UE PRIP
Principes des réseaux informatiques par la pratique
Course overview

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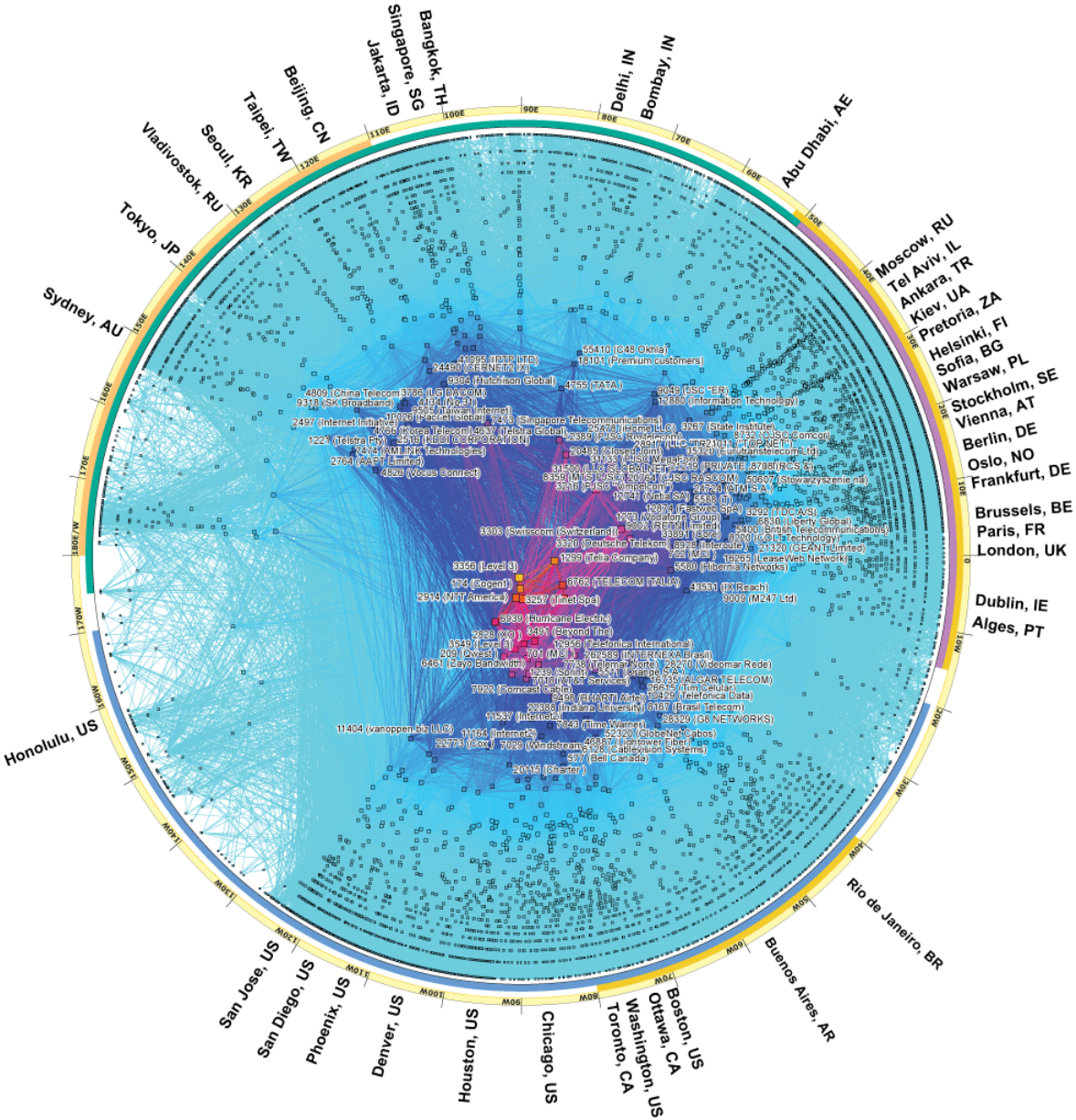
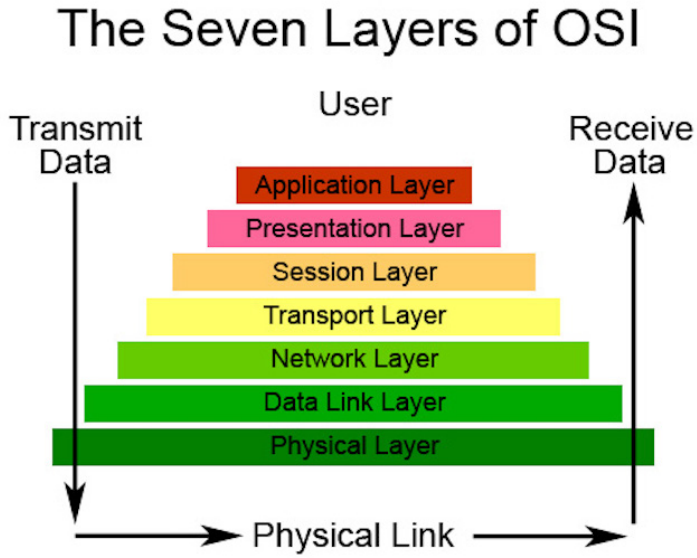
2022

How do data networks work? principles, protocoles, configuration, analysis






```
   Network          Next Hop            Metric LocPrf Weight Path
*> 12.0.1.0/29      0.0.0.0                  0         32768 i
*>i12.0.6.0/30      7.7.7.7                  0    100      0 i
*>i12.0.7.0/30      8.8.8.8                  0    100      0 i
*> 13.0.1.0/30      13.0.0.2                 0             0 300 i
*> 25.0.1.0/30      12.0.0.2                 0             0 200 i
*> 35.0.1.0/29      13.0.0.2                               0 300 400 i
*                   12.0.0.2                               0 200 600 400 i
*> 45.0.1.0/30      13.0.0.2                               0 300 400 500 i
*                   12.0.0.2                               0 200 600 400 500 i
*  46.0.1.0/30      13.0.0.2                               0 300 400 600 i
*>                  12.0.0.2                               0 200 600 i
```

84	25.03079300(	12.0.0.2	12.0.0.1	TCP	66 54930 > bgp [ACK] Seq=495 Ack=495 Win=60 Len=0 TSval=750141 TSec
85	25.35069500(	12.0.0.1	12.0.0.2	BGP	87 NOTIFICATION Message
86	25.35071400(	12.0.0.2	12.0.0.1	TCP	66 54930 > bgp [ACK] Seq=495 Ack=516 Win=60 Len=0 TSval=750221 TSec
87	25.35082200(	12.0.0.1	12.0.0.2	TCP	66 bgp > 54930 [FIN, ACK] Seq=516 Ack=495 Win=59 Len=0 TSval=750221
88	25.35107700(	12.0.0.2	12.0.0.1	TCP	66 54930 > bgp [FIN, ACK] Seq=495 Ack=517 Win=60 Len=0 TSval=750221
89	25.35109200(	12.0.0.1	12.0.0.2	TCP	66 bgp > 54930 [ACK] Seq=517 Ack=496 Win=59 Len=0 TSval=750221 TSec
90	33.36211600(	12.0.0.2	12.0.0.1	TCP	74 54978 > bgp [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSv
91	33.36213900(	12.0.0.1	12.0.0.2	TCP	74 bgp > 54978 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK
92	33.36215800(	12.0.0.2	12.0.0.1	TCP	66 54978 > bgp [ACK] Seq=1 Ack=1 Win=29696 Len=0 TSval=752224 TSecr
93	33.36227500(	12.0.0.2	12.0.0.1	BGP	119 OPEN Message
94	33.36228500(	12.0.0.1	12.0.0.2	TCP	66 bgp > 54978 [ACK] Seq=1 Ack=54 Win=29184 Len=0 TSval=752224 TSec
95	33.36241200(	12.0.0.1	12.0.0.2	TCP	66 bgp > 54978 [RST, ACK] Seq=1 Ack=54 Win=29184 Len=0 TSval=752224
96	36.36235100(	12.0.0.1	12.0.0.2	TCP	74 53486 > bgp [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSv
97	36.36237000(	12.0.0.2	12.0.0.1	TCP	74 bgp > 53486 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK
98	36.36238500(	12.0.0.1	12.0.0.2	TCP	66 53486 > bgp [ACK] Seq=1 Ack=1 Win=29696 Len=0 TSval=752974 TSecr
99	36.36287500(	12.0.0.1	12.0.0.2	BGP	119 OPEN Message
100	36.36288700(	12.0.0.2	12.0.0.1	TCP	66 bgp > 53486 [ACK] Seq=1 Ack=54 Win=29184 Len=0 TSval=752974 TSec
101	36.36339200(	12.0.0.2	12.0.0.1	BGP	138 OPEN Message, KEEPALIVE Message
102	36.36340400(	12.0.0.1	12.0.0.2	TCP	66 53486 > bgp [ACK] Seq=54 Ack=73 Win=29696 Len=0 TSval=752974 TSe
103	36.36389500(	12.0.0.1	12.0.0.2	BGP	104 KEEPALIVE Message, KEEPALIVE Message
104	36.36412900(	12.0.0.2	12.0.0.1	BGP	85 KEEPALIVE Message
105	36.40133300(	12.0.0.1	12.0.0.2	TCP	66 53486 > bgp [ACK] Seq=92 Ack=92 Win=29696 Len=0 TSval=752984 TSe
106	37.36407400(	12.0.0.2	12.0.0.1	BGP	85 KEEPALIVE Message
107	37.36409200(	12.0.0.1	12.0.0.2	TCP	66 53486 > bgp [ACK] Seq=92 Ack=111 Win=29696 Len=0 TSval=753224 TS
108	37.36426500(	12.0.0.2	12.0.0.1	BGP	334 UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message,
109	37.36427800(	12.0.0.1	12.0.0.2	TCP	66 53486 > bgp [ACK] Seq=92 Ack=399 Win=30720 Len=0 TSval=753224 TS
110	37.36477100(	12.0.0.1	12.0.0.2	BGP	141 KEEPALIVE Message, UPDATE Message

Who is this course for?

- TAFs ILSD, DCL, UE libre

Prerequisites:

- There are no prerequisites, however you will fill more comfortable if you:
  - have notions about operating Systems, in particular Linux
  - have notions about algorithms,
  - have some programming skills

What is this course about?

Introductory (first) course in computer networking

- learn principles of computer networking
- learn practice of computer networking
- Internet architecture/protocols as case study

Goals

- Understand the main problems of computer networks
- Understand the main principles solving such problems and technologies used in networks
- Know how to apply and analyze the different network technologies
- Being able to analyze a realistic scenario of services deployment over a network
- Understand the challenges related to network security and existing solutions

Target skills (compétences)

CG	Niveau	Jetons
1. Comprendre et analyser, synthétiser un problème et/ou une situation complexes	3	3
2. Résoudre un problème complexe en alliant théorie et pratique	1	3
4. Critiquer et décider	2	3
14. S'engager	3	3

Evaluation

- 2 TPs' reports
- 3 Labs' quizzes
- 3 Cours' quizzes
- 1 final exam divided into two parts

Teaching Staff

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Course approach

- A top-down approach:
  - end-system applications, end-end transport
  - network core: routing,
  - link-level protocols, e.g., Ethernet
  - other stuff: access technologies, Internet architecture, new paradigms, security
- A hands-on approach
  - Labs (lab work emulated environment), TPs (*Travaux Pratique* with real routers and switches) and CMs (*Cours Magistraux*)

Course outline

1. Introduction (2x1h15)
2. Application layer (1x1h15)
   Lab DNS (2x1h15)
3. Information transport principles (2x1h15
   Transport layer (1x1h15)
   TP Protocoles TCP, UDP, IP (2x1h15)
4. Networking layer (2x1h15)
   Lab OSPF (2x1h15)
   TP QoS (2x1h15)
5. Data link layer (2x1h15)
   Lab Ethernet (2x1h15)
6. Access technologies and Internet Architecture (2x1h15)
7. SDN, NFV, and Lab SDN (4x1h15)
8. Security (2x1h15) TP VPN (2x1h15)

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8. Security (2x1h15) TP VPN hands on! (2x1h15)

Books and bibliography

Some suggested resources

- Computer Networking: A Top Down Approach Featuring the Internet, J. Kurose, K. Ross, Pearson (available at the library)
- Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Pearson (available at the library)
- Computer Networking : Principles,Protocols and Practice, O. Bonaventure et al. (available online `https://www.computer-networking.info/`)

Please note courses do not substitute reading the bibliography!!

End of course overview

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