C2: ADVANCED TELECOMMUNICATION PROTOCOL – DEVELOPMENT

Part 1 Datacom Fundamentals.

1.1 Introduction to Data Networks.
1.2 Network Components (Hub, Switch, Router, Gateway)
1.3 ARP, RARP, BOOTP, DHCP, Ethernet, PPP, FR, ATM, 802.11X
1.4 IPV4, IPV6, RIP, OSPF and BGP, Multicasting, Broadcasting &IGMP,Subnetting,Internet Routing,ICMP.
1.5 TCP, UDP, SCTP.
1.6 SSLV3,TSLV1,FTP,SFTP,DNS,SSH,Telnet.
1.7 Wireshark Protocol Analyzer

Part 2 Telecom Fundamentals & 2G , 2.5G

2.1 Telecom Basics & Cellular principles
2.2 Analog & digital modulations and multiple access Techniques - BPSK,QPSK,QAM,FDMA,TDMA,CDMA,WCDMA,OFDMA,SC-FDMA,FDD,TDD.
2.3 GSM(2G)- Introduction to wireless networks -> MS,BTS,BSC,VLR,GMSC,HLR,EIR,AUC,etc..
2.4 GSM Air interface &channel structure
2.5 Protocol Basics: CC,MM,RR,LAPD,BSSMAP,MTP,SS7
2.6 Call Processing: Message and signaling flows, Handover Scenarios
2.7 GPRS(2.5G) - Introduction to packet Core -> Data on wireless, PDP Context, Signalling Procedures & protocols.
2.8 Introduction to EDGE & CDMA 2000.

Part 3 UMTS Technology - 3G&HSPA

3.1 Migration from 2G/2.5G to 3G
3.2 UMTS Services and Applications
3.3 Air Interface dynamics and various Concepts
-> Spreading, Scrambling, Modulation, Coding Techniques
3.4 UTRAN system Architecture & Interfaces.
-> UE,Node-B,RNC,CN-CS,CN-PS.
-> Interfaces:Uu,IUb,IUr,IUcs,IUps,IUbc.
-> Protocols: CC, MM, SMS, SS, GMM, SM, RRC, PDCP, RLC, MAC, FP, NBAP, GTP-U, IU-UP, RANAP, RNSAP, SCCP, MTP3B, ATM (AAL2, AAL5, SAAL).
3.5 Call Processing:
-> Message & Signaling Flows.
-> AMR, PS-RT, PN-NRT, SMS.
-> Handover Scenarios.
-> QoS Flows
3.6 High Speed Packet Access (HSDPA, HSUPA).
-> MAC-Hs, MAC-ehs, MAC-e, MAC-es, MAC-i, MAC-is, HS-DSCH FP, E-DCH FP, FRLC
-> HS-DSCH, HS-PDSCH, HS-PDCCH, HS-SCCH,E-DCH, E-DPDCH, E-DPCCH, EHICH,E-AGCH, E-RGCH, FDPCH
3.7 Detailed learning on 3GPP standards R99, REL4, Rel5, Rel6, R8, R9.

Part 4 Long Term Evolution (LTE)

4.1 Improvements & Evolution from 3G.
4.2 LTE Architecture

-> E-UTRAN, EPC, HSS.
4.3 LTE protocol architecture, services and applications

-> E-NODEB, MME, S-GW, P.GW, DCRF, HSS.
4.4 LTE Protocols

-> E-RRC, PDCP, RLC, MAC, LTE L1(OFDMA/SC-FDMA)

-> X2-Ap, S1AP, GTPUv2, GTPCv1, MIPv4, MIPv6, PMIPv6, DIAMETER.
4.5 LTE Interfaces.

-> LTE-Uu,X2,SI-MME,SI-U,S5/S8,S6d,S11,Gx,Gxc,Rx,SGi,S3,S4,S6d,Gn,Gi,S12.
4.6 LTE Air Interfaces - OFDMA & SC-FDMA, MIMO, DC.
4.7 LTE Call Sequences, Handover Scenarios.
4.8 LTE Integration with IMS, WLAN, WiFi, Wimax, 3GPP, non-3GPP access systems.
4.9 Voice solutions in LTE: CSFB and VOLTE.

Part 5 VOIP, SIP, IMS and OSS(Billing)

5.1 Introduction to VOIP
5.2 Introduction to H.323, SIP, MGCP.
5.3 Session Initiation protocol (SIP) & SDP, RTP, RTCP.
5.4 IP Multimedia Subsystem (IMS).

-> P-CSCF, I-CSCF, S-CSCF -> Cx,Sh interfaces
5.5 Kenon (online & offline) billing.

->CGF,OCS

Part 6 Development Aspects & Tools

6.1 Understanding SDLC & Bug Life cycle.
6.2 Agile-Scrum development Methodology.
6.3 LINUX
6.4 Scripting Languages:

-> PERL -> SHELL -> EXPECT
6.5 Protocol debugging tools: Wireshark
6.6 Code Management tool: SVN
6.7 C / C++ Dev aspects.

Part 7 Practical session.

7.1 3GPP Specification exercises.
7.2 LTE Protocol Development Project (Real Time)

Back To Courses

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