Second Edition

Javvin

Network Protocols Handbook

TCP/IP
ATM
Ethernet
LAN
Frame Relay
WAN
SS7/C7
VOIP
WLAN
Security
SAN
IETF
MAN
ISO
VPN
VLAN
ITU-T
IEEE
Apple
IBM
ANSI
Cisco
Novell
Microsoft

Javvin Technologies, Inc.

Network Protocols Handbook

2nd Edition.

13485 Old Oak Road
Saratoga CA 95070 USA
408-872-3881
handbook@javvin.com

Warning and Disclaimer

This book is designed to provied information about the current network communication protocols. Best effort has been made to make this book as complete and accurate as possible, but no warranty or fitness is implied. The infomation is provided on an "as is" basis. The author, publisher and distributor shall not have liability nor responsibility to anyone or group with respect to any loss arising from the information contained in this book and associated materials.

Table of Contents

Figure

Transport Layer Protocols

Protocol Name

ITOT: ISO Transport Service on top of TCP

Protocol Description

ISO Transport Service on top of TCP (ITOT) is a mechanism that enables ISO applications to be ported to a TCP/IP network. There are two basic approaches which can be taken when "porting" ISO applications to TCP/IP (and IPv6) environments. One approach is to port each individual application separately, developing local protocols on top of TCP. A second approach is based on the notion of layering the ISO Transport Service over TCP/IP. This approach solves the problem for all applications which use the ISO Transport Service.

ITOT is a Transport Service which is identical to the Services and Interfaces offered by the ISO Transport Service Definition [ISO8072], but which will in fact implement the ISO Transport Protocol [ISO8073] on top of TCP/IP (IPv4 or IPv6), rather than the ISO Network Service [ISO8348]. The 'well known' TCP port 102 is reserved for hosts which implement the ITOT Protocol.

Two variants of the ITOT protocol are defined, "Class 0 over TCP" and "Class 2 over TCP", which are based closely on the ISO Transport Class 0 and 2 Protocol. Class 0 provides the functions needed for connection establishment with negotiation, data transfer with segmentation, and protocol error reporting. It provides Transport Connection with flow control based on that of the NS-provider (TCP). It provides Transport Disconnection based on the NS-provider Disconnection. Class 0 is suitable for data transfer with no Explicit Transport Disconnection.

Class 2 provides the functions needed for connection establishment with negotiation, data transfer with segmentation and protocol error reporting. It provides Transport Connection with flow control based on that of the NS-provider TCP. It provides Explicit Transport Disconnection. Class 2 is suitable when independence of Normal and Expedited Data channels is required or when Explicit Transport Disconnection is needed.

Protocol Structure

8	16	32bit	Variable
Version	Reserved	Packet Length	TPDU
Message Length			

Protocol Version: Value: 3
Reserved - Value: 0
Packet Length - Value: Length of the entire TPKT in octets, including Packet Header
TPDU - ISO Transport TPDU as defined in ISO 8073.

Mapping parameters between the TCP service and the ISO 8348 CONS service is done as follow:

ISO Network Service	*TCP*
CONNECTION ESTABLISHMENT	
Called address	Server's IPv4 or IPv6 address and TCP port number.
Calling address	Client's IPv4 or IPv6 address
All other parameters	Ignored
DATA TRANSFER	
NS User Data (NSDU)	DATA
CONNECTION RELEASE	
All parameters	Ignored

Related protocols

TCP, UDP, IP, CMIP, CMOT, CMIS, ACSE, ROSE, CMISE, ITOT

Sponsor Source

LPP is defined by ISO (http://www.ietf.org) and IETF (http://www.ietf.org).

Reference

http://www.javvin.com/protocol/rfc1085.pdf
ISO Presentation Services on top of TCP/IP-based internets
http://www.javvin.com/protocol/rfc2126.pdf
ISO Transport Service on top of TCP (ITOT)

Protocol Name

ATM PNNI: ATM Private Network-to-Network Interface

Protocol Description

The ATM Private Network-Node Interface (PNNI), an ATM network-to-network signaling protocol, provides mechanisms to support scalable, QoS-based ATM routing and switch-to-switch switched virtual connection (SVC) interoperability.

The PNNI (Private Network-to-Network Interface) is a hierarchical, dynamic link-state routing protocol. It is designed to support large-scale ATM networks. The PNNI protocol uses VPI/VCI 0,18 for its messages. In addition, it uses signalling messages to support connection establishment across multiple networks. PNNI is based on UNI 4.0 and Q.2931. Specific information elements were added to UNI 4.0 in order to support the routing process of PNNI. PNNI Signalling contains the procedure to dynamically establish, maintain and clear ATM connections at the private network to network interface or network node interface between 2 ATM networks or 2 ATM network nodes. The PNNI signalling protocol is based on the ATM forum UNI specification and on Q.2931.

PNNI Messages include:

ALERTING, CALL PROCEEDING, CONNECT, SETUP, RELEASE, RELEASE COMPLETE, NOTIFY, STATUS, STATUS ENQUIRY, RESTART, RESTART ACKNOWLEDGE, STATUS, ADD PARTY, ADD PARTY ACKNOWLEDGE, PARTY ALERTING, ADD PARTY REJECT, DROP PARTY, DROP PARTY ACKNOWLEDGE

Protocol Structure

The structure of the PNNI header is shown in the following illustration:

2	2	1	1	1	1
Packet type	Packet length	Prot ver	Newest ver	Oldest ver	Reserved

- Packet type: The following packet types are defined:
    1. Hello - Sent by each node to identify neighbor nodes belonging to the same peer group.
    2. PTSP - PNNI Topology State Packet. Passes topology information between groups.
    3. PTSE - PNNI Topology State Element (Request and Ack). Conveys topology parameters such as active links, their available bandwidth, etc.
    4. Database Summary - Used during the original database exchange between two neighboring peers.
- Packet length - The length of the packet.
- Prot ver - Protocol Version. The version according to which this packet was formatted.
- Newest ver / Oldest ver - Newest version supported / oldest version supported. The newest version supported and the oldest version supported fields are included in order for nodes to negotiate the most recent protocol version that can be understood by both nodes exchanging a particular type of packet.

Related protocols

ATM, BISDN, SONET, AAL0-AAL5, LAN Emulation (LANE), CES, UNI, NNI, MPOA and Q.2931

Sponsor Source

The ATM protocols are based on standards developed by the ITU.
http://www-comm.itsi.disa.mil/atmf/sig.html#af10.1
UNI 4.0 Specification
http://www.atmforum.com/standards/approved.html
ATM Forum approved specifications

Reference

http://www.atmforum.com/standards/approved.html#uni
ATM User-Network Interface Specification
http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/atm.htm
ATM Overview

Protocol Name

Token Ring: IEEE 802.5 LAN Protocol

Protocol Description

Token Ring is a LAN protocol, defined in IEEE 802.5 where all stations are connected in a ring and each station can directly hear transmissions only from its immediate neighbor. Permission to transmit is granted by a message (token) that circulates around the ring.

Token Ring as defined in IEEE 802.5 is originated from the IBM Token Ring LAN technologies. Both are based on the Token Passing technologies. While they differ in minor ways; they are generally compatible with each other.

Token-passing networks move a small frame, called a token, around the network. Possession of the token grants the right to transmit. If a node receiving the token has information to send, it seizes the token, alters 1 bit of the token (which turns the token into a start-of-frame sequence), appends the information that it wants to transmit, and sends this information to the next station on the ring. While the information frame is circling the ring, no token is on the network, which means that other stations wanting to transmit must wait. Therefore, collisions cannot occur in Token Ring networks.

The information frame circulates the ring until it reaches the intended destination station, which copies the information for further processing. The information frame continues to circle the ring and is finally removed when it reaches the sending station. The sending station can check the returning frame to see whether the frame was seen and subsequently copied by the destination.

Unlike Ethernet CSMA/CD networks, token-passing networks are deterministic, which means that it is possible to calculate the maximum time that will pass before any end station will be capable of transmitting. This feature and several reliability features make Token Ring networks ideal for applications in which delay must be predictable and robust network operation is important.

The Fiber Distributed-Data Interface (FDDI) also uses the Token Passing protocol.

Protocol Structure

<table>
<tr><th>1</th><th>2</th><th>3</th><th>9</th><th>15bytes</th></tr>
<tr><td>SDEL</td><td>AC</td><td>FC</td><td>Destination address</td><td>Source address</td></tr>
<tr><td colspan="5">Route information 0-30 bytes</td></tr>
<tr><td colspan="5">Information (LLC or MAC) variable</td></tr>
<tr><td colspan="2">FCS (4 bytes)</td><td>EDEL</td><td>FS</td><td></td></tr>
</table>

- SDEL / EDEL - Starting Delimiter / Ending Delimiter. Both the SDEL and EDEL have intentional Manchester code violations in certain bit positions so that the start and end of a frame can never be accidentally recognized in the middle of other data.
- AC - Access Control field contains the priority fields.
- FC - Frame Control field indicates whether the frame contains data or control information
- Destination address – Destination station address.
- Source address –Source station address.
- Route information – The field with routing control, route descriptor and routing type information.
- Information - The Information field may be LLC or MAC.
- FCS - Frame check sequence.
- Frame status - Contains bits that may be set on by the recipient of the frame to signal recognition of the address and whether the frame was successfully copied.

Related protocols

IEEE 802.2, 802.3, 802.4, 802.5

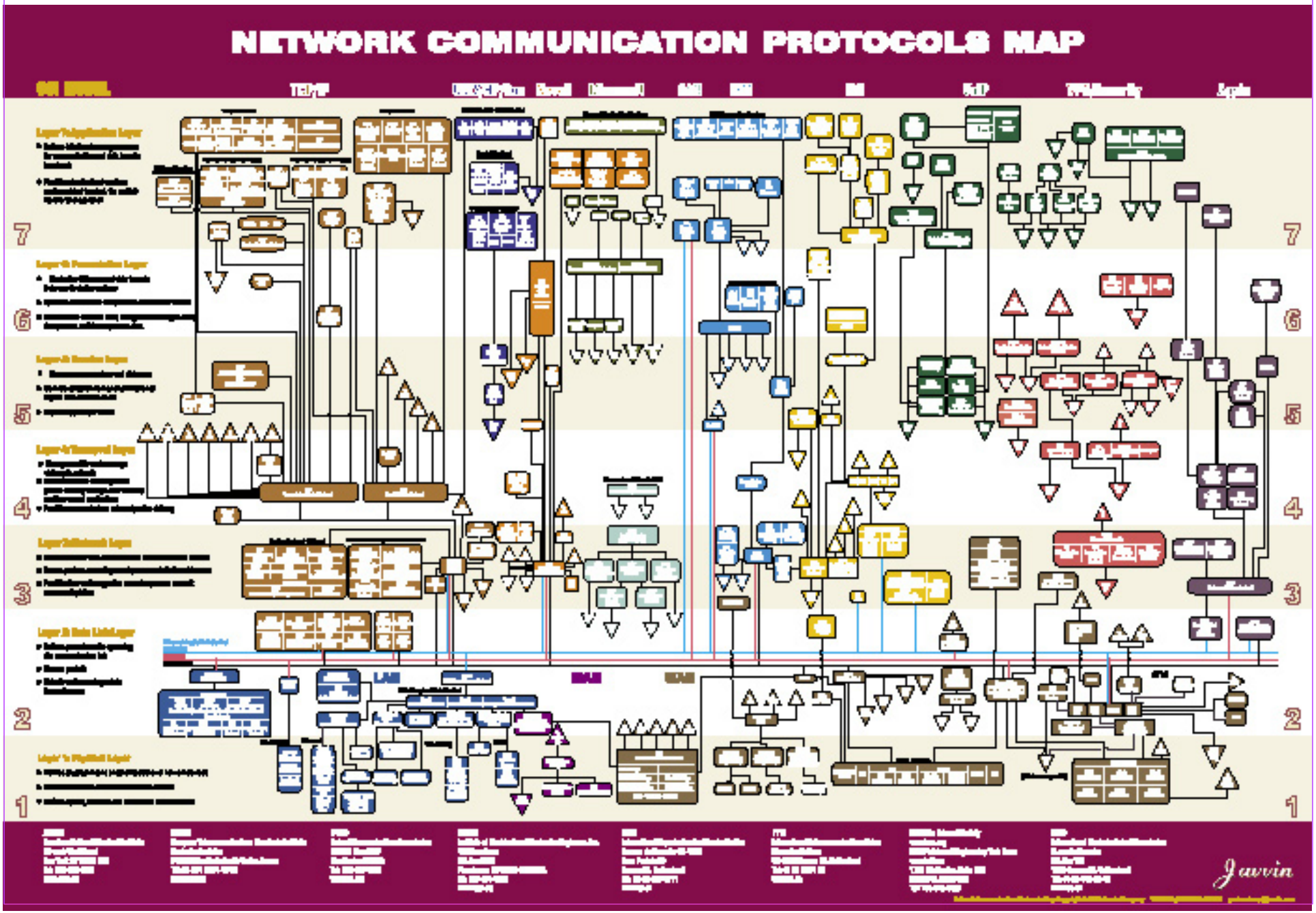
Sponsor Source

Token Ring is defined by IEEE (http://www.ieee.org) 802.5.

Reference

http://standards.ieee.org/getieee802/download/802.5-1998.pdf
Token Ring Access Method and Physical Layer Specification
http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/tokenrng.htm
Token Ring and IEEE 802.5

Network Communication Protocols Map



Second Edition

Network Protocols Handbook

"This book is an excellent reference for Internet programmers, network professionals and college students who are majoring IT and networking technologies. It is also useful for any individuals who want to know more details about Internet technologies. I highly recommend this book to our readers."

Dr. Ke Yan
Chief Architect of Juniper Networks
Founder of NetScreen Technologies

Fully explains and illustrates all commonly used network communication protocols, including TCP/IP, WAN, LAN technologies

Covers the latest and emerging technologies such as VOIP, SAN, MAN, VPN/Security,WLAN, VLAN and more

Addresses vendor specific technologies: Cisco, IBM, Novell, Sun, HP, Microsoft, Apple,etc.

Reviews the ISO networking architecture and protocols

Covers SS7 protocols

Hundreds of illustrations of protocol formats and header structures

Hundreds of references for further reading and studies

"Must-Have" for IT/Networking professionals and students

ISBN: 0-9740945-2-8

EAN: 978-0-9740945-2-6

Javvin

Javvin Technologies, Inc.

13485 Old Oak Way
Saratoga CA 95070 USA

www.javvin.com