Beyond
Mobile WiMAX Rel 1.0

Current and upcoming topics in

WiMAX Standardization

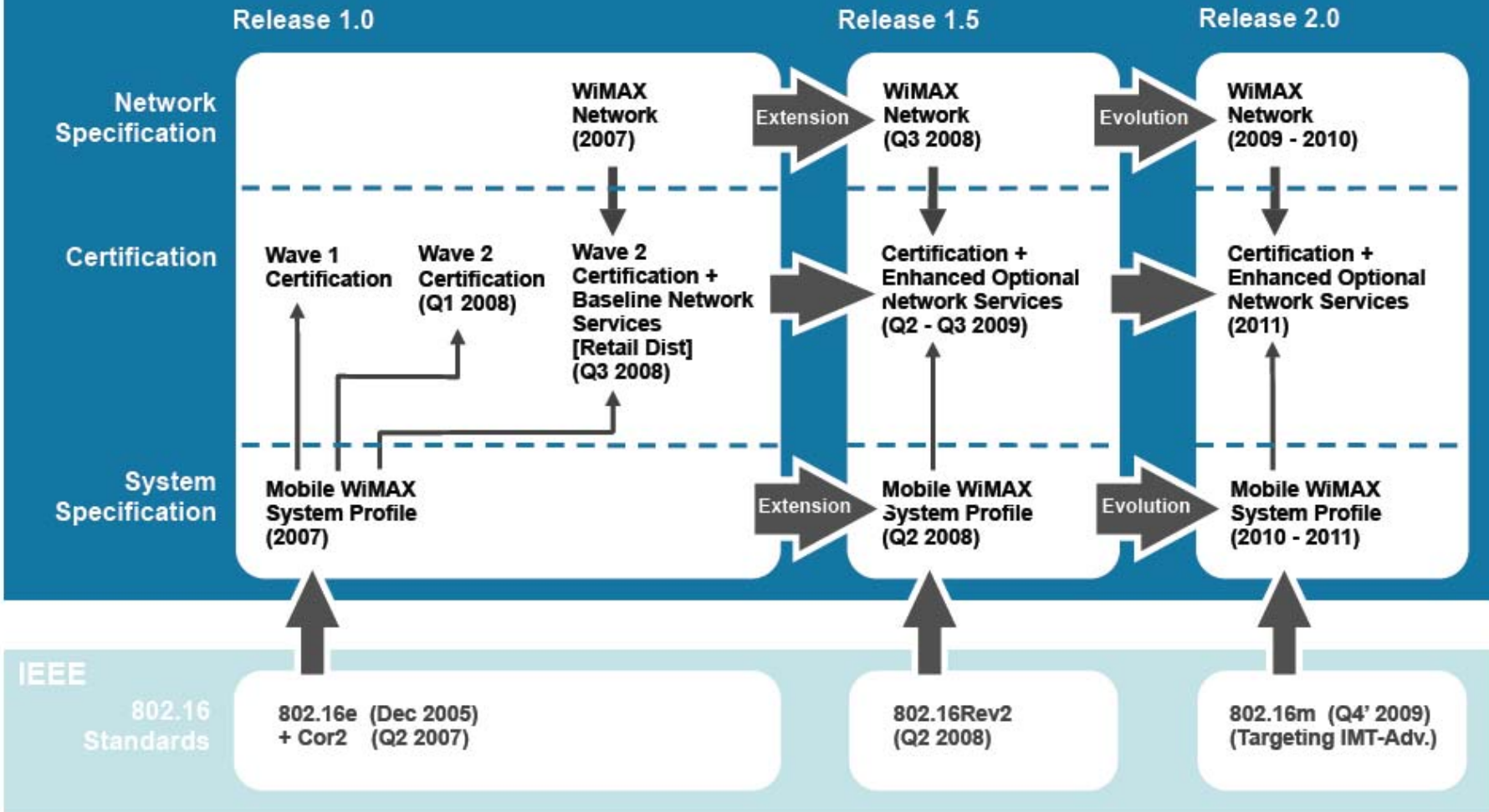**Max Riegel**

2008-05-09

'LTE / WiMAX' Workshop, ITG-Fachgruppe 5.2.1, Jena

Nokia Siemens Networks

Outline

- Mobile WiMAX Technology Evolution

- Mobile WiMAX Radio Profiles

- Mobile WiMAX Network Releases

- Network Release Establishment and Maintenance

- Mobile WiMAX Differentiation

- Mobile WiMAX Interworking with DSL

- Conclusion

© Nokia Siemens Networks   Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09

WiMAX Technology Roadmap (October 2007 General Assembly)

     Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09

Mobile WiMAX Technology Evolution Plan

Projections, Subject to change →

WMF SPWG Req's	Mobile WiMAX Requirements Rel 1.0 (2005) → *Extension* → Mobile WiMAX Requirements Rel 1.5 (2007) → *Extension* → Mobile WiMAX Requirements Rel 2.0 (2008)		

WMF Network Spec's — *Mobile WiMAX Release 1*

WiMAX Network Release 1.0 2007 → *Extension* → WiMAX Network Release 1.5 Q4, 2008 → *Evolution* → WiMAX Network Release 2.0 2009/10

WMF Certification

Release 1.0 — Wave 1 Certification — Wave 2 Certification (Q2 2008) → Release 1.0 Wave 2 Certification + Baseline Network Services (Retail Distribution) Q4 2008 → Release 1.5 Certification + Enhanced Optional Network Services Q2-Q3 2009 → Release 2.0 Certification + Enhanced Optional Network Services 1H 2011

WMF System Profile Spec.'s

Mobile WiMAX System Profile Release 1.0 (2007) → *Extension* → Mobile WiMAX System Profile Release 1.5 (Q4 2008) → *Evolution* → Mobile WiMAX System Profile Release 2.0 2010/11

IEEE 802.16 Standards

802.16e (Dec '05) + Cor2 (Q2'07) → 802.16Rev2 (Q4'08)

802.16m (Q4' 10) (*Targeting IMT-Adv.*)

Nokia Siemens Networks

Mobile WiMAX Radio Profiles

Release 1.0

Underlying Standards

Air Interface: *IEEE802.16-2004*
IEEE802.16e-2005

Network: *NWG Release 1.0/1.5*

Specifications

- Channel BW:
  8.75(Korea), 5, 10MHz
- Focus on TDD
- Modulation:
  - DL: 64QAM, 16QAM, QPSK
  - UL: 16QAM, QPSK
- Peak Data Rates Per Sector/Per Carrier:
  - DL: 1.93 bps/Hz
  - UL: 0.88 bps/Hz
- Advanced Antenna Features and Configurations:
  - SIMO (1x2) in Wave 1
  - MIMO (DL 2x2; UL 1x2) and Beam Forming in Wave 2

Release 1.5

Underlying Standards

Air Interface: *IEEE802.16 REV2*
Multihop Relay: *IEEE802.16j*
Network: *NWG Release 1.5*

Enhancements

- Additional Spectrum Bands
- Enabling both TDD and (H)FDD with Maximum Commonality
- Some Performance Improvement (Focus on Software Upgrades)
- Enabling Network Release 1.5 Advanced Features

Applications

- Higher VoIP Capacity
- Enhanced LBS
- Enhanced Multicast and Broadcast Services
- VLAN/Ethernet Services
- Multi-Hop Relay Deployments

Release 2.0

Underlying Standards

Air Interface: *IEEE802.16m*

Network: *NWG Release 2.0*

Enhancements

- Wider Band Channels (TDD & FDD in 5,10, 20MHz)
- Multiple Carrier Support
- Higher Spectrum Efficiency/Cap.
- Higher Peak&Average Data Rates
- Integrated Relay
- Improved Mobility And Lower Latency
- Improved MIMO (focus on higher order and multiuser MIMO)
- Enhanced Inter-tech Handoffs/ Coexistence With 3G and WiFi
- Improved Power Saving

Applications

IMT-A

Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09

Networks

Mobile WiMAX Network Releases

Release 1.0

Release date: March 2007

Radio: *Mobile Profile 1.0*

Functions

- Mobile and stationary base spec
- ASN anchored mobility
- CSN anchored mobility (MIP),
- IPv4 & optional IPv6 connectivity
- Pre-provisioned/static QoS,
- Sleep/Idle modes,
- Network discovery/selection
- Optional RRM
- EAP based authentication
- Pre- and postpaid accounting
- Roaming (RADIUS only)
- 3GPP I-WLAN compatible IWK
- 3 ASN profiles

NWIOT

- Initial NCT/IIOT specs

Release 1.5

Release date: Dec 2008 (planned)

Radio: *Mobile Profile 1.0/1.5*

Additional features

- Network architecture /wo MIP ('Simple IP', 'Simple ETH')
- IMS and PCC
- Telephony VoIP with emergency services and lawful interception
- RoHC support
- OTA and device management
- Location based services
- Diameter based AAA
- 3GPP2 IWK optimizations
- Dynamic QoS /wo PCC
- VLAN & Ethernet services
- DSL IWK
- Multi-host support
- Universal Services Interface

NWIOT

- Release 1.5 (NCT/IIOT) and enabling IOT for retails devices

Release 2.0

Release date: t.b.d.

Radio: *Mobile Profile 2.0*

Additional features (t.b.d.)

- Multimedia Session Continuity
- Seamless WiMAX-WiFi handover
- 3GPP/2 IWK (optimized HO)
- 3GPP SAE IWK
- Multicast/Broadcast Services
- Roaming Enhancements
- Network Management
- Emergency Services Support
- Support for Relay/Femto-cell
- …

NWIOT

- Second-gen. NWIOT framework

     Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09
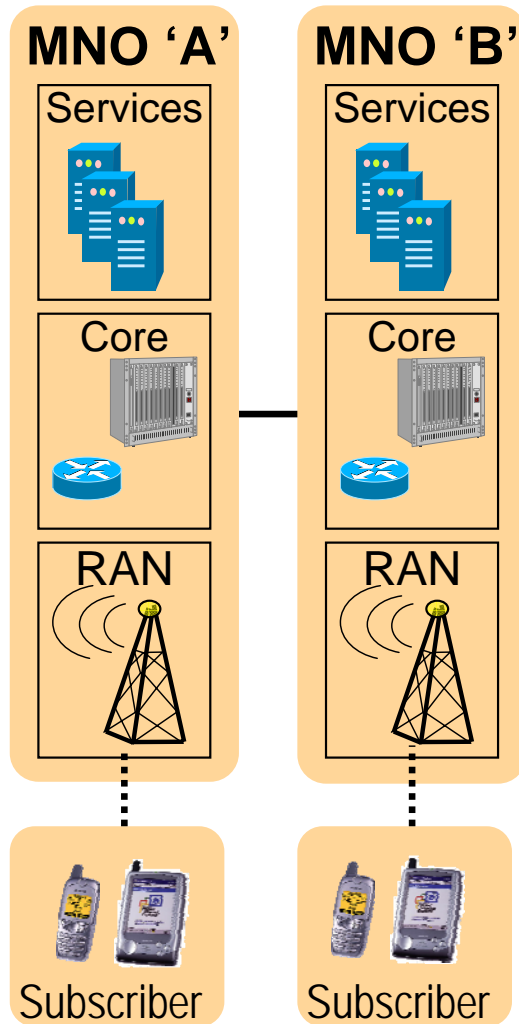
Networks
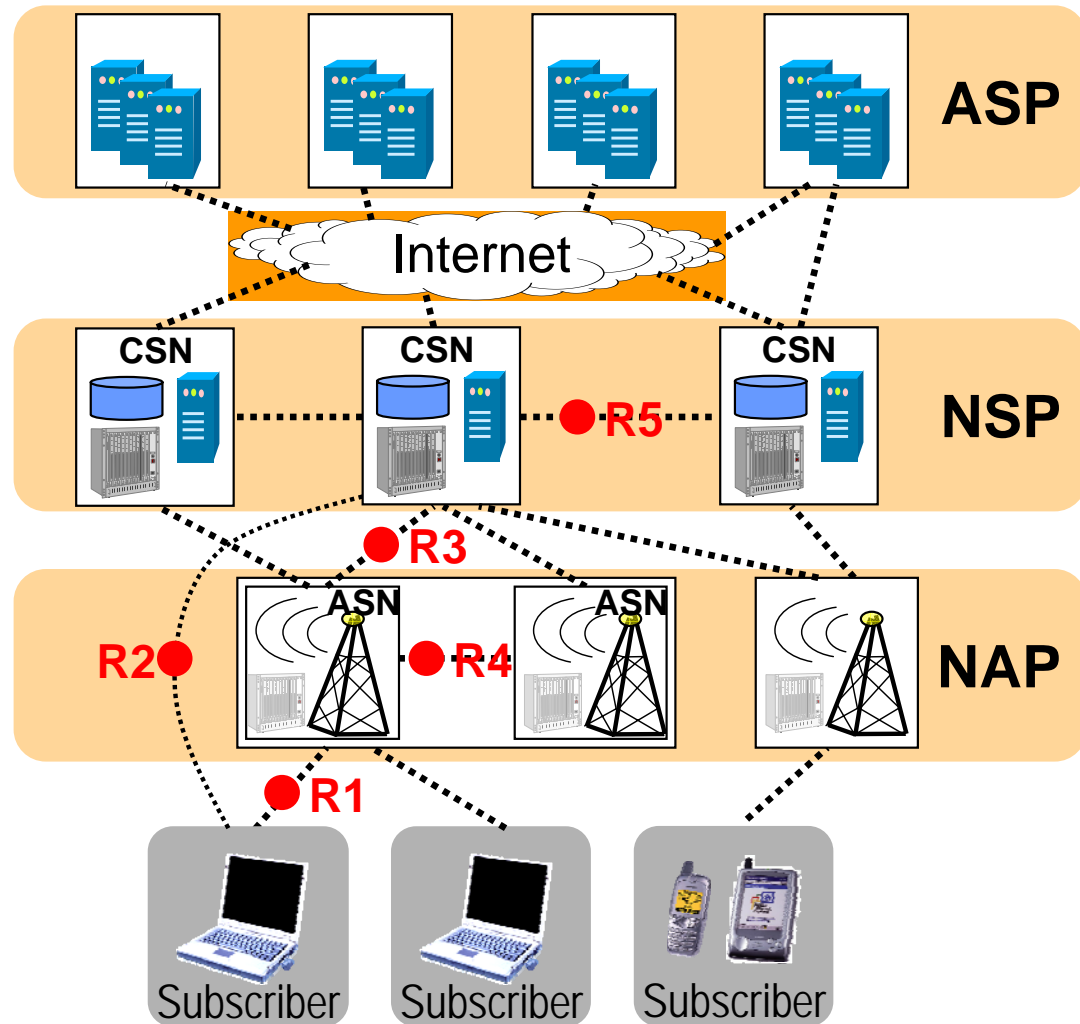
Network Release Establishment and Maintenance
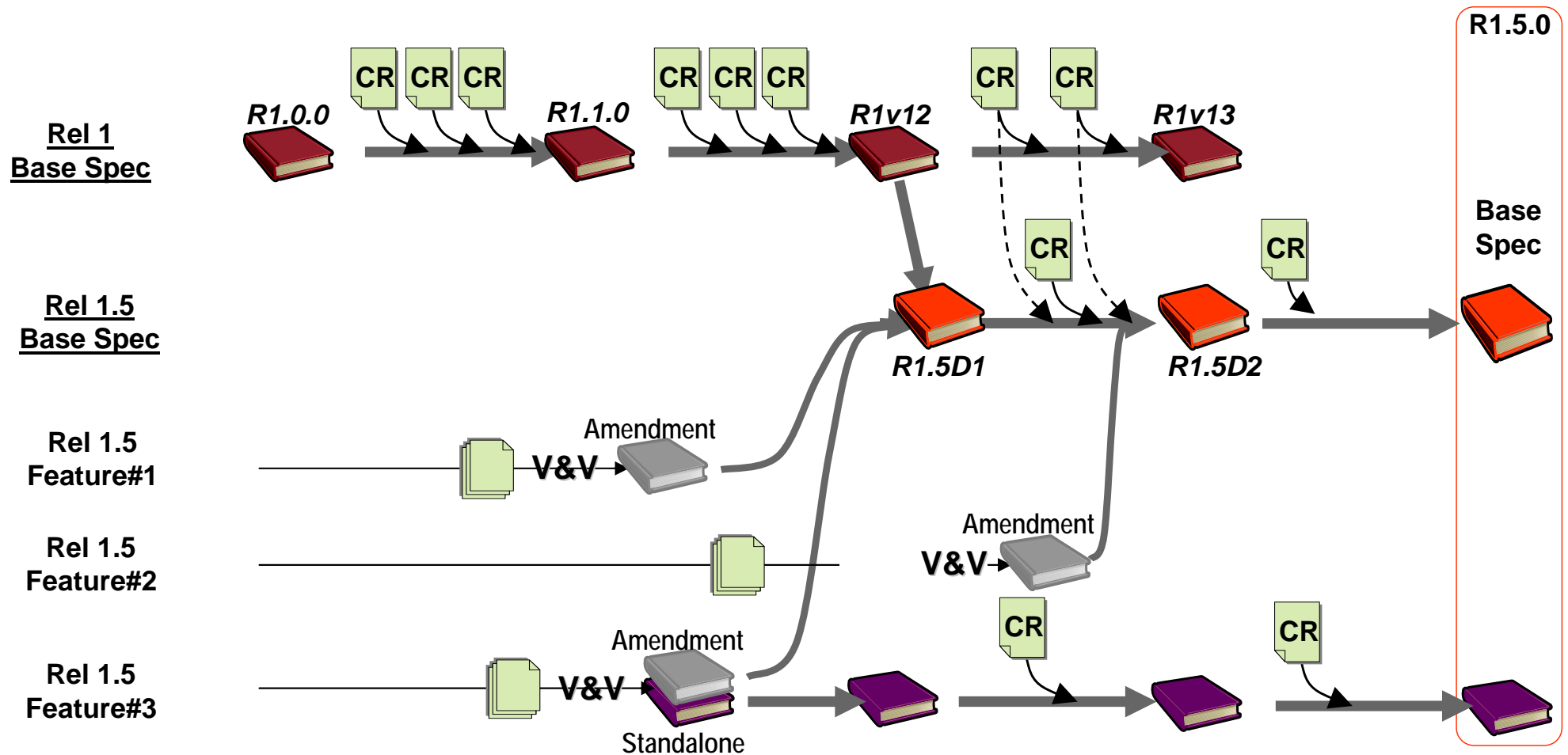
- Release numbering has become a (technical) issue in the WiMAX Forum
  - Calling a full release 'Rel 1.5', 'Rel 2.0' is tied to 802.16m/IMT-A
- Most likely document identification will be detached from release names

Mobile WiMAX Differentiation #1
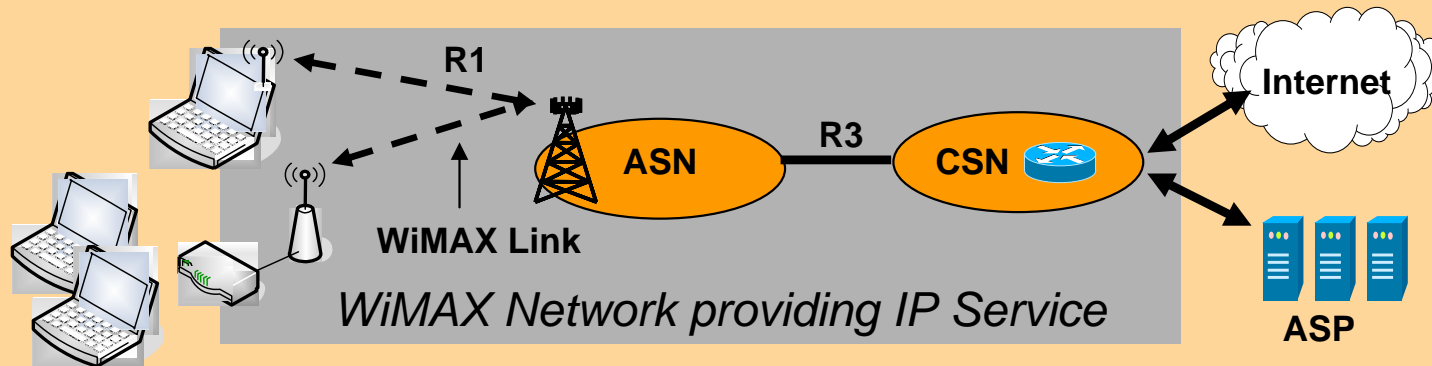
Legacy Architecture

MNO 'A'
- Services
- Core
- RAN
- Subscriber

MNO 'B'
- Services
- Core
- RAN
- Subscriber

Mobile WiMAX Network Architecture

ASP

Internet

CSN   **CSN**   **CSN** — R5   **NSP**

R3

ASN   **ASN**   **NAP**

R2   R4

R1

Subscriber   Subscriber   Subscriber

  Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09

Nokia Siemens Networks

Mobile WiMAX Differentiation #2

IP Network Service

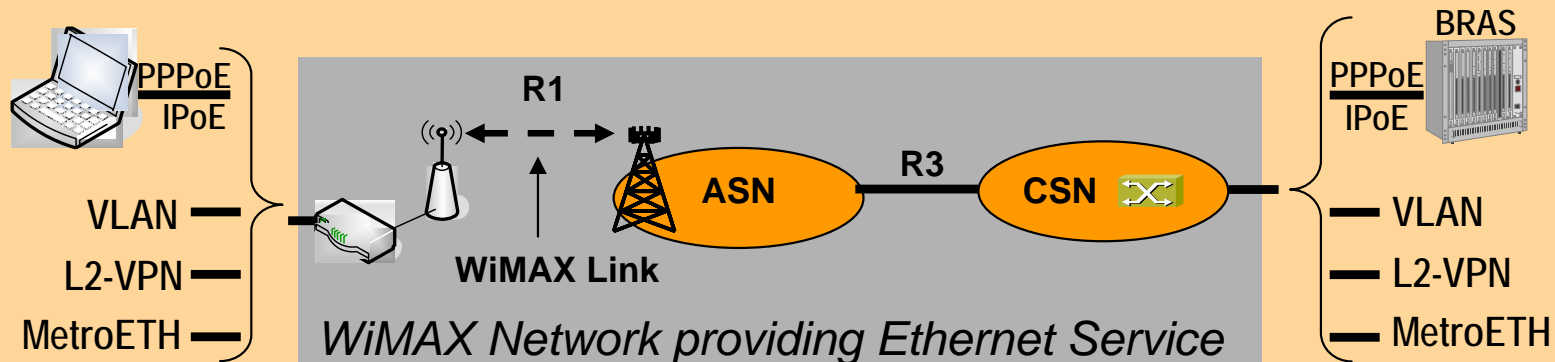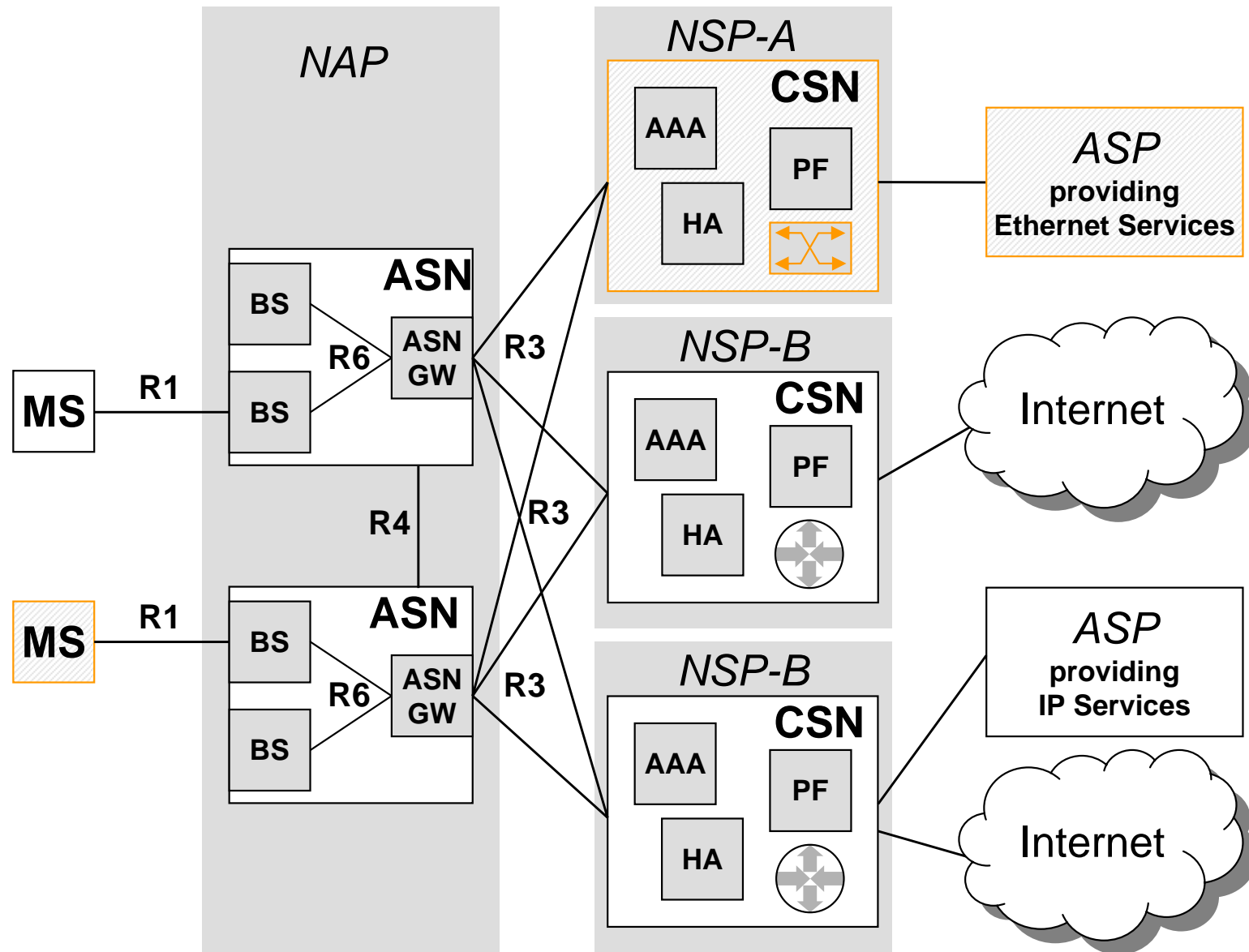WiMAX Network providing IP Service

- The WiMAX network provides IP connectivity to the Internet and operator services for single hosts or multiple hosts behind a gateway.
  - Like a 3GPP or 3GPP2 mobile network

Ethernet Network Service

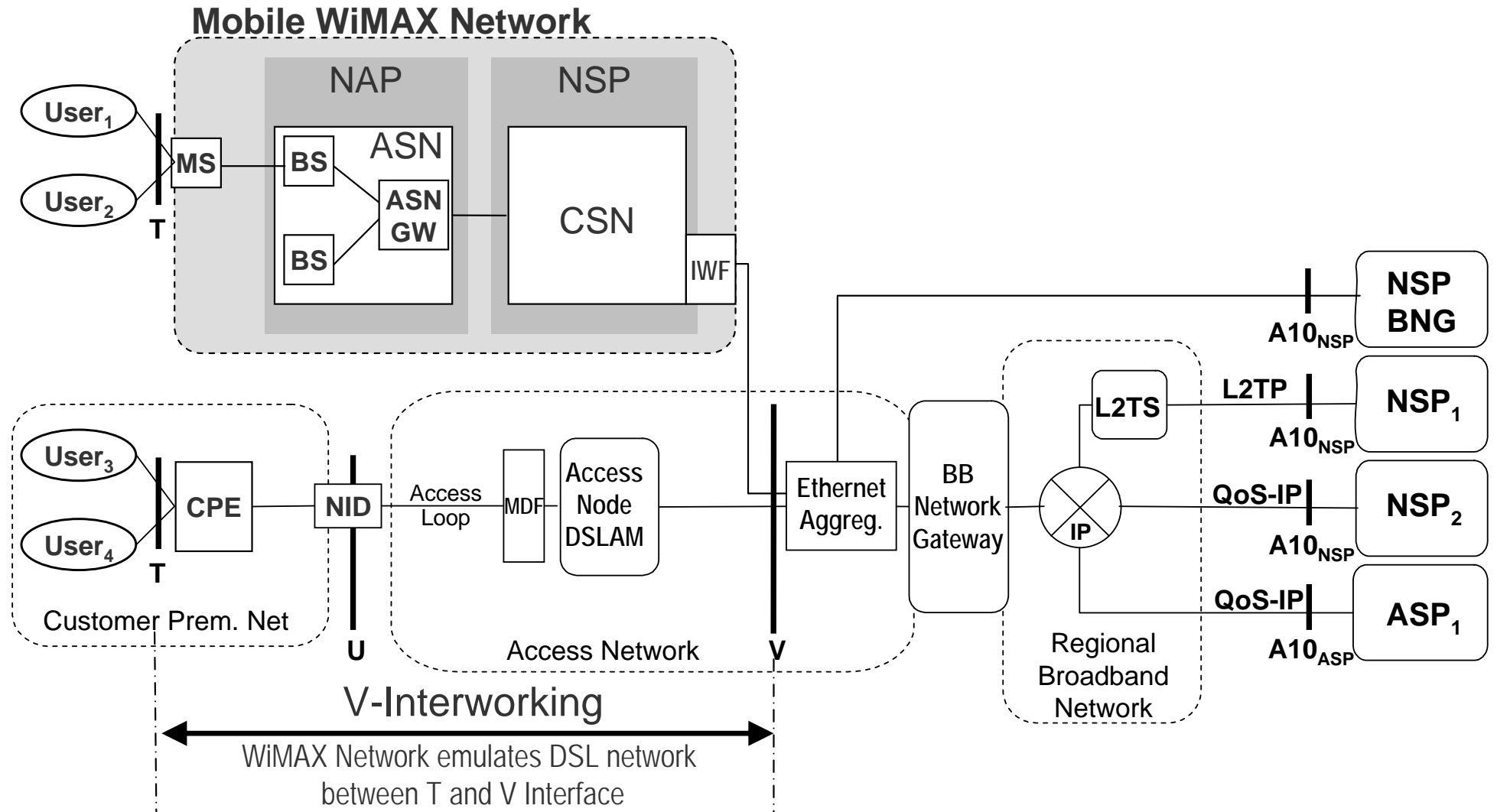WiMAX Network providing Ethernet Service

- The WiMAX network provides plain Ethernet connectivity end-2-end.
  - Like a DSL network, but without wires.

Mobile WiMAX Network Reference Architecture

© Nokia Siemens Networks   Beyond Mobile WiMAX Rel 1.0 /Max Riegel / 2008-05-09

Mobile WiMAX Interworking with DSL Networks

Mobile WiMAX Network

NAP — NSP

User₁, User₂ — T — MS — BS, BS — ASN — ASN GW — CSN — IWF

V-Interworking

WiMAX Network emulates DSL network between T and V Interface

User₃, User₄ — T — CPE — NID — U — Access Loop — MDF — Access Node DSLAM — V — Ethernet Aggreg. — BB Network Gateway

Customer Prem. Net

Access Network

Regional Broadband Network — L2TS — IP

NSP BNG — A10_NSP
L2TP — NSP₁ — A10_NSP
QoS-IP — NSP₂ — A10_NSP
QoS-IP — ASP₁ — A10_ASP

Nokia Siemens Networks

Conclusion

- Like 3GPP/3GPP2 the WiMAX Forum has established a forward looking release roadmap for Mobile WiMAX

- For marketing purposes the releases are now consistently denoted as Rel 1.0, Rel 1.5, Rel 2.0

- The specifications are roughly following the releases approach but are written feature-by-feature
  - Independent evolution path for each of the features

- Feature-by-feature approach is much more suited for the horizontal network operator model adopted by Mobile WiMAX

- Mobile WiMAX introduces in Rel 1.5 new features like 'VLAN/Ethernet support over Cellular' to address markets beyond the traditional mobile communication market
  - Keeping extremely high commonality in the network architecture

Nokia Siemens Networks

THE END

Thank you for your attention!

Questions?
Comments!