

A dramatic landscape with a large, jagged rock formation in the foreground and a bright sun or moon in a cloudy sky.

Contribuição ao projeto de redes de comunicação de voz e dados utilizado as tecnologias Ethernet e Frame Relay

Universidade de Brasília
Faculdade de Tecnologia
Departamento de Engenharia Elétrica



Defesa de Dissertação de Mestrado

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Prof. Dr.

Luís Fernando Ramos Molinaro

Divisão do Trabalho

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Padrões de conexão física

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Conclusões

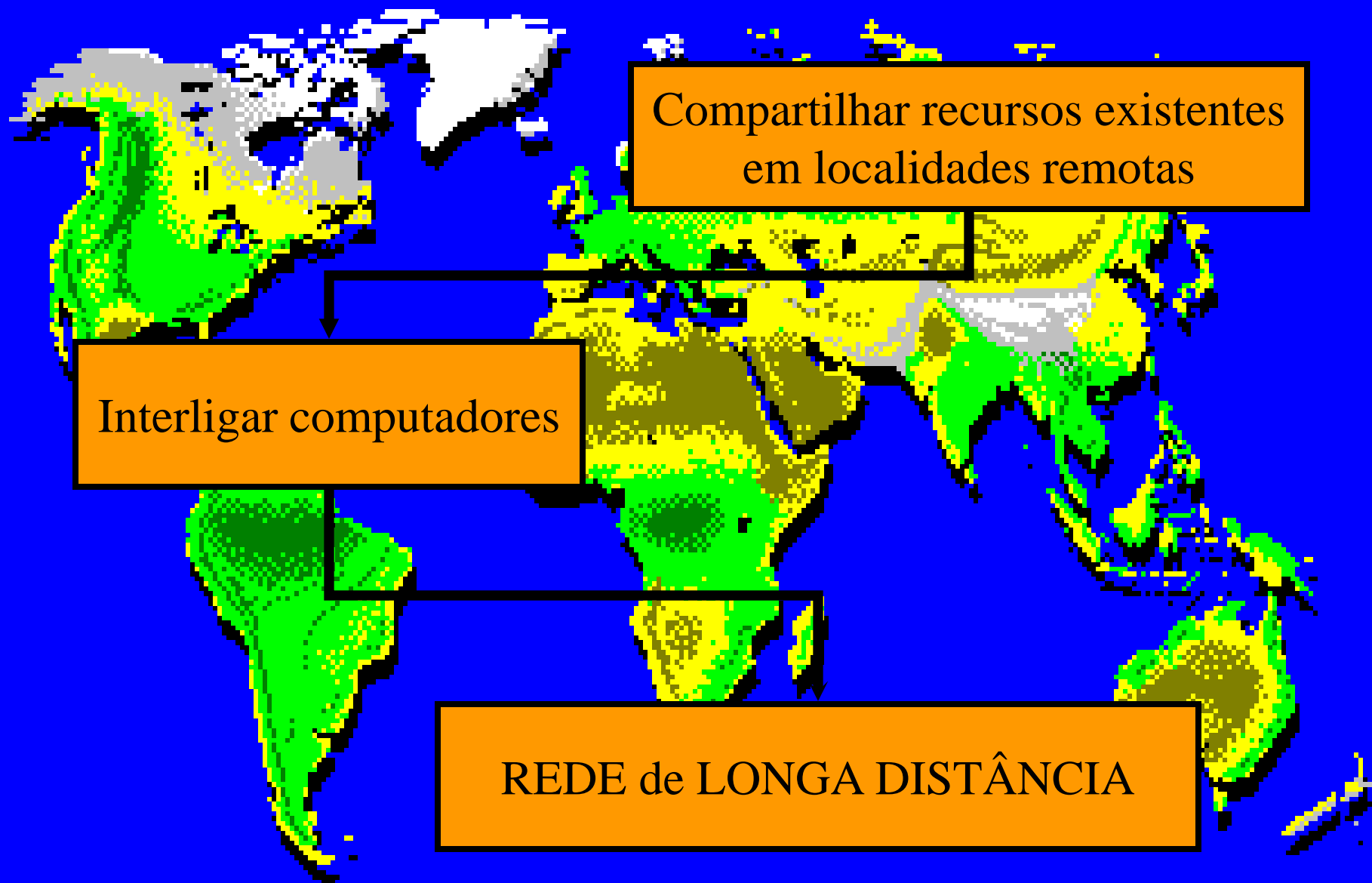


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graph TD; A[Compartilhar recursos existentes no mesmo prédio] --> B[Interligar computadores]; B --> C[REDE LOCAL];
```

Compartilhar recursos existentes
no mesmo prédio

Interligar computadores

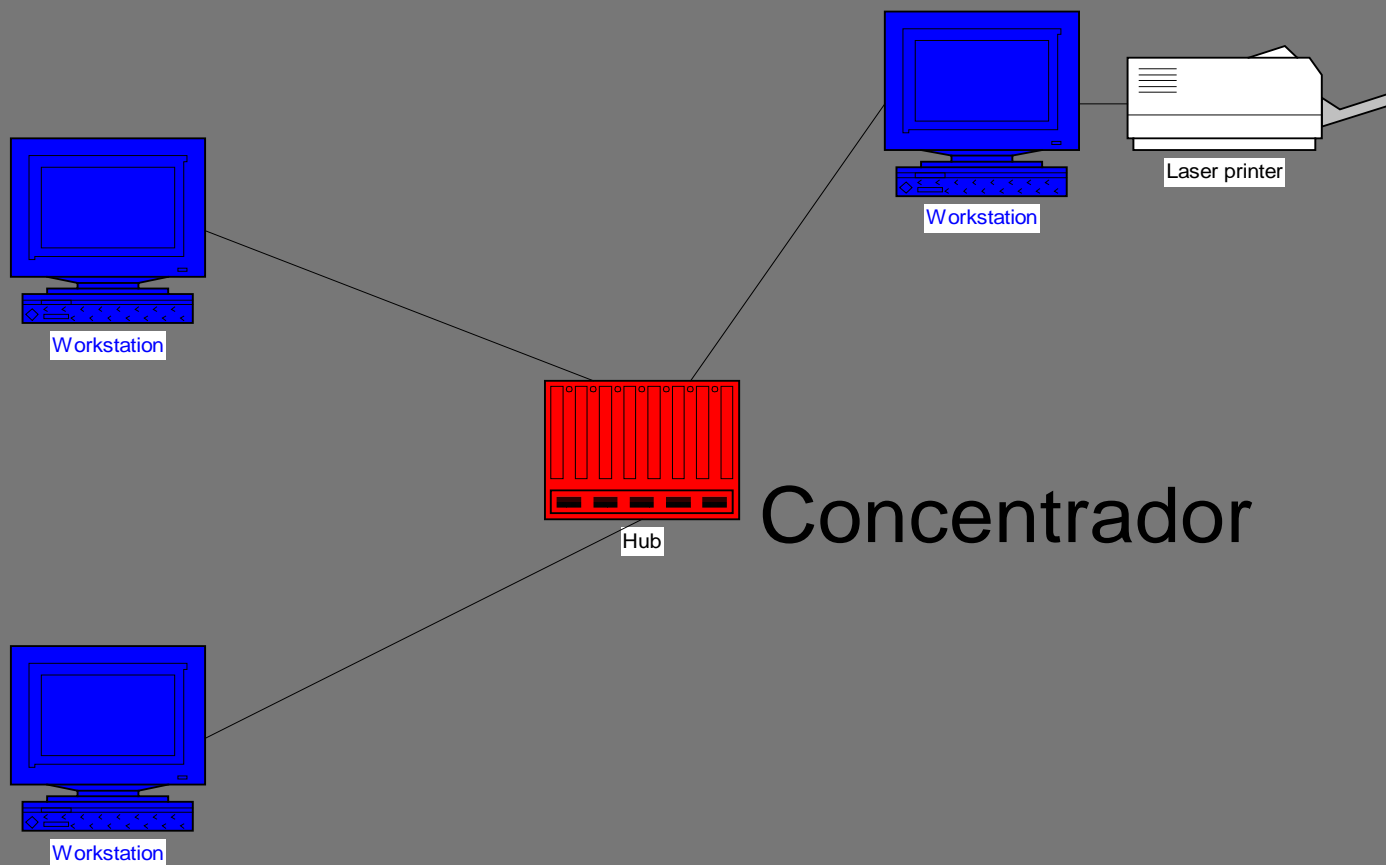
REDE LOCAL



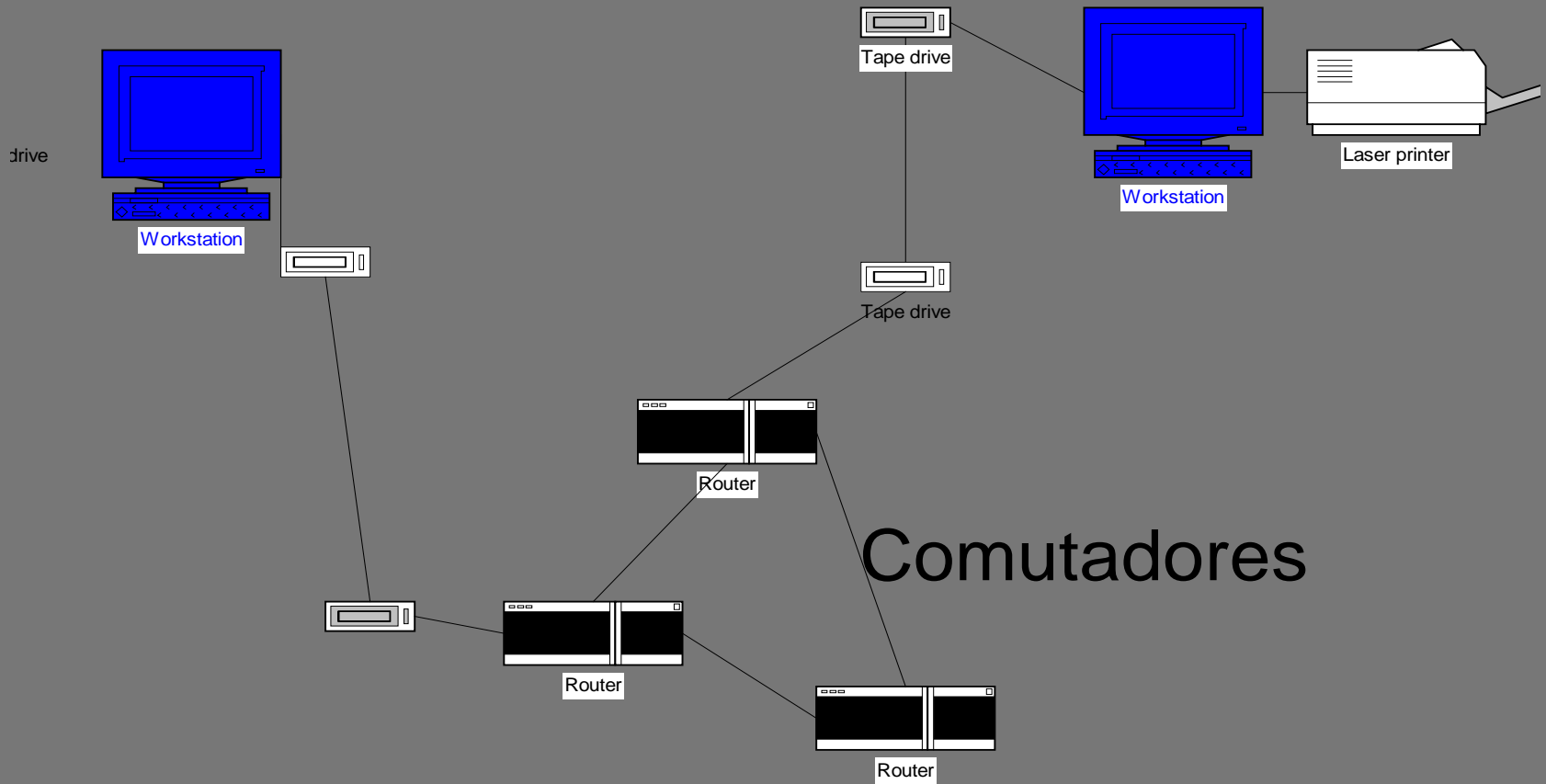


Elementos

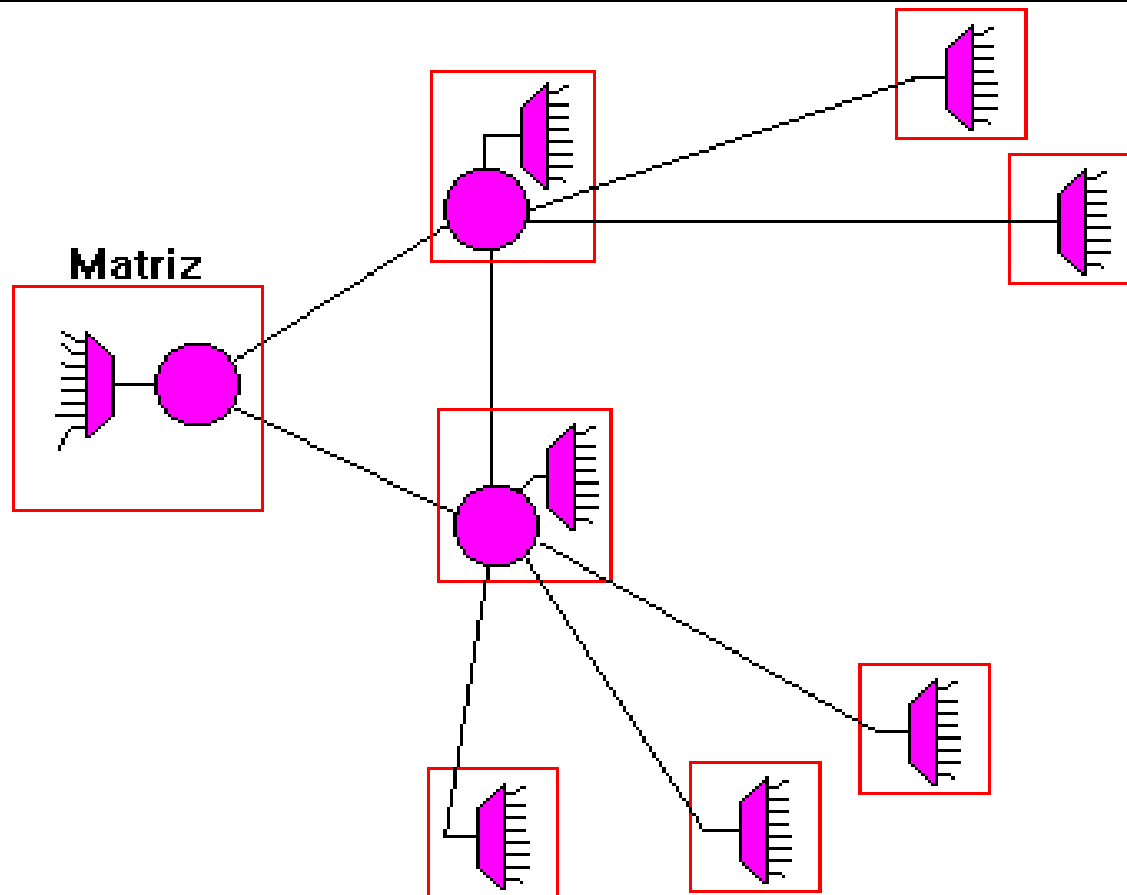
- Meio de comunicação (Transmissão)
- Equipamento de acesso
- Equipamento de comutação



Rede Local

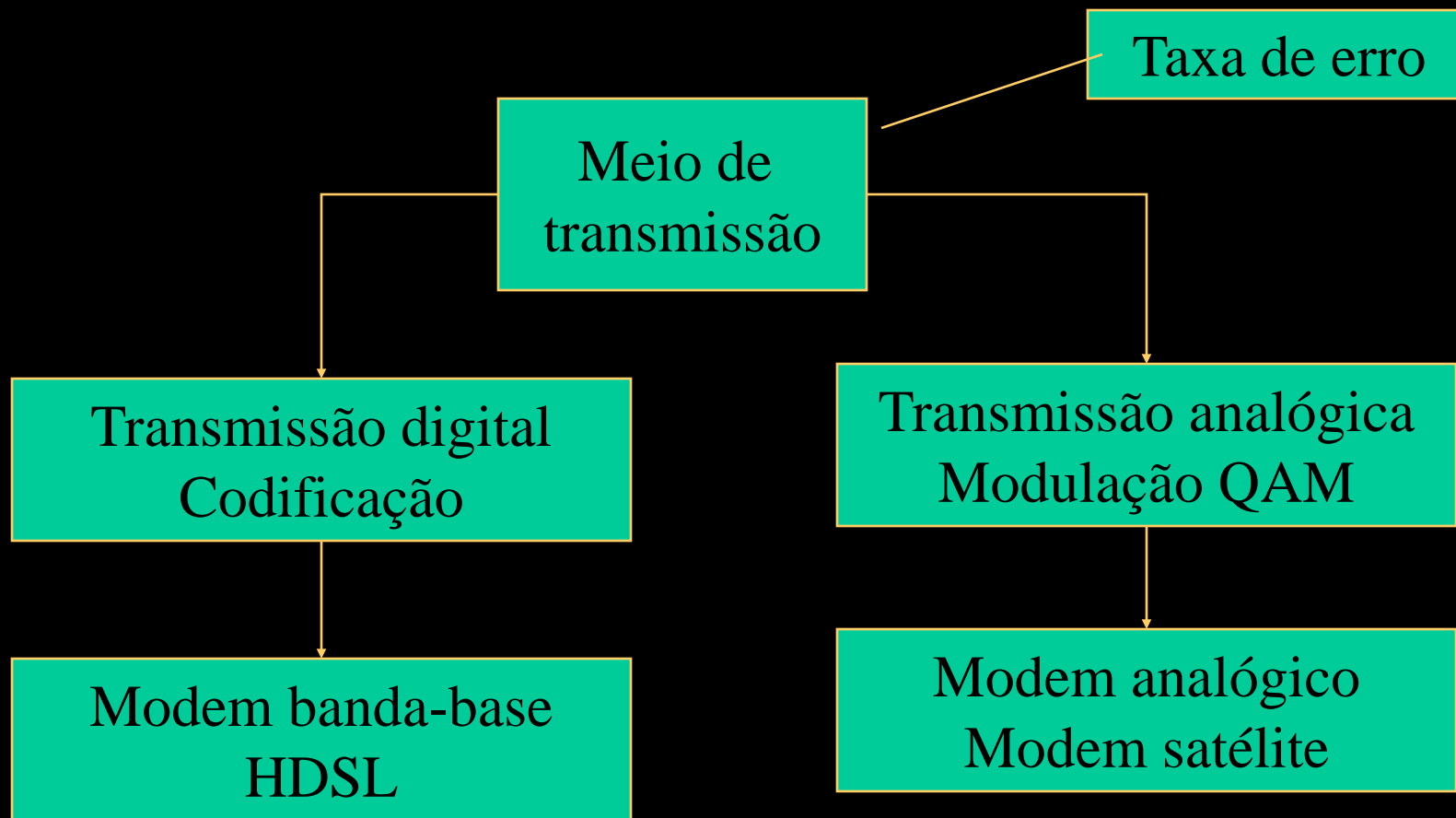


Rede de longa distância

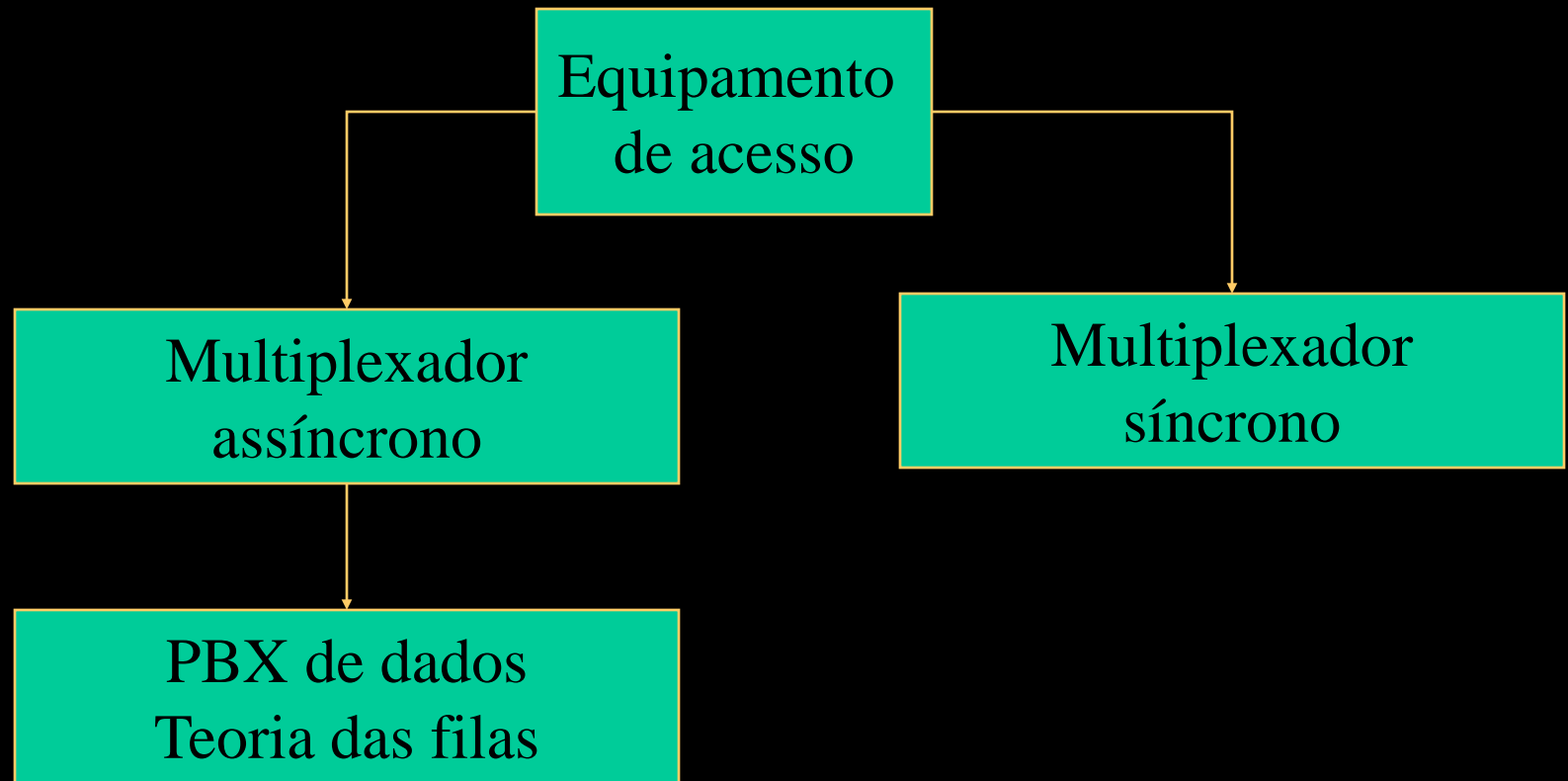


Rede de longa distância

Capítulo 2



Capítulo 2



A evolução do Modem

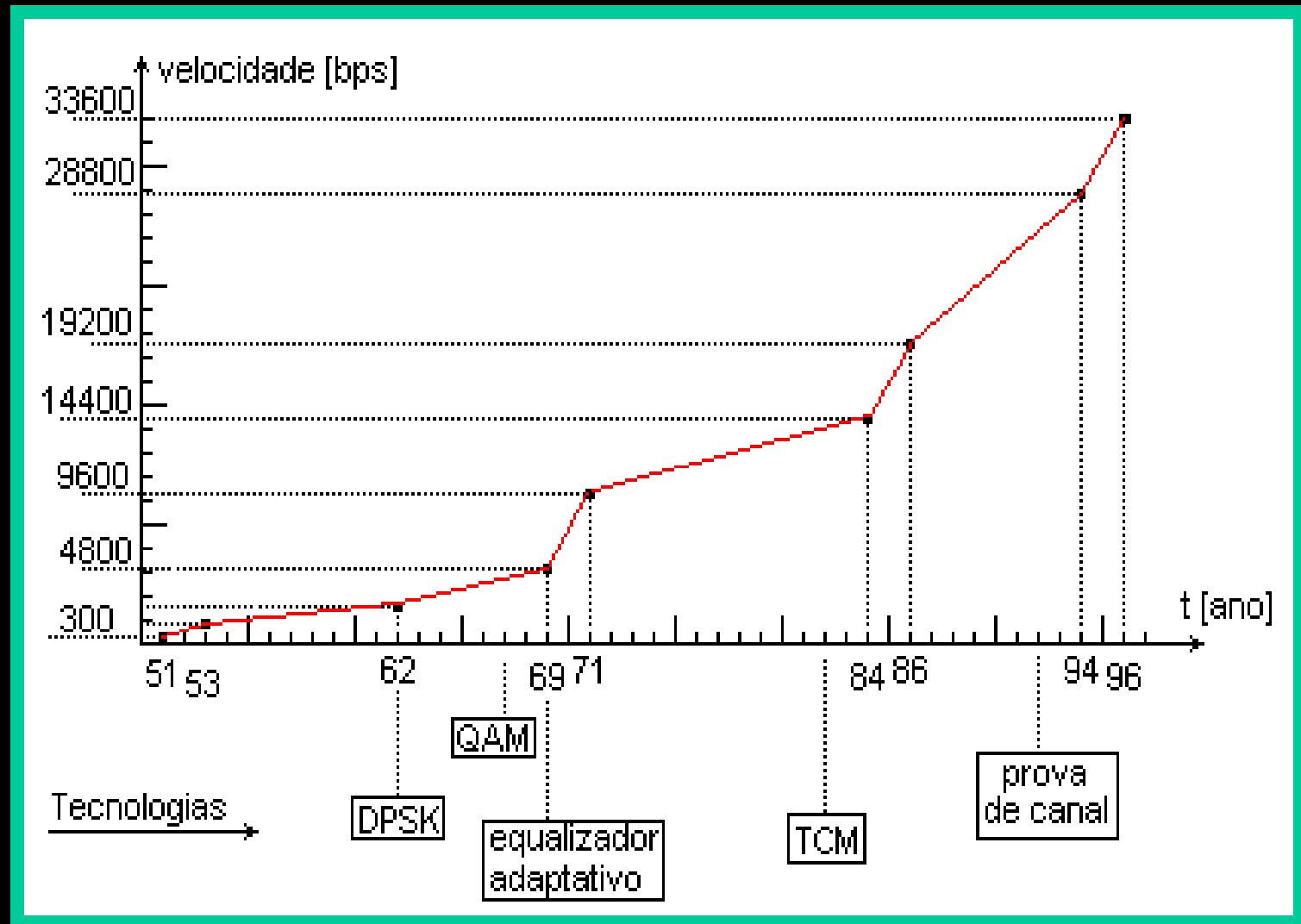
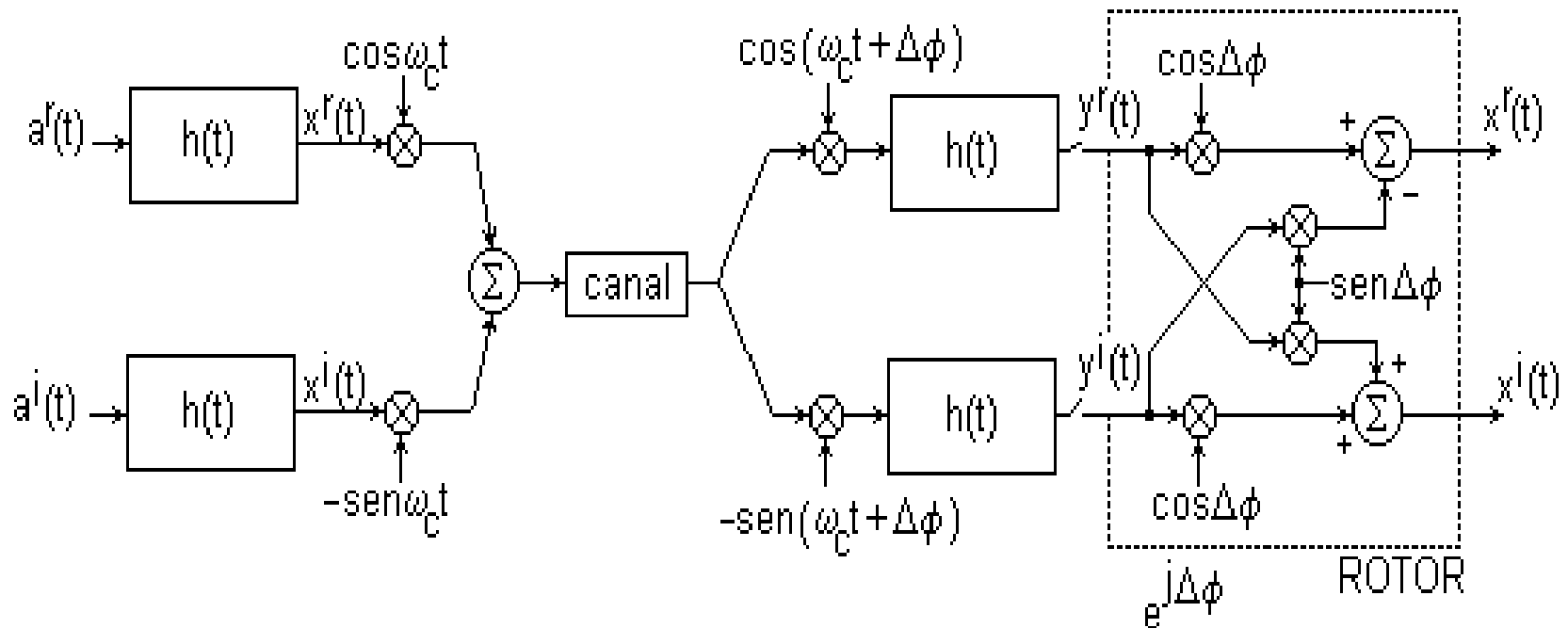
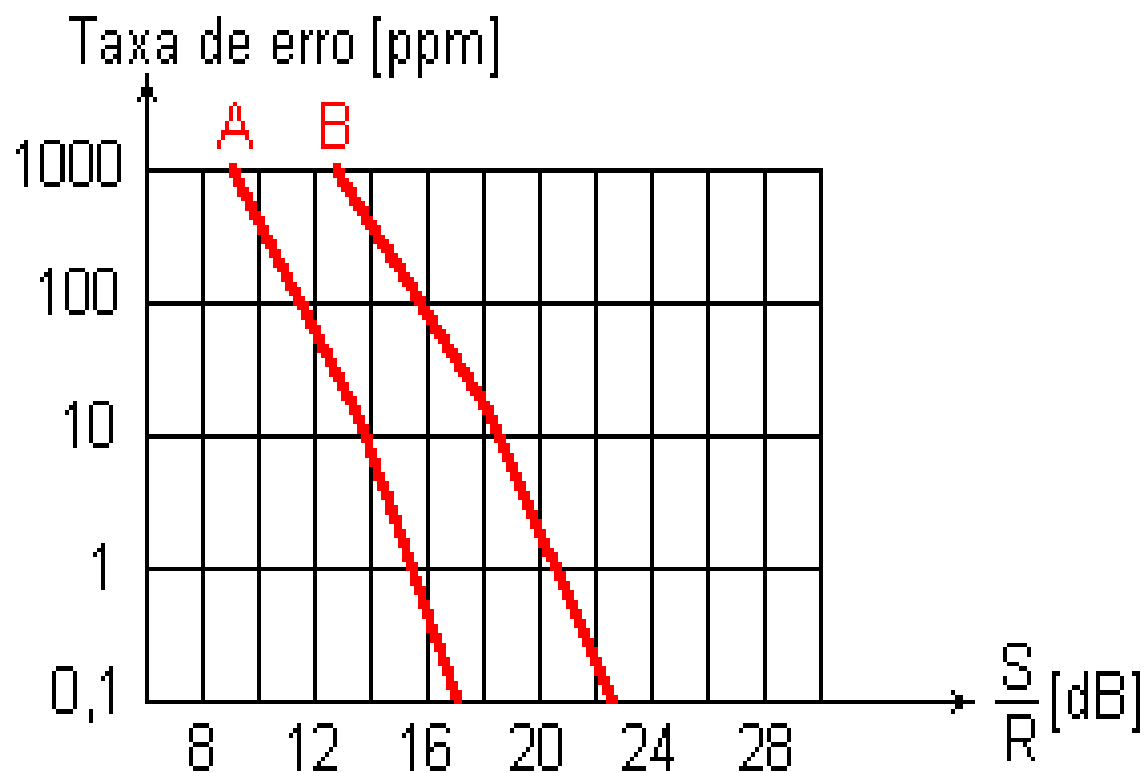


Diagrama do modem QAM

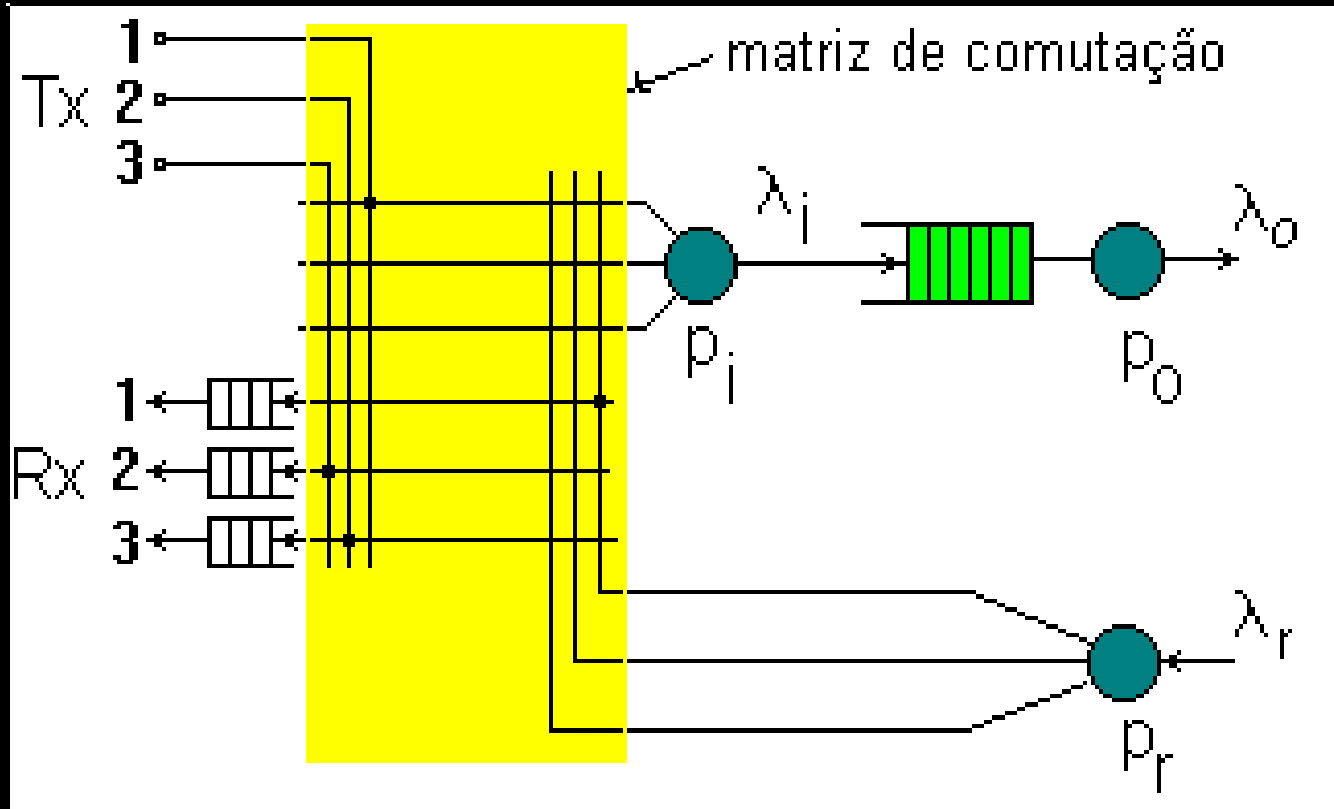


$$S(t) = a^r(t) \cdot \cos(\omega_c t) - a^i(t) \cdot \sin(\omega_c t)$$

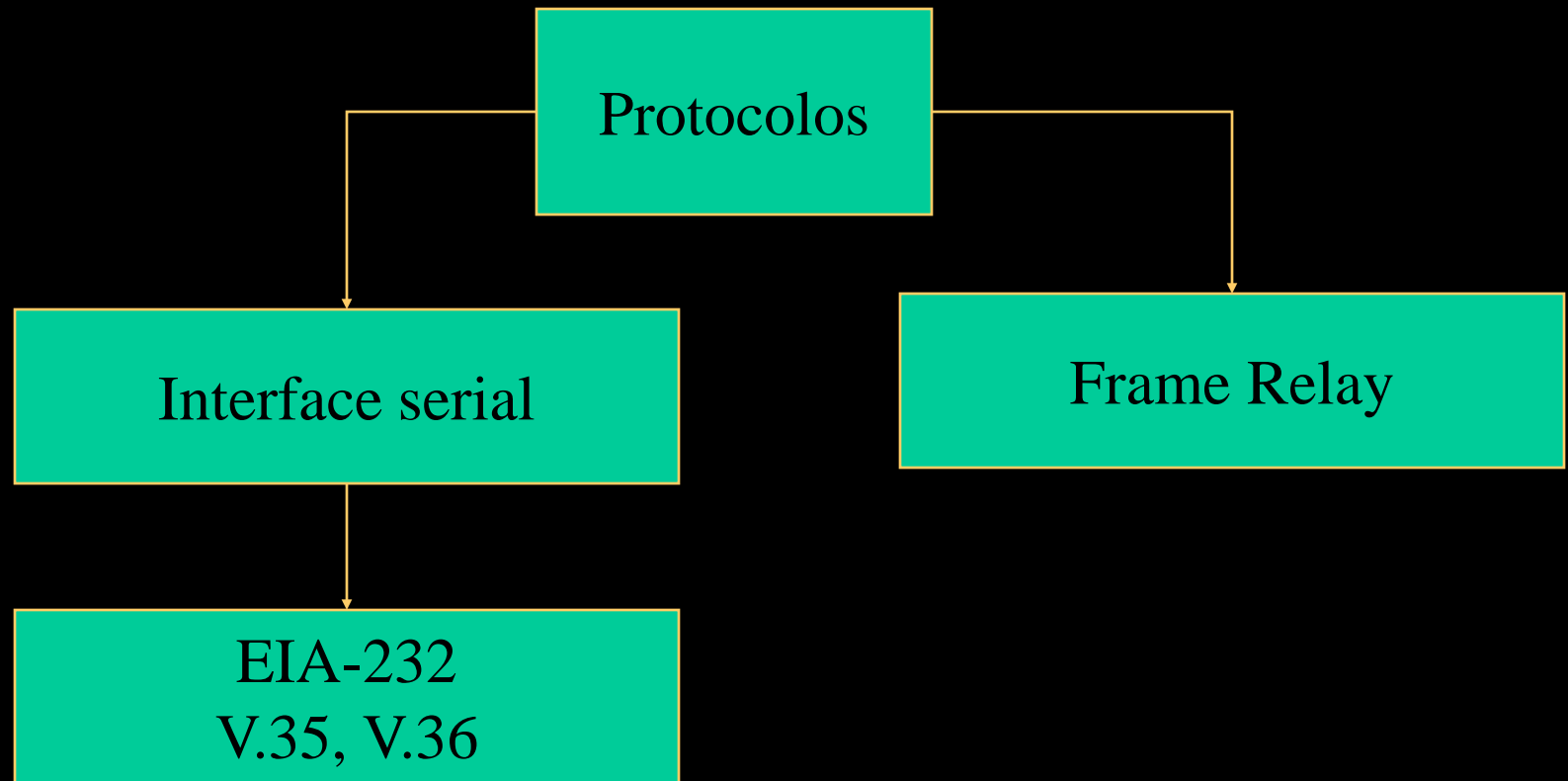
Taxa de erro



Mux-PBX assíncrono



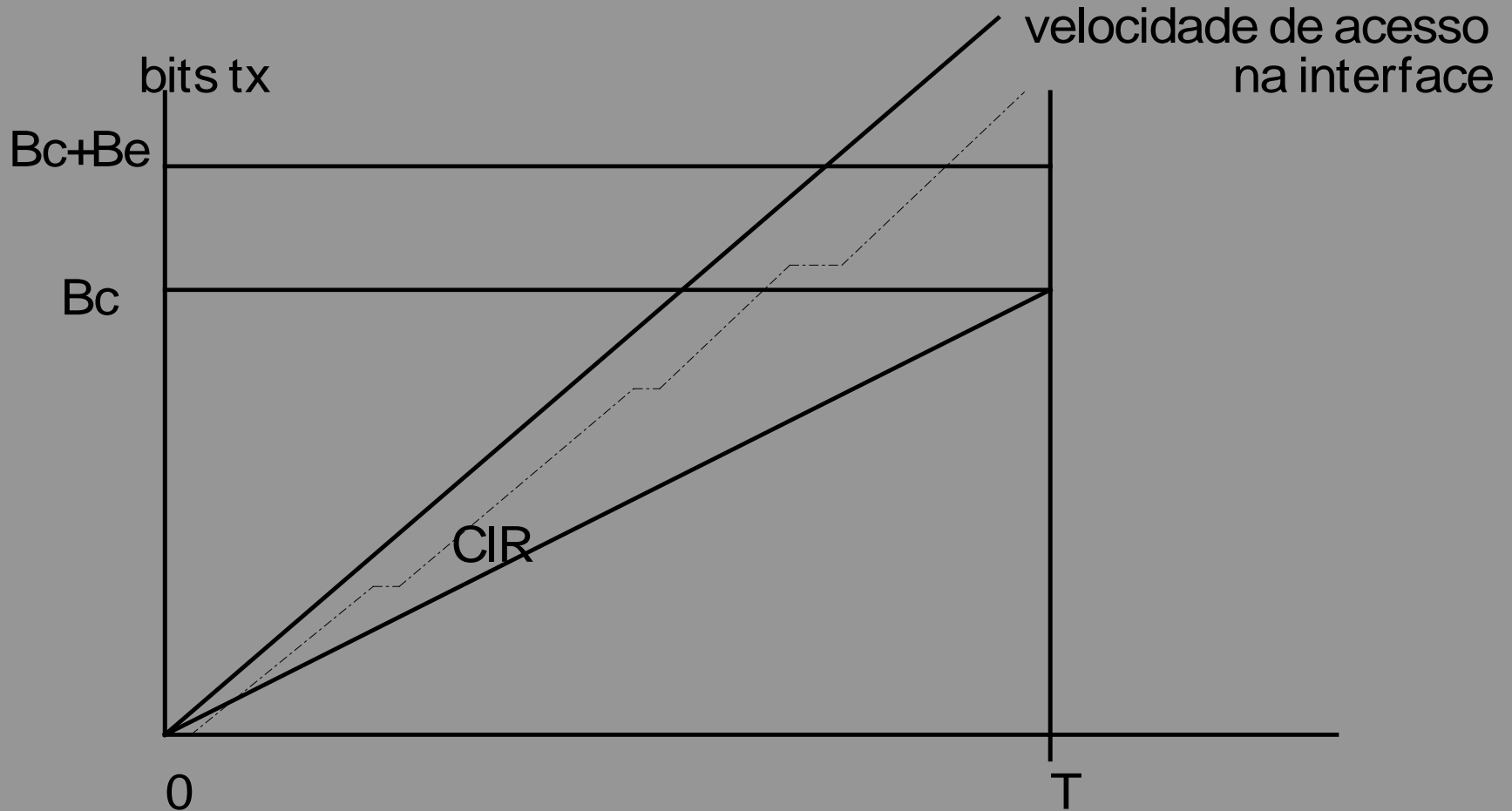
Capítulo 3



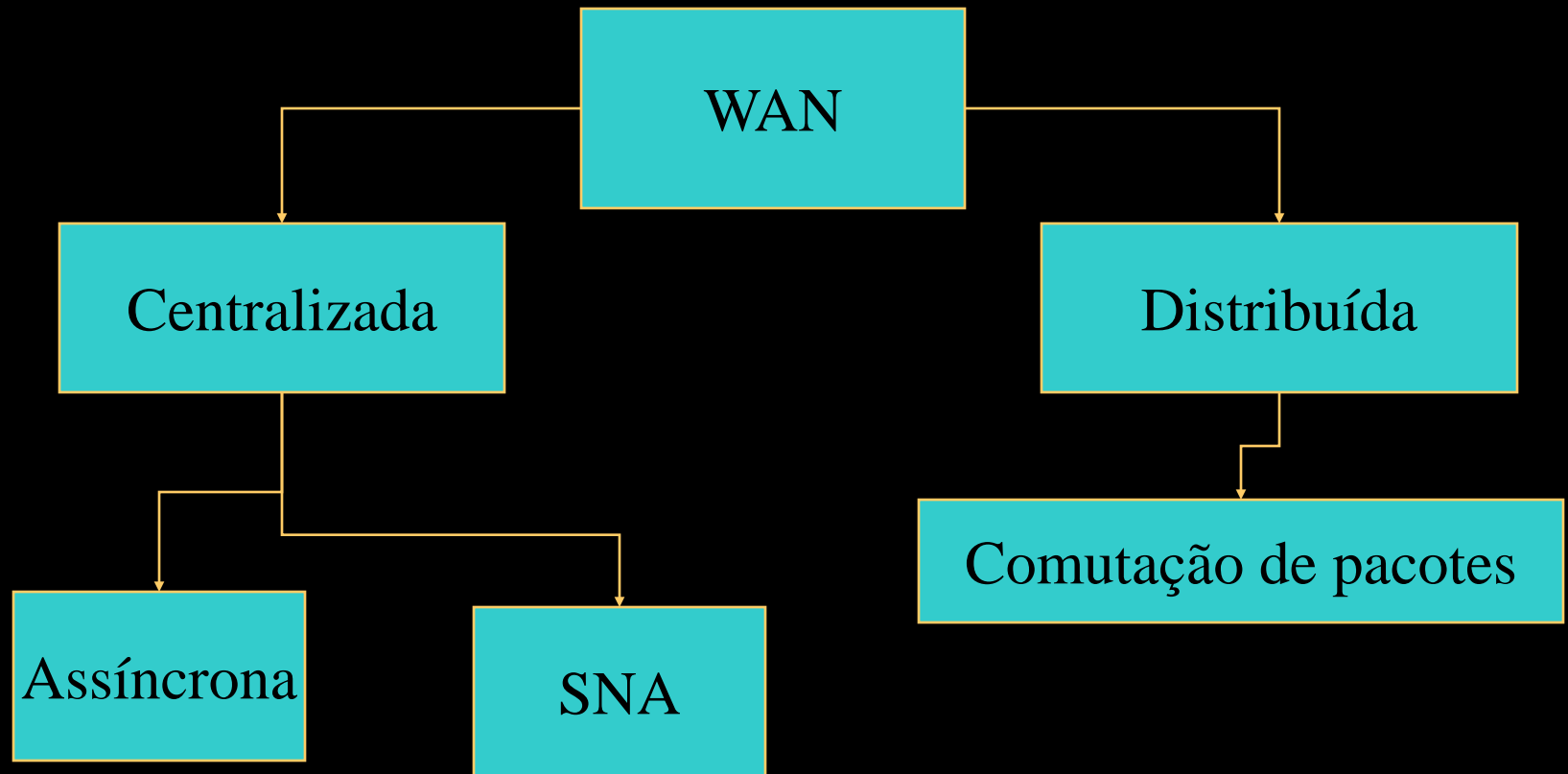
Normas para interface serial

Norma¹	Elétrica	Mecânica	Lógica	Conector	Velocidade
EIA232	EIA232D	EIA232D	EIA232D	DB25	20 kbps
V.35	V35, V28	ISO2593	ISO2593, V.35	M34	48 kbps
V.36	V10, V11	ISO4902	ISO4902, V.36	DB37	72 kbps
V.10	V10	-	-	-	100 kbps
V.11	V11	-	-	-	10 Mbps
V.24	-	-	V.24	-	-
V.28	V28	ISO2110	-	DB25	20 kbps
X.21	V10, V11	ISO4903	ISO4903, X.24	DB15	-
EIA422	EIA422A	-	-	-	10 Mbps
EIA423	EIA423A	-	-	-	100 kbps
EIA449	EIA422, 423	EIA449	EIA449	DB37	10 Mbps
EIA530	EIA530A	EIA530A	EIA530A	DB25	2 Mbps
EIA562	EIA562	EIA232D	EIA232D	DB25	64 kbps

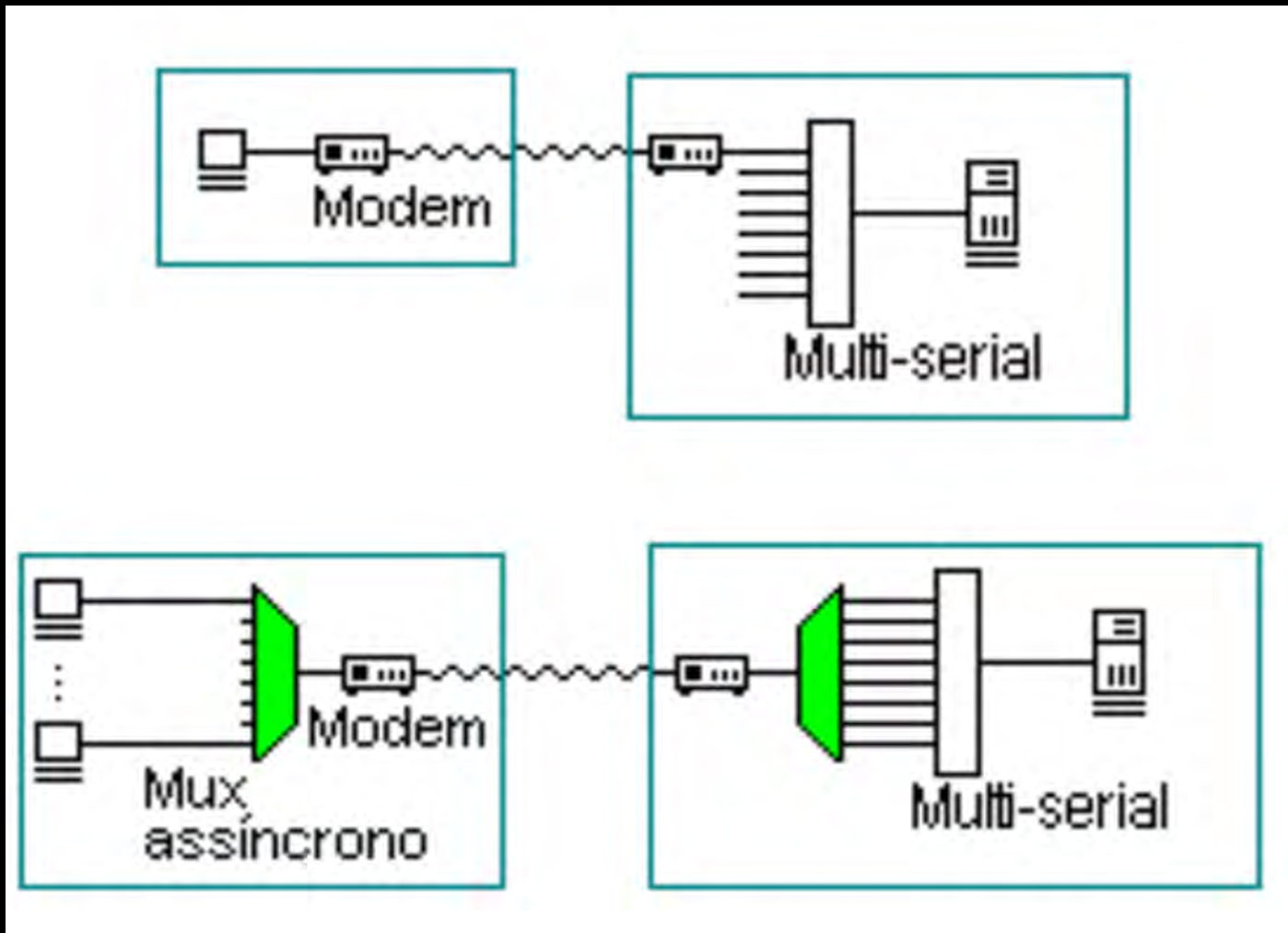
Frame Relay

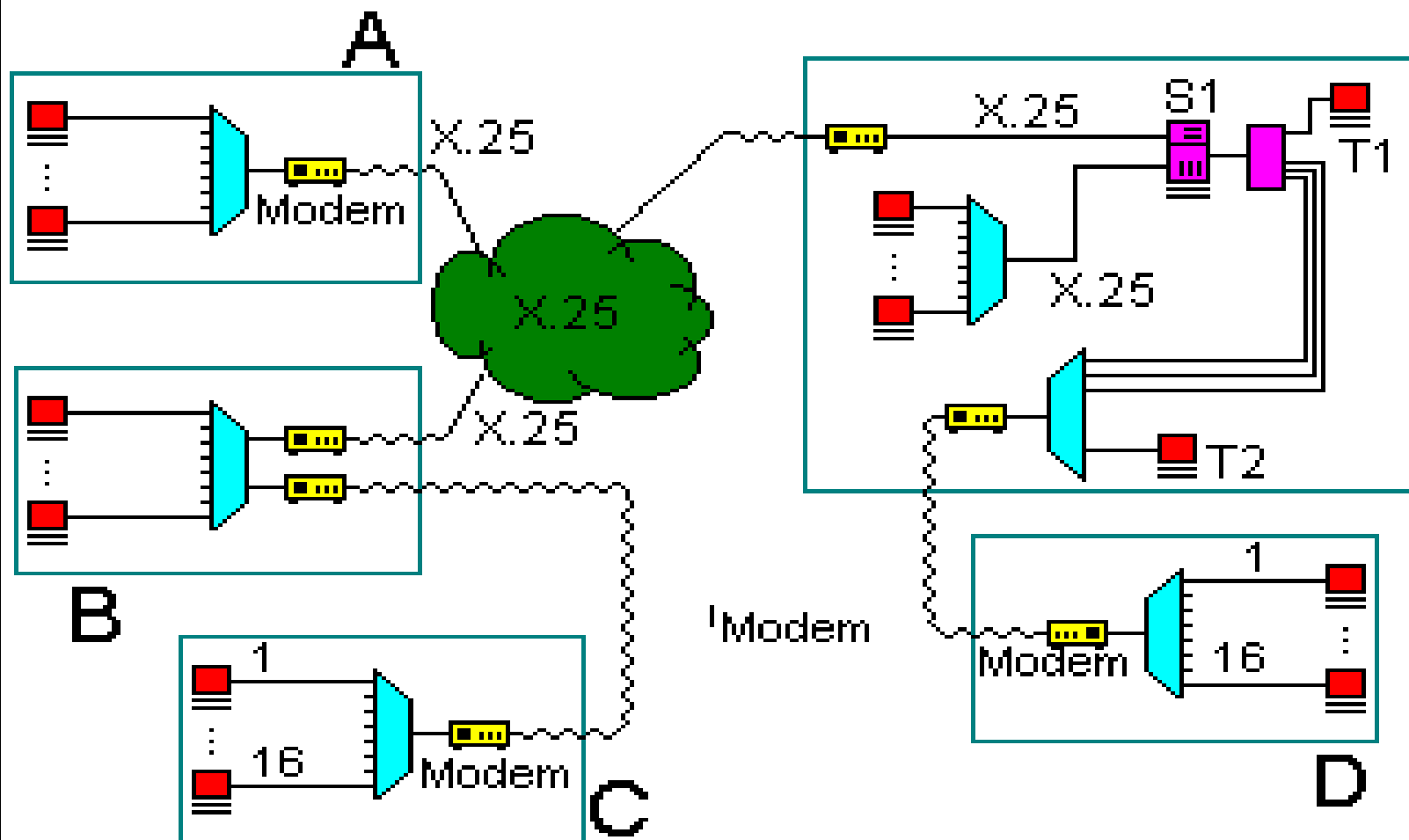


Capítulo 4

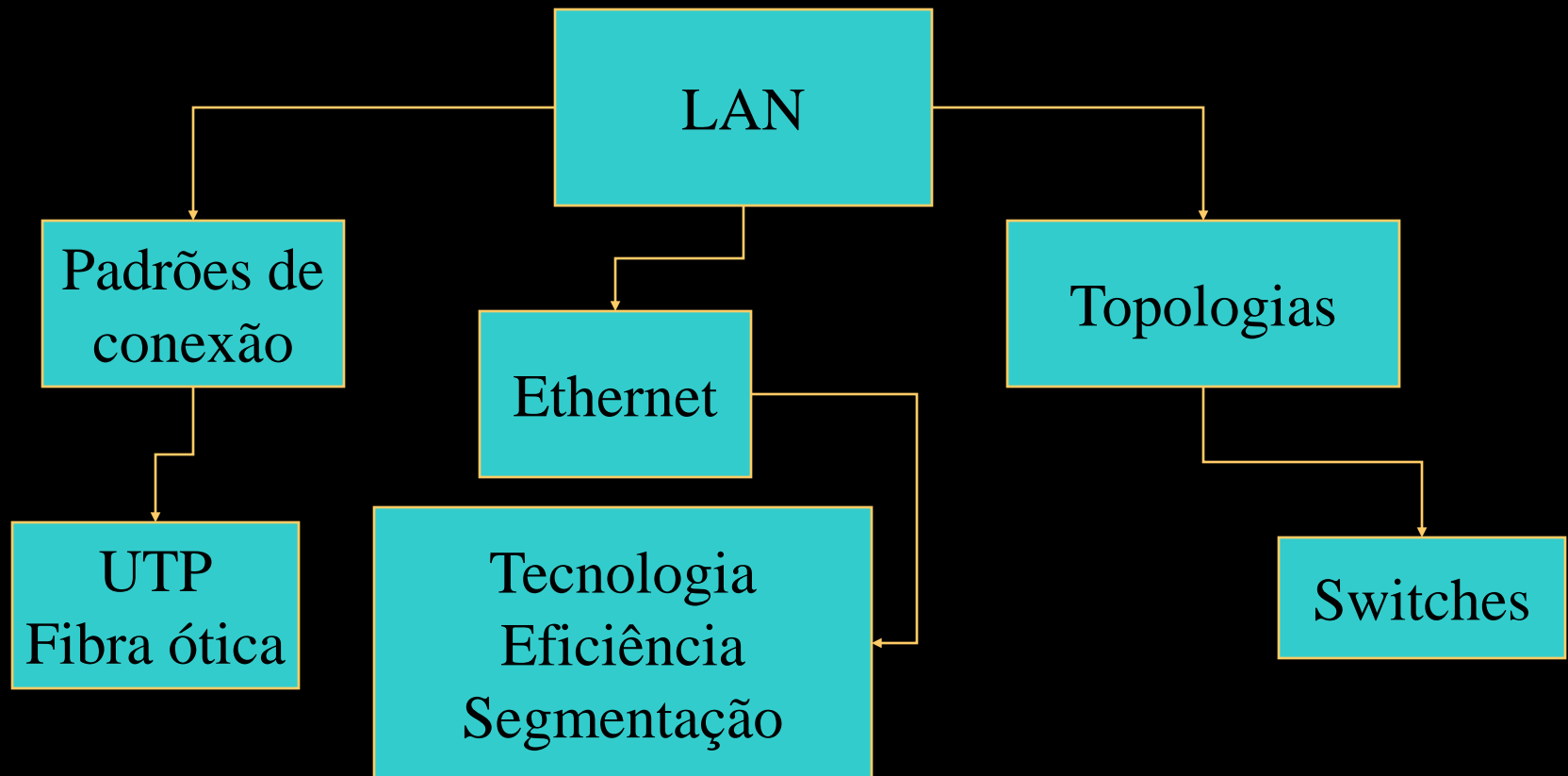


Multiplexador estatístico

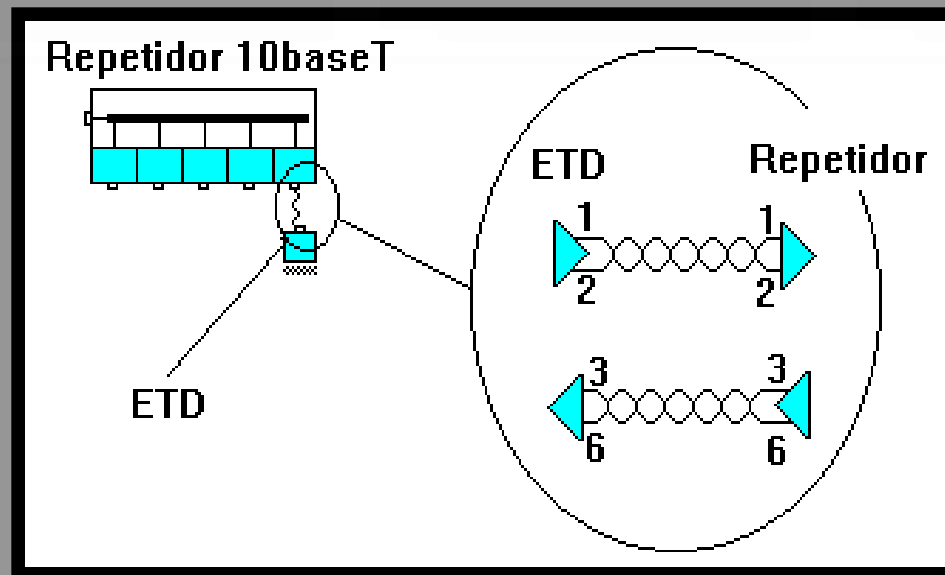
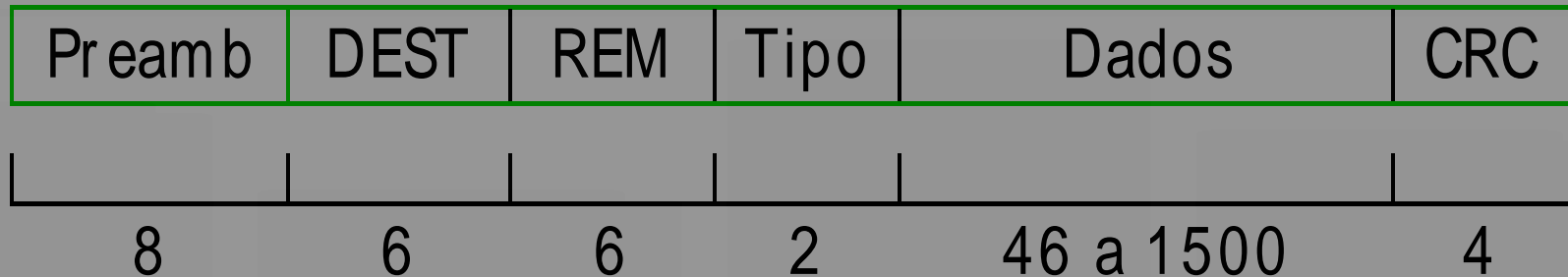




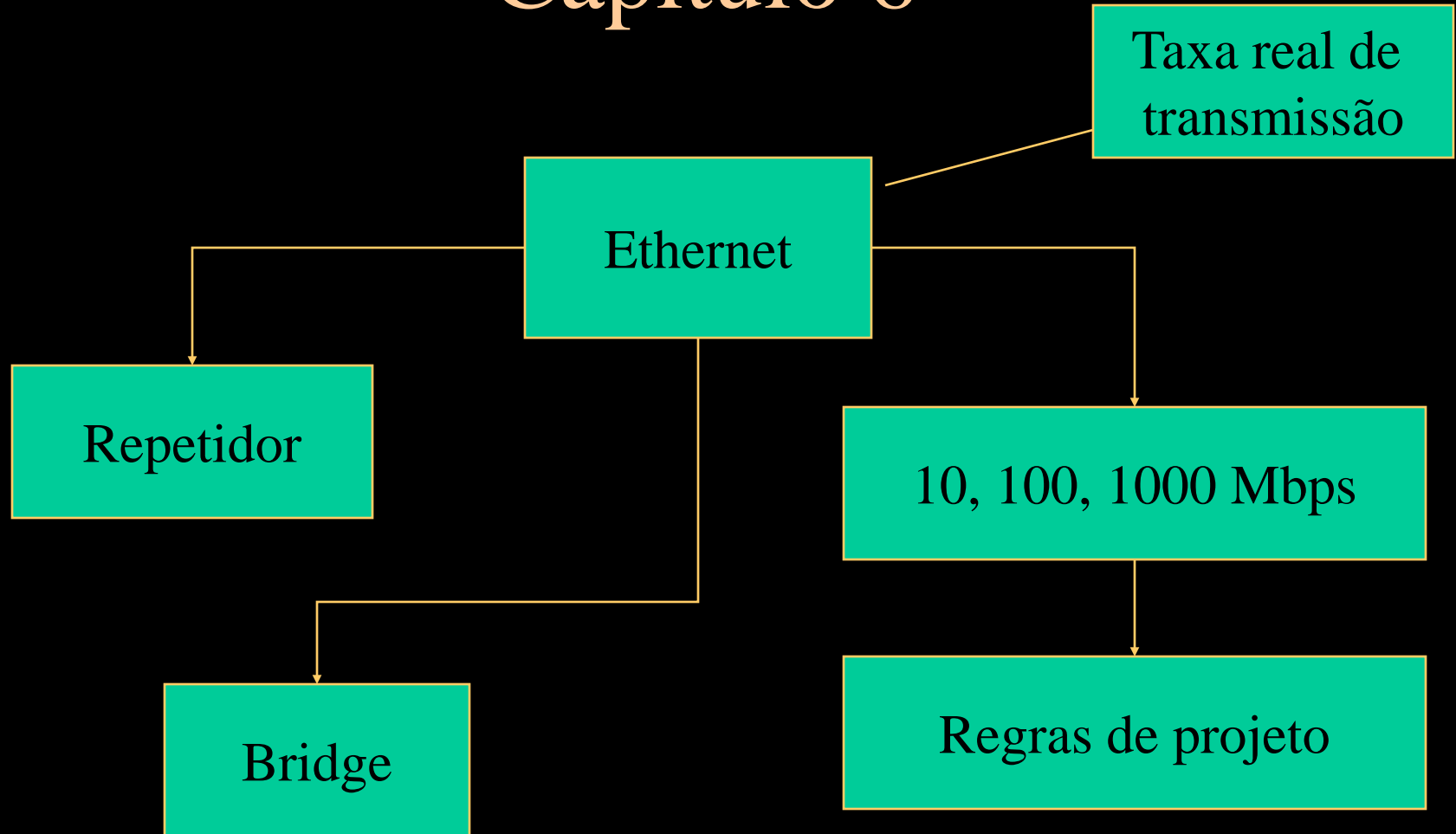
Capítulos 5, 6 e 7

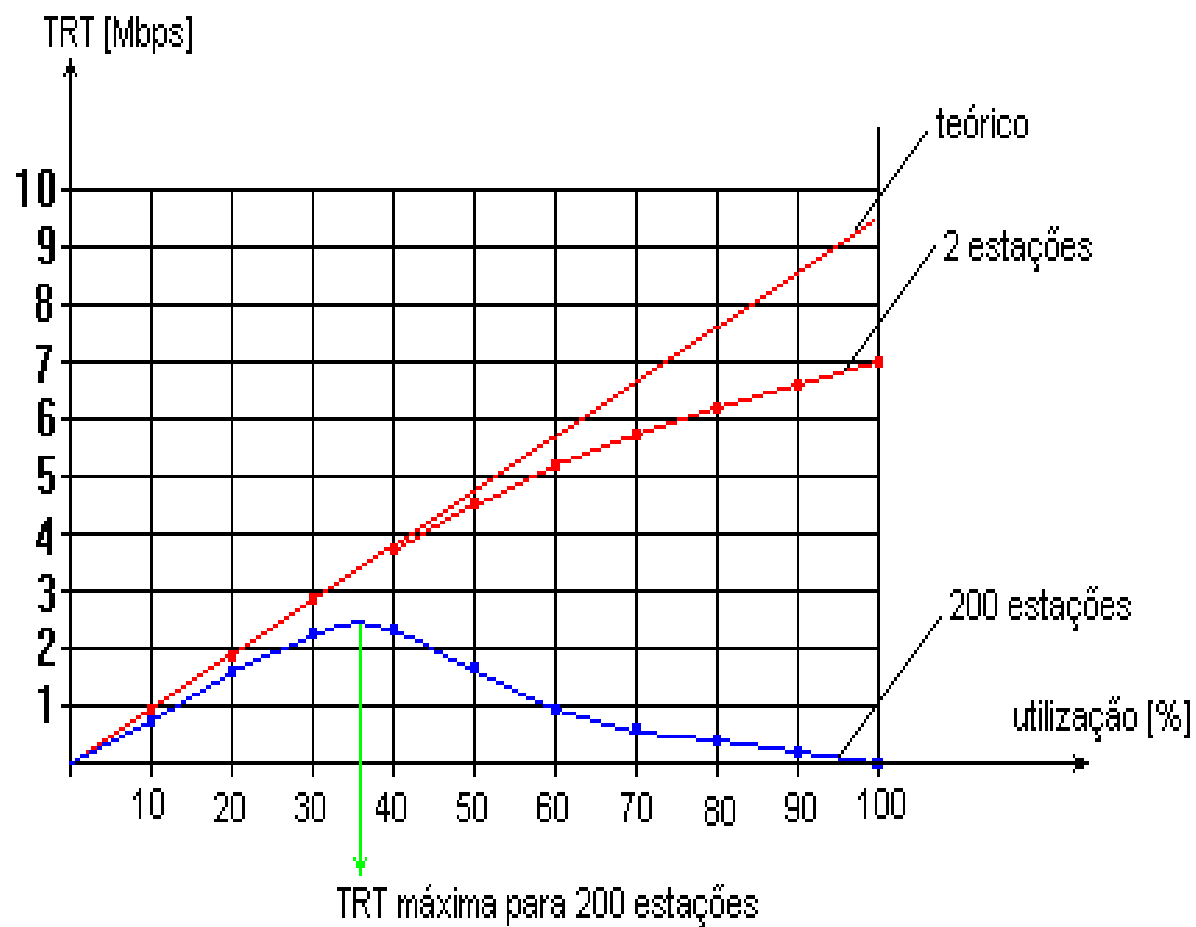


Pacote Ethernet

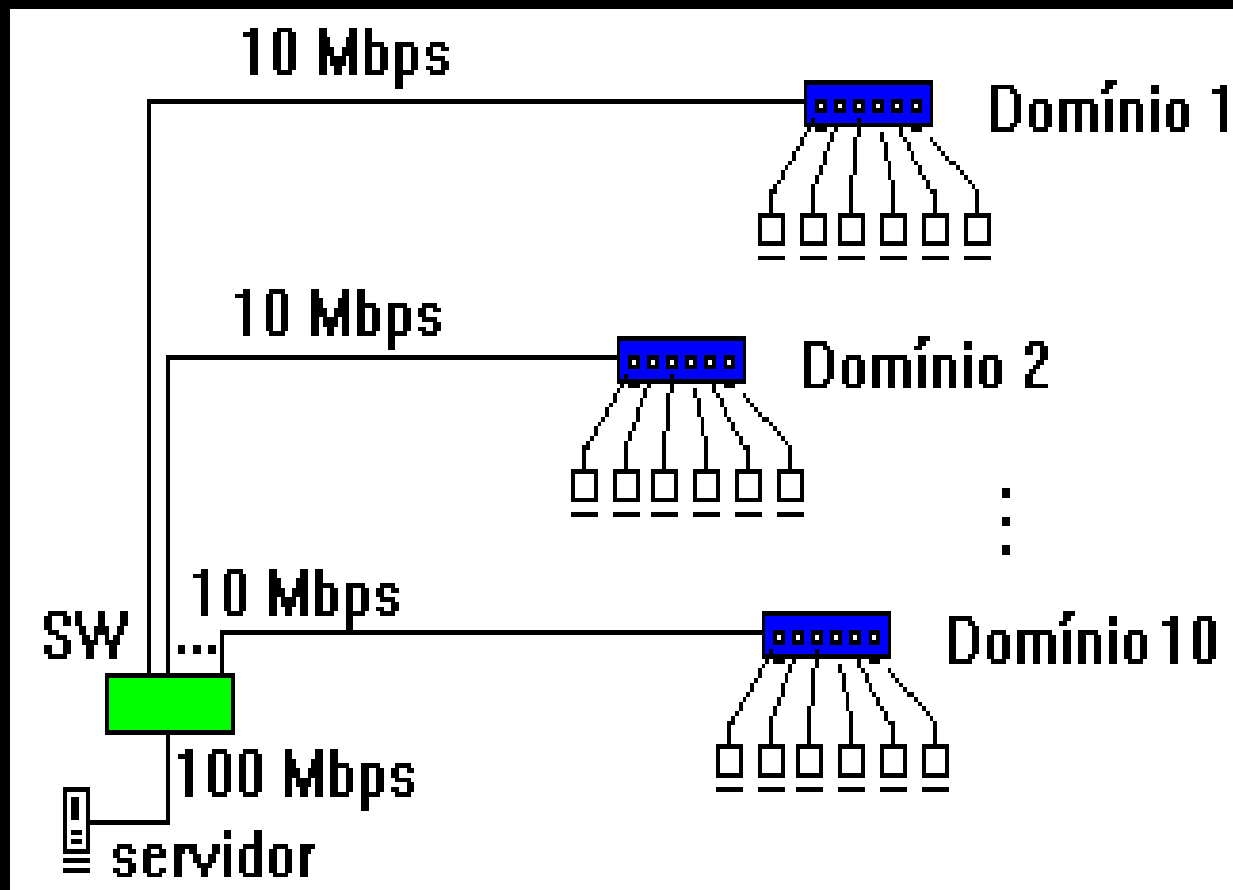


Capítulo 6

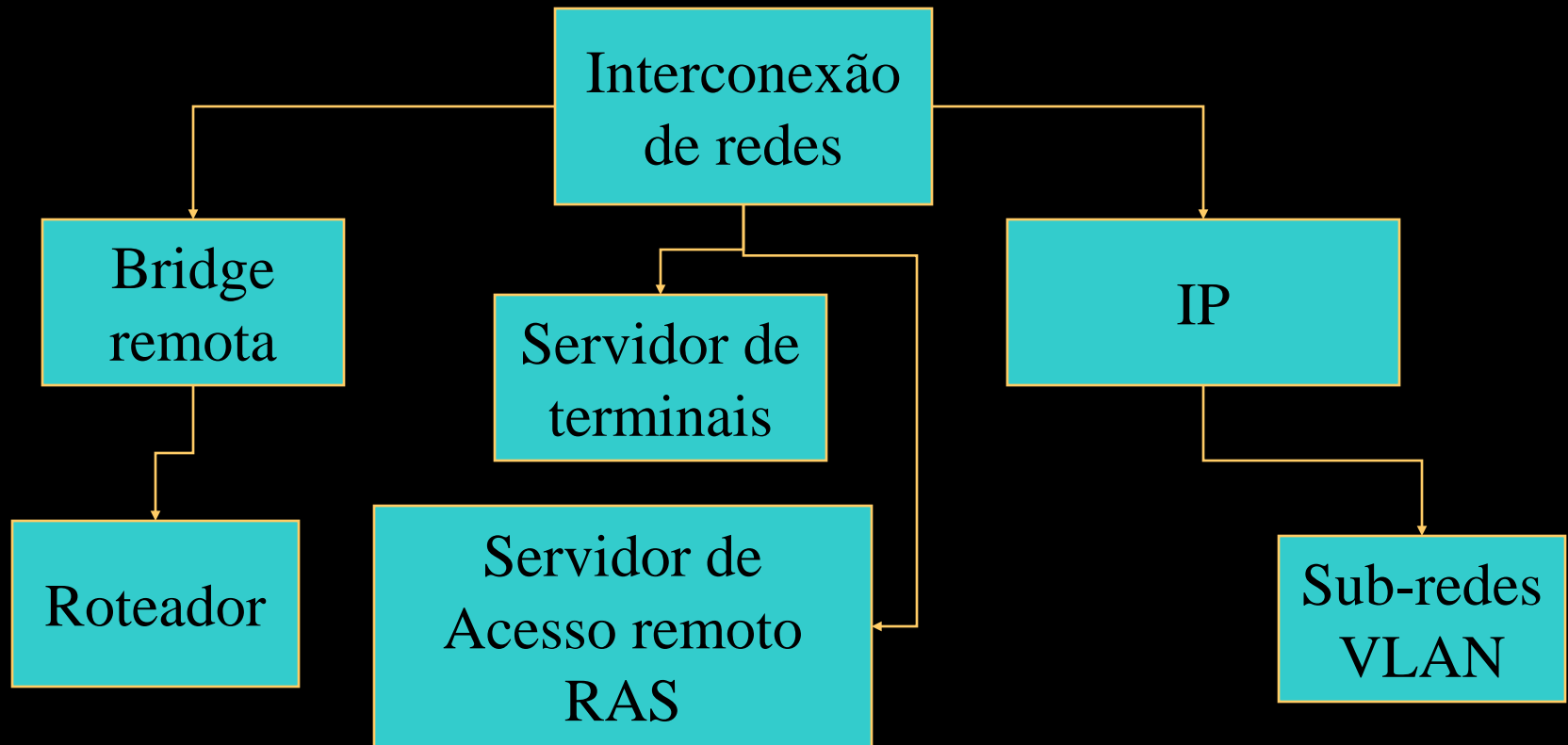




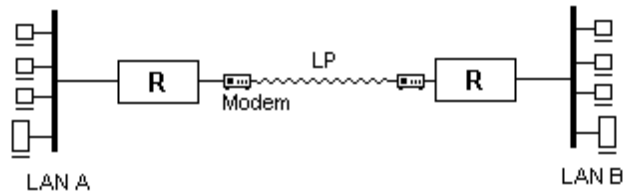
Switches central e de andares



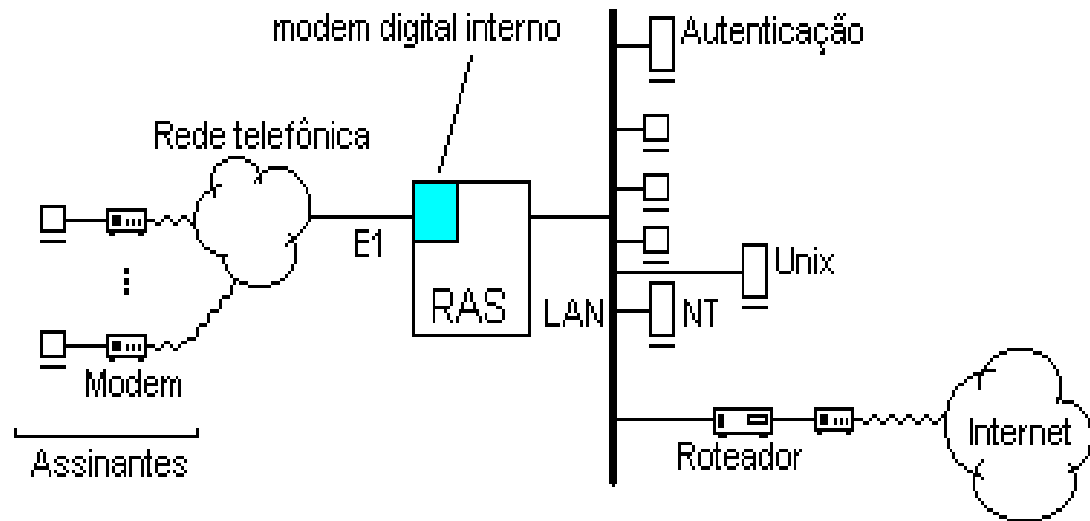
Capítulo 8



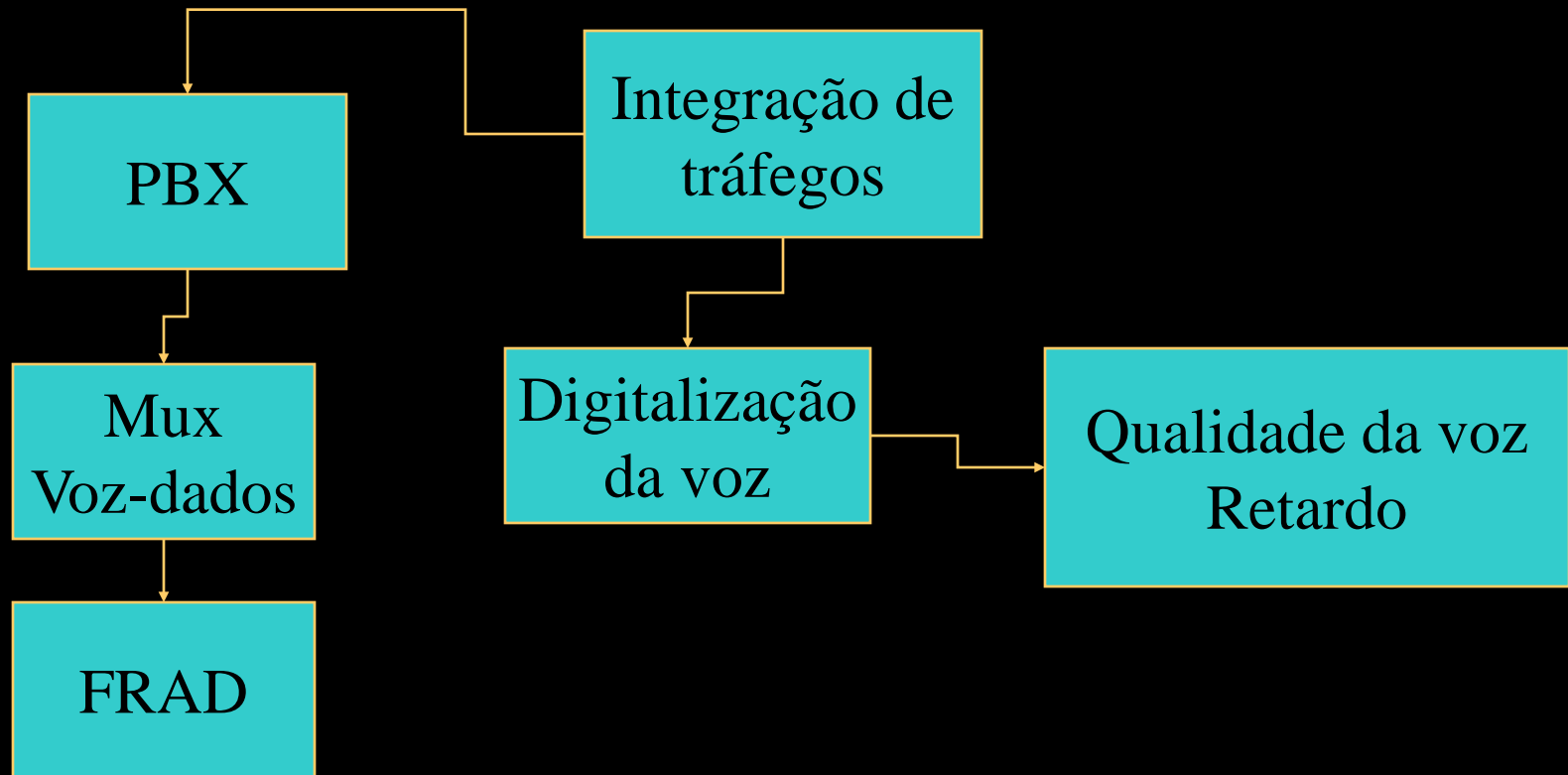
Roteador

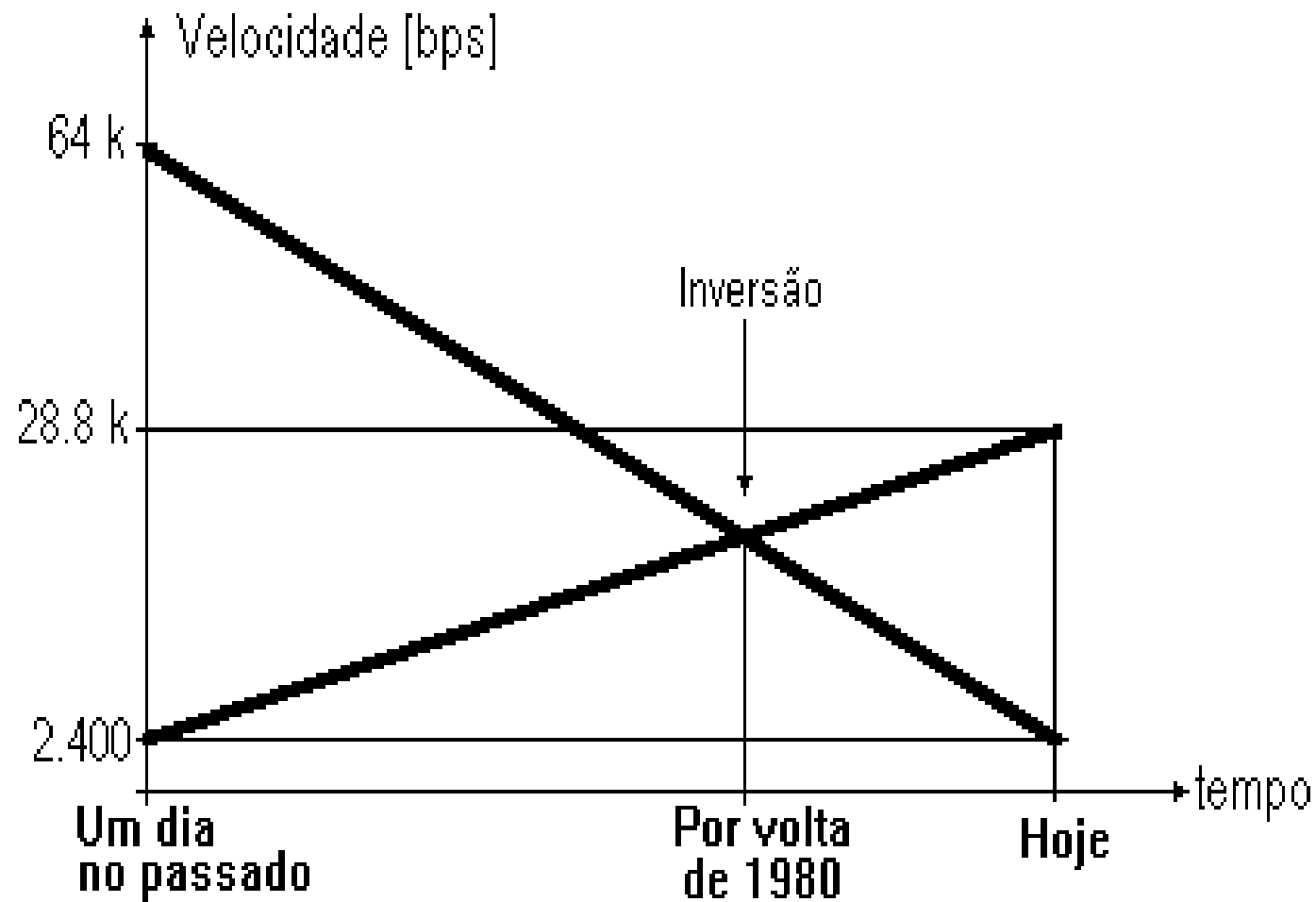


RAS

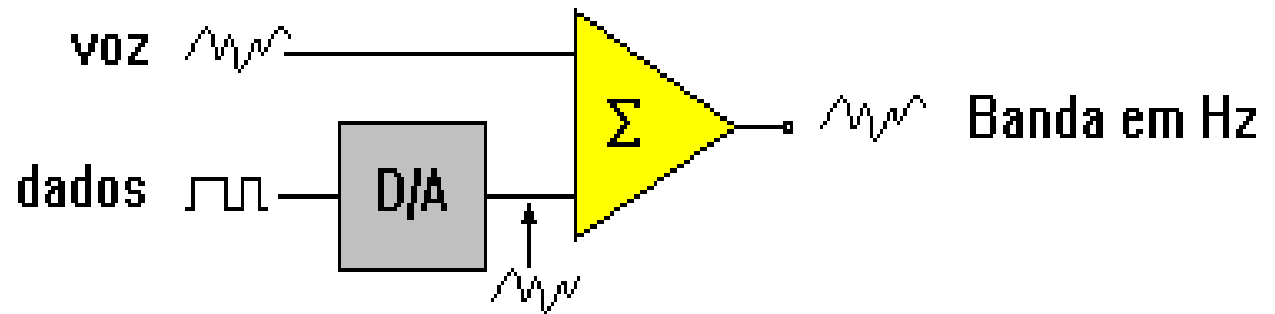


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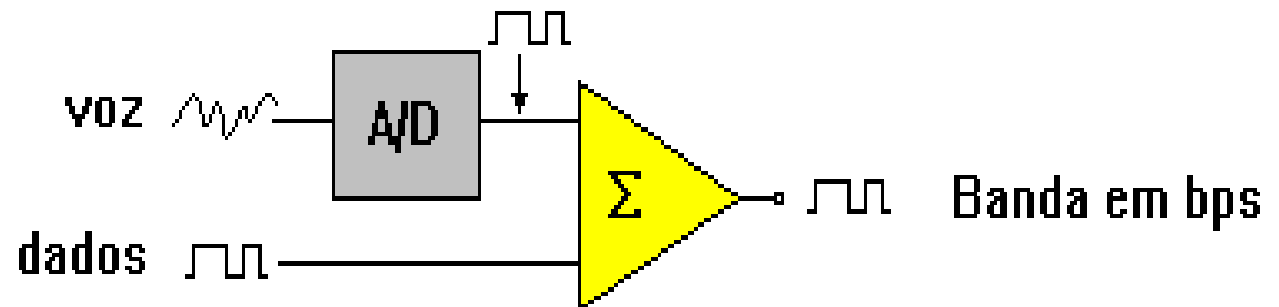


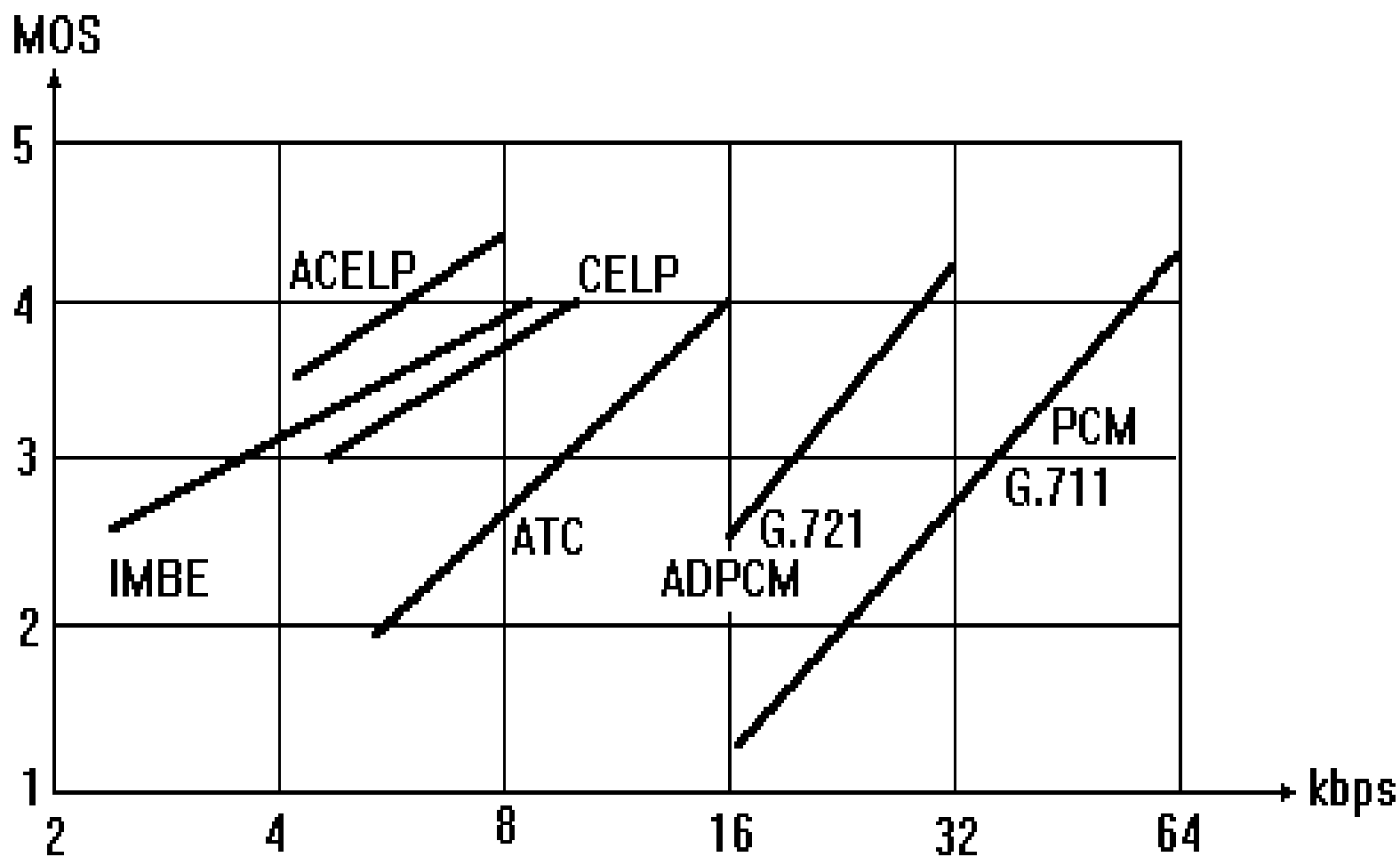


FDM



TDM







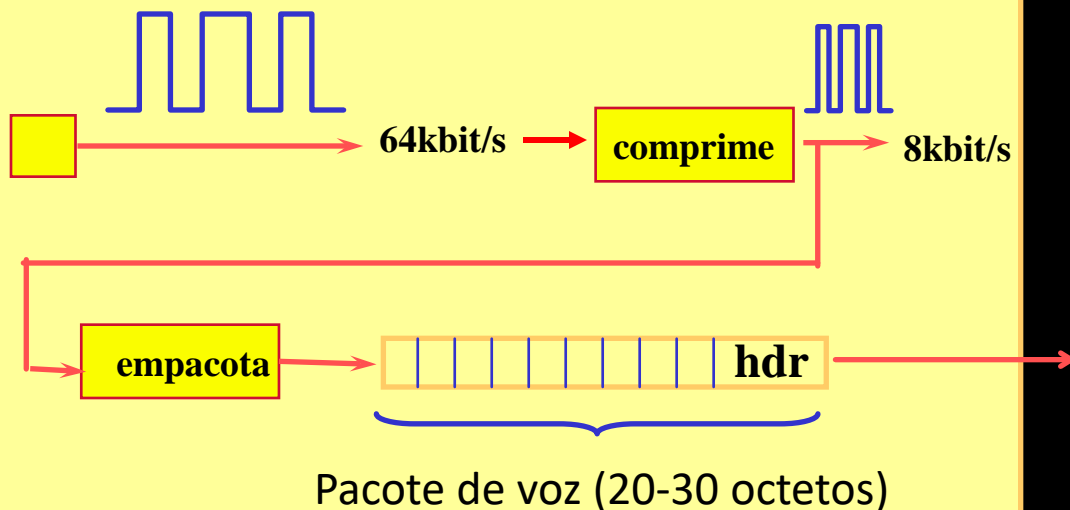
Analógico



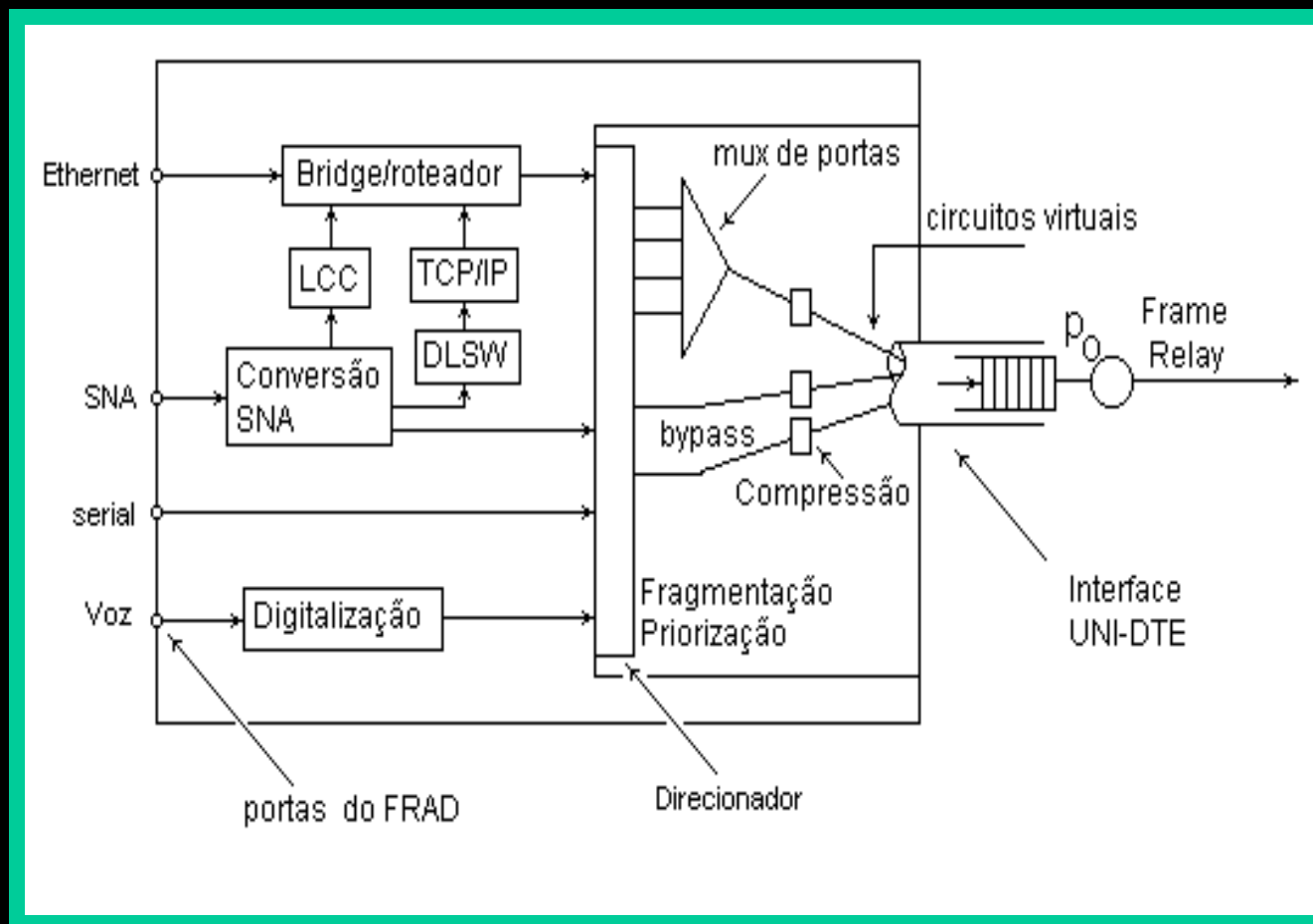
**Digital Signal
Processor
(DSP)**



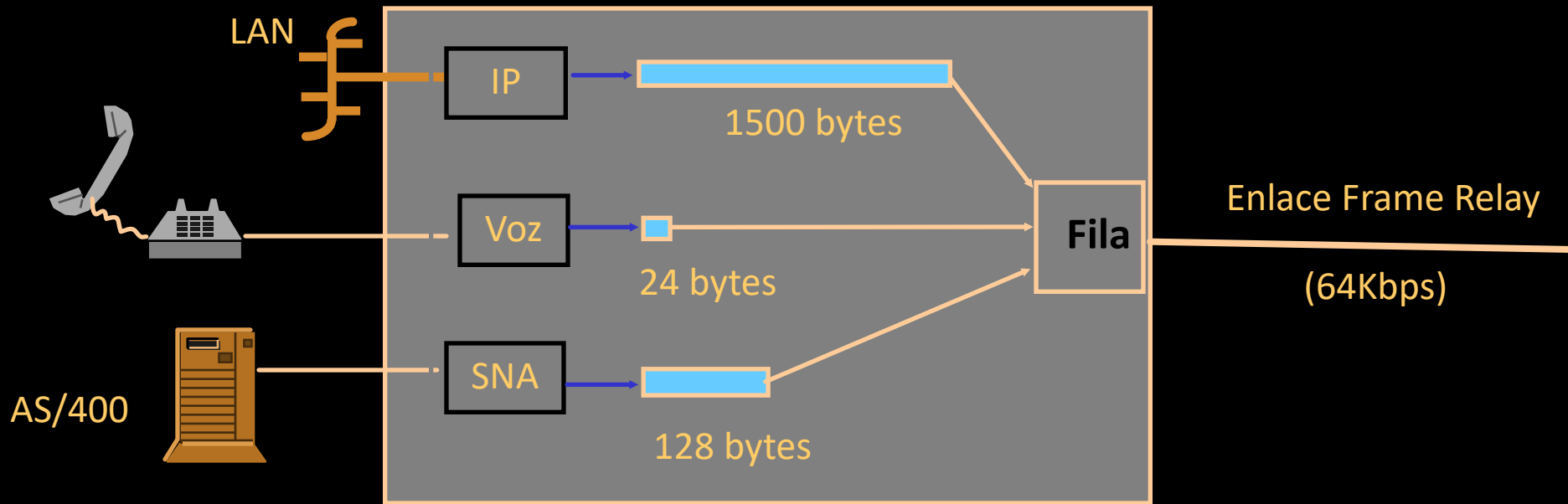
Digital (PCM)



PCM = 64 kbps
G723.1 = 5,3/6,3 kbps
G729a = 8 kbps
CVSELP = 8 e 16 kbps
ACELP = 4,8 kbps

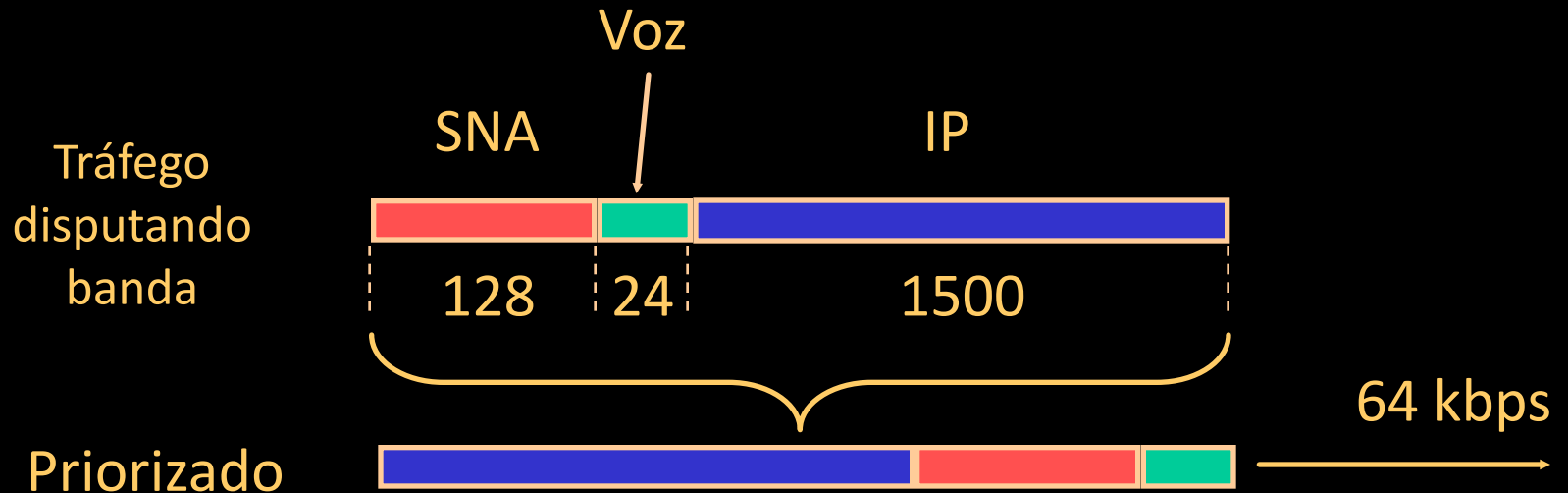


Exemplo



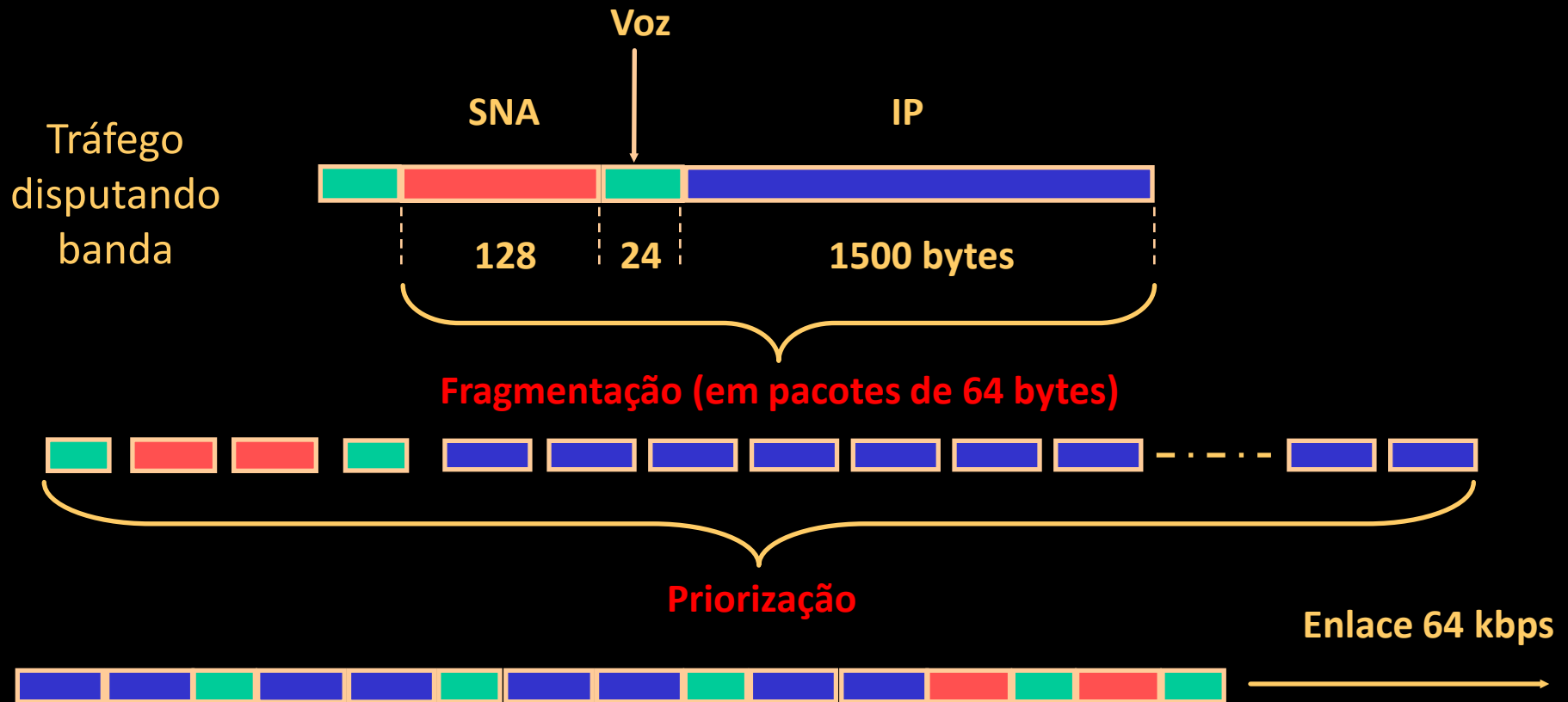
**Se o pacote de voz entra na fila atrás de um pacote IP,
digamos a 64 kbps, será retardado de 188 ms
- isso é inaceitável !**

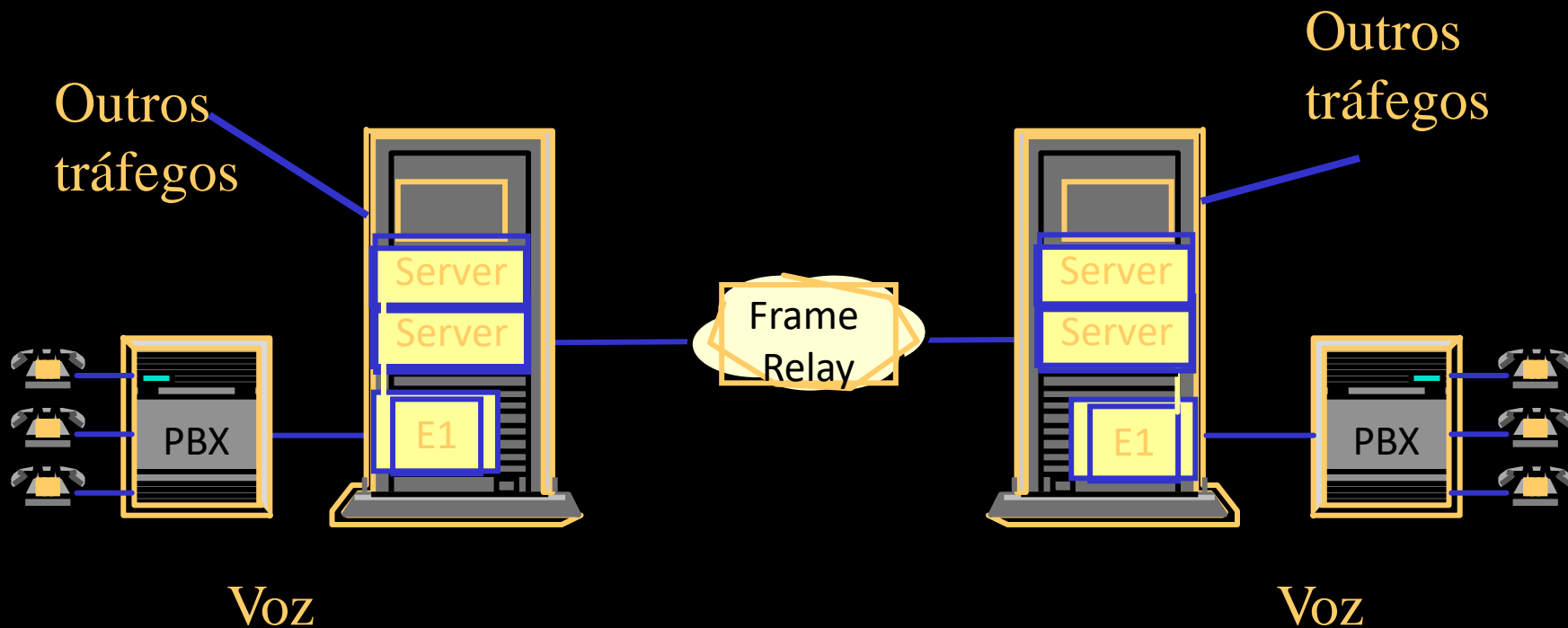
Priorização

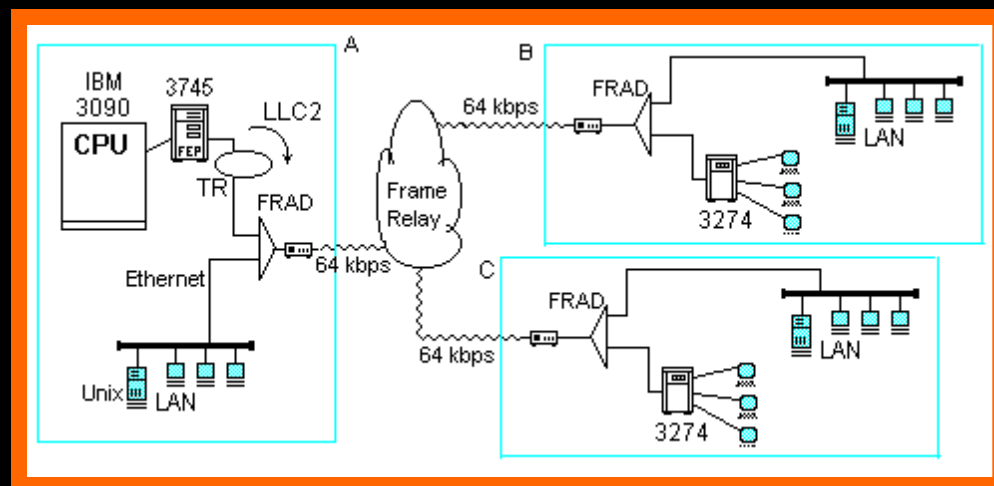
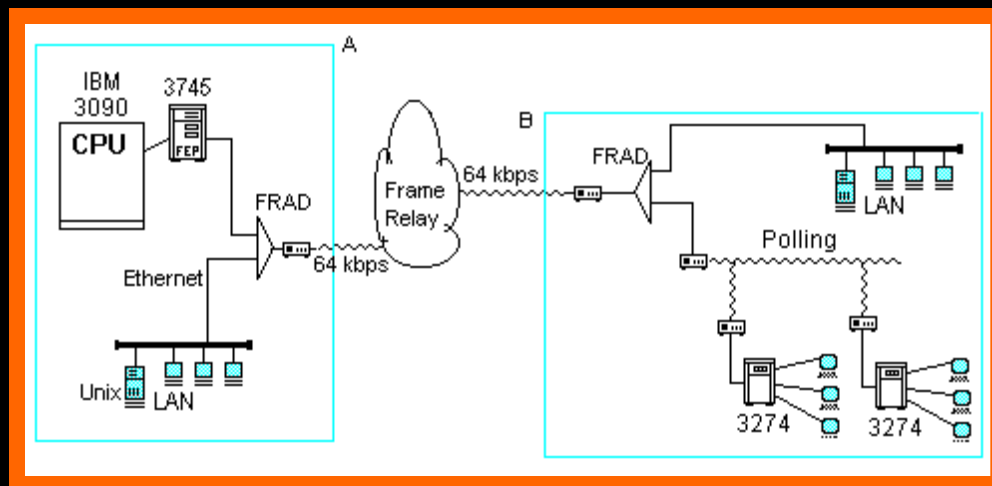


- Pacotes de voz são curtos e tem maior prioridade
- Demais tráfegos podem ser configurados
 - Mas ... - só a priorização não é suficiente !

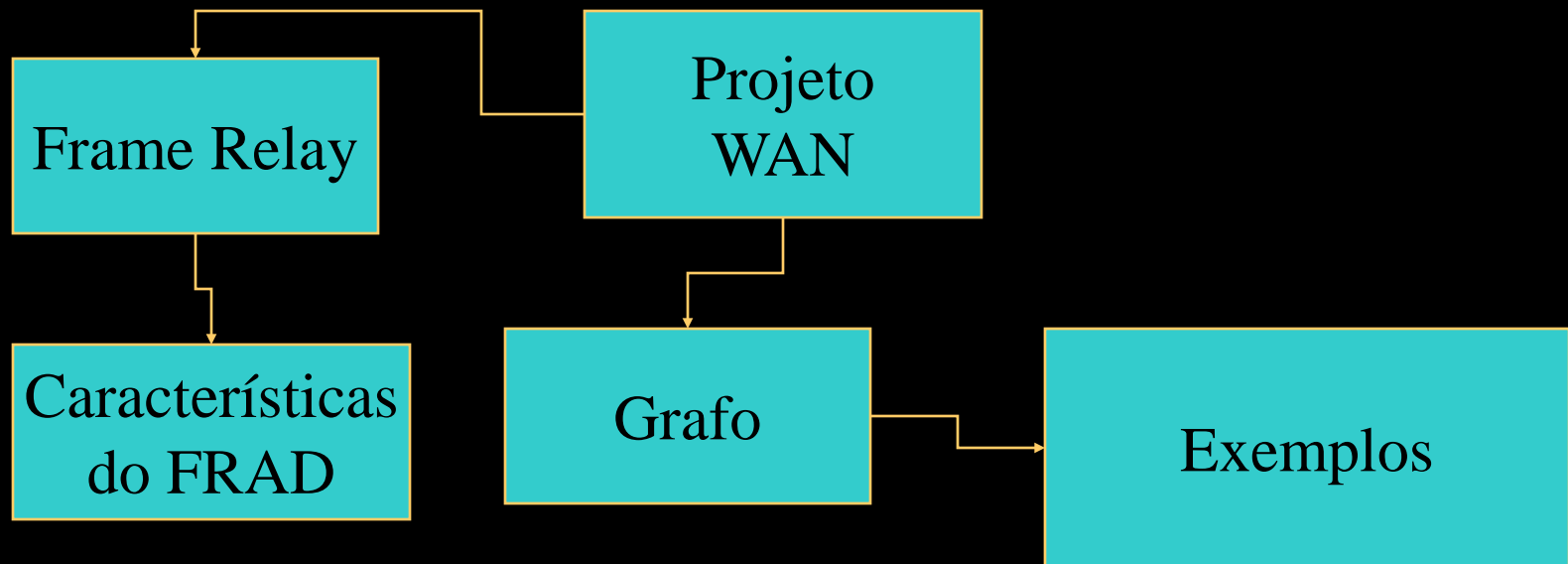
Fragmentação



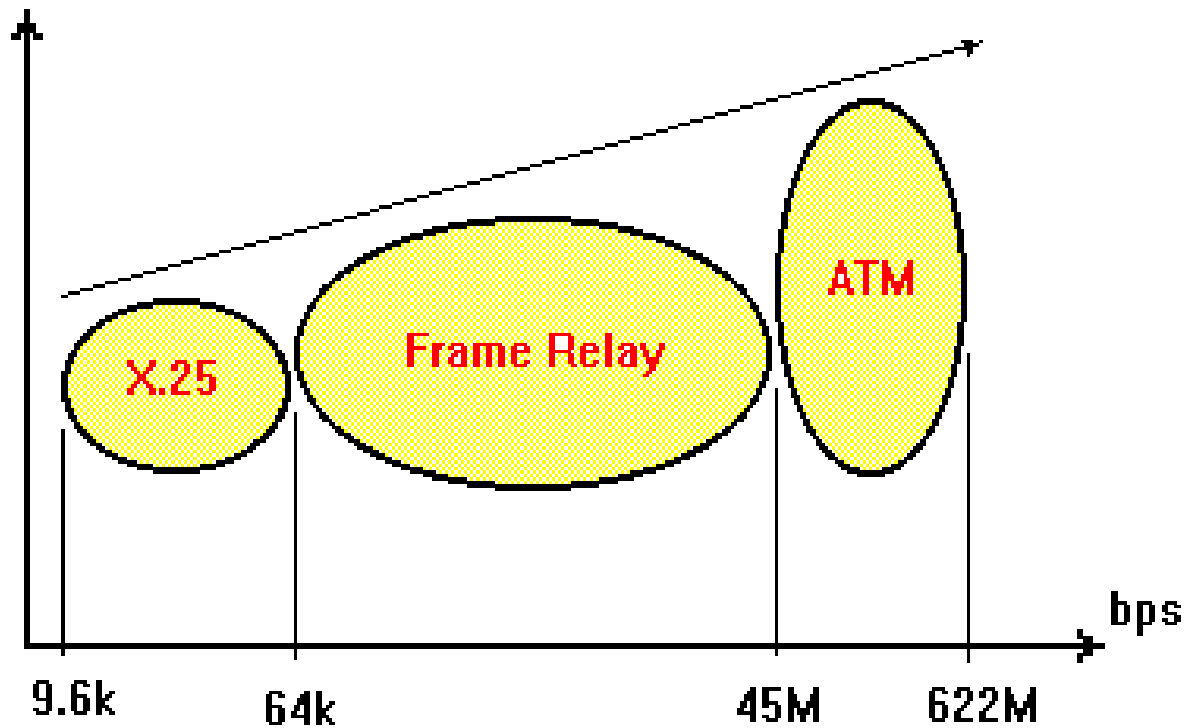


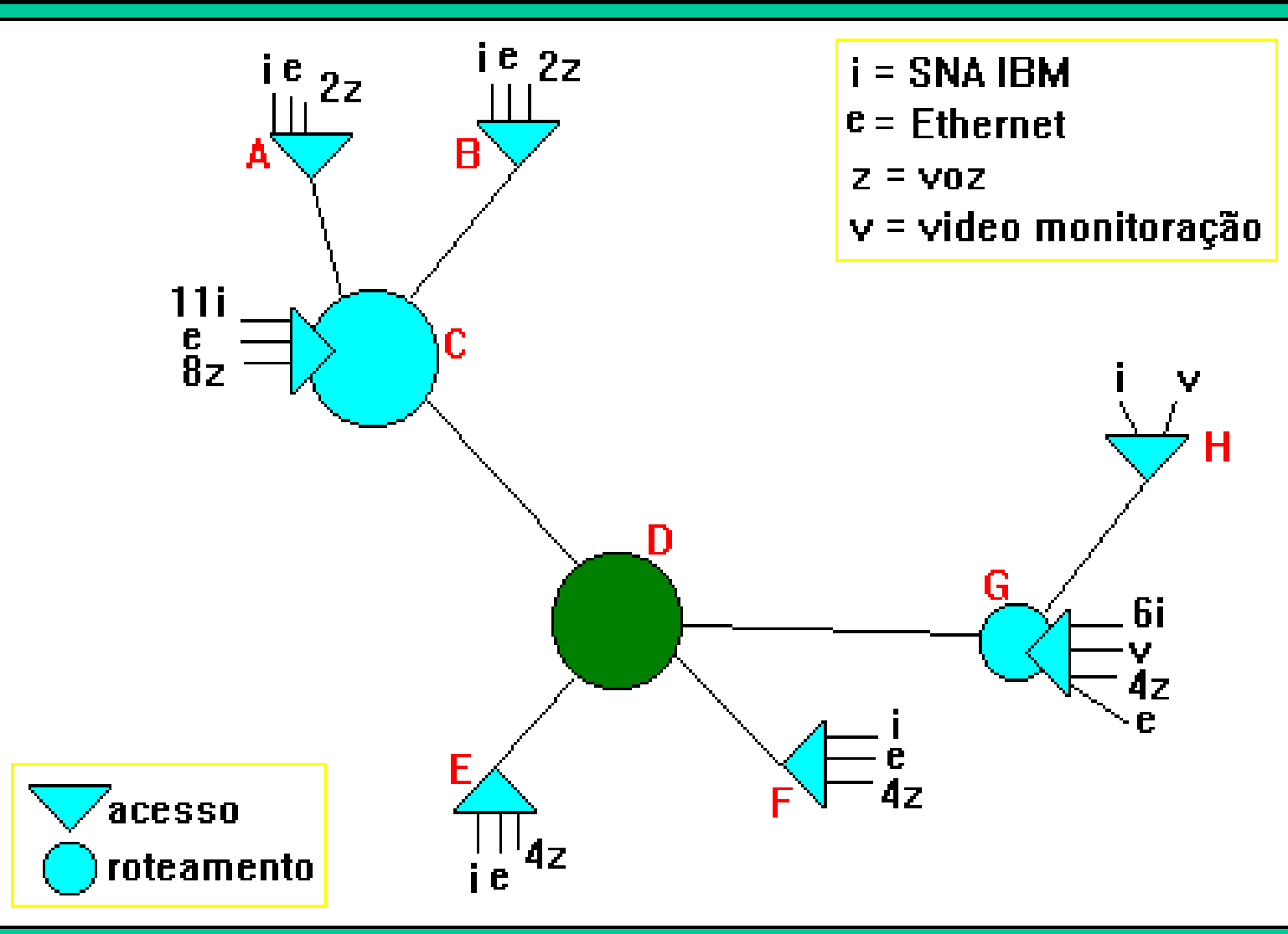


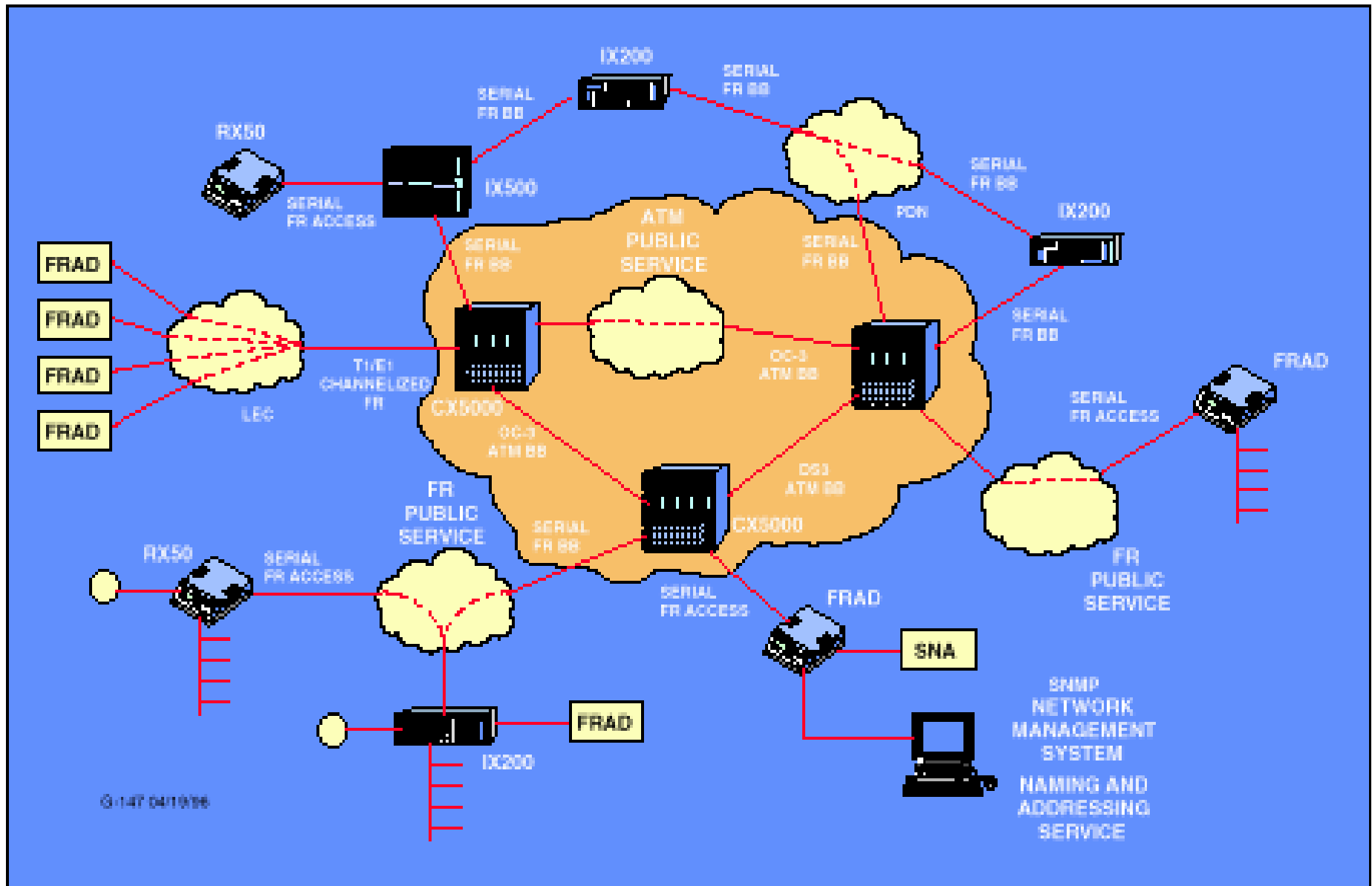
Capítulo 10



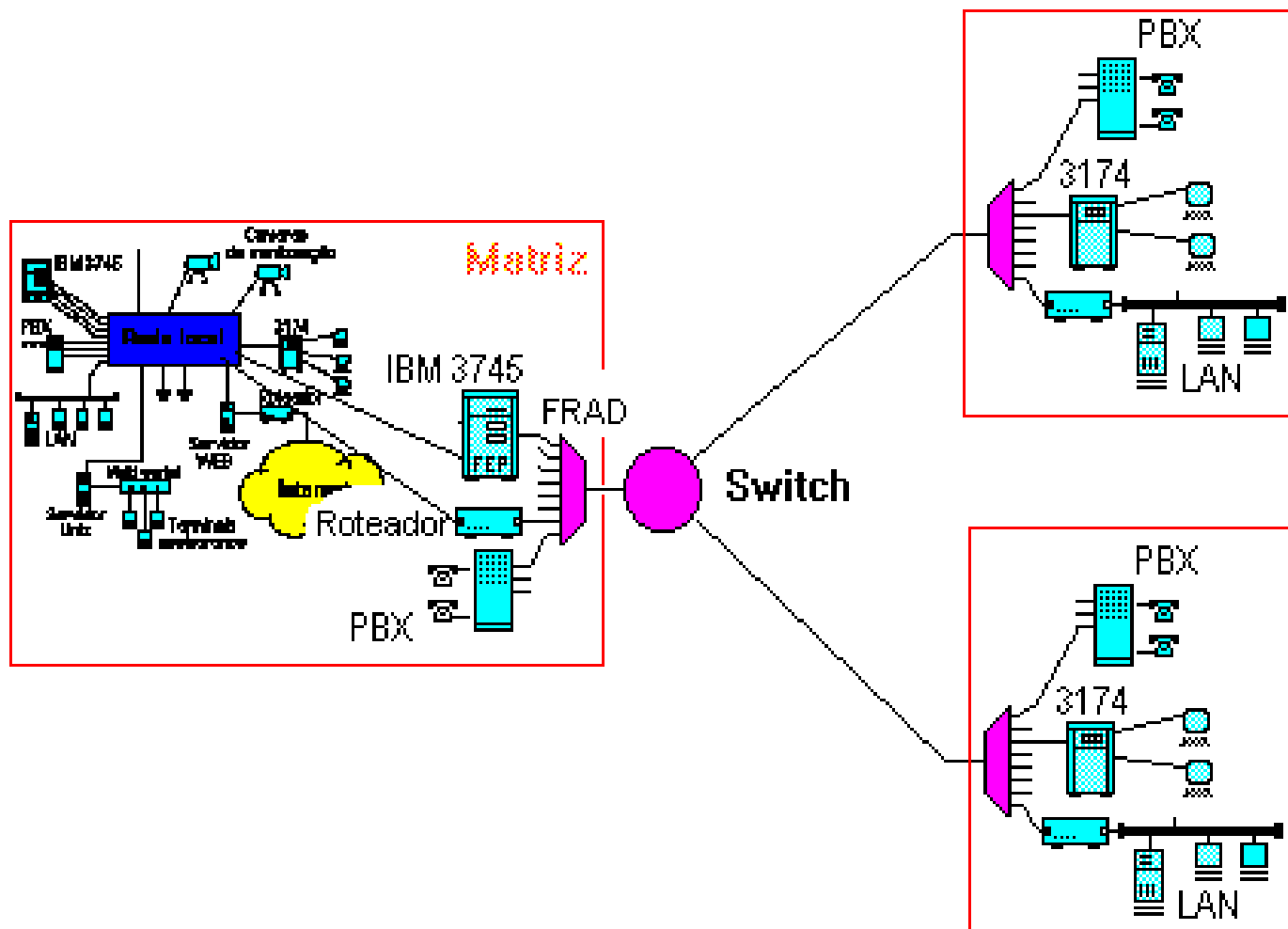
Variância
do tráfego





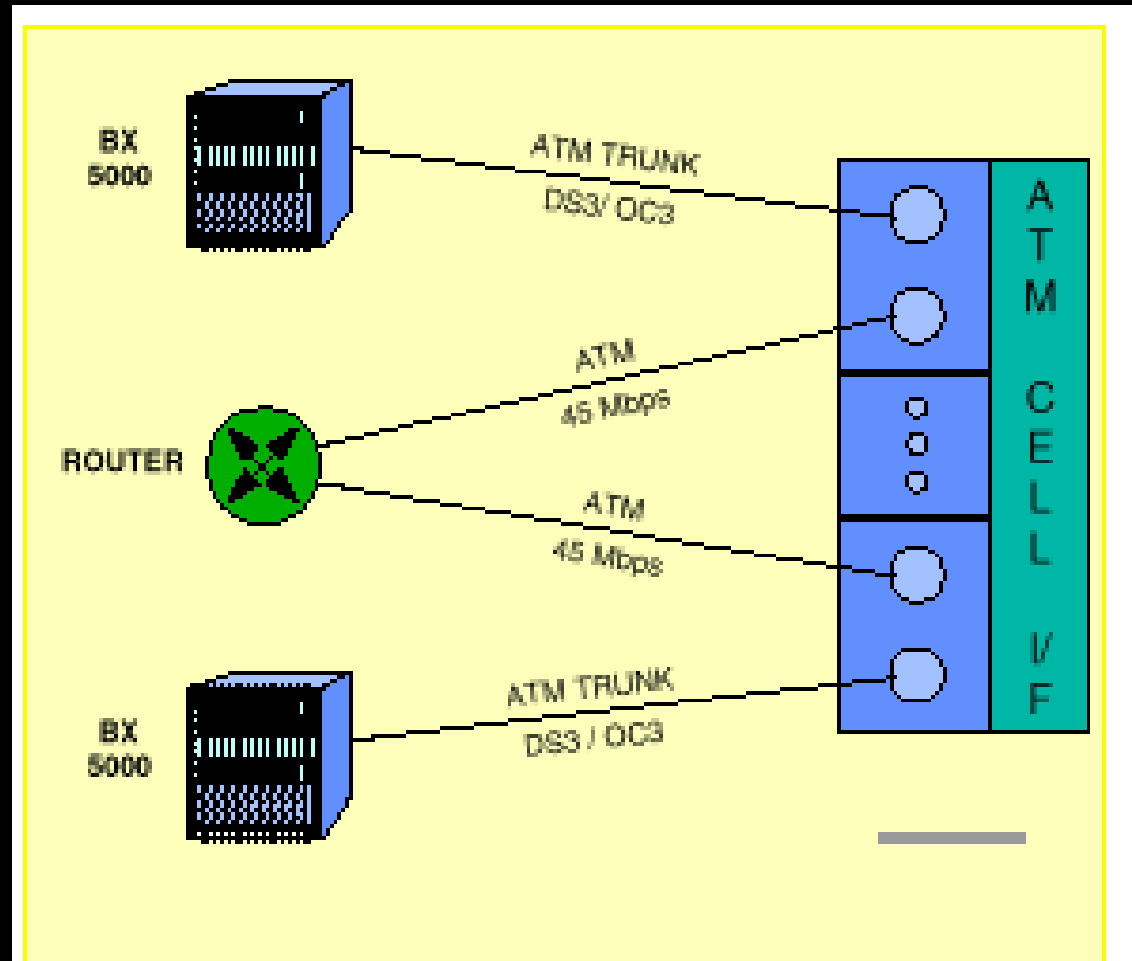


Os dois elementos básicos



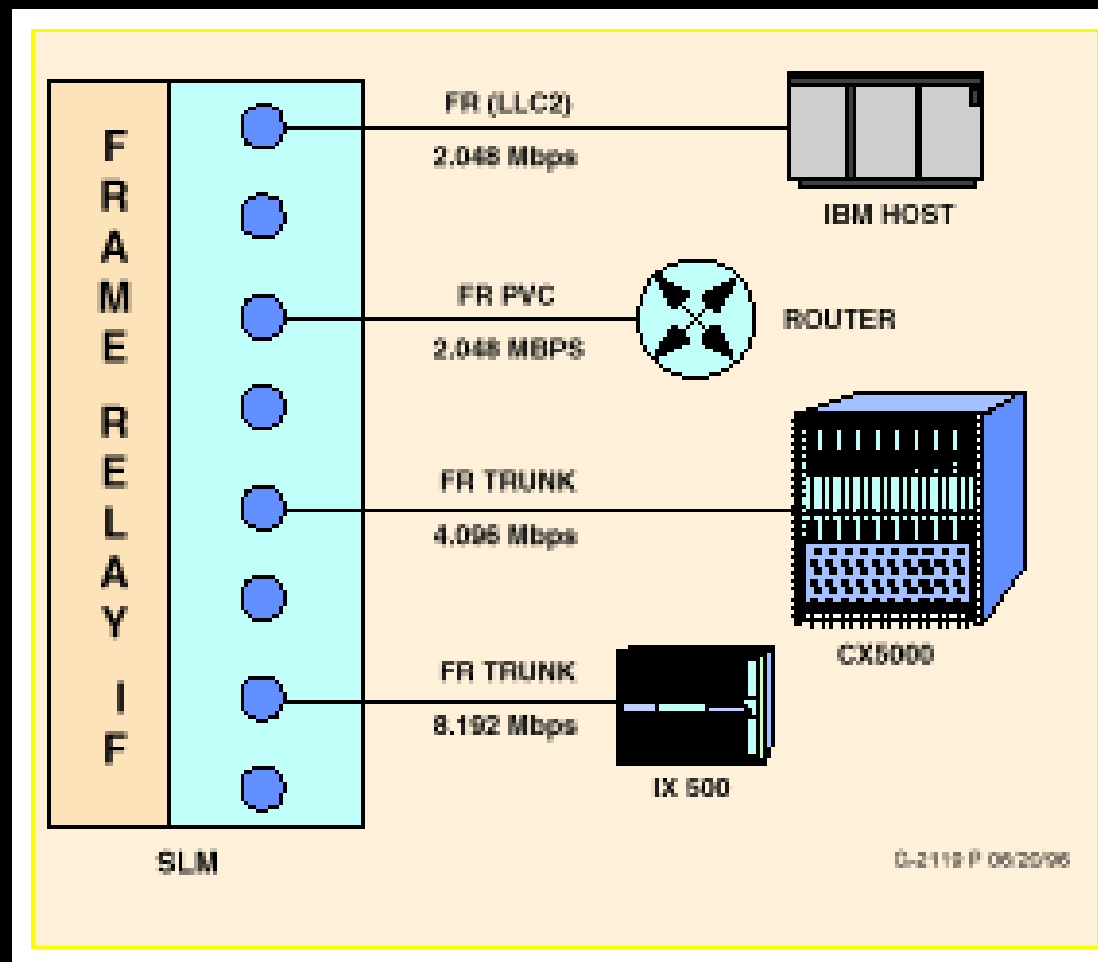
Comutador ATM/Frame Relay

Entradas ATM



Comutador ATM/Frame Relay

Entradas FR

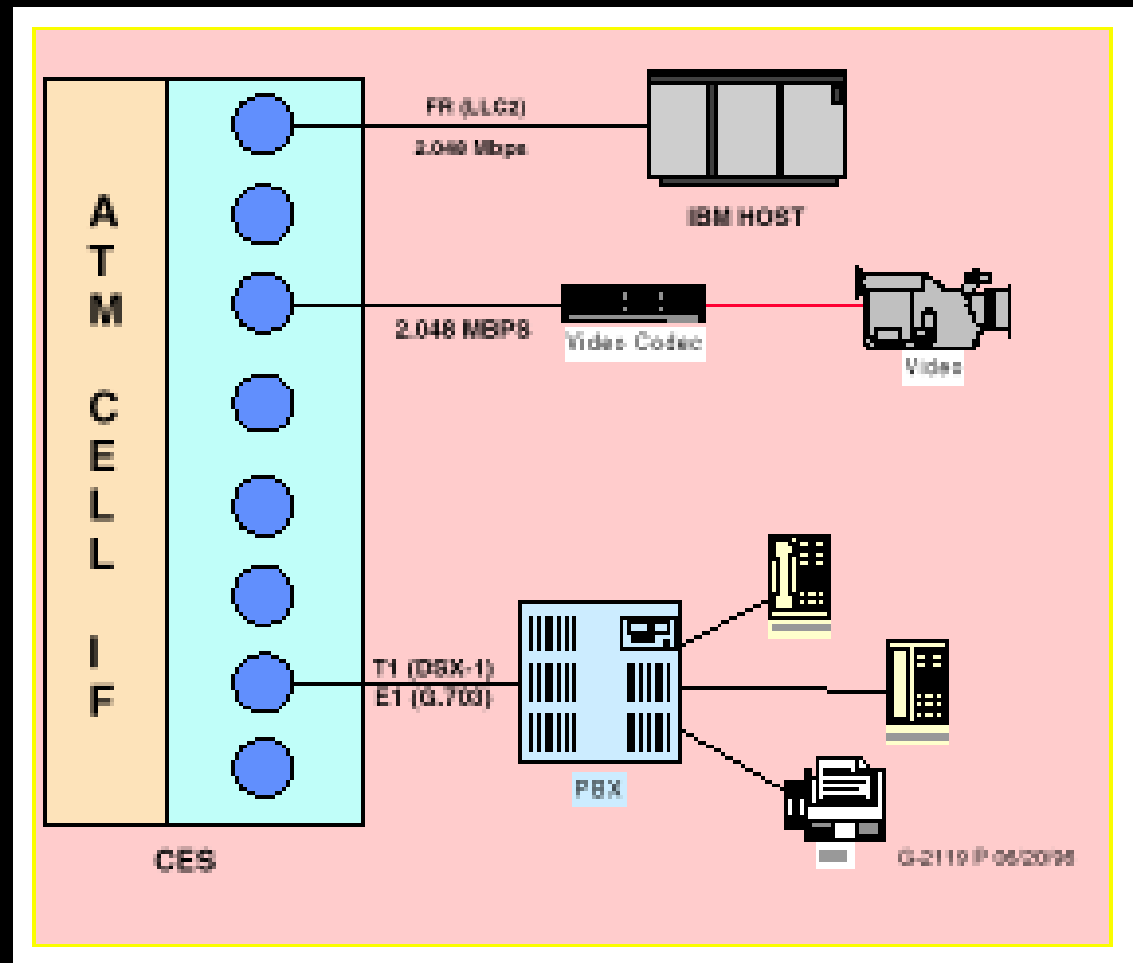


Comutador ATM/Frame Relay

Emulação de
Circuitos

Transportar

- voz
- vídeo
- outros

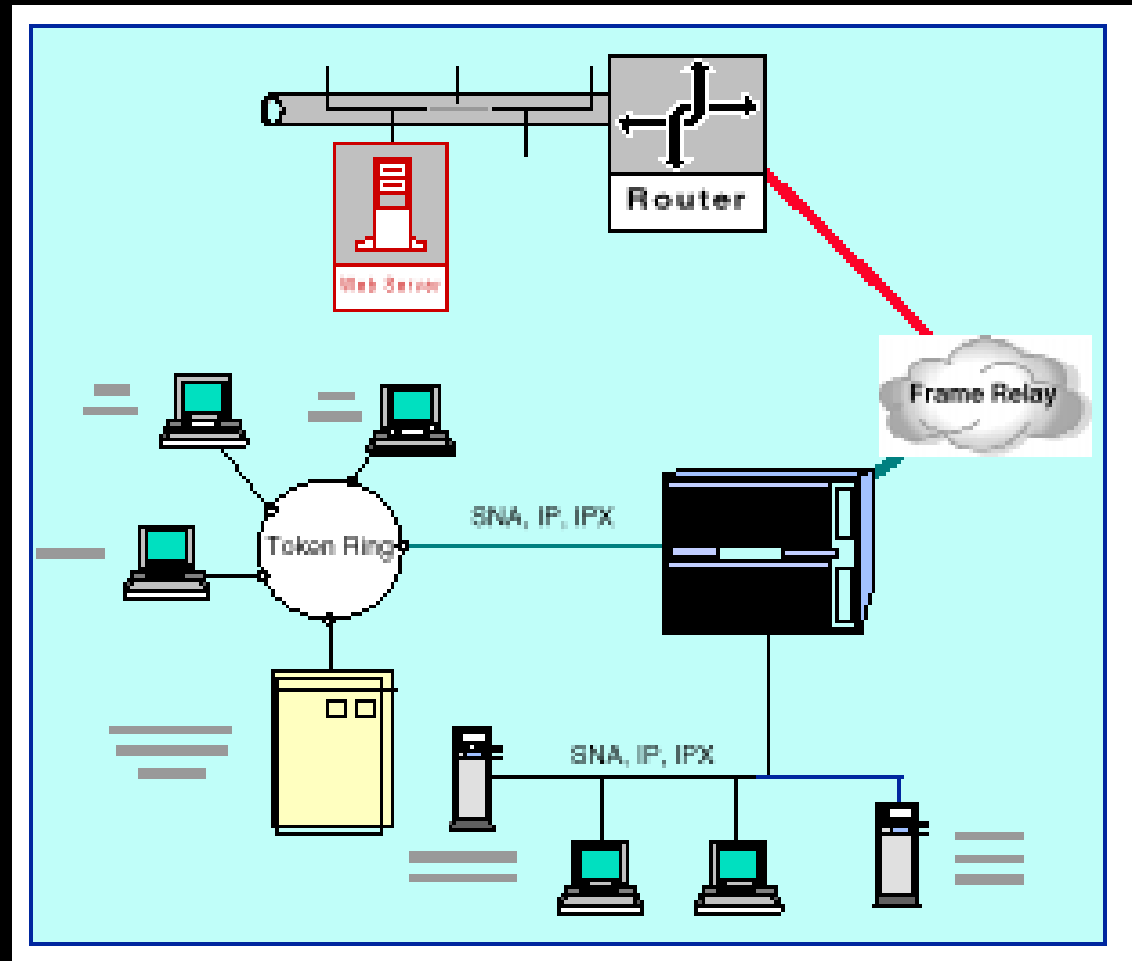


Comutador ATM/Frame Relay

Transporte de
tráfego de LAN
Ethernet/TR






Transportar

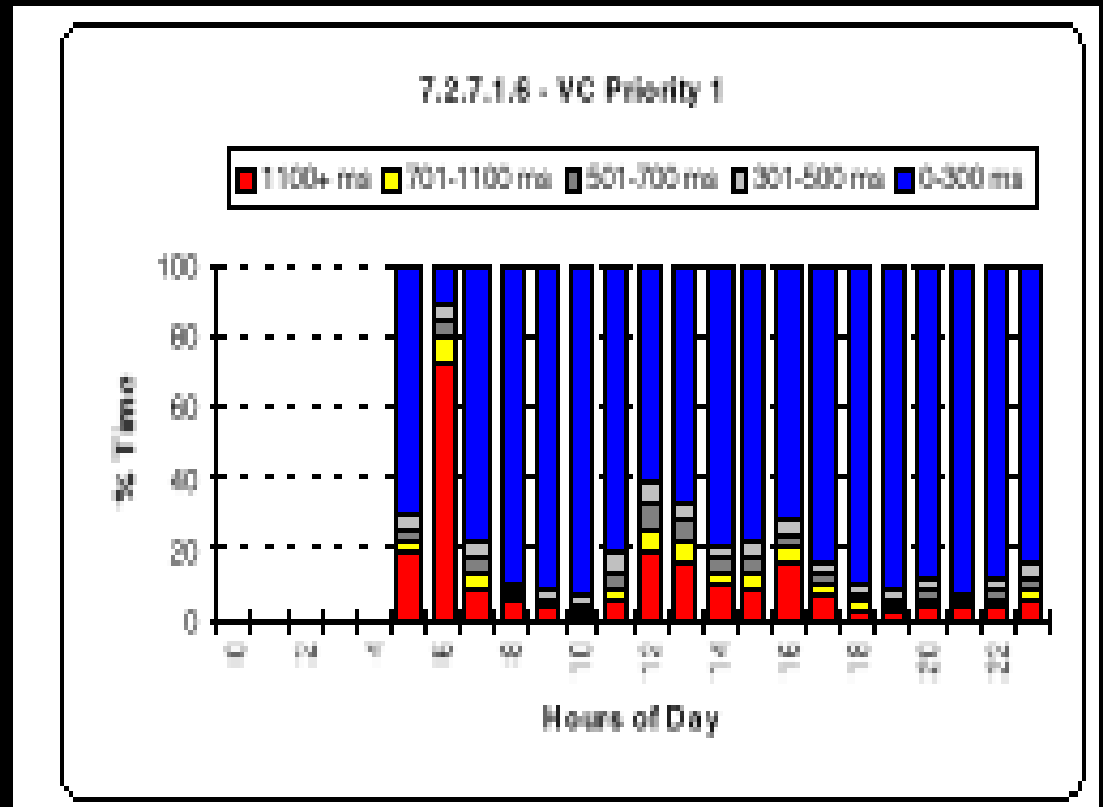
- IP
- SNA/LLC2



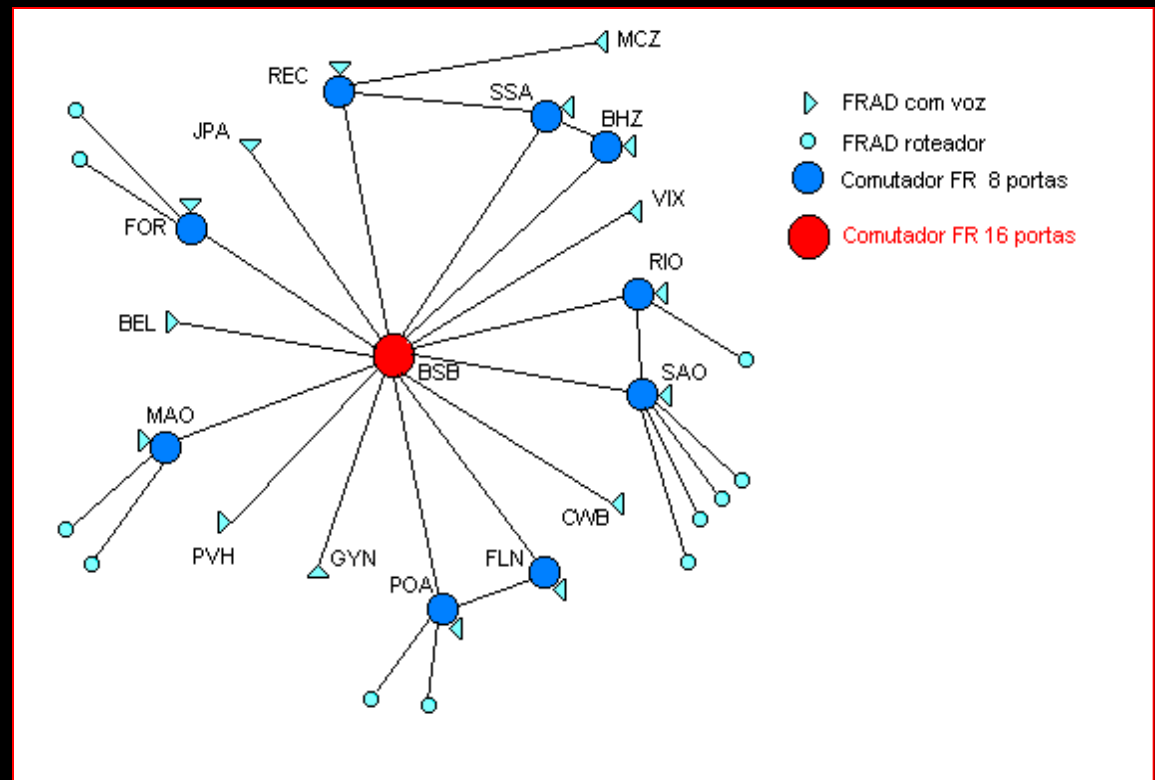
Gerenciamento

Exemplo:
Gráfico de retardo de pacotes

0 a 300 ms 
301 a 500ms 
501-700ms 
701-1100ms 
> 1100ms 

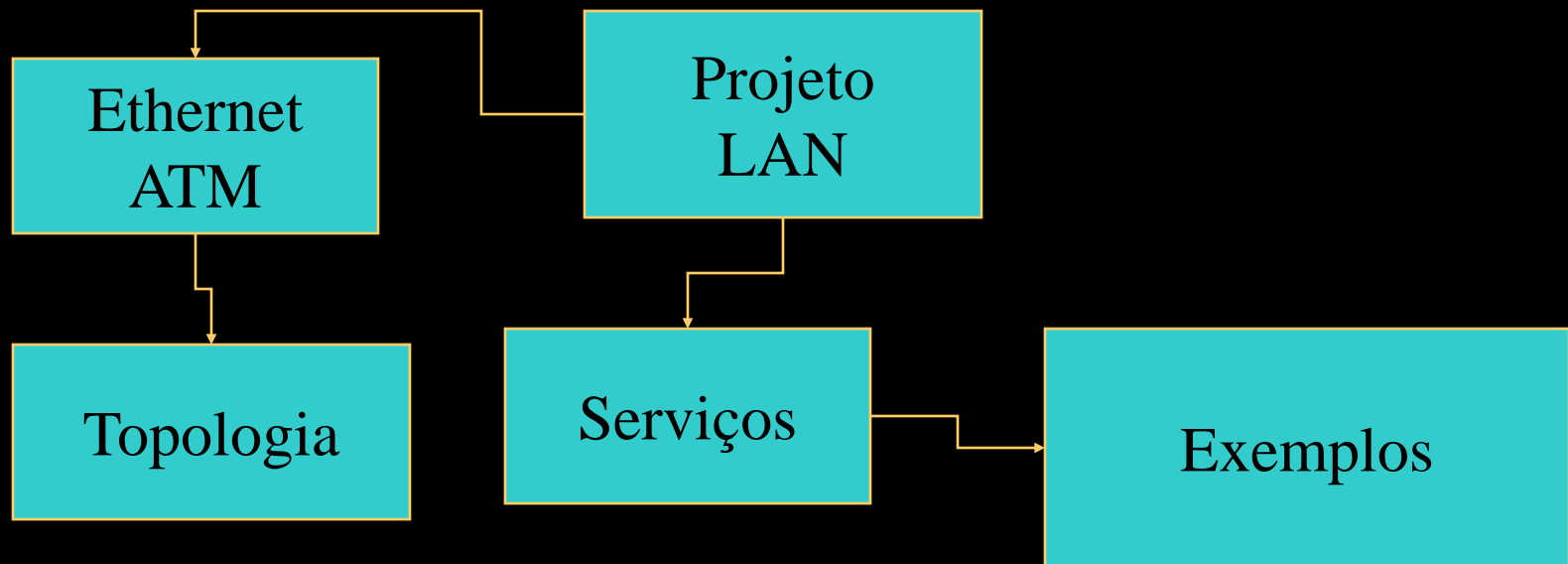


Exemplo de projeto



- 28 cidades
- 1 concentração principal
- 9 concentrações com FRAD
- 7 cidades com FRAD sem concentração
- 11 cidades com FRAD roteador

Capítulo 11



Tecnologia de rede local

- 1. Velocidades crescem
 - Ethernet: 10 → 100 → 1000
 - ATM: 25 → 155 → 622 → 2468
 - Token Ring: 16 → 100 → 1000
- 2. Custo cai
- 3. Converge
 - mais funcionalidade em um produto
- 4. Agrega serviços

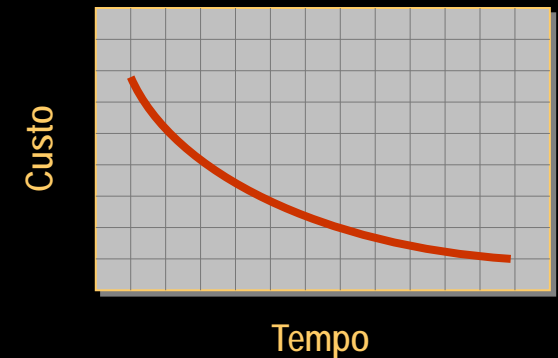
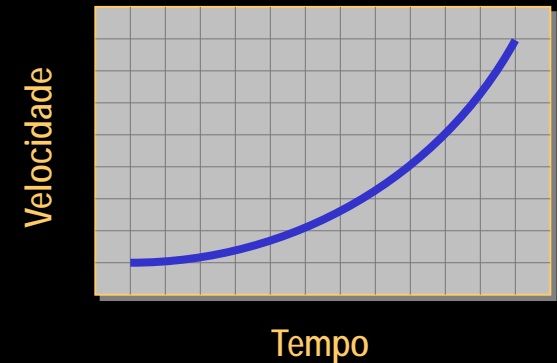
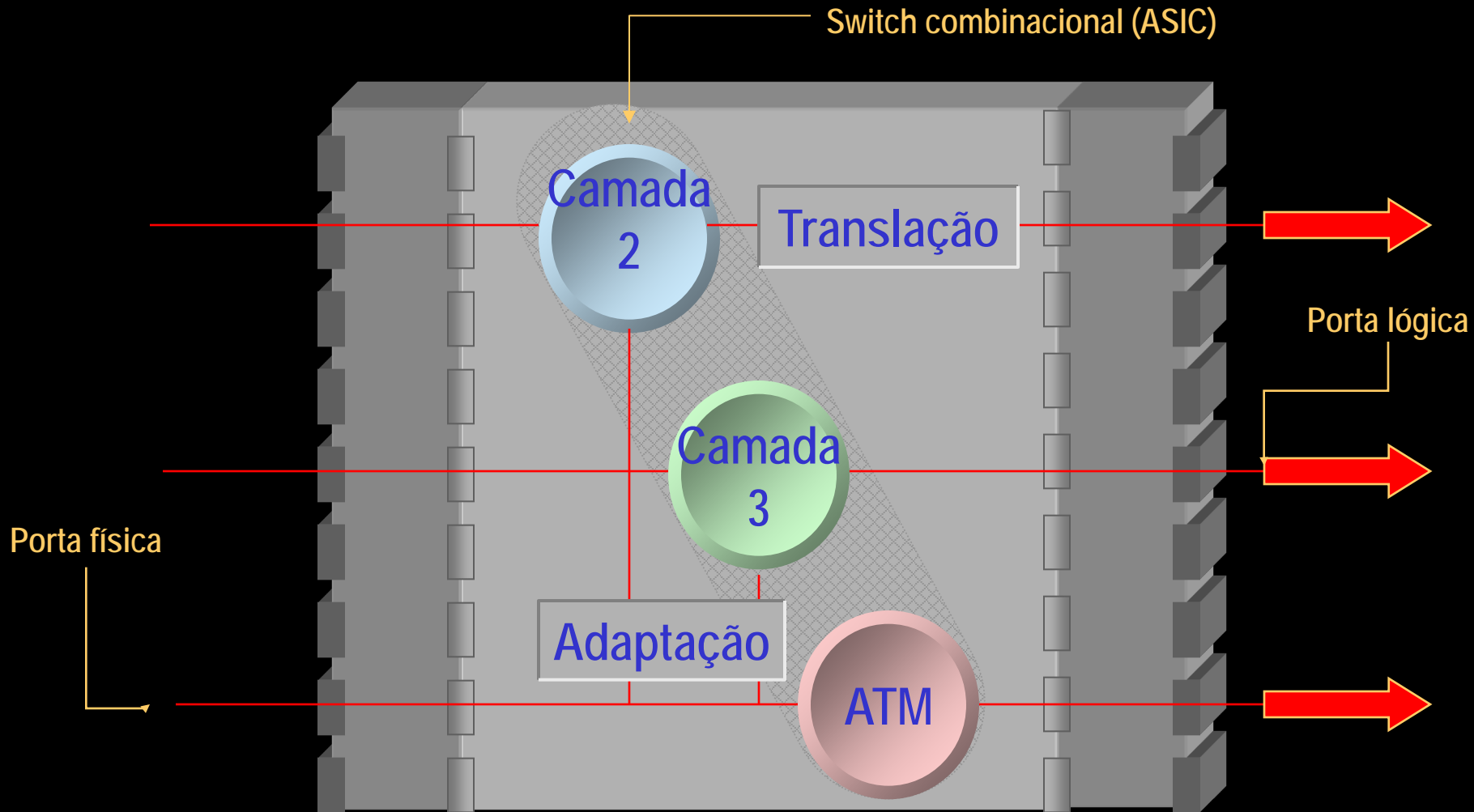
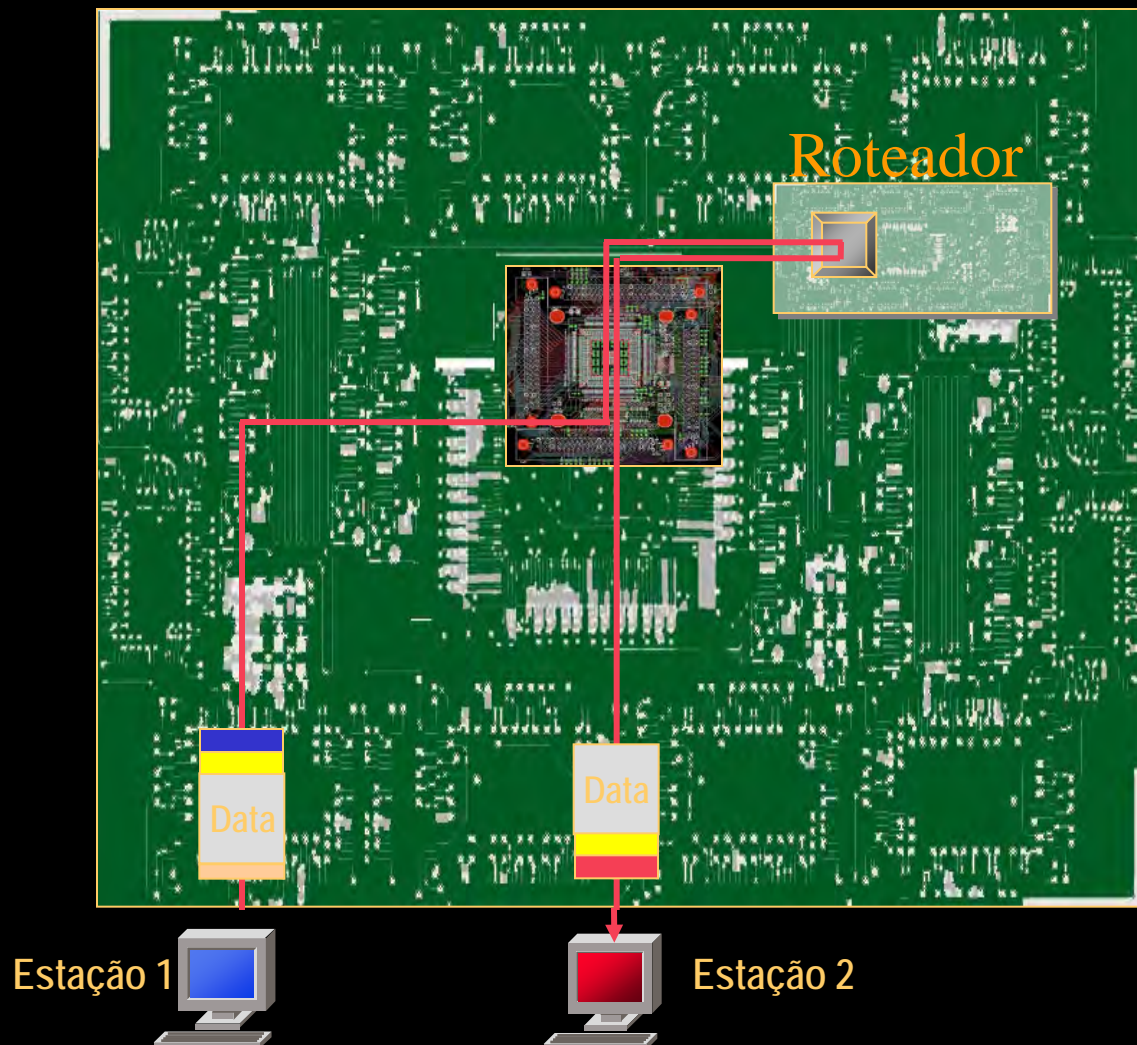


Diagrama em blocos do switch

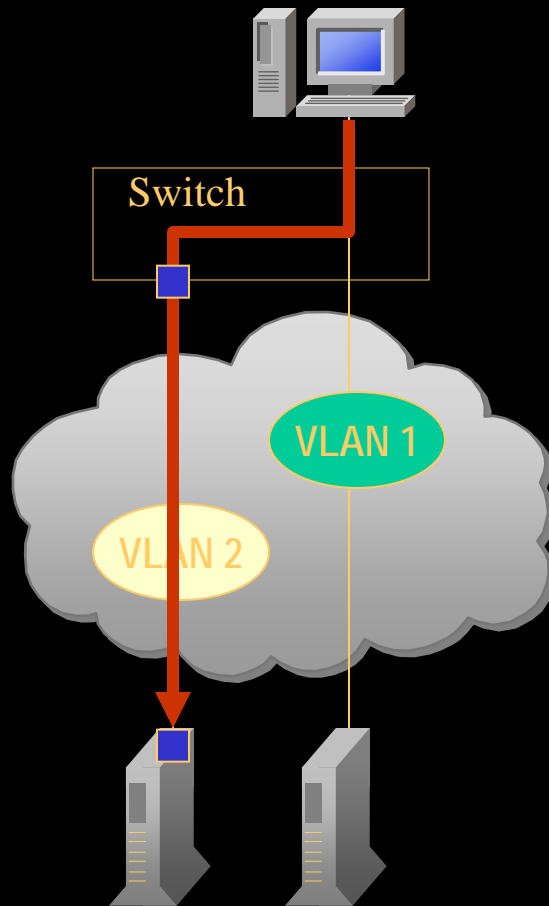


Roteamento Interno ao switch

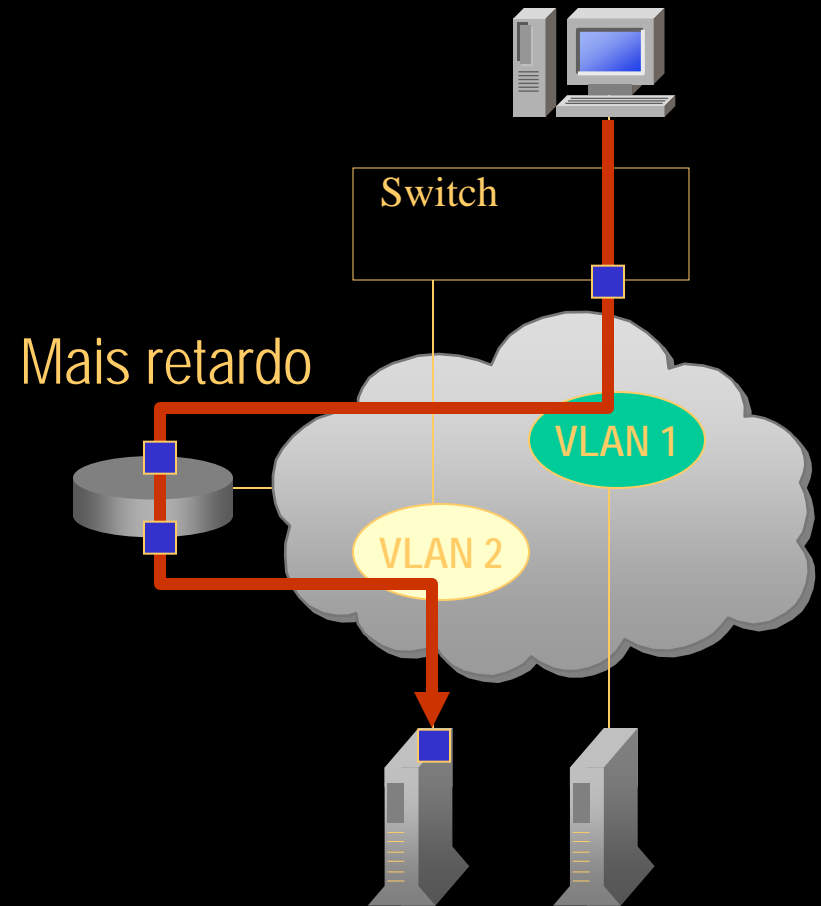


Switching de camada 3

- Com roteamento

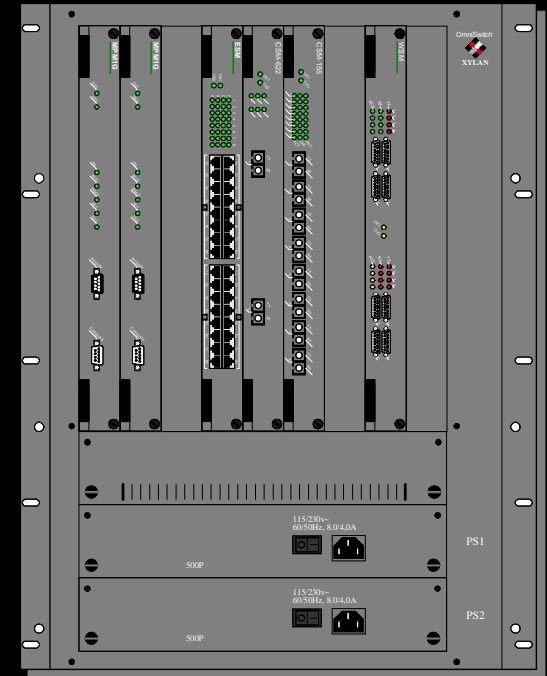


- Sem roteamento



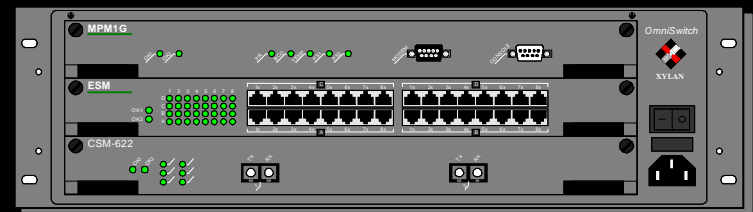
Switch central:

- Chassis modular
- Ethernet, Fast e Giga
- ATM
- Emulação de circuito
- Serviços



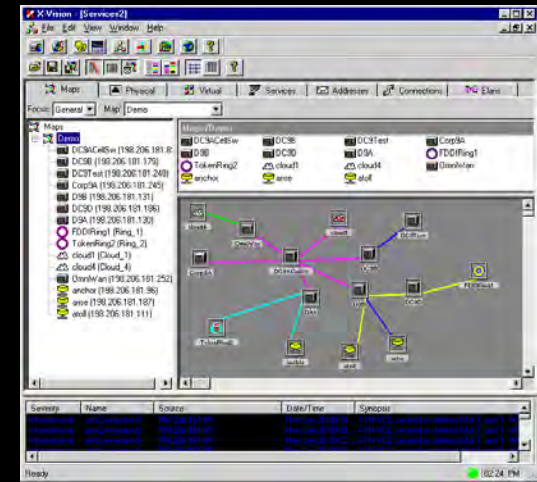
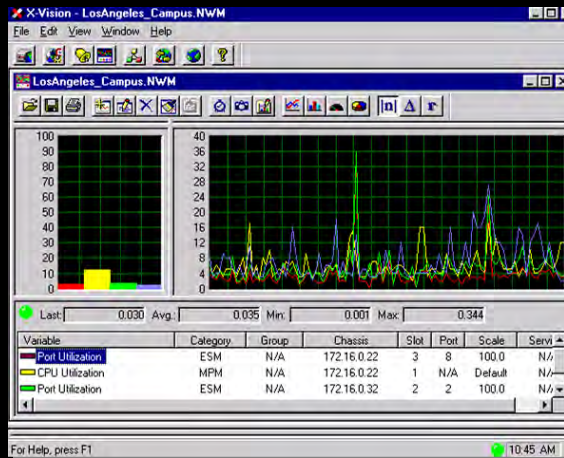
Switch de andar:

- Chassis modular ou monobloco
- Up-link Ethernet, Fast e Giga
- Up-link ATM
- Serviços



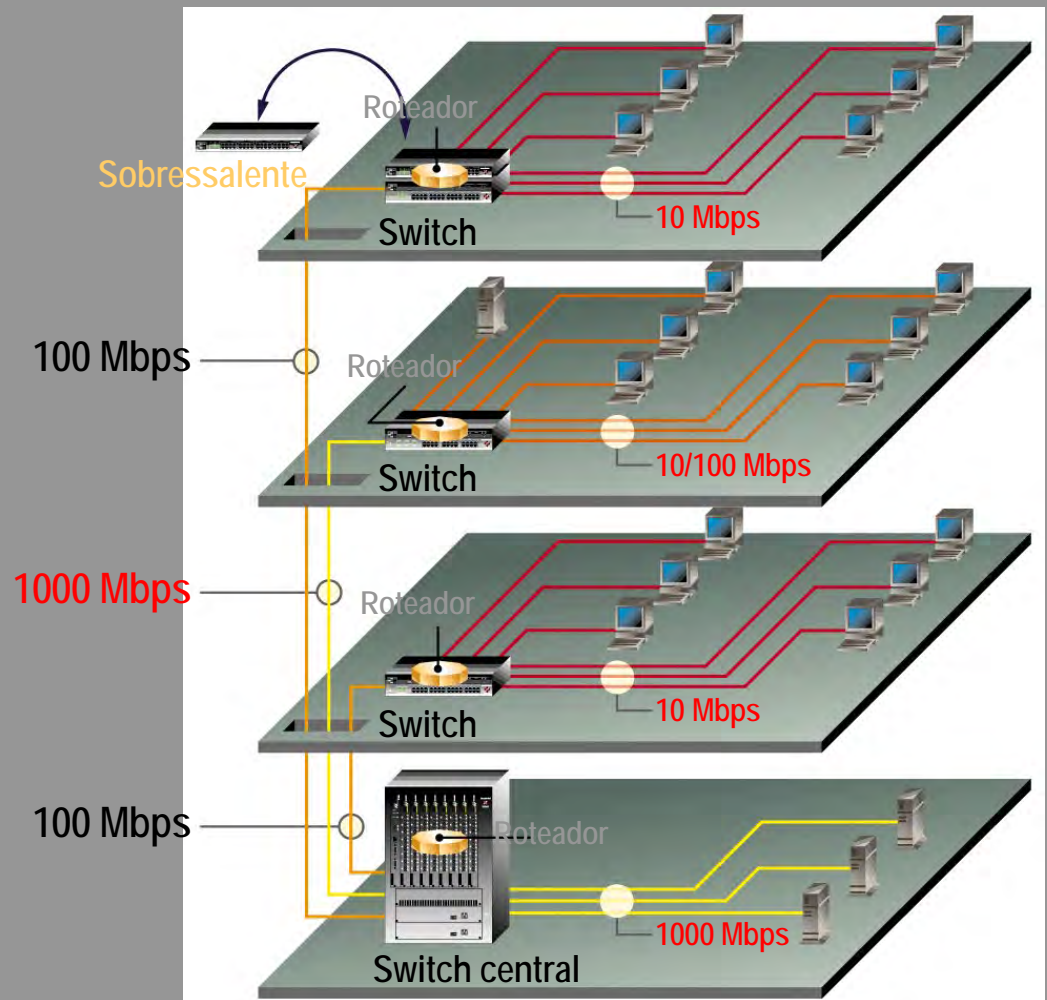
Gerenciamento

- Configuração
- Estatísticas
- Localização de falhas



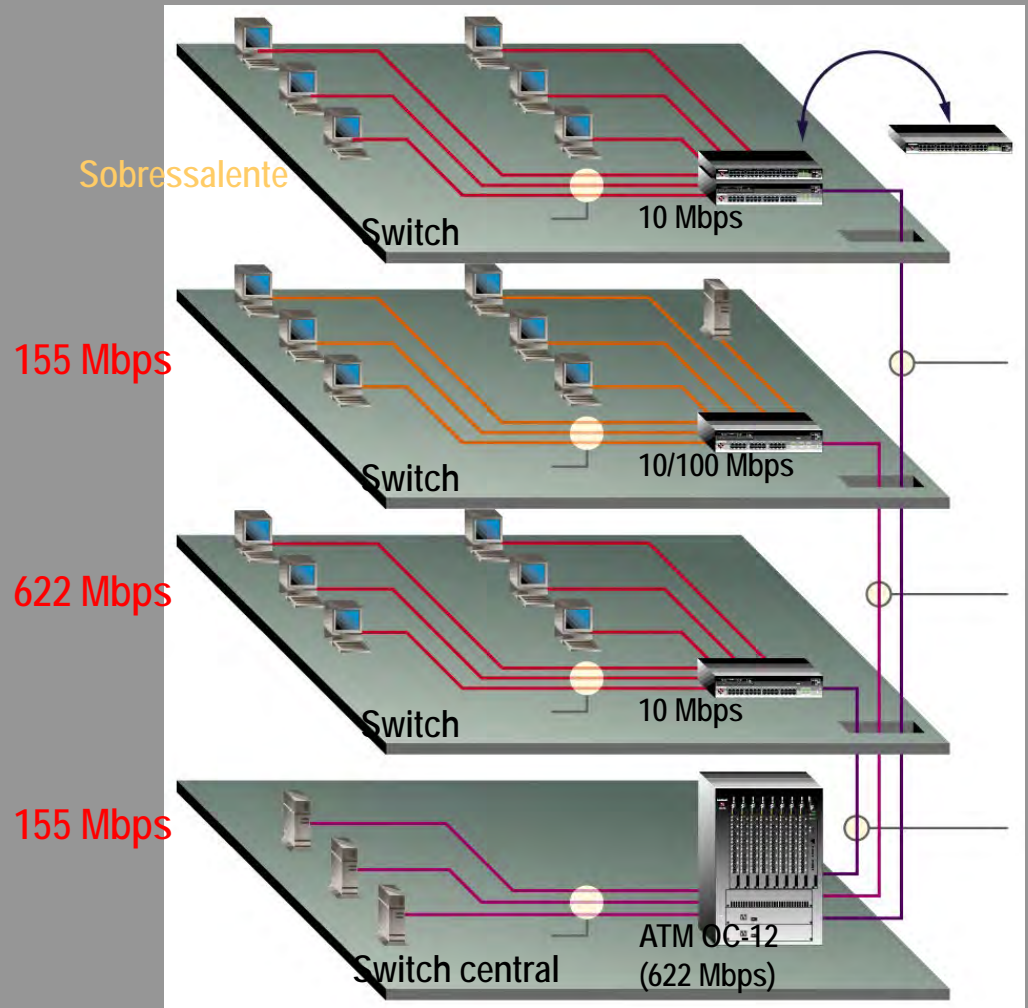
Backbone:
Fast e Giga Ethernet

Servidores:
Giga Ethernet

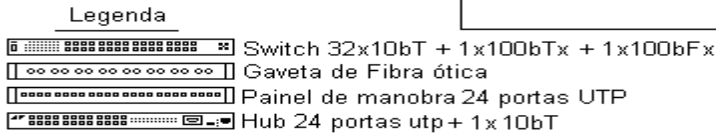


Backbone:
ATM 155 e 622 Mbps

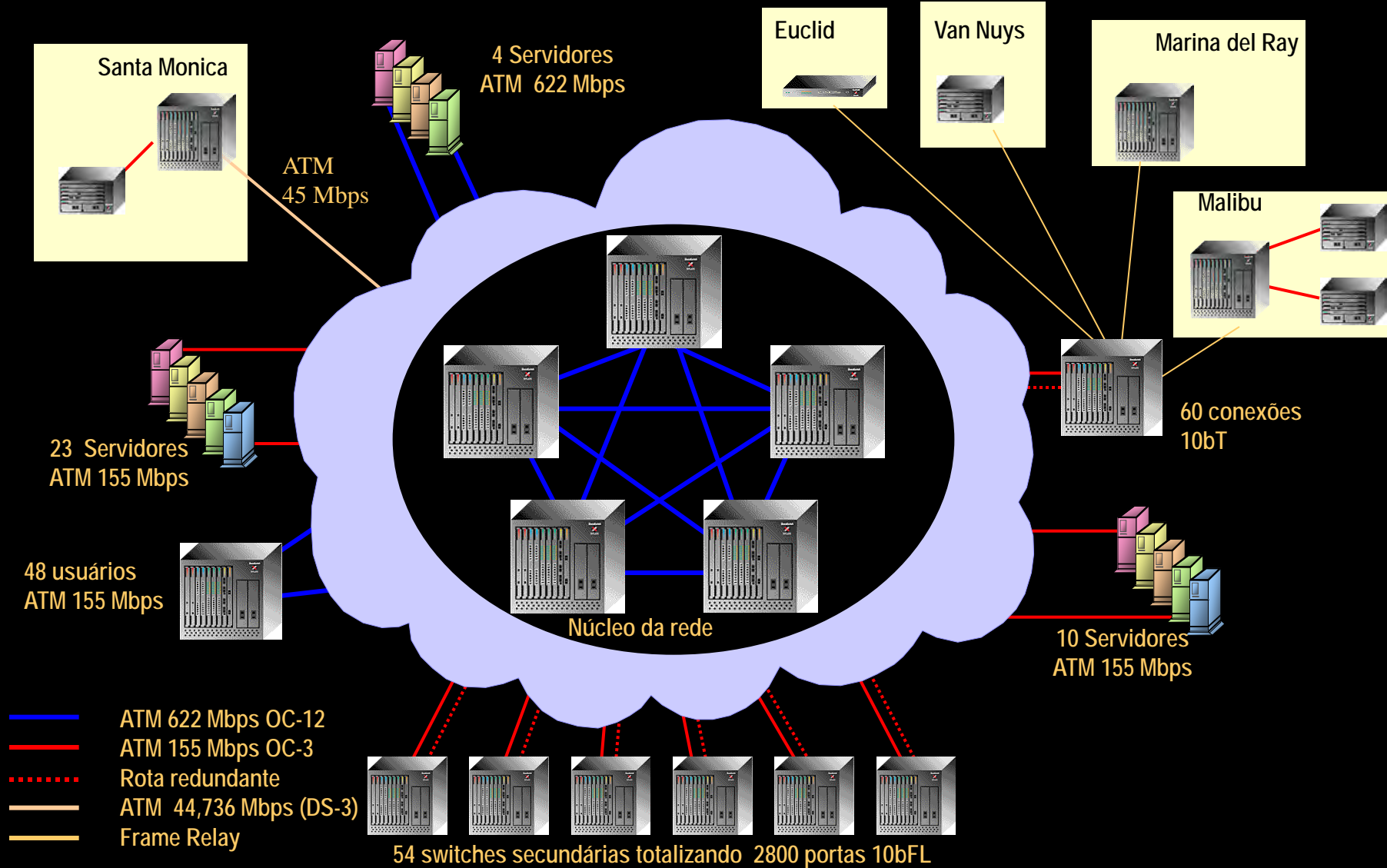
Servidores:
ATM 622 Mbps



- Prédio com 8 andares
- 216 portas 10bT para cada andar
 - 24 dedicadas @ 3,1 Mbps cada
 - 192 compart. @ 0,13 Mbps cada
- 20 servidores
- 1728 estações



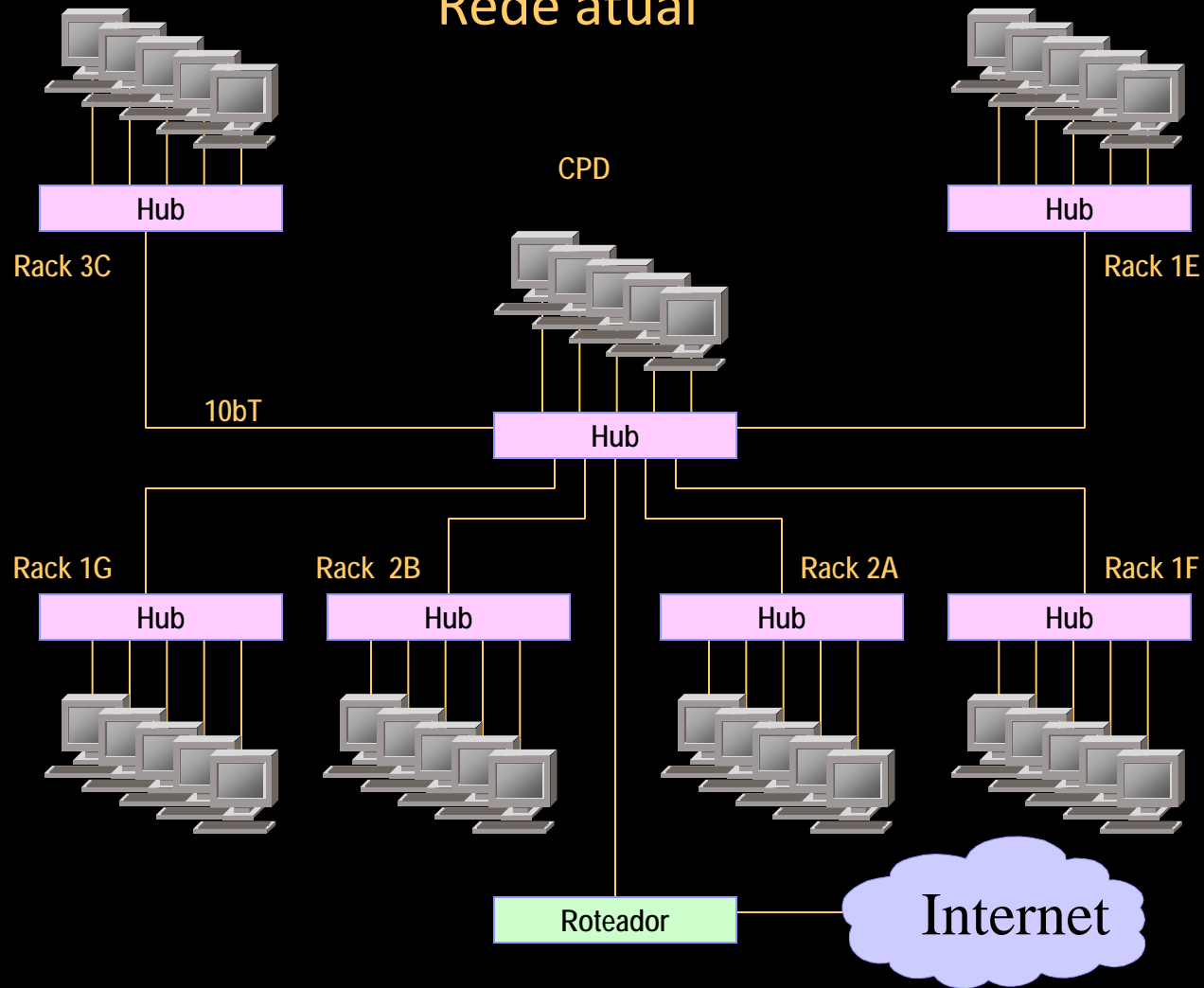
Rede do Getty Center

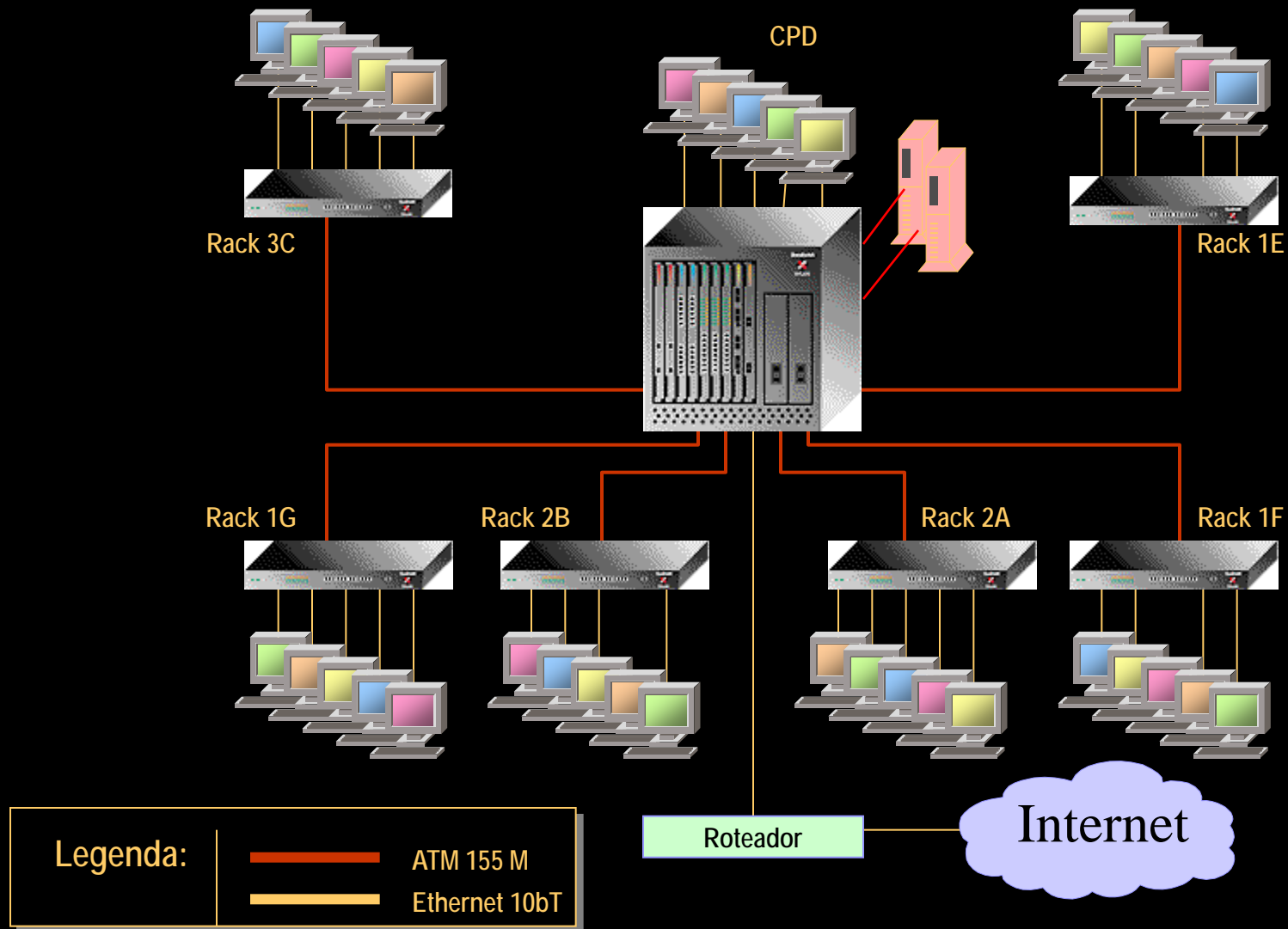


Evolução de rede

- Rede atual tem um único segmento Ethernet
- Novos aplicativos vão exigir mais banda
- Mais estações entrarão em rede
- Deseja-se deixar uma certa folga para ampliação

Rede atual





FIM

