



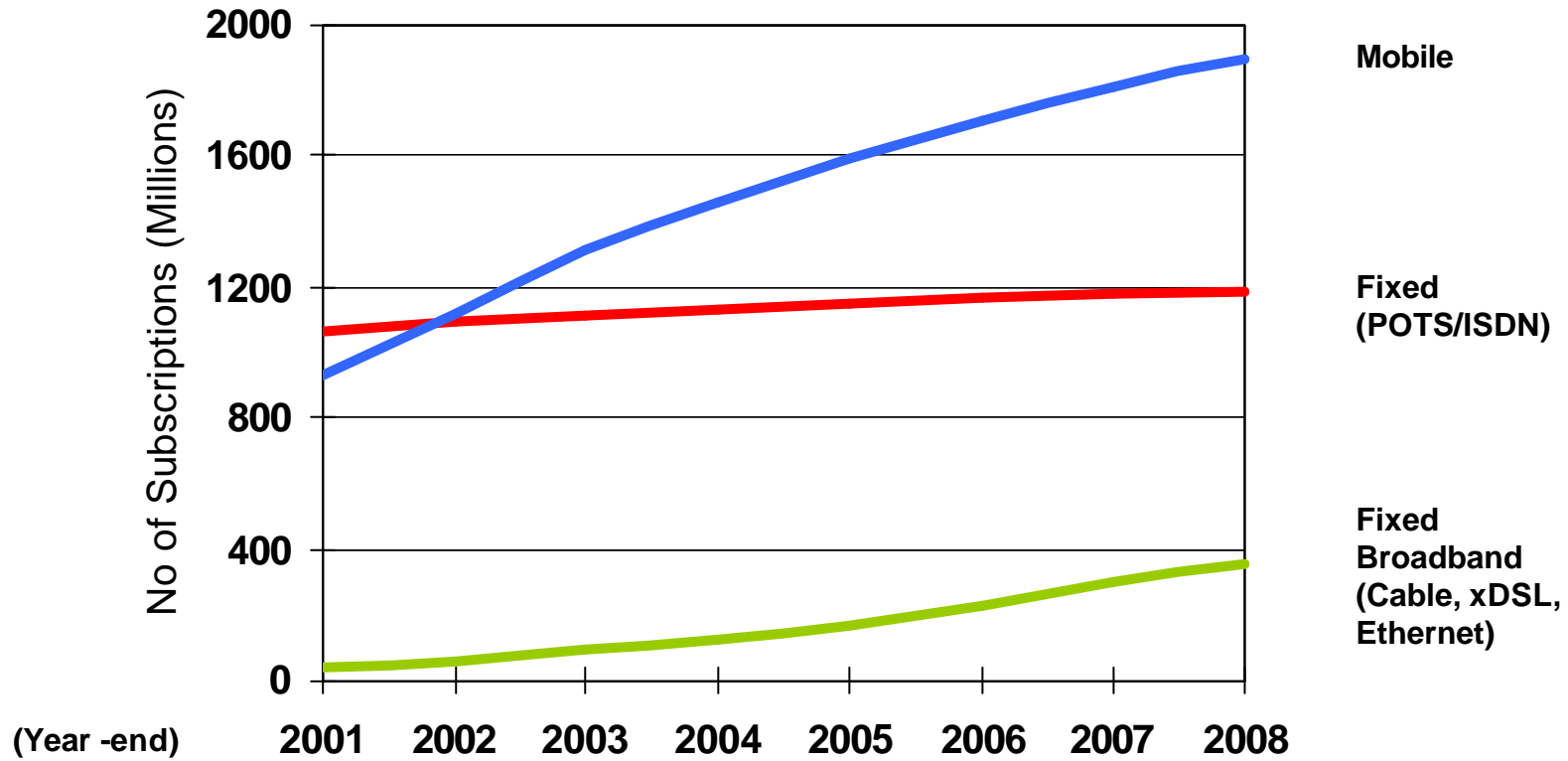
IPv6 and 3G Mobile Networks

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Outline

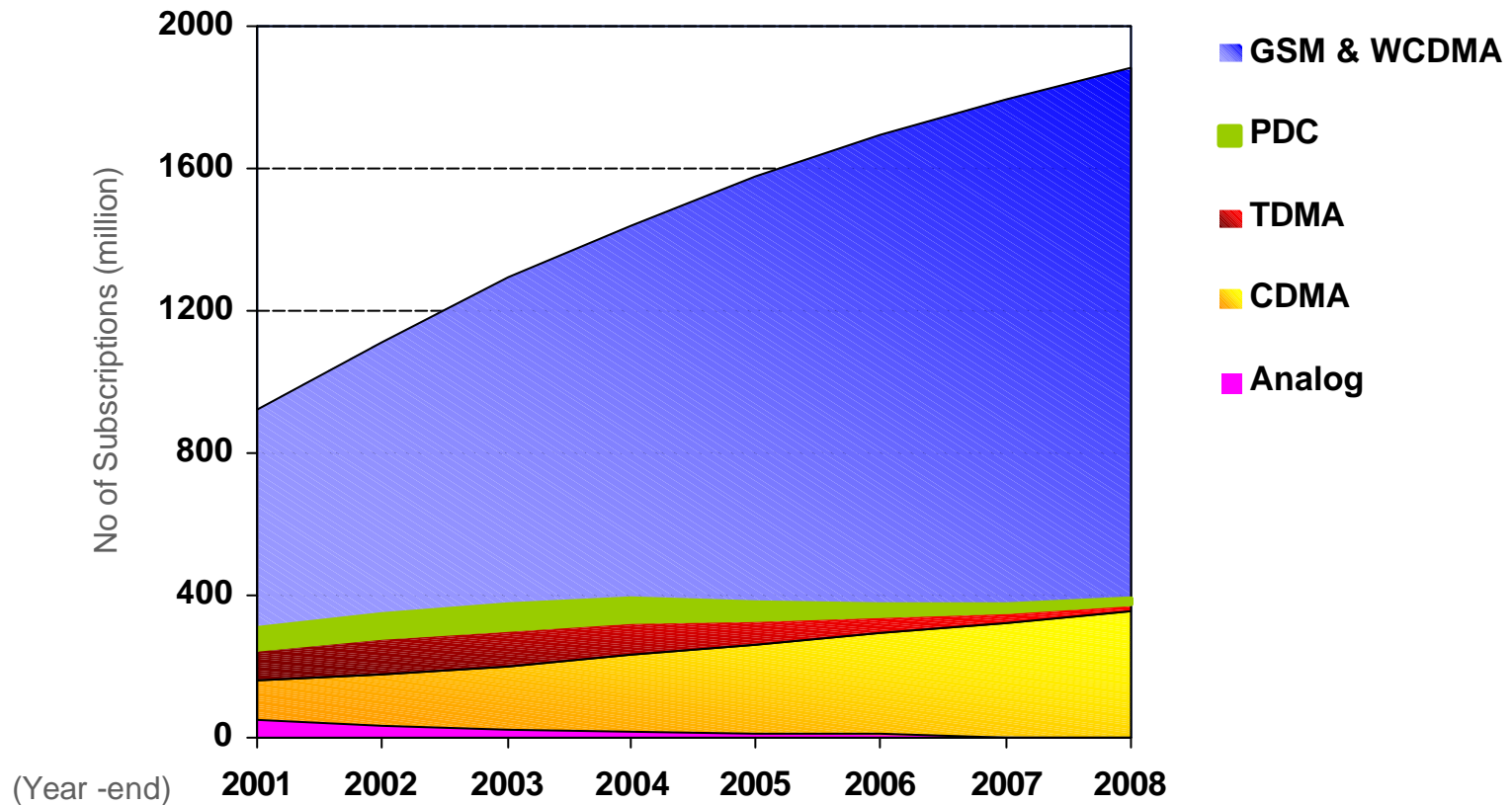
- ◆ **Trends and forecasts in the wireless world**
- ◆ **A Challenge for Europe**
- ◆ **IPv6 in 3G Networks**
- ◆ **Mobile IPv6 for WLAN/3G/Internet Mobility**
- ◆ **Future Trends**
- ◆ **Deployment Experience**

Worldwide Subscriptions Forecast

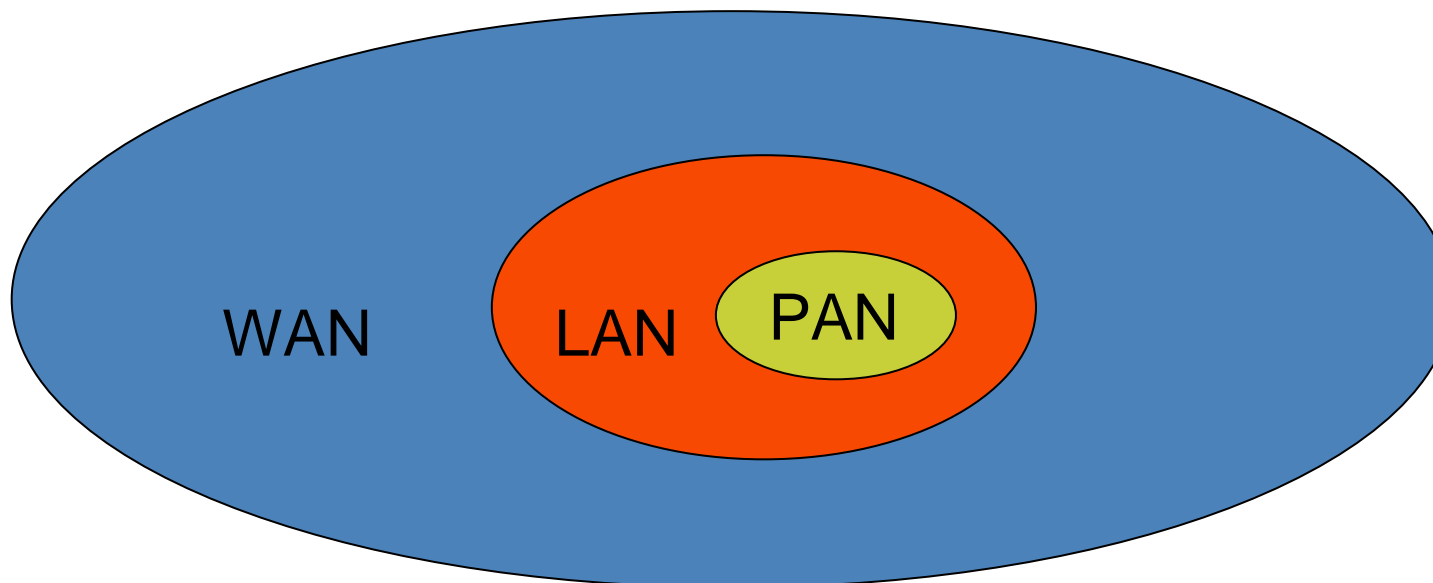


Mobility is becoming the norm

Cellular subscriptions by system standard (01-08)



Heterogeneous access networks



- ◆ **Different wireless technologies for different scenarios: PAN (e.g. Bluetooth), LAN (e.g. 802.11) and WAN (e.g. WCDMA/GSM)**
- ◆ **Different characteristics for each wireless technology: Coverage, QoS, Cost, reliability ...etc**
- ◆ **Different IP versions: IPv4 and IPv6**

What does this mean?

- ◆ Large and rising number of mobile users
 - ◆ Each has a unique mobile phone number
 - ◆ How do we give them each an IP address without imposing limits on applications?
- ◆ New Services
 - ◆ 3G (WCDMA/EDGE) allow advanced services
- ◆ Multiple Radio technologies
 - ◆ A mix of radio technologies will be useful to provide local and global coverage

The future is peer-to-peer!

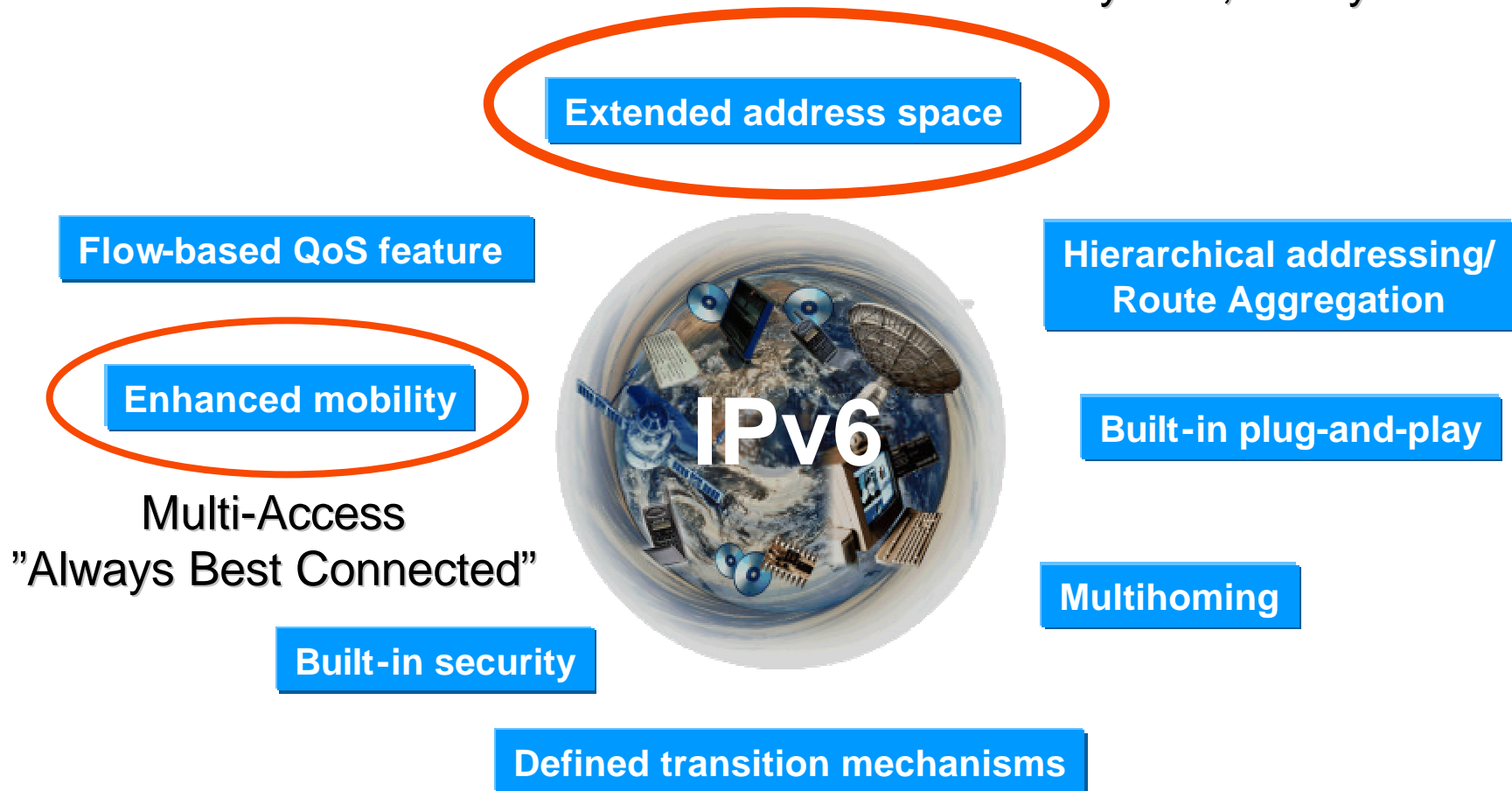
- ◆ Peer-to-peer communication already exists in today's mobile networks

- ◆ IP-based wireless networks will inherit the same services and more:
 - Voice
 - Multimedia messages
 - Gaming
 - Chatting
 - And many more in future!

- ◆ Mobile Hosts need to be reachable on a public IP address

IPv6 in a nutshell

Millions of Mobile Devices
"Always On, Always Reachable"



The Challenge for Europe

- ◆ Europe is an important player in 3G
 - ◆ Research and Commercial deployment
- ◆ Europe is an important player in IPv6
- ◆ We must strive to put the two together!
 - ◆ "IPv6 in Mobile" Leader: Some useful early results in EU projects
- ◆ How?
 - ◆ More Real Trials
 - ◆ Create open Test-beds
 - ◆ Work on fundamental issues to develop & test solutions:
 - ◆ IPv6/IPv4 co-existence and migration
 - ◆ Develop further the IPv6 Mobile Internet -> Applications

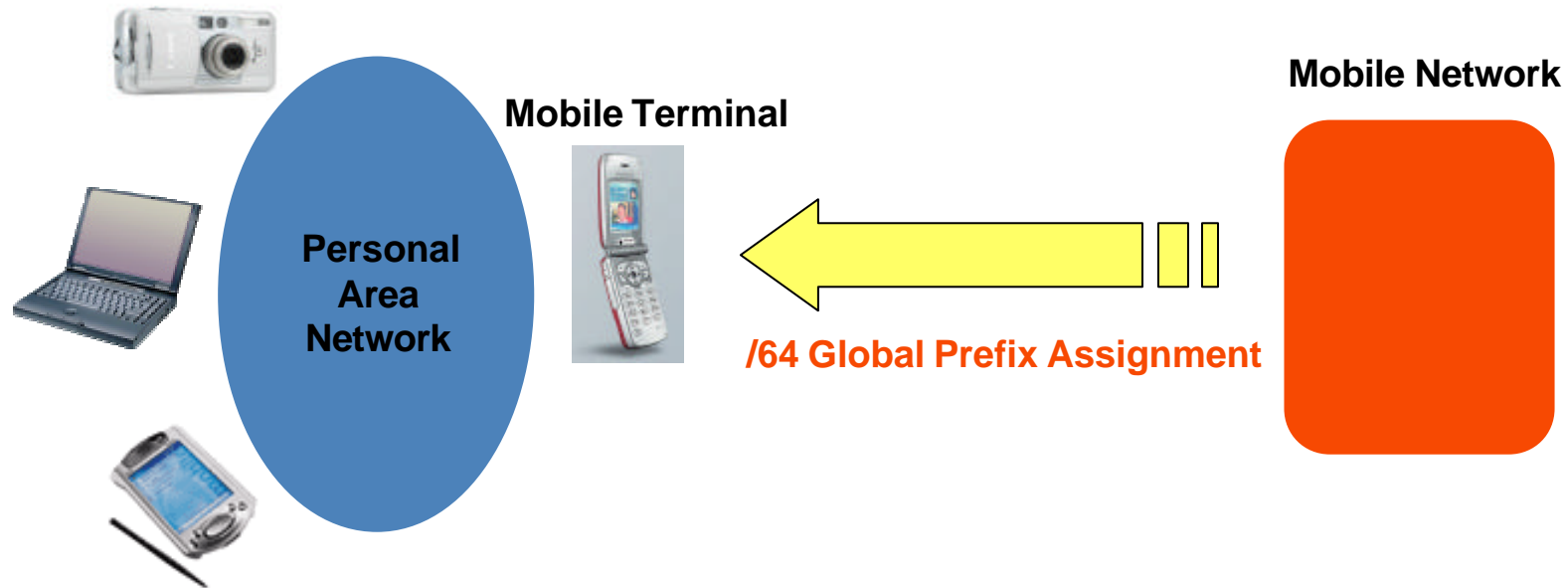
IPv6 in 3G Mobile Networks

The role of IPv6 in 3G Networks

- **IPv6 as an enabler of new services (peer-to-peer, IMS Mobile Multimedia)**
3GPP IMS Multimedia Services will support IPv6
- **IPv6/IPv4 will co-exist for many years to come**
- **IPv6 on end-user application level**
IPv6 as a service enabler, providing IPv6 connectivity for end-user services and applications.
- **IPv6 on 'transport' level**
The usage of IPv6 in the lower layers interconnecting nodes



How are IPv6 addresses assigned to Mobiles?



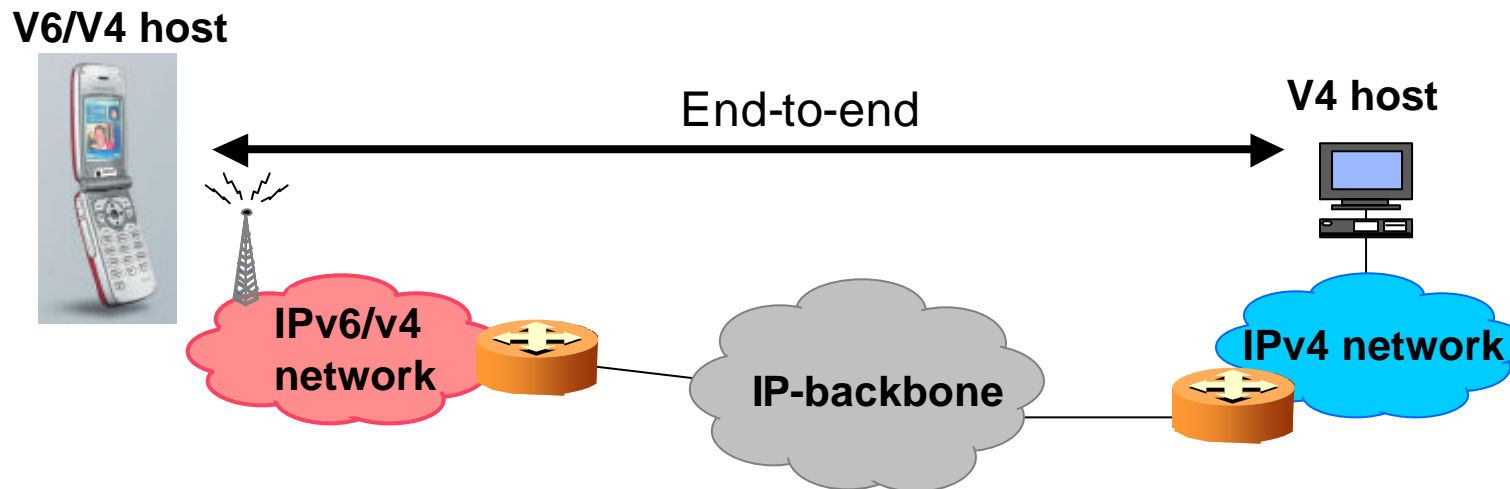
- **IETF/3GPP successful collaboration produced future-proof IPv6 standard for Mobile Networks**
- **Each Mobile Terminal is assigned a unique /64 IPv6 prefix**
 - **Personal Area Networks**

Phased Introduction of IPv6

- **Aims:**
 - Enable new IPv6-based services as required by the operator's business – starting with peer2peer
 - Maximise gains and Minimise risks for operators
 - Allow operators to gain deployment experience
- **IPv6 on end-user application level first**
 - Initially creating an IPv6 “service environment” on one or two sites
 - Try out and create incentive for the development of new applications
 - Use IPv6 P2P to increase data traffic usage

End-to-end incompatibility

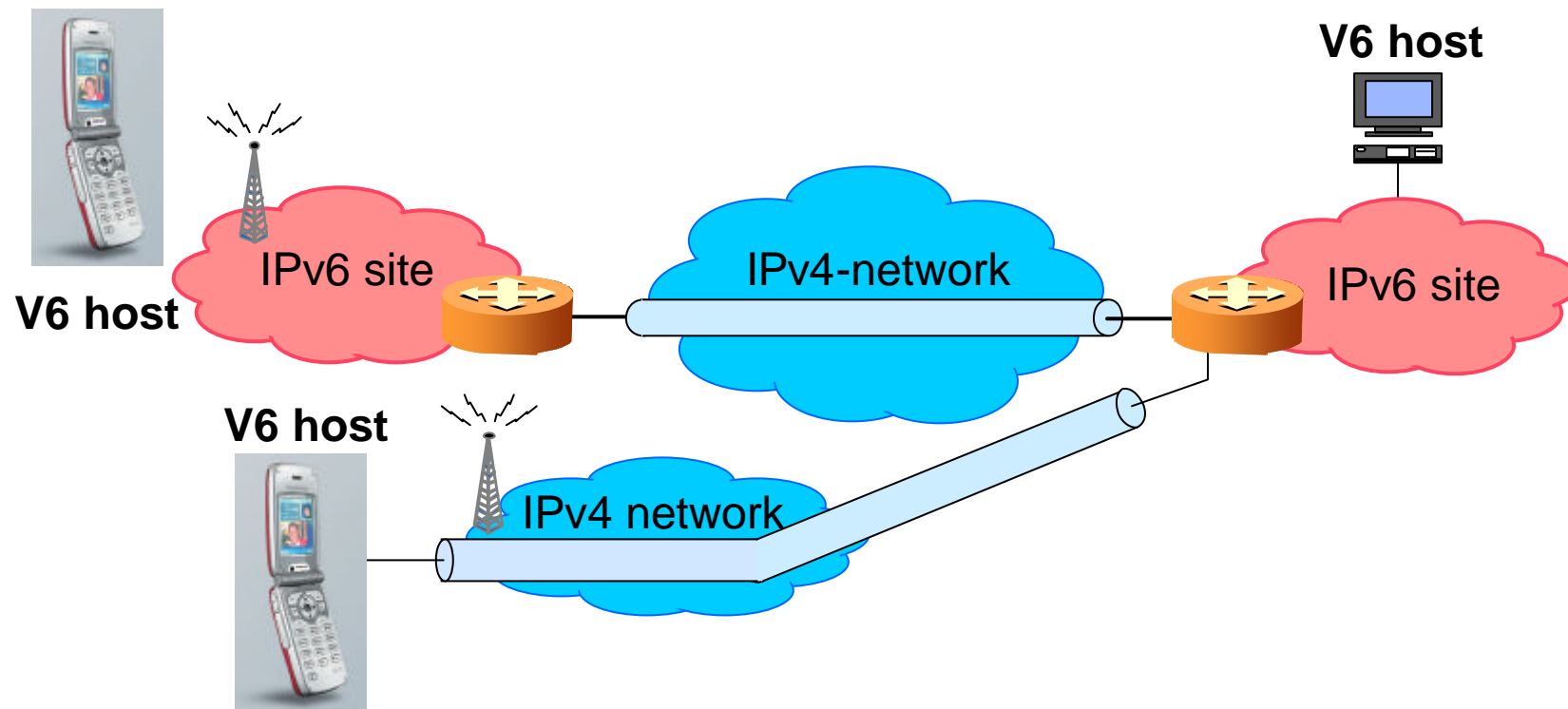
IPv6 host communicating with an IPv4 peer



Solutions:

- **Dual stack terminals** (choice of stack depending on application & peer)
 - Choose compatible IP type whenever possible (note: some app.s IPv6-only)
 - Cannot assume all terminals can get simult. IPv4 and IPv6 connectivity
- **Dual-stack Application Proxies** (e.g. HTTP, E-mail, WAP etc.)
- **Translators** (for Mobile hosts using only IPv6 Connectivity)
 - Translators esp. for SIP-based communication (3GPP IMS)

Tunnelling: solving e2e IPv6 connectivity



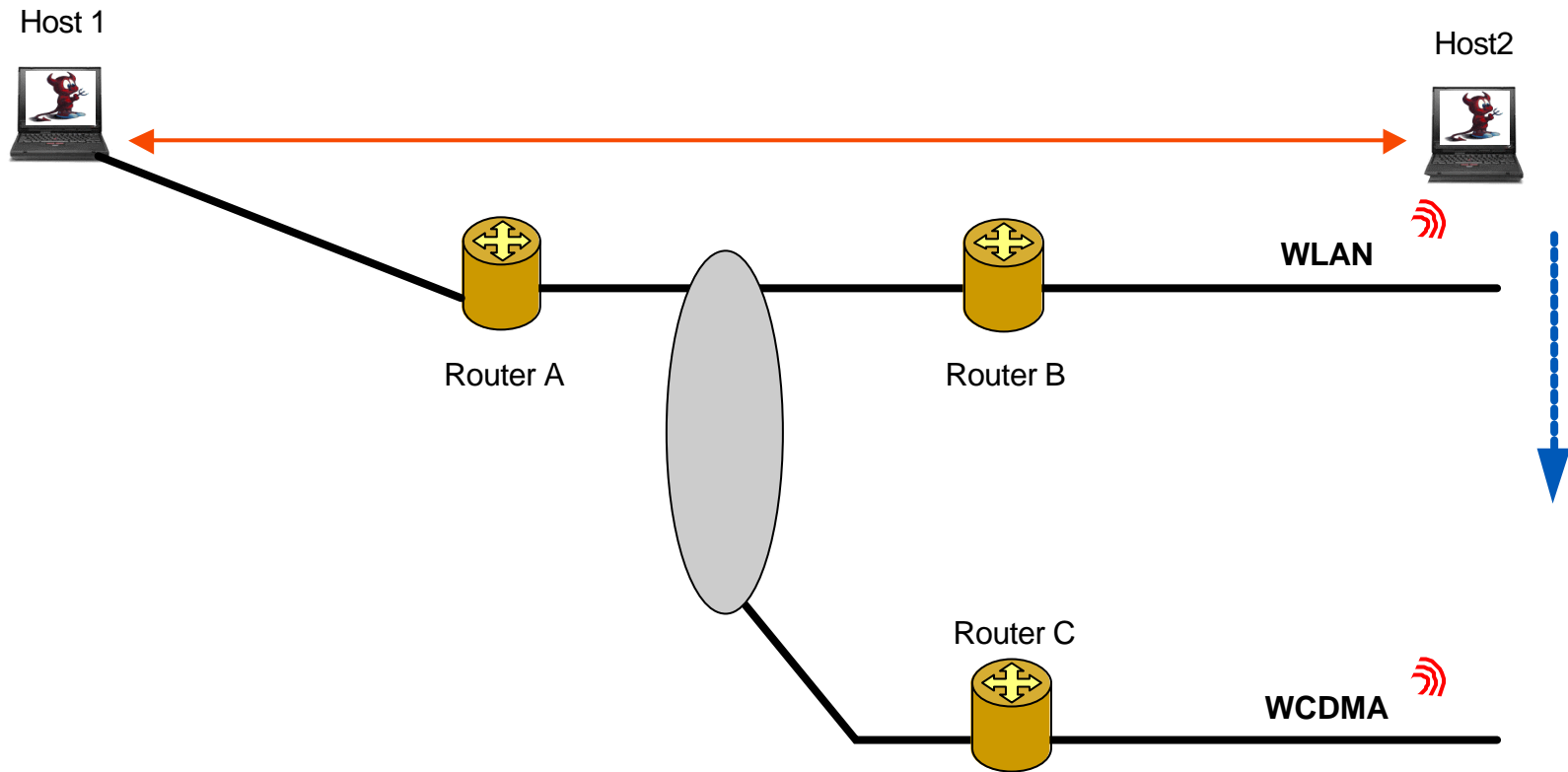
IPv6 in IPv4 tunneling:

- Router-to-router (interconnecting v6-sites/islands)
- Host-to-router (e.g. ISATAP) – when IPv6 native connection not avail.

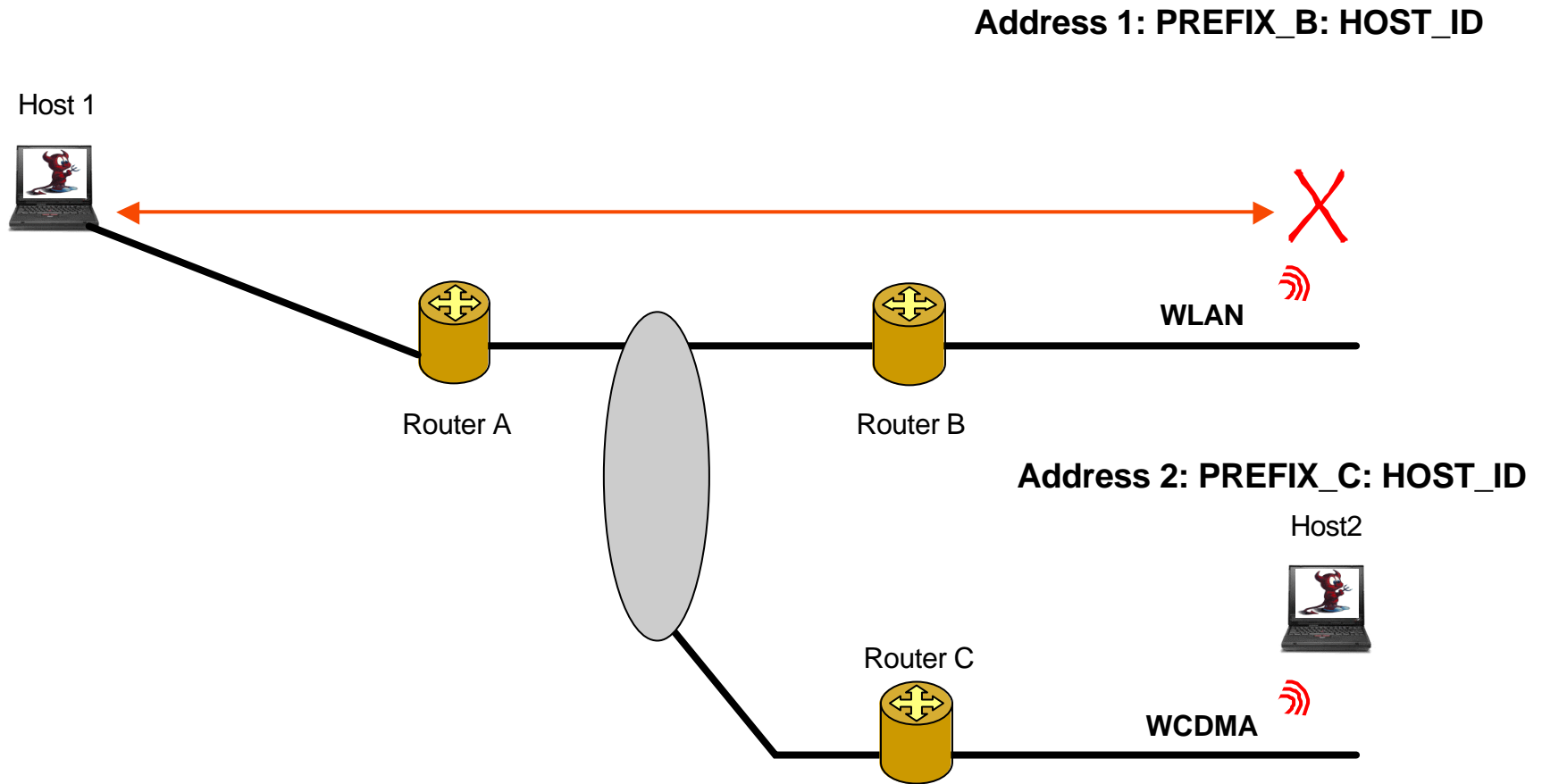
IPv6 Mobility

Why IP mobility?

Address 1: PREFIX_B: HOST_ID



Why IP mobility?



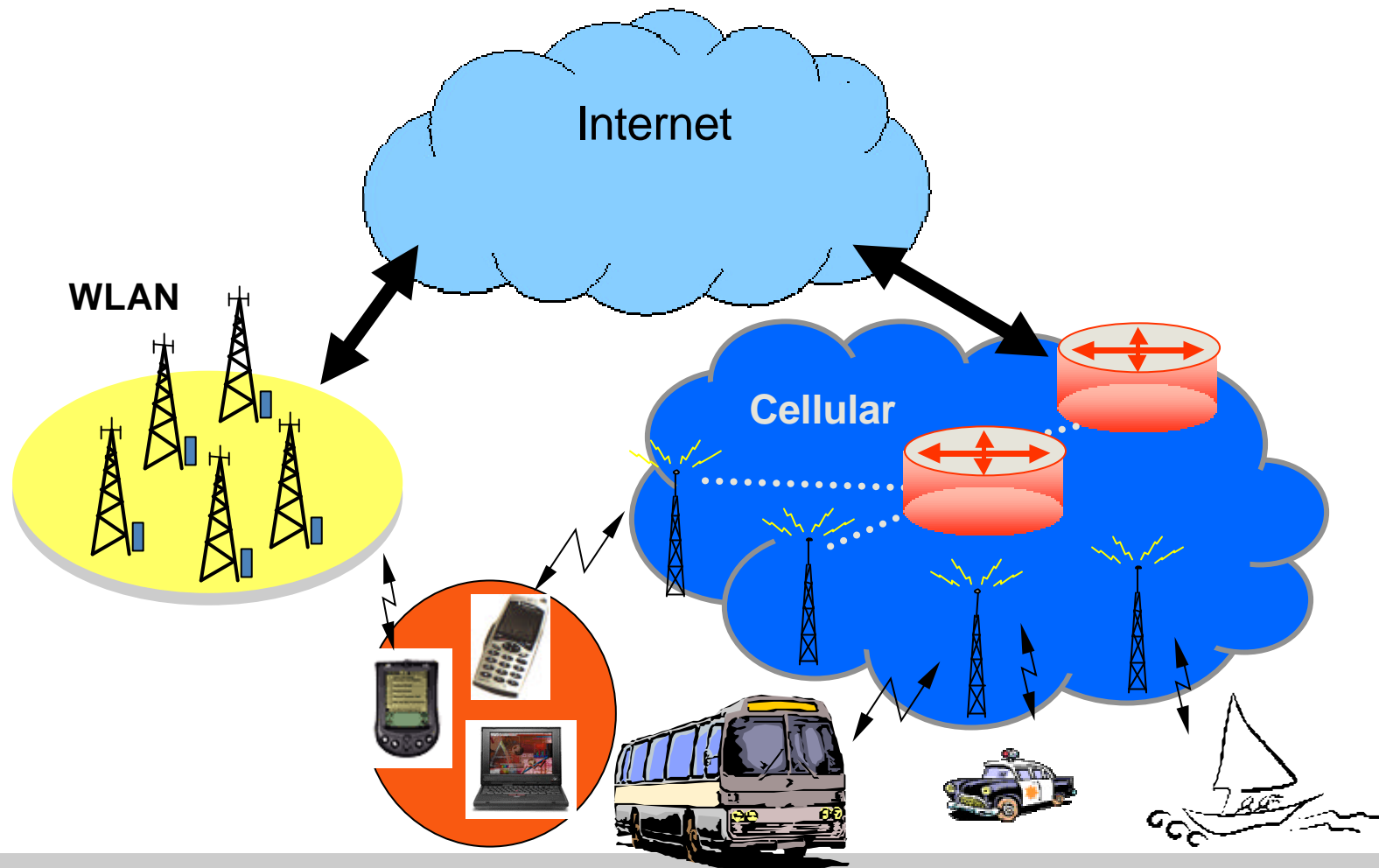
Mobile IPv6 in current wireless systems

- Why is it needed?
 - Session continuity
 - Access independence
 - Reachability => Permanent Public IP addresses

- The role of Mobile IP in current wireless systems:

IP Network	Mobile IP			
Core Network	GPRS CN (GTP)		CDMA2000 (MIP-based)	
RAN	GSM	WCDMA	CDMA	WLAN/Other

Future Trend: Mobile Networks Cars, PANs, Trains, Buses etc.



IPv6 Deployment Experience – 6ref

Objectives:

- Demonstrate a set of end-to-end IPv6 applications
- Provide a test bed to verify MT, RAN, Core Network and Service Network IPv6 functionality
- Provide input to standardization
- Ensure release compatibility and perform IOT
- Generate customer involvement

31 Jan 2003 World First IPv6 over WCDMA Demo with multi-access WLAN/WCDMA Mobility (6WINIT)



23 Sept 2003 Belgian IPv6 Event - IPv6 services in roaming over commercial GPRS network



Conclusions

- IPv6 will become an important part of mobile networks
- Enabler for new services requiring IP Reachability (peer2peer)
- Important for operators to gain early operational experience
- Europe must make the most of its position!
 - Real trials – Thinking Ahead
 - IPv4-v6 Transition Mechanisms
 - Applications
- The 6Ref testbed is an example of what actions are needed
 - Working towards integrated **e2e IPv6 solutions**

