Modelo de interconexión de sistemas abiertos

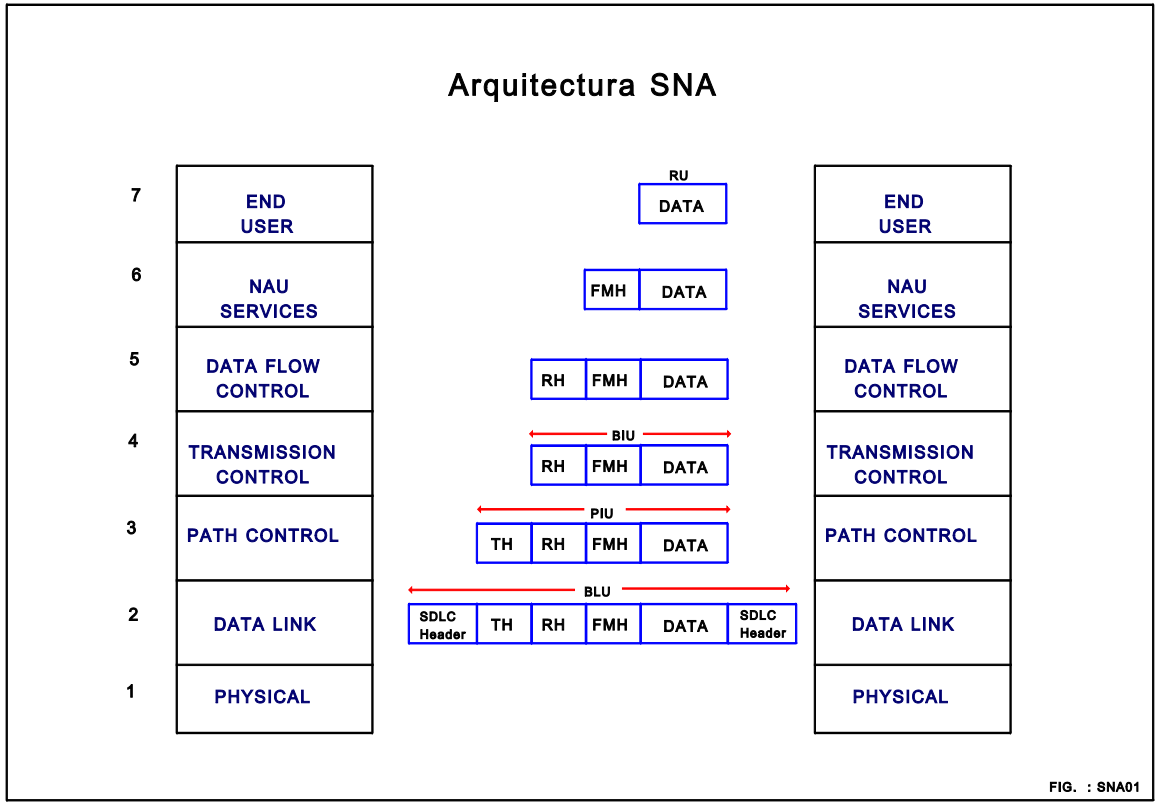
Historia:

El porque de un modelo de interconexión …

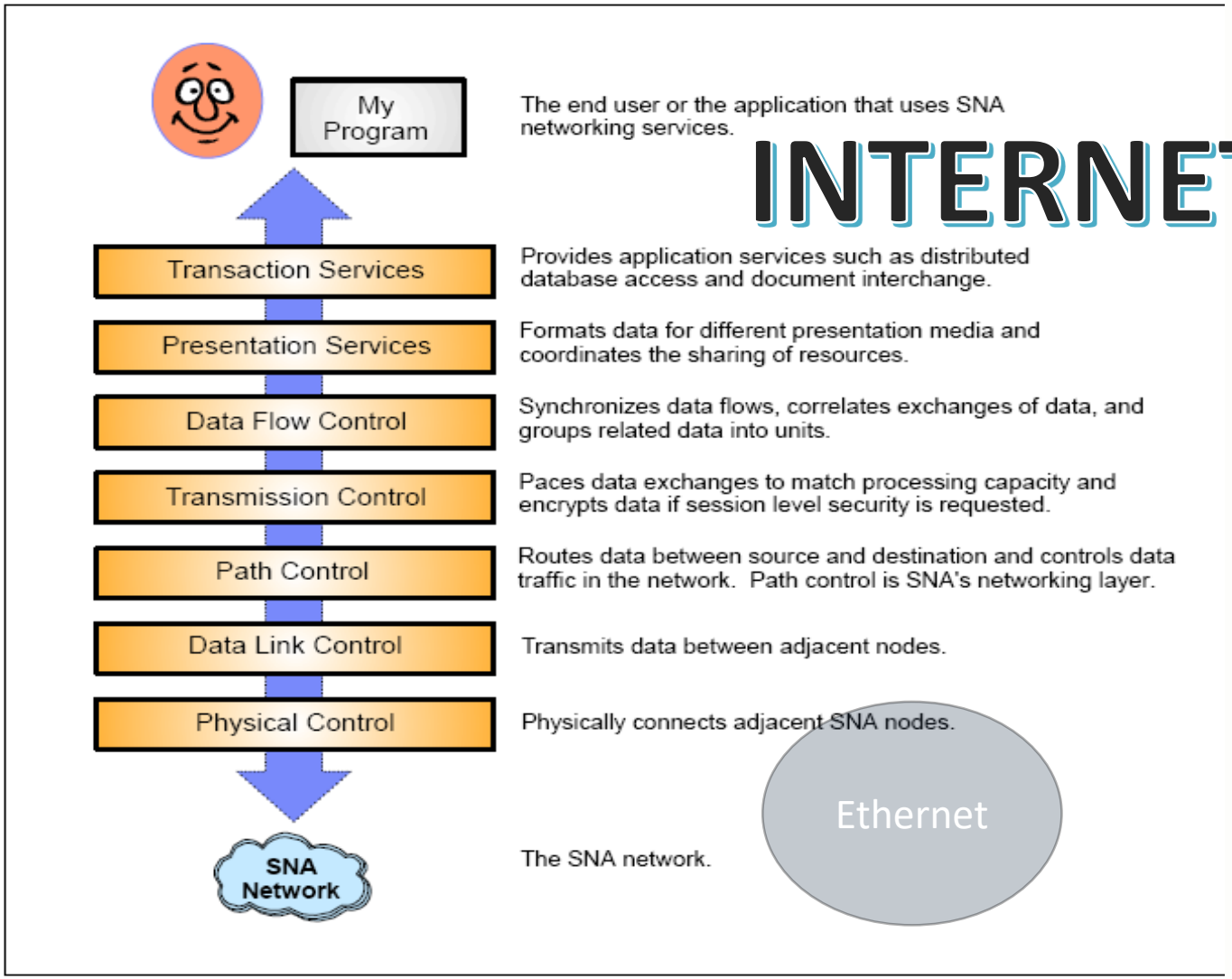
La historia de IBM …

La arquitectura SNA ……

Systems Network Architecture (**SNA**) I
Es propiedad de IBM creada en **1974.**



3. – MODELO OSI.-



INTERNET ?

Figure 1-5 SNA protocol layers

The main purpose of such a layered approach was, and still is, to support change.

Bibliografía : Reedbooks IBM

MODELO OSI.-

Buscamos en WIKIPEDIA? Una mirada a los trabajos de tranporte…..

Layer names and number of layers in the literature [edit]

The following table shows various networking models. The number of layers varies between three and seven.

RFC 1122, Internet STD 3 (1989)	Cisco Academy[35]	Kurose,[36] Forouzan[37]	Comer,[38] Kozierok[39]	Stallings[40]	Tanenbaum[41]	Arpanet Reference Model (RFC 871)	OSI model
Four layers	*Four layers*	*Five layers*	*Four+one layers*	*Five layers*	*Five layers*	*Three layers*	*Seven layers*
"Internet model"	"Internet model"	"Five-layer Internet model" or "TCP/IP protocol suite"	"TCP/IP 5-layer reference model"	"TCP/IP model"	"TCP/IP 5-layer reference model"	"Arpanet reference model"	OSI model
Application	Application	Application	Application	Application	Application	Application/Process	Application
							Presentation
							Session
Transport	Transport	Transport	Transport	Host-to-host or transport	Transport	Host-to-host	Transport
Internet	Internetwork	Network	Internet	Internet	Internet		Network
Link	Network interface	Data link	Data link (Network interface)	Network access	Data link	Network interface	Data link
		Physical	(Hardware)	Physical	Physical		Physical

Some of the networking models are from textbooks, which are secondary sources that may conflict with the intent of RFC 1122 and other IETF primary sources.[42]

Encuentre los errores….en WIKI!!!!

3. – MODELO OSI.-

ICS › 35 › 35.100 › 35.100.01

ISO/IEC 7498-1:1994

Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model

THIS STANDARD WAS LAST REVIEWED AND CONFIRMED IN 2000.
THEREFORE THIS VERSION REMAINS CURRENT.

The electronic version of this International Standard can be downloaded from the ISO/IEC Information Technology Task Force (ITTF) web site

ABSTRACT

PREVIEW

Cancels and replaces the first edition (1984). The model provides a common basis for the coordination of standards development for the purpose of systems interconnection, while allowing existing standards to be placed into perspective within the overall Reference Model. The model identifies areas for developing or improving standards. It does not intend to serve as an implementation specification

BUY THIS STANDARD

FORMAT	LANGUAGE
✓ PAPER	English

Please note that paper format is currently unavailable.

CHF 178 BUY

MODELO OSI

International Organization for Standardization

About ISO ISO members

ISO members

ISO is made up of [illegible] members which are divided into three categories:
Member bodies, Correspondent members, Subscriber members.

Country	Acronym	Membership	TC participation	PDC participation
Afghanistan	ANSA	Correspondent member	0	1
Albania	DPS	Correspondent member	4	3
Algeria	IANOR	Member body	41	3
Angola	IANORQ	Correspondent member	0	1
Antigua and Barbuda	ABBS	Subscriber member	0	0
Argentina	IRAM	Member body	314	3
Armenia	SARM	Member body	29	3
Australia	SA	Member body	529	3
Austria	ON	Member body	508	3
Azerbaijan	AZSTAND	Member body	26	3
Bahrain	BSMD	Member body	6	2
Bangladesh	BSTI	Member body	9	2
Barbados	BNSI	Member body	46	3
Belarus	BELST	Member body	152	2
Belgium	NBN	Member body	619	3
Benin	CEBENOR	Correspondent member	23	2
Bhutan	SQCA	Correspondent member	6	1
Bolivia	IBNORCA	Correspondent member	9	3
Bosnia and Herzegovina	BAS	Member body	40	2
Botswana	BOBS	Member body	29	3
Brazil	ABNT	Member body	440	3
Brunei Darussalam	CPRU	Correspondent member	4	3
Bulgaria	BDS	Member body	343	3
Burkina Faso	FASONORM	Correspondent member	1	0
Burundi	BBN	Subscriber member	0	0
Cambodia	ISC	Subscriber member	0	0
Cameroon	CDNQ	Member body	27	3
Canada	SCC	Member body	383	3

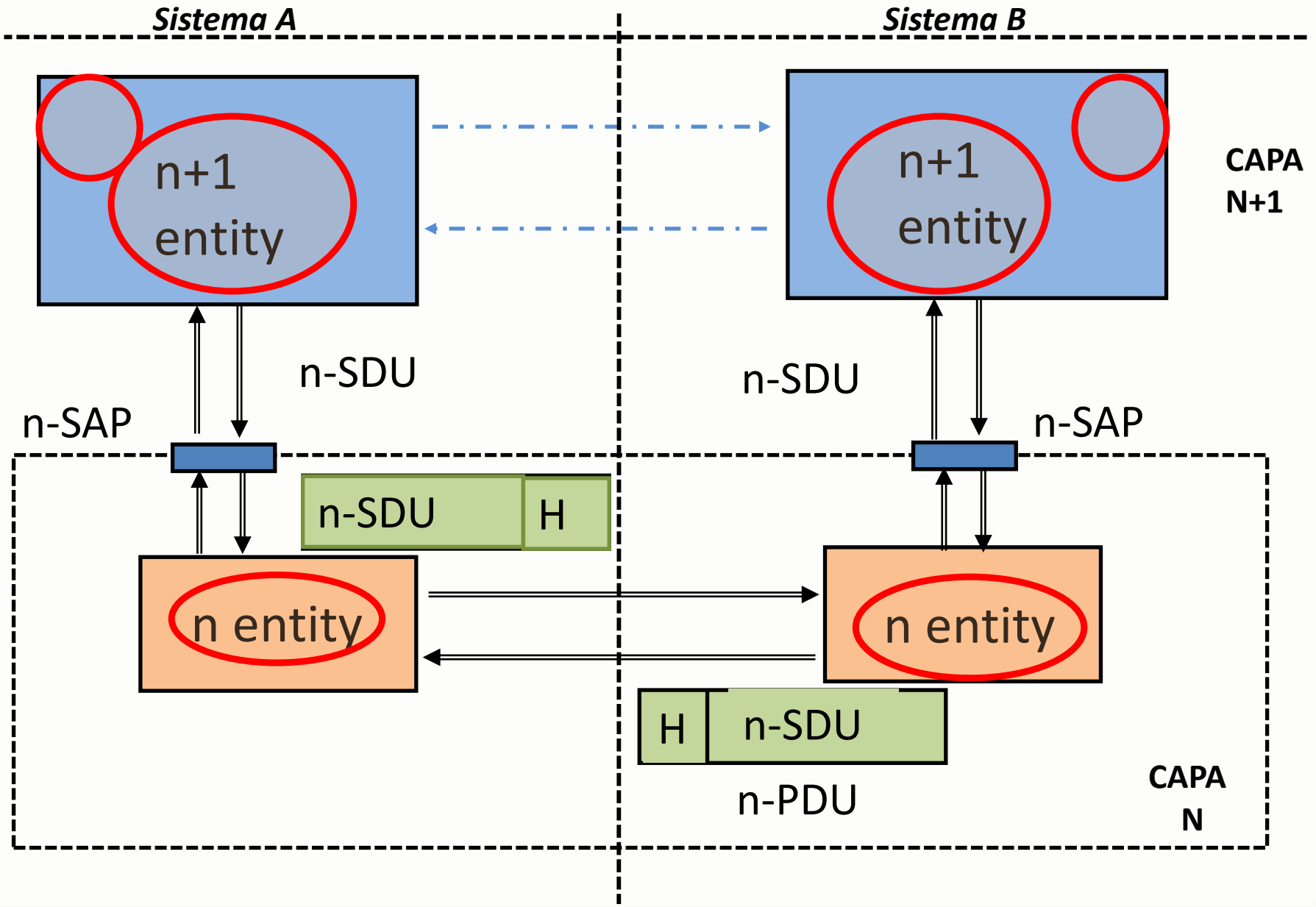
IRAM INSTITUTO ARGENTINO DE NORMALIZACIÓN Y CERTIFICACIÓN 5

El IRAM, Instituto Argentino de Normalización y Certificación, (nexo de continuidad con "IRAM, Instituto Argentino de Racionalización de Materiales"), es una asociación civil sin fines de lucro, constituida como tal en 1935. Nuestras finalidades específicas son las establecidas en el Art. 1º del ESTATUTO SOCIAL, las cuales se reproducen a continuación por ser consideradas importantes para el conocimiento general:

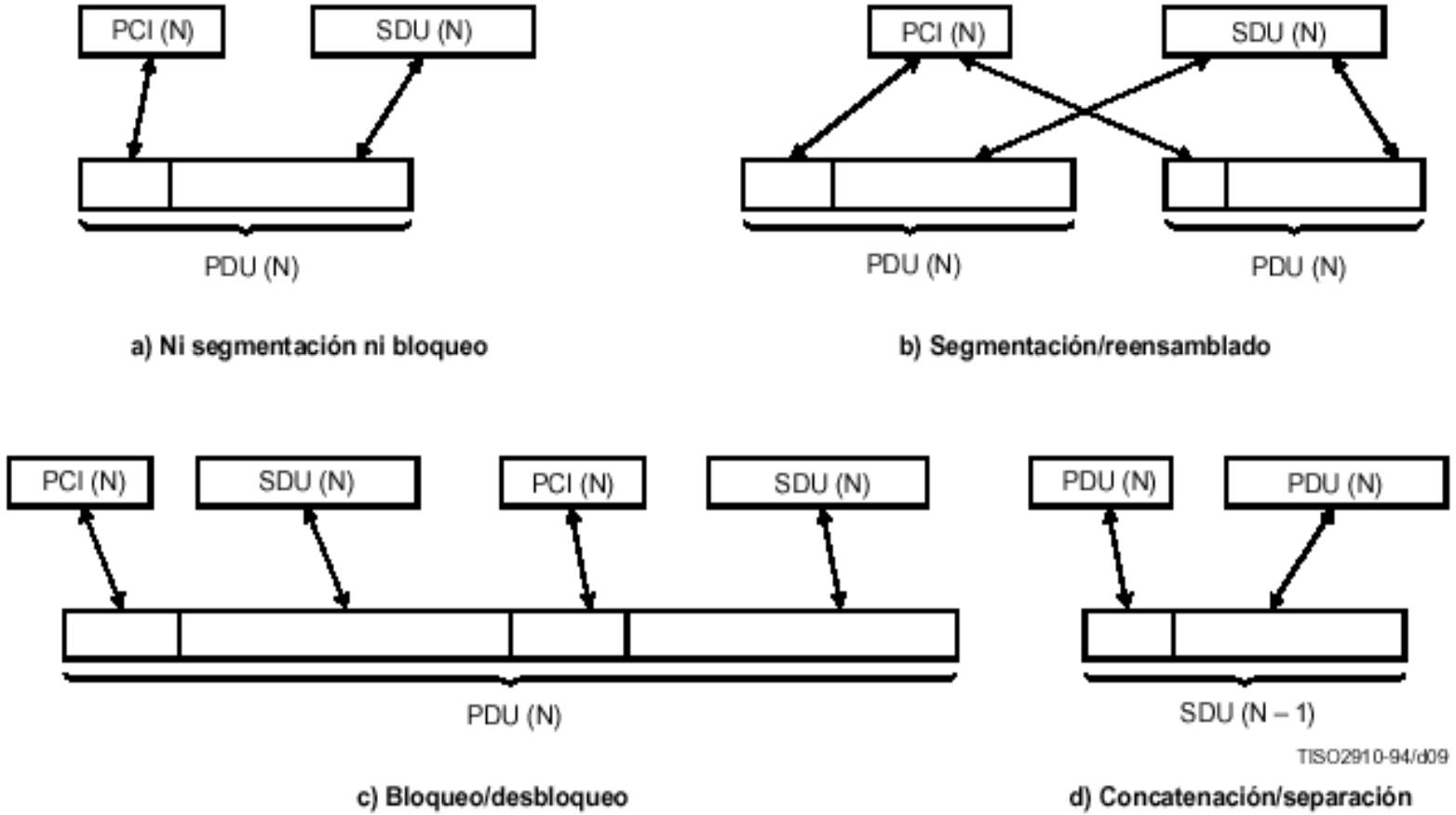
a) Promover el uso racional de los recursos y la actividad creativa y facilitar la producción, el comercio y la transferencia de conocimiento, contribuyendo a mejorar la calidad de vida, el bienestar y la seguridad de las personas.

b) Estudiar y aprobar normas, sin limitaciones en los ámbitos que abarquen, siguiendo la metodología establecida por las reglamentaciones sancionadas por los organismos competentes del IRAM.

ENTIDADES Y SERVICIOS DE LAS CAPAS

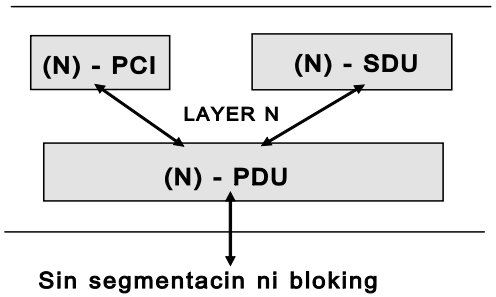


FUNCIONES DE CADA CAPA

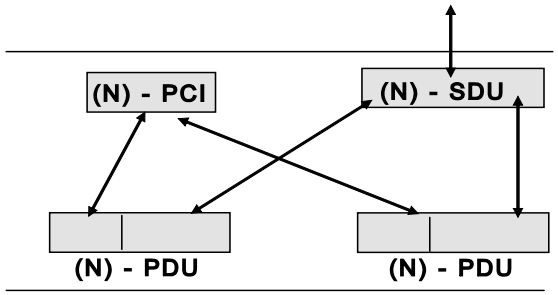


SDU Unidad de datos de servicio
PCI Información de control de protocolo
PDU Unidad de datos de protocolo

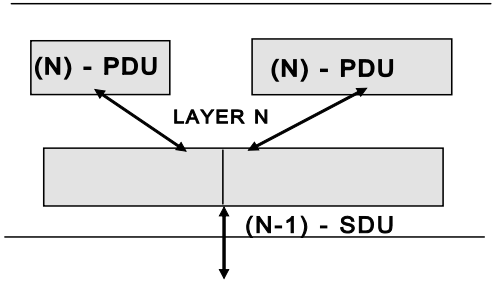
Funciones de las Capas



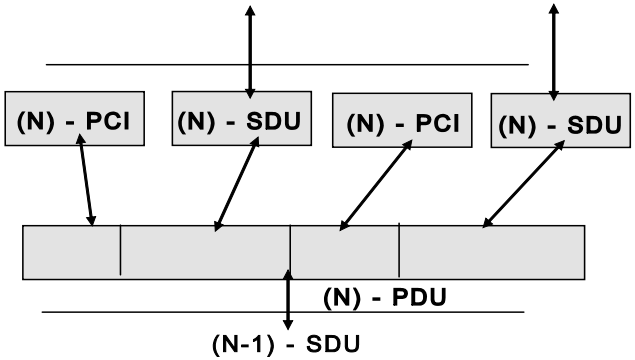
Sin segmentacin ni bloking



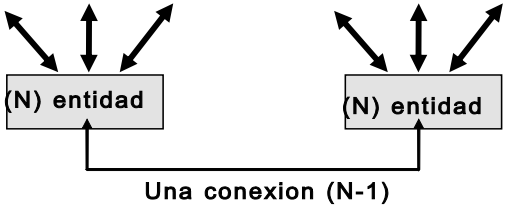
Segmentacion / Reesamblado



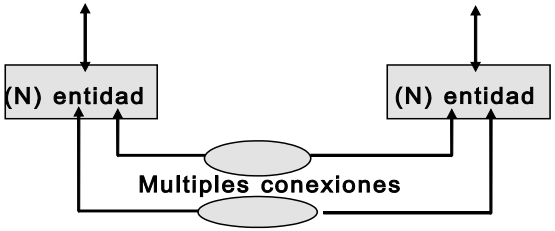
Concatenacin / Separacin



Blocking / Deblocking

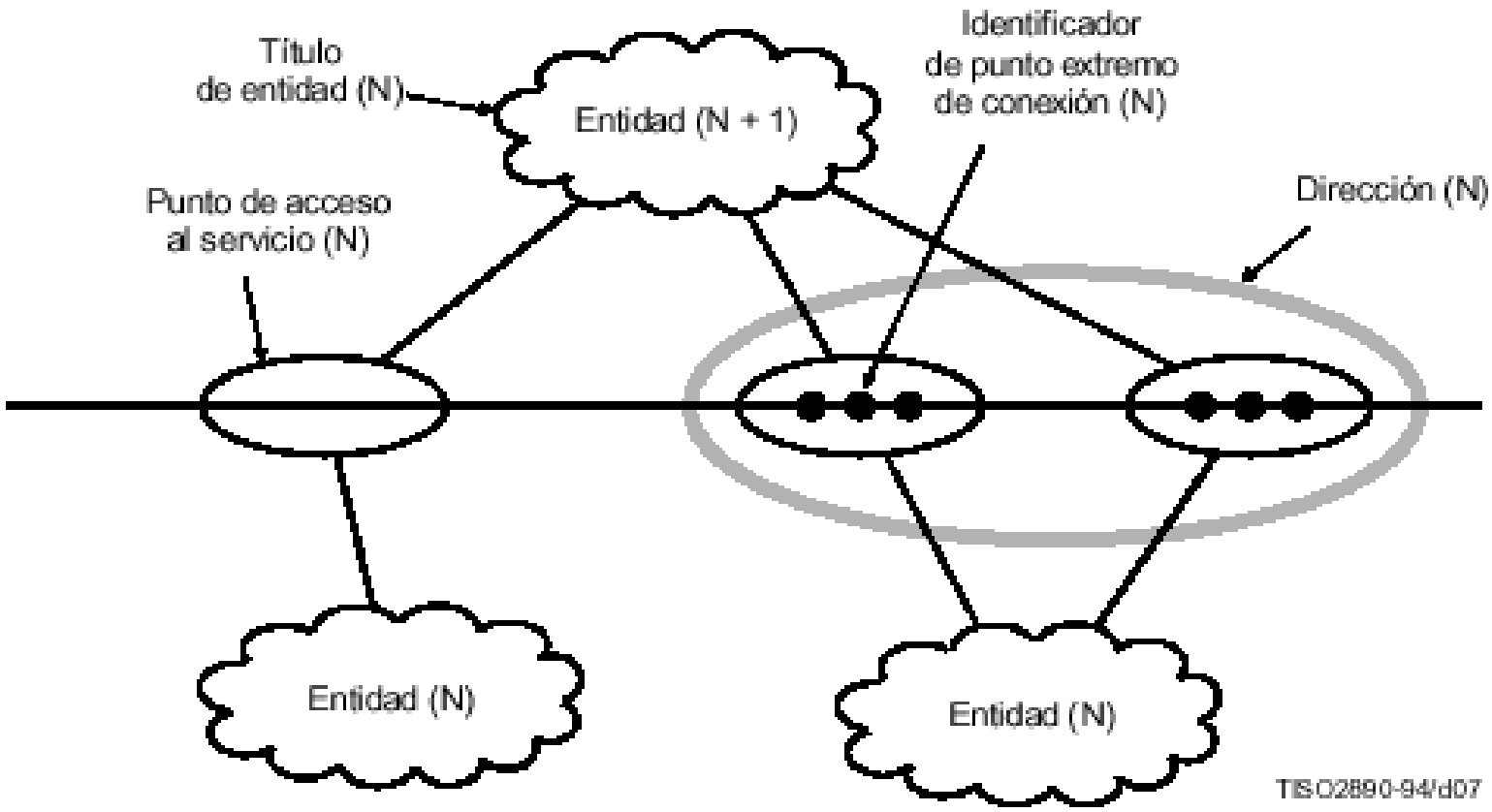


Multiplexacin



Spliting

Fig. OSI05



PUNTOS DE ACCESO DE SERVICIOS entre capas

3.1 – CAPA FISICA -

Propósito:

El modelo de referencia define las funciones y servicios de la capa física ***proveyendo de procedimientos :***

mecánicos , eléctricos y funcionales para activar mantener y desactivar conexiones físicas para la transmisión de bit entre entidades de data link.

Funciones de la Capa Física:

Las funciones de la capa física básicamente están comprendidas en cuatro aspectos :

a) Conexiones físicas : activación y desactivación.
b) Transmisión de unidades de datos de servicios.
c) Multiplexing.
c) Gestión de la capa física.

Servicios de la Capa Física :

Las definiciones de los servicios de la capa física están en la recomendación X.211.
Estos servicios provee *para* la capa data link :

a) Conexiones físicas .
b) Physical -service data unit ..
c) Physical connections endpoints.
d) Data - circuit identifications.
e) Sequencing.
f) Foult condition notification.
g) Quality of service parameter .

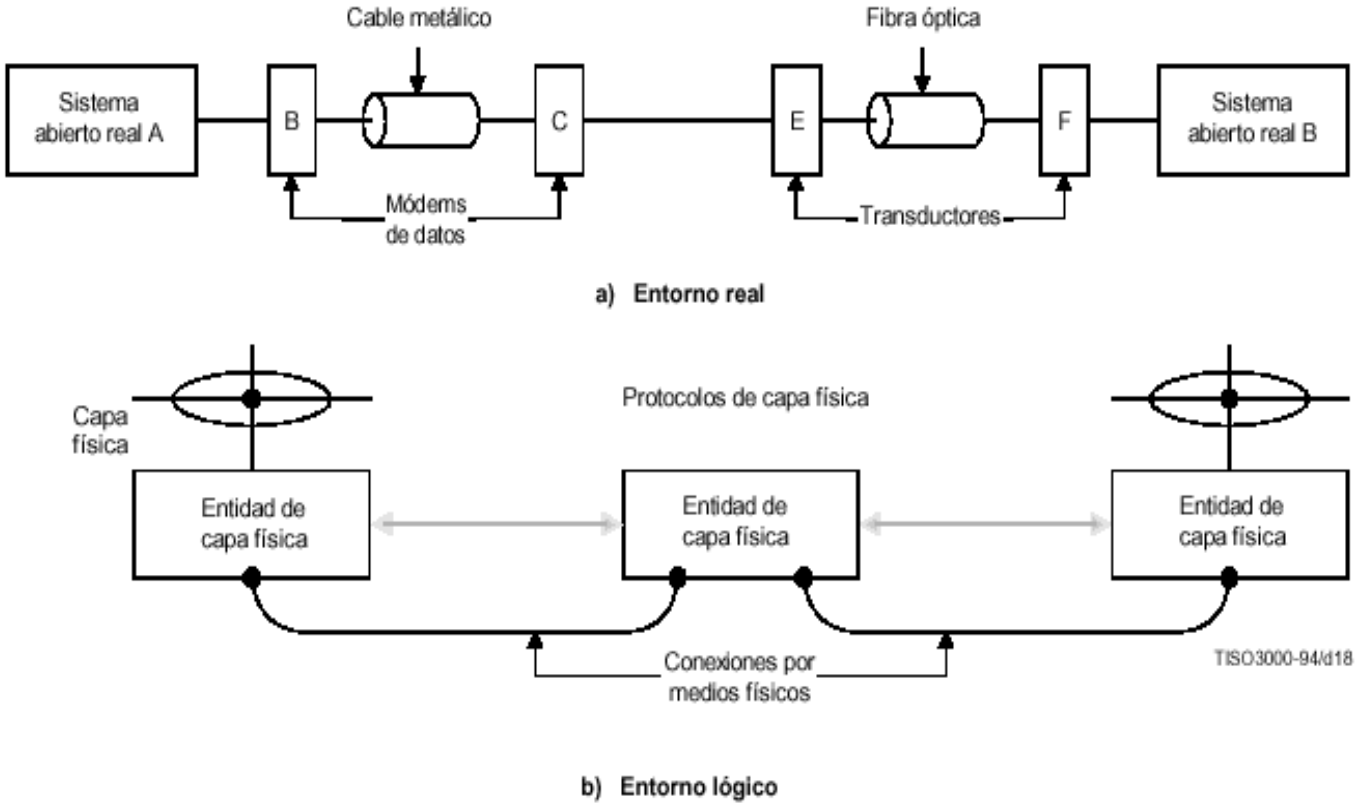
"The physical service provides for the transparent transfer of data between Physical service user . It makes invisible to the Physical service user the way in wich supporting communications resources are utilised to archieve this transfer."

LA CAPA FISICA.

Calidad del servicio, QoS*:*
Esto puede ser caracterizado por :
a) Service availability.
b) Error rate.
c) Througput.
d) Transit delay .
e) Protection (encryption).

Depende del medio físico ?

ISO/CEI 7498-1 : 1994 (S)



Las implementaciones de la Capa Física.

Clasificación :

Tipo de transmisión : **Síncrona, asíncrona.**

Modo de transmisión : **Balanceada , desbalanceada.**

Modo de operación : **Half- duplex , full duplex**

Tipo de configuración **: Punto a punto , multipunto**

Según Aplicación : **WAN - LAN**

Serie – Paralelo ? : SCSI , Fiber Channel , HIPPI…

EJEMPLOS DE INTERFACE DE CAPA FISICA (no LAN)

Aspectos	**X.21 Digital**	**RS232**	**V.35**	
Mecánico	ISO 4903	ISO2110	ISO2593	Conector
ELÉCTRICO	V.11o V.10	V.28	V.35	Niveles eléctricos
Funcional	X.21	V.24	V.24	Las funciones de las señales

Aspectos mecánicos : en los equipos …

Recomendación RS-232-C (A-F)

Esta recomendación emitida inicialmente por la **Electronic Industries Association, EIA** en 1962, en la actualidad es mundialmente aceptada para las interconexiones a nivel WAN, define la :

"INTERFACE BETWEEN DATA TERMINAL EQUIPMENT AND DATA COMMUNICATION EQUIPMENT EMPLOYING SERIAL BINARY DATA INTERCHANGE"

La recomendación define específicamente
(de manera como lo siguiere la capa física del modelo OSI):

- Características mecánicas de la interface:
- Características de las señales eléctricas
- Procedimientos de las señales para el intercambio de circuitos.

La recomendación menciona que es aplicable a :

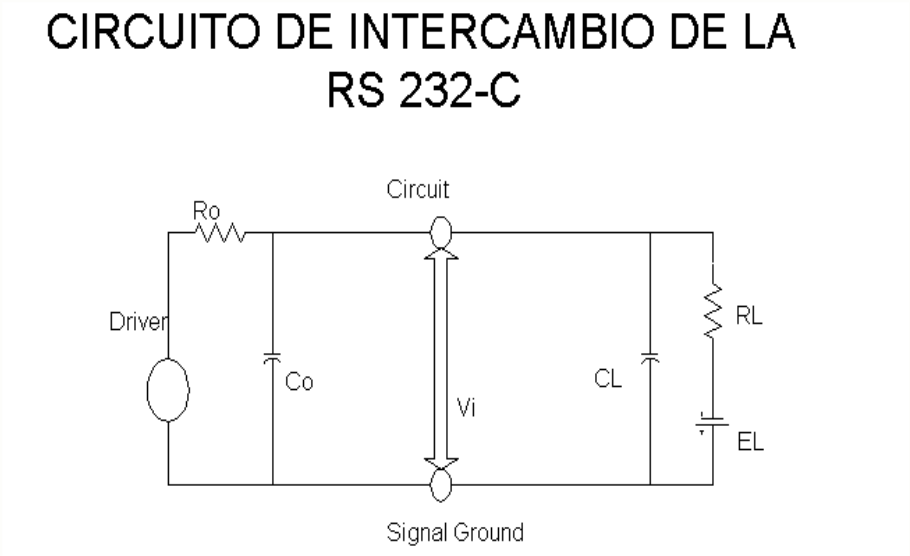
- ⇨ Velocidades : desde 0 bps hasta de 20 Kbps .
- ⇨ Transmisión síncrona o asíncrona .
- ⇨ Tipo de líneas : dedicadas (2 o 4 hilos) o conmutadas .
- ⇨ Recomienda la longitud del cable en 15 metros entre DTE y DCE , aunque permite el uso de mayores distancia atendiendo a las características eléctricas de carga de las señales.

Recomendación RS-232-C (A-F)

Aspectos	**RS232**
Mecánico	ISO2110
ELÉCTRICO	V.28
Funcional	V.24

DATA
TERMINAL
EQUIPMENT

DATA
COMMUNICATION
EQUIPMENT



El uso universal de esta recomendación y el avance en determinadas parámetros que involucró la misma , provocó el uso <u>fuera del contexto original de la recomendación , por ejemplo :</u>

-Los USART y driver posibilitan velocidades mayores que los 20 kbps (el UART 16550 llega a transmitir mas de 250 kbps)
-Las diferentes características en los cables posibilitan mayores distancias excediendo los 15 metros recomendados .
- Su utilización en otros tipos de configuración que DTE -DCE comunicaciones

Recomendación RS-232-C (A-F)

Tipos de señales dentro de una RS232

De referencia :
- ◆Protective Ground (opcional)
- ◆Signal Ground

De datos :
- ◆Trasmited data
- ◆Received Data

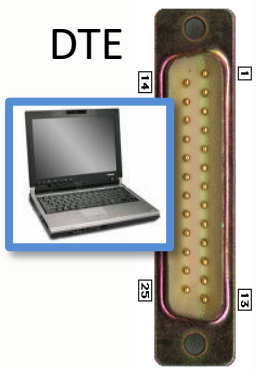
De control :
- ◆Request to Send
- ◆Clear to Send
- ◆Data set Rerady
- ◆Data terminal ready
- ◆Ring Indicator
- ◆Recieve Line Signal Detector
- ◆Signal Quality Detector
- ◆Data Signal Rate Selector (DTE)
- ◆Data Signal Rate Selector (DCE)

De temporización :
- ◆Transmitter Signal Element Timing (DTE)
- ◆Transmitter Signal Element Timing (DCE)
- ◆Reciever signal Element Timing (DCE)

De Datos y señalización Secundaria :
- ◆Trasmitted Data
- ◆Received Data
- ◆Request to Send
- ◆Clear to Send
- ◆Line signal Detector

"USO" de Recomendación RS-232-C (A-F)

DTE



DCE

DTE

DCE

?

DTE

DTE

?

TABLE 1. DTE-to-DCE DB-9 connection (Straight cable)

DB-9 DTE Device (Computer) Pin # / RS-232 Signal Name	Signal Direction	DB-9 DCE Device (Modem) Pin # / RS-232 Signal Name
#1 Data Carrier Detect (DCD)	←	#1 Data Carrier Detect (DCD)
#2 Receive Data (RD)	←	#2 Receive Data (RD)
#3 Transmit Data (TD)	→	#3 Transmit Data (TD)
#4 DTE Ready/Data Terminal Ready (DTR)	→	#4 DTE Ready/Data Terminal Ready (DTR)
#5 Signal Ground/Common (GND)	—	#5 Signal Ground/Common (GND)
#6 DCE Ready/Data Set Ready (DSR)	←	#6 DCE Ready/Data Set Ready (DSR)
#7 Request to Send (RTS)	→	#7 Request to Send (RTS)
#8 Clear to Send (CTS)	←	#8 Clear to Send (CTS)
#9 Ring Indicator (RI)	←	#9 Ring Indicator (RI)
Soldered to DB-9 metal—shield	—	Soldered to DB-9 metal—shield

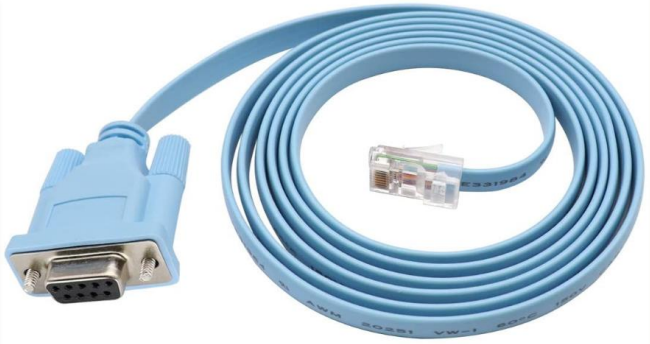
TABLE 2. DCE-to-DCE DB-9 connection (Crossover cable)

DB-9 DCE Device (Modem) Pin # / RS-232 Signal Name	Signal Direction	DB-9 DCE Device (Modem) Pin # / RS-232 Signal Name
#1 Data Carrier Detect (DCD)		#1 Data Carrier Detect (DCD)
#2 Receive Data (RD)	→	#2 Receive Data (RD)
#3 Transmit Data (TD)	←	#3 Transmit Data (TD)
#4 DTE Ready/Data Terminal Ready (DTR)	→	#4 DTE Ready/Data Terminal Ready (DTR)
#5 Signal Ground/Common (GND)	—	#5 Signal Ground/Common (GND)
#6 DCE Ready/Data Set Ready (DSR)	←	#6 DCE Ready/Data Set Ready (DSR)
#7 Request to Send (RTS)	→	#7 Request to Send (RTS)
#8 Clear to Send (CTS)	←	#8 Clear to Send (CTS)
#9 Ring Indicator (RI)		#9 Ring Indicator (RI)
Soldered to DB-9 metal—shield	—	Soldered to DB-9 metal—shield

"RS232" en algunos equipos : CISCO

10BT

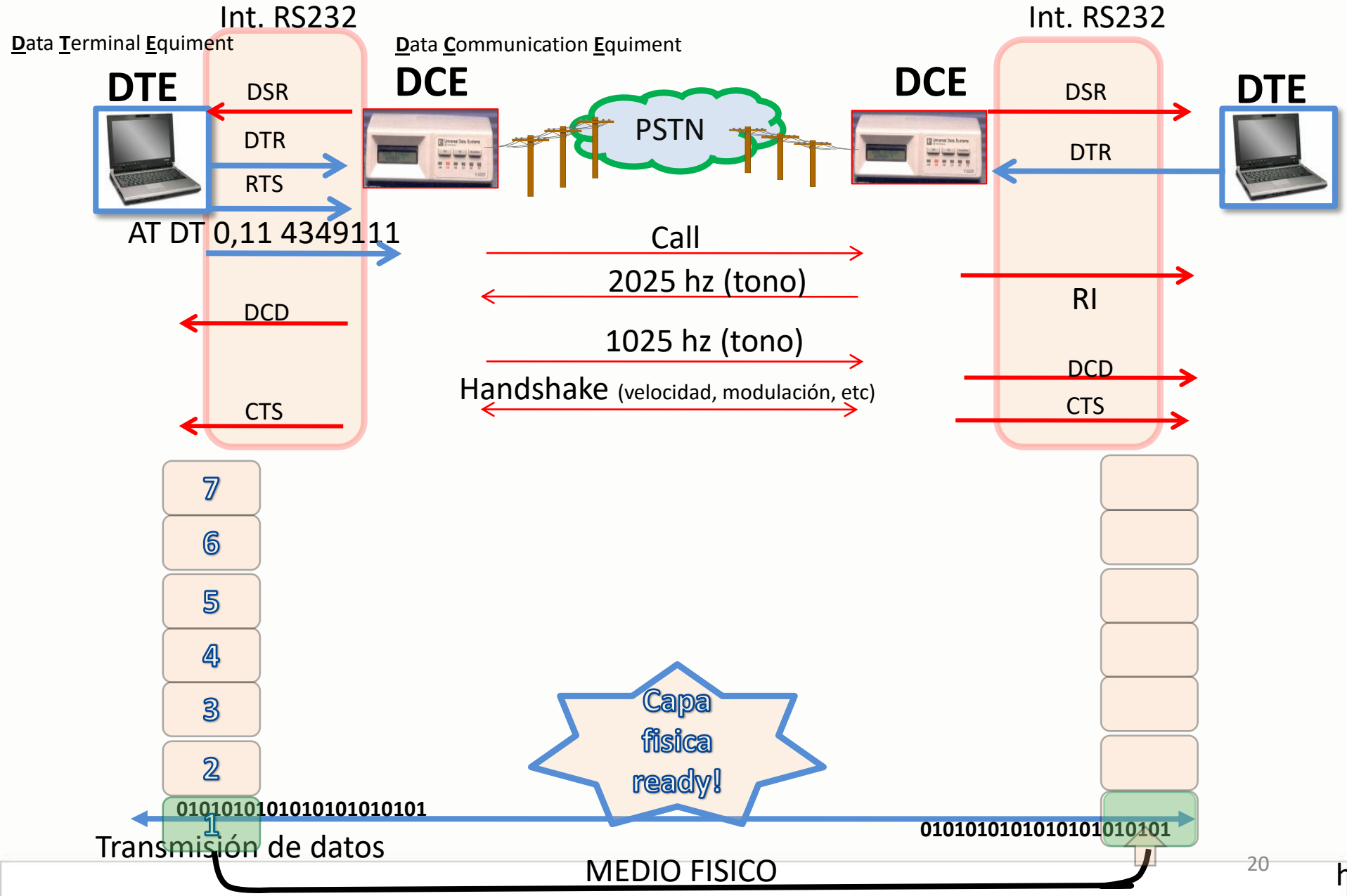
Cable cisco



Consola : RS232!!!

- Que tiene de la RS232??
- Que aspectos de la normativa se ajusta y cual no?

Ej : Handshake en una interface física (a través de modem en una PSTN)



	RS232	RS422	RS485
Cabling	single ended	single ended multi-drop	multi-drop
Number of Devices	1 transmit 1 receive	1 transmitter 10 receivers	32 transmitters 32 receivers
Communication Mode	full duplex	full duplex half duplex	full duplex half duplex
Max. Distance	50 feet at 19.2 Kbps	4000 feet at 100 Kbps	4000 feet at 100 Kbps
Max. Data Rate	19.2 Kbps for 50 feet	10 Mpbs for 50 feet	10 Mpbs for 50 feet
Signaling	unbalanced	balanced	balanced
Mark (data 1)	-3 V min. -15 V max.	2 V min. (B>A) 6 V max. (B>A)	1.5 V min. (B>A) 5 V max. (B>A)
Space (data 0)	3 V min. 15 V max.	2 V min. (A>B) 6 V max. (A>B)	1.5 V min. (A>B) 5 V max. (A>B)
Input Level Min.	+/- 3 V	0.2 V difference	0.2 V difference
Output Current (short circuit)	500 mA **(*Note that the driver ICs normally used in PCs are limited to 10 mA)***	150 mA	250 mA

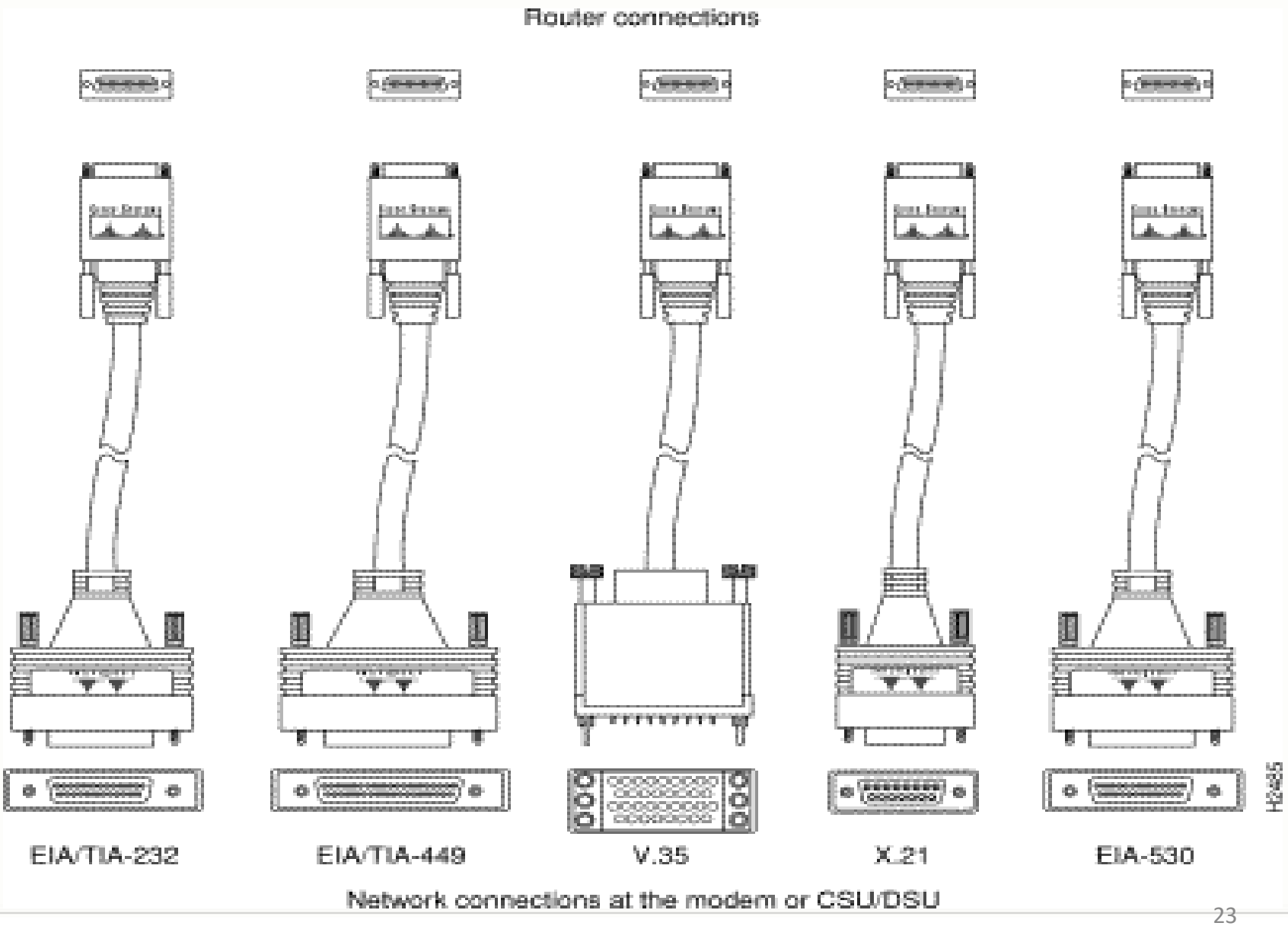
RS-449

- Inicialmente nuevo sustituto de RS-232.
- Interface balanceada.
- Típicamente usa conector DB-37.
- RS-449: Mecánico, funcional y procedimental.
- RS-423-A: Eléctrica desbalanceada. 2Mbps y 6 mts.
- RS-422-A: Eléctrica balanceada.

Convertidores de Interface (equipamiento RAD)

DTE \ DCE	V.24	V.35	V.36	X.21	RS-530	G.703 2 Mbps	G.703 1.544 Mbps	G.703 (Co-directional)	G.703 Contra-directional)	V.11/RS-422A sync	Current Loop	RS-485
V.24		MIC-24/35 RIC-24/35 UCI	MIC-24/36 RIC-232/530 UCI	MIC-24T/21C RIC-232/530 UCI	MIC-232/530 RIC-232/530 UCI			ITA-703 SPD-703-1 UCI		MIC-24/11	MIC-24/CL RIC-24/CL	MIC-232/485
V.35	MIC-24/35 RIC-24/35 UCI		MIC-35T/36C UCI	MIC-35T/21C UCI	MIC-35T/530C UCI	ASM-40 *FCD-2 UCI-HS	ASM-40 *FCD-1 UCI-HS	SPD-703-1 UCI	SPD-703/C			
V.36/V.11	MIC-24/36 RIC-232/530 UCI	MIC-36T/ 35C UCI		CBL-36T/21C UCI	CBL-530/499 UCI	ASM-40 *FCD-2 UCI-HS	ASM-40 *FCD-1 UCI-HS	SPD-703-1 UCI	SPD-703/C			
X.21/V.11	MIC-21T/24C UCI	MIC-21T/ 35C UCI	MIC-21T/36C UCI		MIC-21T/530C UCI	ASM-40 *FCD-2 UCI-HS	ASM-40 *FCD-1 UCI-HS	SPD-703-1 UCI	SPD-703/C			
RS-530	MIC-232/530 RIC-232/530 UCI	MIC-530T/35C UCI	CBL-530/499 UCI	CBL-530T/21C UCI		ASM-40 *FCD-2 UCI-HS	ASM-40 *FCD-1 UCI-HS	SPD-703-1 UCI	SPD-703/C			
V.11/RS-422 Async	MIC-24/11											
Current Loop	MIC-24/CL RIC-24CL											

TIPO DE CONECTORES

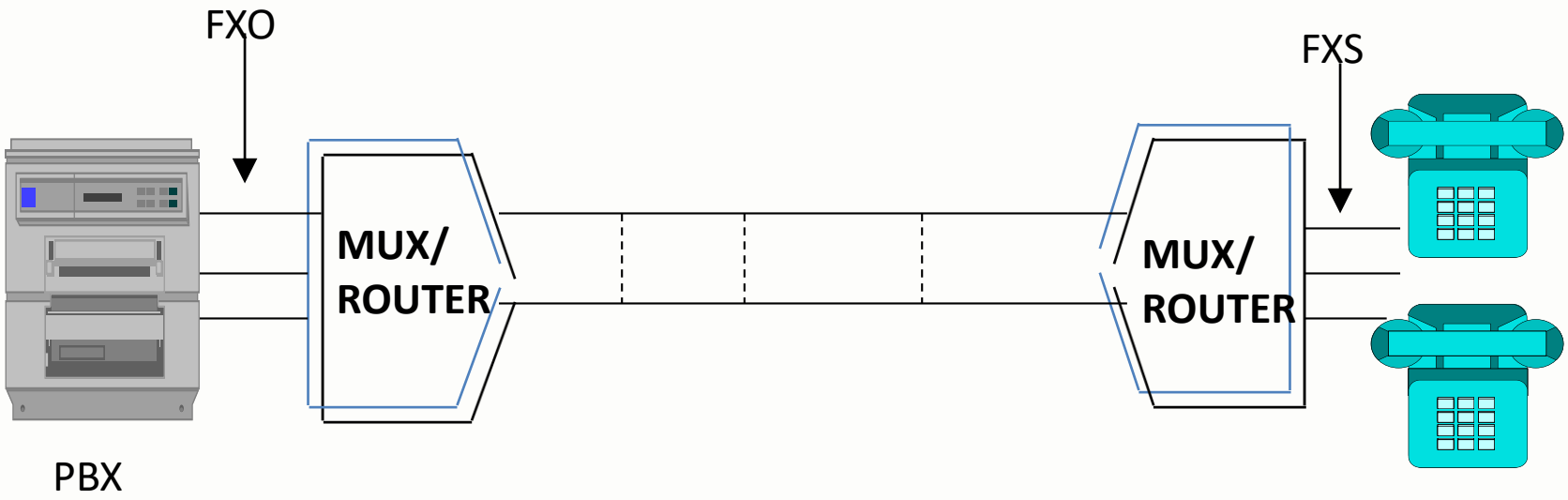


EQUIVALENCIA DE SEÑALES EN INTERFACE FISICA

	EIA RS-232 C Description	Abbr.	Direction of Signal to	EIA RS-232 C RS-232 D		V.35			RS-449 (V.36)			RS-449 RS-530	RS-530			CCITT V.24 V.35 V.36	CCITT X.21			
				Circuit	25-pin	34-pin		Type	37-pin		Circuit	Type	25-pin		Circuit		Abbr.	Circuit Name	15-pin	
						A	B		A	B			A	B					A	B
Ground	Protective Ground (shield)			AA	1	A			1				1			101		Shield	1	
	Signal Ground (common return)	SG		AB	7	B			19		SG		7		AB	102	G	Ground	8	
	DTE Common Return								37		SC					102a				
	DCE Common Return								20		RC					102b				
Data	Transmitted Data	TD	DCE	BA	2	P	S	Bal	4	22	SD	Bal	2	14	BA	103	T	Transmit	2	9
	Received Data	RD	DTE	BB	3	R	T	Bal	6	24	RD	Bal	3	16	BB	104	R	Receive	4	11
Control	Request to Send	RTS	DCE	CA	4	C		Unbal	7	25	RS	#	4	19	CA	105	C	Control	3	10
	Clear to send	CTS	DTE	CB	5	D		Unbal	9	27	CS	#	5	13	CB	106				
	Data Set Ready	DSR	DTE	CC	6	E		Unbal	11	29	DM	#	6	22	CC	107				
	Data Terminal Ready	DTR	DCE	CD	20	H		Unbal	12	30	TR	#	20	23	CD	108/2				
	Data Carrier detect	DCD	DTE	CF	8	F		Unbal	13	31	RR	#	8	10	CF	109	I	Indication	5	12
	Ring Indicator*	RI	DTE	CE	22	J		Unbal	15		IC	Unbal				125				
Timing	Transmit Clock (from DTE)	TTC	DCE	DA	24	U	W	Bal	17	35	TT	Bal	24	11	DA	113				
	Transmit Clock (from DCE)	TC	DTE	DB	15	Y	AA[&]	Bal	5	23	ST	Bal	15	12	DB	114	S	Signal Timing	6	13
	Receive Clock (from DCE)	RC	DTE	DD	17	V	X	Bal	8	26	RT	Bal	17	9	DD	115				
Tests	Remote Digital Loopback V.54/2*	RLB	DCE	RL	21			Unbal	14		RL	Unbal	21		RL	140				
	Local Analog Loopback V.54/3*	LLB	DCE	LL	18			Unbal	10		LL	Unbal	18		LL	141				
	Test Mode*	TM	DTE	TM	25			Unbal	18		TM	Unbal	25		TM	142				
	SOURCES		EIA RS-232		ISO 2110	ISO 2593		V.35 V.36	ISO 4902		RS-449					CCITT V.24	ISO 4903 (X.21/X.27)			

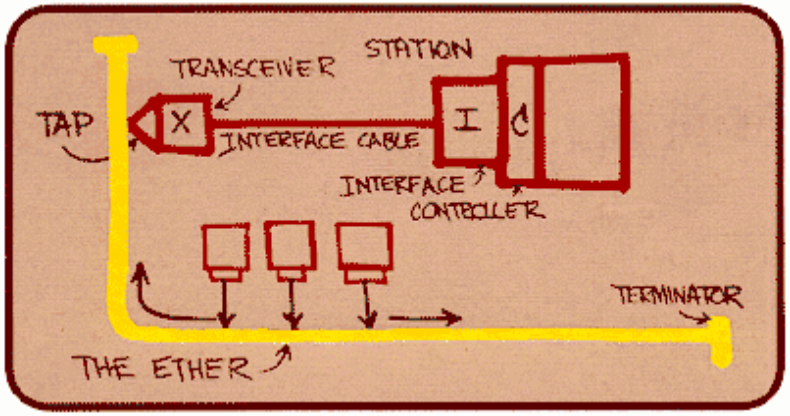
FXS/FXO

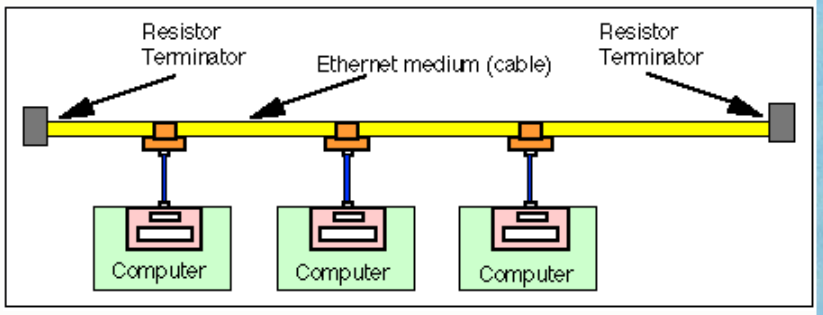
- Interface telefónica analógica.
- **FXS** (Foreign eXchange Station): Es la interface hacia el teléfono. Genera ring, voltaje y el tono de llamado.
- **FXO** (Foreign eXchange Office): Simula al teléfono para la central.
- Típicamente en conector RJ-11 .
- Ventaja: No se requieren tarjetas especiales en el lado de la planta telefónica ya que puedo usar troncales o extensiones.

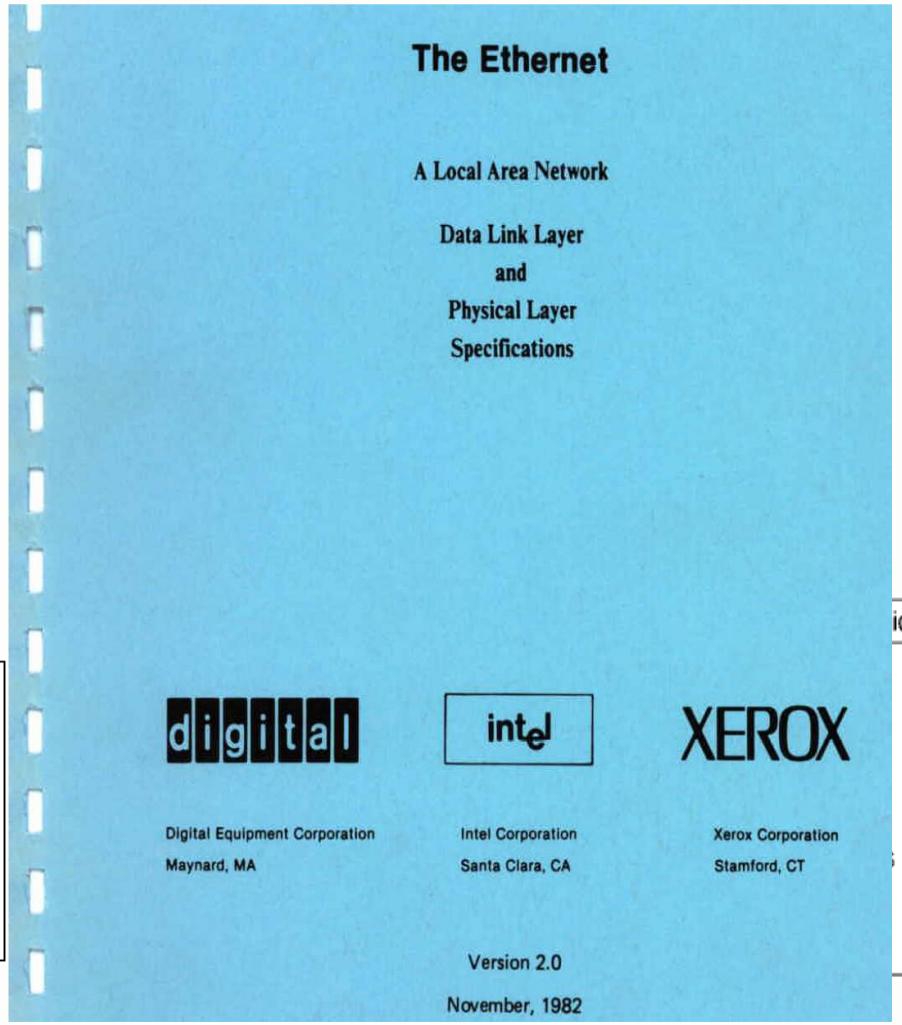


Interface Ethernet

- Ethernet fue desarrollado por **Robert Metcalfe en 1973**
  - *Basado en la red la **Red ALOHA**, inicialmente en 2,93 Mbps*
- Posteriormente , trabajo conjunto en denominado **DIX** (Digital, Xerox e Intel)10Mbps:
- 1983 el IEEE , especifica el 802.3.







Interface Ethernet

SUPERSEDED

IEEE Std 802.3™-2002
(Revision of IEEE Std 802.3, 2000 Edition)

IEEE Standards

802.3™

IEEE Standard for
Information technology—

Telecommunications and information exchange between systems—

Local and metropolitan area networks—

Specific requirements

Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE

Published by
The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

8 March 2002

Print: SH94973
PDF: SS94973

SUPERSEDED*

IEEE Std 802.3™-2002
(Revision of IEEE Std 802.3, 2000 Edition)

Information technology—
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Specific requirements—

Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications

Sponsor

LAN/MAN Standards Committee
of the
IEEE Computer Society

Abstract: The media access control characteristics for the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method for shared medium local area networks are described. The control characteristics for full duplex dedicated channel use are also described. Specifications are provided for MAU types 1BASE5 at 1 Mb/s; Attachment Unit Interface (AUI) and MAU types 10BASE5, 10BASE2, FOIRL (fiber optic inter-repeater link), 10BROAD36, 10BASE-T, 10BASE-FL, 10BASE-FB, and 10BASE-FP at 10 Mb/s; Media Independent Interface (MII) and PHY types 100BASE-T4, 100BASE-TX, 100BASE-FX, and 100BASE-T2 at 100 Mb/s; and the Gigabit MII (GMII) and 1000BASE-X PHY types, 1000BASE-SX, 1000BASE-LX, and 1000BASE-CX, which operate at 1000 Mb/s (Gigabit Ethernet) as well as PHY type 1000BASE-T. Repeater specifications are provided at each speed. Full duplex specifications are provided at the Physical Layer for 10BASE-T, 10BASE-FL, 100BASE-TX, 100BASE-FX, 100BASE-T2, and Gigabit Ethernet. System considerations for multisegment networks at each speed and management information base (MIB) specifications and additions to support Virtual Bridged Local Area Networks (VLANs) as specified in IEEE P802.1Q are also provided. Also specified is an optional Link Aggregation sublayer which multiple physical links to be aggregated together to form a single logical link.

Keywords: Aggregated Link; Aggregator; Auto Negotiation; Category 5; copper; data processing; Ethernet; gigabit; information interchange, Link Aggregation; local area networks, management; MASTER-SLAVE; medium dependent interface; mode of data transmission; models; network interconnection; physical coding sublayer; Physical Layer; physical medium attachment; repeater; type field; VLAN TAG

"Superseded" standards are standards that are no longer useful or contain significant obsolete or erroneous information. All amendments or corrigenda associated with this standard have also been superseded.

Interface Ethernet

Significado de la nomenclatura en etherne

5	coaxial (grueso) 500 metros
2	Coaxial (fino) 200 metros
E	Extra-long optical wavelength λ (1510/1550 nm)
F	Fiber (2 km)
K	Backplane
L	Long optical wavelength λ .
P	Passive optics, with single or multiple downstrea asymmetric qualifiers, as well as eXternal source
RH	Red LED plastic optical fiber with PAM16 coding optics
S	Short optical wavelength λ (850 nm)
T	Par trenzado

Table 80–1—40 Gb/s and 100 Gb/s PHYs

Name	Description
40GBASE-KR4	40 Gb/s PHY using 40GBASE-R encoding over four lanes of an electrical backplane, with reach up to at least 1 m (see Clause 84)
40GBASE-CR4	40 Gb/s PHY using 40GBASE-R encoding over four lanes of shielded balanced copper cabling, with reach up to at least 7 m (see Clause 85)
40GBASE-SR4	40 Gb/s PHY using 40GBASE-R encoding over four lanes of multimode fiber, with reach up to at least 100 m (see Clause 86)
40GBASE-FR	40 Gb/s PHY using 40GBASE-R encoding over one lane on single-mode fiber, with reach up to at least 2 km (see Clause 89)
40GBASE-LR4	40 Gb/s PHY using 40GBASE-R encoding over four WDM lanes on single-mode fiber, with reach up to at least 10 km (see Clause 87)
40GBASE-ER4	40 Gb/s PHY using 40GBASE-R encoding over four WDM lanes on single-mode fiber, with reach up to at least 40 km (see Clause 87)
100GBASE-KR4	100 Gb/s PHY using 100GBASE-R encoding, Clause 91 RS-FEC and 2-level pulse amplitude modulation over four lanes of an electrical backplane, with a total insertion loss up to 35 dB at 12.9 GHz (see Clause 93)
100GBASE-KP4	100 Gb/s PHY using 100GBASE-R encoding, Clause 91 RS-FEC and 4-level pulse amplitude modulation over four lanes of an electrical backplane, with a total insertion loss up to 33 dB at 7 GHz (see Clause 94)
100GBASE-CR4	100 Gb/s PHY using 100GBASE-R encoding and Clause 91 RS-FEC over four lanes of shielded balanced copper cabling, with reach up to at least 5 m (see Clause 92)
100GBASE-CR10	100 Gb/s PHY using 100GBASE-R encoding over ten lanes of shielded balanced copper cabling, with reach up to at least 7 m (see Clause 85)
100GBASE-SR10	100 Gb/s PHY using 100GBASE-R encoding over ten lanes of multimode fiber, with reach up to at least 100 m (see Clause 86)
100GBASE-SR4	100 Gb/s PHY using 100GBASE-R encoding over four lanes of multimode fiber, with reach up to at least 100 m (see Clause 95)
100GBASE-LR4	100 Gb/s PHY using 100GBASE-R encoding over four WDM lanes on single-mode fiber, with reach up to at least 10 km (see Clause 88)
100GBASE-ER4	100 Gb/s PHY using 100GBASE-R encoding over four WDM lanes on single-mode fiber, with reach up to at least 40 km (see Clause 88)

Interface Ethernet

El IEEE en la 802.3 tiene una cantidad significativa de normas según medios, velocidades ….

Estándar de Ethernet	Denominación	Velocidad de datos	Tecnología de cables	Año de publicación
802.3	10Base5	10 MB/s	Cable coaxial	1983
802.3a	10Base2	10 MB/s	Cable coaxial	1988
802.3i	10Base-T	10 MB/s	Cable de par trenzado	1990
802.3j	10Base-FL	10 MB/s	Cable de fibra óptica	1992
802.3u	100Base-TX100Base-FX100Base-SX	100 MB/s	Cable de par trenzado, cable de fibra óptica	1995
802.3z	1000Base-SX1000Base-LX	1 GB/s	Cable de fibra óptica	1998
802.3ab	1000Base-T	1 GB/s	Cable de par trenzado	1999
802.3ae	10GBase-SR, 10GBase-SW, 10GBase-LR, 10GBase-LW, 10GBase-ER, 10GBase-EW, 10GBase-LX4	10 GB/s	Cable de fibra óptica	2002
802.an	10GBase-T	10 GB/s	Cable de par trenzado	2006

IEEE 802.3 ETHERNET WORKING GROUP

- The IEEE 802.3 Working Group develops standards for Ethernet networks. We have a number of active projects, study groups, and ad hocs as listed below:
  - IEEE P802.3ca 25 Gb/s and 50 Gb/s Ethernet Passive Optical Networks Task Force.
  - IEEE P802.3ch Multi-Gig Automotive Ethernet PHY Task Force.
  - IEEE P802.3ck 100 Gb/s, 200 Gb/s, and 400 Gb/s Electrical Interfaces Task Force.
  - IEEE P802.3cp Bidirectional 10 Gb/s, 25 Gb/s, and 50 Gb/s Optical Access PHYs Task Force.
  - IEEE P802.3cr Isolation (Maintenance #14) Task Force.
  - IEEE P802.3cs Increased-reach Ethernet optical subscriber access (Super-PON) Task Force.
  - IEEE P802.3ct 100 Gb/s over DWDM systems Task Force.
  - IEEE P802.3cu 100 Gb/s and 400 Gb/s over SMF at 100 Gb/s per Wavelength Task Force.
  - IEEE P802.3cv Power over Ethernet (Maintenance #15) Task Force.
  - IEEE P802.3cw 400 Gb/s over DWDM systems Task Force.
  - IEEE P802.3cx Improved PTP Timestamping Accuracy Task Force.
  - IEEE 802.3 Greater than 10 Gb/s Automotive Ethernet Electrical PHYs Study Group.
  - IEEE 802.3 Multi Gigabit Automotive Optical PHYs Study Group.
  - IEEE 802.3 10SPE Multidrop Enhancements Study Group.
  - IEEE 802.3 100 Gb/s Wavelength Short Reach PHYs Study Group.
  - IEEE 802.3 New Ethernet Applications Ad Hoc.
  - IEEE 802.3 SCC18 Ad Hoc.

Interface Ethernet

10Base5 (Thick Coax)	10Base2 (Thin Coax)	10Base-T (UTP cat 3,4,5)	10Base-F (Fibre)
100Base-FX (Fibre)	100Base-TX (UTP cat 5)		100Base-T4 (UTP cat 3,4,5)
1000Base-CX (Twinax)	1000Base-SX (Short WL Fibre)	1000Base-LX (Long LW Fibre)	1000Base-T (Twisted Pair)

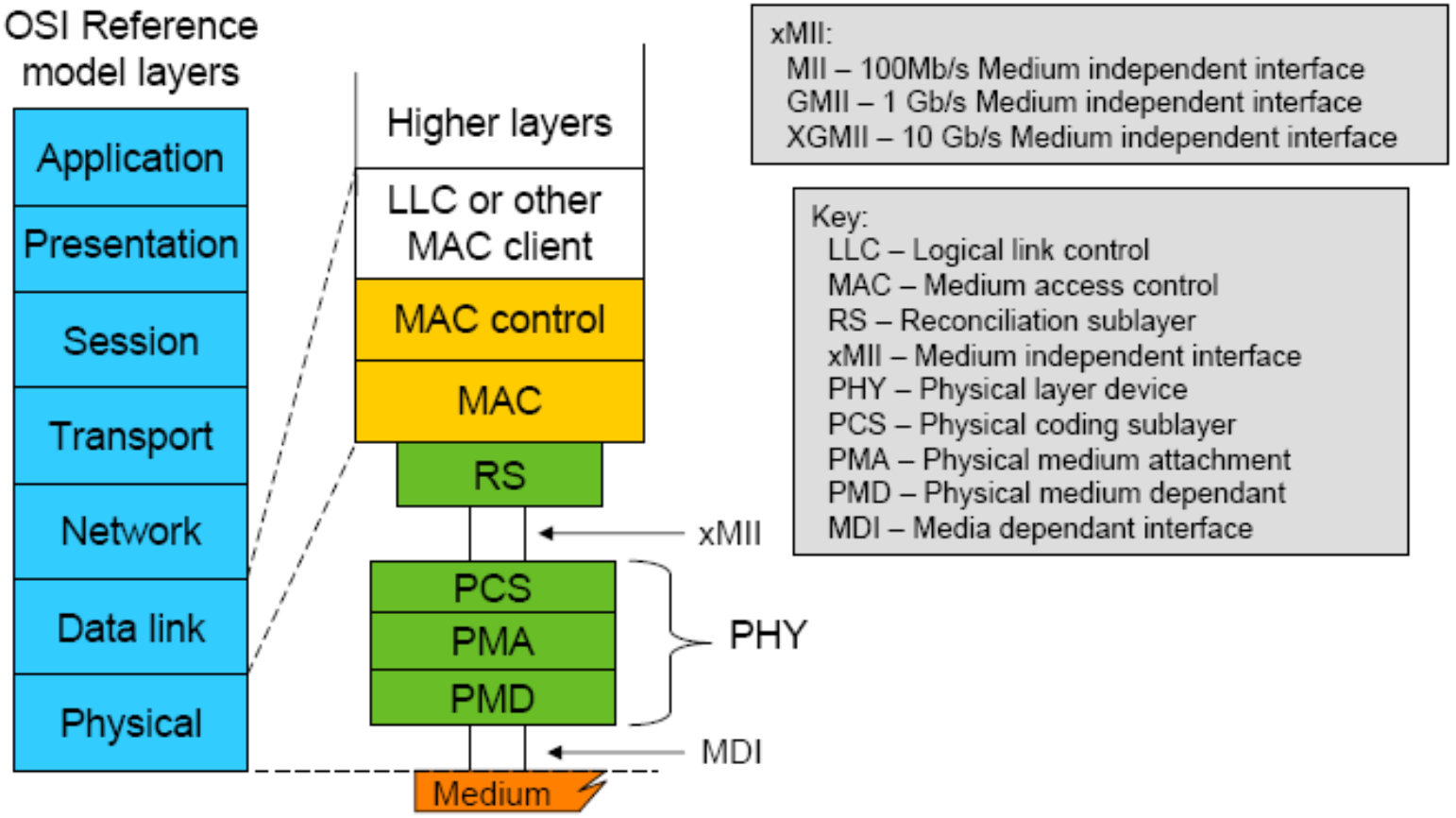
port?

412 CHAPTER 13 / LAN SYSTEMS

TABLE 13.2 IEEE 802.3 100BASE-T physical layer medium alternatives.

	100BASE-TX		100BASE-FX	100BASE-T4
Transmission medium	2 pair, STP	2 pair, Category 5 UTP	2 optical fibers	4 pair, Category 3, 4, or 5 UTP
Signaling technique	4B5B, NRZI	4B5B, NRZI	4B5B, NRZI	8B6T, NRZ
Data rate	100 Mbps	100 Mbps	100 Mbps	100 Mbps
Maximum segment length	100 m	100 m	100 m	100 m
Network span	200 m	200 m	400 m	200 m

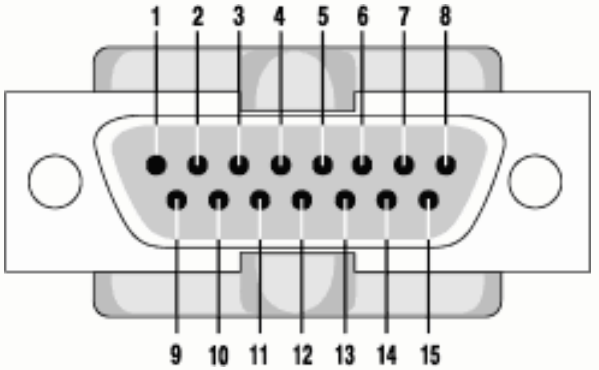
IEEE Std 802.3 layer diagram 100Mb/s and above



IEEE

Interface Ethernet

Una Interface de LAN….



AUI

attachment unit interface

Pin Signal
1 Control In (Shield)
2 Control In
3 Transmit Data
4 Recieve Data (Shield)
5 Recieve Data
6 Voltage
7 Control Out
8 Control Out (Shield)

Pin Signal
9 Control In (Return)
10 Transmit Data (Return)
11 Transmit Data (Shield)
12 Recieve Data (Return)
13 Voltage Plus
14 Voltage (Shield)
15 Control Out

Pin	Signal	Function
1	MEXT	External ground, shield
2	CLSN	Collision +
3	**TRMT / TPETXD**	**Transmit + / TPE transmit data +**
4	Ground	Ground 5V
5	**RCV / TPERXD**	**Receive + / TPE Receive Data +**
6	M15V	Ground 15V
7	TPE_SEL	AUI/ITP switchover
8	Ground	Ground 5V
9	CLSN_N	Collision –
10	**TRMT_N / TPETXD_N**	**Transmit – / TPE transmit data –**
11	Ground	Ground 5V
12	**RCV_N / TPERXD_N**	**Receive – / TPE receive data –**
13	P15V	+ 15V
14	Ground	Ground 5V
15	–	

Interface Ethernet

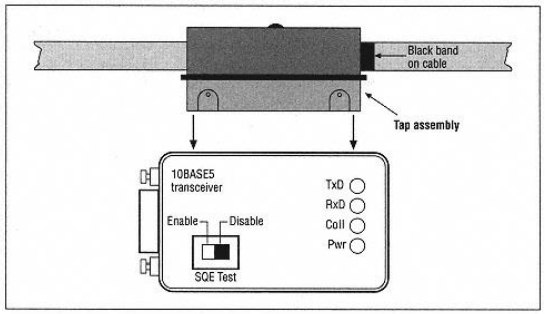


Figure B-30.
Thick coax transceiver tap

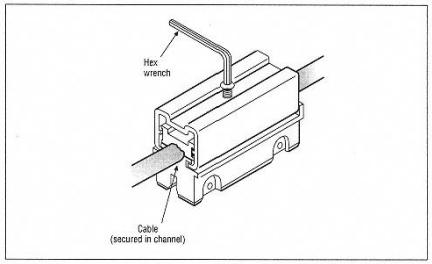


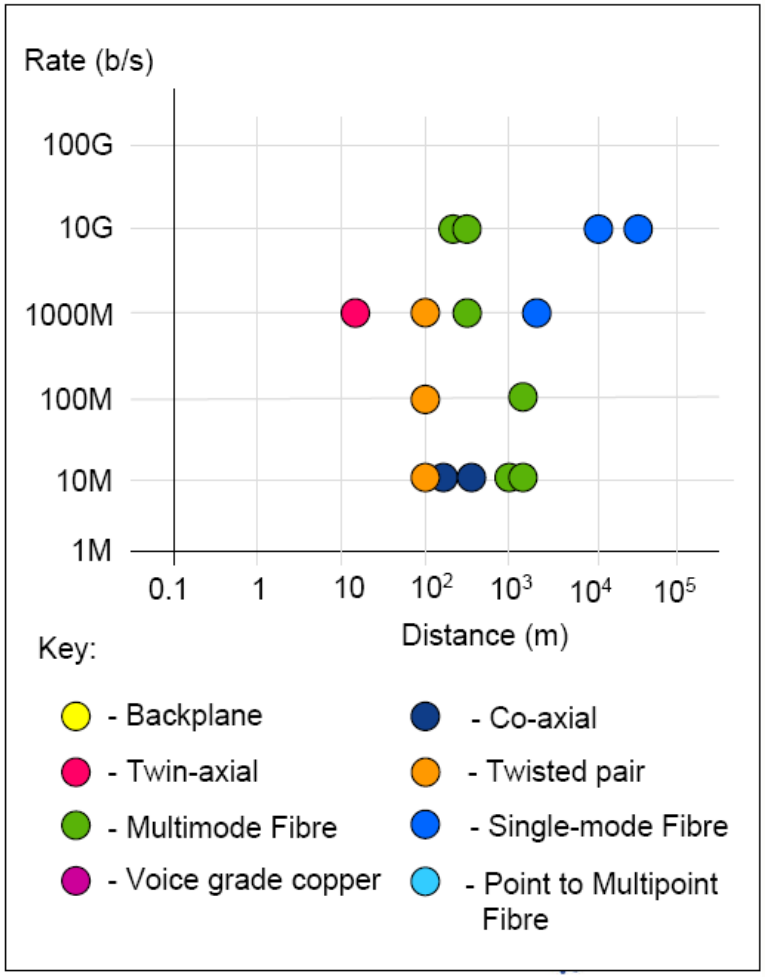
Figure B-32.
Cable clamped into place

10B5

10B2

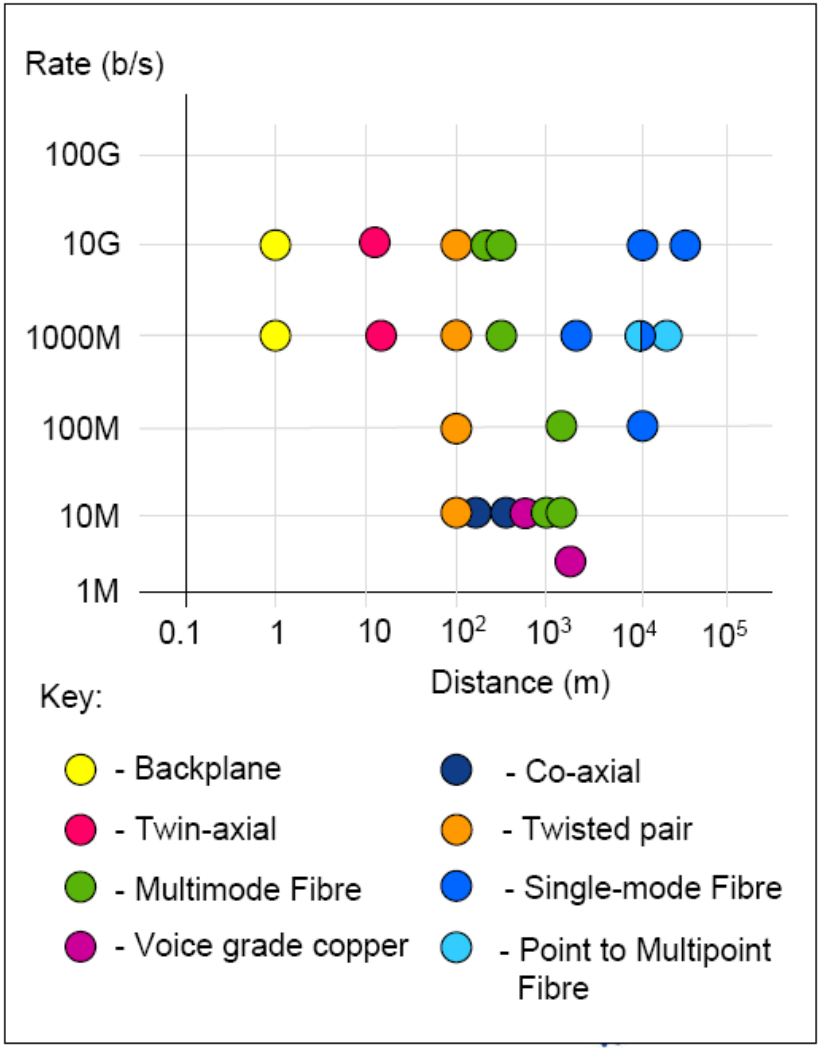
1Gb/s and 10 Gb/s Ethernet

PHY Type	Data rate	Distance	Media
IEEE Std 802.3z-1998 1 Gb/s Operation			
1000BASE-SX	1Gb/s	220m 550m	Two multimode fibres
1000BASE-LX	1Gb/s	5Km 550m	Two single-mode Two multimode
1000BASE-CX	1Gb/s	25m	Copper cable assembly
IEEE Std 802.3ab-1999, 1000BASE-T			
1000BASE-T	1Gb/s	100m	Twisted-pair
IEEE Std 802.3ad-2000 Link Aggregation			
IEEE Std 802.3ae-2002 10 Gb/s Operation			
10GBASE-SR/W	10Gb/s	33m 300m	Two multimode
10GBASE-LX4	10Gb/s	10Km 300m	Two single-mode Two multimode
10GBASE-LR/W	10Gb/s	10Km	Two single-mode
10GBASE-ER/W	10Gb/s	40Km	Two single-mode



10 Gb/s PHYs, Backplane Ethernet

PHY Type	Data rate	Distance	Media
IEEE Std 802.3ak-2004, 10GBASE-CX4			
10GBASE-CX4	10Gb/s	15m	Copper cable assembly
IEEE Std 802.3an-2006, 10GBASE-T			
10GBASE-T	10Gb/s	100m	Twisted-pair
IEEE Std 802.3ap-2007,Electrical Backplanes			
1000BASE-KX	1000Mb/s	1m	Backplane
10GBASE-KX4	10Gb/s	1m	Backplane
10GBASE-KR	10Gb/s	1m	Backplane
IEEE Std 802.3aq-2006, 10GBASE-LRM			
10GBASE-LRM	10Gb/s	100m 220m	Two multimode



Interface Ethernet: 2020?

800G Specification

Web: http://ethernettechnologyconsortium.org
or http://25gethernet.org/

3.1.1 Leveraging Existing Standards

800 Gb/s capability can be supported by utilizing two 400 Gb/s PCSs (with the included FEC) and supporting 8 lanes of a 106.25G each.

The IEEE 802.3 standard for 400 Gb/s employs multi-lane distribution (MLD) to distribute data from a single Media Access Control (MAC) channel across 16 PCS lanes. This 800G standard will use a MAC scaled up to 800 Gb/s along with two 400Gb/s PCSs (with a few modifications) in order to drive 8x100G lanes. There will be a total of 32 PCS lanes (2x16 from the 400G standard), all with RS(544,514) FEC that is supported in the 400 Gb/s standard.

An important aspect of the MLD striping technique is the use of a unique alignment marker (AM) for each virtual lane. For 400Gb/s the AMs are inserted into the striped data stream every 163,840 x 257b blocks. This will continue with 800 Gb/s (and keeping the same spacing per 400G stream), but there will be twice as many AMs inserted, and AMs will have to be modified to ensure both a coherent 800 Gb/s stream and to prevent a misconfigured 400 Gb/s port from syncing up to the 800 Gb/s stream.

802.3ck will be leveraged for the C2M and C2C interfaces (operating at 106.25G per lane).

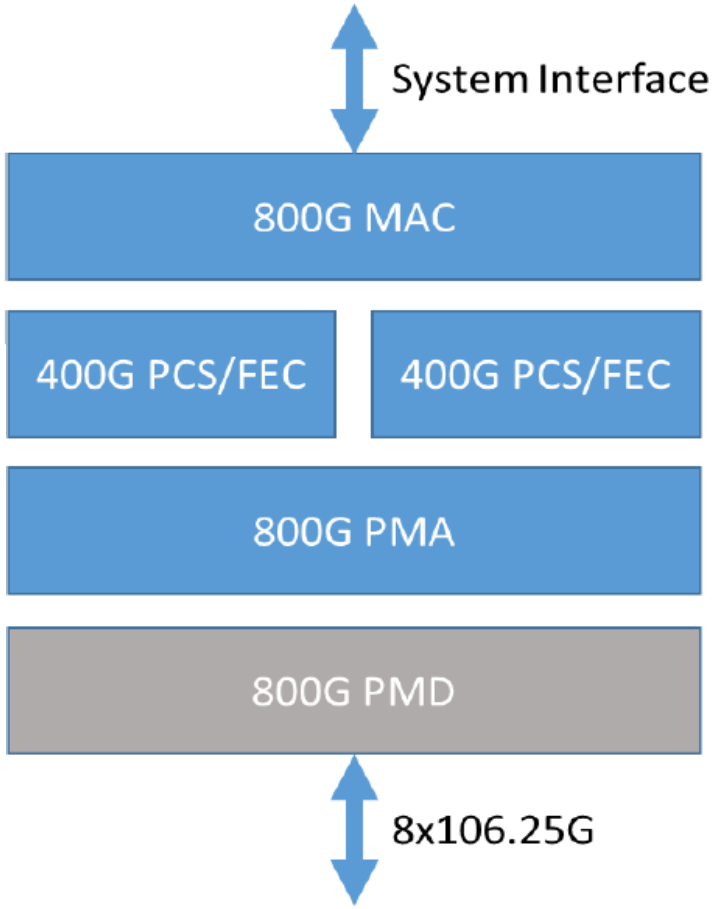


Figure 1: 800G MAC High Level Block Diagram

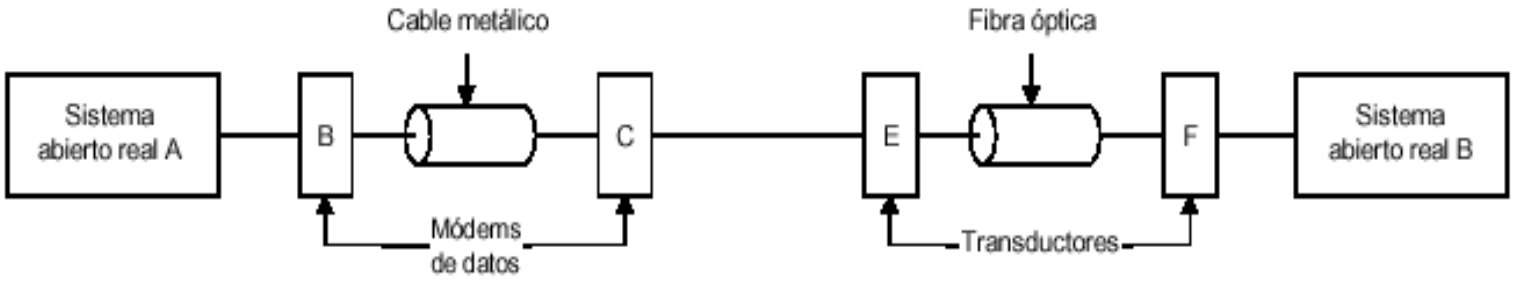
Interface WAN : G.703

- Creada por la ITU-T para voz sobre redes digitales.
- Define el aspecto eléctrico y funcional de la interface.
- Opera a 64 Kbps, 1.544 y 2 Mbps. 4 hilos.
- G.704 Define el framing.
- Se puede implementar sobre par trenzado de 120 ohmios de forma balanceada y/o de forma desbalanceada con dos cables coaxiales de 75 ohmios
- T1: (1544 Kbps), AMI o B8ZS. 1 par para transmisión y otro para recepción.
- **E1:** (2048 Kbps), AMI o HDB3. Coaxial o 4 hilos simétricos por cada dirección.

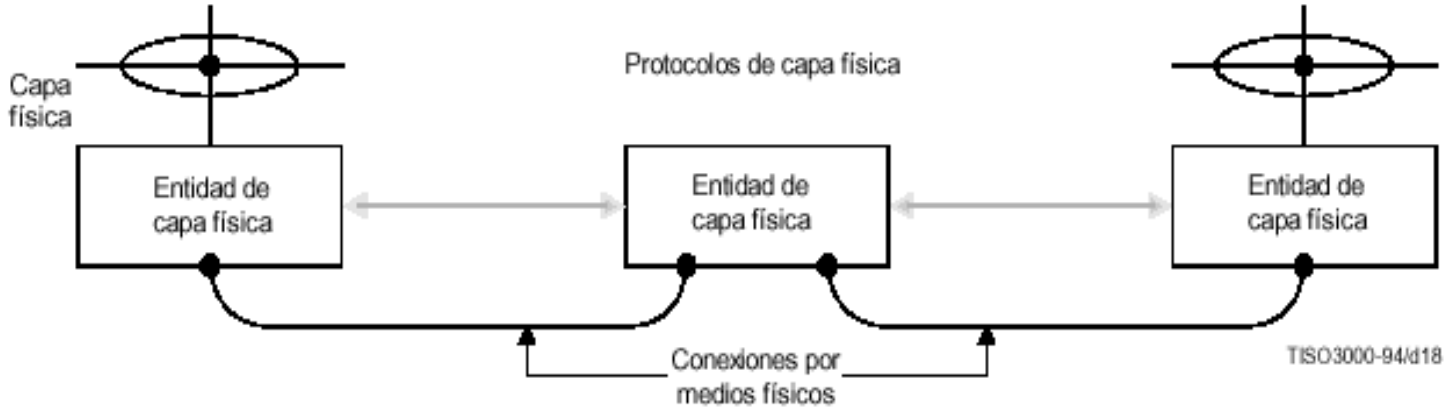
Independiente del medio físico !

CAPA FISICA

ISO/CEI 7498-1 : 1994 (S)



a) **Entorno real**



b) **Entorno lógico**

Ej : RS 232 en medio físico de Fibra óptica

Multi-Interface (RS-232/422/485) Fiber Optic Modem

Model TC1540

- Async Data Rates to 500 Kbps*
- Distances up to 80km
- Multimode or Single Mode (850/1300/1550nm)
- Switch-Selectable RS-485 (2/4 wire) or RS-422
- Mix & Match RS-232/422/485
- Built-In Test Signal Generator
- 7 LEDs & 7 DIP Switches for Diagnostics
- Detachable Terminal Block Connectors
- Local & Remote Loopback
- 12VDC, 24VDC, -48VDC, or 115/230VAC

TC1540 (RS-232/422/485) Fiber Optic Modem

RS 232 en medio físico de radio enlace

GSM & GPRS MODEM

GSM100LITE
GSM100T

- GSM and GPRS
- Voice / Fax / SMS and Data
- Dual Band 900 / 1800MHz GSM Transmission
- Full voice call, SMS support
- Accepts Standard SIM Card
- Data enabled SIM Cards available
- Miniature size 88 x 60 x 26mm
- Can Be Used On Standard GSM Network
- RS232 Interface
- AT command set (GSM 07.05 and 07.07)
- One user programmable input/Output Port
- GPRS Class B Class 10 (36Kb/s download / 24Kb/s upload)
- GSM100T: TCP/IP stack available for data and internet

RS 232 en medio físico de Cable Coaxial

ITEM 686.8000 COAXIAL CABLE MODEM

DESCRIPTION

The bidder shall furnish an RS-232-based coaxial RF cable modem, capable of data rates between 1,200 and 19,200 bits per second, working in either synchronous or asynchronous modes. The modem must be compatible with a 75-ohm, bidirectional CATV system containing standard components (i.e. splitters, taps, bidirectional amplifiers, etc.). The system amplifiers used have a rated outbound (from the Traffic Control Center to the field units) frequency range of 5 to 30 MHz, and an inbound range (from the field units to the Traffic Control Center) of 50 to 300 MHz. The entire frequency band is not available and exact modem frequency ranges will be discussed below.

FORCE
OPTICAL BROADCAST SYSTEMS

CATV
Model 2804
- Request Pricing
- Download User Manual

CATV Transmitter

- Transmits up to 110 channels over one single-mode fiber.
- VSB/AM transmission ensures compatibility with standard CATV modulators, processors, etc.
- The transmitter includes a 7-segment LED and other indicator LEDs that allow critical system parameters to be accurately monitored.
- An integral -20 dB RF test point simplifies installation, commissioning, and troubleshooting.
- Key lock power switch prevents accidental power-down.
- Multiple laser output power options provide complete system design flexibility.
- Excellent for medium to large campus video distribution systems.

Model 2804 Transmitter

Otras Interface física y el medio físico

T1/E1 Fiber Optic Modem

Model TC1630 (Pocket Rocket)

- Distances up to 80km
- Hardened Temperature Version
- Local/Remote Loopback
- Eight LED Indicators
- No Jitter
- Multimode & Single Mode (850/1300/1550nm)
- Low Power Consumption (3 Watts)
- Full Digital Technology Design
- Supports AMI/B8ZS/HDB3 Line Codes
- 12 / 24 /-48VDC, or 115/230VAC Power

TC1630 Pocket Rocket

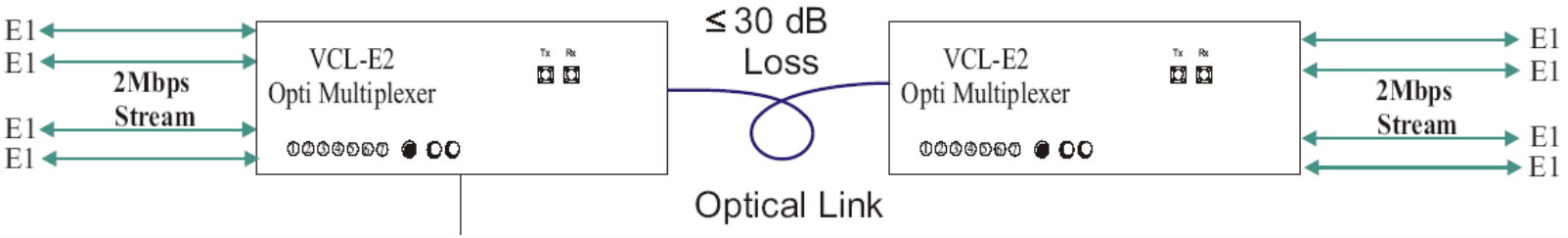
Otras Interface física y el medio físico

EXTERNAL INTERFACES AND CONNECTORS :

VCL Opti Multiplexer unit provides the following interfaces to the external world:

- 4, Primary rate 2Mbps & 120 Ohms balanced E1 interfaces
- 1300nm, Single Mode optical fiber interface, Tx and Rx through FC/PC Connectors
- -48V input for on-board power supply
- RS232 interface for connection to Network Management System, used for configuration and monitoring of the Opti Multiplexer system.
- 2 External alarm extensions for visual and

E2, Opti Multiplexer - Basic Application



CROCUS INVERSE MULTIPLEXER

FEATURES & BENEFITS

- > CONNECTS UP TO 8 MBPS SERIAL DATA OVER SEVERAL E1 LINKS
- > AUTOMATIC SPEED ADAPTATION IN CASE OF E1 LINK LOSS
- > ADVANCED FREE MAINTENANCE SOFTWARE
- > MANAGEABLE UNDER HP OPENVIEW®
- > MODULAR PLUG-IN DATA INTERFACES FOR MAXIMUM FLEXIBILITY AND EFFICIENT STOCK MANAGEMENT

> THE CROCUS INVERSE MULTIPLEXER PROVIDES TRANSPARENT TRANSMISSION OF SYNCHRONOUS DATA AT SPEEDS UP TO 7808 KBPS ON A SERIAL INTERFACE USING MULTIPLE 2 MBPS E1 LINES.

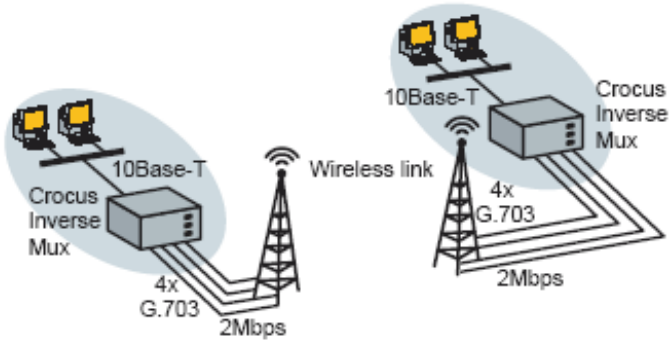
Based on an efficient bonding mechanism for multiple E1 lines, the equipment enables one to cross the 2 Mbps barrier without having to adapt the installed user applications. These E1 lines may have a difference in throughput delay as high as 64 msec, so different routings of the constituent E1 lines can be used. In addition, an automatic fallback/step-up mechanism permits the user to add or suppress E1 lines and so to adapt dynamically the user speed in multiples of 1952 kbps.

A complete range of serial plug-in interface boards makes the Crocus Inverse Multiplexer ideal for interfacing with almost any high-speed application. Not only traditional interfaces such as V.35, V.36, X.21 or RS-530, but also direct 10Base-T connections with integrated bridge or router functionality are available.

Typical 2 Mbps transport infrastructures on which this equipment can realise a cost-effective high-speed connection include HDSL (High-speed Digital Subscriber Lines), wireless 2 Mbps point-to-point and SDH (Synchronous Digital Hierarchy).

The example shows how the Crocus Inverse Multiplexer, equipped with an

TYPICAL APPLICATION: HIGH SPEED LAN-TO-LAN CONNECTION USING 2 MBPS BASED WIRELESS LINKS



SALES CODES

- > 153862 Crocus 4E1 inv mux BU 115/230Vac
- > 153863 Crocus 4E1 inv mux BU 48Vac
- > 150322 RMK 01003/Crocus 4E1 inv mux (19" rackmount kit)

SALES CODES: INTERFACES

All transparent data interface modules are found in the sales codes quick reference section