

Redes Locais

LANs – Local Area Networks

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Agenda

- Conceito
- Topologias
- Camadas/Funcionalidades
- Principais tecnologias
- Dispositivos
- Evolução

Origens

- As LANs surgiram como forma de compartilhar recursos
- Na década de 80.
- Foram projetadas para comunicação em um meio compartilhado
- Para distâncias curtas.

As redes segundo a escala (Tanenbaum)

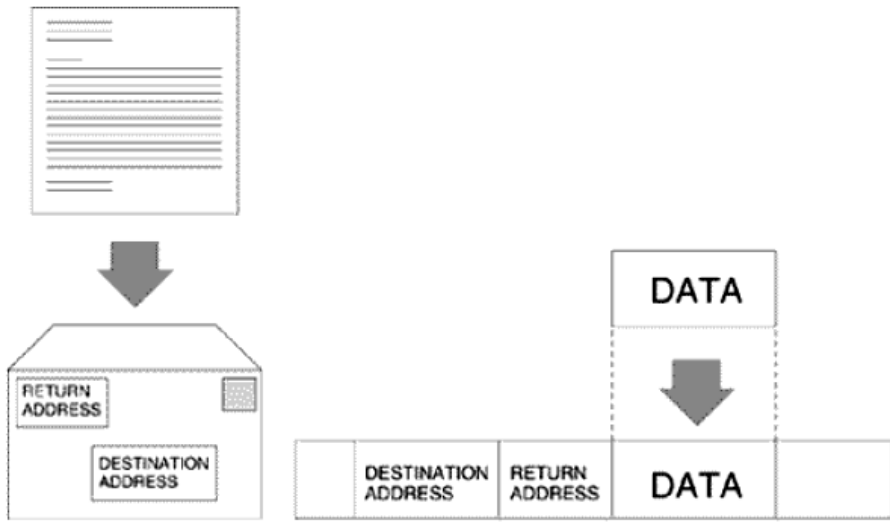
Interprocessor distance	Processors located in same	Example
1 m	Square meter	Personal area network
10 m	Room	Local area network CAN?
100 m	Building	
1 km	Campus	
10 km	City	Metropolitan area network
100 km	Country	Wide area network GAN? The Internet
1000 km	Continent	
10,000 km	Planet	

Redes Locais – O conceito

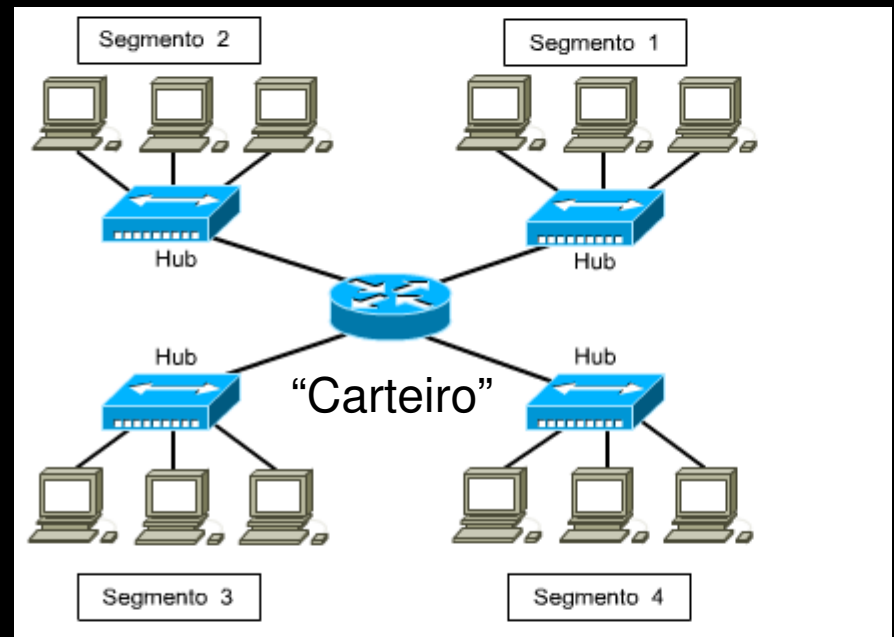
- Uma rede local (LAN) é uma rede que conecta um conjunto de computadores
- De forma que essas máquinas consigam comunicar-se diretamente umas com as outras
- Sem a necessidade de um gateway

(Sidnie Feit)
Local Area High Speed Networks

Envelope Digital

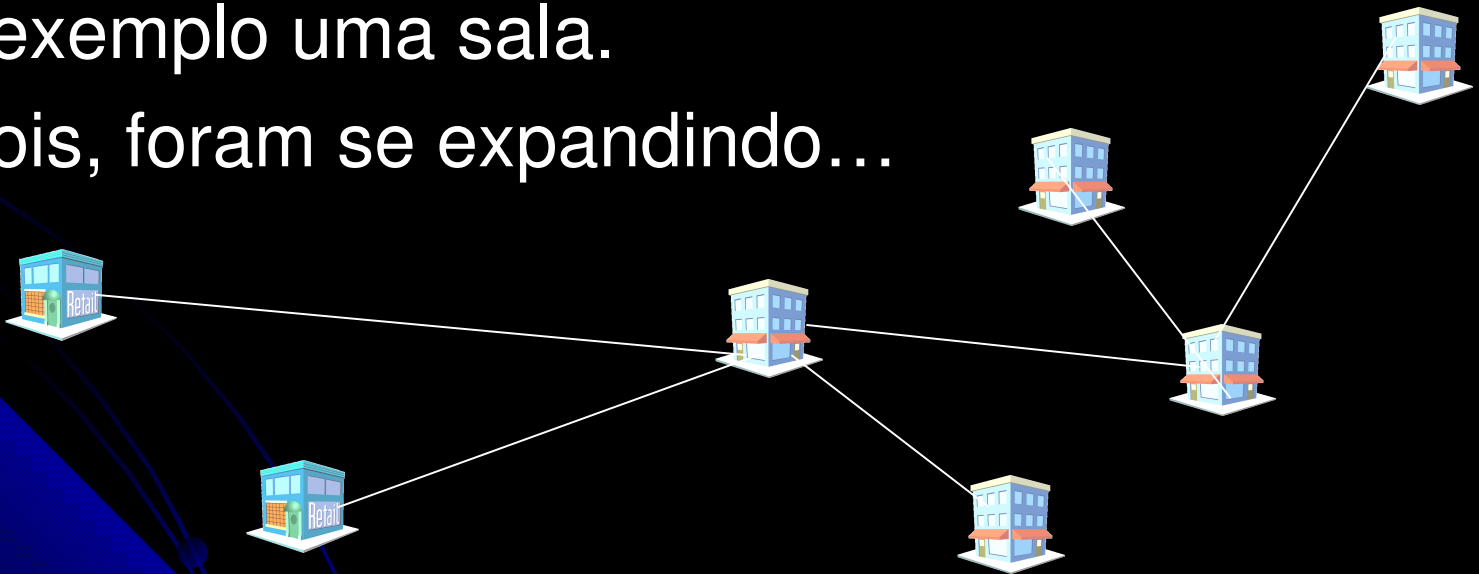


Entrega direta=rede local



Local é um conceito ‘mutante’

- Antigamente, o conceito “Local” era mais adequado
- Uma vez que as LANs ocupavam espaços limitados,
- Por exemplo uma sala.
- Depois, foram se expandindo...



Características das LANs

(Perlman)
Interconnections

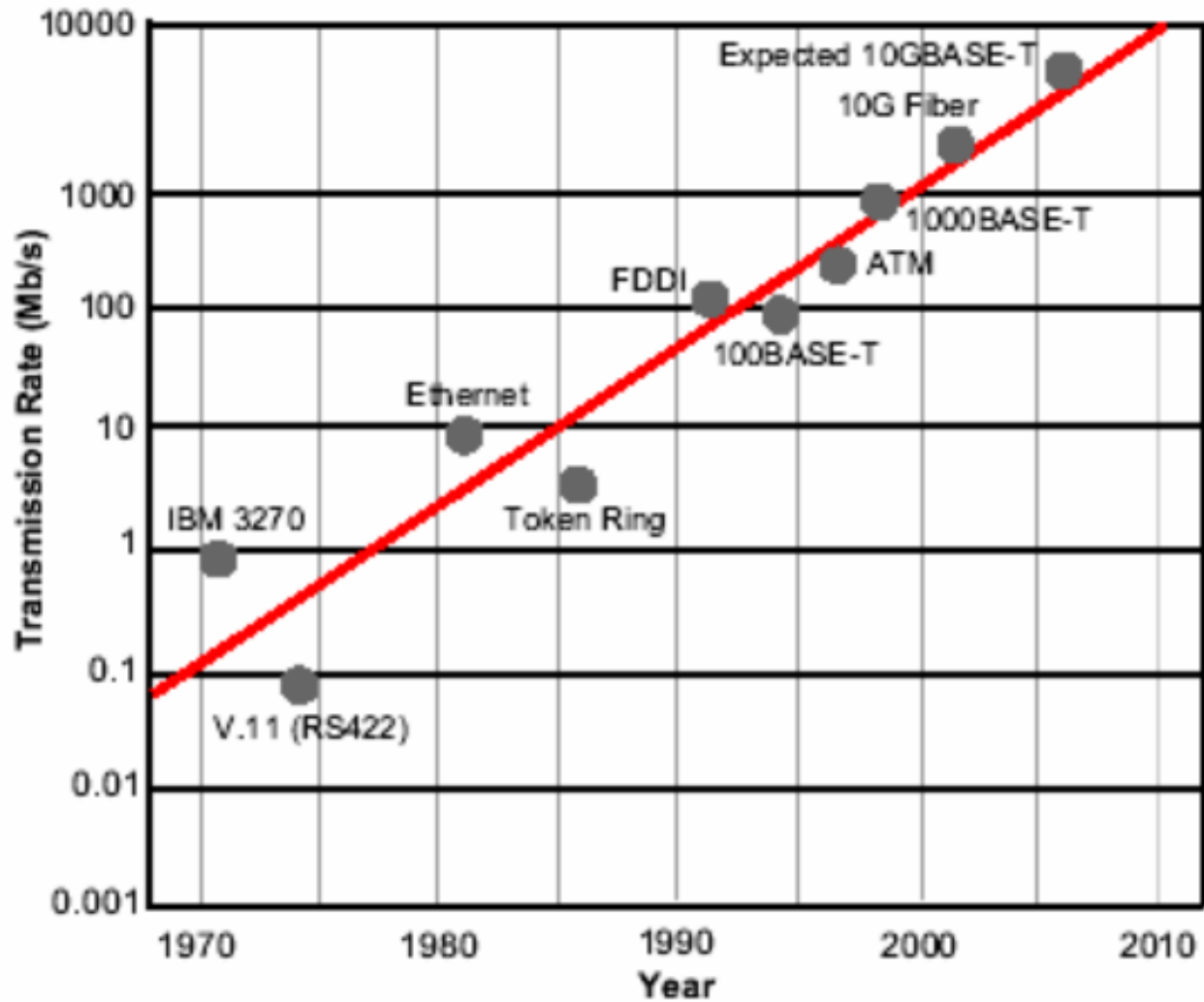
- Meios compartilhados
- Muita largura de banda
- Atraso pequeno / PDV / jitter
- Baixa taxa de erro (Bit Error Rate)
- Capacidade de broadcast
- Geograficamente limitadas
- Número de estações limitadas
- Relação de parceria entre as estações (em oposição a relação mestre/escravo)
- Não estão sujeitas as redes públicas (telecoms)

Convergência

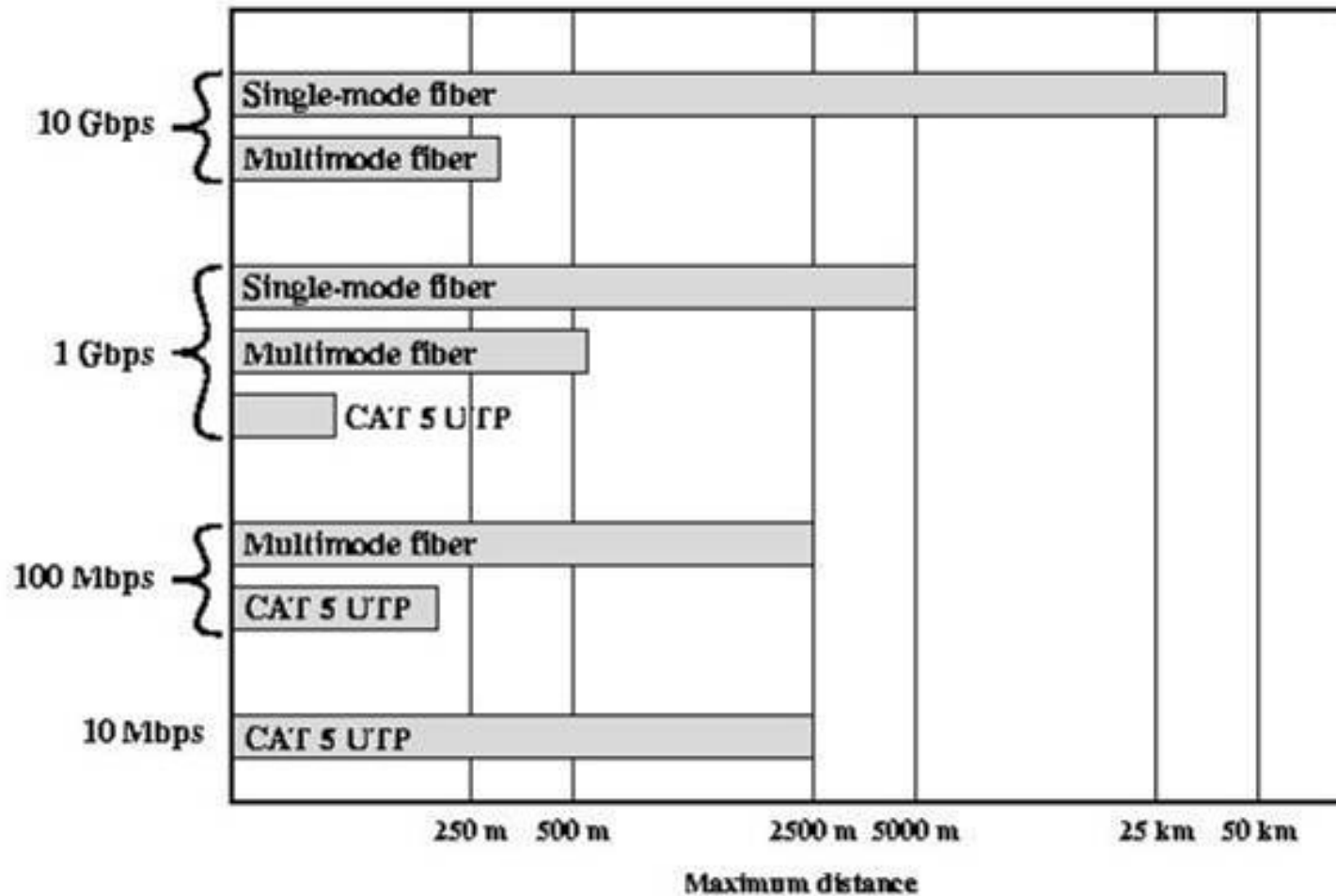
- Conforme as LANs foram aumentando as distâncias
- As WANs foram aumentando suas velocidades e bandas.
- A distinção entre uma e outra está cada vez menos clara.

LAN	WAN
Limited geographic area	Citywide to worldwide geographic area
Privately owned and controlled media	Media leased from a service provider
Plentiful, cheap bandwidth	Limited, expensive bandwidth

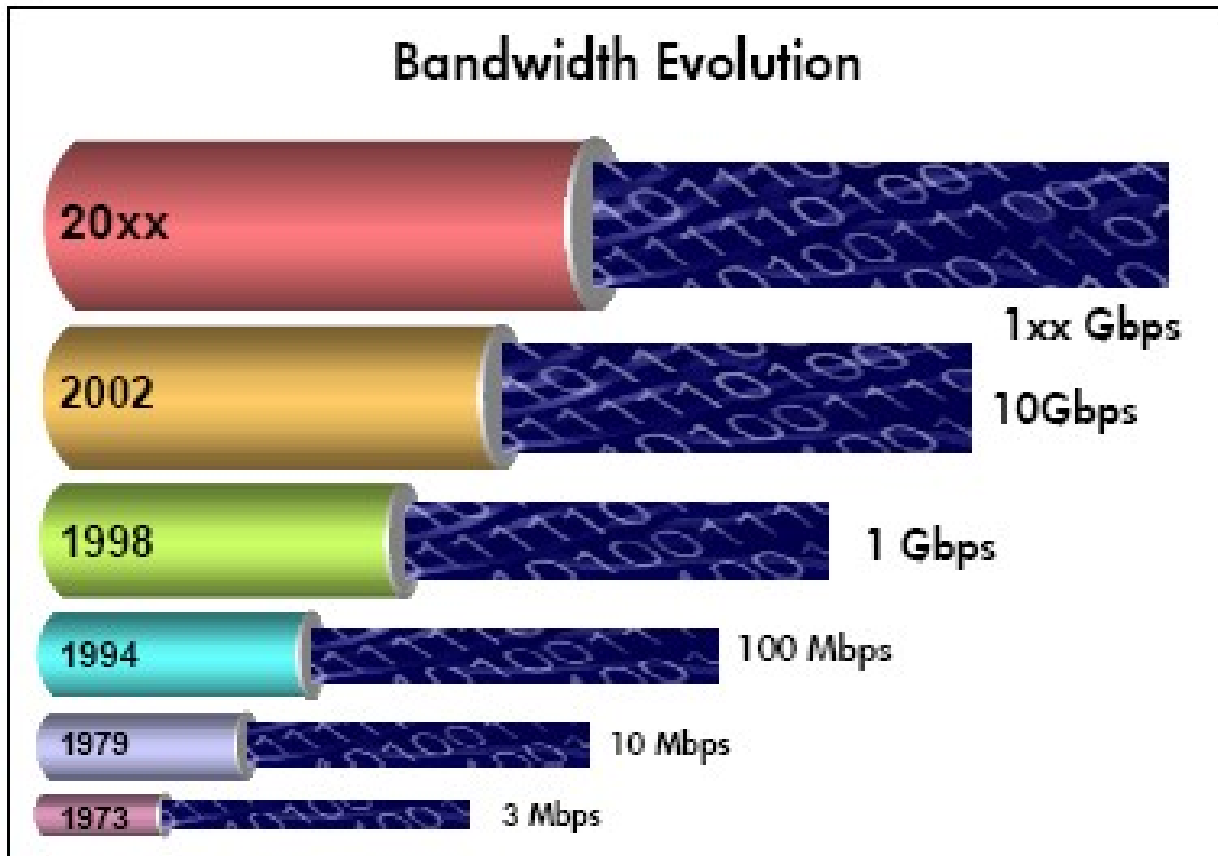
Taxas de bits



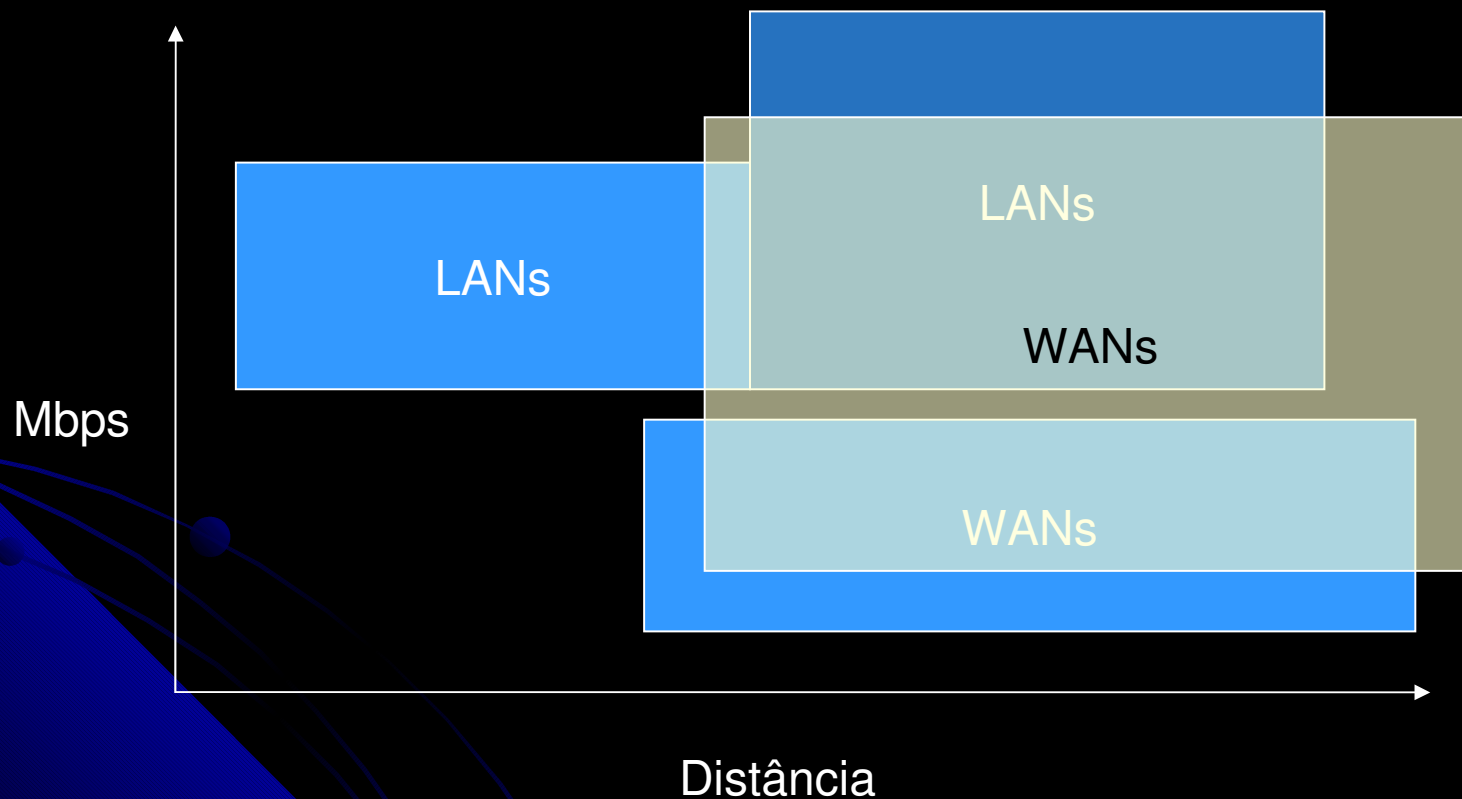
Taxas e distâncias do Eth



Evolução das taxas - eth



Convergência?



Padrões LANs

Grupo IEEE 802

Number	Topic
802.1	Overview and architecture of LANs
802.2 ↓	Logical link control
802.3 *	Ethernet
802.4 ↓	Token bus (was briefly used in manufacturing plants)
802.5	Token ring (IBM's entry into the LAN world)
802.6 ↓	Dual queue dual bus (early metropolitan area network)
802.7 ↓	Technical advisory group on broadband technologies
802.8 †	Technical advisory group on fiber optic technologies
802.9 ↓	Isochronous LANs (for real-time applications)
802.10 ↓	Virtual LANs and security
802.11 *	Wireless LANs
802.12 ↓	Demand priority (Hewlett-Packard's AnyLAN)
802.13	Unlucky number. Nobody wanted it
802.14 ↓	Cable modems (defunct: an industry consortium got there first)
802.15 *	Personal area networks (Bluetooth)
802.16 *	Broadband wireless
802.17	Resilient packet ring

• IEEE 802.1 Standards

- Standard Date Description
- 802.1b LAN/MAN Management
- 802.1D 1998, 2004 MAC Bridges
- 802.1e System Load Protocol
- 802.1f 1993 Common Definitions and Procedures for IEEE 802 Management Information
- 802.1G 1998 Remote MAC Bridging
- 802.1H 1997 Ethernet MAC Bridging
- 802.1p merged into 802.1D-2004 Traffic Class Expediting and Dynamic Multicast Filtering
- 802.1Q 1998, 2003 Virtual LANs
- 802.1r withdrawn GARP Proprietary Attribute Registration Protocol (GPRP)
- 802.1s merged into 802.1Q-2003 Multiple Spanning Trees
- 802.1t merged into 802.1D-2004 802.1D Maintenance
- 802.1v merged into 802.1Q-2003 VLAN Classification by Protocol and Port

- 802.1w merged into 802.1D-2004 Rapid Reconfiguration of Spanning Tree
- 802.1X 2001 Port Based Network Access Control
- 802.1AB 2005 Station and Media Access Control Connectivity Discovery
- 802.1ad 2005 Provider Bridges
- 802.1AE 2006 MAC Security
- 802.1af in work KeySec
- 802.1ag in work Connectivity Fault Management
- 802.1ah in work Provider Backbone Bridges

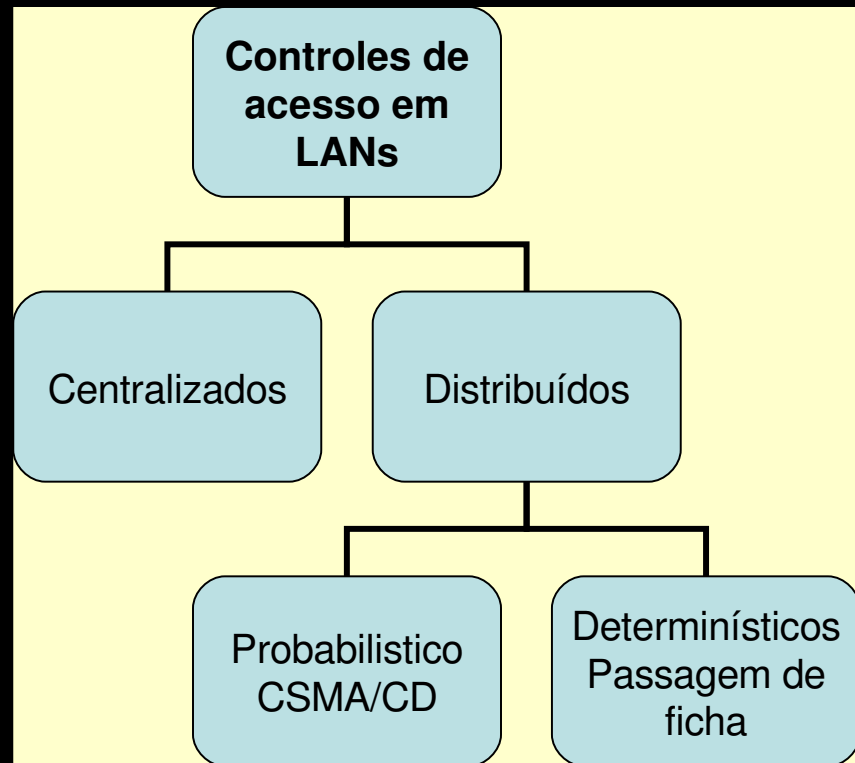
Tecnologias LAN – Alta velocidade

- FDDI
- 100VG-Any-LAN

	Fast Ethernet	Gigabit Ethernet	Fibre Channel	Wireless LAN
Data Rate	100 Mbps	1 Gbps, 10 Gbps	100 Mbps - 3.2 Gbps	1 Mbps - 54 Mbps
Transmission Media	UTP, STP, optical Fiber	UTP, shielded cable, optical fiber	Optical fiber, coaxial cable, STP	2.4-GHz, 5-GHz microwave
Access Method	CSMA/CD	CSMA/CD	Switched	CSMA/Polling
Supporting Standard	IEEE 802.3	IEEE 802.3	Fiber Channel Association	IEEE 802.11

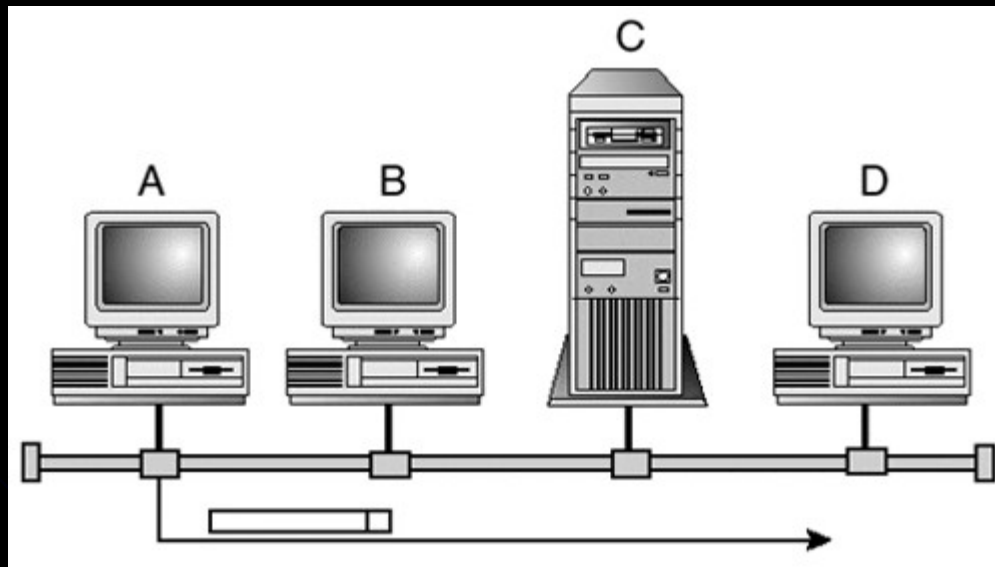
Topologias das LANs

- Física
 - Lay-out
- Lógica
 - Método de acesso

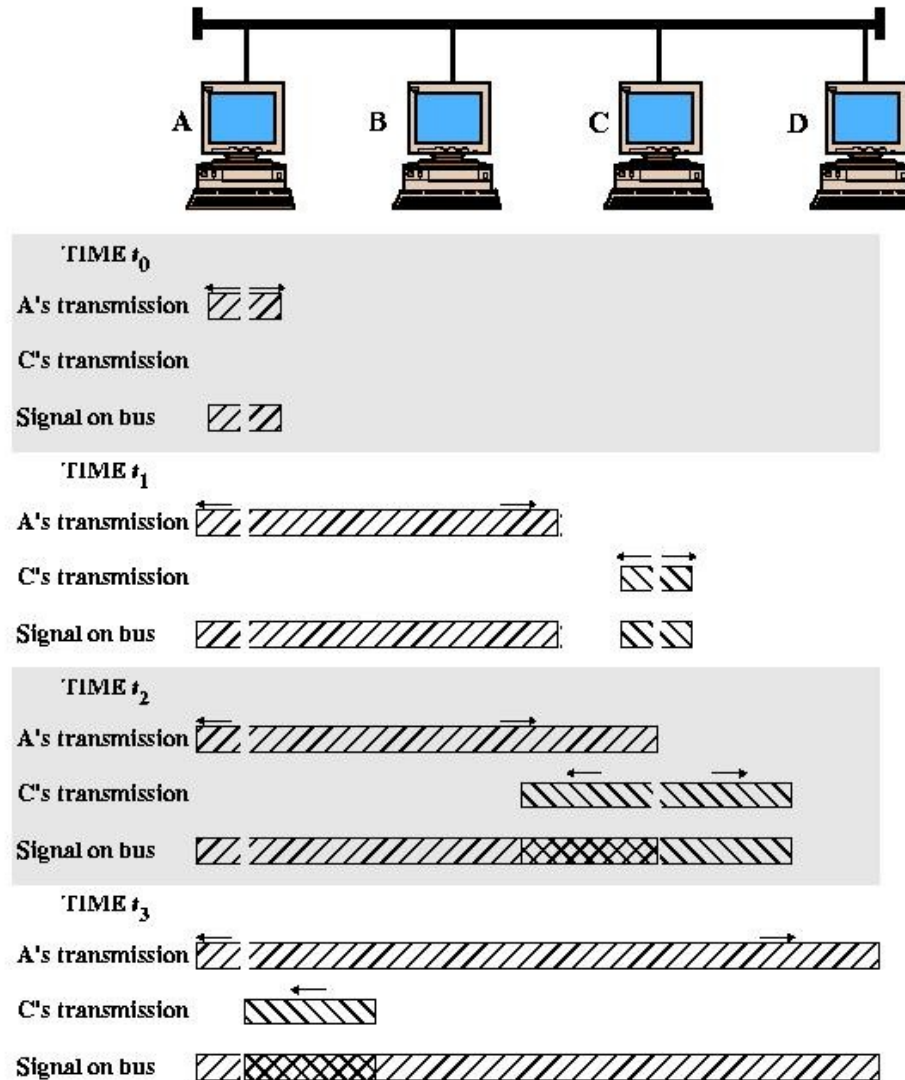


Barramento

- Acesso: CSMA/CD

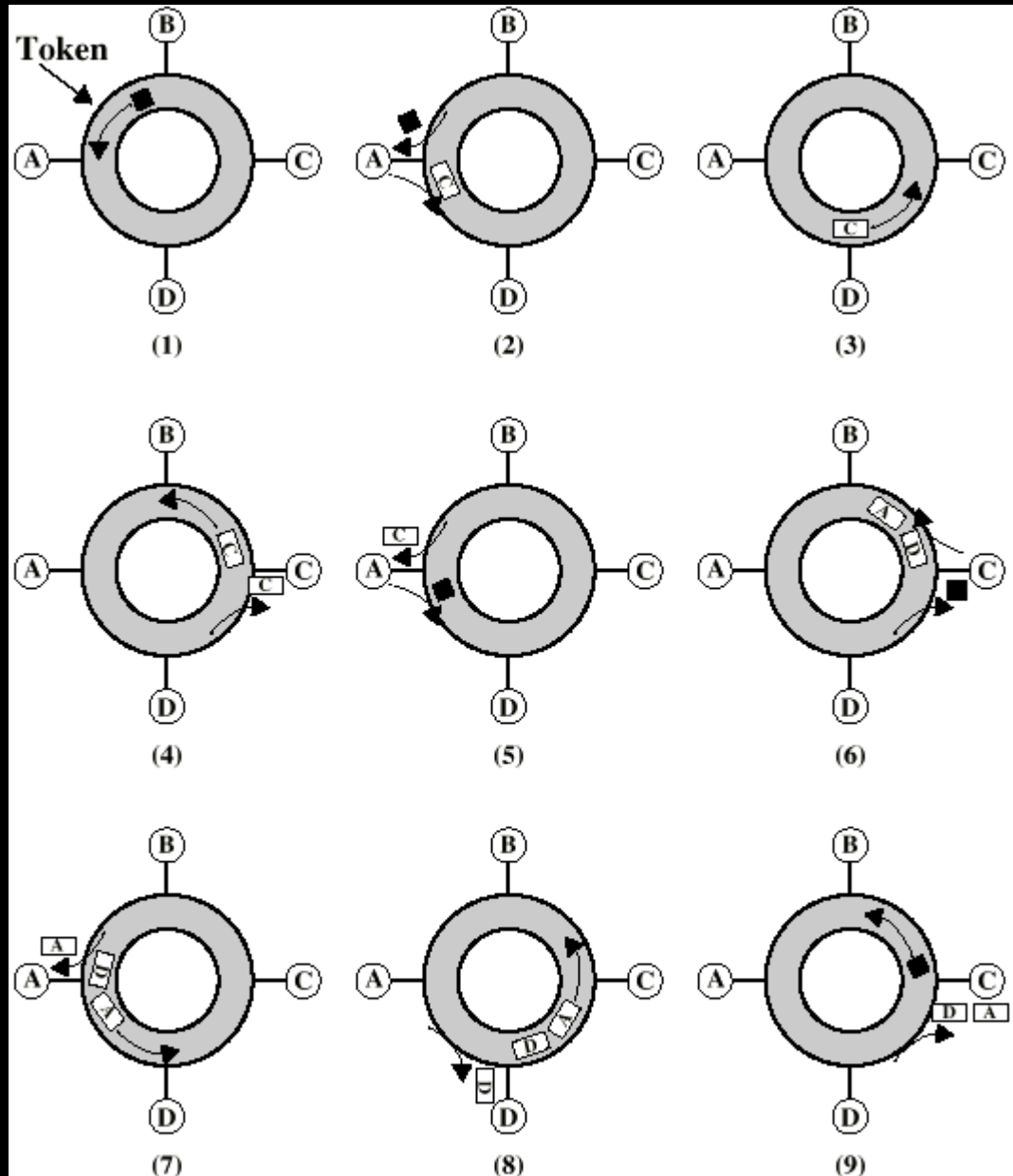


Operação do CSMA/CD




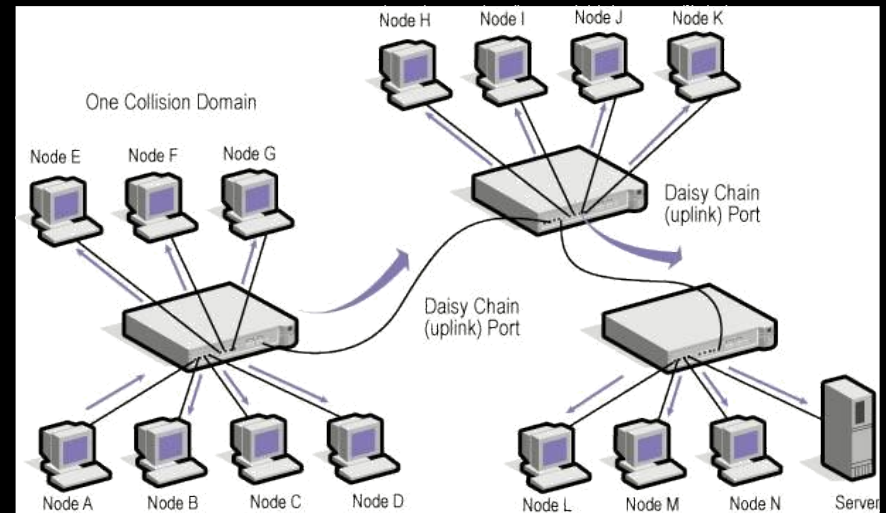
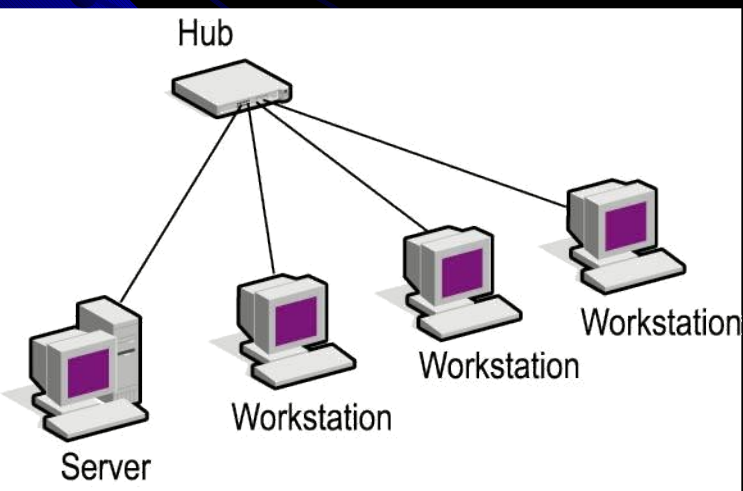
Anel

- Acesso:
Passagem
de ficha
- 802.5

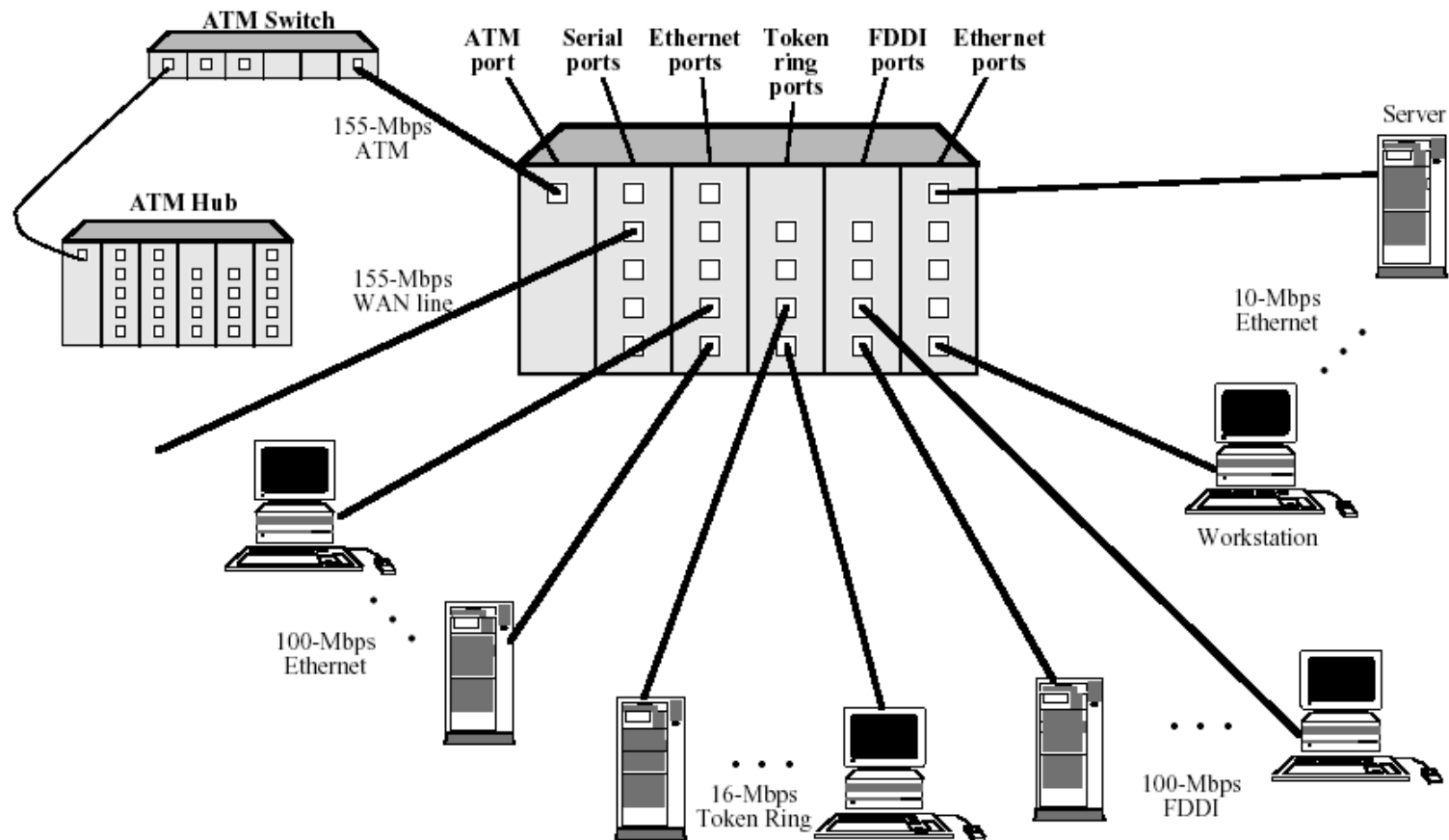


Estrela

- existência de um dispositivo central, ao qual os demais se conectam.
 - Classicamente, as redes ATM funcionam com esse projeto.
- 
- A diagram illustrating a star network topology. It features a central node labeled 'Node A' at the top. Below it, four other nodes are arranged in a horizontal row, labeled 'Node H', 'Node I', 'Node J', and 'Node K' from left to right. Each of these peripheral nodes is connected to the central 'Node A' by a single line, representing a dedicated connection to the central hub.



Switches com várias tecnologias



As LANs e as camadas

DATA LINK LAYER

Address Format
Frame Format
Medium Access Rules

PHYSICAL LAYER

Physical Medium
Signals Used to Represent Information
Cable Length Restrictions
Connectors
Environmental Constraints

datalink
layer
(OSI layer 2)

physical
layer
(OSI layer 1)

logical link control (LLC)	IEEE 802.2		
medium access control (MAC)	IEEE 802.3	IEEE 802.4	IEEE 802.5
physical protocol layer (PHY)	ethernet	token bus	token ring
physical medium dependent (PMD)			

Figure 4.2 IEEE standards for LANs.

Formatos dos frames

IEEE 802.3

PREAMBLE	DESTINATION ADDRESS	SOURCE ADDRESS	LENGTH	DATA	FRAME CHECK SEQUENCE
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IEEE 802.5/TOKEN RING

S D	A C	F C	DESTINATION ADDRESS	SOURCE ADDRESS	DATA	FRAME CHECK SEQUENCE	E D
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FDDI

PREAMBLE	S D	F C	DESTINATION ADDRESS	SOURCE ADDRESS	DATA	FRAME CHECK SEQUENCE	E D	F S
----------	--------	--------	---------------------	----------------	------	----------------------	--------	--------

SD = Start Delimiter

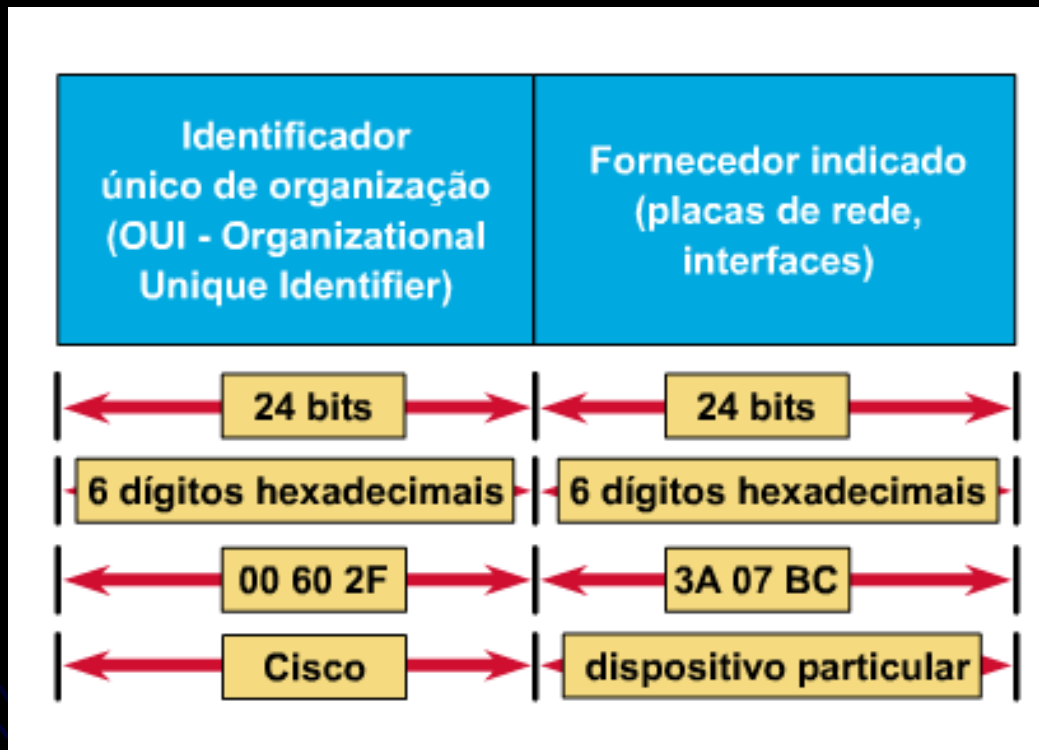
AC = Access Control

FC = Frame Control

ED = End Delimiter

FS = Frame Status

MAC Address

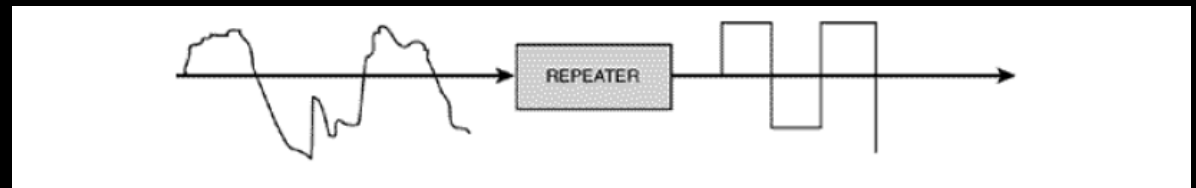
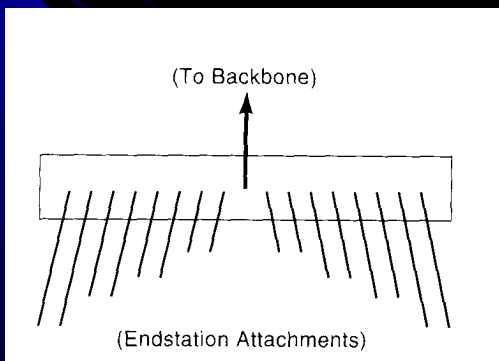
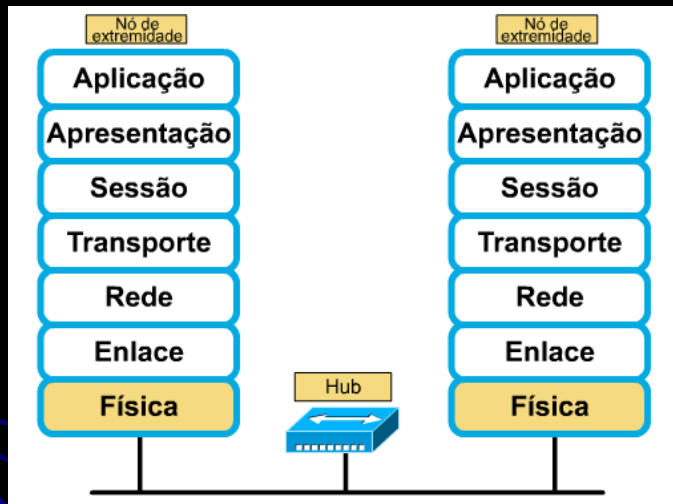


Dispositivos das LANs

- Hubs
- repetidores
- NICs
- Switches/bridges

HUB

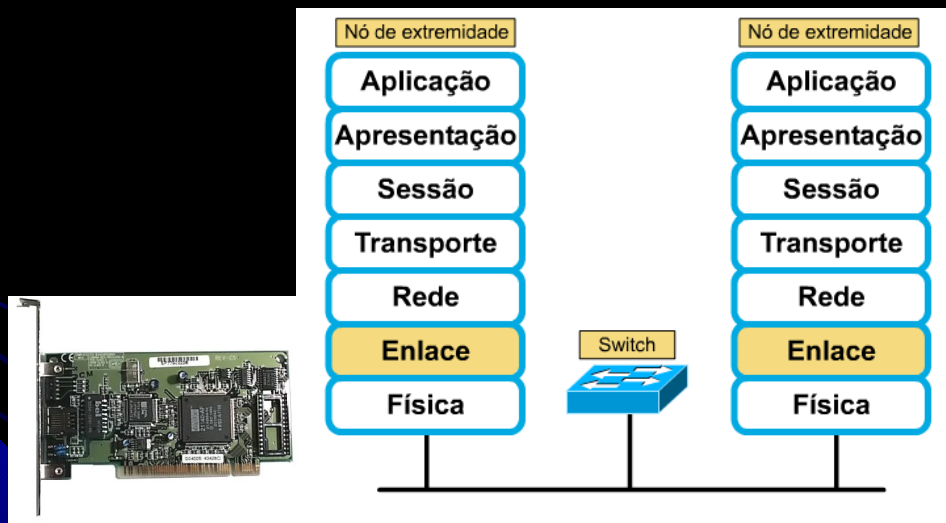
- HUB



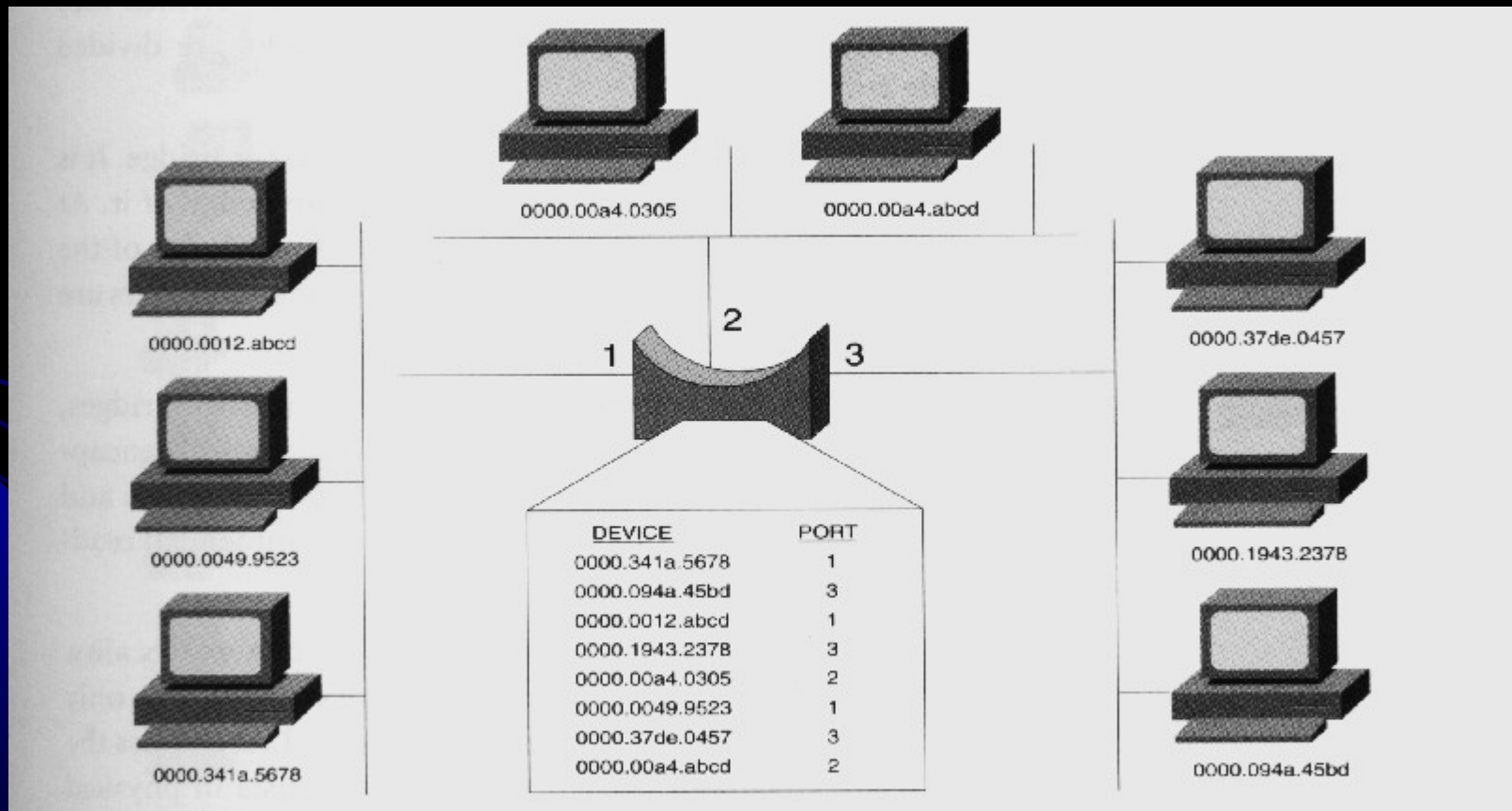
Um repetidor, regenerando o sinal

Switches/Bridges

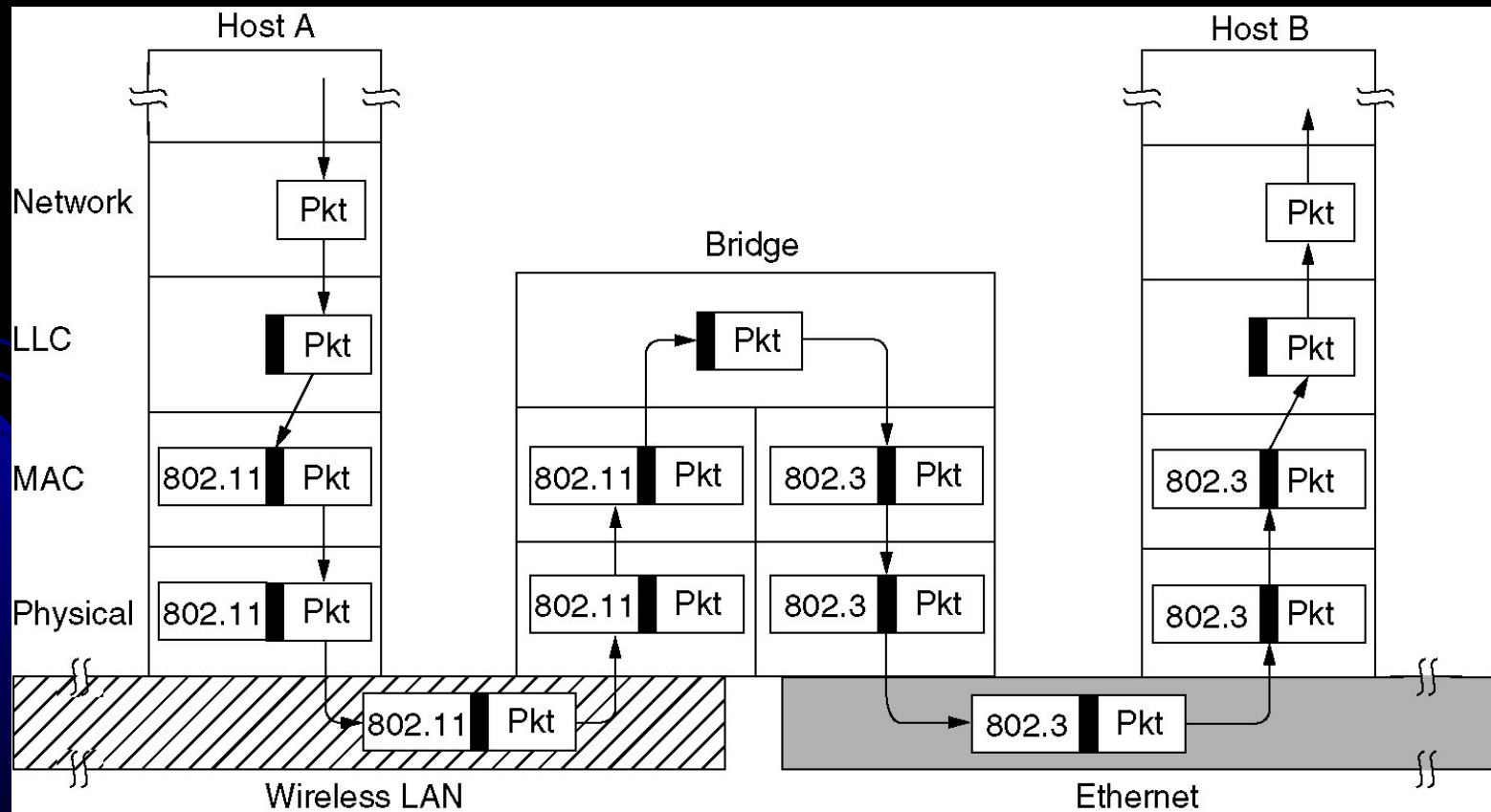
Comutadores/pontes



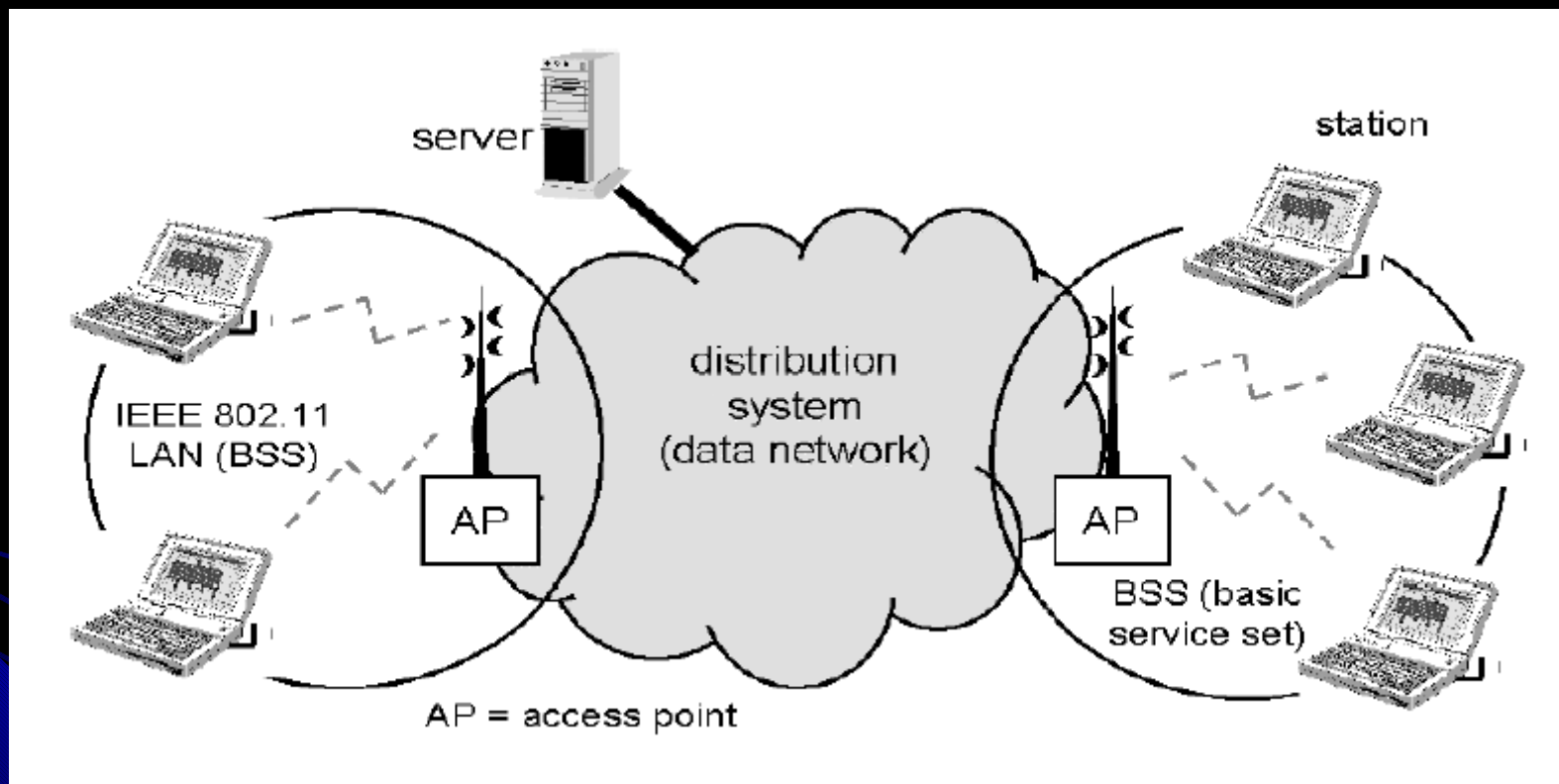
Switches/bridges



Pontes de 802.x para 802.y (Troca de formatos de frames)



WLAN – IEEE 802.11



Meios não guiados

CERUTTI

WLAN – IEEE 802.11

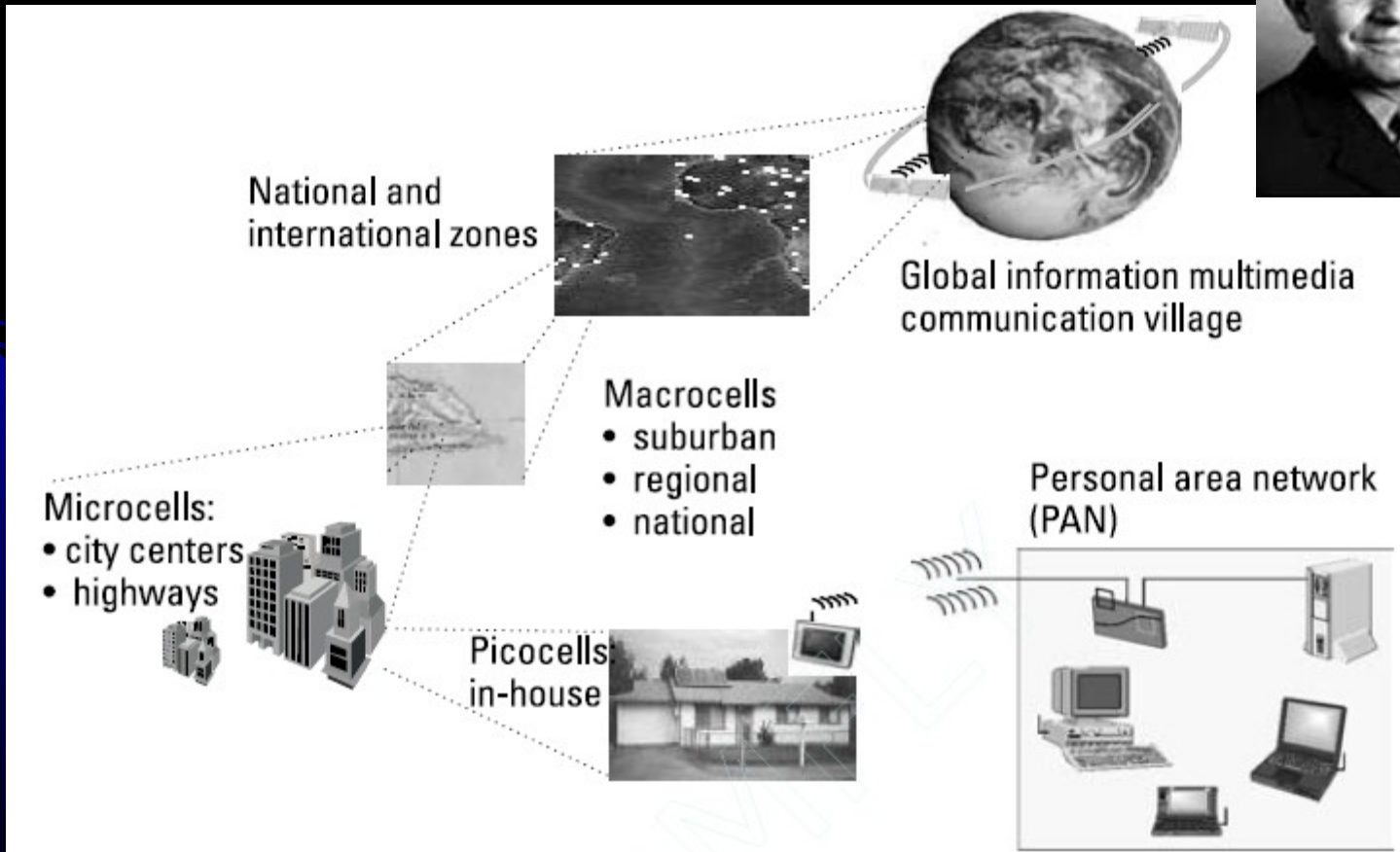
Standard	Contents
802.11	Wireless local area network (WLAN) MAC (medium access control) and PHY (physical layer) specification
802.11a	High speed physical layer in 5 GHz radio band
802.11b	High speed physical layer extension in the 2.4 GHz radio band
802.11c	MAC bridges
802.11d	Specification for operation in additional regulatory domains
802.11e	MAC quality-of-service (QOS) enhancements
802.11f	Multi-vendor access point (AP) interoperability via the Inter-Access-Point protocol (IAPP)
802.11g	Further higher rate data extension in the 2.4 GHz band
802.11h	Transmit power management for use in the 5 GHz band in Europe
802.11i	MAC security enhancements

Mudança de nomenclatura?

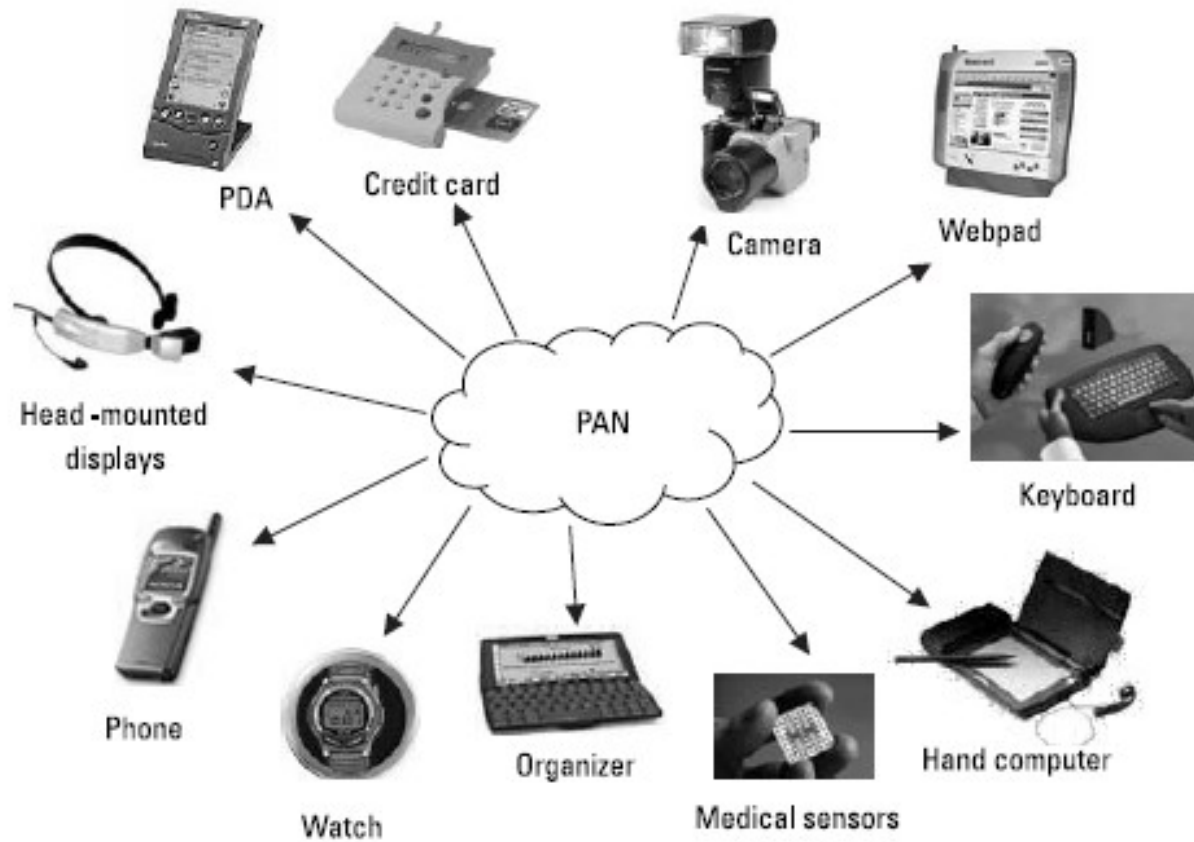
- Computação móvel

'morte' da localização

Hossein Eslambolchi

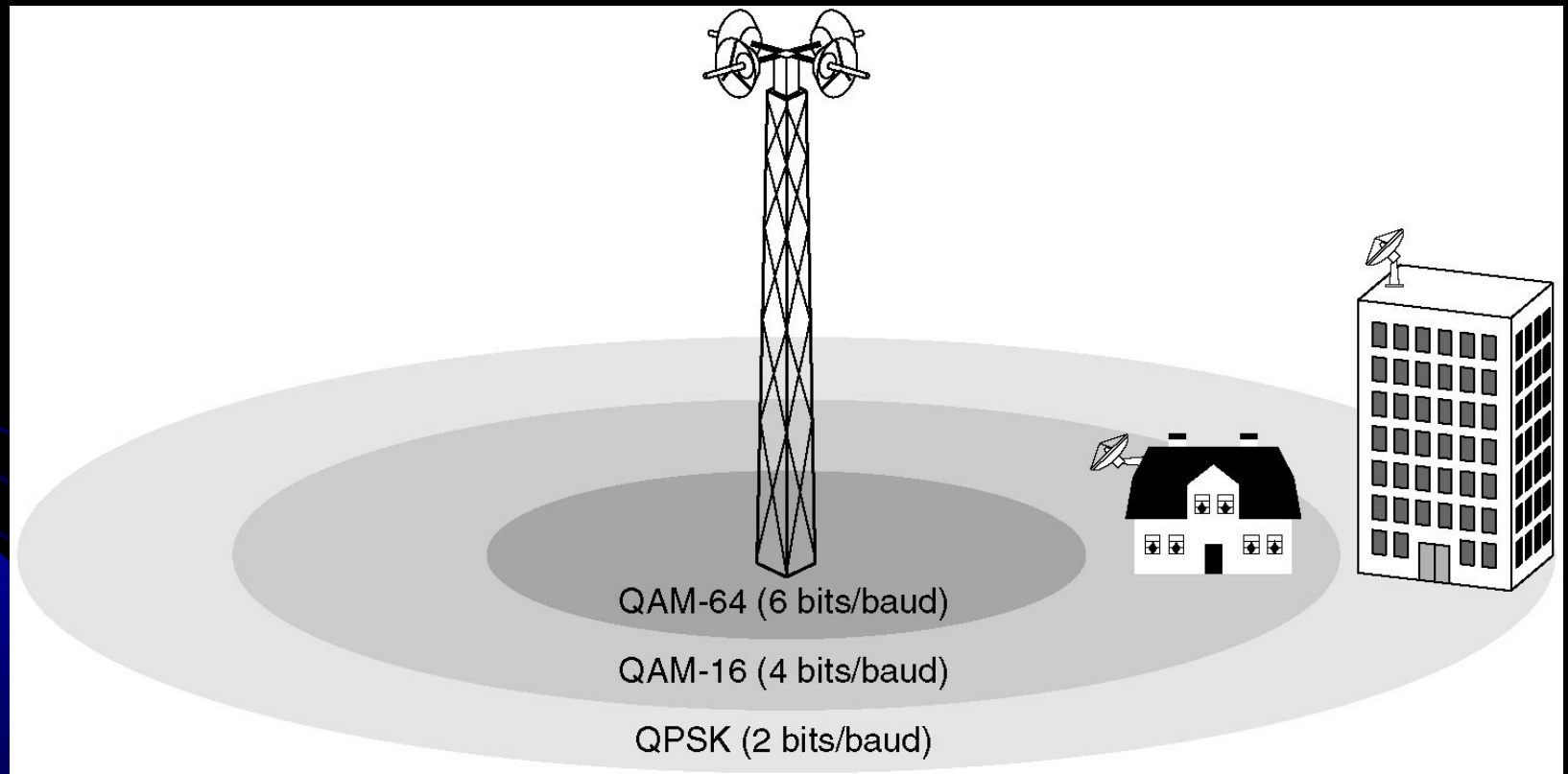


PANs



WiMAX – WRAN

- IEEE 802.16



O domínio do Ethernet

Círculo de tecnologia Eth

ETHERNET'S CIRCLE OF TECHNOLOGY

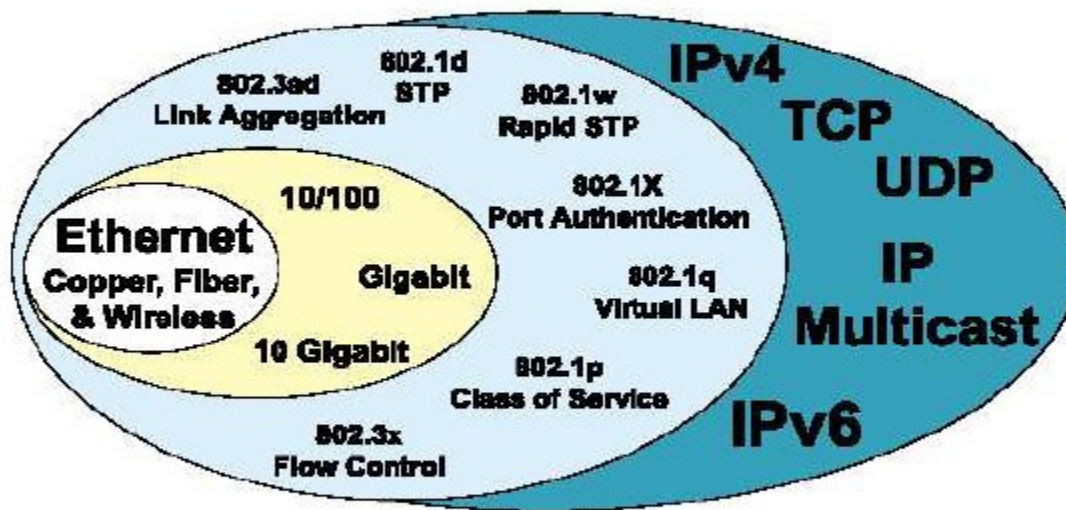
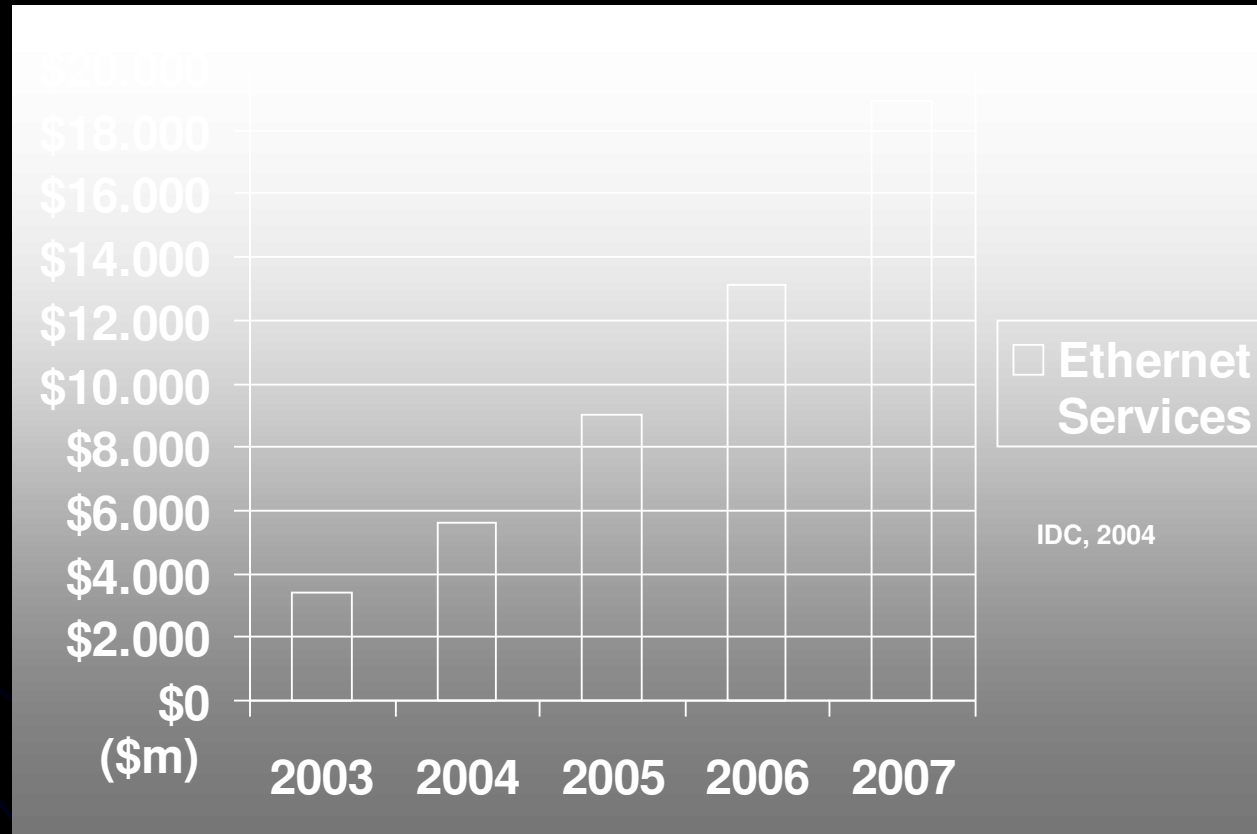


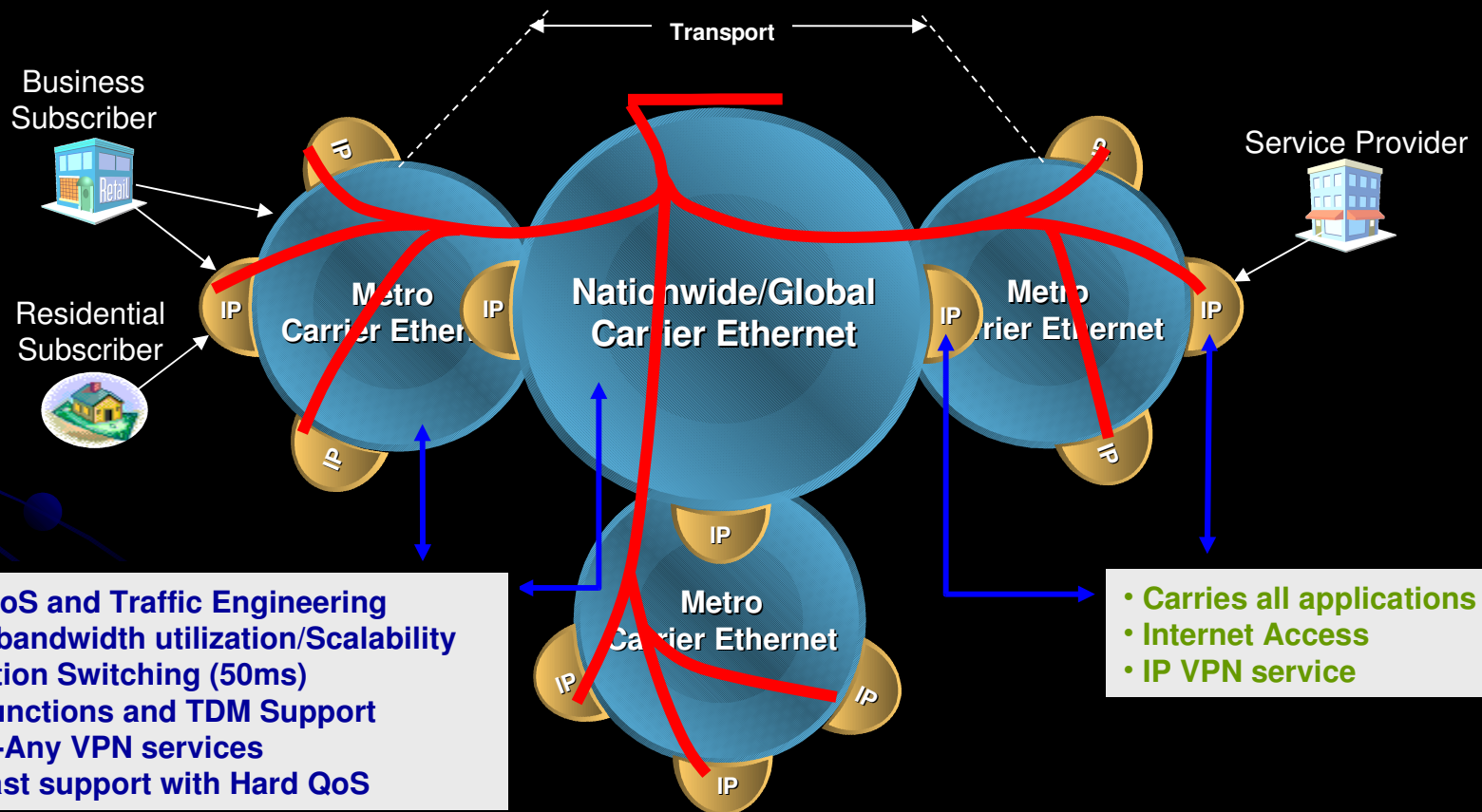
Figure - 1: Various Standards that Work with Ethernet.

Mercado mundial do ethernet



Nova Arquitetura de redes

- Ethernet como rede de transporte



Evolução

