Att planera för 10 Gigabit Ethernet

Standardiseringsläget inom IEEE

Cisco produkter med support för 10GE

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Standardiseringsläget inom IEEE

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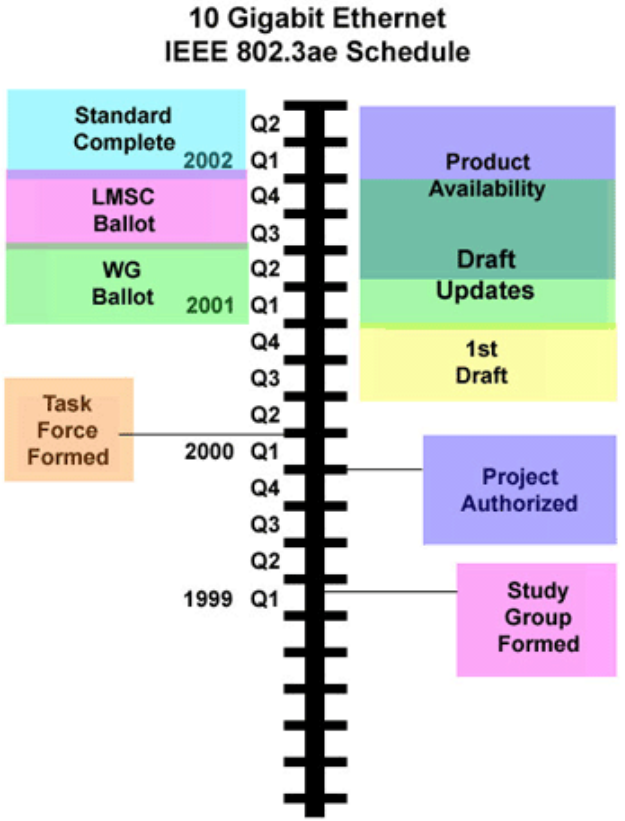
- June 17, 2002
- 10 Gigabit Ethernet Alliance Announces Official Ratification of 10 Gigabit Ethernet Standard
- IEEE 802.3ae Ratified With 100 Percent Approval



Standardiseringsläget inom IEEE

- **The IEEE 802.3ae Task Force is a standards group responsible for defining the technical specifications for the ”pending” 10 Gigabit Ethernet standard.**
- **The Task Force’s key goals include:**

  Preserve the Ethernet frame format, including minimum/maximum frame size

  Support full-duplex operation only

  Provide physical layer specifications that support link distances of at least:

  o 65 m over multimode fiber (MMF)

  o 300 m over installed MMF

  o 2 km over single mode fiber (SMF)

  o 10 km over SMF

  o 40 km over SMF

  Define two families of physical interfaces:

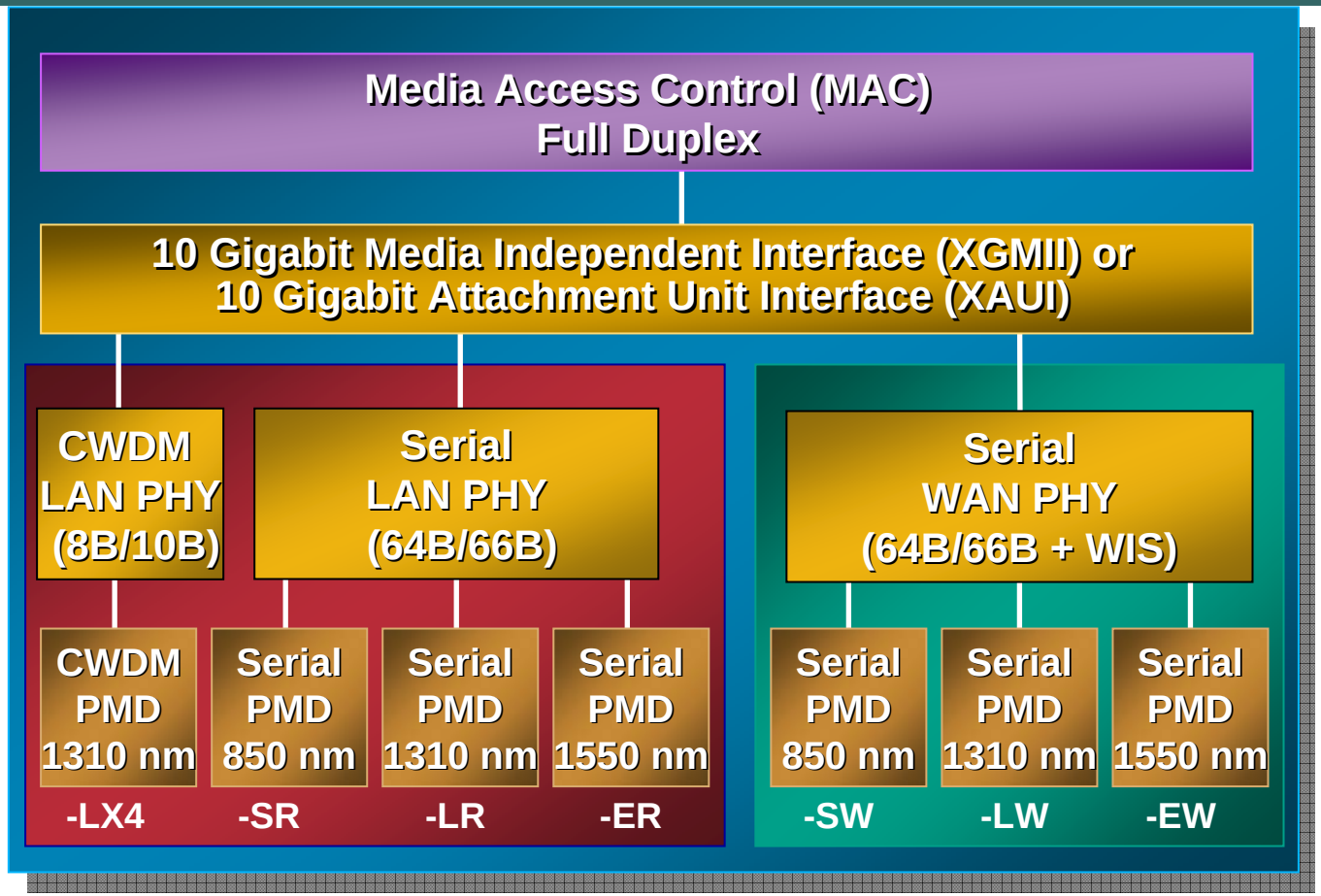
  o A LAN PHY operating at data rate of 10.000 Gbps

  o A WAN PHY operating at a data rate compatible with STS-192c/VC-4-64c (9,95 Gbps), adds SONET/SDH framing but not the SONET/SDH control channel

Standardiseringsläget inom IEEE

- **IEEE 802.3ae includes the following**
  - **10GBASE-SR/-SW, MMF (850nm) up to 300m**
  - **10GBASE-LX4, MMF (1310nm) up to 300m**
  - **10GBASE-LR/-LW, SMF (1310nm) up to 10km**
  - **10GBASE-ER/-EW, SMF (1550) up to 40km**

Introduction to 10 Gigabit Ethernet
10 GE Layer Diagram



CWDM= coarse WDM

PMD= physical media dependent sublayer or transceiver

WIS= WAN interface sublayer

PHY = physical layer

IEEE 802.3 Ethernet Working Group
Latest 10GE standard release

- **IEEE 802.3ak 10GBASE-CX4, approved by IEEE on 9th February 2004**
- **10 Gigabit Ethernet over Infiniband cables**
- **As defined by IEEE 802.3ak 15 m is the maximum range over twinaxial cable assemblies (Infiniband cables).**
- **Cisco offers 4 cables for the following distances:**

  CAB-INF-28G-1= : 1m

  CAB-INF-28G-5= : 5m

  CAB-INF-28G-10= : 10m

  CAB-INF-26G-15= : 15m

  (G represents the American Wire Gauge).

IEEE 802.3 Ethernet Working Group
Latest 10GE standard release

- **How does a 10GBASE-CX4 cable look like?**

IEEE 802.3 Ethernet Working Group
10 Gigabit Ethernet Work in progress

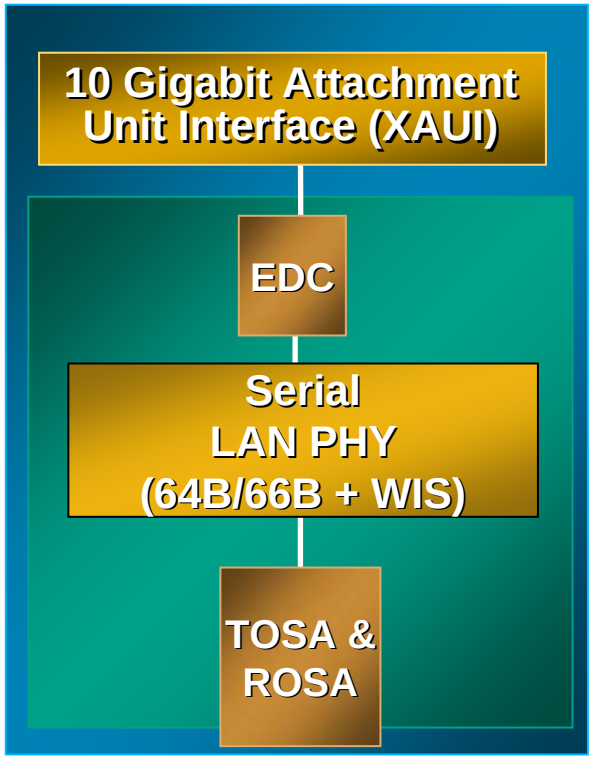
- **Task Forces/ Study Groups in Progress:**

  IEEE 802.3an: 10 GE on Category 5 or better UTP cabling

  IEEE 802.3aq: 10GBASE-LRM project for 10 GE on 220 meter of FDDI type MM Fiber

IEEE 802.3aq: 10GBASE-LRM Project

- Goal: cheaper 62.5 MMF 10 Gigabit Ethernet solution than LX4
- Design: LR optic plus (a) electronics or (b) optical correction
- Timing: samples late CY'05
- Study Group/TF formed Nov 2003 in IEEE
- Cisco is committed to -LX4, no plans to support LRM *
- Standard CY2006



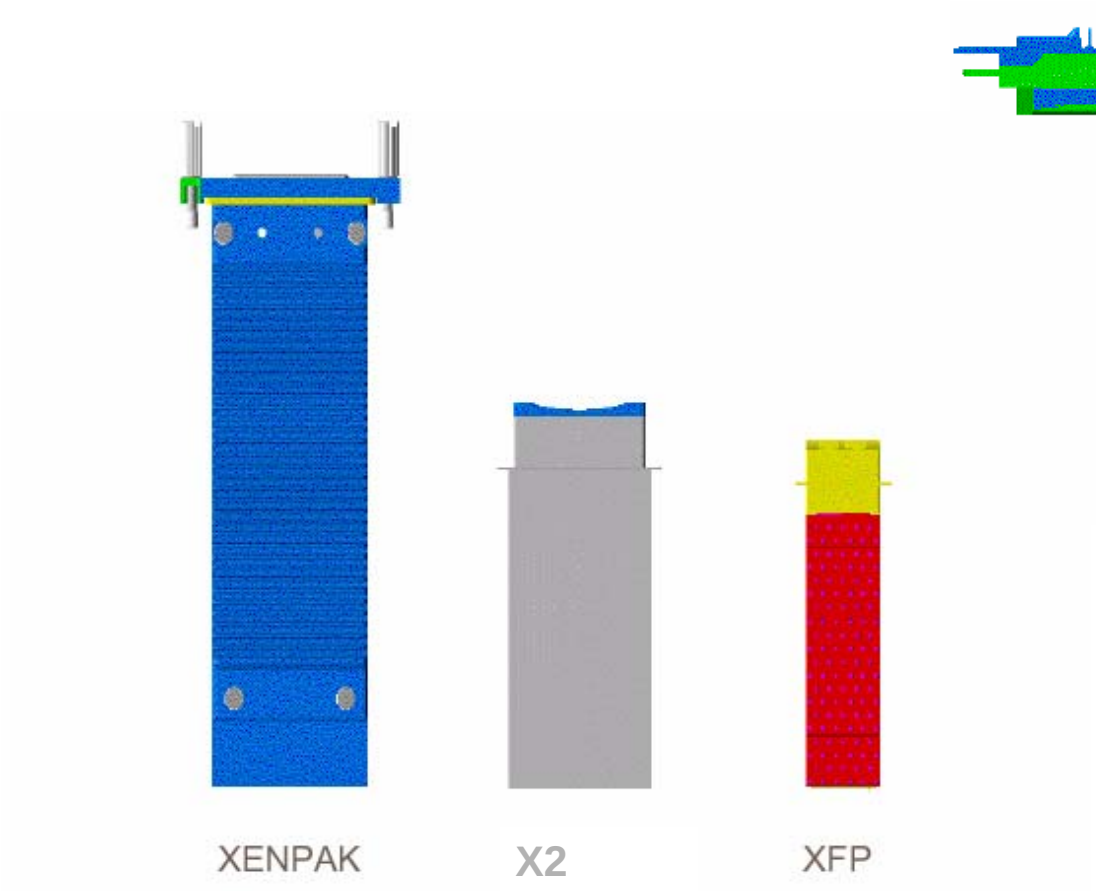
IEEE 802.3an: 10GBASE-T Project

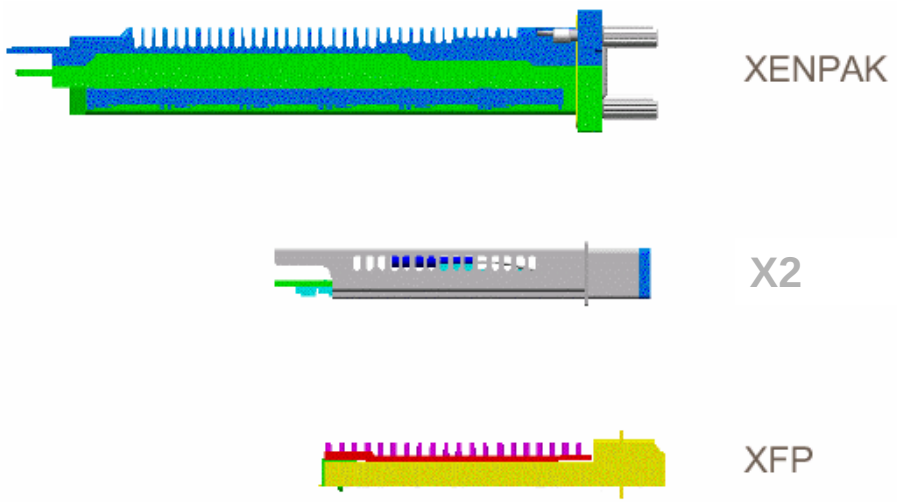
- **Goal: Define a single 10 Gbps PHY that would support links of:**
  - 100 meters on 4-pairs Class F (Category 7)
  - 55-100 meters on 4-pairs Class E (Category 6)
- **Goal: Support operation over 4-connector structured 4-pair, twisted-pair copper cabling for all supported distances and Classes**
- **Study Group formed November 2002, standard mid 2006**
- **Status: Products are far off because high power consumption**
- **Concerns: The technology will develop slowly because:**
  - Customers will need Cat6 or better cabling.
  - There will not be high density solution since the PHYs consume so much power.
- **Work is going on to see if Class D (Category 5e) cables can support 10GBASE-T, problem is crosstalk etc.**

IEEE 802.3 Ethernet Working Group
What Comes Next?

- No discussion or activity in 802.3 standards process on 40GE or 100GE
- Some discussions and investigations going on in industry
  - 40G serial up to 2 or 3 km
  - 4 X 10G using WDM up o 10km
  - 8 X 10G using WDM up to 10km
- Questions:
  - Are longer distances needed
  - Is MM fiber support needed
  - Is ITU grid support needed

10 Gigabit Ethernet Pluggable Optics





(courtesy JDSU)

Pictures show actual scaled comparisons between the form factors.

Cisco produkter med 10 Gigabit Ethernet support

Switchar (1)

- **Catalyst 3750**

Catalyst 3750 16 10/100/1000BT+ 10GbE (req XENPAK) Enh

Catalyst 3750 16 10/100/1000BT+ 10GbE (req XENPAK) Std

- **Catalyst 4500**

The Catalyst 4500 is ready for 10GE and 10GE products are coming*

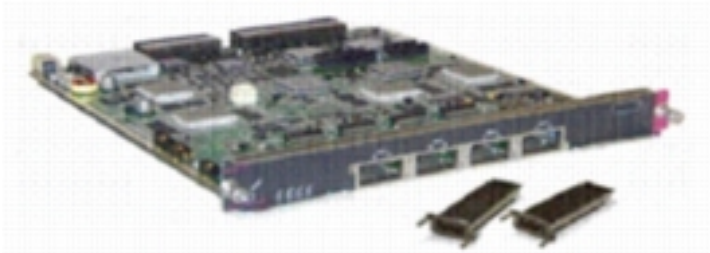
Switchar (2)

- **Catalyst 6500**

  The first 1-port 10GE IEEE 802.3ae compliant module was released September 5, 2001. Fixed optics

  Cat6500 4-port 10 Gigabit Ethernet Module (req. XENPAKs)

  Cat6500 2-port 10 Gigabit Ethernet Module (req. XENPAKs) with ”WAN-type” buffer capacity for traffic shaping etc.



Routrar

- **CRS-1**

  Cisco CRS-1 Carrier Routing System 8-port 10 Gigabit Ethernet Interface Card

- **Cisco 12000**

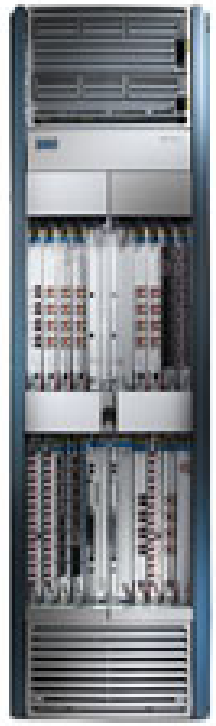
  Cisco 12000 1-Port 10GE Card, 1310nm serial, 10km

  Cisco 12000 1-Port 10GE Card, 1550nm serial, 40km

- **Cisco 7600**

  Cat6500 4-port 10 Gigabit Ethernet Module (req. XENPAKs)

  Cat6500 2-port 10 Gigabit Ethernet Module (req. XENPAKs) with ”WAN-type” buffer capacity for shaping etc.



10GE Pluggable Optics

- 10GBASE-ER XENPAK Module
- 10GBASE-LR XENPAK Module
- 10GBASE-LX4 XENPAK Module
- 10GBASE-SR XENPAK Module
- 10GBASE-CX4 XENPAK Module*

- X2 Optics are evaluated *