



# **Perspektiver på trådløs kommunikasjon**

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# Wireless perspectives

- From mountain to mountain with fire
- From ship to ship with light signalling
- Over line of sight using flags and signal stations
- Analog communication
- Analog broadcasting
- Analog cellular
- Digital communication
- Digital broadcasting
- Digital cellular
- Light
  - Infrared
  - Laser



- **Marconi demo 1896 atlantic 1901**
- **First demo of television 1927**
- **AMPS in Tokyo (Japan) 1979**
- **DVB established 1993**
- **First GSM network Radiolinja 1991**
- **First UMTS call by Nokia 1999**

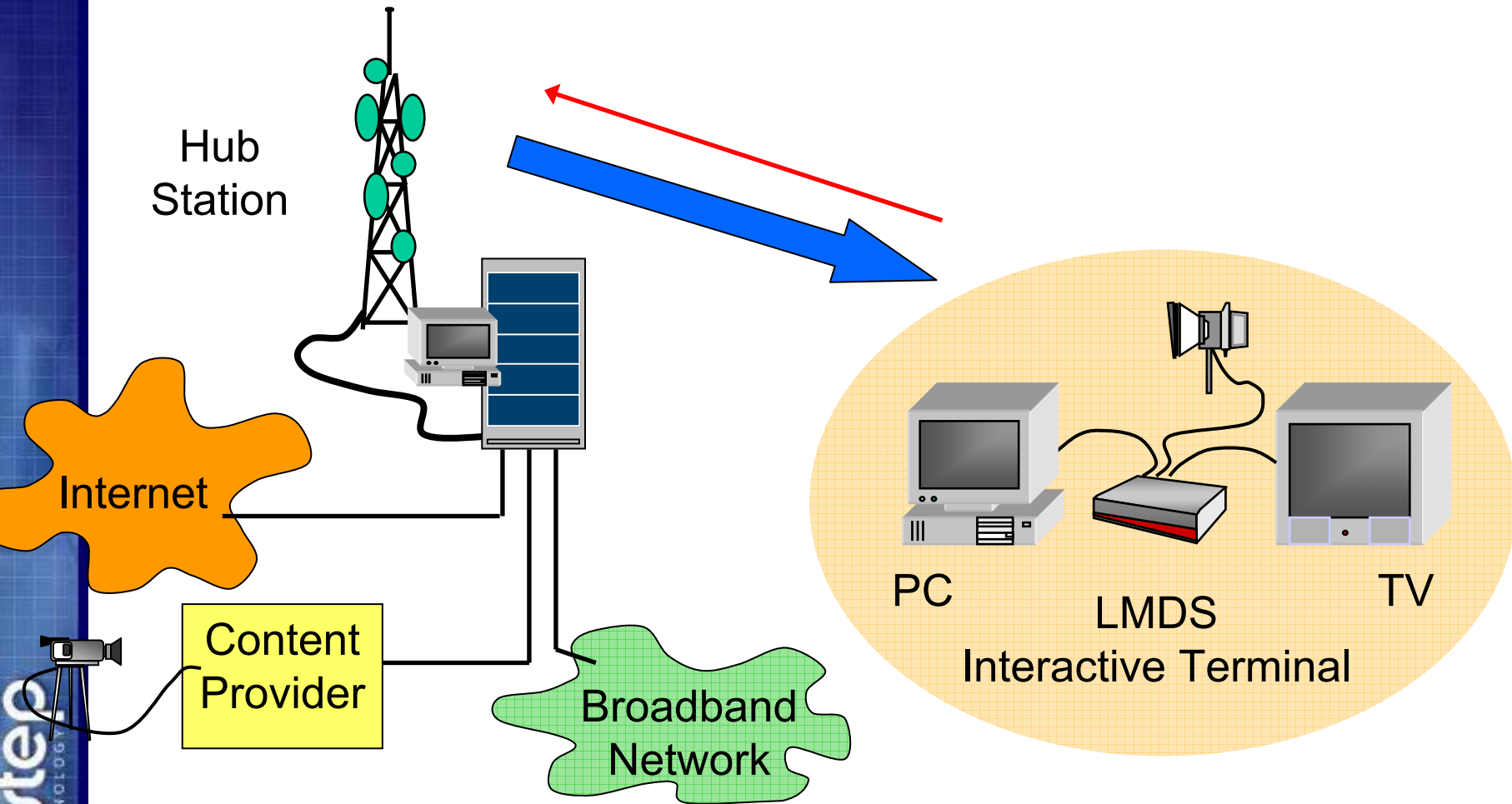
# Wireless data communication

- Physical layer
  - Radio access for stationary subscribers
  - Mobile access
  - Satellite
- Radio systems
  - PAN – ad hoc communication
  - WLAN – high speed in local area
  - 2G / 2.5G – low speed wide area
  - 3G – medium speed wide area
  - DVB – high speed broadcast, very limited uplink
- Terminals
  - Integrated radio (cellular, WLAN, bluetooth, infrared)
  - Computer capabilities
- Software
  - Operating systems with wireless capabilities
  - Security
  - Compression
  - Middleware
  - Connection managers

# Radio access to stationary subscribers

- Local Multipoint Distribution System (LMDS)
- Digital TV broadcast (DVB-T)
- IEEE 802.11a (6-45 Mbit/s)
- IEEE 802.11b (11 Mbit/s)
- IEEE 802.11g/h/i/e/n (New wireless LAN standards)
- IEEE 802.16a/e high speed radio access (WiMAX)
- IEEE 802.20 Mobile Broadband Wireless Access (MBWA)
- IEEE 802.22 Wireless Regional Area Networks

# Local Multipoint Distribution System (LMDS)



# Radio access to mobile subscribers

- Bandwidth to mobile subscribers will always be limited!
  - Most subscribers will be narrowband (except when close to base stations, such as IP zones and 3G base stations)
- Coverage strategies
  - indoor
  - spots
  - Outdoor
- DECT
- TETRA
- 2G and 2.5G systems
  - GSM - HSCSD, GPRS, EDGE
  - CDMA – IS95A – circuit switched mode, IS95B packet mode
- Satellite (Inmarsat, ICO, LOS-systems, etc)
- IEEE 802.11-based WLAN-standards now, WiMAX and other high-capacity standards in the future
- 3G systems
  - 3GPP (UMTS)
  - 3GPP2 (CDMA2000)

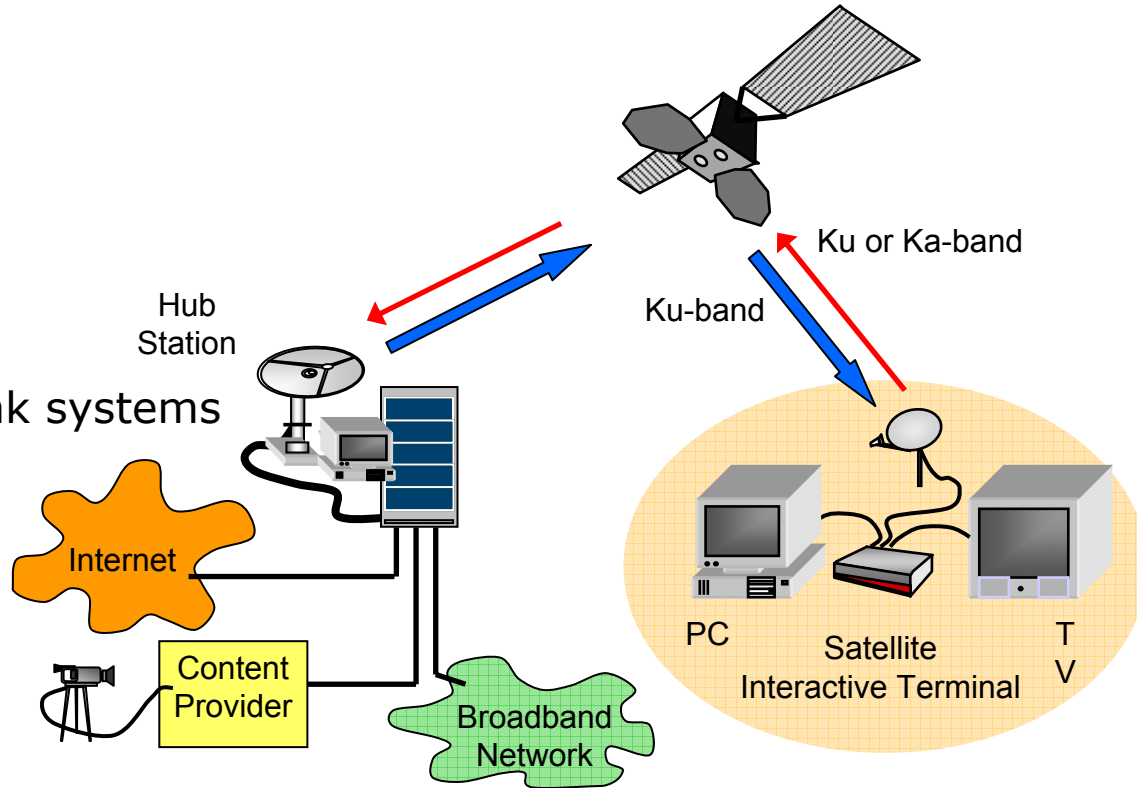
# Satellite

## Broadband

- DVB-S
- Astrolink
- VSAT
- Alternative DVB uplink systems

## Narrowband

- Inmarsat
- ICO
- TeleDesic
- GlobalStar
- Iridium



(c) Nera

# Combining access networks

At Home



ADSL/CATV  
modem  
with optional  
WLAN

Mobile Network (GPRS/UMTS)

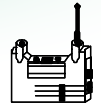
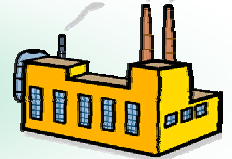
On the Move



Public WLAN Hotspots



At the Office



Corporate WLAN

Seamless roaming

Laptop with  
GPRS / WLAN



PDA with  
GPRS / WLAN



SmartPhone with  
GPRS / WLAN

# Dual radio terminals



Laptop/tablet with  
cellular / WLAN



PDA with  
cellular / WLAN



SmartPhone with  
cellular / WLAN

# Mobile Work Force

- Increased Flexibility
- Enhanced Collaboration
- Increased Productivity
- Reduced Support & Installation Costs
- Enhance Employee Satisfaction

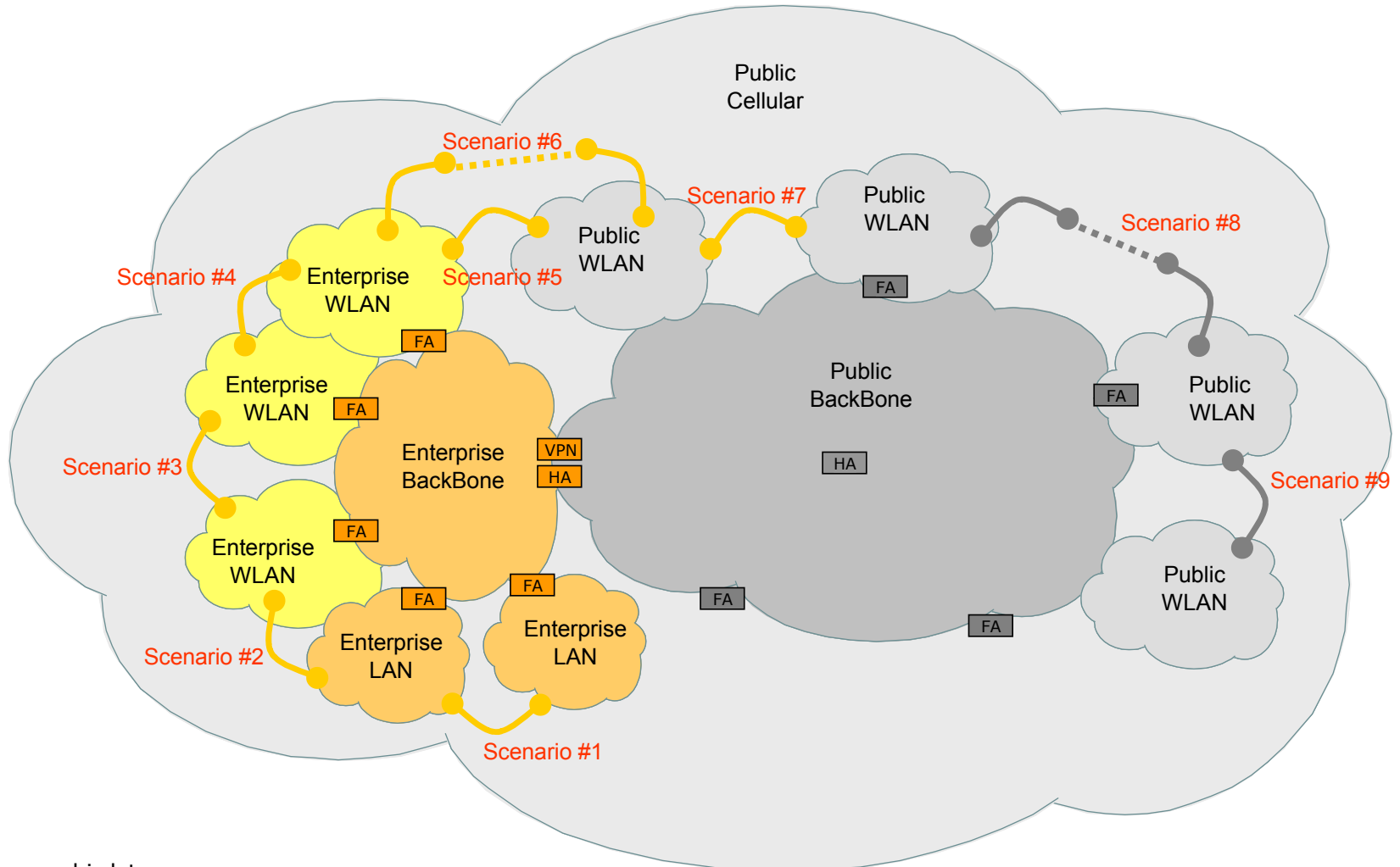


# Typical Mobile User Locations



1. In the Office – [Wired Ethernet LAN](#) and [Secure WLAN](#)
2. In the Taxi – [Cellular](#)
3. In the Hotel/Airport/Customer Office – [WLAN Guest Zone/Dialup](#)
4. In the Bus/Train – [Cellular](#)
5. In the Cafe/Library – [Public Hotspot](#)

# Seamless mobility across any access network



# End User motivation

- Ease of use
  - The number of access networks and access methods complicates wireless network access
  - Lack of simplicity reduce customers willingness to use public wireless networks
- Increased service expectations
  - Broadband at work (Ethernet/WLAN)
  - Broadband at home (ADSL/CATV/WLAN)
  - We get used to receive 10 MB Powerpoint files!!
- Intranet everywhere
  - Mobile workers need secure access to reach their critical information
  - Security and simplicity is a must – automatic VPN
- Simplify connection
  - Always best connected
  - Use and configure wireless networks
- Manage cost

# New applications

- Enterprise mobility
  - Email/PIM
  - Camera applications
  - CRM
  - ERP
  - Bluecollar workers
- Consumer applications
  - Networked games
  - Chat
  - Mobile TV
- Location based services
- Voice over IP

# Conclusion

- New terminals
  - New access networks
  - New middleware
  - New applications
- 
- Key elements of a successful solution, always using the best available network
    - Security
    - Mobility
    - Adaptivity
    - Compression
    - Connection management
    - Cost control