INTRODUCTION AUX RESEAUX INFORMATIQUES

PROTOCOLES & ARCHITECTURE INTERNET

6 décembre 2007

Gérald Litzistorf

Comprendre l'architecture et les protocoles internet

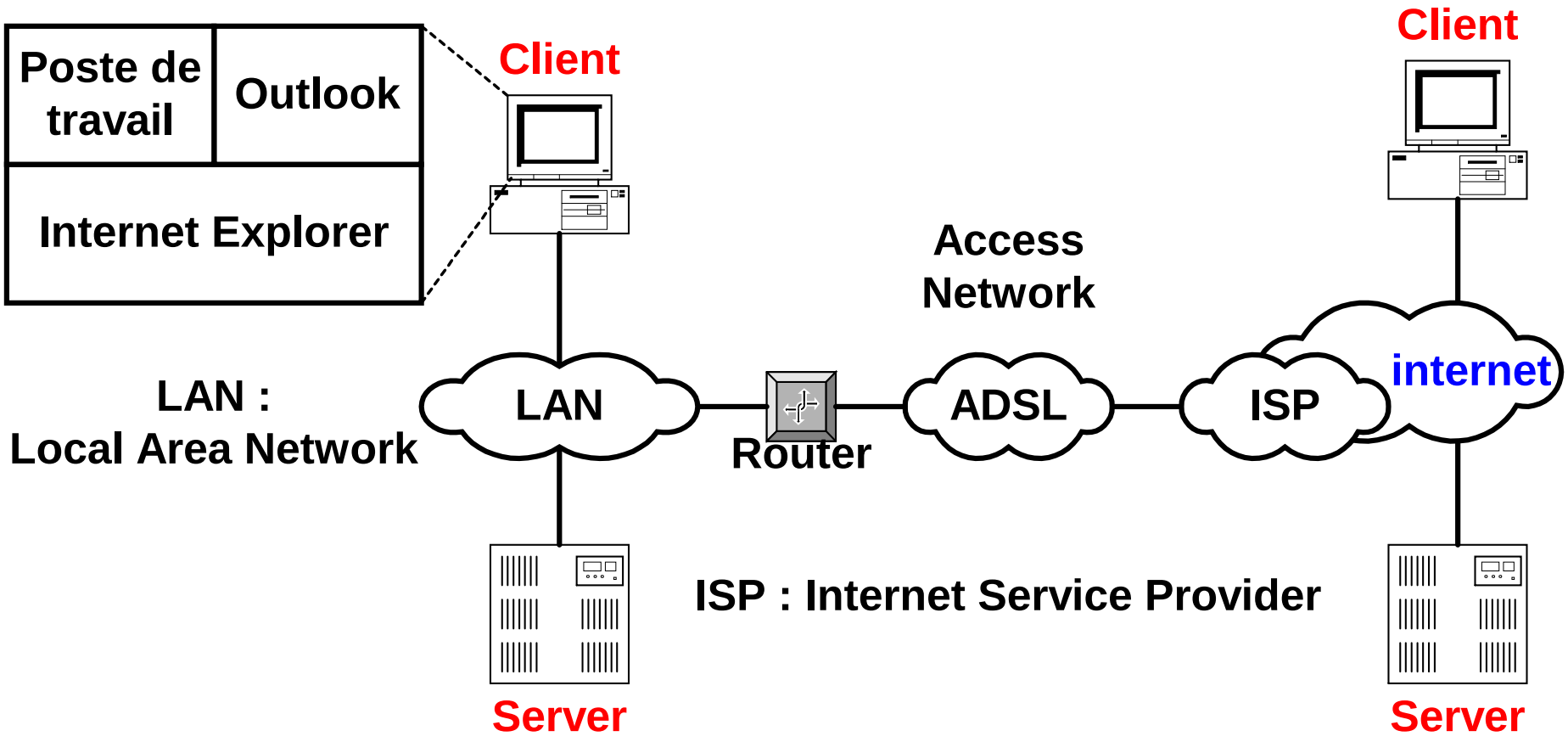
Contenu

- ***Internet*** **et mon poste de travail**
- **Modèle en couches : …,** ***switch***, ***router***, ***firewall***, ***proxy***, **…**
- ***Domain Name System*** **– FQDN**
- ***Internet***
- **Famille de protocoles TCP/IP …, IP, TCP, UDP, DNS, HTTP, …**
- **Adresse IP**
- **Routeur**
- **Ports TCP**
- **Topologie : point à point et multipoint, …**
- **Réseau d'accès,** ***dedicated line***, **commutation, ADSL**
- **URLs**

Internet et mon poste de travail

http://www.unige.ch/

Outlook Express



Internet : historique

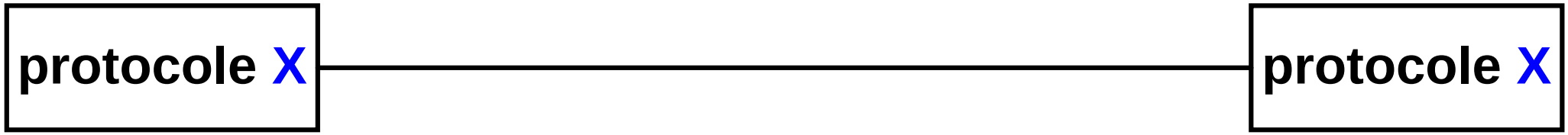
- d'Arpanet à *internet* 1969 – 1980
- *Internet* universitaire 1980 – 1990
- *World-Wide Web* 1989 CERN
- *Internet* commercial 1990 – 2000
- *Internet* pour tous 2000 –

Normalisation : IETF *(Internet Engineering Task Force)*

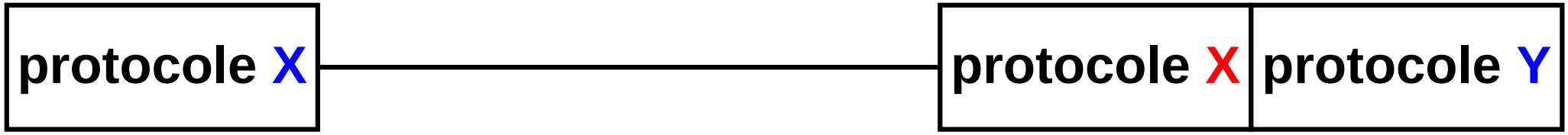
RFC *(Requests For Comment)*

Systèmes homogènes et hétérogènes

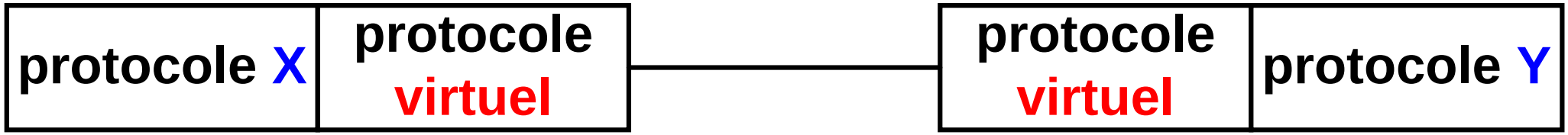
Structure homogène



Structure hétérogène et émulation

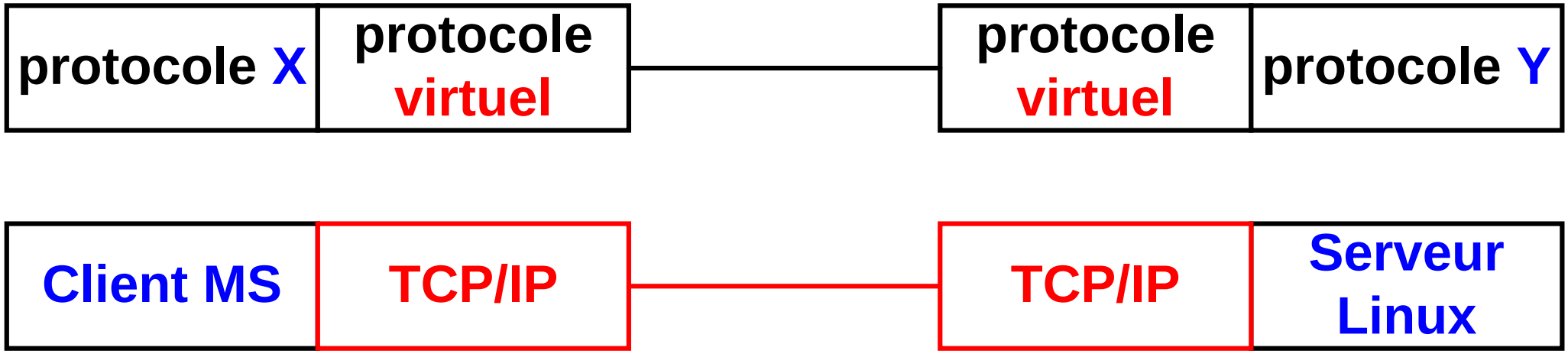


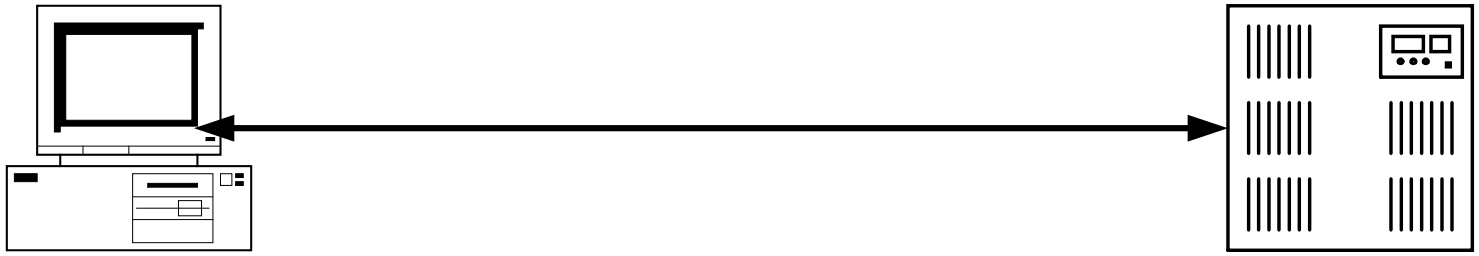
Structure hétérogène et concept virtuel



Protocoles TCP/IP

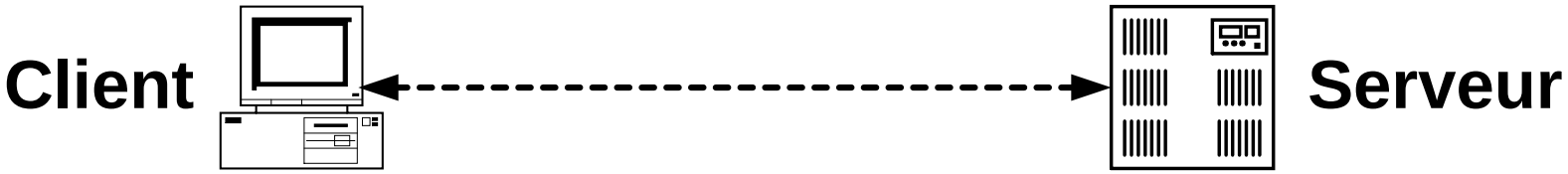
- Indépendance de l'ordinateur

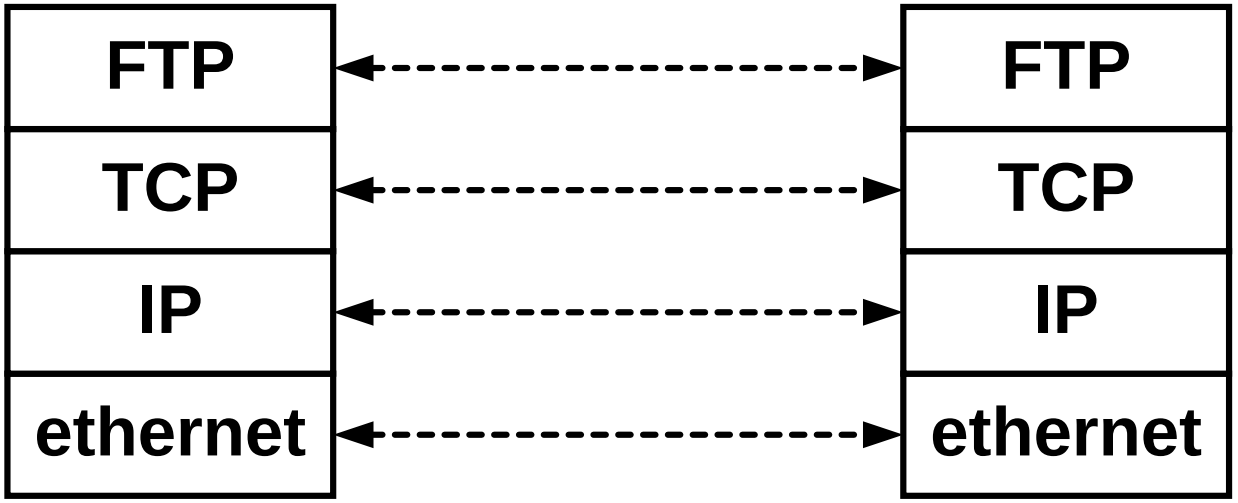


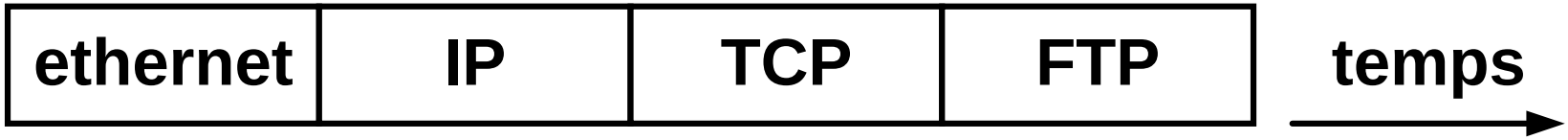


Démo

Modèles en couches

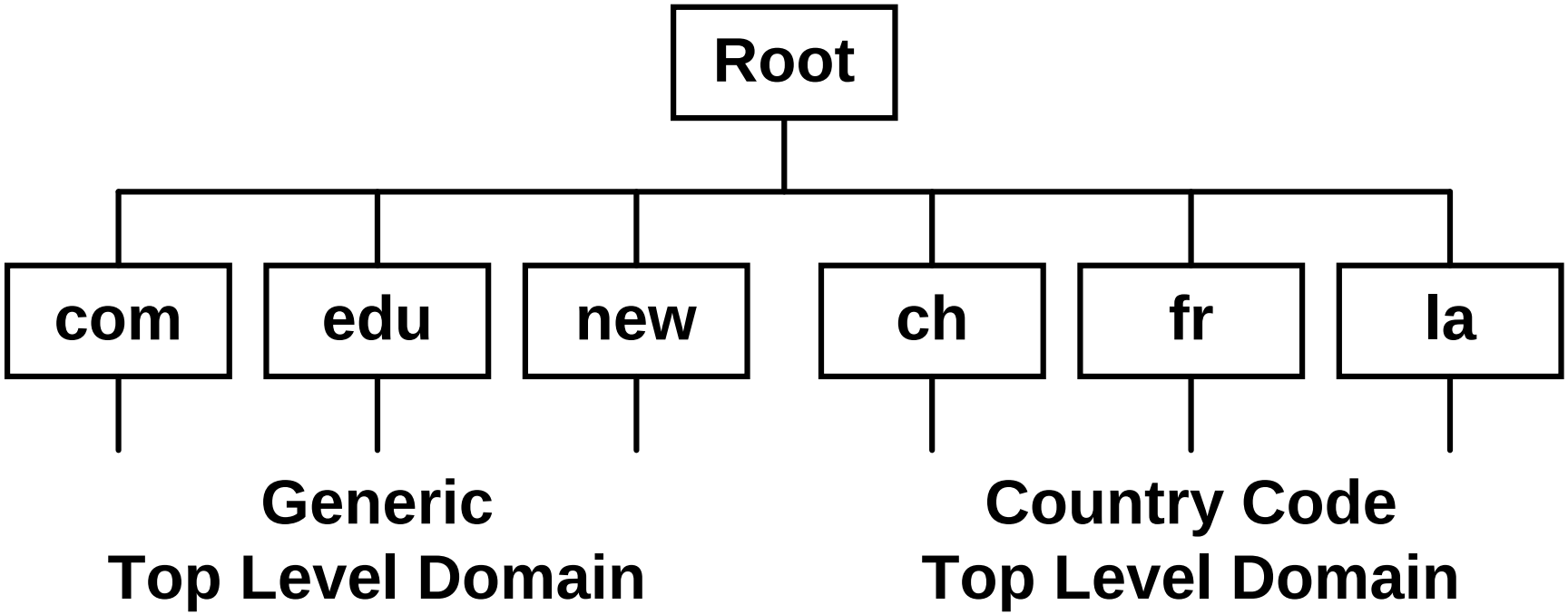






DNS : Structure arborescente

- Le *Domain Name System* est une base de données distribuée



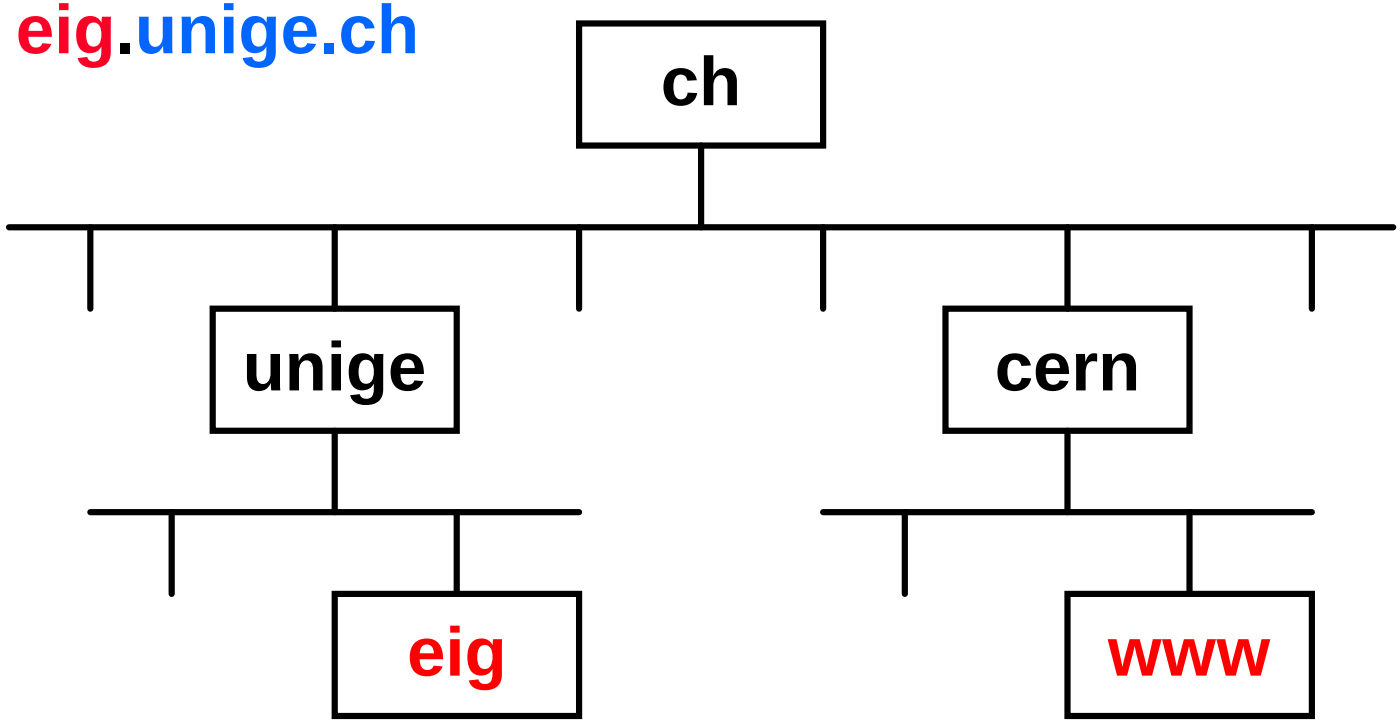
- Nom unique comme www.unige.ch

DNS : Délégation d'authorité

- FQDN : host.domain

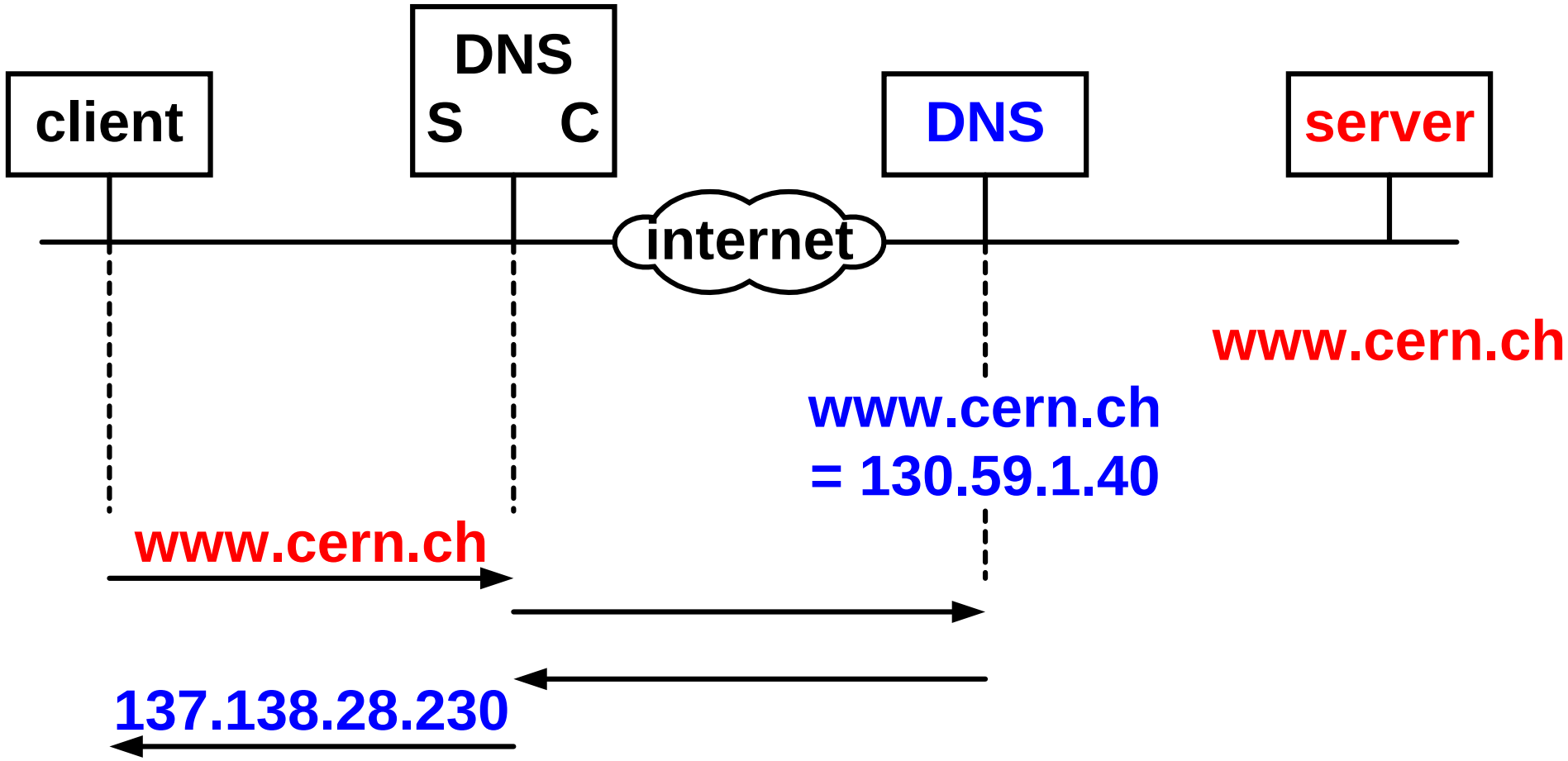
  www.cern.ch

  eig.unige.ch



- Unige peut déléguer l'authorité à td.unige.ch

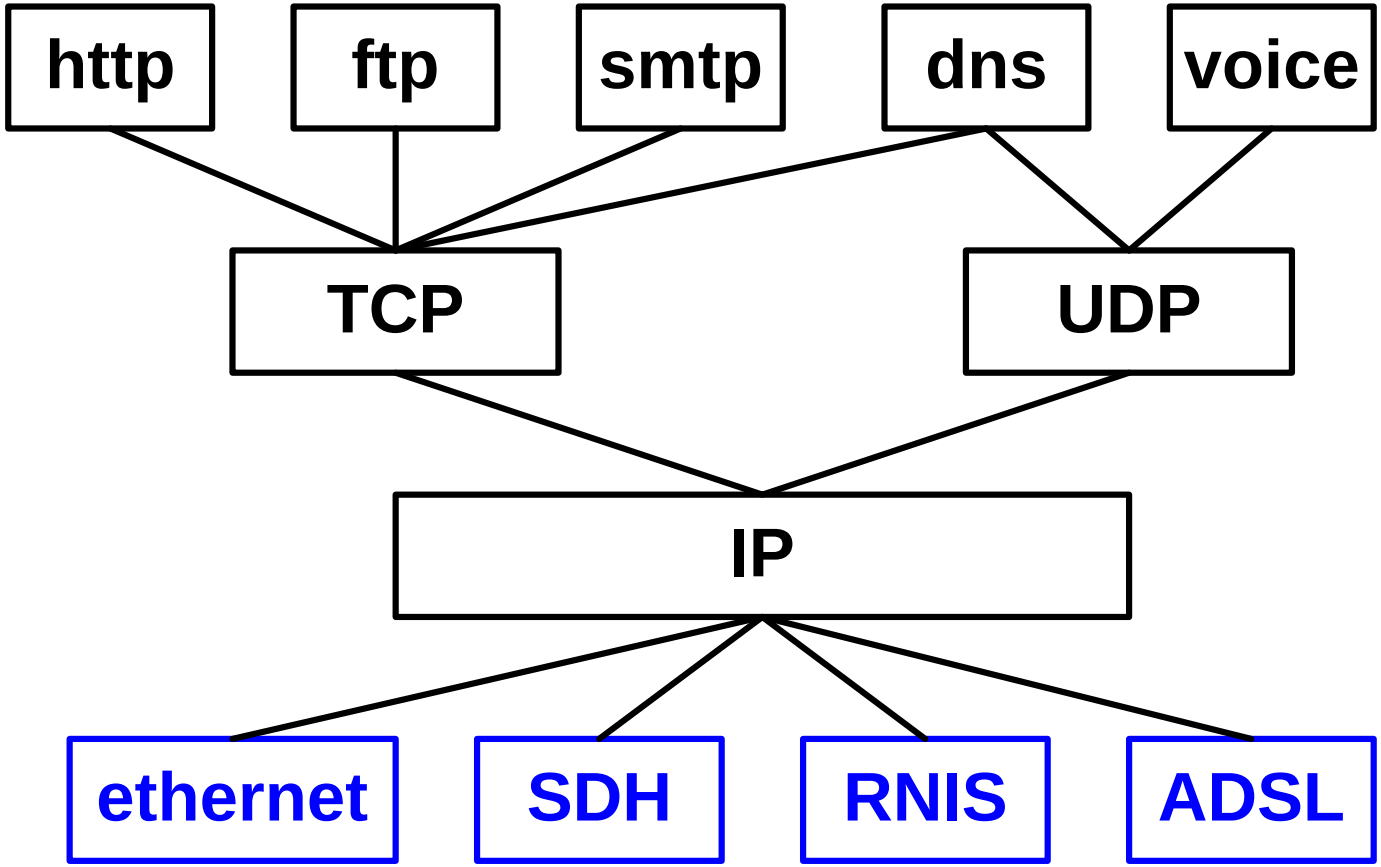
DNS : Fonctionnement



- Echange du type client *(resolver)* – serveur *(name server)*
- Mémoire cache dans client et serveurs DNS

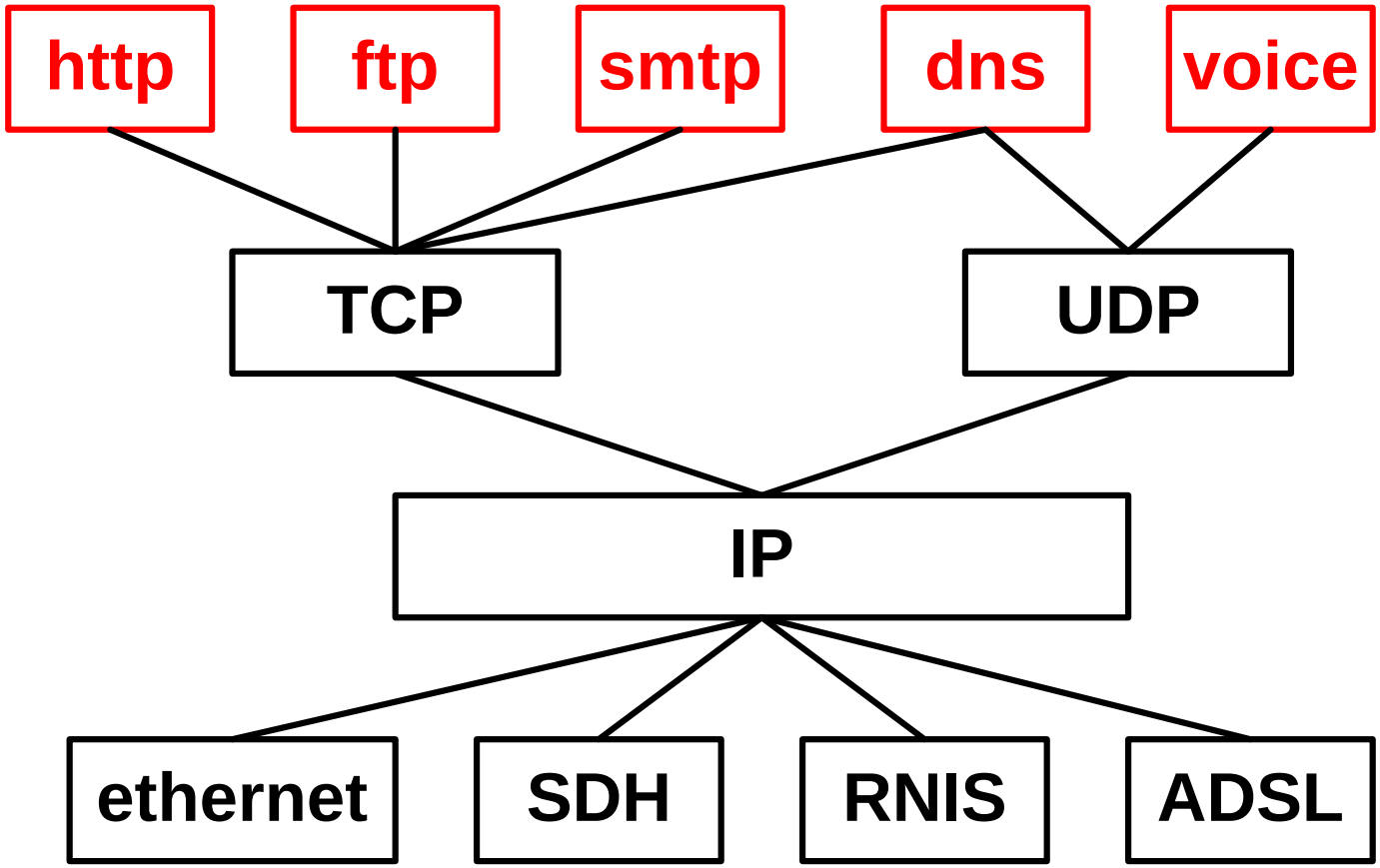
Famille de protocoles TCP/IP (1)

- Indépendance de la technologie du réseau



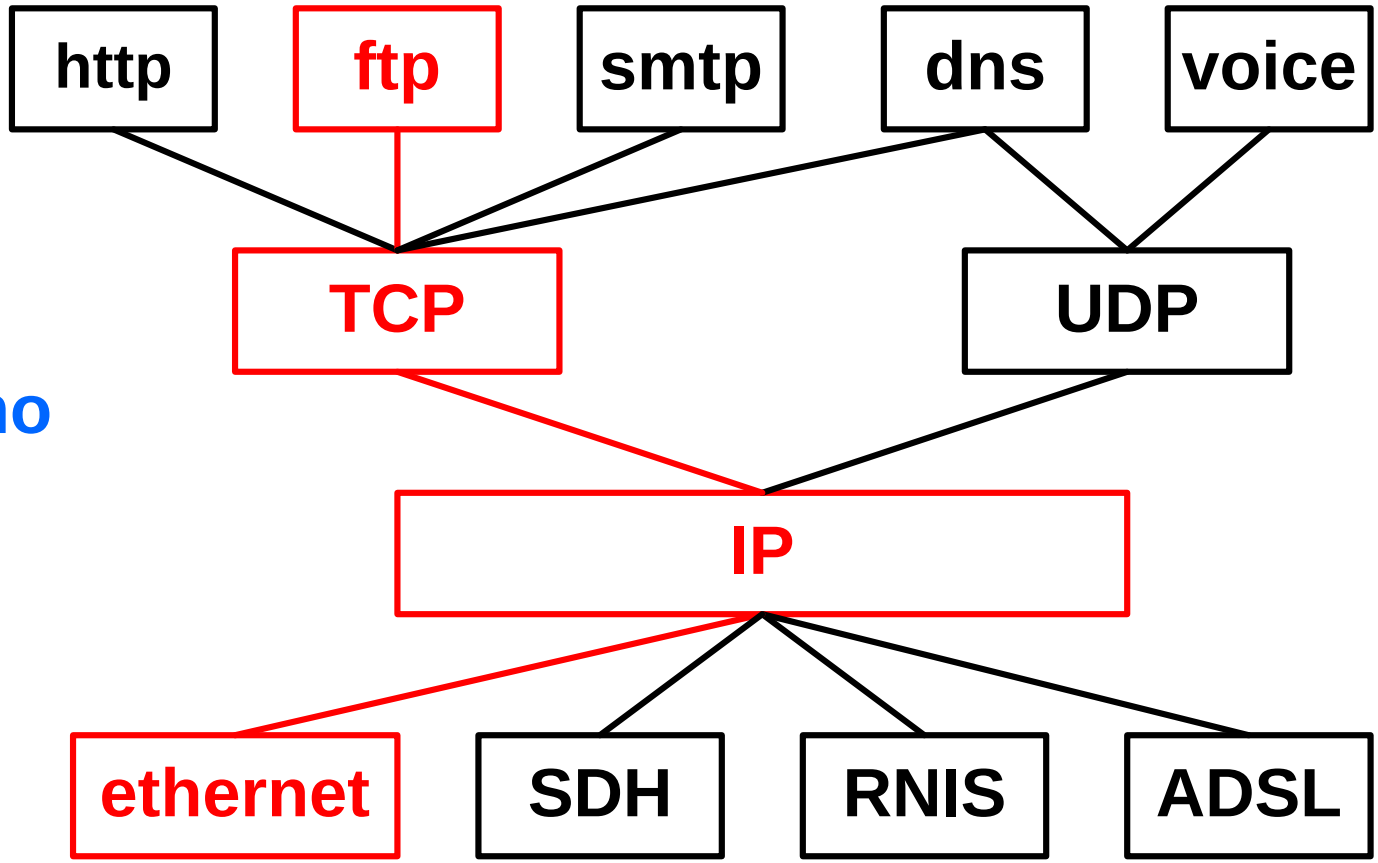
Famille de protocoles TCP/IP (2)

- Protocoles d'application



File Transfer Protocol : illustration

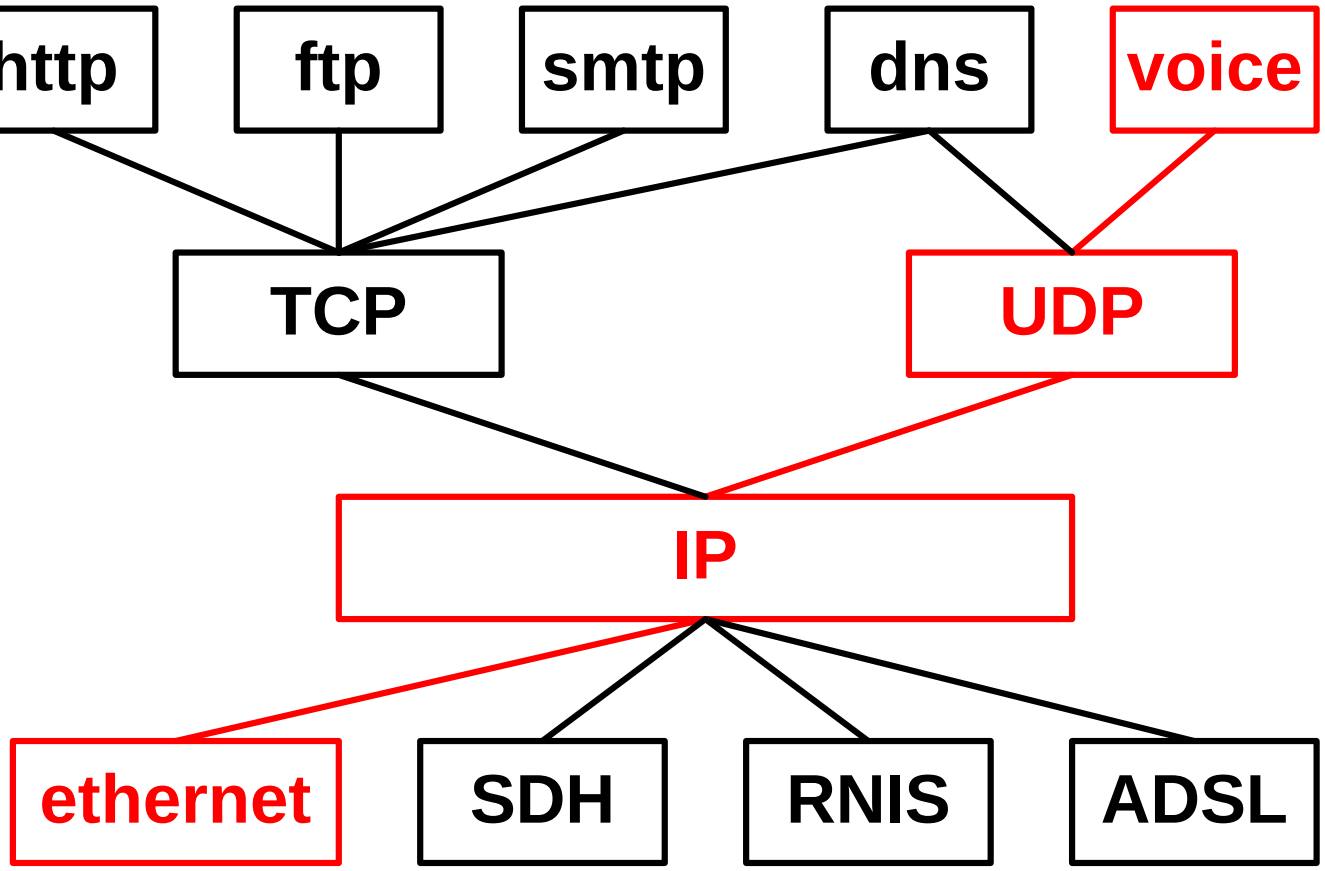
- Transfert fiable grâce à TCP



Démo

Voice over IP : illustration

- Simplicité (performance) grâce à UDP

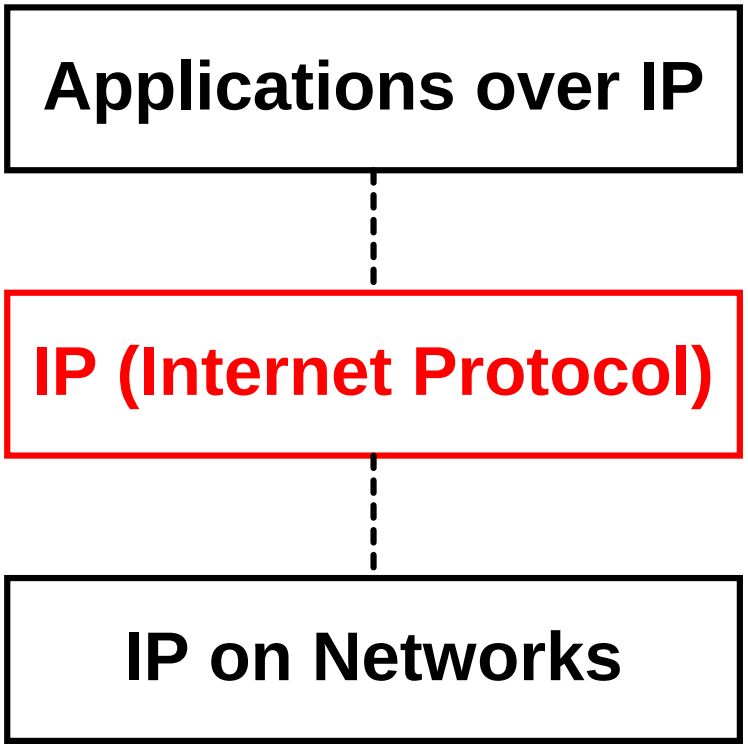


Internet : architecture

Protocoles d'application

Rôle fédérateur de la couche IP

Indépendance de la technologie du réseau

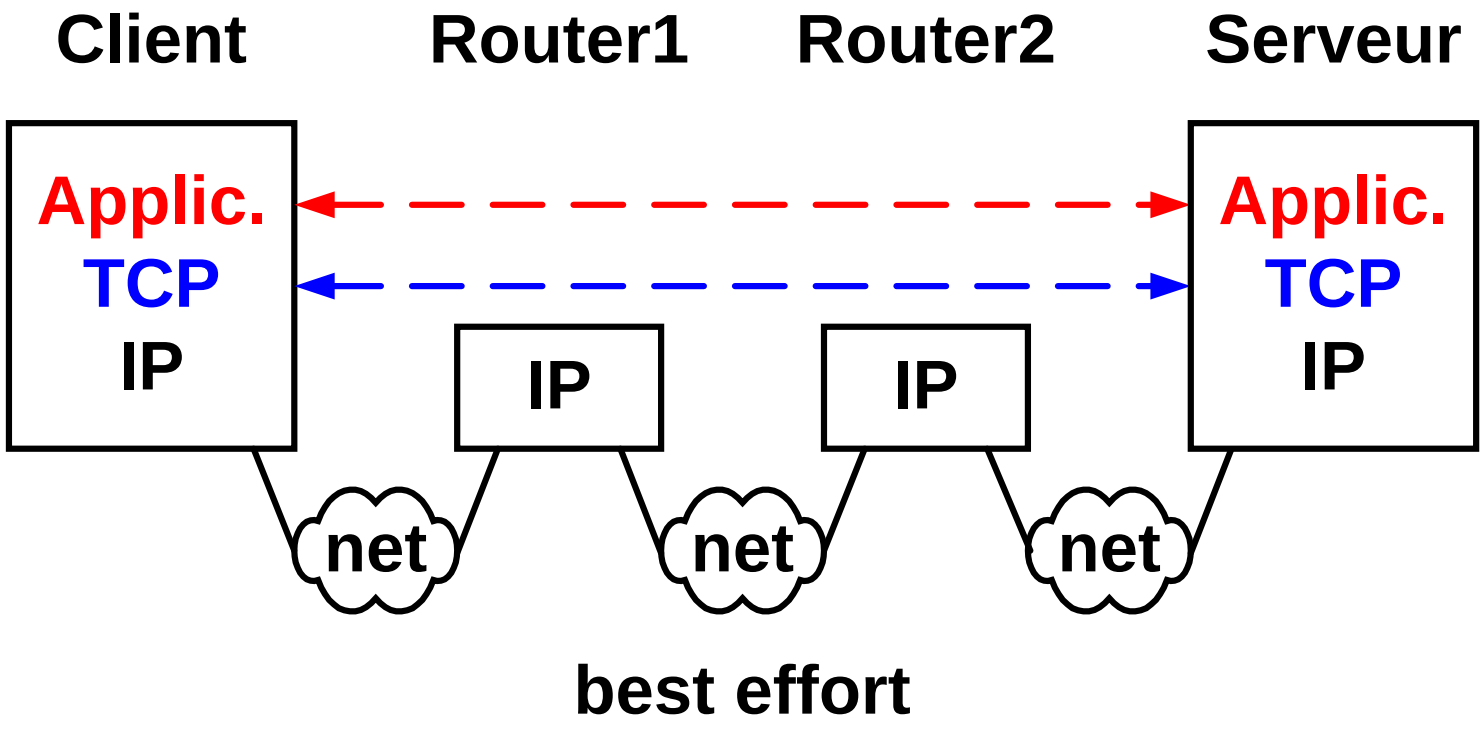


Voice over IP

IP on ISDN

Client – internet – Serveur

- **Les couches Application et TCP ont une signification d'extrémité à extrémité *(end to end protocol)***

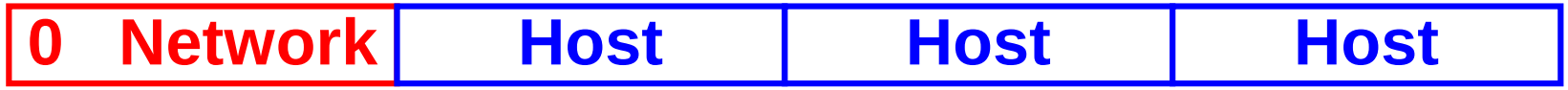


Démo

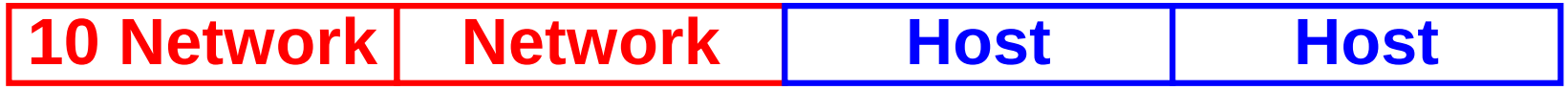
Adresse IP

- Adresse IP (32 bits) = network + host

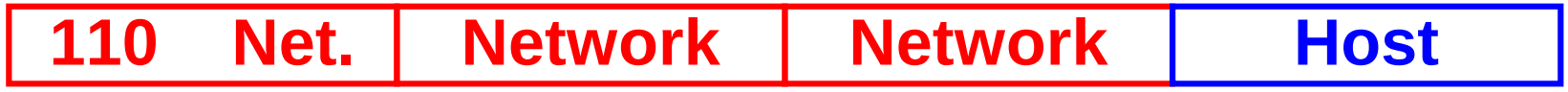
Classe A 1.H.H.H - 127.H.H.H



Classe B 128.N.H.H - 191.N.H.H



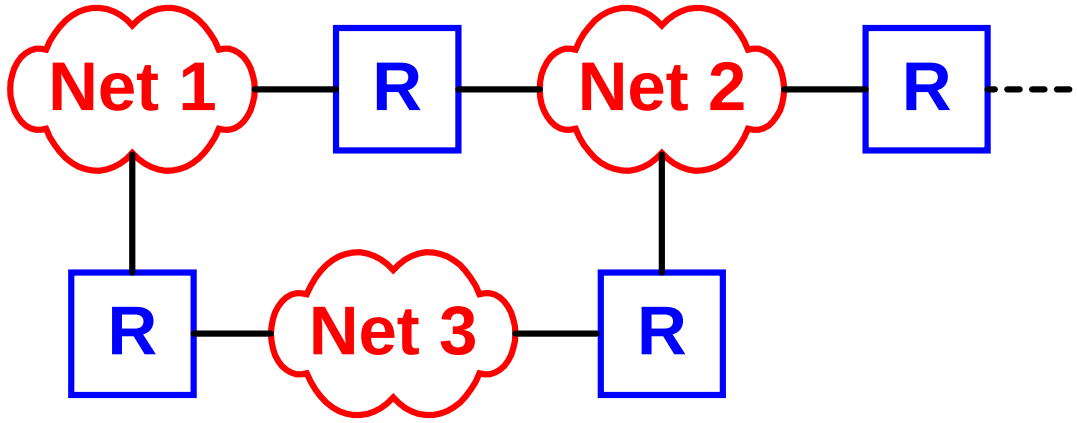
Classe C 192.N.N.H - 223.N.N.H



- Adresses source et destination

Internet : routeur

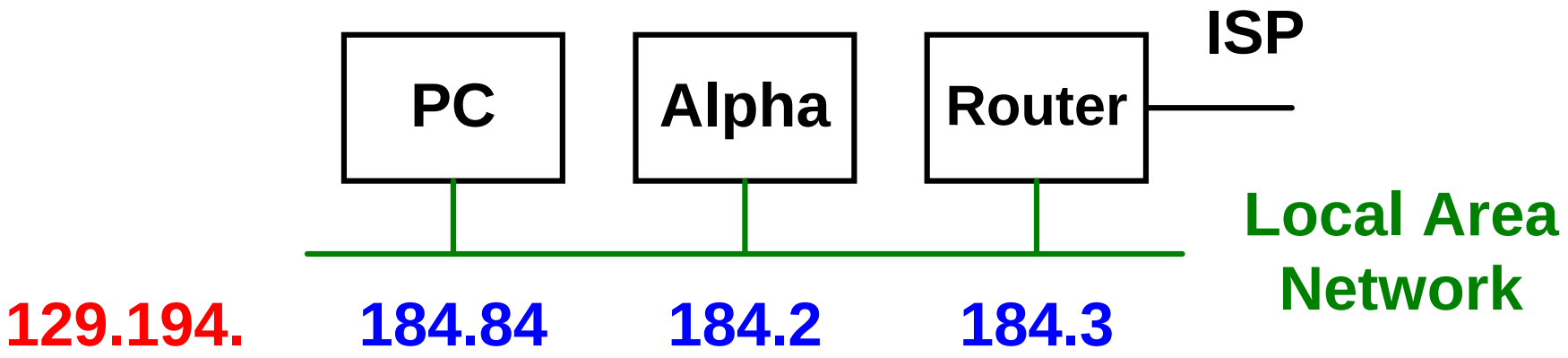
- ***Internet*** **est constitué de réseaux *(Network)* reliés par des routeurs *(Router)***



- **Des ISPs *(Internet Service Providers)* relient les utilisateurs (PCs, serveurs, LAN, …) au *backbone***

Configuration de mon PC

- UniGE dispose de la classe B 129.194.H.H



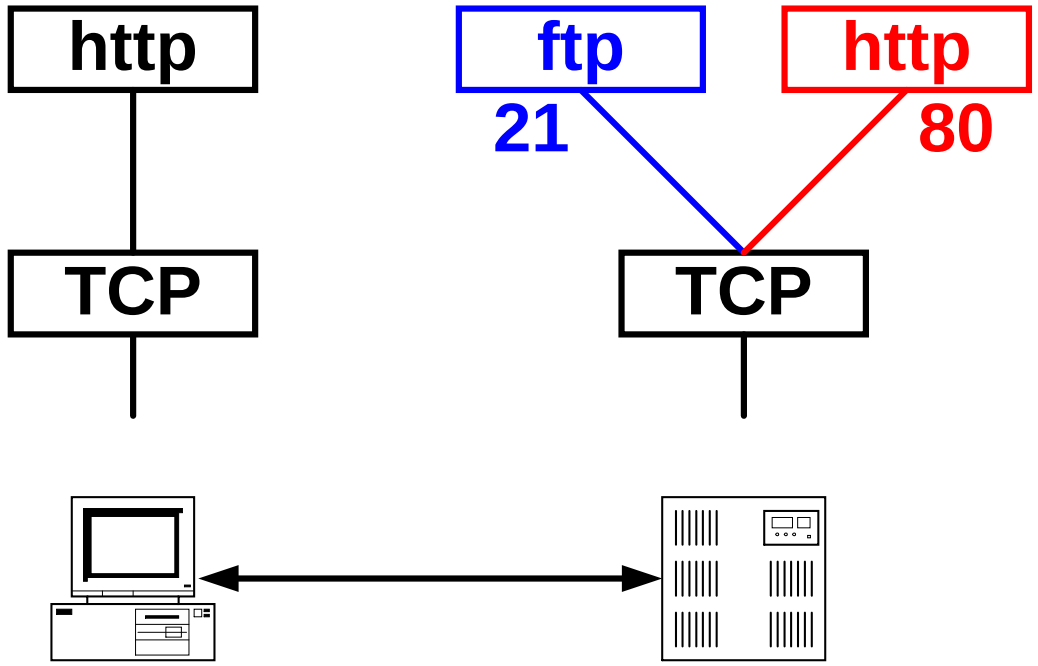
- PC

Démo

IP address	129.194.184.84	Adresse IP
Subnet mask	255.255.0.0	Masque
Router	129.194.184.3	Routeur
DNS	129.194.4.6	Serveur DNS

Ports TCP

- Ce serveur offre les services ftp et http via les ports 21 et 80



Démo

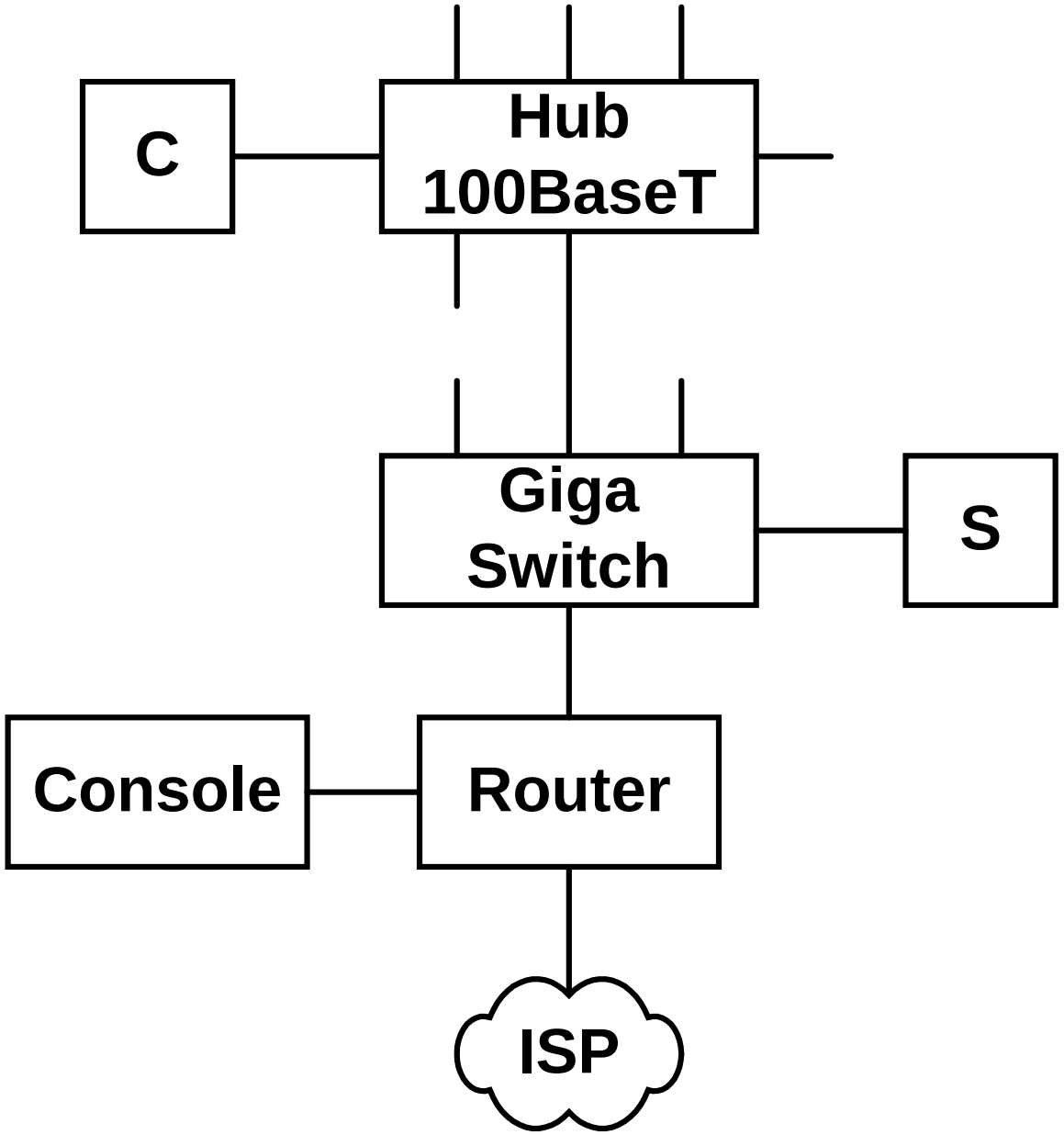
- *Socket* = adresse IP + port

Débit binaire

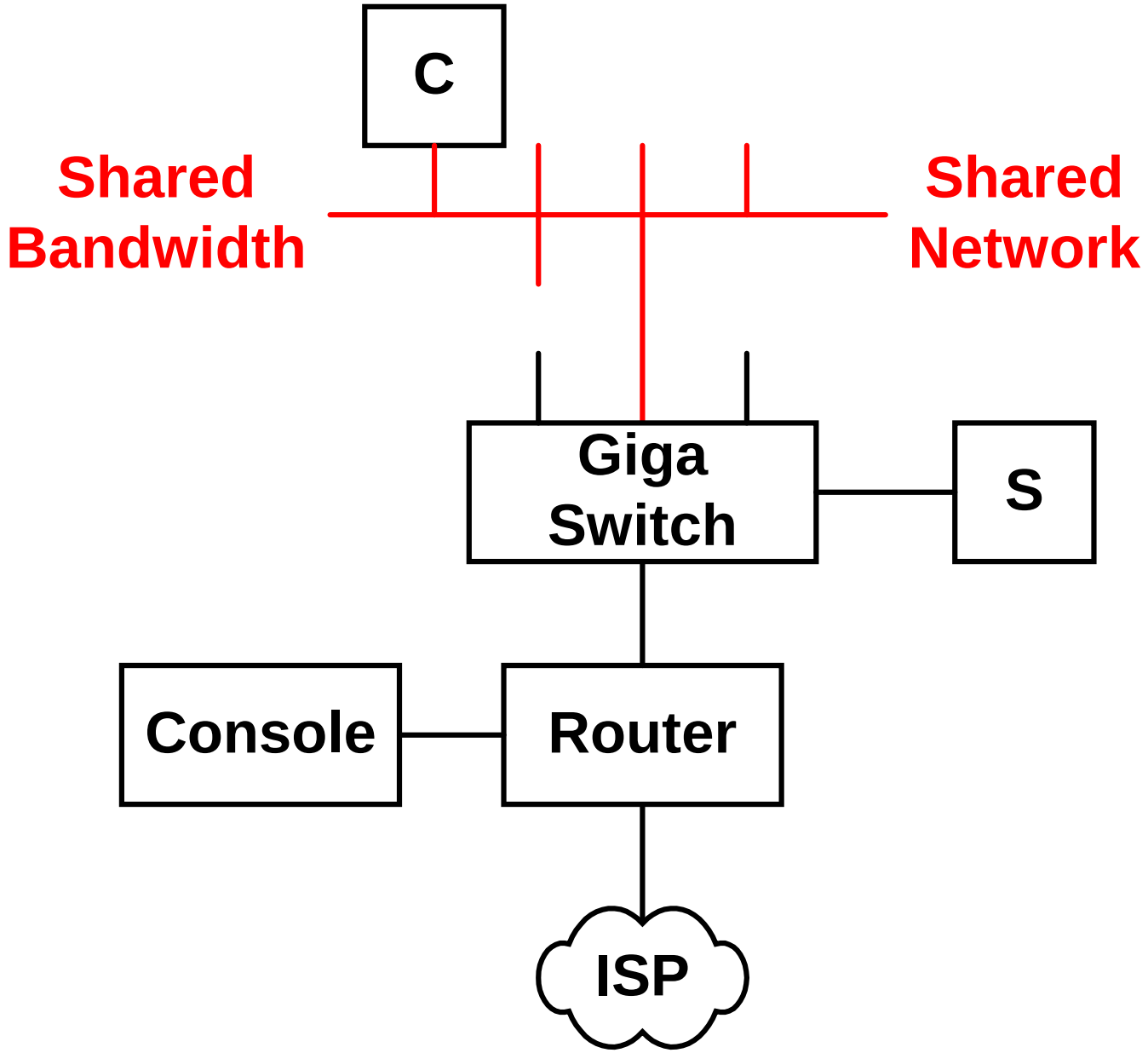
• Série	9600 bit/s		Performances ?
	~ 10 kbit/s		
• 10Base5	10 Mbit/s	1983	Cu
• 10BaseT	10	1990	Cu
• 100BaseT	100	1994	Cu – Fo
• Gigabit	1 Gbit/s	1999	Fo – Cu
• 10Gigabit	10	2002	Fo – Cu

- …Tera (10^{12}), Peta (10^{15}), Exa (10^{18}), Zetta (10^{21}), Yotta (10^{24}), …

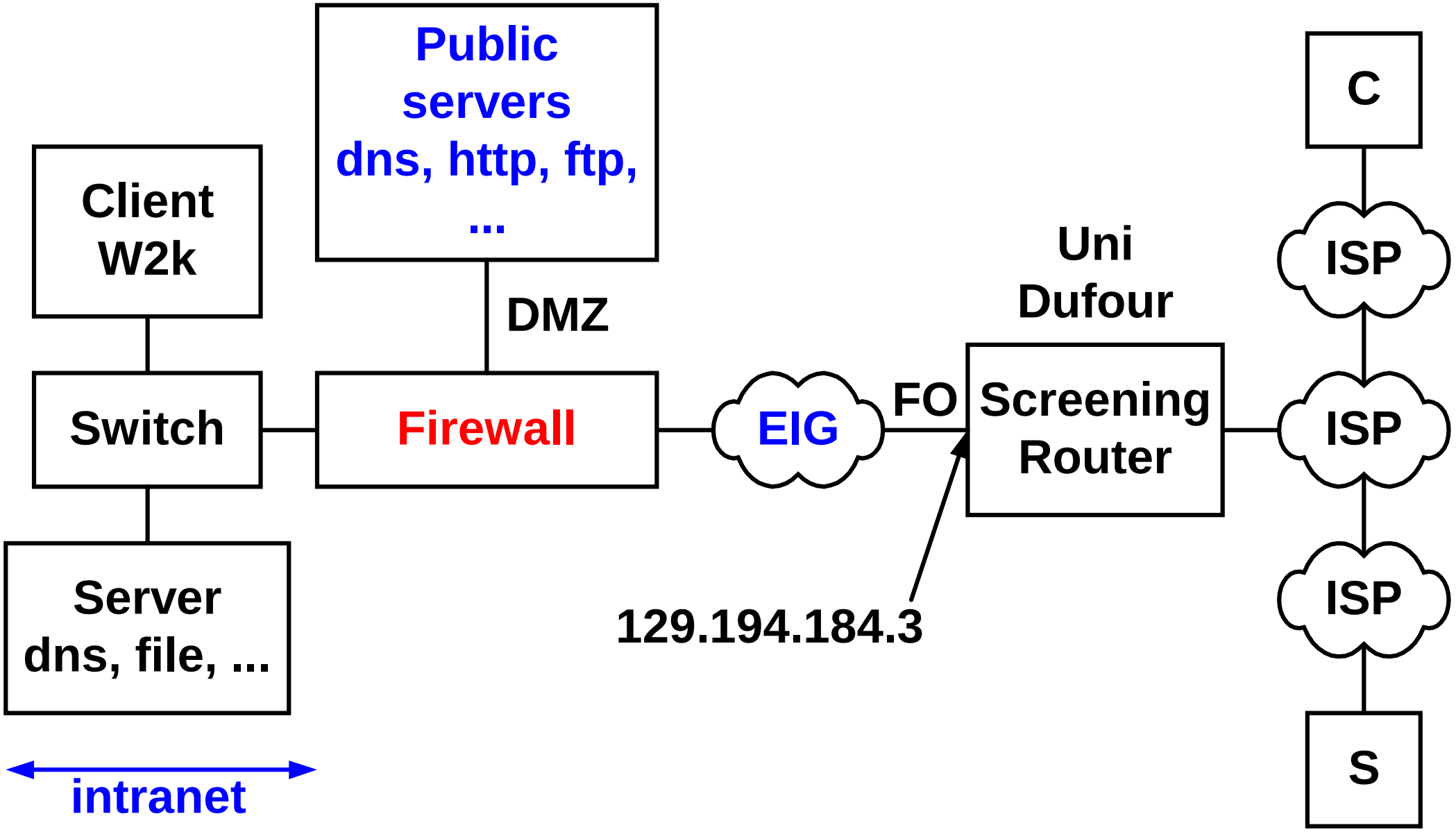
Liaison point à point



Multipoint

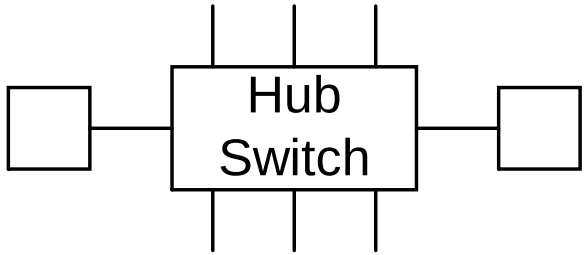


Labo

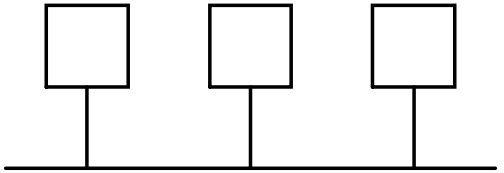

Public
servers
dns, http, ftp,
...
DMZ
Client
W2k
Switch
Firewall
EIG
FO
Uni
Dufour
Screening
Router
C
ISP
ISP
ISP
S
Server
dns, file, ...
129.194.184.3
intranet

Topologies

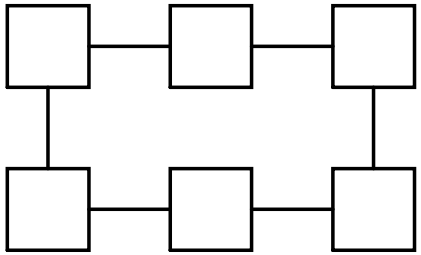
Etoile



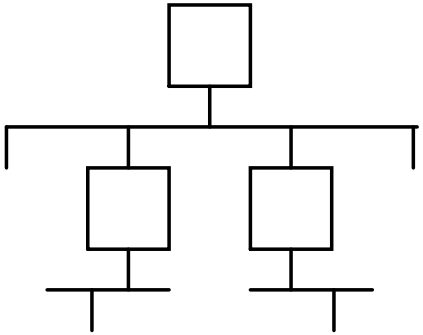
Bus, multipoint



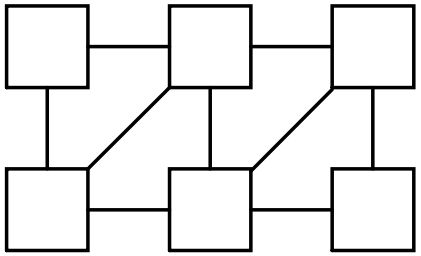
Anneau



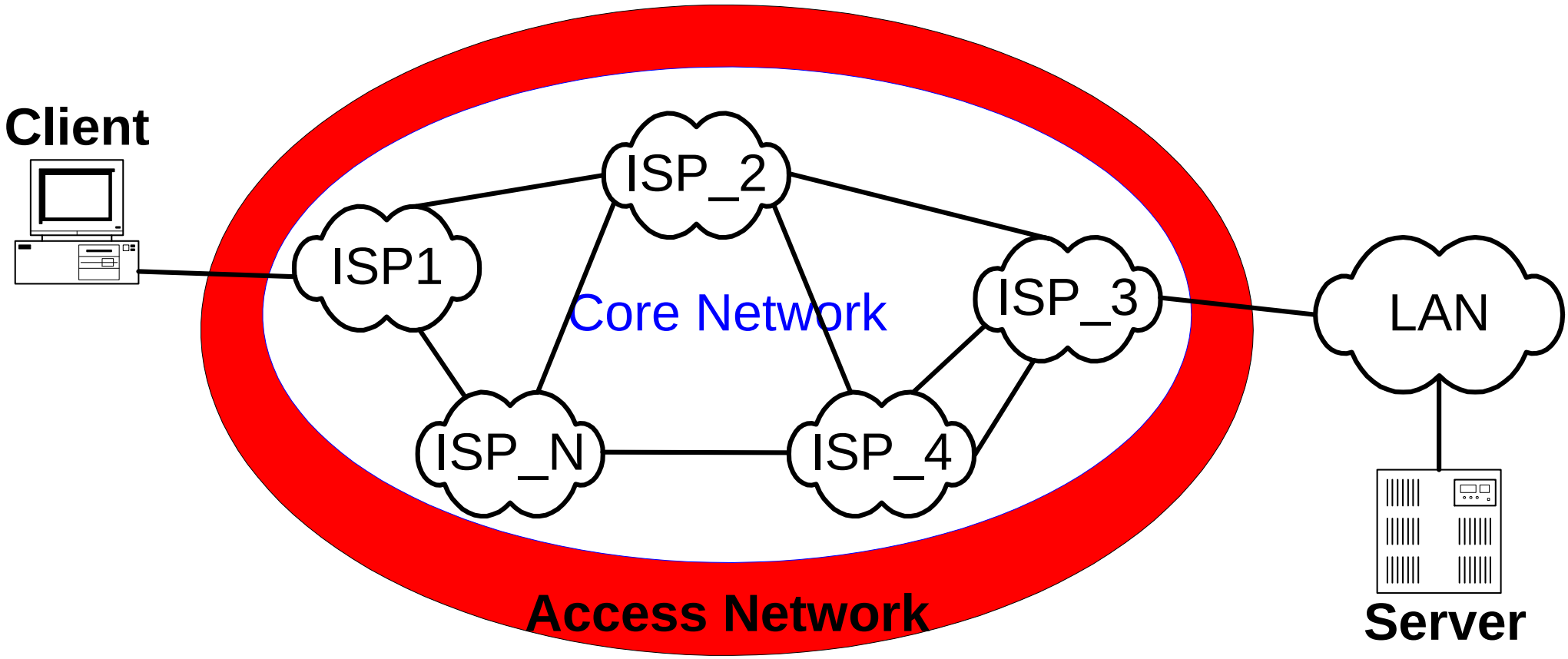
Arbre



Maillée



Users – Access Network – Internet



- Switched network (POTS, ISDN, wireless, …)
- Leased line, ADSL, …

Leased line – dedicated line

- **Service physique**

  Support cuivre (Cu) & fibre optique (FO) – *dark fiber*

  Utilisateur gère modem, routeur, ...

  Affaiblissement → distance max → régénérer

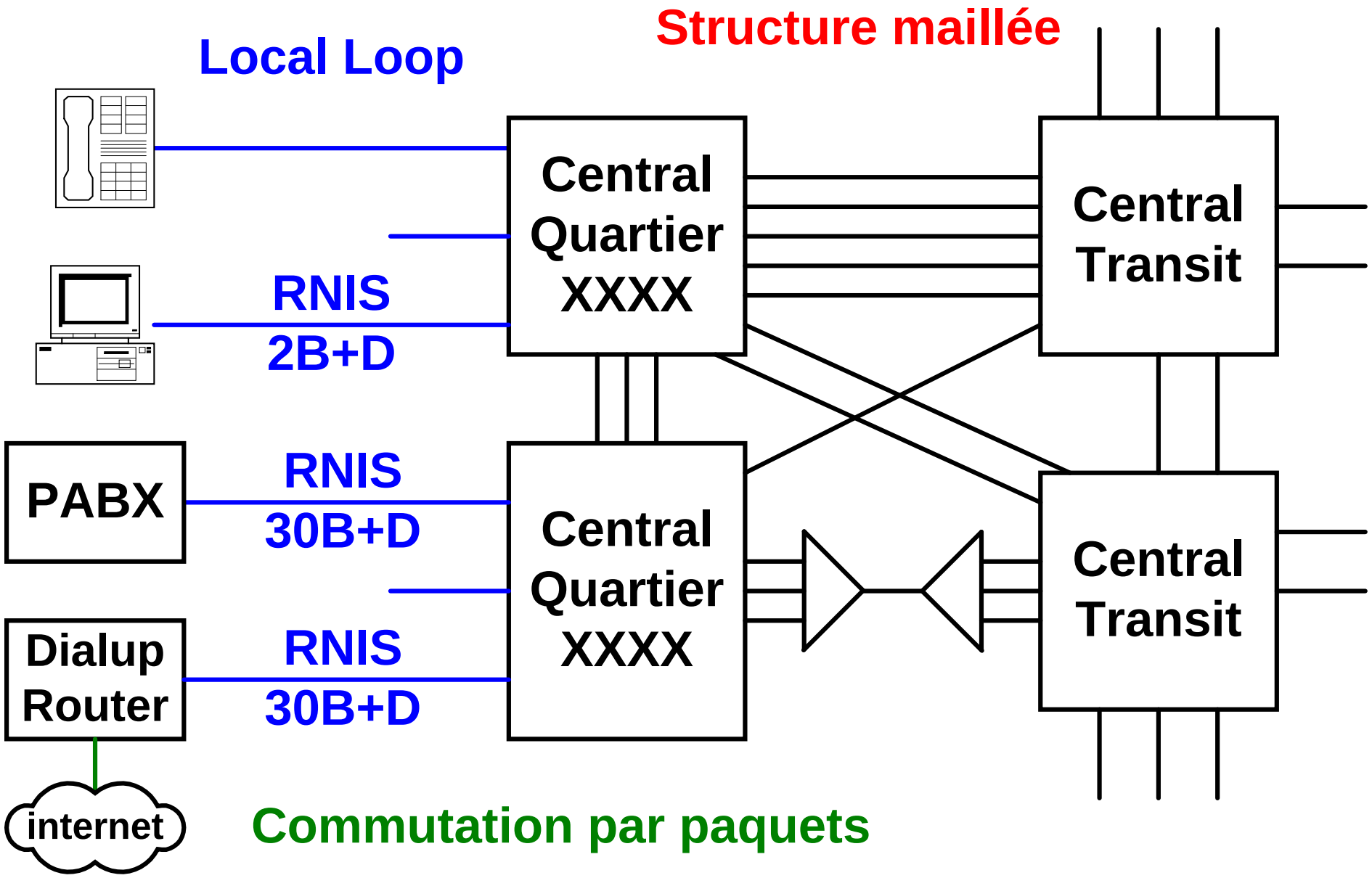
- **Service multiplexé**

  Liaison 2 Mbit/s entre GE et ZH

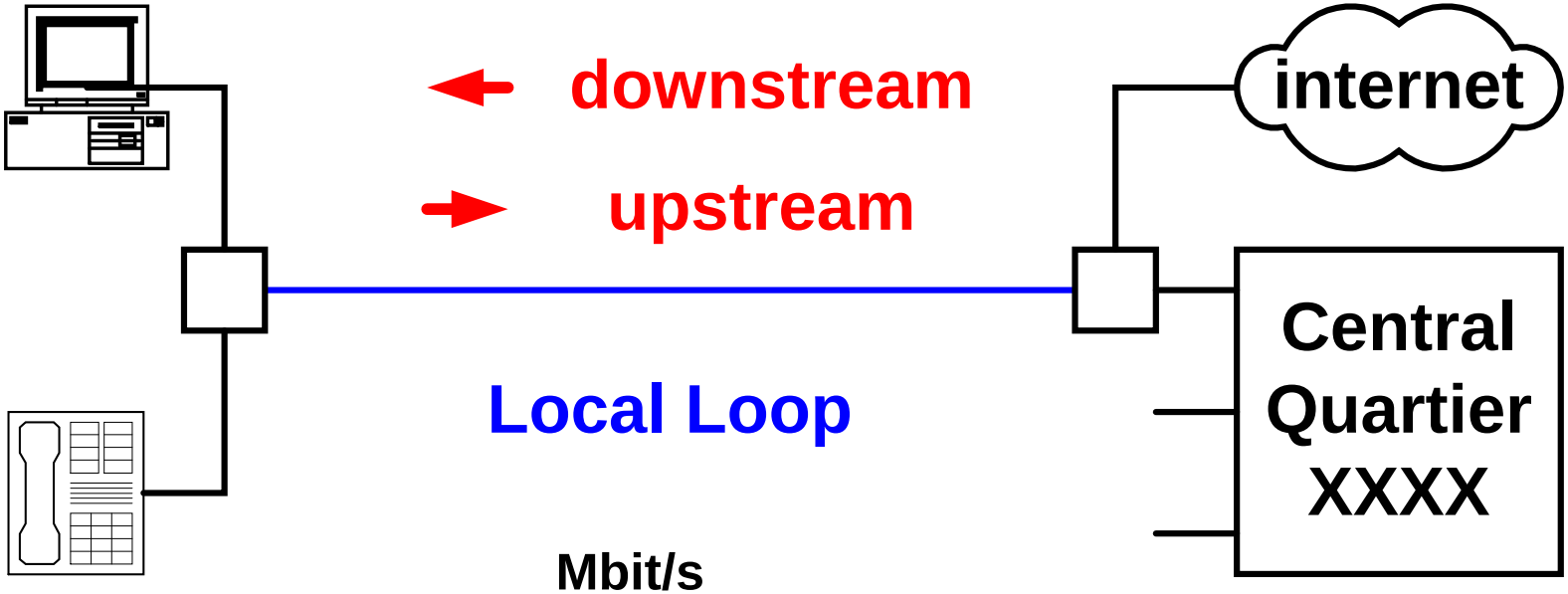
  Opérateur utilise sa FO à 2,1 Gbit/s → 30720 x 64 kbit/s

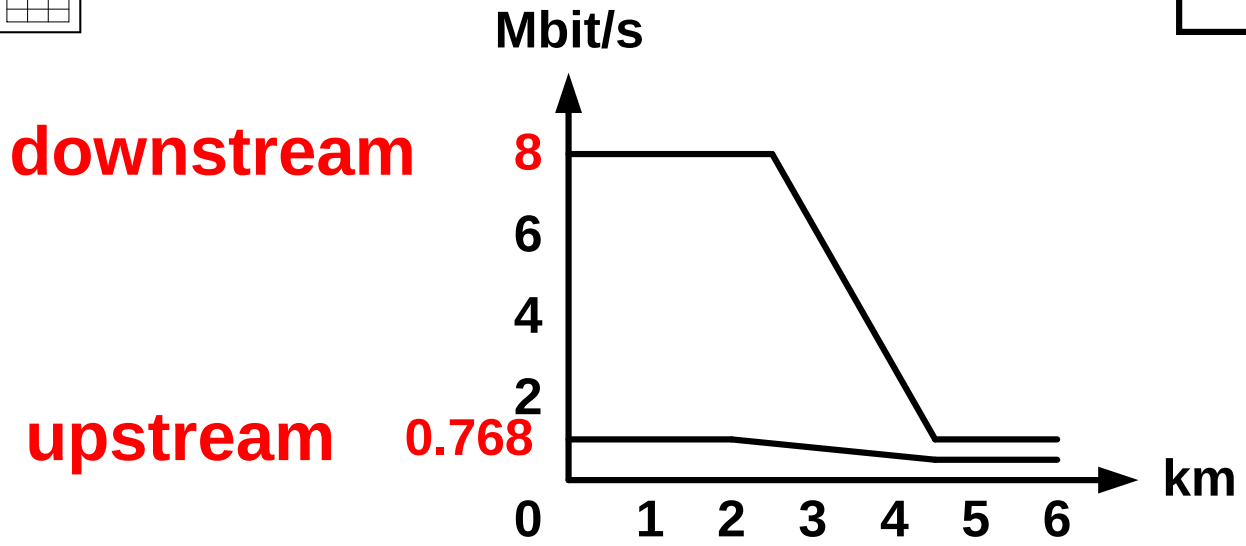
- **Taxation forfaitaire**

Commutation de circuit



Asymetric Bit rate Digital Subscriber Line





VDSL2

← 22056 kbps

5544 kbps →

Mnémoniques (1)

- **DB** *Data Base*
- **DNS** *Domain Name System*
- **FQDN** *Full Qualified Domain Name*
- **FTP** *File Transfer Protocol*
- **HTML** *Hypertext Markup Language*
- **HTTP** *Hypertext Transfer Protocol*
- **ID** *Identificator*
- **IETF** *Internet Engineering Task Force*
- **IP** *Internet Protocol*
- **ISDN** *Integrated Service Digital Network*
- **ISP** *Internet Service Provider*
- **LAN** *Local Area Network*
- **MTBF** *Mean Time Before Failure*

Mnémoniques (2)

- **OS** *Operating System*
- **PBX** *Private Branch eXchange*
- **PPP** *Point to Point Protocol*
- **RAID** *Redundant Array of Independent Disks*
  originally Redundant Array of Inexpensive Disks
- **RFC** *Request For Comment*
- **SMTP** *Simple Mail Transfer Protocol*
- **TELNET** *Terminal Emulation Protocol*
- **TCP** *Transmission Control Protocol*
- **UDP** *User Datagram Protocol*
- **URL** *Uniform Resource Locator*

Mnémoniques (3)

- **WAN** — ***Wide Area Network***
- **WWW** — ***World-Wide Web***

www.osinet.fr/code/glo.asp — **glossaire internet**

www.whatis.com — **glossaire**

www.icann.org — ***Internet Corporation for Assigned Names & Numbers*** **(.com .net .org …)**

www.nic.ch — **Attribution au niveau suisse par Switch**