Universal Ethernet Telecommunications Service: Towards a New Layer 2 Based Internet

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UETS/EFR - Comments

- Bob Metcalfe, Ethernet inventor:
  - «*Ethernet is the answer; what is the question*?»
- Vint Cerf, the father of Internet:
  - «*I think I understand - this is basically like the telephone numbering plan and different segments of the address are used at different layers in the switching hierarchy.*»
- Bob Colwell, Intel's chief architect, Pentium II, III, y 4:
  - «*I liked the comment about "any 3rd rate engineer can increase complexity, but it takes a certain flair of mind to simplify things". Good luck with your initiatives, we need'em.*»

UETS/EFR – References

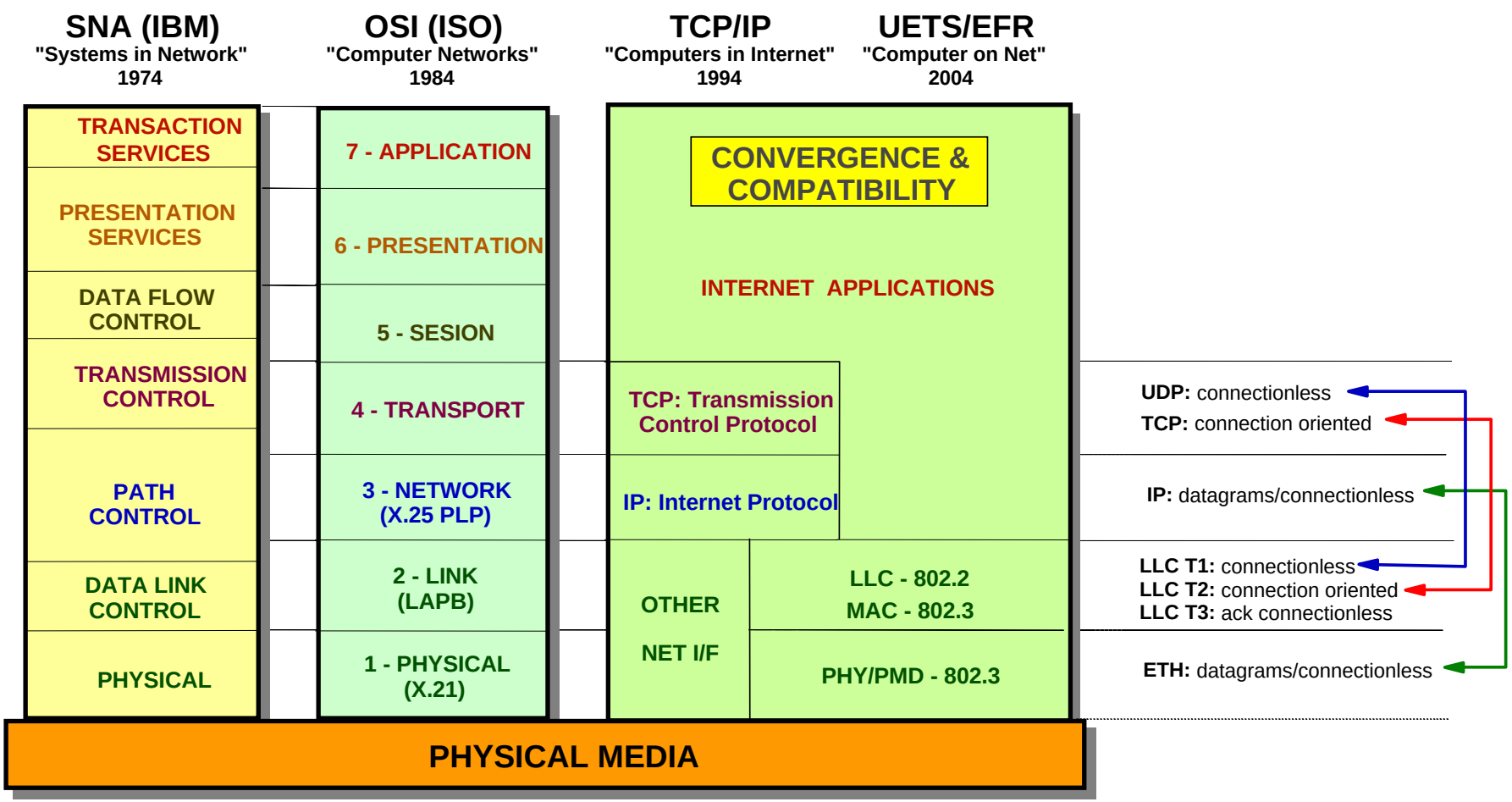
- **Publications**
  - Anales de mecánica y electricidad, january 2005
    - UETS (universal ethernet telecommunications service)
  - IEEE Communications Magazine / GCN, pp. 2-4, october 2005
    - From "computer networks" to the "computer on net“
  - Global Communications, april 2006
    - UETS: The new generation' layer 2 network
  - Anales de mecánica y electricidad, june 2006
    - The XXIst century network: convergence of the electric power grid and telecommunications
- **Conferences**
  - ISOC “Monographic Monthly Meeting”, march 2006
    - Ethernet everywhere. The dawn of the net [and/means] the decline of the internet?
  - INFOCOM 2006. High-speed networking workshop: The Terabits Challenge. April 2006
    - EFR: A scalable and secure ultrahigh speed switching architecture
  - ETHERNET FORUM - European Conference. Power saving and telecommunications
    - Convergence with the electric power grid and sustainable development
  - eChallenges e-2006, october 2006
    - UETS: towards a new layer 2 based internet
- **Citations**
  - Internet Mark 2 project : “Ethernet everywhere”
  - City University of New York, Verizon Communications. IEEE INFOCOM 2006. April 2006
    - On the vision of implementing a truly native Ethernet-based global multi-service infrastructure
- **Projects**
  - Carlos III University of Madrid
    - UETS/EFR switch development
  - Andres Laguna Foundation Project
    - Implementation of the convergent network and renewable energies for rural development

Ethernet & Internet Issues Today

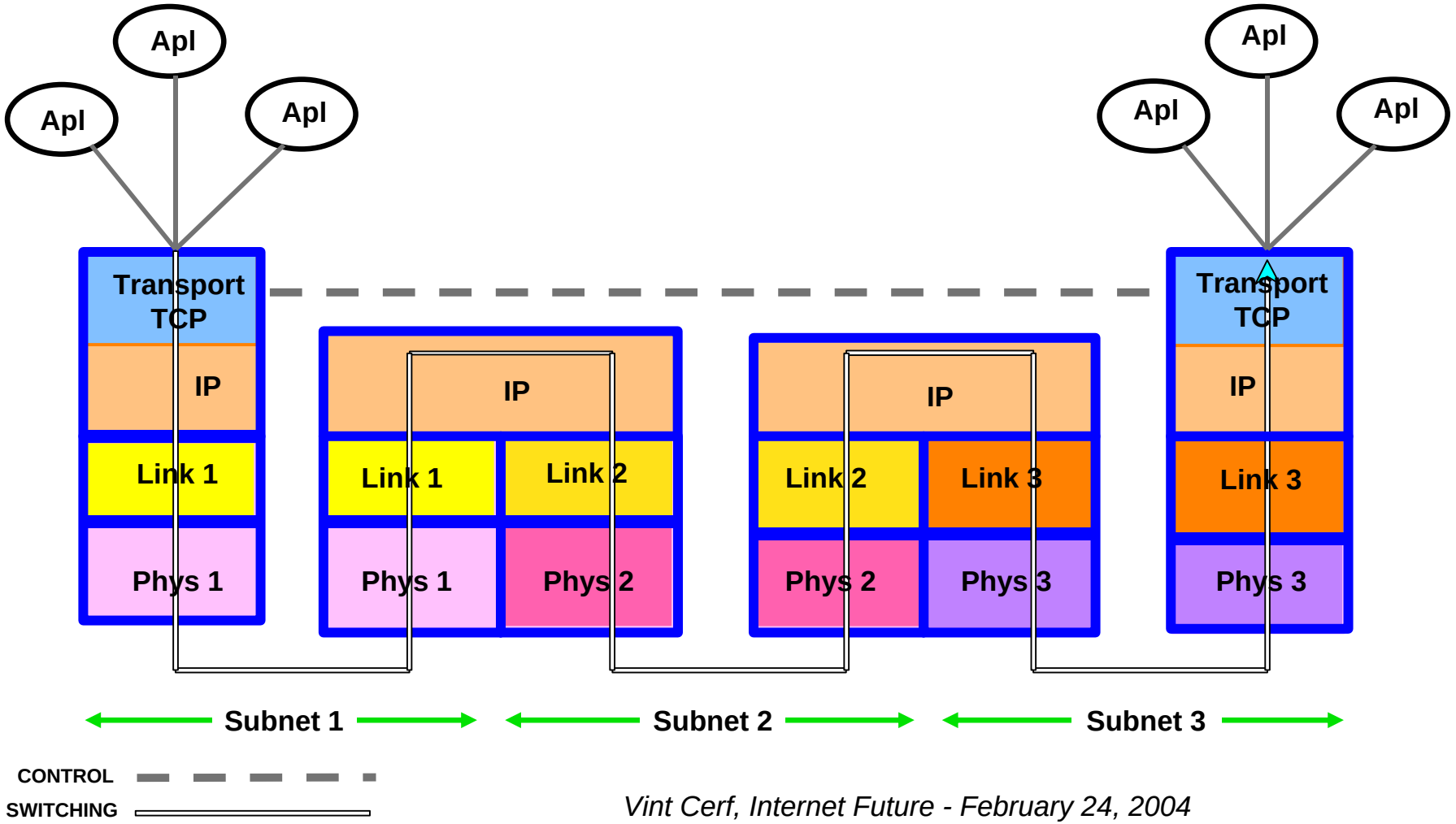
- Complexity: L2 bridges, PBB, L3 routers, MPLS/GMPLS
- Throughput/speed, congestion management, QoS
- Scalability, security, real time services

- UETS: The Simple Network
  - Reduces the complexity to an astonishing simplicity
- Increased throughput
  - Only two protocols (LLC/ETH) make, essentially, everything: Ethernet transports the information, LLC performs the control
- Scalability to trillions of users with existing protocol stack
  - Use of local MAC (LMAC) addresses hierarchically: >70 trillion

Computer and Communications Convergence

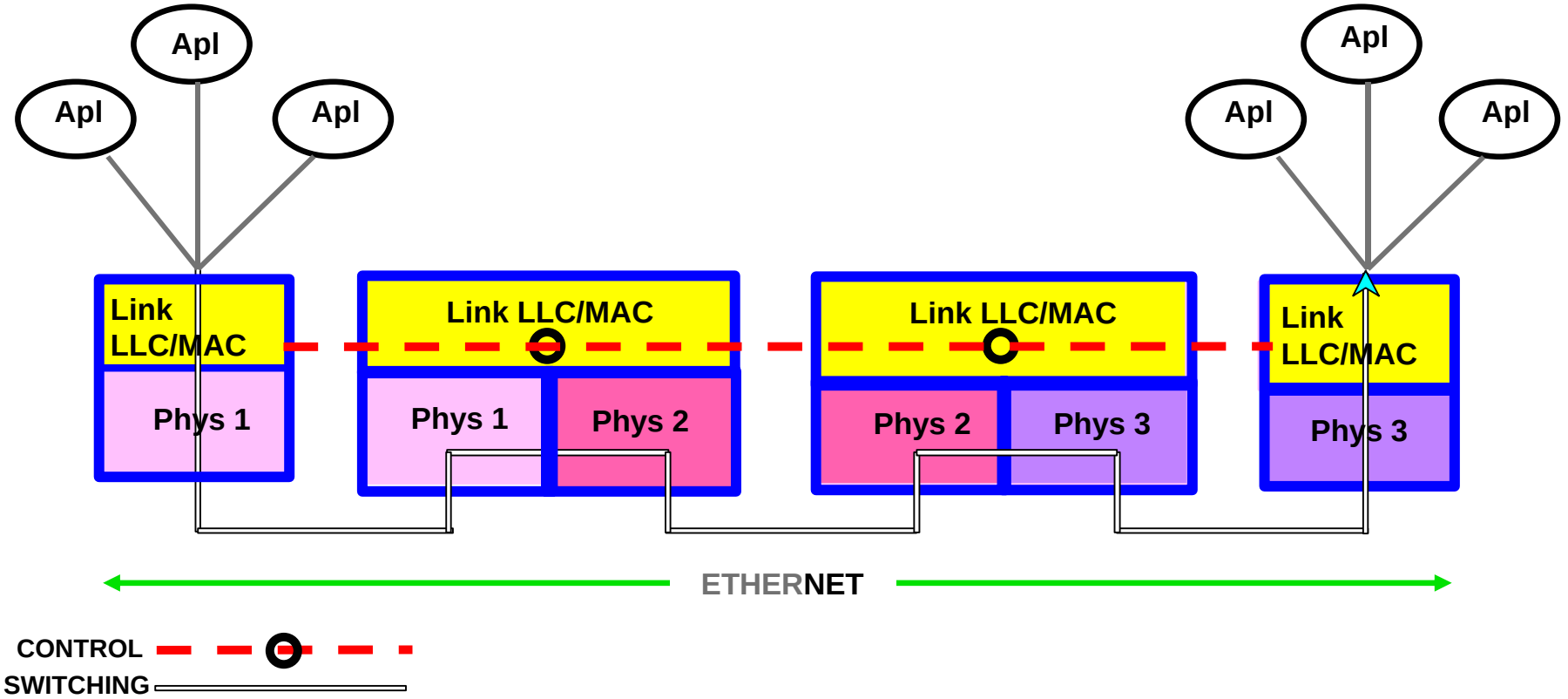


IP: the “Thin Waist” of the Earth’s Internet



Vint Cerf, Internet Future - February 24, 2004

UETS: the “ Thinnest Waist” of the Earth’s Internet



Research Objectives

- Extreme simplicity “Ultra Broadband Technology”
  - “Quadruple play” over a single network based in Ethernet
- Applications
  - LAN/MAN/WAN, Enterprise, ISP
  - Transport networks, Multipoint-to-Multipoint L2VPNs
  - Computer on Net
  - HDTV distribution, Home Networking, Grid
  - High Performance Computing
  - SAN/NAS, Network of Workstations
  - Secure networks

Research Approach, Methodology

- Building blocks
  - The internet applications provides the platforms' independence
    - Full compatibility with Internet applications and IP networks
  - Ethernet and IEEE protocols provide the connectivity
  - The physical switching provides security and scalability
- Features
  - Dual stack: full compatibility and interoperability with TCP/IP
  - Scalability from minimum UETS domain sizes to world size
  - High performance: direct hardware switching, minimum latency
  - Multipoint to multipoint datagrams network
  - Inherent layer two security, no spoofing or spanning tree attacks
  - Table-free, no label swapping, no spanning tree limitations
  - Power management for energy saving

6 BYTES (48 BITS)

I/G = INDIVIDUAL (O) OR GROUP (1) ADDRESS
U/L = GLOBAL (O) OR LOCAL (1) ADMINISTERED ADDRESS

IEEE 802.3 - Figure 3-2 - Address field format

LOCAL ADMINISTRATION

OCTET

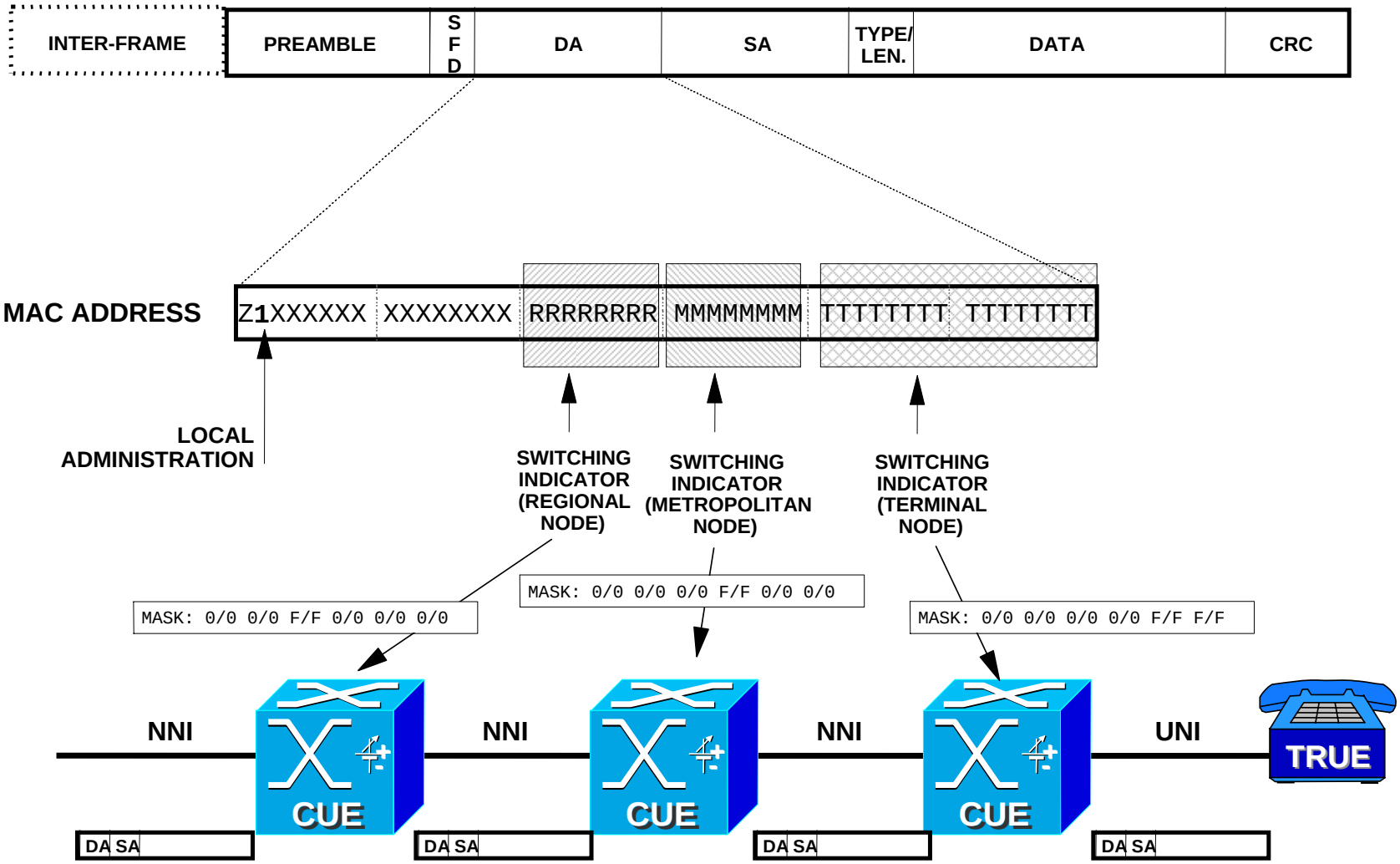
2^{46} = 70.368.744.177.664

I/G U/L

0	0	Individual / Universal	
1	0	Group / Universal	
0	1	0	Local Fixed
		1	**Local Mobile** → **4G: ETHoWi-Fi/WiMAX/3G**
1	1	Group / Local	

2^{45} = 35.184.372.088.832

Switching Indication: Example

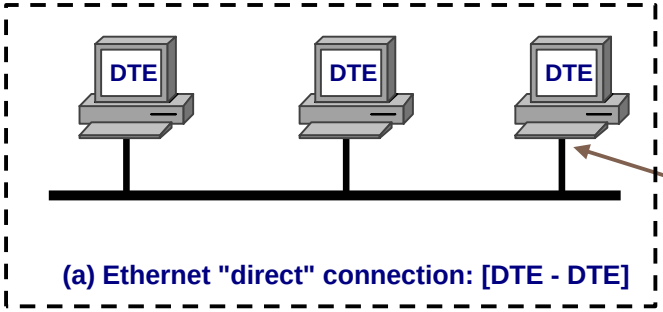


Energy Saving

- UETS original objective was saving power
  - Integrated power management system
- Terminals are not powered when they are not in use
  - Applied worldwide, will save in 2010 <> 40 nuclear plants
- Remote powering via the twisted pair from CO
  - Emergency calls service guaranteed by means of batteries
- European Conference on this subject:

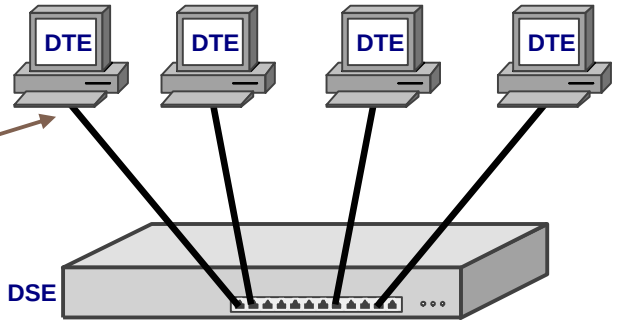
`http://www.lmdata.es/uets/etherforum-10-06-en.pdf`

UETS: a True Telecoms Service



(a) Ethernet "direct" connection: [DTE - DTE]

MAC address identifies the DTE



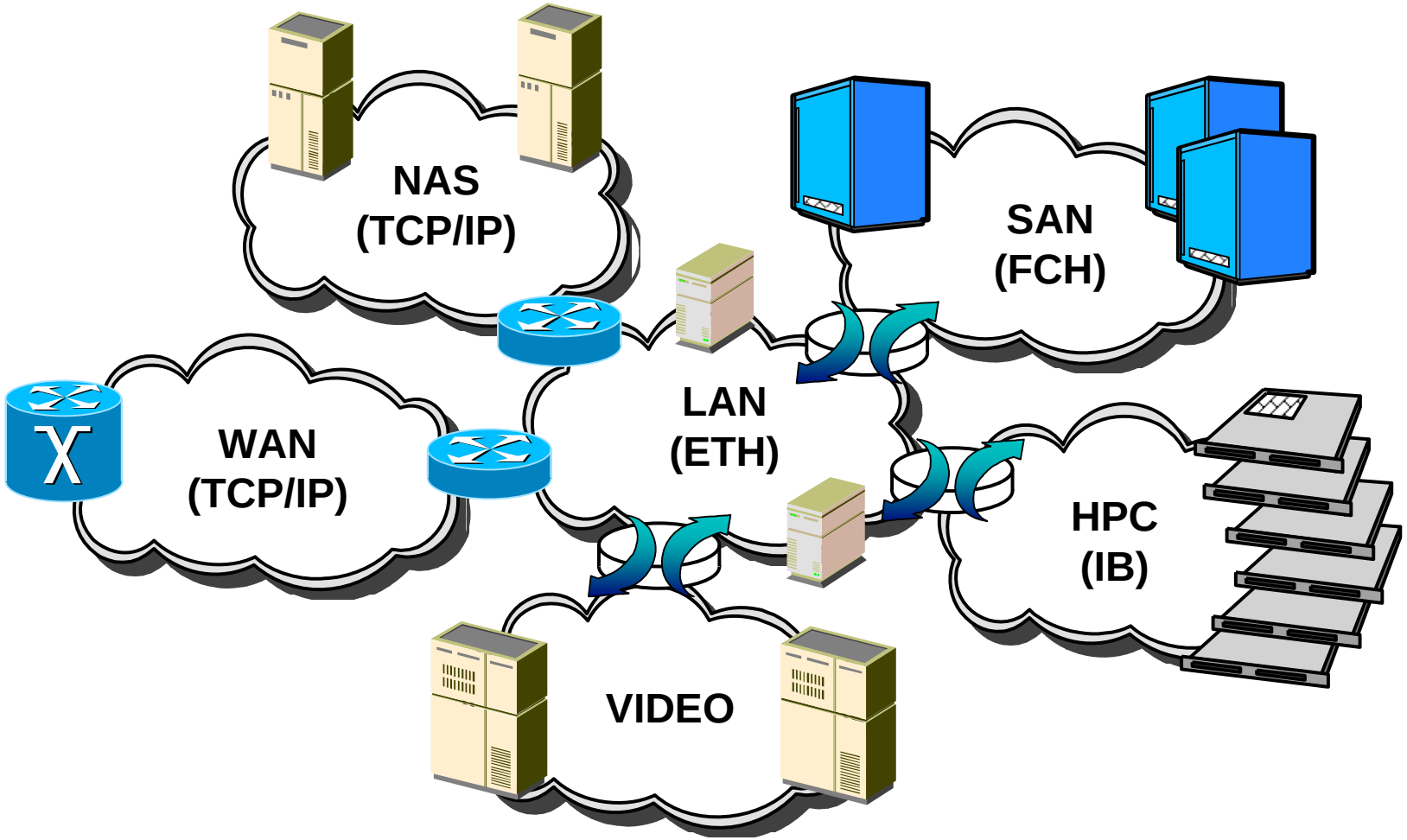
(b) Ethernet to MPR / bridge / switch: [DTE - DSE - DTE]

DTE - Data Terminal Equipment
DCE - Data Communications Equipment
DSE - Data Switching Equipment

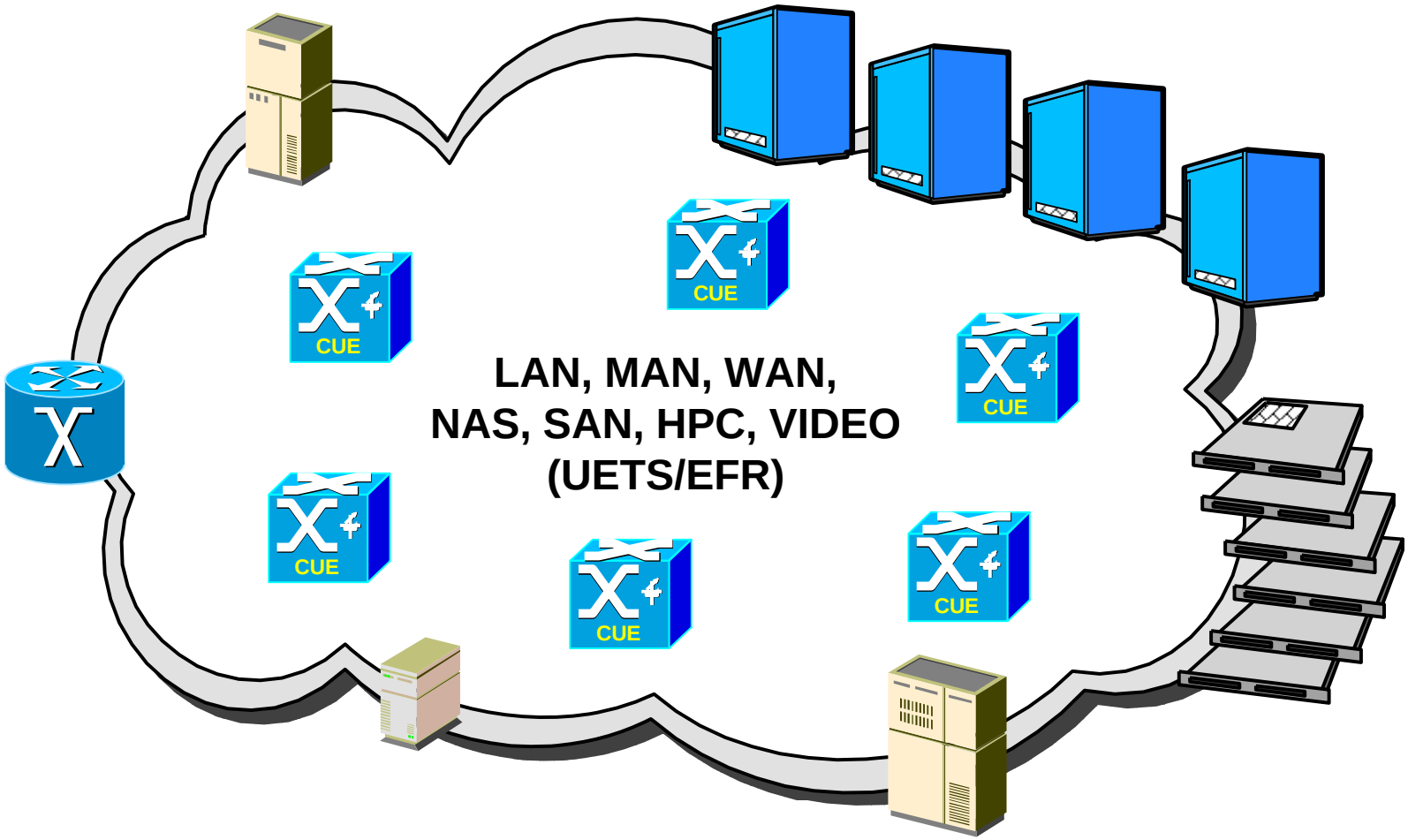
Local MAC address identifies the physical connection

(c) Ethernet connection in UETS: [DTE - DCE - DSE - DCE - DTE]

Today: Multiple Networks



UETS/EFR: Only ONE Network Technology



Conclusion and Outlook

- UETS/EFR is an extremely simple an efficient network technology
  - A SINGLE NETWORK (net), not a set of interconnected networks (internet)
    - Total compatibility and scalability without disruption
  - Offer LINK (layer 2 LLC) and NETWORK (layer 3 IP) services
    - It is unnecessary to migrate from Internet/TCP/IP
  - Data, REAL TIME and MOBILE services convergence efficient and secure
  - Full CONNECTIVITY to the IP domain to access Internet services

- We have the model, skilled people and knowledge to implement it
  - Just need the political/industrial ambition to create lobby and public support
- Europe missed some opportunities to lead the Internet revolution
  - Donald Davies (National Physics Lab, UK): packet switching
  - Louis Pouzin (CYCLADES, France): The catenet and datagram concepts
  - Tim Berners-Lee's (CERN, CH): world wide web
- We must not allowing to miss this European opportunity: UETS/EFR

UETS/EFR Page

http://www.LMdata.es/uets.htm

