



VON Conference: WiMAX Network Model



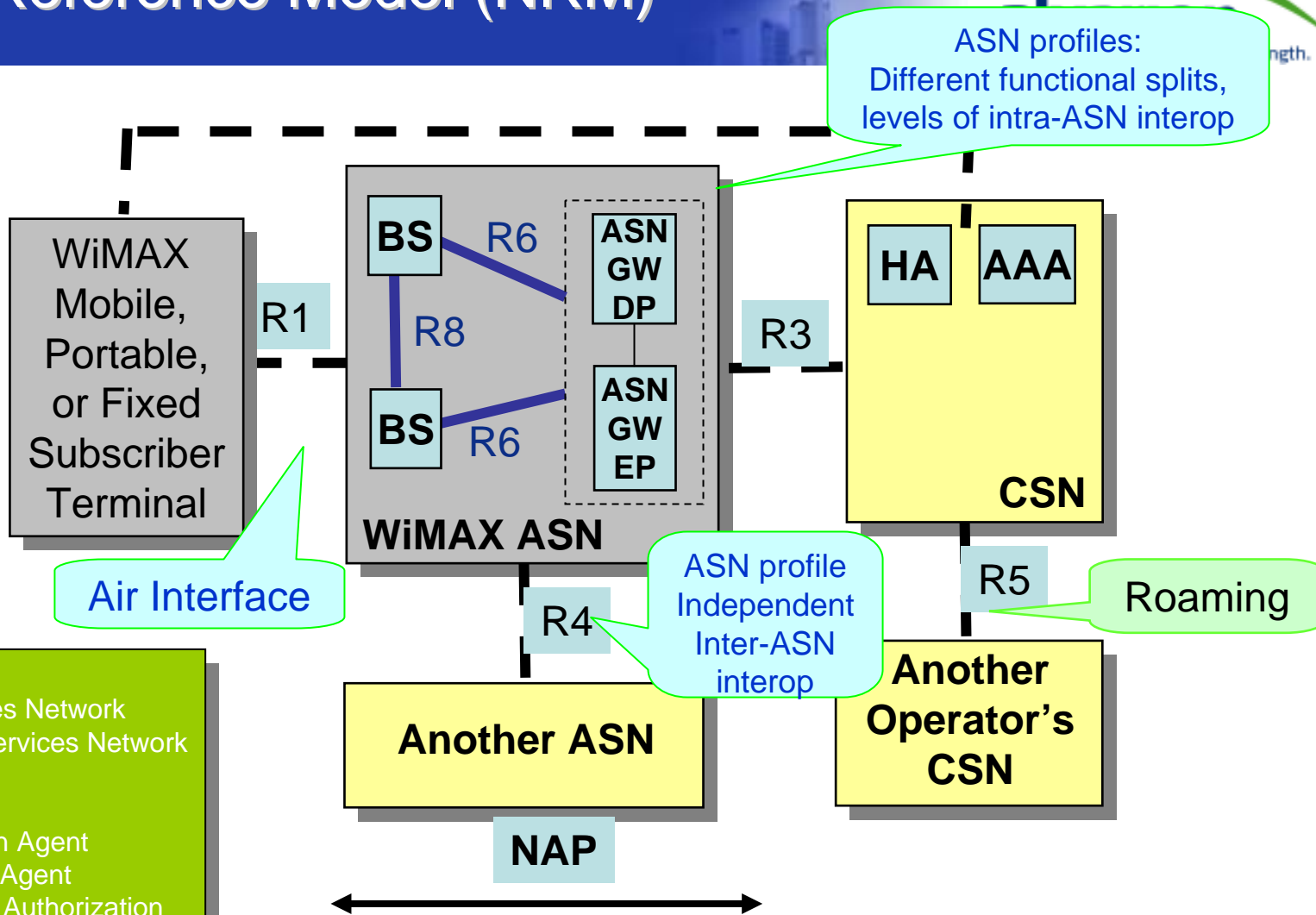
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- **Fixed, Portable and Mobile usage**
- **Standalone and Interworking deployments**
 - Wireline, Greenfield and cellular operator domains
 - Quad play services
- **Consistent client to network interface(s)**
- **Multi-vendor network interoperability**
- **Accommodate vendor differentiation**
- **Up/down network scaling**
- **Unbundling of access, connectivity and application service providers**

- **Unified Network Reference Model**
- **IP-based Access and Core Network**
- **Functional decomposition based architecture**
- **Open interfaces for MVNO, Interworking and single provider models**
- **Open interfaces for interoperability within access networks**
- **IP/Ethernet based 'loosely-coupled' Interworking**

Network Reference Model (NRM)



- Acronyms
- ASN – Access Services Network
 - CSN – Connectivity Services Network
 - BS – Base Station
 - GW – Gateway
 - FA – Mobile IP Foreign Agent
 - HA – Mobile IP Home Agent
 - AAA – Authentication, Authorization and Accounting
 - NAP – Network Access Provider
 - NSP – Network Service Provider
 - DP - Decision Point (Control)
 - EP - Enforcement Point (Bearer)

Dashed lines represent NRM reference interfaces

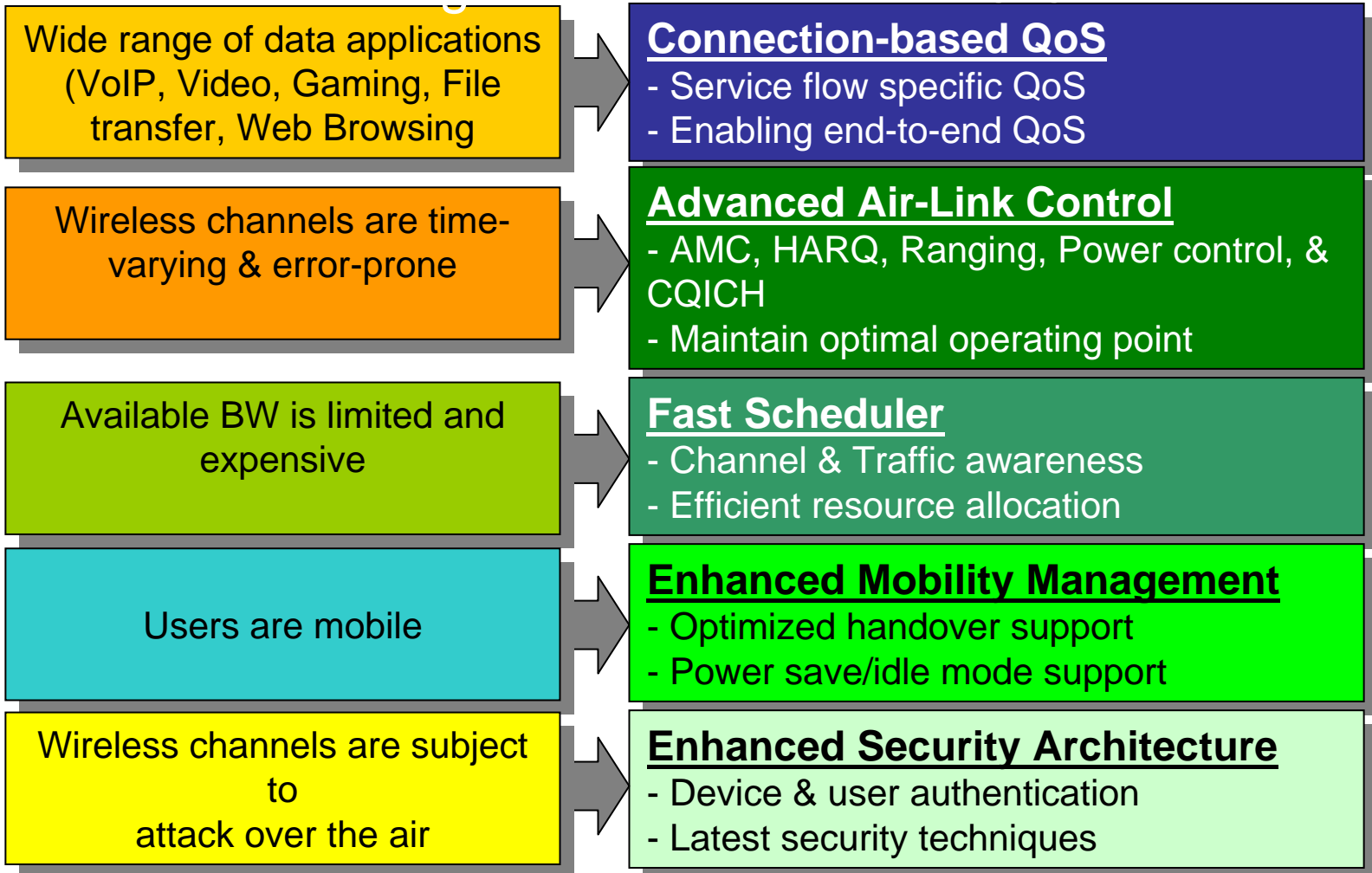
Tightly Coupled

- WiMAX ASN considered as 3GPP RAN
- WiMAX traffic is injected into 3GPP core network
- Mobile clients run 3GPP protocol stack over IEEE 802.16e network interface
- 3GPP and WiMAX share the same AAA, billing, and mobility infrastructure

Loosely Coupled

- WiMAX ASN not considered as 3GPP RAN
- IP gateway routes WiMAX traffic to Internet without impacting 3GPP core resources
- Mobile clients run standard IP protocols over IEEE 802.16e network interface
- Permits reuse of AAA and consolidated billing via protocol interworking

Loosely coupled interworking preferred as it enables independent yet integrated mobility management



QoS Category	Applications	QoS Specifications
UGS Unsolicited Grant Service	VoIP	<ul style="list-style-type: none"> ⦿ Maximum Sustained Rate ⦿ Maximum Latency Tolerance ⦿ Jitter Tolerance
rtPS Real-Time Polling Service	Streaming Audio or Video	<ul style="list-style-type: none"> ⦿ Minimum Reserved Rate ⦿ Maximum Sustained Rate ⦿ Maximum Latency Tolerance ⦿ Traffic Priority
ErtPS Extended Real-Time Polling Service	Voice with Activity Detection	<ul style="list-style-type: none"> ⦿ Minimum Reserved Rate ⦿ Maximum Sustained Rate ⦿ Maximum Latency Tolerance ⦿ Jitter Tolerance ⦿ Traffic Priority
nrtPS Non-Real-Time Polling Service	File Transfer Protocol (FTP)	<ul style="list-style-type: none"> ⦿ Minimum Reserved Rate ⦿ Maximum Sustained Rate ⦿ Traffic Priority
BE Best Effort Service	Data Transfer, Web Browsing, etc.	<ul style="list-style-type: none"> ⦿ Maximum Sustained Rate ⦿ Traffic Priority

WiMAX Applications: 5 Classes



Class	Application	BW Guideline		Latency Guideline		Jitter Guideline	
1	Multiplayer Interactive Gaming	Low	50 kbps	Low	<25 ms	n/a	
2	VoIP & Video Conference	Low	32 to 64 kbps	Low	<160 ms	Low	<50 ms
3	Streaming Media	Low to High	5 kbps to 2 Mbps	n/a		Low	<100 ms
4	Web Browsing & Instant Messaging	Moderate	10 kbps to 2 Mbps	n/a		n/a	
5	Media Content Downloads	High	>2 Mbps	n/a		n/a	