobility Access Manager, Router, and AAA**
- **IPv6 Access Router**
- **Server, Content, and Gateway Services**
- **Other Provider Services**
- **Internet Core/Edge**
- **Subscriber, Policy, AAA, and Security Services**
- **Voice, Video, and Gaming Services, Mobile Correspondent Nodes, and AAA**
Mobile IPv6 Taxonomy

- **Home Agent**
  - Acts as proxy for Mobile Node while away from Home
  - Tunnels packets from Correspondent Nodes to Mobile Node
  - Keeps location of Mobile Node as it moves
  - Forwards Home Network configuration to the Mobile Node

- **Correspondent Node**
  - Point of Services for the Mobile Node
  - Understands how to communicate to the Mobile Node
    - Directly through Route Optimizations
    - Indirectly through the Mobile Nodes’ Home Agent

- **Mobile Node**
  - Usually a client that moves between Wireless Cells or Access Points
  - Maintain knowledge of Home Agent and Correspondent Nodes
Macro and Localized Mobility Management

- Macro Mobility
  - Communications from the Mobile Node to the Home Agent Node
  - Communications from the Mobile Node to the Correspondent Node
  - Communications from the Correspondent Node to Home Agent
  - Communications update for Mobile, Home, and Correspondent

- Localized Mobility Management
  - Communications to address Mobile Terminal Movement
    - Fast Handoff (reduce packet delay)
    - Smooth Handoff (reduce packet loss)
    - Seamless Handoff == Fast+Smooth
  - Communications to handle Context Transfer
    - Buffer packets during movement detection
    - Forwarding packets after movement completed
Mobile IPv6 Advantages

- **Large Address Space**
  - Can support billions of Mobile Devices
  - Distributed hierarchy with NAT won’t work and not deployed
- **Automatic Link Configuration**
  - Neighbor Discovery on home and visited networks
  - Stateless and Statefull Address Configuration
- **Destination Options** removes need for signal and user plane
  - Binding Updates to identify location
  - Registration Updates to identify movement
- **Routing is Optimized** because of Binding Updates
Mobile IPv6 continued Evolution

- Seamless Handoffs
- Header Compression
- Authentication, Accounting, and Authorization (AAA)
- Enhancements to Transport Layer Protocols
- Quality of Service (QOS)
- Local Mobility Management
- Mobile Ad-Hoc Networking
Full Seamless IP Wireless to the Internet

- IPv6 will be Mandatory for full Evolution to the Internet
- Radio Access Network parts will become IP Access Routers and Gateways
- Mobile IPv6 will be the architecture for Handoffs and to access Location Based Services
- Local Mobility Agents will distribute the processing of Wireless Handoffs and Integration of Wireless to Wireline access
- AAA will become the prime security, billing, and subscriber database infrastructure
Impact on the Mobile Communications Industry

- Internet End-2-End Model is restored
  - NAT is not required
  - Tunnels are not required
  - **New** End-2-End Applications can now evolve again
  - Internet Access will be pervasive and cheaper for underdeveloped nations and enabler for the have-nots in the world
- Internet End-2-End Security is restored
  - Security is between you and your ISP and your peer on the network
- Complexity is reduced by limiting the signal planes from existing Wireless and Telephone network protocols
- Seamless mobile computing on the Internet is achieved because of IPv6 and Mobile IPv6 Routing
- Wireline, Wireless, and Telephone System is integrated and manageable as a single network domain

*Internet e2e + Pervasive Services + New Applications + Reduced Cost = Profit*
Thank You

Questions??