

**Second Edition**

*Javvin*

# **Network Protocols Handbook**

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

**Javvin Technologies, Inc.**

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# Network Protocols Handbook

2nd Edition.

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**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:

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

1	2	3	9	15bytes
SDEL	AC	FC	Destination address	Source address
Route information 0-30 bytes				
Information (LLC or MAC) variable				
FCS (4 bytes)		EDEL	FS	

- 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**

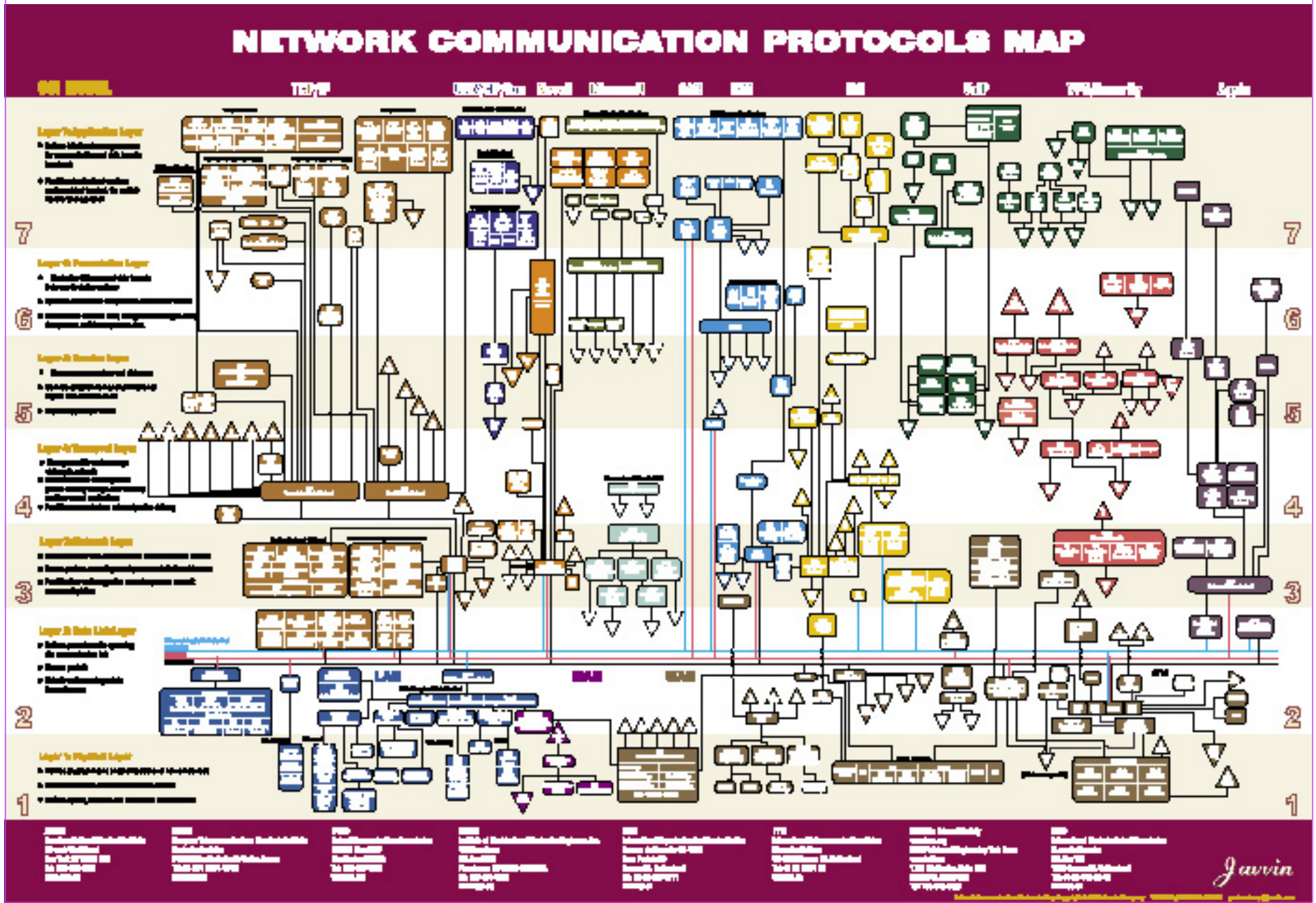
<http://standards.ieee.org/getieee802/download/802.5-1998.pdf>

Token Ring Access Method and Physical Layer Specification

[http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito\\_doc/to-kenrng.htm](http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/to-kenrng.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

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