Network Interface and Protocol Expertise – from the Application to the Physical Media

Key Concepts:

OSI - Open Systems Interconnection

Seven Functional Layers - Physical, Data-Link, Network, Transport, Session, Presentation, Application
... corresponding roughly to bits, frame, packet, segment and the data

Ethernet and the Internet

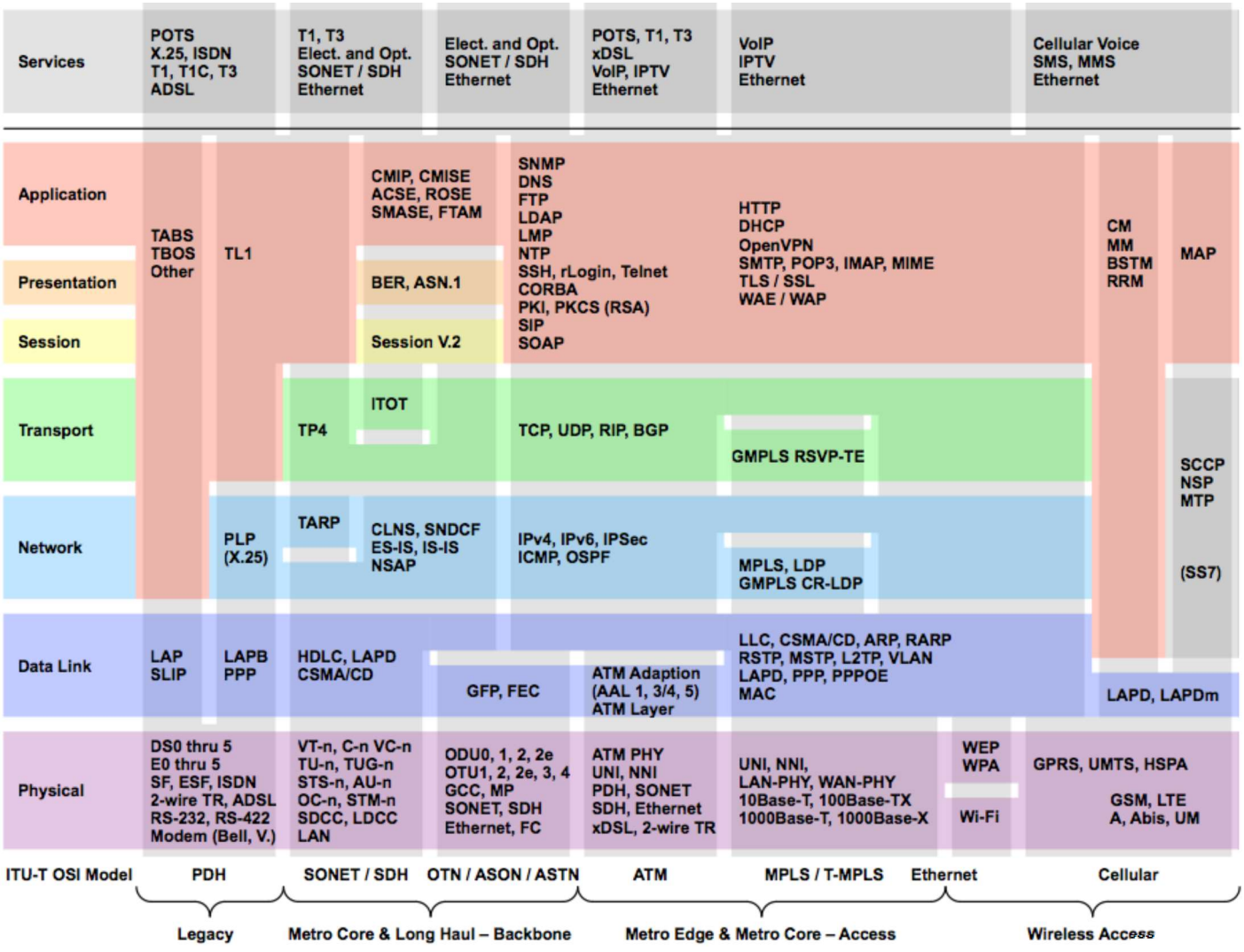
"Foundation" Standards:

ITU-T X.200 / ISO 7498-1 OSI - Basic Reference Model: The Basic Model

IEEE 802 IEEE Standard for LANs and MANs: Overview and Architecture

IETF STD 5, 6, 7 Internet Protocol, User Datagram Protocol, Transmission Control Protocol

Expertise Summary Chart:



This chart reflects many interfaces and protocols that TELE-WORX consults on. This chart is not intended to be exhaustive; only the primary protocol acronyms are indicated above. Further, several protocols in this chart reflect encyclopedic collections of functions that may span multiple layers. The chart above, therefore, is intended to be illustrative and not necessarily definitive.

Assignment of a protocol stack to a particular transport technology that is supported by a particular network management application is not as rigorous as this chart may suggest. For example, there are many instances of SONET network equipment managed with TL1 or SNMP through a TCP/IP stack.

Technical Standards - Read and Understood:

ANSI Standards
- T1.102 Digital Hierarchy - Electrical Interfaces
- T1.105 SONET - Optical Interface Rates and Formats Specifications
- T1.105.04 SONET - Data Communication Channel Protocol and Architecture
- T1.105.06 SONET - Physical Layer Specifications
- T1.107 Digital Hierarchy - Formats Specifications
- T1.107a Digital Hierarchy - Supplement to Formats Specifications (DS3 format applications)
- T1.204 OAM&P - Lower-layer protocols for TMN interfaces between OS and NE
- T1.208 OAM&P - Upper layer protocols for TMN interfaces between OS and NE

IEEE Standards — click here - all familiar IEEE 802 Standards
- IEEE 802-2001 (R2007) IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture
- IEEE 802a-2003 (R2007) IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture Amendment 1: Ethertypes for Protype and Vendor-Specific Protocol Development
- IEEE 802b-2004 (R2007) IEEE Standard for Local and Metropolitan Area Networks - Overview and Architecture - Amendment 2: Registration of Object Identifiers
- IEEE 802.2-1998 (ISO/IEC 8802-2:1998), IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 2: Logical Link Control
- IEEE 802.3-2008 IEEE Standard for Information technology-Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CMSA/CD) Access Method and Physical Layer Specifications
- IEEE 802.11-2007 IEEE Standard for Information technology-Telecommunication and information exchange between systems-Local and metropolitan area networks-Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
- IEEE 802.16-2004 IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems

IETF Standards — click here - all familiar IETF Standards
- STD 5 Internet Protocol
- STD 6 User Datagram Protocol
- STD 7 Transmission Control Protocol
- STD 8 Telnet Protocol
- STD 9 File Transfer Protocol
- STD 12 Network Time Protocol
- STD 35 ISO Transport Service on top of the TCP Version 3
- STD 51 The Point-to-Point Protocol (PPP)
- STD 62 Simple Network Management Protocol Version 3 (SNMPv3)

ITU Standards — click here - all familiar ITU-T X-Series Standards
- X.200 / ISO 7498-1 OSI - Basic Reference Model: The Basic Model

ITU-T Information Technology - OSI - Physical Layer Standards
- X.211 Physical service definition

ITU-T nformation Technology - OSI - Data Link Layer Standards
- X.212 / ISO 8886 Data link service definition
- X.222 Use of X.25 LAPB-compatible data link procedures to provide the OSI connection-mode data link service

ISO Information Technology - OSI - Network Layer Standards
- 8648 Internal organization of the network layer
- 9542 End system to intermediate system routing exchange protocol for use in conjunction with the protocol for providing the connectionless-mode network service (ISO 8473).
- 10589 Intermediate system to intermediate system intra-domain routing exchange protocol for use in the conjunction with the protocol for providing the connectionless-mode network service (ISO 8473).
- 10747 Protocol exchange of intra-domain routing information among

SIDEBAR

Assignment of a protocol to a layer is generally made according to its functionality when no formal assignment has been documented by a standards body or industry forum. Reference to contemporary writing about interfaces and protocols exposes significant disagreements even among the experts about layer assignment. In the case of Ethernet, the philosophy of the designers was not entirely consistent with the OSI reference model of layers and layer functionality, and several protocols in the Ethernet suite spill into the adjacent layer of OSI functions.

intermediate systems to support forwarding of ISO-8473 PDUs.

ITU-T Information Technology - OSI - Network Layer Standards
- X.213 / ISO 8348 Network service definition
- X.213 / ISO 8348 Add. 1: Connectionless mode transmission
- X.213 / ISO 8348 Add. 2: Network layer addressing
- X.223 / Use of X.25 to provide connection mode network service to CCITT applications
- X.233 / ISO 8473 Protocol for providing the connectionless mode network service
- X.233 / ISO 8473 Add. 3: Subnetwork dependent convergence function (SNDCF)

ITU-T Information Technology - OSI - Transport Layer Standards
- X.25 Interfaces between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for terminals operating in the packet mode and connected to public dayta networks by dedicated circuit
- X.214 / ISO 8072 Transport service definition
- X.224 / ISO 8073 Protocol for providing the connection-mode transport service
- X.224 / ISO 8073 Add. 2 Operation of Class 4 over connectionless network service (CLNS).
- X.234 / ISO 8602 Connectionless-mode transport protocol

ITU-T Information Technology - OSI - Session Layer Standards
- X.215 / ISO 8326 Session service definition
- X.215 / ISO 8326 Add. 2 Incorporation of unlimited user data
- X.225 / ISO 8327 Session protocol specification for OSI

ITU-T Information Technology - OSI - Presentation Layer Standards
- X.208 / ISO-8824 Specification of Abstract Syntax Notation One (ASN.1)
- X.209 / ISO-8825 Specification of Basic Encoding Rules for ASN.1
- X.216 / ISO 8822 Presentation service definition
- X.226 / ISO 8823) Presentation protocol specification

ISO Information Technology - OSI - Application Layer Standards
- 8571-1 File transfer, access and management part 1 - General introduction
- 8571-1 File transfer, access and management part 2 - Virtual filestore definition
- 8571-3 File transfer, access and management part 3 - File service definition
- 8571-4 File transfer, access and management part 4 - File protocol specification

ITU-T Information Technology - OSI - Application Layer Standards
- X.207 / ISO 9545 Application layer structure
- X.217 / ISO-8649 Service Definition for the Association Control Service Element
- X.219 / ISO-9072-1 Remote Operations: Model, notation and service definition
- X.227 / ISO-8650 Connection-Oriented Protocol Specification for the association control service element
- X.229 / ISO-9072-2 Remote Operations: Protocol Specification
- X.500 / ISO 9594-1 The Directory: Overview of concepts, models and services
- X.710 / ISO-9595 Common Management Information Services
- X.711 / ISO-9596-1 Common Management Information Protocol Specification

ITU-T Signaling System No. 7
- Q.711 Functional description of the signaling connection control part
- Q.712 Definition and function of signaling connection control part messages
- Q.713 Signaling connection control part formats and codes
- Q.714 Signaling connection control part procedures

ITU-T Synchronous Digital Hierarchy
- G.773 Protocol suites for Q-interfaces for management of transmission systems.
- Q.811 Lower layer protocol profiles for the Q3 interface.
- Q.812 Upper layer protocol profiles for the Q3 interface.

Other Technical Documents - Read and Understood:

AT&T
- AT&T Compatibility Bulletin No. 149, "Maintenance Standards for Digital Transmission Systems", Issue 3, Sep. 1, 1986
  See also Pub 49001, Pub 43804 (TBOS Telemetry Byte-Oriented Serial Protocol)
- TR-54016 Requirements For Interfacing Digital Terminal Equipment To Services Employing the Extended Superframe Format, AT&T, September 1989
  (TABS Telemetry Asynchronous Block Serial Protocol)

IETF RFC's
- RFC 768 User Datagram Protocol
- RFC 791 Internet Protocol
- RFC 792 Internet Protocol Control Message Protocol
- RFC 793 Transmission Control Protocol
- RFC 854 Telnet Protocol Specification
- RFC 855 Telnet Option Specifications
- RFC 891 DCN Local-Network Protocols
- RFC 894 A Standard for the Transmission of IP Datagrams over Ethernet Networks

RFC 919 Broadcasting Internet Datagrams
RFC 922 Broadcasting Internet Datagrams in the Presence of Subnets
RFC 950 Internet Standard Subnetting Procedure
RFC 959 File Transfer Protocol
RFC 1006 ISO Transport Service on top of the TCP
RFC 1042 Standard for Transmission of IP Datagrams over IEEE 802 Networks
RFC 1055 Nonstandard for Transmission of IP Datagrams over Serial Lines (SLIP)
RFC 1112 Host Extensions for IP Multicasting
RFC 1305 Network Time Protocol (v.3) Specification, Implementation and Analysis
RFC 1661 The Point-to-Point Protocol (PPP)
RFC 2126 ISO Transport Service on top of TCP (ITOT)
RFC 2328 OSPF Version 2
RFC 2453 RIP Version 2
RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3413 Simple Network Management Protocol (SNMP) Applications
RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
RFC 3415 View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
RFC 3416 Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)
RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP)
RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)

NSIF / SIF
NSIF-033-1999 Requirements for the TCP/IP Protocol Suite on the SONET Access DCN
SIF-004-1996 TARP/500: The TARP and X.500 Directory Services Interworking Specification.
SIF-009-1997 NE-NE Remote Login Implementation Requirements Specification
SIF-011-1998 FTAM Profile for SONET Operations Communications
SIF-019-1998 Interoperability Requirements for TARP

Telcordia:
TL1
GR-199 TL1 Memory Administration Messages
GR-811 OTGR Section 12: Operations Application Messages - TL1 Messages Index
GR-831 OTGR Section 12.1: Operations Application Messages - Language For Operations Application Messages
GR-833 TL1 Surveillance and Maintenance Messages
GR-834 Network Maintenance: Access and Testing Messages
GR-1093 Generic State Requirements for Network Elements
TR-TSY-000827 OTGR Section 11.1: Generic Operations Interface - Non-OSI Communications Architecture
TR-NWT-000835 OTGR Section 12.5: Network Element and Network System Security Administration Messages
SR-NWT-002723 Applicable TL1 Messages for SONET Network Elements

OSI
GR-828 OTGR Section 11.2: Operations Technology Generic Requirements (OTGR): Generic Operations Interface - OSI Communications Architecture
SR-2751 OCS OS-NE Interface Support for the OSI/CMISE Protocol Stack
SR-3317 OPS/INE to Network Element Generic OSI/CMISE Interface Support

Acronyms on this Page:

ANSI - American national standards institute
IETF - internet engineering task force
IP - internet protocol
ITU-T - International Telecommunication Union - Telecommunication Standardization Sector
NSIF - network services integration forum
OSI - open systems interconnection
RFC - request for comment
SIF - SONET interoperability forum

(I'm working on the acronyms...)