

# Mobile Computing

## Lecture 18

### Wireless LAN 3



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- ATM
- Basic principle
- Cell-based transmission
- WATM services
- BRAN
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## Some history: Why wireless ATM?



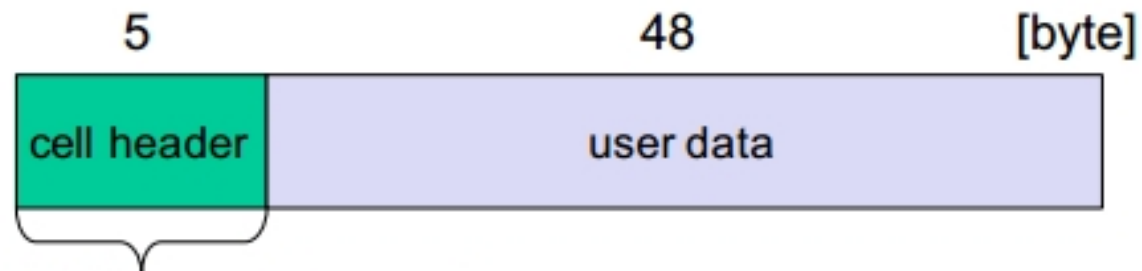
- seamless connection to wired ATM, an integrated services high-performance network supporting different types of traffic streams
- ATM networks scale well: private and corporate LANs, WAN
- B-ISDN uses ATM as backbone infrastructure and integrates several different services in one universal system
- Mobile phones and mobile communications have increasing importance in everyday life
- Current wireless LANs do not offer adequate support for multimedia data streams
- Merging mobile communication and ATM leads to wireless ATM from a telecommunication provider point of view
- Goal: seamless integration of mobility into B-ISDN

# ATM - basic principle



- favored by the telecommunication industry for advanced high-performance networks, e.g., B-ISDN, as transport mechanism
- statistical (asynchronous, on demand) TDM (ATDM, STDN)
- cell header determines the connection the user data belongs to
- mixing of different cell-rates is possible
  - different bit-rates, constant or variable, feasible
- interesting for data sources with varying bit-rate:
  - e.g., guaranteed minimum bit-rate
  - additionally bursty traffic if allowed by the network

ATM cell:



connection identifier, checksum etc.

# Cell-based transmission

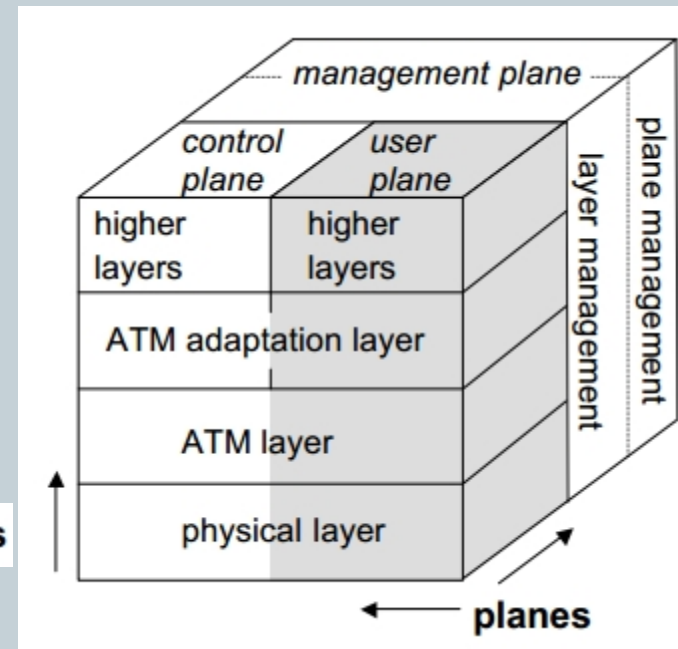


- asynchronous, cell-based transmission as basis for ATM
- continuous cell-stream
- additional cells necessary for operation and maintenance of the network (OAM cells; Operation and Maintenance)
- OAM cells can be inserted after fixed intervals to create a logical frame structure
- if a station has no data to send it automatically inserts idle cells that can be discarded at every intermediate system without further notice

# B-ISDN protocol reference model

## 3 dimensional reference model

- three vertical planes (columns)
  - user plane
  - control plane
  - management plane
- three hierarchical layers
  - physical layer
  - ATM layer
  - ATM adaptation layer
- Out-of-Band-Signaling: user data is transmitted separately from control information



# ATM Forum Wireless ATM Working Group



- ATM Forum founded the Wireless ATM Working Group June 1996
  - Task: development of specifications to enable the use of ATM technology also for wireless networks with a large coverage of current network scenarios (private and public, local and global)
  - compatibility to existing ATM Forum standards important
  - it should be possible to easily upgrade existing ATM networks with mobility functions and radio access
  - two sub-groups of work items
1. Radio Access Layer (RAL) Protocols
    - radio access layer
    - wireless media access control
    - wireless data link control
    - radio resource control
    - handover issues
  2. Mobile ATM Protocol Extensions
    - handover signaling
    - location management
    - mobile routing
    - traffic and QoS Control
    - network management

# WATM services



## Office environment

- multimedia conferencing, online multimedia database access

## Universities, schools, training centers

- distance learning, teaching

## Industry

- database connection, surveillance, real-time factory management

## Hospitals

- reliable, high-bandwidth network, medical images, remote monitoring

## Home

- high-bandwidth interconnect of devices (TV, CD, PC, ...)

## Networked vehicles

- trucks, aircraft etc. interconnect, platooning, intelligent roads

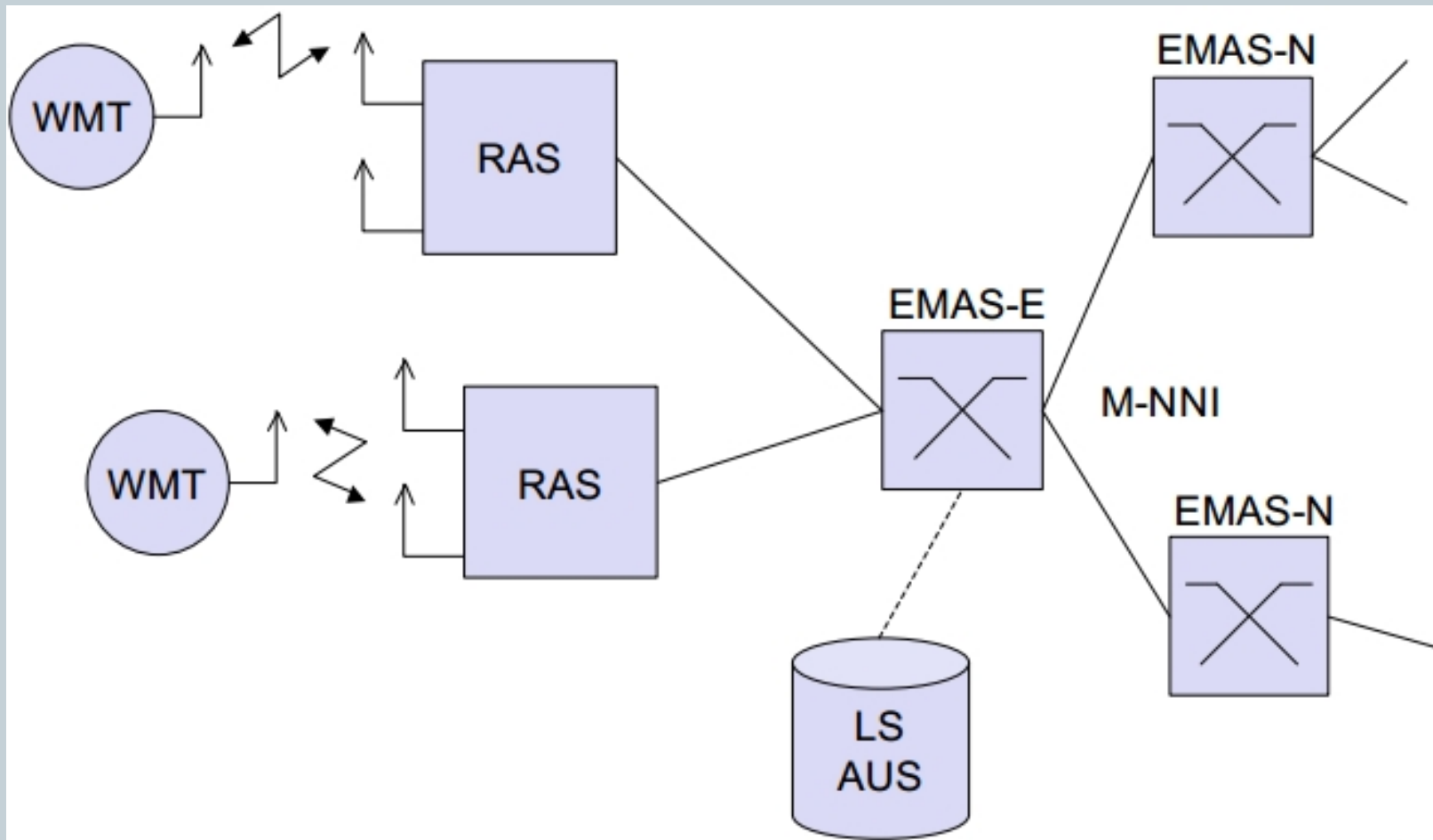


# WATM components



- WMT (Wireless Mobile ATM Terminal)
- RAS (Radio Access System)
- EMAS-E (End-user Mobility-supporting ATM Switch - Edge)
- EMAS-N (End-user Mobility-supporting ATM Switch - Network)
- M-NNI (Network-to-Network Interface with Mobility support)
- LS (Location Server)
- AUS (Authentication Server)

# Reference model



# BRAN – Broadband Radio Access Networks



## Motivation

- deregulation, privatization, new companies, new services
- How to reach the customer?
  - alternatives: xDSL, cable, satellite, radio

## Radio access

- flexible (supports traffic mix, multiplexing for higher efficiency, can be asymmetrical)
- quick installation
- economic (incremental growth possible)

## Market

- private customers (Internet access, tele-xy...)
- small and medium sized business (Internet, MM conferencing, VPN)

## Scope of standardization

- access networks, indoor/campus mobility, 25-155 Mbit/s, 50 m-5 km
- coordination with ATM Forum, IETF, ETSI, IEEE, ....

# Broadband network types



## Common characteristics

- ATM QoS (CBR, VBR, UBR, ABR)

## HIPERLAN/2

- short range (< 200 m), indoor/campus, 25 Mbit/s user data rate
- access to telecommunication systems, multimedia applications, mobility (<10 m/s)

## HIPERACCESS

- wider range (< 5 km), outdoor, 25 Mbit/s user data rate
- fixed radio links to customers (“last mile”), alternative to xDSL or cable modem, quick installation
- Several (proprietary) products exist with 155 Mbit/s plus QoS

## HIPERLINK – currently no activities

- intermediate link, 155 Mbit/s
- connection of HIPERLAN access points or connection between HIPERACCESS nodes

# BRAN and legacy networks

## Independence

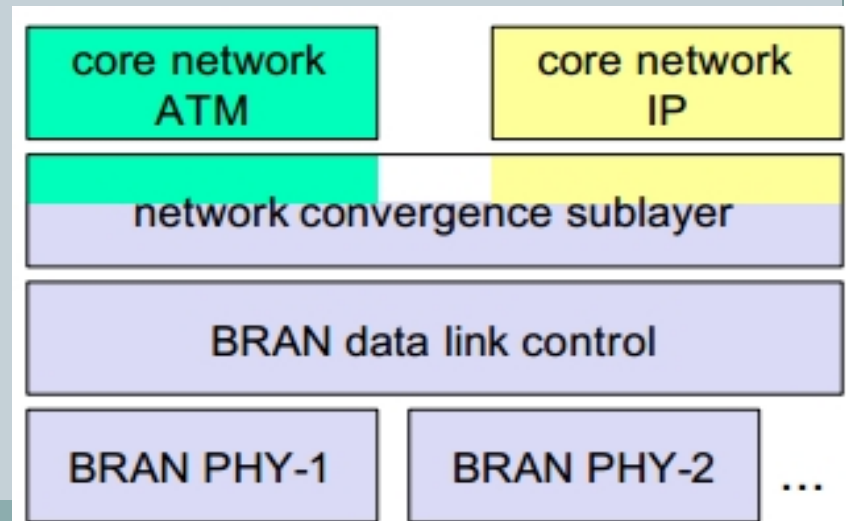
- BRAN as access network independent from the fixed network
- Interworking of TCP/IP and ATM under study

## Layered model

- Network Convergence Sub-layer as superset of all requirements for IP and ATM

## Coordination

- IETF (TCP/IP)
- ATM forum (ATM)
- ETSI (UMTS)
- CEPT, ITU-R, ... (radio frequencies)



# HiperLAN2 (historical)



Official name: BRAN HIPERLAN Type 2

- H/2, HIPERLAN/2 also used

High data rates for users

- More efficient than 802.11a

Connection oriented

QoS support

Dynamic frequency selection

Security support

- Strong encryption/authentication

Mobility support

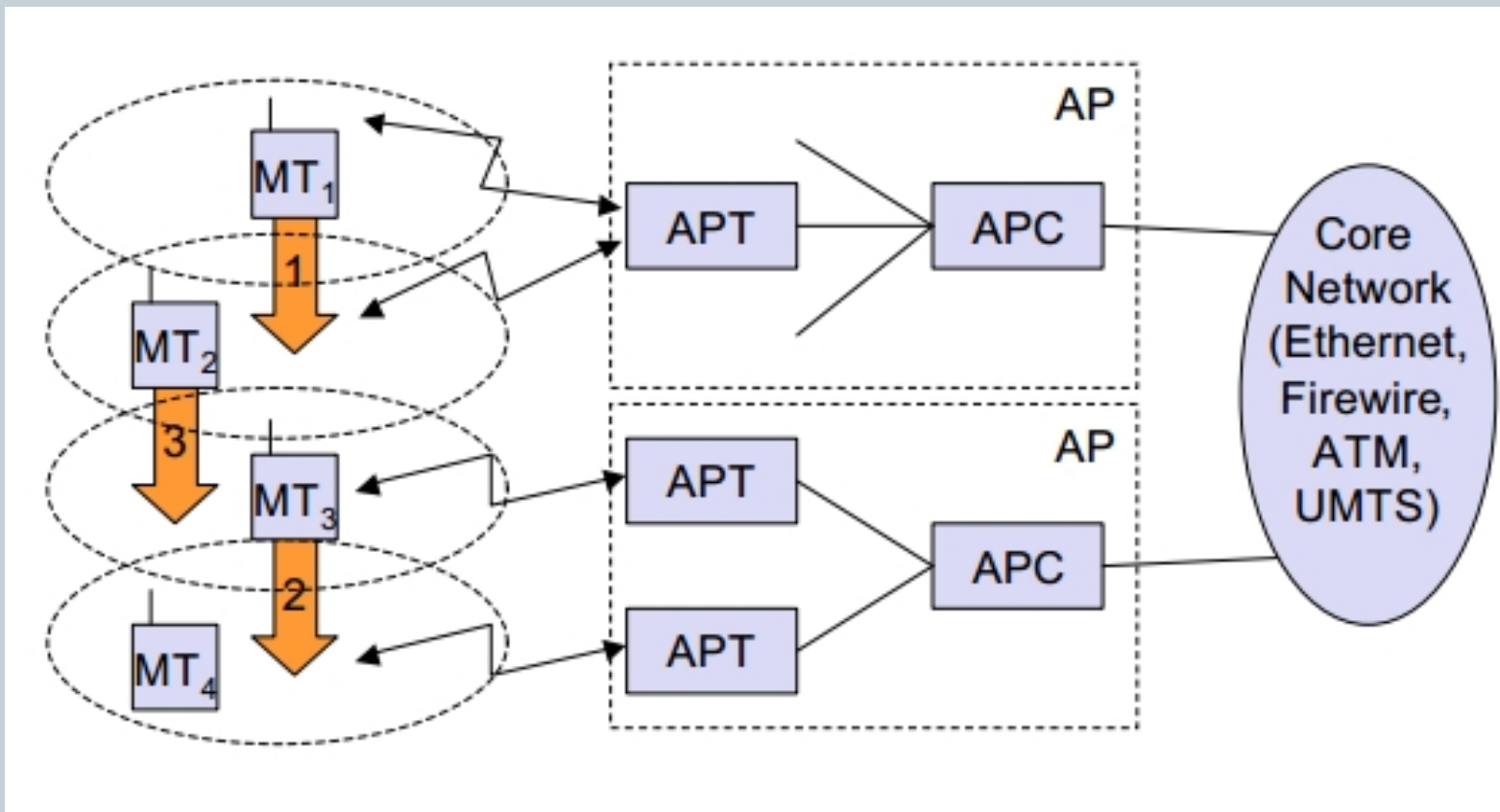
Network and application independent

- convergence layers for Ethernet, IEEE 1394, ATM, 3G

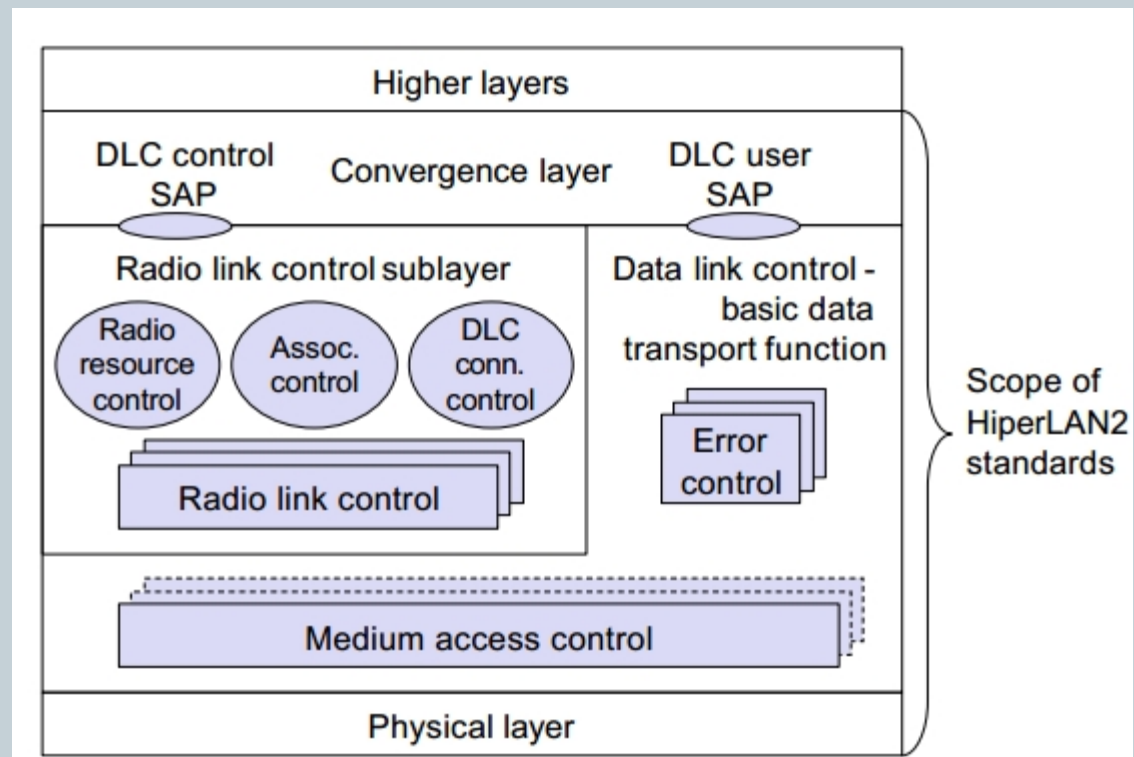
Power save modes

Plug and Play

# HiperLAN2 architecture and handover scenarios



# HiperLAN2 protocol stack





# Operating channels of HiperLAN2 in Europe

