



HomePNA



*Networking the Digital Home*



# The HPNA - Background

---

- “Technology of choice” for major NA Telco IPTV deployments
- 30 new members in last 12 months: Semi & passive suppliers, gateway and set-top OEMs, CE equipment, Telcom test equipment
- Promoters comprise the TelcoTV food-chain:



# New Focus

---

- Finalize extension of the standard to cover IP multimedia distribution over **mixed coax/phoneline** backbones
  - Identify new requirements/address higher system level application needs
- Basic product requirements HW/SW definition
- Interoperability certification procedures and facilities
- Promotion of the technology through PR and Education
- Define installation recommendations
- Liaison with SIGs and Standards Organizations such as the ITU, DSLF, DLNA, UPnP Forum, etc.
- New members joining



# HPNA - Milestones

---

- June 2003 - HPNA 3.0 Approved (240Mbps)
- May 2004 – First HPNA 3.0 products announced
- February 2005 – ITU approves G.9954–2004 (240Mbps)
- November 2006 – HPNA 3.1 Approved (320Mbps)
- November 2006 – HPNA 3.1 Certification Spec released
- November 2006 – First HPNA 3.1 chipset announced
- January 2007 – ITU approves G.9954-2007 (320Mbps)
- March 2007 - Certification and Plugfest



HomePNA Technology

# HomePNA V3 PHY

---

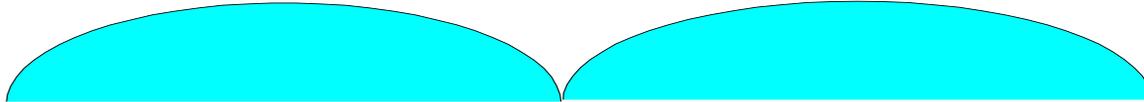
- Frequency Diverse QAM and QAM Modulation Schemes
  - Very efficient in handling deep spectral notches
- 2 to 32 Mbaud with 2-10 bit constellations
  - Peer to peer rate negotiation
- Focus on high bit-rates and robustness
  - High bit rates even in most problematic wiring topologies
  - Immunity to impulse noise and RFI noise
  - Highly adaptable to line conditions
- FCC part 68 and part 15 compliant

# HomePNA V3 Spectral Behavior

HPNA 3  
32Mbaud  
QAM

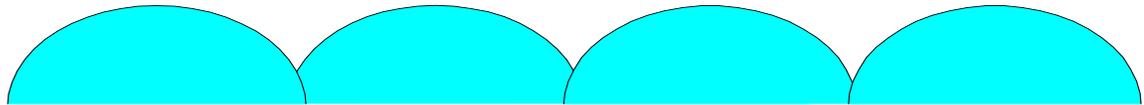


HPNA 3  
16Mbaud  
FQAM



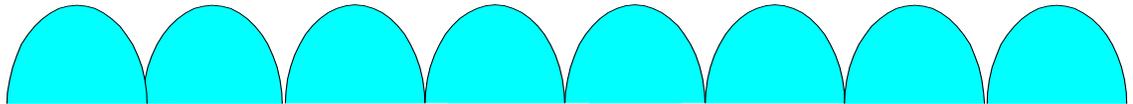
+3dB

HPNA 3  
8Mbaud  
FDQAM



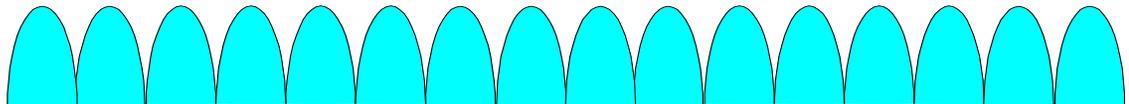
+6dB

HPNA 3  
4Mbaud  
FDQAM



+9dB

HPNA 3  
2Mbaud  
FDQAM



+12dB

4 - 36 MHz



FDQAM's margins exceeds that of QAM by at least 3 dB for each reduction in the baud rate

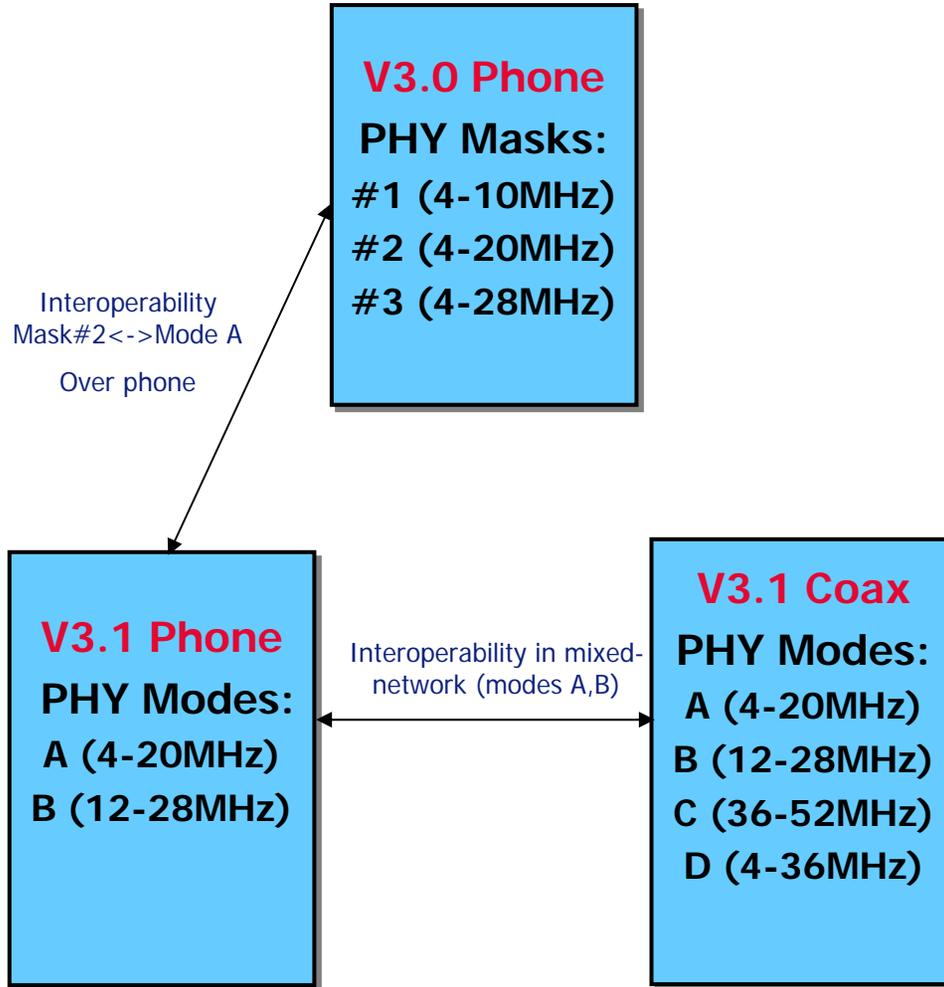
# HomePNA V3 Spectral Allocations

---

- HPNA V3.1P Over Phone-line
  - Two spectral modes:
    - A (4-20MHz): 2, 4, 8, 16 MBaud (4Mbps - 160Mbps)
    - B (12-28MHz): 2, 4, 8, 16 MBaud (4Mbps - 160Mbps)
- HPNA V3.1C Over Coax
  - Four spectral modes:
    - A (4-20MHz): 2, 4, 8, 16 MBaud (4Mbps - 160Mbps)
    - B (12-28MHz): 2, 4, 8, 16 MBaud (4Mbps - 160Mbps)
    - C (36-52MHz): 2, 4, 8, 16 MBaud (4Mbps - 160Mbps)
    - D (4-36MHz): 2, 4, 8, 16, 32 Mbaud (4Mbps – 320Mbps)
- Hybrid Coax&Phone-line support in spectral modes A and B

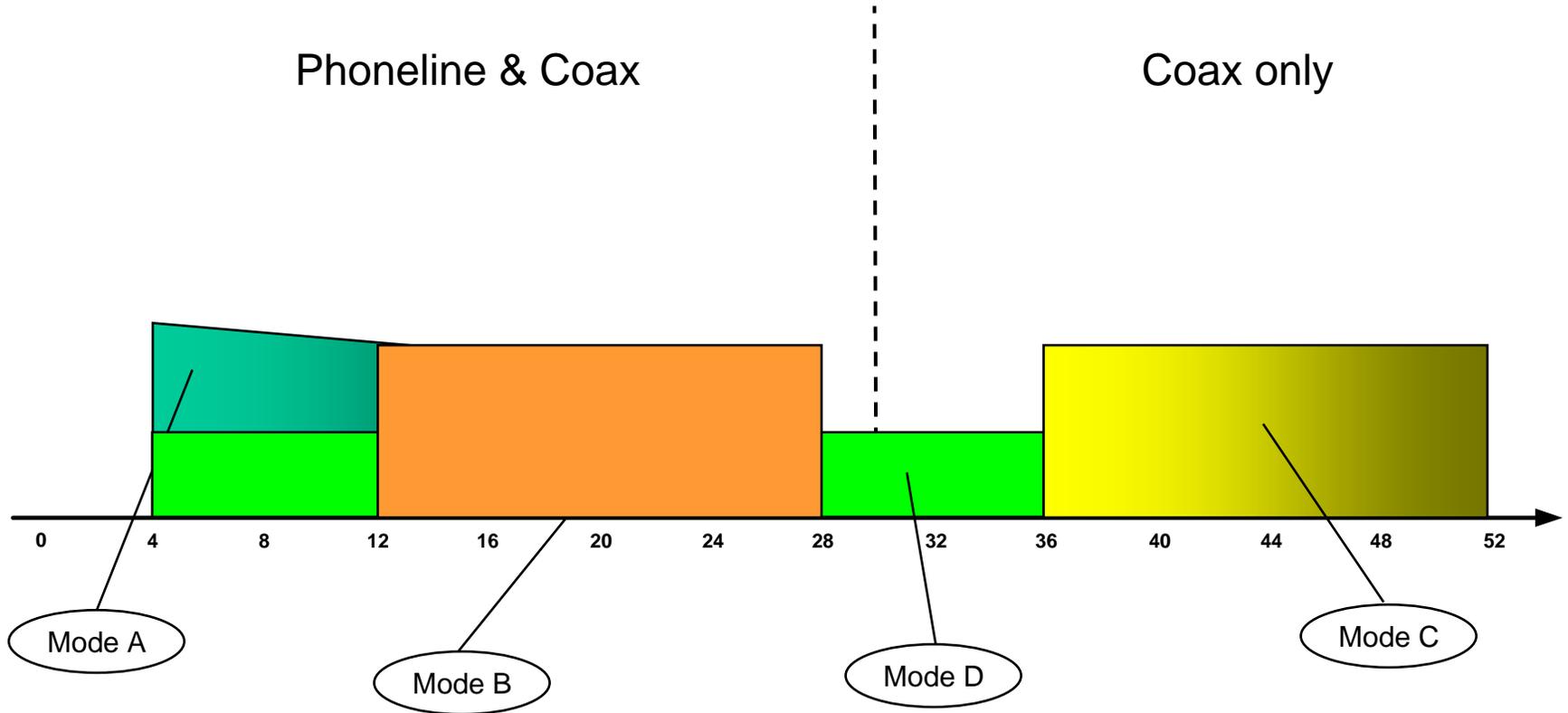
# HomePNA V3 PHY Interoperability

---



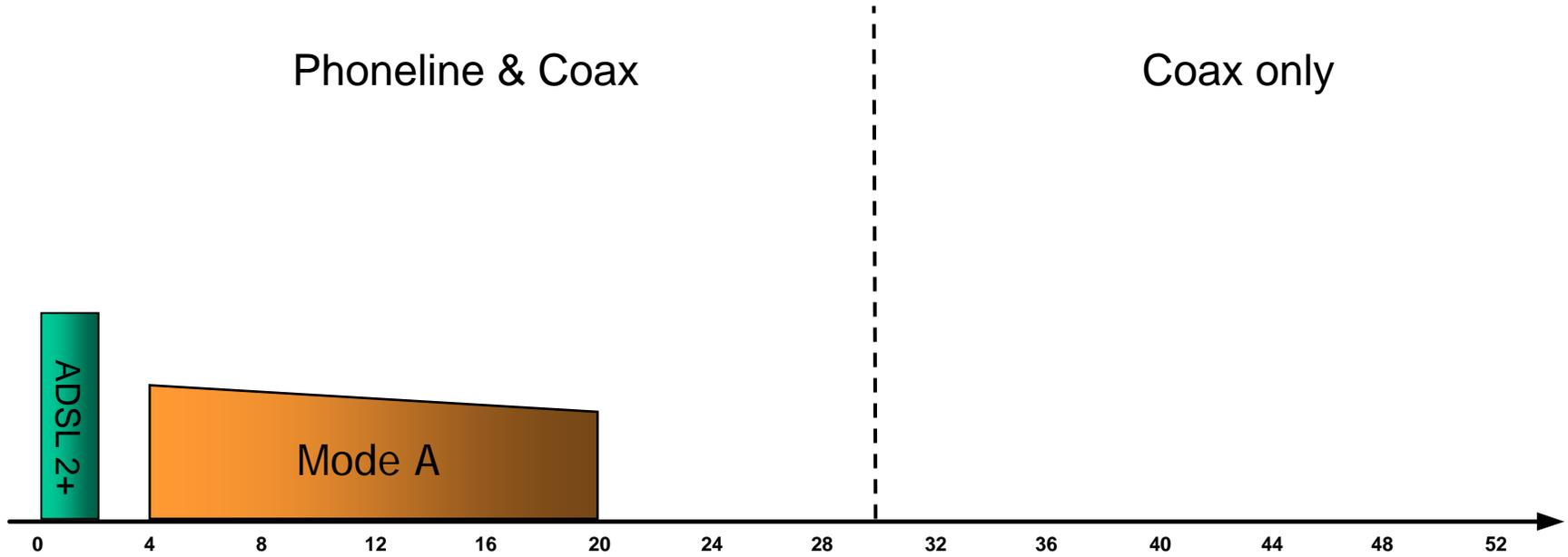
# HomePNA V3 Spectral Allocations (cont)

---



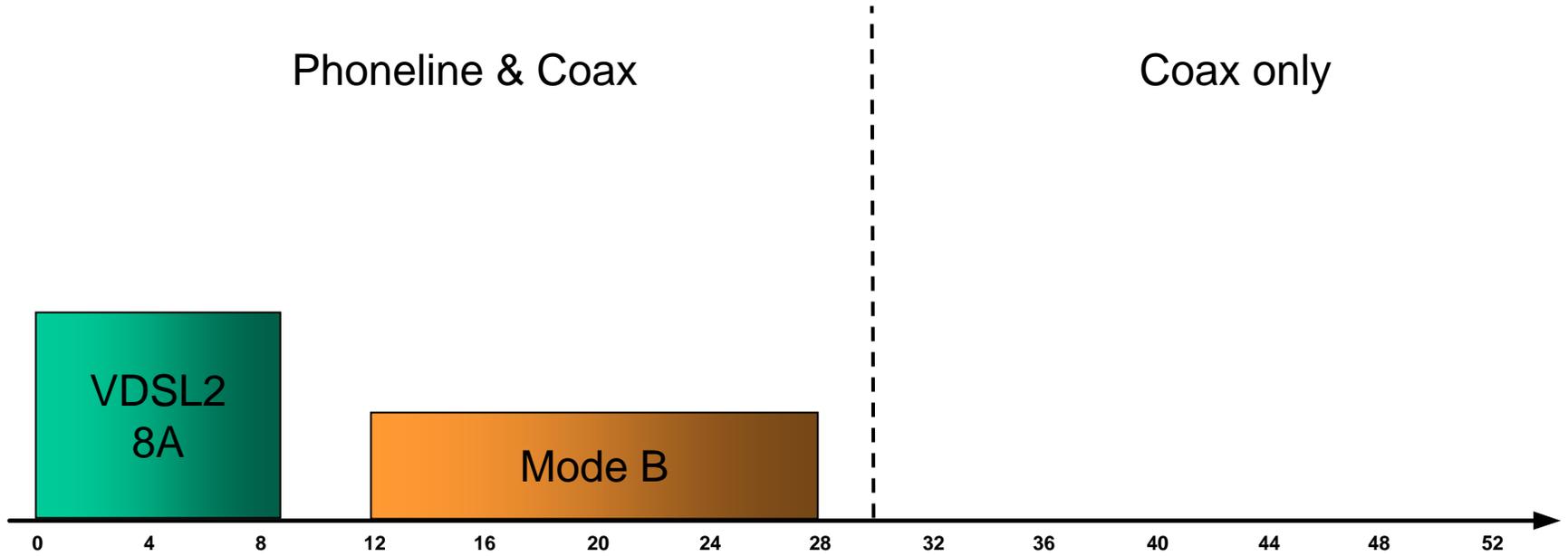
# Coexistence with ADSL

---



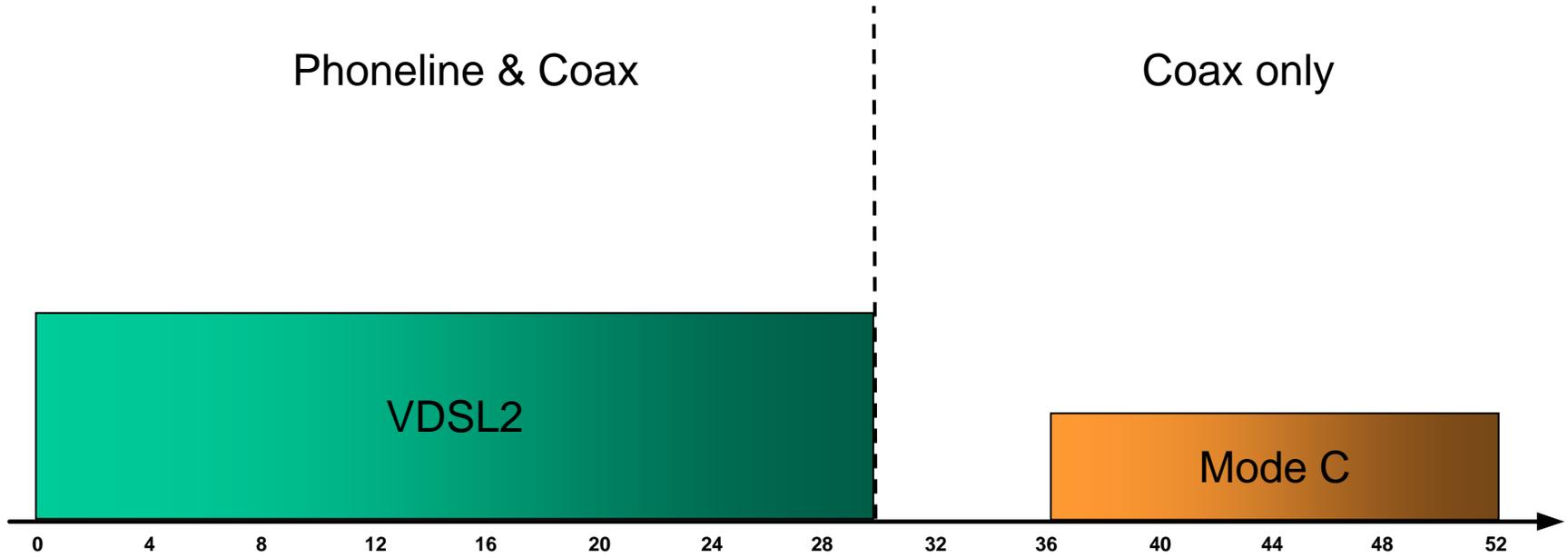
# Coexistence with VDSL 8A

---



# Coexistence with VDSL2

---



# HomePNA 3 Coexistence

---

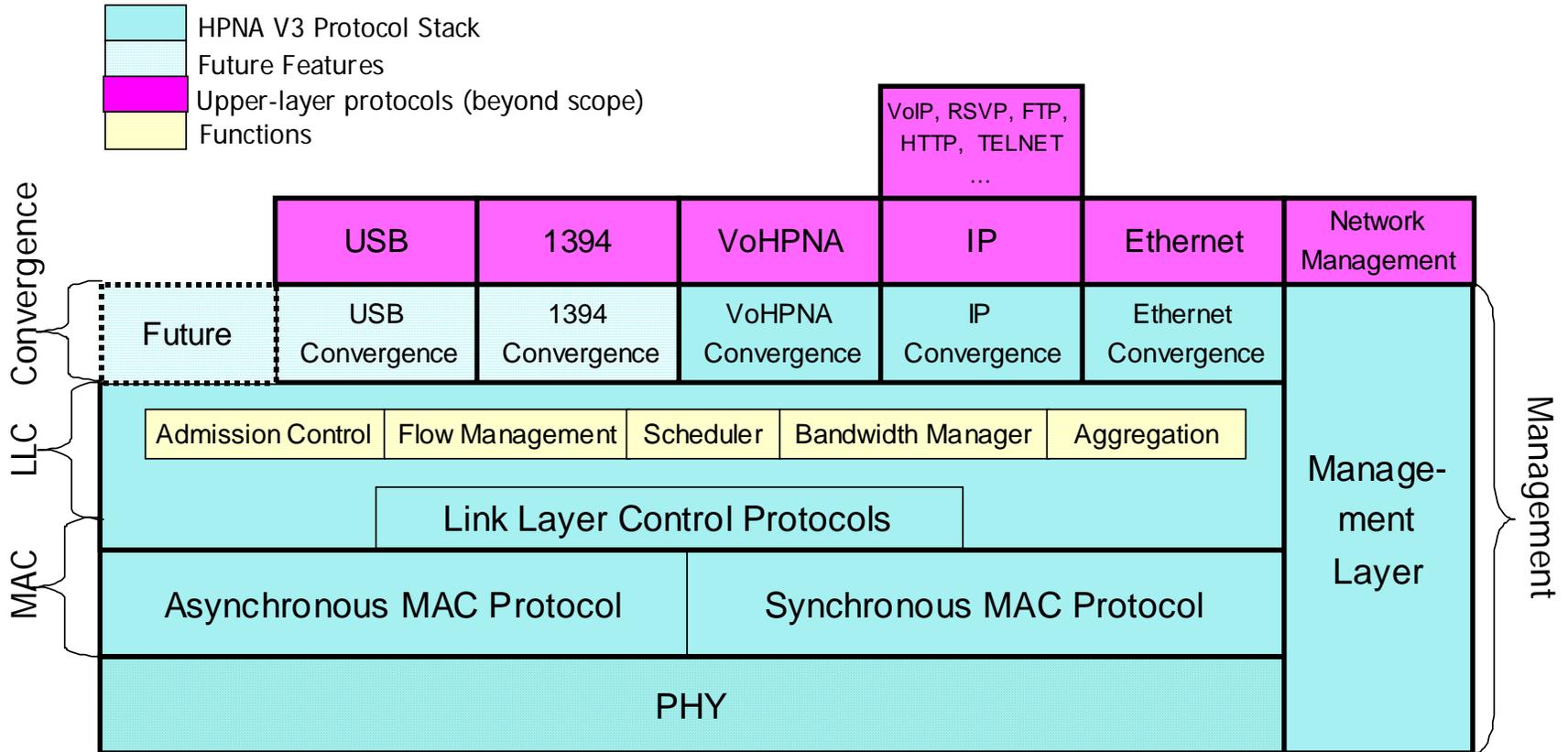
- Mode A: 4-20MHz (16MBaud)
  - Coexists with ADSL, TV-Channels
- Mode B: 12-28MHz (16MBaud)
  - Coexists with ADSL, VDSL2 8A, TV-Channels
- Mode C: 36-52MHz (16MBaud)
  - Coexists with ADSL, VDSL2, TV-Channels
  - Coexists with Mode A/B for HPNA Dual-Band
- Mode D: 4-36MHz (32MBaud)
  - Coexists with ADSL, TV-Channels
  - Interoperable with Mode A and Mode B (16MBaud)

# HPNA V3 MAC Highlights

---

- Supports both Mini-Slots and SMAC with TXOPs
- Default MAC mechanism: Mini-Slots
  - Efficient and Flexible for best-effort traffic control
  - Supports Guaranteed QoS
  - Optimized for both networking and MxU Access applications.
  - Fits both phone and coax environments
    - Eliminates the need for Collision detection. Collision detection mechanism is not applicable in coax networks due to high dynamic ranges.

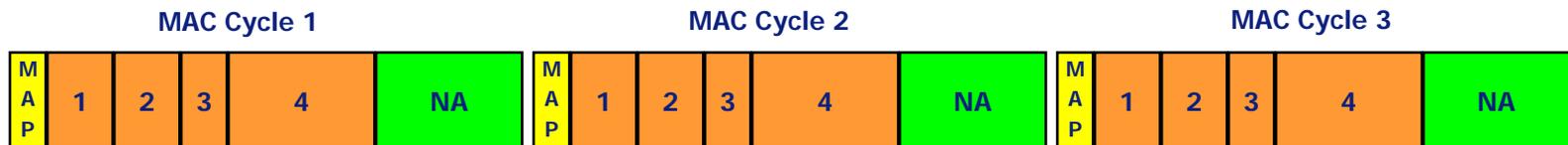
# HomePNA V3 Protocol Stack



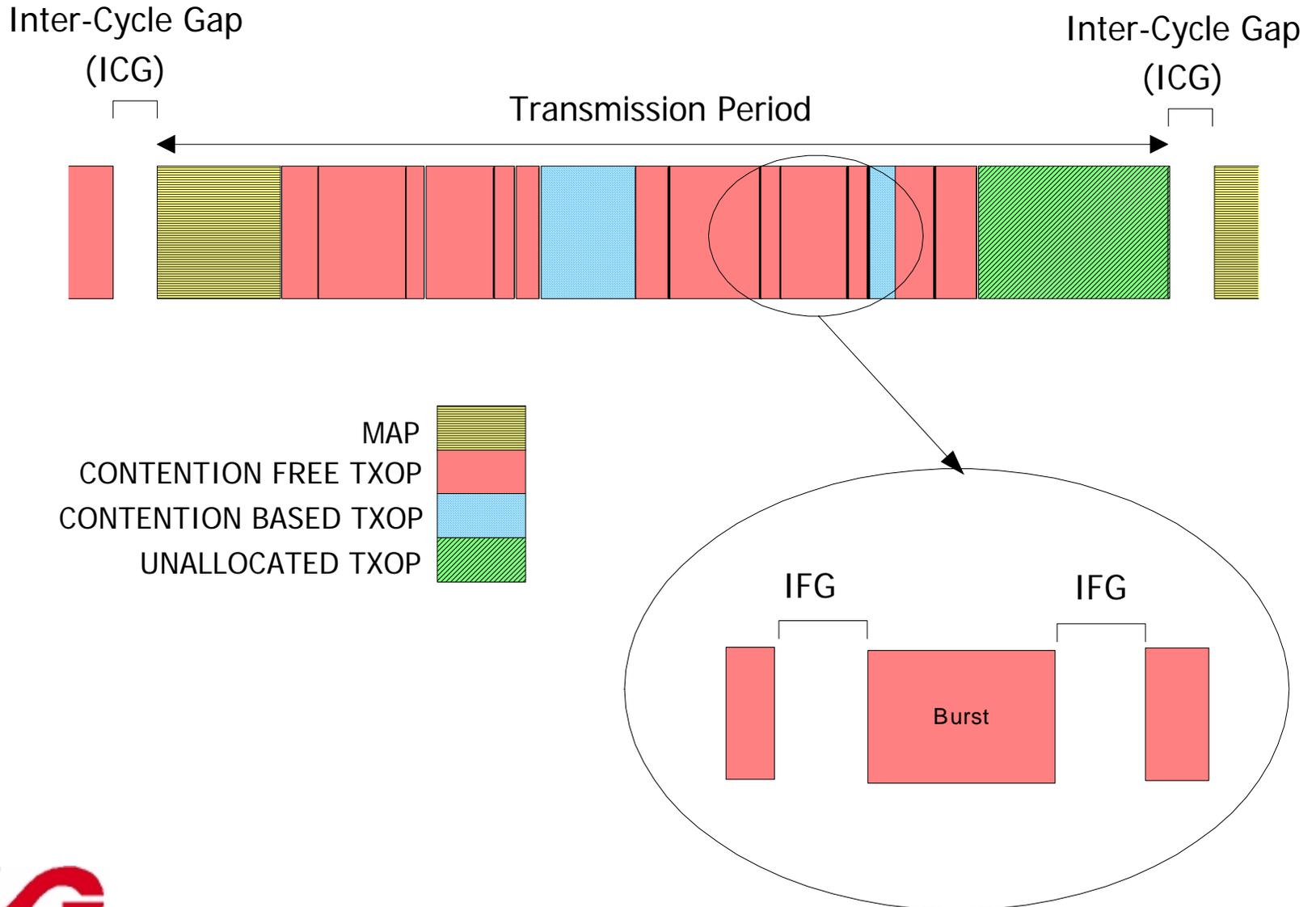
# The HomePNA V3 Protocol Layers

---

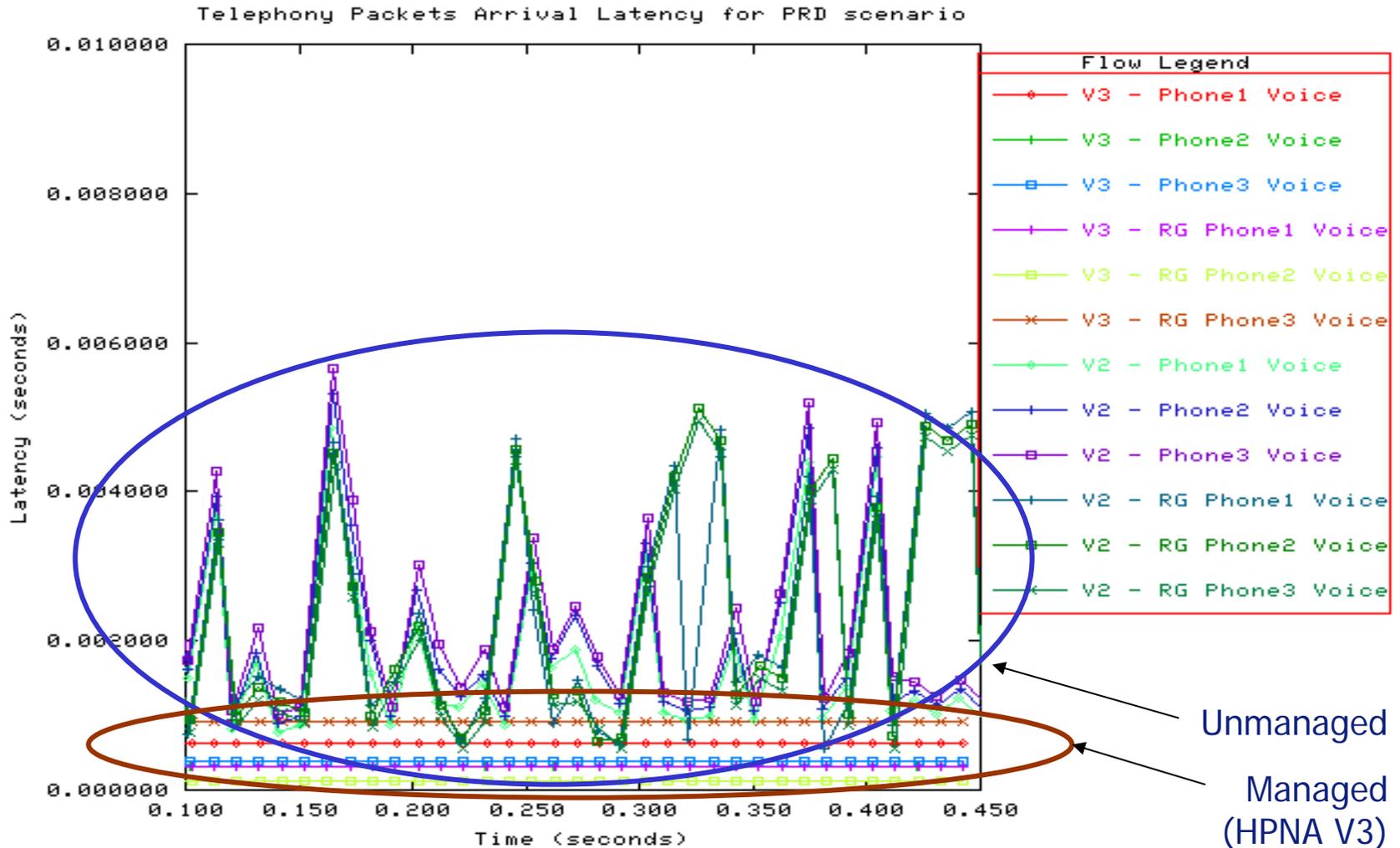
- Master-controlled, peer-to-peer communication
- Synchronous and Asynchronous MAC Protocol
  - Collision avoidance + Packet aggregation = Protocol efficiency
- Link-Layer Control Protocol
  - Flow setup, Admission Control, Rate Negotiation, MASTER Selection, LARQ
- Convergence Sublayer
  - Bridge to External Networks and Protocols
  - Network synchronization
- Local and Remote Management



# MAC Cycle Structure



# QoS Latency Results





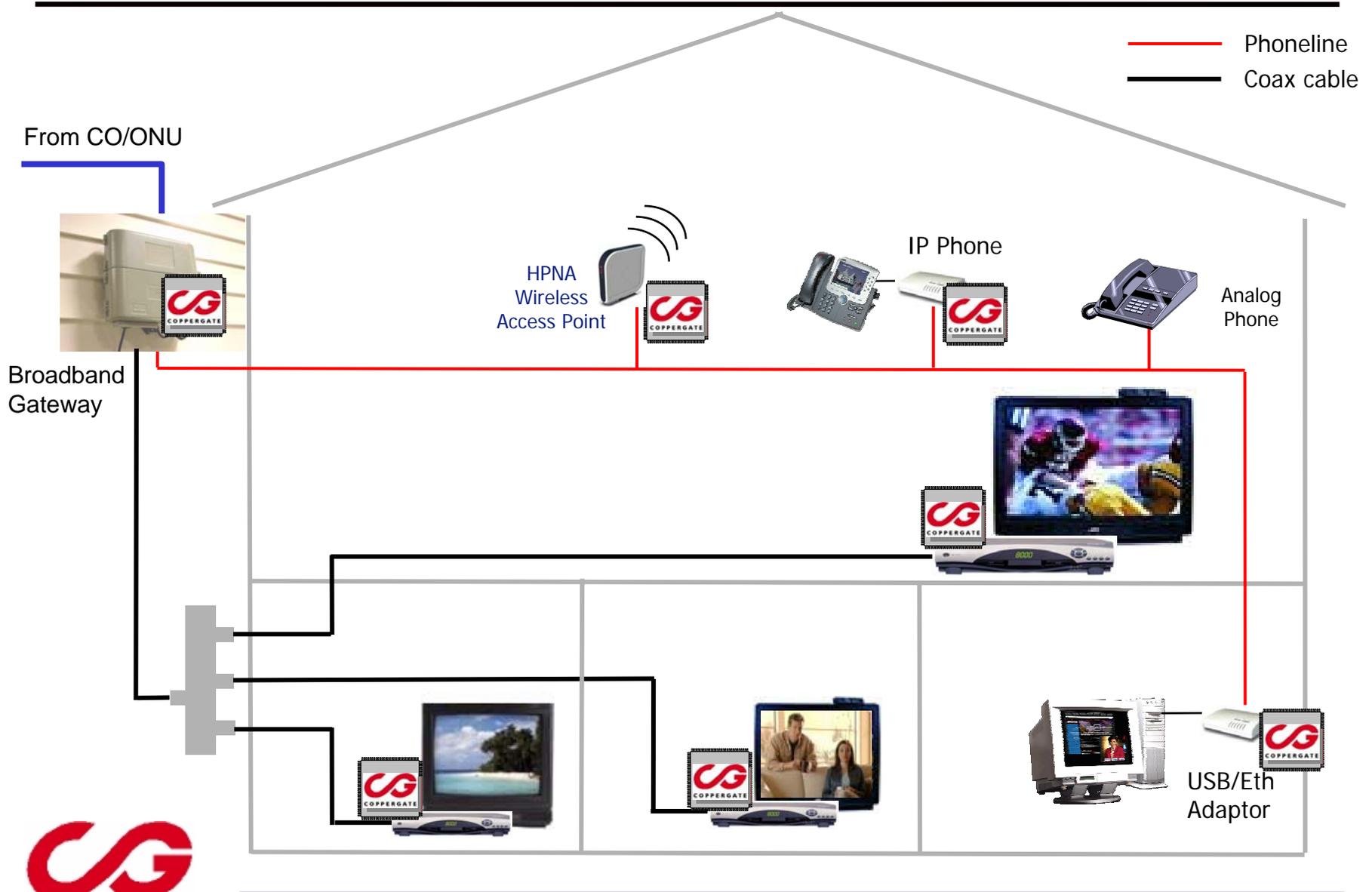
# Deployment Scenarios

# Target Applications

---

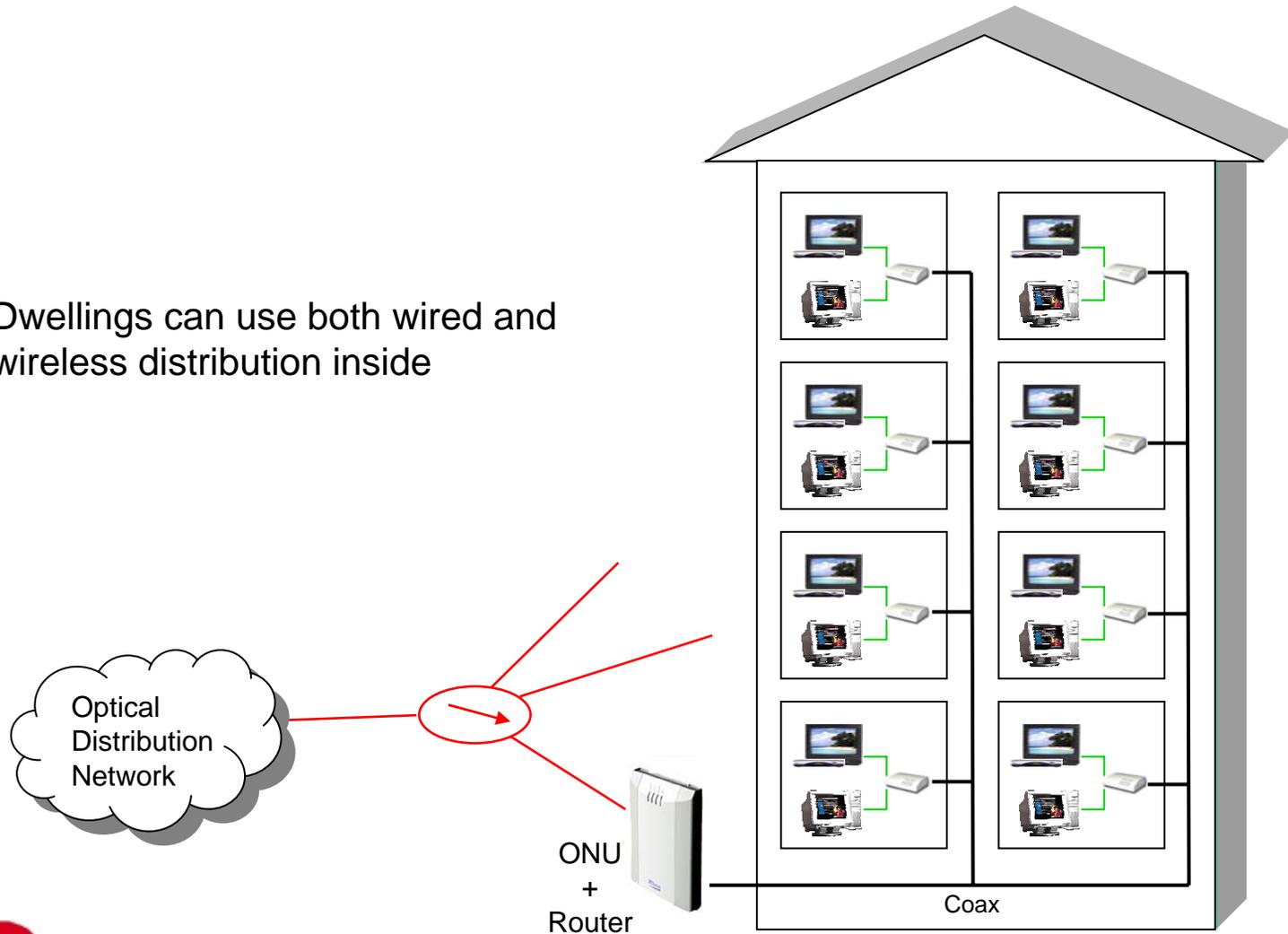
- IPTV
  - Multi-room distribution of IPTV content to multiple TVs and PCs in the home via high-speed, QoS, Plug-and-Play, "no-new-wires" network
- MDU/MTU Access Systems
  - Distribution of broadband services over existing coax wires in multiple-apartment dwelling units, hospitality environments and college campuses
- Multi Room PVR
  - For Telco's and Satellite providers

# HomePNA 3 in the "Digital Home"



# IP Services to Multiple Dwelling Units

Dwellings can use both wired and wireless distribution inside





Thank you

*[Dudi\\_b@copper-gate.com](mailto:Dudi_b@copper-gate.com)*