Open Mobile Network Interface (OMNI) Layer for an IEEE 802 HetNet: Architecture and Functionality

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*<http://standards.ieee.org/faqs/affiliationFAQ.html>

Re:

Solicitation of input contributions by IEEE 802.16's Study Group on the WirelessMAN Radio Interface in Heterogeneous Networks <http://ieee802.org/16/sg/het> for IEEE 802.16's Session #79 of 14-17 May 2012

Base Contribution:

IEEE 802.16-2-0350-00-Shet

Purpose:

The proposal requests that the HetNet Study Group review the contribution in support the OMNI Layer proposal in IEEE 802.16-12-0350-00-Shet.

WirelessMAN radio interface *in* Heterogeneous Networks

- IEEE 802.16 WG Study Group on the WirelessMAN radio interface *in* Heterogeneous Networks
- per Wikipedia (2012-05-08), the term “heterogeneous network” is “used in wireless networks using different access technologies.”
  - “For example, a wireless network which provides a service through a wireless LAN and is able to maintain the service when switching to a cellular network is called a wireless heterogeneous network.”
  - Multi-RAT network
- Can 802.16 do “Het”?
  - Multi-RAT includes other 802 radios
- Can 802.16 do “Net”?
  - above Layer 2
- Therefore, we need to look *outside* of 802.16.

IEEE 802 Scope per IEEE Std 802-2001

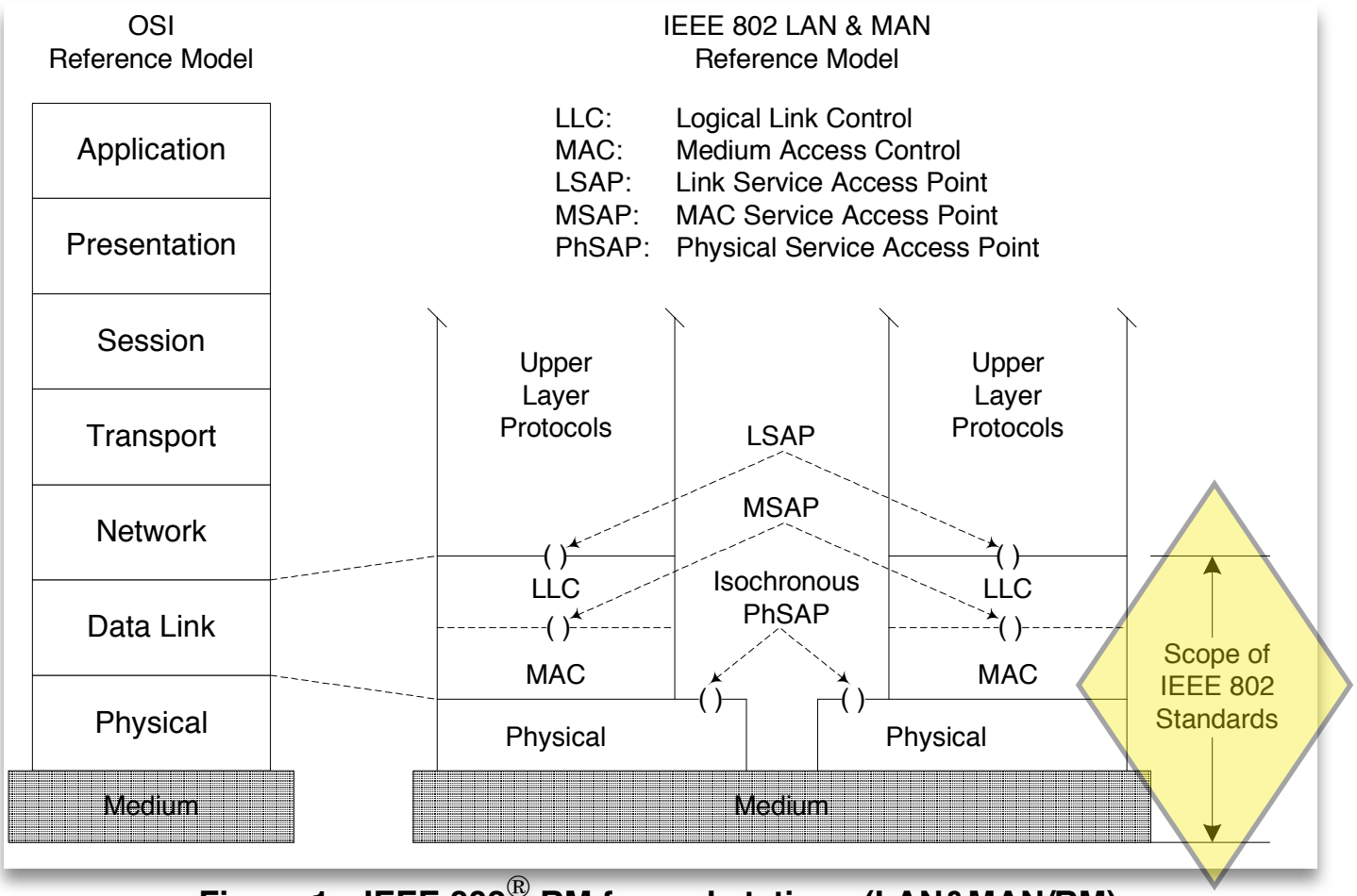


Figure 1—IEEE 802® RM for end stations (LAN&MAN/RM)

IEEE 802 Scope per IEEE P802-REV/D1.3 (Dec 2011)

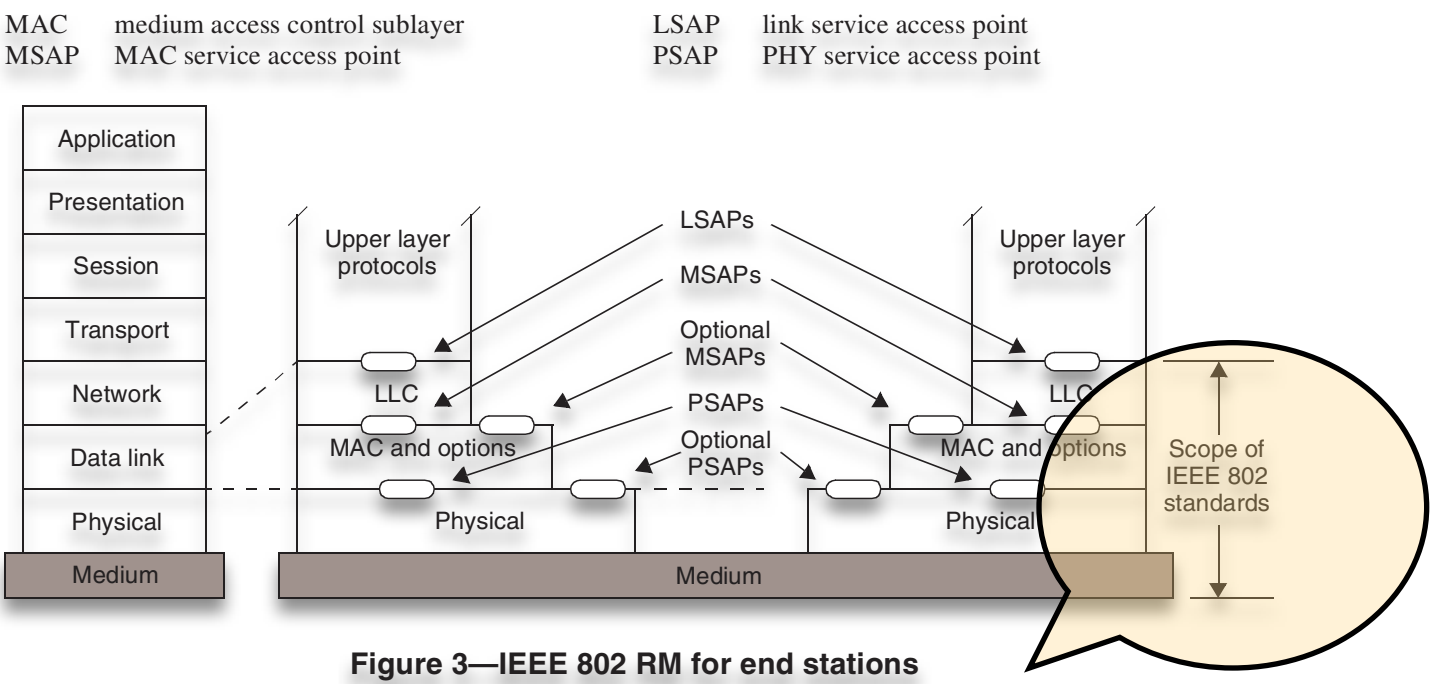
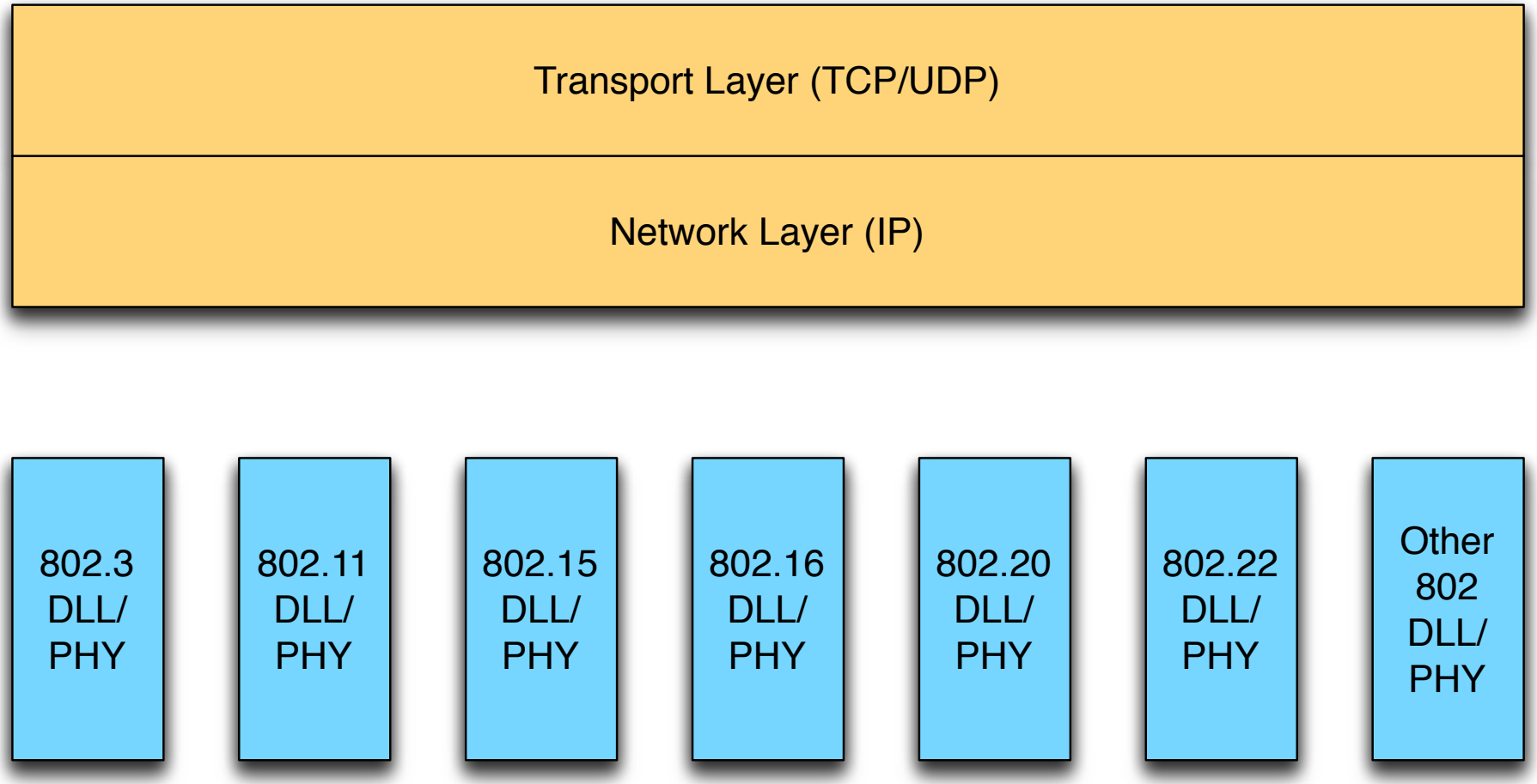


Figure 3—IEEE 802 RM for end stations

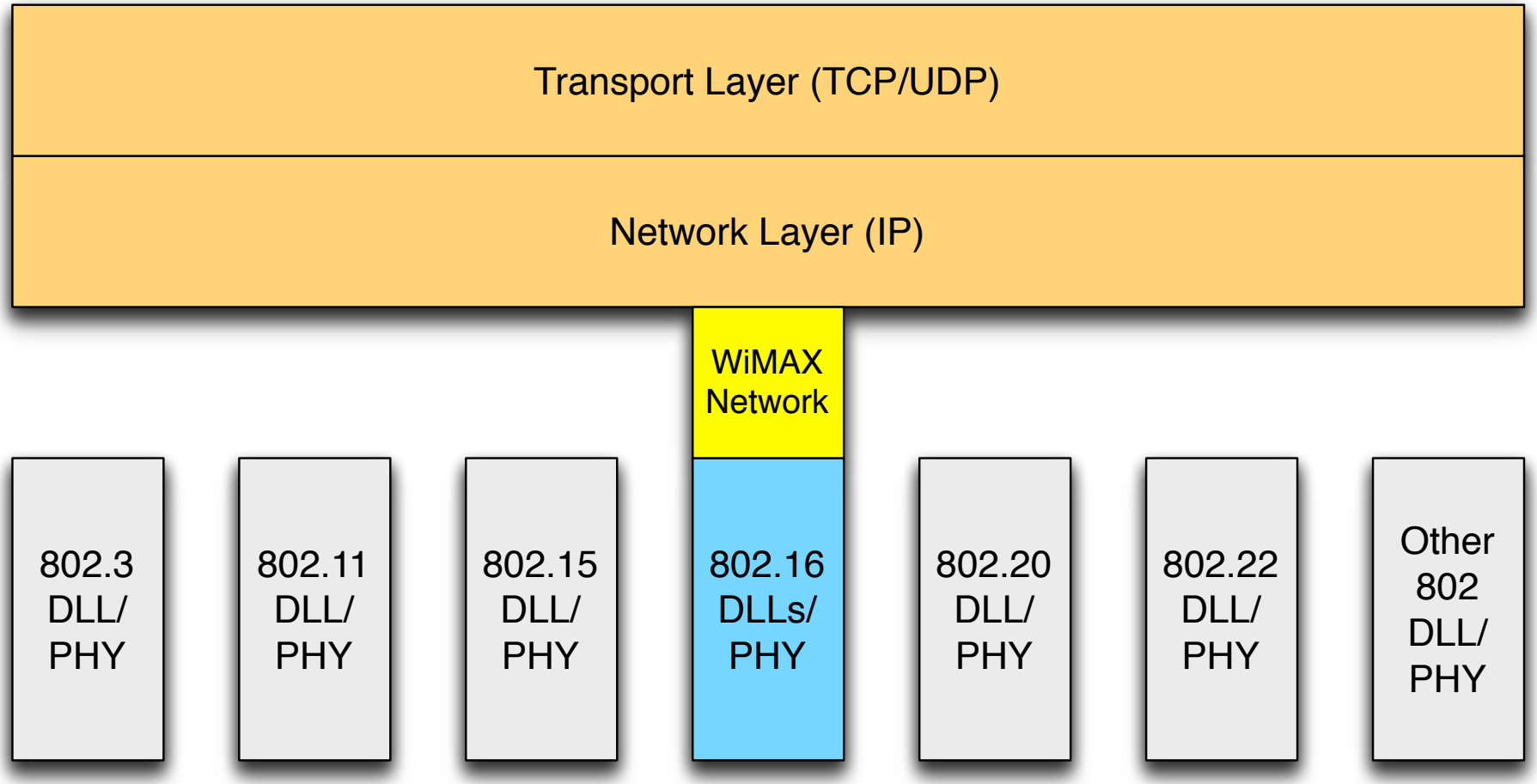
But:
(1) "The scope of 802 standards is not limited to only MAC and PHY standards."
(2) IEEE 802 ballot comment resolution agreement (March 2012):
"Remove 'Scope of IEEE 802 standards' (plus related arrows and lines) from Figure 3 on page 11."

IEEE 802 under IP, per IEEE Std 802

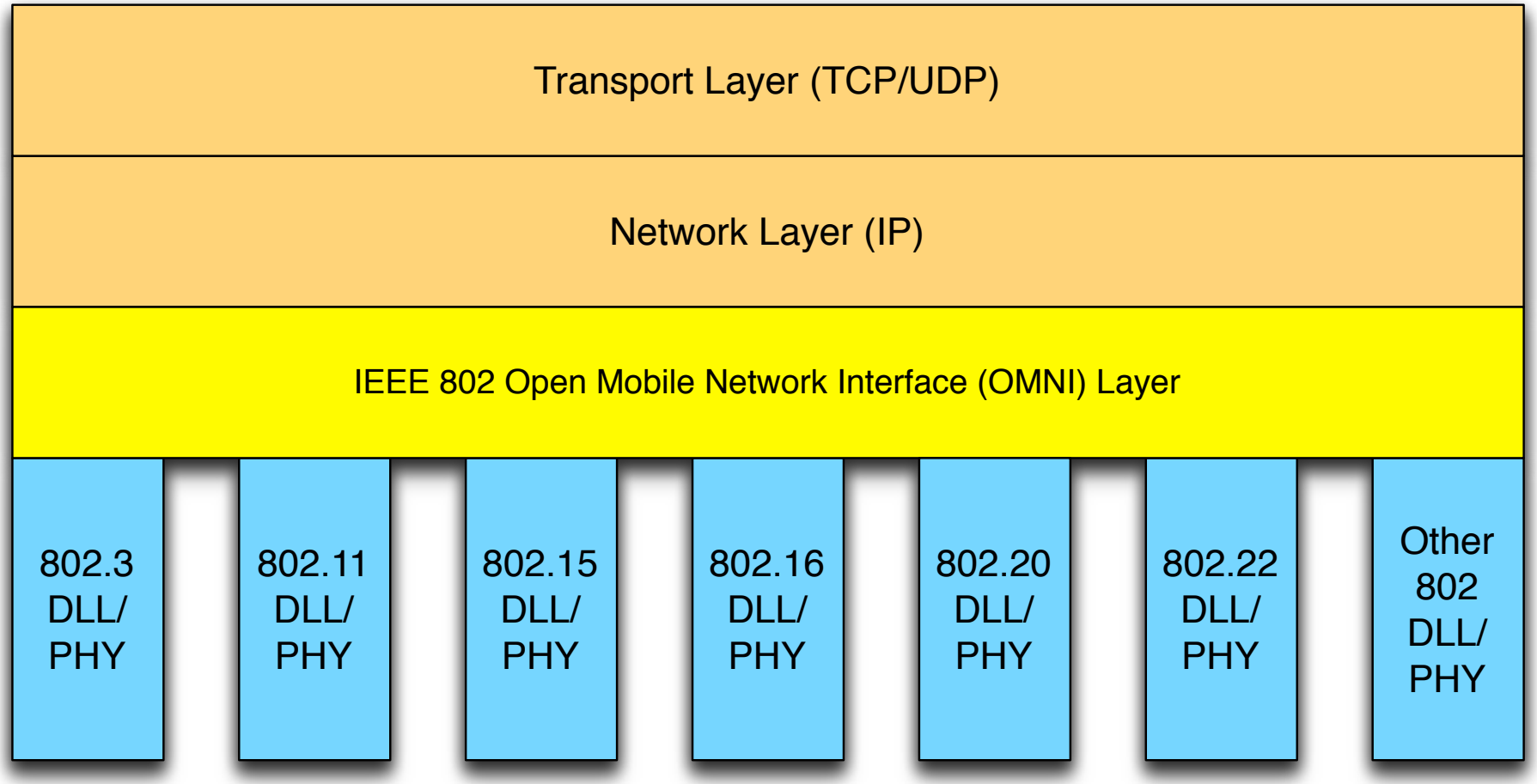
Per IEEE Std 802, this is a “family of standards”.
But is this a real family, or just a set of “roommates”?



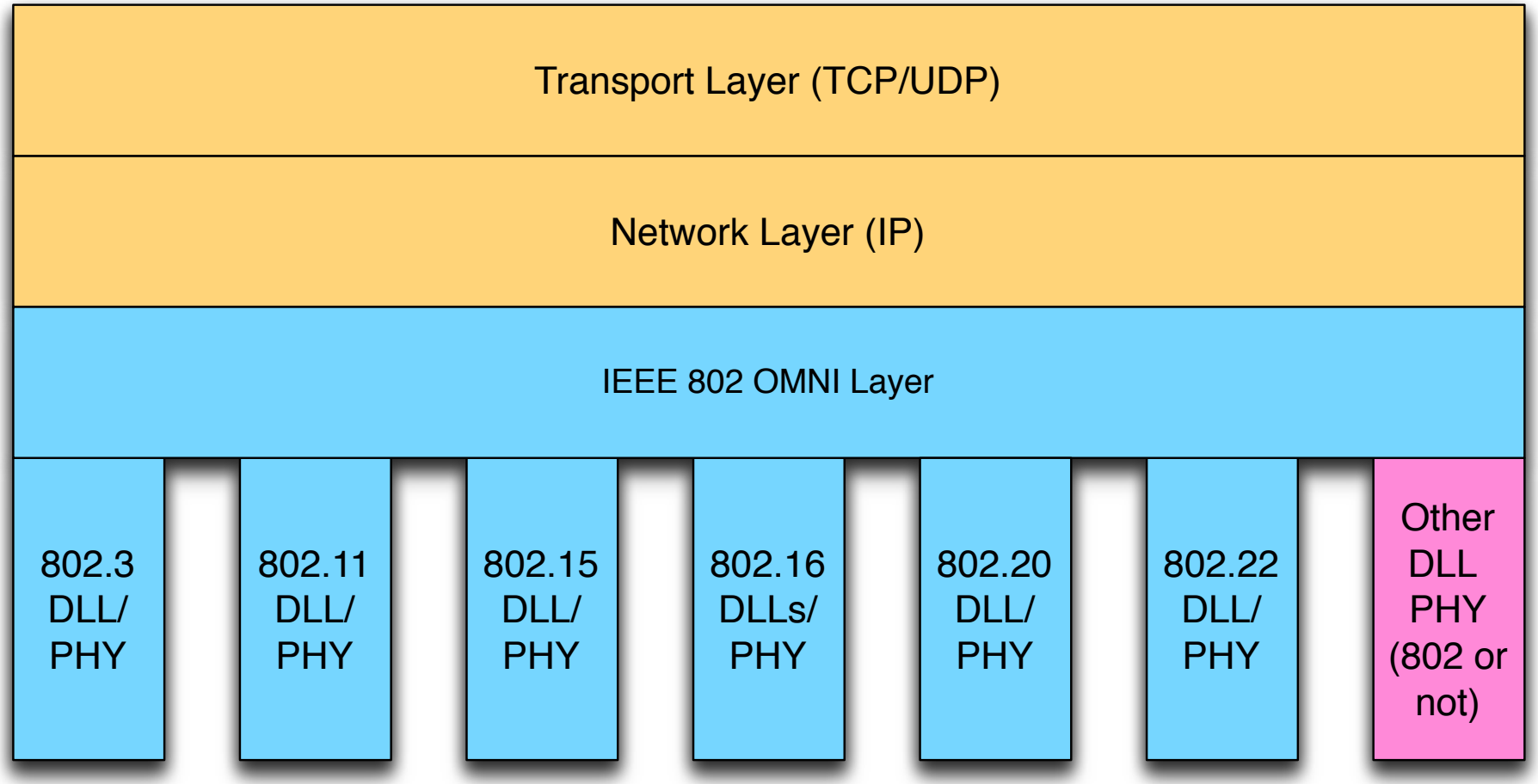
IEEE 802.16 in Practice: Deployed in a WiMAX Network



New Proposal: IEEE 802 OMNI Layer



A Real IEEE 802 Family, within a Heterogeneous Network



Target Market for the OMNI Layer

- New operators (including current wireline operators) with focus on:
  - data
  - IP connectivity
  - mobility functions, such as authentication, provisioning, handover, billing and roaming (even in fixed deployments)
  - possible heterogeneous deployments
    - should not be presupposed
    - OMNI Layer should support a successful homogeneous network based on any IEEE 802 DLL/PHY
  - no need to support non-802 legacy wireless devices
  - a lean, low-complexity network

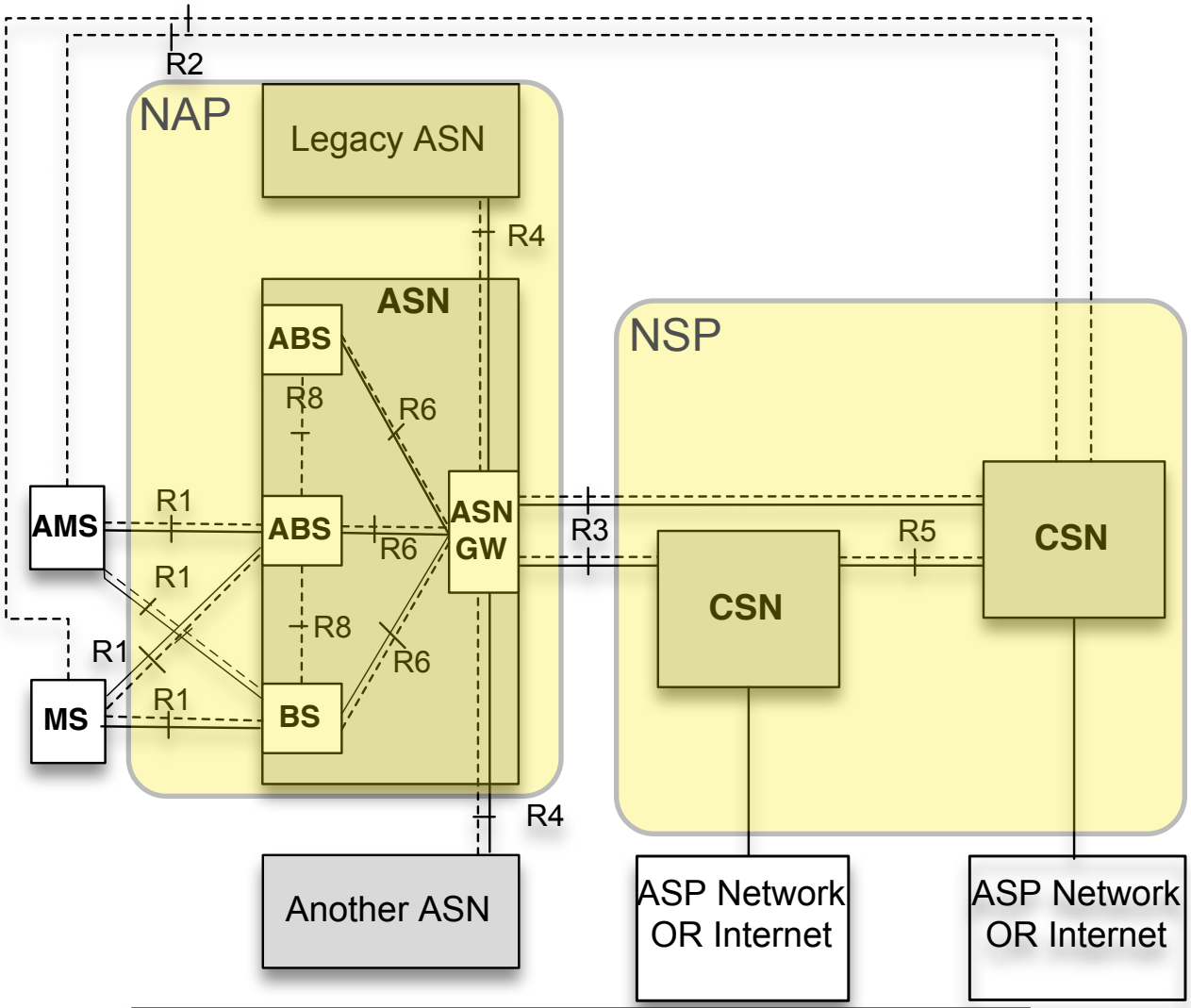
OMNI Layer Scope Considerations

- Consider existing examples of pure IP-based mobile network specifications
- Only one example:
  - WiMAX Forum Network Specifications
- WiMAX Forum Network Specifications
  - Optimized for IEEE 802.16 Air Interface
  - Could be generalized to include support for:
    - other DLL/PHY interfaces
    - heterogeneous set of interfaces

WiMAX Forum Network Specs

- Network Requirements
  - http://wimaxforum.org/resources/documents/technical/T31
- Network Architecture
  - http://wimaxforum.org/resources/documents/technical/T32
    - esp. WMF-T32-001-R020v01
- Detailed Protocols and Procedures
  - http://wimaxforum.org/resources/documents/technical/T33
    - esp. WMF-T33-001-R020v01
- Interworking
  - http://wimaxforum.org/resources/documents/technical/T37

WiMAX Forum Network Architecture



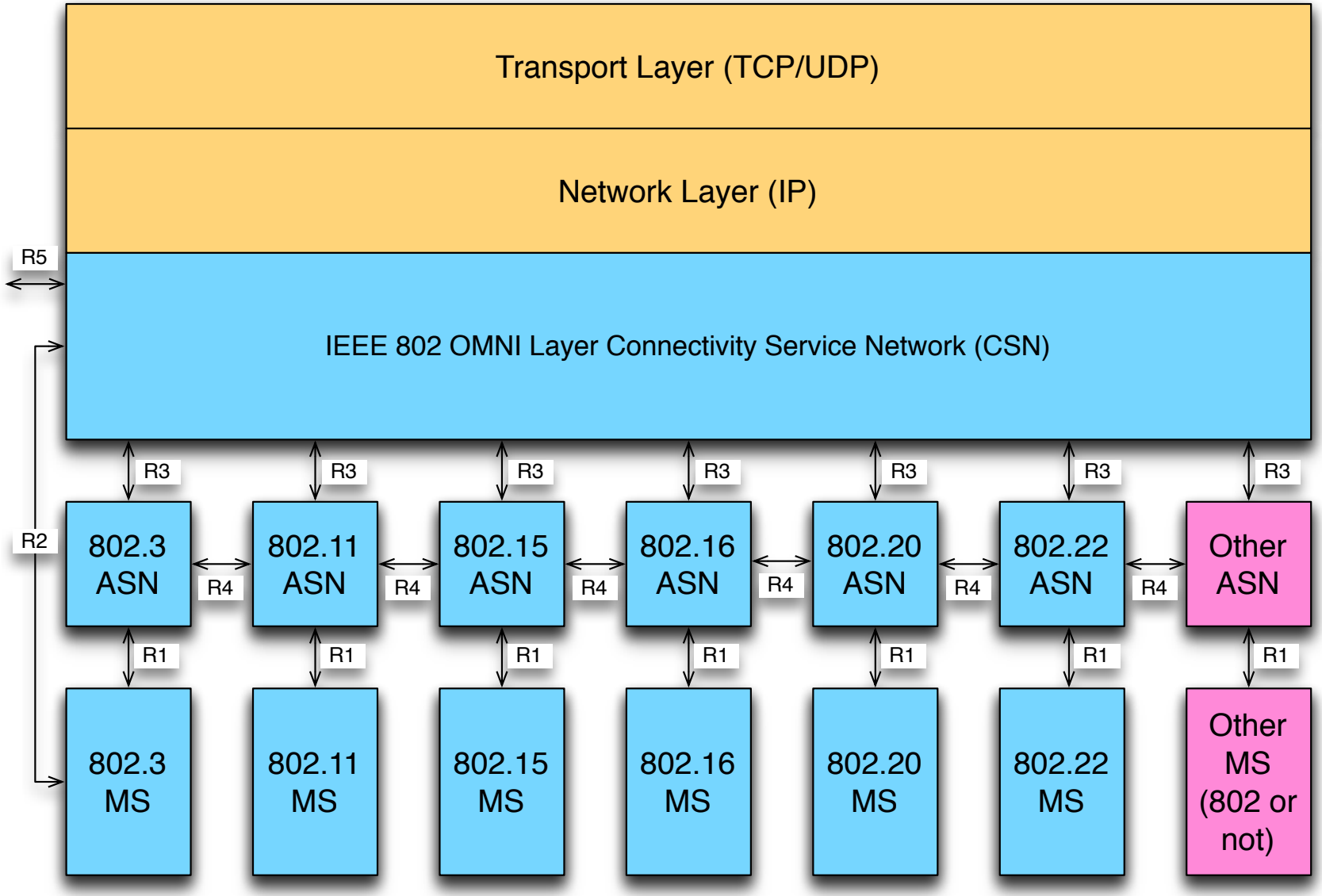
MS, AMS	Mobile Station
BS, ABS	Base Station
ASN	Access Service Network
CSN	Connectivity Service Network
ASP	Application Service Provider
GW	Gateway
NAP	Network Access Provider
NSP	Network Service Provider

WiMAX Network Architecture Tenets

See WMF-T32-001-R020v01, Clause 5 for all tenets. Just a few here:

- based on IEEE Std 802.16... use appropriate IETF RFCs and IEEE Ethernet standards
- permits decoupling of access architecture (and supported topologies) from connectivity IP services and consider network elements of the connectivity serving network (CSN) agnostic to the IEEE Std 802.16 radio specifics
- sharing of a NAP's ASN(s) by multiple NSPs
- support a single NSP providing service over multiple ASN(s) – managed by one or more NAPs
- discovery and selection of accessible NSPs by an MS
- specify open, published and accepted standards based and well-defined reference points between various groups of network functional entities
- support the most trivial scenario of a single operator deploying an ASN together with a limited set of CSN functions, so that the operator can offer basic Internet access service without ... roaming or interworking
- voice, multimedia services and other mandated regulatory services such as emergency services and lawful interception
- IP Broadcast and Multicast services

Proposed OMNI Network Architecture (schematic)



WiMAX Forum Network Functionality

- Provisioning
- Network Discovery and Selection
- Security
- Accounting, Charging, and Settlement
- SS/MS Connection Management
- Mobility Support
- QoS, Admission Control and Service Flow
- SS/MS Power Management
- Interworking and Roaming
- Radio Resource Management
- Operation, Administration, Maintenance and Provisioning
- Lawful Interception
- Location Services
- Emergency Telecommunications Service
- VoIP

OMNI Layer Network Functionality

- Draw on the key functionality provided by the WiMAX Forum network specifications.
- Provide additional services to IEEE 802 devices that allow them to be incorporated into a operator's network, including features such as authentication, provisioning, mobility management, QoS management, and roaming.
- Provide those services in a uniform manner for the whole range of IEEE 802 devices, to minimize the cost of the network and provide the flexibility of heterogeneous deployments.

Conclusion

- IEEE 802 Open Mobile Network Interface (OMNI) Layer can tie 802 devices into an family of standards within a heterogeneous network under IP.
- The functionality of the OMNI Layer should be based on a generalization of the WiMAX Forum network specifications.
- The core functionality of the OMNI Layer would be as a Connectivity Service Network (CSN).
- The OMNI Layer network architecture should be based on the WiMAX Forum network architecture.
  - ASN customized for each interface technology.
  - The ASN need not be internally modularized for the purpose of the OMNI Layer network.