

REDES DE COMPUTADORES 2018/2019

aula 0001 - Introdução

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SUMÁRIO

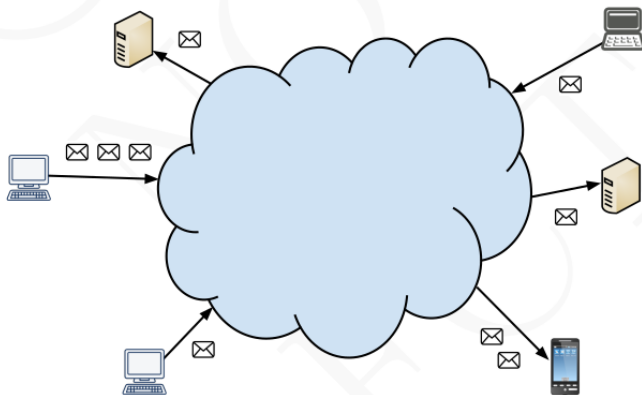
1. Redes e Internet
2. Internet e Protocolo IP
3. Aplicações de Rede
4. Outros protocolos

REDES E INTERNET

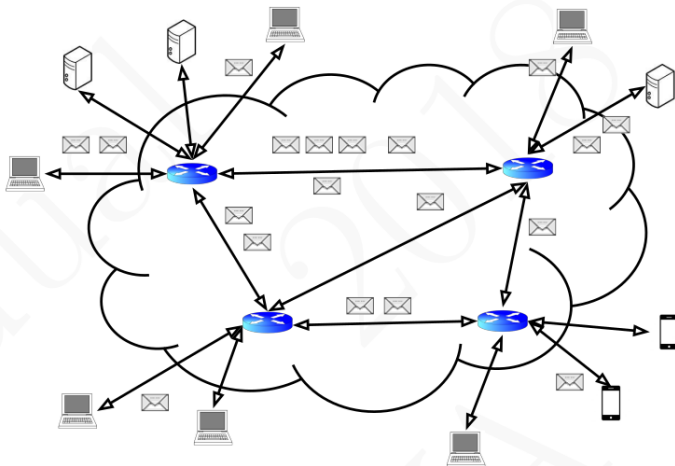
O QUE É UMA REDE?

- Infraestrutura física
- Canais de comunicação
- Troca de mensagens entre computadores (*hosts*)
 - Na realidade, entre *softwares* (clientes e servidores)
 - Pacotes e datagramas

EXEMPLO DE REDE

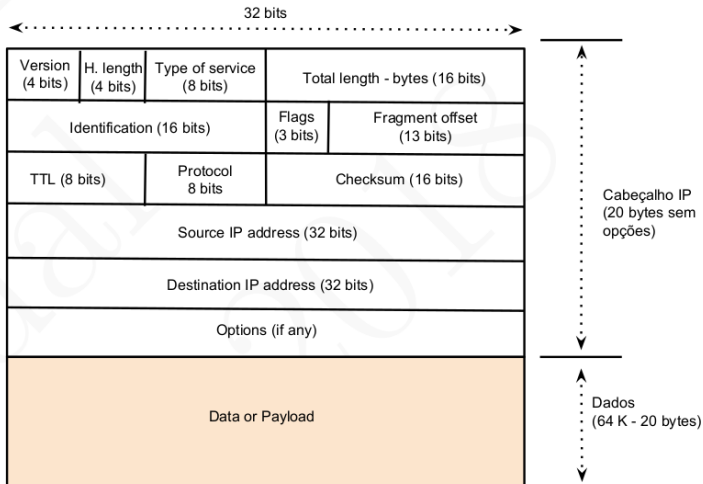


EXEMPLO DE REDE (RX)



- Regras de comunicação entre clientes e servidores
- Definem uma “linguagem”
- Diferentes protocolos para diferentes níveis
 - IP
 - TCP, UDP
 - ICMP
 - IEEE 802.3 (Ethernet), IEEE 802.11 (WiFi)
- Definidos em RFCs (Request For Comments)
<https://www.ietf.org/standards/rfcs/>
 - RFC 1945 (HTTP)

PACOTES



PORQUÊ PACOTES?

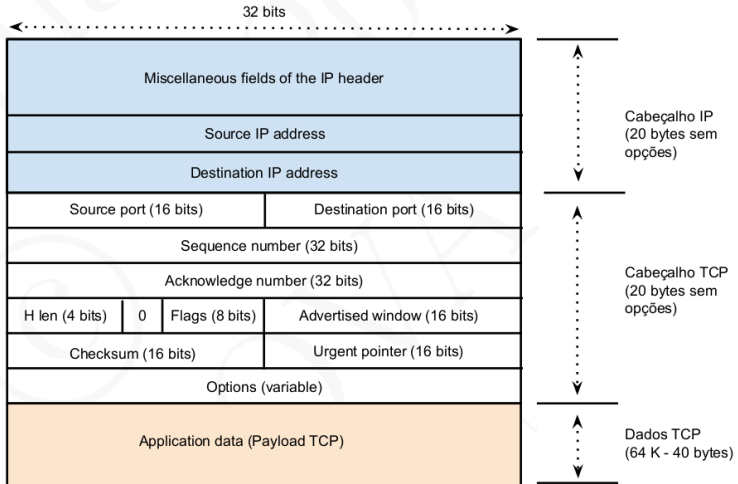
Multiplexing!

INTERNET E PROTOCOLLO IP

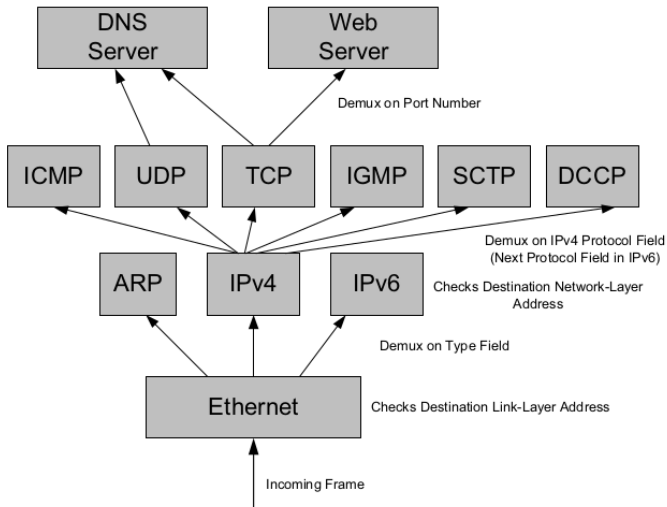
- Rede de redes
- Heterogénea
- Protocolos de encaminhamento (routing)
- Endereços IP (interfaces de rede)
- *Best-effort*
- Pacotes destinados a uma interface de rede
- Não é garantida a ordem nem a ausência de perdas

- Transmission Control Protocol
- Garante a ordem
- Pacotes destinados a uma **porta**
- Garante a chegada, através de retransmissão
- Permite adaptar a velocidade de transmissão ao grau de saturação da rede

PACOTES TCP



PROTOCOLOS E CAMADAS



CAMADAS OSI (1983)

	Number	Name	Description/Example
Hosts	7	Application	Specifies methods for accomplishing some user-initiated task. Application-layer protocols tend to be devised and implemented by application developers. Examples include FTP, Skype, etc.
	6	Presentation	Specifies methods for expressing data formats and translation rules for applications. A standard example would be conversion of EBCDIC to ASCII coding for characters (but of little concern today). Encryption is sometimes associated with this layer but can also be found at other layers.
	5	Session	Specifies methods for multiple connections constituting a communication session. These may include closing connections, restarting connections, and checkpointing progress. ISO X.225 is a session-layer protocol.
	4	Transport	Specifies methods for connections or associations between multiple programs running on the same computer system. This layer may also implement reliable delivery if not implemented elsewhere (e.g., Internet TCP, ISO TP4).
All Networked Devices	3	Network or Internetwork	Specifies methods for communicating in a multihop fashion across potentially different types of link networks. For packet networks, describes an abstract packet format and its standard addressing structure (e.g., IP datagram, X.25 PLP, ISO CLNP).
	2	Link	Specifies methods for communication across a single link, including "media access" control protocols when multiple systems share the same media. Error detection is commonly included at this layer, along with link-layer address formats (e.g., Ethernet, Wi-Fi, ISO 13239/HDLC).
	1	Physical	Specifies connectors, data rates, and how bits are encoded on some media. Also describes low-level error detection and correction, plus frequency assignments. We mostly stay clear of this layer in this text. Examples include V.92, Ethernet 100BASE-T, SONET/SDH.

CAMADAS TCP/IP

	Number	Name	Description / Example	
Hosts	7	Application	Virtually any Internet-compatible application, including the Web (HTTP), DNS (Chapter 11), DHCP (Chapter 6).	
	4	Transport	Provides exchange of data between abstract "ports" managed by applications. May include error and flow control. Examples: TCP (Chapters 13-17), UDP (Chapter 10), SCTP, DCCP.	
All Internet Devices	3.5	Network (Adjunct)	Unofficial "layer" that helps accomplish setup, management, and security for the network layer. Examples: ICMP (Chapter 8) and IGMP (Chapter 9), IPsec (Chapter 18).	"Network Layer"
	3	Network	Defines abstract datagrams and provides routing. Examples include IP (32-bit addresses, 64KB maximum size) and IPv6 (128-bit addresses, up to 4GB maximum size). Chapters 2,5.	
	2.5	Link (Adjunct)	Unofficial "layer" used to map addresses used at the network to those used at the link layer on multi-access link-layer networks. Example: ARP (Chapter 4).	"Driver"

APLICAÇÕES DE REDE

- Processos executados nos *hosts*
- Obedecem a protocolos na camada de aplicação
- Utilizam os serviços das camadas de transporte

- O cliente solicita serviços ao servidor
- Utiliza-se um protocolo *request/reply*
- O servidor responde aos pedidos de clientes
- Um servidor que serve um cliente de cada vez diz-se **iterativo** (serializa os pedidos)
- Um servidor que serve vários clientes em paralelo diz-se **concorrente**

- Não existe noção de cliente e de servidor
- Todos são clientes e servidores
- Exemplo: protocolo bittorrent
 - Um *peer* pede pedaços de ficheiros aos outros *peers*, ao mesmo tempo que é responsável por enviar a outros os pedaços que já tem
 - Aos *peers* que possuem todos os pedaços do ficheiro chamamos *seeds*

OUTROS PROTOCOLOS

- Baseia-se em “datagramas”
- *Connectionless*
- Não garante ordem
- Não retransmite
- Ideal para streaming de áudio ou vídeo

PACOTES UDP

