

Réseau Laurent Bedat - cours 2011

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27 avril 2011

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1 Introduction

1.1 Les titres du poly

Page	Titre
1	Uses of Computer Networks
2	Business Applications of Networks
3	Home Network Applications
4	Network Hardware
4	Broadcast Networks
5	Local Area Networks
6	Metropolitan Area Networks
6	Wide Area Networks
7	Wireless Networks
9	Home Network Categories
9	Network Software
10	Protocol Hierarchies
11	Design Issues for the Layers
12	Service Primitives
13	Services to Protocols Relationship
13	Reference Models
15	Comparing OSI and TCP/IP Models
16	A Critique of the OSI Model and Protocols
16	Bad Timing
17	A Critique of the TCP/IP Reference Model
17	Hybrid Model
18	Example Networks
18	The ARPANET
19	NSFNET
20	Internet Usage
20	Architecture of the Internet
21	Ethernet
21	Wireless LANs
23	ATM Virtual Circuits
23	The ATM Reference Model
24	Network Standardization
25	ITU
25	IEEE Standards

1.2 Quelques définitions

- **Protocoles unifiés** : N'importe quel terminal est capable de dialoguer avec n'importe quel serveur ou autres terminaux. (ex : Un tablet pc peut dialoguer avec un ordinateur MAC OS)
- **Boucle locale** : Installation (filiaire) partant de l'opérateur jusqu'à la prise téléphonique.

- **Processeur ARM** : Processeur virtuel embarqué dans un FPGA (puce reprogrammable).
- **Taille d'une cellule** : Périmètre sur lequel la cellule est capable de communiquer. (ex : UMTS (3G+) = 4Km, MTE (4G) = 50Km)
- **Protocole auto-adaptif** : Protocole qui permet de reconfigurer lui-même son routage en cas de changement de la toile (ex : TCP/IP)
- **Contrôle de flux** : Problème lié au fait que les réseaux soient hétérogènes. Les vitesses sont différentes entre les terminaux et cela peut mener à des encombrements du trafic.
- **Multiplexage** : Être en mesure de faire plusieurs activités réseaux "simultanément". (ex : mail + P2P + streaming)

2 La couche physique

Principe : signal binaire \iff signal optique/électrique

2.1 Les titres du poly

Page	Titre
1	The theoretical Basis for Data Communication
1	Bandwidth-limited signals
3	Guided Transmission Data
3	Twisted Pair
4	Coaxial Cable
4	Fiber Optics
5	Transmission of Light through Fiber
5	Fiber Cables
6	Fiber Optic Networks
7	Wireless Transmission
8	The Electromagnetic Spectrum
8	Radio Transmission
9	Politics of the Electromagnetic Spectrum
9	Lightwave Transmission
10	Communication Satellites
12	Low-Earth Orbit Satellites Iritium
12	Globalstar
13	Public Switched Telephone System
13	Structure of the Telephone System
14	Major Components of the Telephone System
15	The politics of Telephones
15	The Local Loop : Modems, ADSL and Wireless
16	Modems
17	Digital Subscriber Lines (ADSL)
19	Wireless Local Loops (Ex : WIMAX)
19	Frequency Division Multiplexing
20	Wavelength Division Multiplexing
20	Time Division Multiplexing
22	Circuit Switching
23	Message Switching
23	Packet Switching
24	The Mobile Telephone System
24	Advanced Mobile Phone System
25	Channel Categories
25	D-AMPS - Digital Advanced Mobile Phone System
26	GSM - Global System for Mobile Communications
27	Third and forth Generation Mobile Phones : Digital Voice and Data
27	Cable Television
28	Community Antenna Television
28	Internet over Cable
29	Spectrum Allocation
30	Cable Modems

3 La couche liaison

3.1 Les titres du poly

Page	Titre
1	Functions of the Data Link Layer
2	Services Provided to Network Layer
3	Framing
5	Error Detection and Correction
5	Error-Detecting Codes
6	Elementary Data Link Protocols
6	Unrestricted Simplex Protocol
7	Simplex Stop-And-Wait Protocol
7	A Simplex Protocol for a Noisy Channel (ex : GSM)
8	Sliding Window Protocols
9	A One-bit Sliding Window Protocol
10	A Protocol Using Go Back N
10	Protocol Verification
11	Petri Net Models
12	Finite State Machined Models
12	The Medium Access Control Sublayer
13	The Channel Allocation Problem
13	Multiple Access Protocols
14	Collision-Free Protocols (temps réel)
14	Pure ALOHA (purement probabiliste)
15	Slotted ALOHA
16	ALOHA
16	CSMA with Collision Detection
17	Wireless LAN Protocols
18	Ethernet
19	Ethernet Cabling
20	Switched Ethernet
20	Ethernet Cabling
21	Fast Ethernet
21	Gigabit Ethernet
22	802.3ae 10 GbE Optical Transceivers
22	10 GbE Layer Diagram
23	Economic Facts
23	IEEE 802.2 : Logical Link Control and Media Access Control
24	MAC Sublayer Protocol
24	@ Ethernet
25	MAC Sublayer Protocol (Collision detection)
26	LLC Sublayer Protocol
27	Wireless LANs
28	The 802.11 Protocol Stack

28	The 802.11 MAC Sublayer Protocol
31	The 802.11 Frame Structure
31	802.11 Services
32	Bluetooth
33	Bluetooth Architecture
33	Bluetooth Applications
34	The Bluetooth Protocol Stack
34	The Bluetooth Frame Structure
35	Data Link Layer Switching
36	Bridges from 802.x to 802.y
37	Data Link Layer Switching
37	Local Internetworking
38	Spanning Tree Bridges
39	Remote Bridges
39	Repeaters, Hubs, Bridges, Switches, Routers and Gateways
40	Virtual LANs
43	The IEEE 802.1Q Standard

3.2 Quelques définitions

Concernant l'accès aux médiums :

- **Système Probabiliste (informatique)** : L'ordinateur sait si le médium est libre, si oui alors il envoie les données.
- **Système déterministe** : Ordonnanceur qui donne les autorisations d'envoi. (temps réel)

4 Couche réseau

4.1 Les titres du poly

Page	Titre
1	Network Layer Design Issues
2	Store-and-Forward Packet Switching
2	Implementation of Connectionless Service
3	Implementation of Connection-Oriented Service
3	Comparison of Virtual-Circuit and Datagram Subnets
4	Routing Algorithms
5	The Optimality Principle
5	Shortest Path Routing
6	Flooding
7	Distance Vector Routing
8	Link State Routing
8	Learning about the Neighbors
9	Measuring Line Cost

9	Building Link State Packets
10	Distributing the Link State Packets
10	Hierarchical Routing
11	Broadcast Routing
11	Multicast Routing
12	Routing for Mobile Hosts
13	Routing in Ad Hoc Networks
13	Route Discovery
15	Route Maintenance
15	Congestion Control Algorithms
16	Congestion
16	General Principles of Congestion Control
17	Congestion Prevention Policies
17	Congestion Control in Virtual-Circuit Subnets
18	Hop-by-Hop Choke Packets
18	Jitter Control
19	Quality of Service
19	Requirements
20	Buffering
20	The Leaky Bucket Algorithm
21	The Token Bucket Algorithm
22	Admission Control
22	Packet Scheduling
23	RSVP - The ReSerVation Protocol
24	Expedited Forwarding
24	Assured Forwarding
25	Label Switching and MPLS
25	Internetworking
26	Connecting Networks
26	How Networks Differ
27	How Networks Can Be Connected
27	Concatenated Virtual Circuits
28	Connectionless Internetworking
28	Tunneling
29	Internetwork Routing
30	Fragmentation
31	The Network Layer in the Internet
31	Design Principles for Internet
32	Collection of Subnetworks
32	The IP Protocol
33	IP Address

34	Subnets
35	CDR - Classless InterDomain Routing
36	NAT - Network Address Translation
36	Internet Control Message Protocol
37	ARP - The Address Resolution Protocol
37	DHCP - Dynamic Host Configuration Protocol
38	OSPF - The Interior Gateway Routing Protocol
39	BGP - The Exterior Gateway Routing Protocol
40	The Main IPv6 Header
40	Extension Headers

5 Couche transport

5.1 Les titres du poly

Page	Titre
1	The Transport Service
2	Services Provided to the Upper Layers
2	Transport Service Primitives
4	Berlemy Sockets
4	Socket Programming Example : Internet File Server
5	Elements of Transport Protocols
6	Transport Protocol
6	Addressing
7	Connection Establishment
8	Connection Release
10	Flow Control and Buffering
11	Multiplexing
12	Crash Recovery
12	A Simple Transport Protocol
13	The Example Transport Entity
18	The Example as a Finite State Machine
19	The Internet Transport Protocols : UDP
19	Introduction to UDP
20	Remote Procedure Call
20	The Real-Time Transport Protocol
21	The Internet Transport Protocols : TCP
22	The TCP Service Model
23	The TCP Segment Header
24	TCP Connection Establishment
24	TCP Connection Management Modeling
25	TCP Transmission Policy
26	TCP Congestion Control

27	TCP Timer Management
28	Wireless TCP and UDP
28	Transitional TCP
29	Performance Issues
29	Performance Problems in Computer Networks
30	Network Performance Measurement
30	System Design for Better Performance
32	Fast TPDU Processing
33	Protocols for Gigabit Networks

5.2 Quelques définitions

- **TPDU** : Transport Protocol Data Unit (taille max des infos)
- **Entêtes** : Données propres au protocole