IEEE 802

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CONTENT

- IEEE802 family
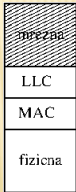- Working group IEEE802.1
- Connecting to IEEE802.1x network

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IEEE 802

- Family of IEEE standards dealing with local area networks(LAN) and metropolitan area networks(MAN)
- Work is done in working groups
- More on URL: http://www.ieee802.org/
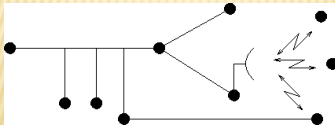 + challange: Go to the website and review the contents.

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IEEE 802 ARCHITECTURE

- Basic architecture:
  + bottom: *media access Control* (*MAC*)
  + top: *logical link layer* (*LLC*)
- Seperate access to the medium and addressing -> transfer of frames

antena
LLC
MAC
fizicna

TRANSPORT AND TOPOLOGY IEEE 802

- uniform frame addressing space
- (local) network has to know how to correctly send frames

LLC
MAC
fizicna

IEEE 802 FAMILY

- **IEEE 802.1**   Bridging (networking) and Network Management
- **IEEE 802.2**   Logical Link Control – LLC
- **IEEE 802.3**   Ethernet
- **IEEE 802.4**   Token bus
- **IEEE 802.5**   Defines the MAC layer for a Token Ring
- **IEEE 802.6**   MANs
- **IEEE 802.7**   Broadband LAN using Coaxial Cable
- **IEEE 802.8**   Fiber Optic TAG
- **IEEE 802.9**   Integrated Services LAN
- **IEEE 802.10**   Interoperable LAN Security

IEEE 802 FAMILY

× IEEE 802.11 Wireless LAN (WLAN) & Mesh (Wi-Fi certification)
× IEEE 802.12 demand priority
× IEEE 802.13 Used for 100BASE-X Ethernet
× IEEE 802.14 Cable modems
× IEEE 802.15 Wireless PAN (Bluetooth, ...)
× IEEE 802.16 Broadband Wireless Access (WiMAX certification)
× IEEE 802.17 Resilient packet ring
× IEEE 802.18 Radio Regulatory TAG
× IEEE 802.19 Coexistence TAG
× IEEE 802.20 Mobile Broadband Wireless Access
× IEEE 802.21 Media Independent Handoff
× IEEE 802.22 Wireless Regional Area Network
× IEEE 802.23 *Emergency Services Working Group* (march 2010)

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IEEE 802.1 – BRIDGING AND NETWORK MANAGEMENT

× *Bridging (networking) and Network Management*
× Connecting between sub-networks
× Network management (for example: smallest spanning tree)
× Network security
× Working on top of LLC
× More on URL: http://www.ieee802.org/1/
  + challange: Go to the website and review the contents.

| LLC |
| MAC |
| fizicna |

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IEEE 802.1 WORKING GROUP

× *802.1b: LAN/MAN management (removed)*
× 802.1d: bridges on MAC layer
× *802.1e – 802.1g: removed*
× 802.1h: Ethernet MAC bridges
× 802.1q: virtual LAN (VLAN)
× 802.1x: network access control (*Port Based Network Access Control*)

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IEEE 802.1 WORKING GROUP

- 802.1ab: stations, access control of the medium and conectivity searching
- 802.1ae: security on MAC layer
- 802.1ar: safe unit identification
- 802.1as: time synchronization and time-sensitive aplications in networks with bridges
- 802.1ax: *link aggregation*
- 802.1ba: avdio/video systems with bridges

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NETWORK CONNECTION MANAGEMENT (IEEE 802.1X)

- Network access is a service, that enables usage of other services
  - Web access, ...
- more on URL

   http://www.ieee802.org/1/pages/802.1x-2004.html

  - challange: Go to the website and review the contents.

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NETWORK CONNECTION MANAGEMENT (IEEE 802.1X)

- Network access is a service, that enables usage of other services
  - Web access, ...
- Usage of a service can be free or controled
- For controled usage of service we need to:
  - Find out, who is a potential user; and
  - if he has premission for usage of service.
- authentication and authorisation (logging also somewhere)
- task: somehow insert AAA into establishment ofconecting to network

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IEEE 802.1X ARHITEKTURA

- × There are three building blocks:
  - + *supplicant*
  - + *authenticator*
  - + *authentication server*
- × supplicant signs in to authenticator, that checks his identity on *authentication server* and if he is authorised for access to the network
- × task: **embend EAP on data link layer**
  - + challange: How(I) authenticator really enables access to network for supplicant?

| supplicant | EAP | authenticator | RADIUS | authentication server |

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IEEE 802.1X EAPOL

- × standard IEEE 802.1x defines EAP on data link layer – EAP over LAN -> EAPOL
  - + Later EAPOL was also used in other work groups IEEE 802.1x:
    - × 802.1ae: security on MAC layer
    - × 802.1ar: safe identification of units
- × EAPOL is defined so that his content is sent directly in Ethernet frames with contents badge 0x888E:
  - + Preamble (7-bytes) Start Frame Delimiter (1-byte)
  - + Dest. MAC Address (6-bytes) Source MAC Address (6-bytes)
  - + Length / Type (2-bytes)
  - + MAC Client Data (0-n bytes)
  - + Pad(0-p bytes) Frame Check Sequence (4-bytes)

Bytes	7	1	2 or 6	2 or 6	2	0-1500	0-46	4
	Preamble		Dest address	Source address	Type or Length	Data	Pad	Checksum
		Start-frame delimiter						

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EAP – FOR REFRESHMENT

- × Defined in RFC 3748
- × Support for different authentication protocols
- × stepping protocol

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IEEE 802.1X – HOW DOES IT OPERATE

- × *inicialization*: when avtenticator (usualy also switch, WLAN access point etc.) detects new supplicant, he enables him **only** IEEE 802.1x comunication
  - + From here on EAP protocol starts

EAP   RADIUS

supplicant   authenticator   authentication server

internet

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IEEE 802.1X – HOW DOES IT OPERATE (CONTINUED)

- × *invitation*: authenticator (periodicaly) sends invitation to supplicant, to introduce himself
  - + Supplicant introduces himself to authenticator, which sends introduction to avtentication server (RADIUS)
  - + Avtenticator is now just an in between server for avtentication server – avtentication server is the one that actualy performs the authentication
  - + trust!! between authenticator and autentication server
    - × challange: How to program that trust?

EAP   RADIUS

supplicant   authenticator   authentication server

internet

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IEEE 802.1X – HOW DOES IT OPERATE (CONTINUED)

- × negotiation: is performed between supplicant and authenticator in accordance with EAP protocol
  - + which authenticacion protocol,
  - + challange and response, …

EAP   RADIUS

supplicant   authenticator   authentication server

internet

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IEEE 802.1X – HOW DOES IT OPERATE (CONTINUED)

× *authentication*: supplicant authentication alone

× authenticator, when server authenticates supplicant, he grantes him access to the local network

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EDUROAM

× federations authentication servers, who trust each other
× user of wichever server can authenticate himself at wichever authenticator in federation
  + Challange: Where is now asimetric criptography, that EDUROAM uses in protocol for authentication? For authentication of who do we use it? Answer in the forum for extra points.

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Thank you for your attention
and
good luck!

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