Heterogeneous Networking – Setting the Scene

[IEEE 802.16 Mentor Presentation Template (Rev. 0)]

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Re:

Call for contributions for IEEE802.16 HET SG for session #79

Base Contribution:

n/a

Purpose:

Introduction of terminology and basic concepts of heterogeneous networking

Heterogeneous Networking
Setting the Scene

2012-05-09

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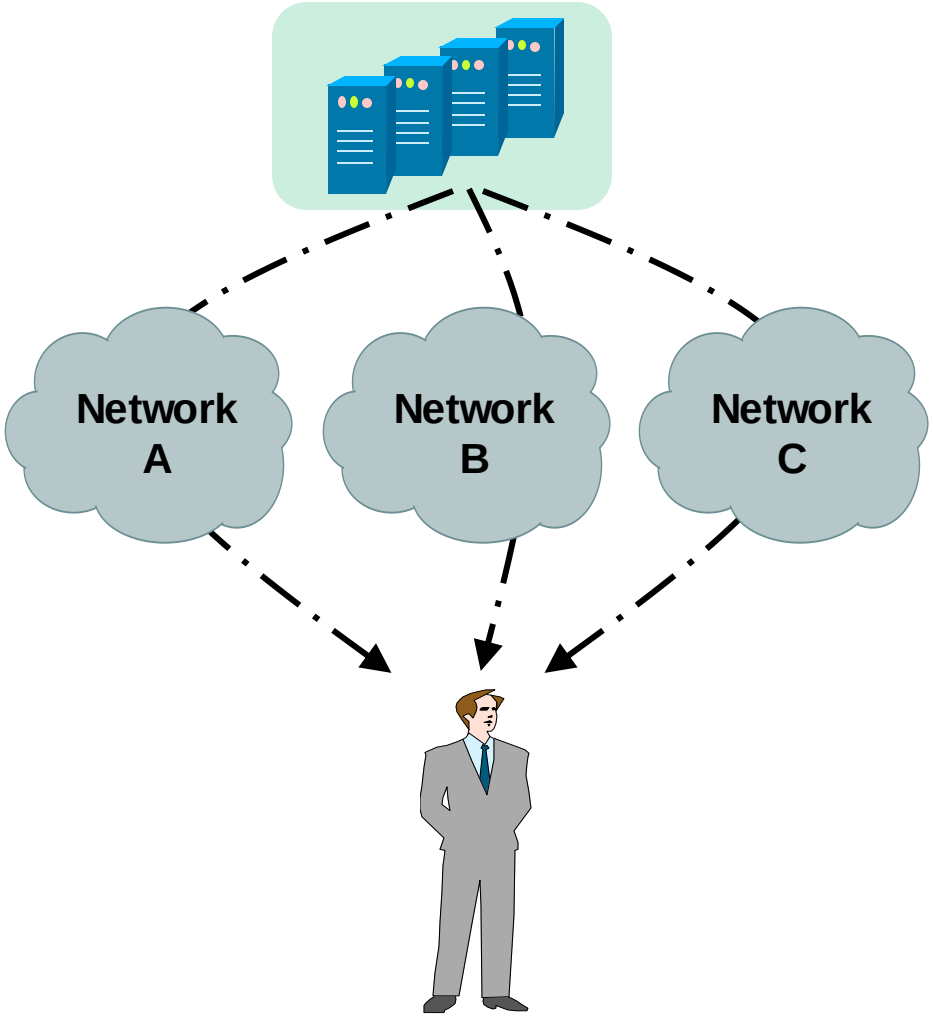
ToC

- Definiton of Heterogeneous Networking
- Heterogeneous Networks
  - Multi-Layer
  - Multi-RAT
  - Multi-Service
  - Multi-Operator
- Rationale for Heterogeneous Networking
- Heterogeneous Networking in IEEE802
  - Potential way forward

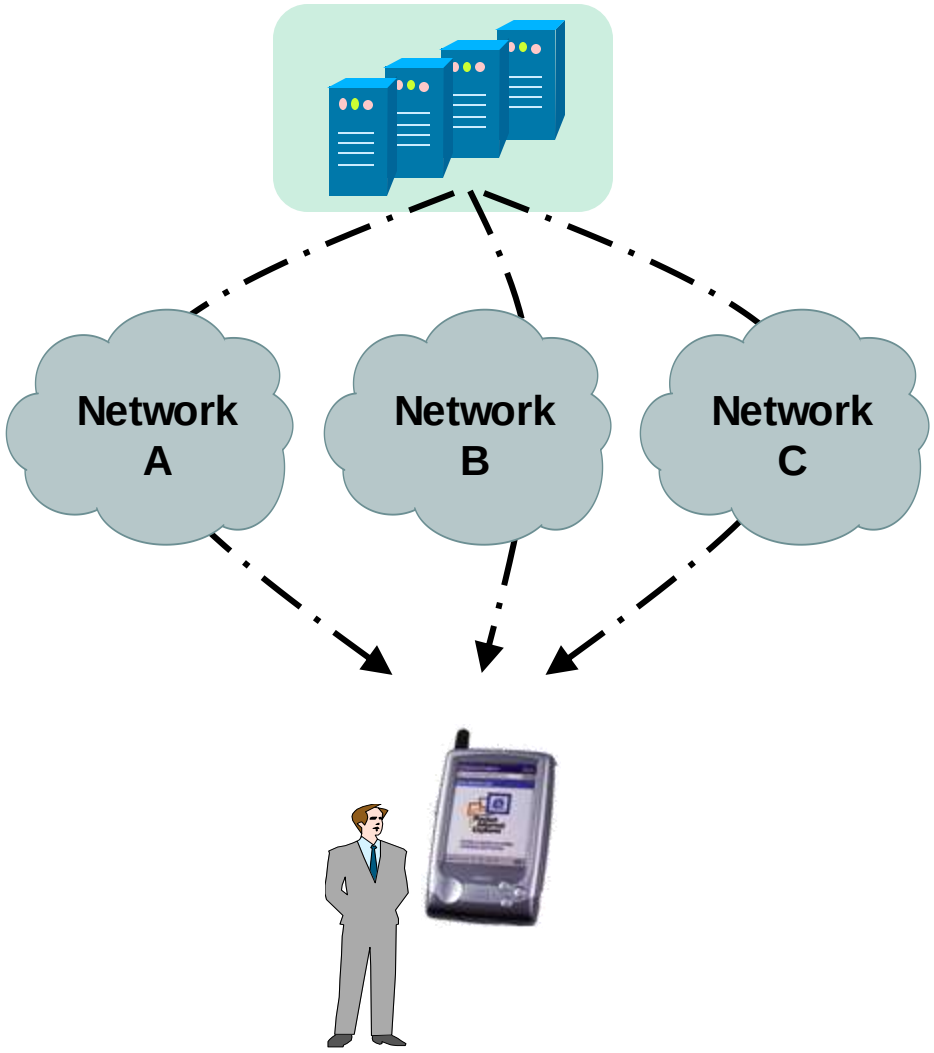
What is ‘Heterogeneous Networking’?

“Getting access to the same content or applications by different networks.”



Open: Same Terminal for all Networks?

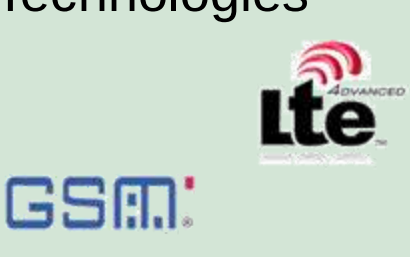
(Terminal = STA / SS / MS / UE)



What are Heterogeneous Networks?

Multi-Layer:
Various cell sizes at same or different frequency layers
(macro and micro cells, metro, pico and femto cells operating eventually in different frequency bands)

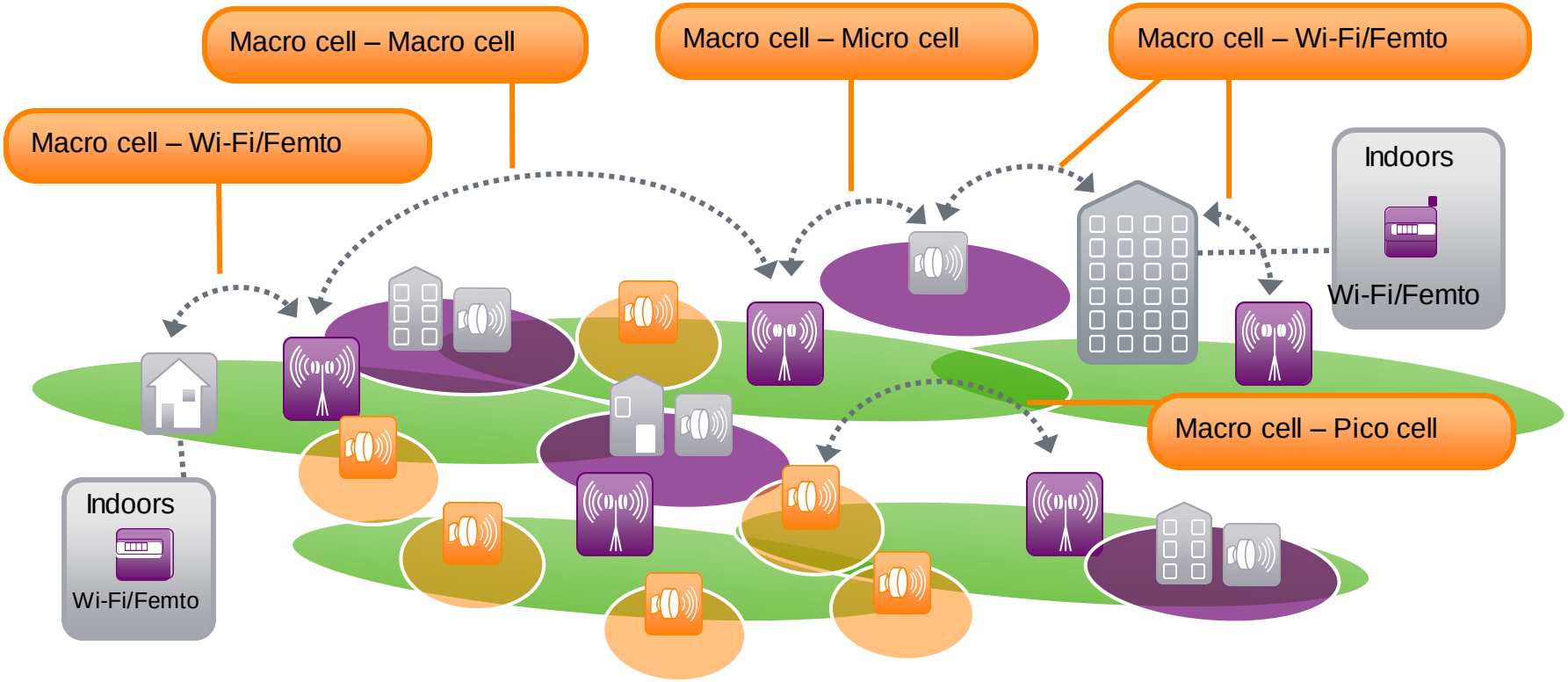
Multi-RAT:
Various Access Network Technologies



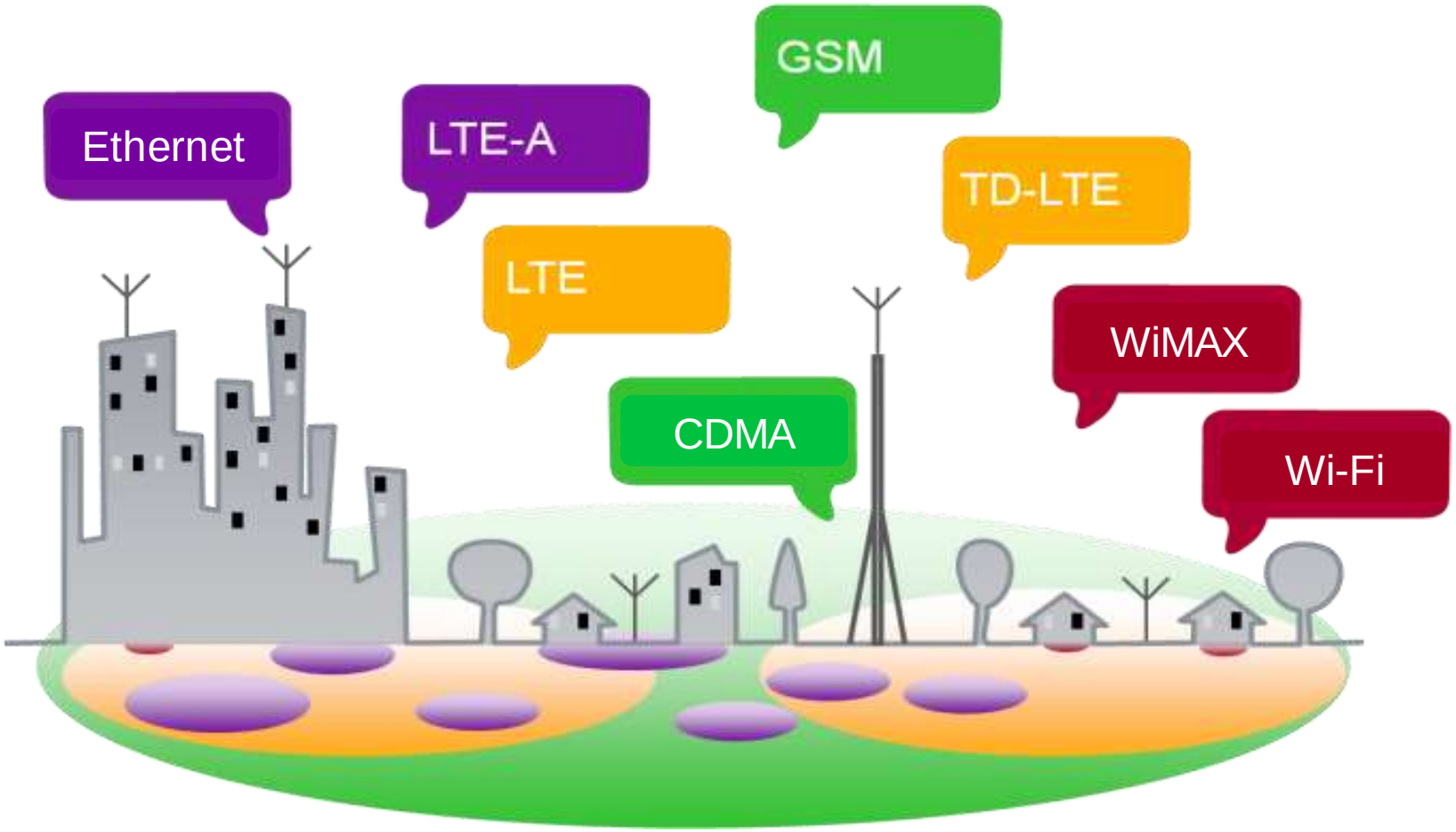
Multi-Operator:
Various operators operating parts or all of the access networks offering whole-sale of access services to other operators
(Roaming)

Multi-Service:
Various access networks providing either fixed, nomadic, portable or mobile network access

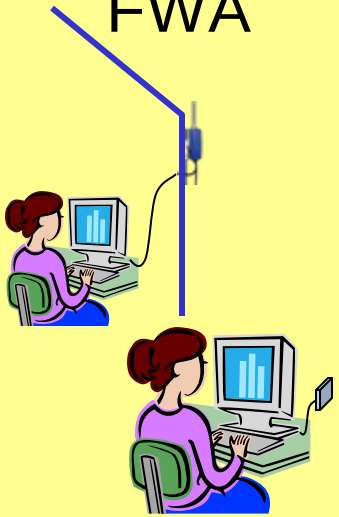
Multi-Layer Networking



Multi-RAT Networking

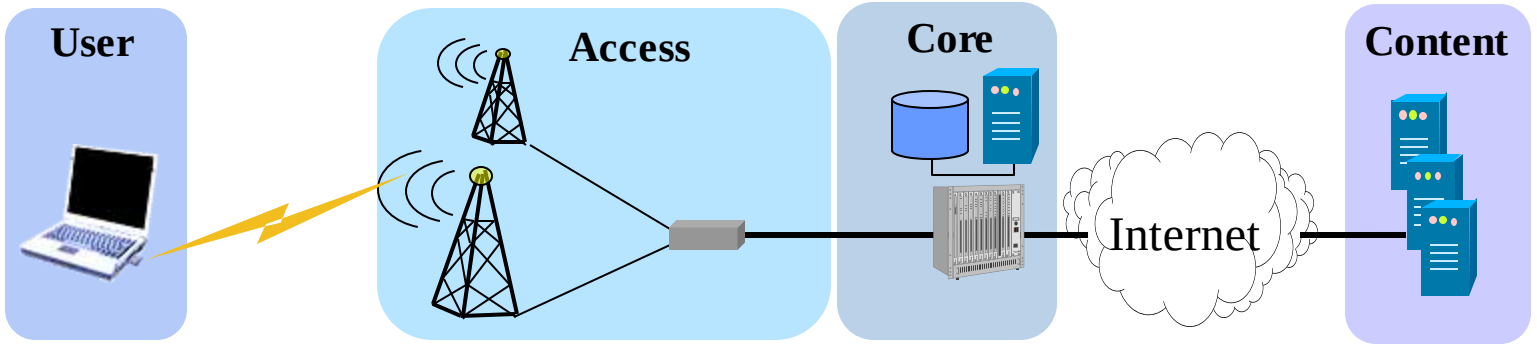


Multi-Service Networking

Fixed	Nomadic	Portable	Mobile
DSL, Cable, FWA	Fixed WiMAX Wi-Fi	Wi-Fi	Cellular
			
no session continuity		***session continuity***	***seamless handover***

Operator Relations

Access Networks for the Internet

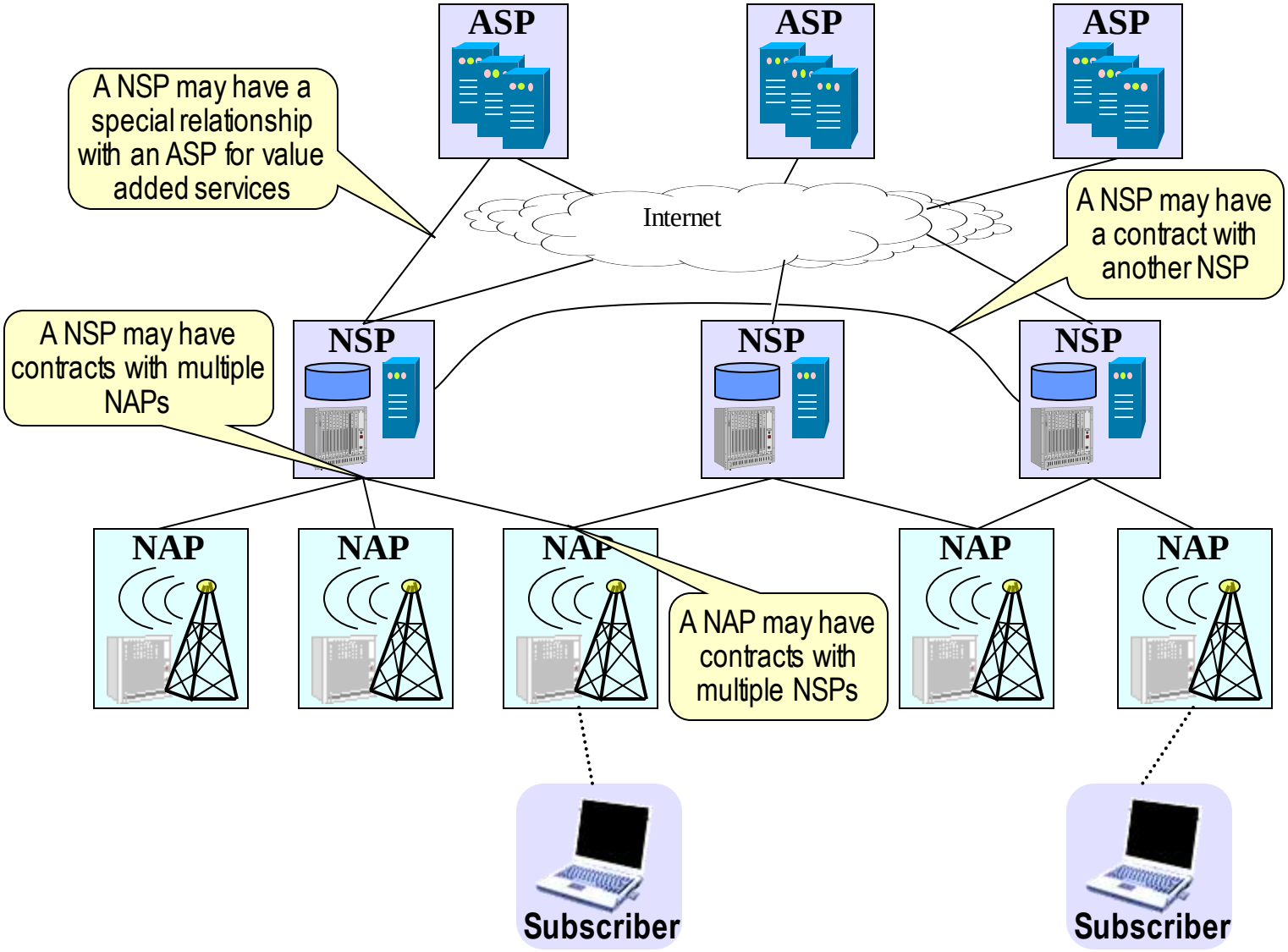


- The Internet decouples the Content from the Core
  - Split between Application Service Provider and Network Service Provider
- Often Access is not owned by Network Service Provider but operated as independent business
  - Network Access Provider does not deal with the particular subscriber but concentrates on establishment and operation of network infrastructure
  - Possibility to sell network access to multiple service providers enables economy of scale and reduces ROI

Operator Roles in the Internet

- Network Access Provider (NAP)
  - A business entity that provides radio access infrastructure to one or more Network Service Providers.
- Network Service Provider (NSP)
  - A business entity that provides IP connectivity and network services to subscribers compliant with the Service Level Agreement it establishes with sub-scribers. To provide these services, an NSP establishes contractual agreements with one or more NAPs.
  - An NSP may also establish roaming agreements with other NSPs and contractual agreements with third-party application providers (e.g. ASPs) for providing IP services to subscribers.
- ASP (Application Service Provider)
  - Provides and manages applications on top of IP
  - Provides value added services, Layer 3+ (e.g. VoIP, corporate access, ...)

Multi-Operator Networking



Why Heterogeneous Networking?

- Heterogeneous Networking is deployed for cost and performance reasons
  - Multi-Layer
    - Higher performance of cellular systems by smaller cells and better link budget
  - Multi-RAT
    - Optimized radio interfaces
  - Multi-Service
    - Reduced complexity and higher throughput when less mobility is needed
  - Multi-Operator
    - Better usage of network resources by sharing
- Heterogeneous Networking is considered as the solution for the data explosion in the mobile networks.

Heterogeneous Networking in IEEE802

- IEEE802 provides PHY and MAC of User-Network-Interfaces for
  - macro, micro, pico and femto cells
  - IEEE802.3, IEEE802.11, IEEE802.15, IEEE802.16, IEEE802.20, IEEE802.22
  - fixed, nomadic, portable and mobile service
- However, IEEE802 does not provide any specifications for inter-operator relations or higher layers of the Network-User-Interface.
- Due to the varieties of its User-Network Interfaces, heterogeneous networking seems to be a reasonable topic for IEEE802.

How to proceed?

- Is there any benefit of specifications for heterogeneous networking in IEEE802?
- Analysis necessary, what is missed by the current IEEE802 specifications:
  - Are there other specifications which can be used for IEEE802 network interfaces?
  - Would cooperation with other SDOs lead to more widely accepted/deployed standards?
  - Which SDOs would be appropriate partners?
- Who would be interested in deploying IEEE802 HetNet standards?