Standards Update

by

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NORDX/CDT

Outline

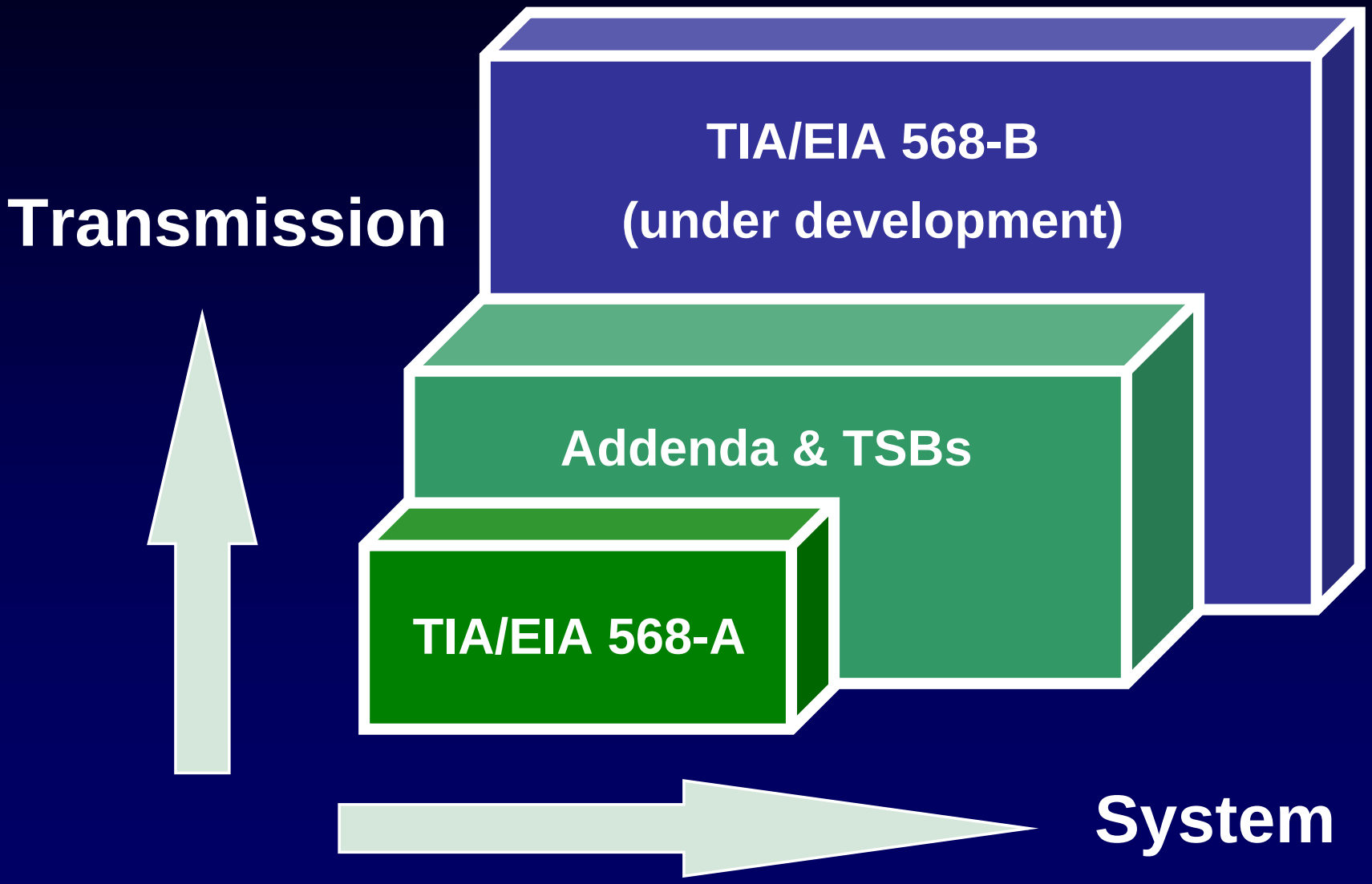
- Standards overview
- Category 5e cabling
  - new transmission parameters
  - patch cord return loss
- Category 6 cabling
  - cable choices
  - backwards compatibility
- Summary


TELECOMMUNICATIONS
TIA
INDUSTRY ASSOCIATION

TIA Organization

- TR 42 Telecommunications Infrastructure
  - TR 42.1 Commercial Building Cabling
  - TR 42.2 Residential Cabling
  - TR 42.3 Pathways & Spaces
  - TR 42.4 Customer Owned Outside Plant
  - TR 42.5 Terminology
  - TR 42.6 Cabling Administration
  - TR 42.7 Copper Cabling Systems
  - TR 42.8 Optical Fiber Cabling Systems

Cabling Standards



Additions to Standards

- ✓ **TSB-67**
  - – Field testing
- ✓ **TSB-72**
  - – Centralized fiber cabling
- ✓ **TSB-75**
  - – Cabling practices for open offices
- • **TSB-95**
  - – Recommendations for installed Category 5 cabling

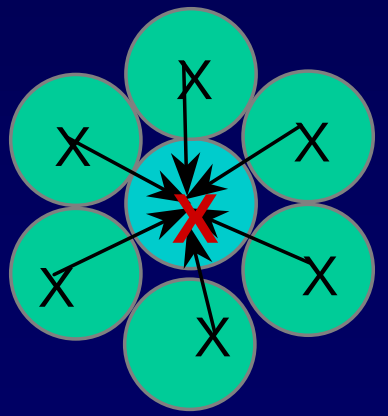
Additions to Standards (cont.)

- ✓ **Addendum 1**
  - – Propagation Delay and Delay Skew
- ✓ **Addendum 2**
  - – NEXT of Connecting Hardware
- ✓ **Addendum 3**
  - – Hybrid cable and bundled cable req’ts.
- • **Addendum 4**
  - – Test method & req’ts. for patch cords
- • **Addendum 5**
  - – Enhanced Category 5 cabling

TIA 568-A Addendum #3

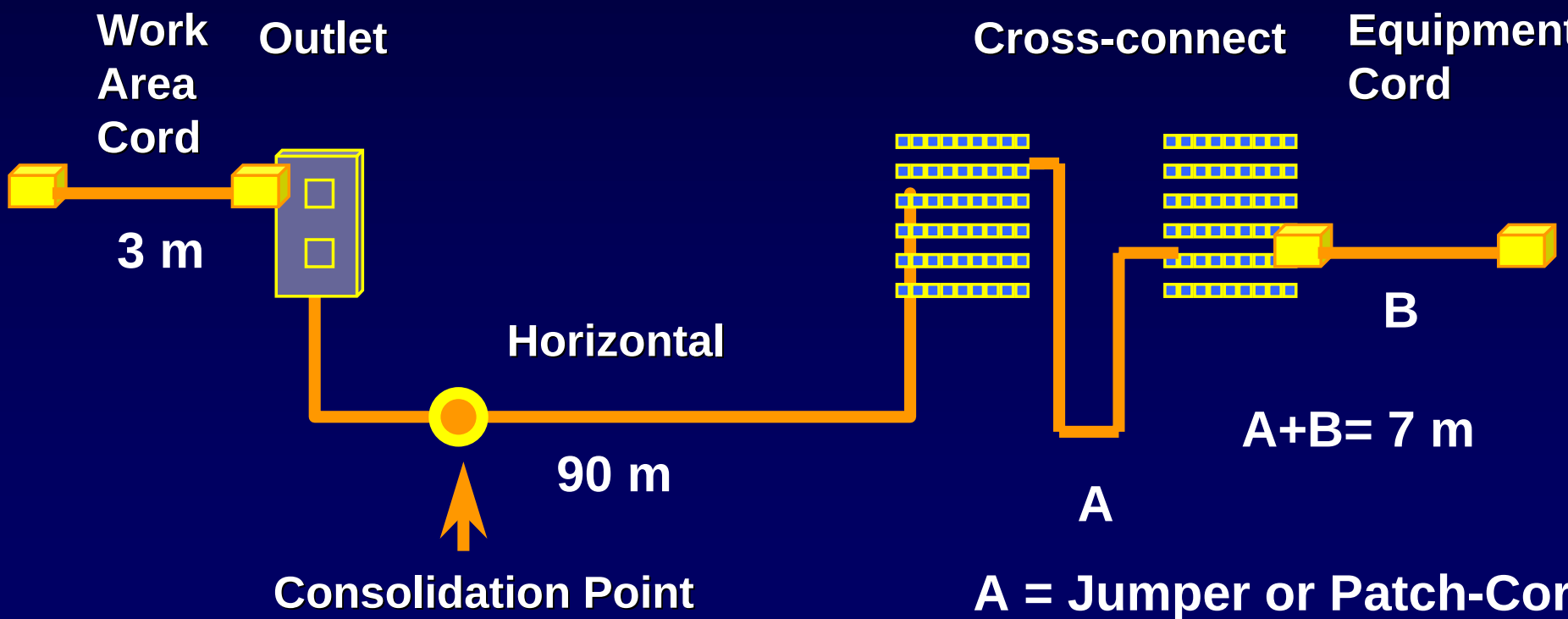
Bundled & Hybrid Cables

- The worst pair power sum NEXT loss between cables shall be 3 dB better than the specified worst pair-to-pair NEXT within any cable
  - recently published
  - reviewed by IEEE 802.3
  - acceptable for 1000BASE-T



Worst Case Channel Model

4-Connector Topology



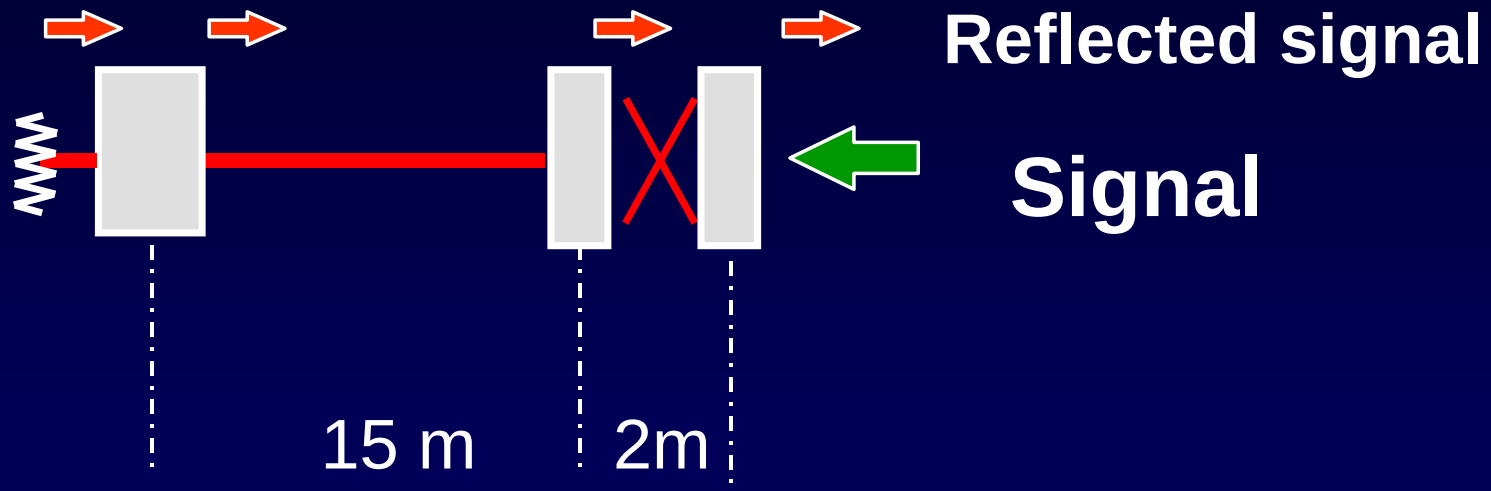
Category 5 & 5e Performance

Test Parameter	*Category 5 (TSB 95)*	*Category 5e (TIA 568-A-5)*
PS NEXT	not specified	≥ 27.1 -17log(f/100) dB
ELFEXT	≥17 - 20log(f/100) dB	≥17.4 - 20log(f/100) dB
PSELFEXT	≥14.4 - 20log(f/100) dB	≥14.4 - 20log(f/100) dB
Return Loss		
1 ≤ f < 20	15 dB	17 dB
20 ≤ f ≤ 100	15 -10log(f/20)	17 -10log(f/20)

TIA 568-A Addendum #5

- Hot Issues
  - Return Loss
- TIA Press Release Warning!!
  - Category 5e channel failures
  - Patch cords
  - Tester inaccuracy
  - Mismatched components
- Category 5e standard is delayed till 4Q99

What is Return Loss?

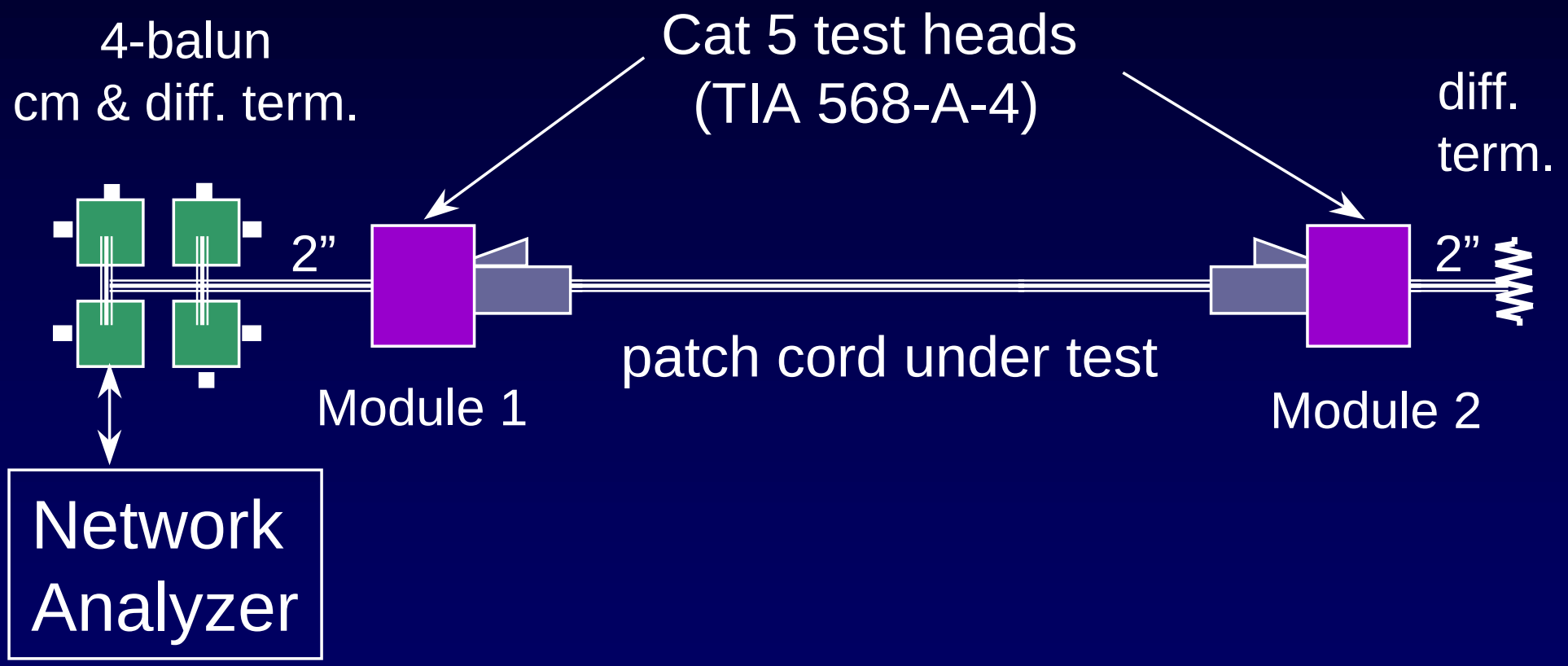


Return Loss is a measure of
the reflected signal energy in dB

More on Return Loss

- Patch Cords
  - Patch cords from different manufacturers do not have the same impedance
  - Cables & cords need to be impedance matched within +/- 5 Ohms to ensure Category 5e compliance
  - Many designs of flexible, stranded cords exhibit unstable performance
  - reading changes when cord is flexed

Patch Cord Return Loss Test



Patch Cord Return Loss Test

- Test Requirements
  - 1 to 20 MHz: 25 dB
  - 20 to 100 MHz: 25 -10*log(f/20)
- Tested in different orientations
  - stretched out
  - twisted +/- 360 degrees
  - coiled forward direction
  - coiled reverse direction

Cabling Evolution

Category 6

Enhanced
Category 5

Category 5

Next Gen. Fiber

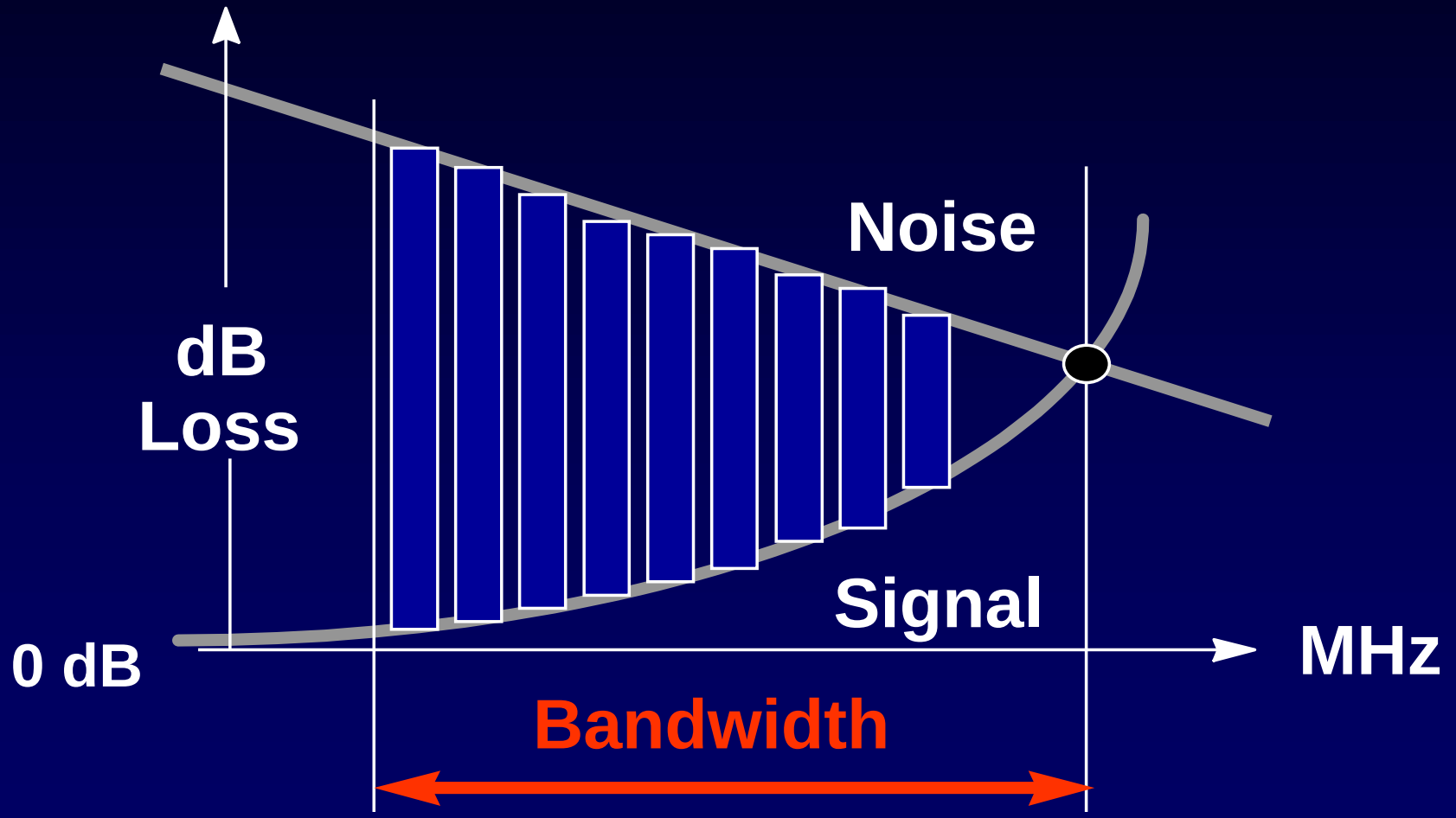
50 µm MM Fiber

62.5 µm MM Fiber

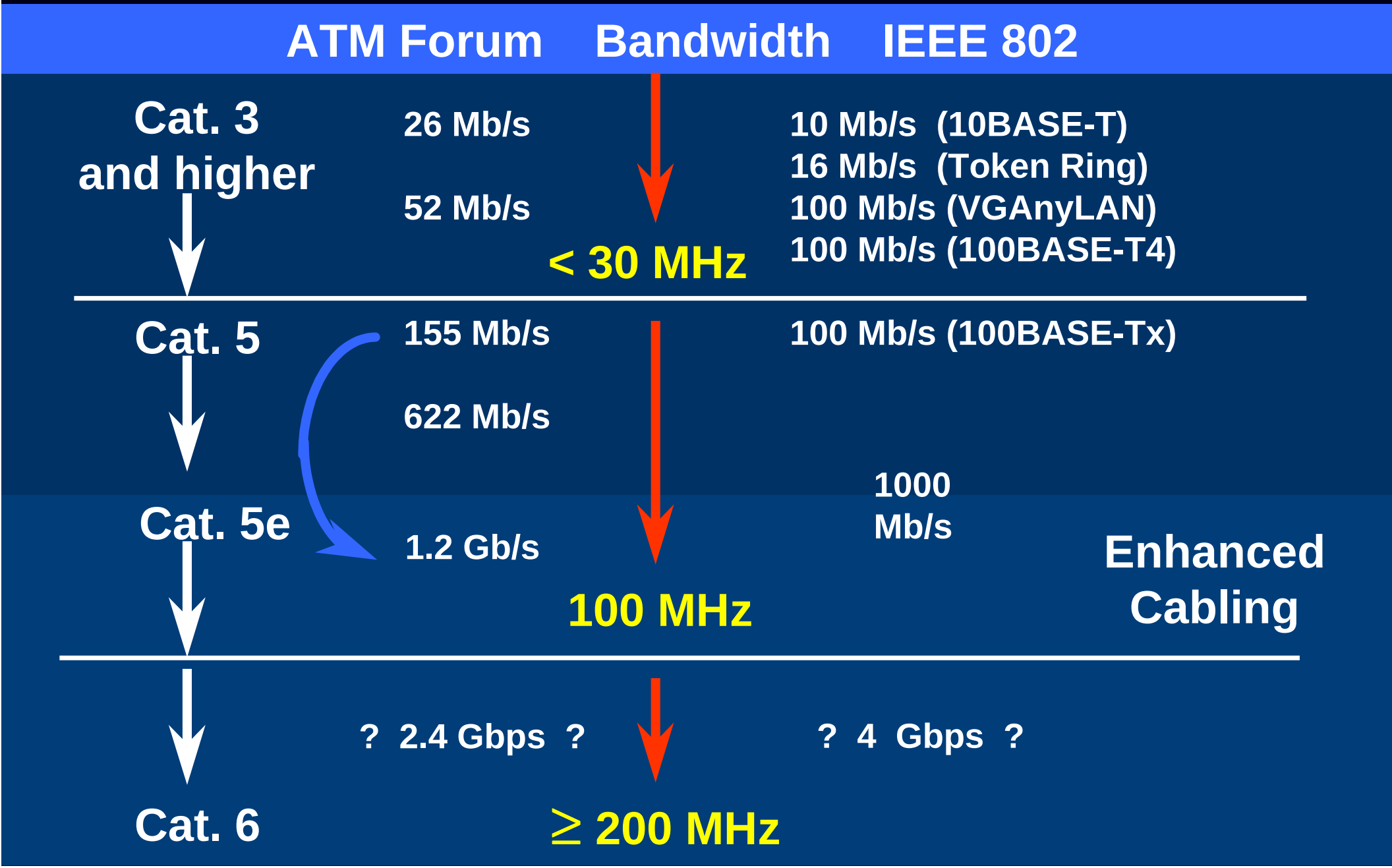
Cabling Choice

- Category 5 cabling
  - Was introduced in the early 90's
  - Data-rate capacity tops out at 1 Gbps
- Future cabling
  - Will need to support multi-gigabit data-rates
  - Must perform in the network infrastructure well into the next millennium

Key Transmission Parameters



LAN Evolution

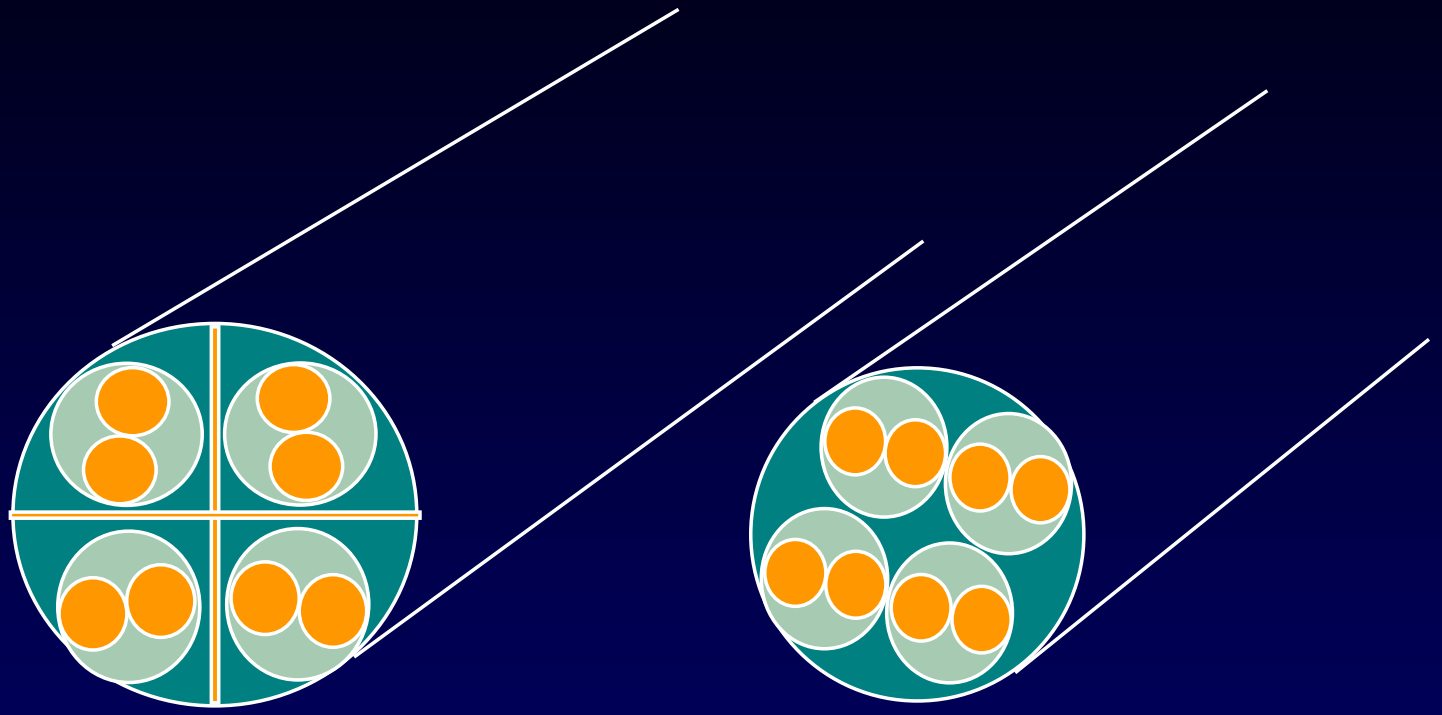


Next Generation Cabling

Category 6 (ISO/IEC & TIA)

- Intended for future applications
- Increased channel bandwidth
  - At least 200 MHz
- Two cable options under study (6A & 6B)
- Same 8-pin modular connector (“RJ45”)
- Backwards compatible with Category 5 / 5e

Cable Options



Category 6B

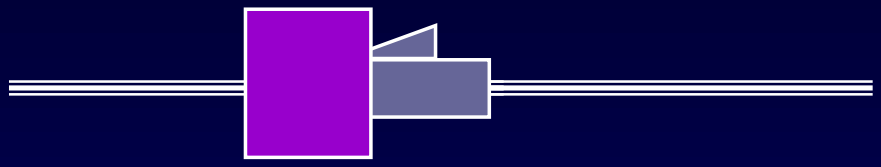
0.6mm copper
X web filler
stable position

Category 6A

0.5 mm copper
pair proximity
pair displacement

Backwards Compatibility

Mated Connection



Jack	Plug	
Cat. 5e	Cat. 6	≥ Cat. 5e
Cat. 6	Cat. 5e	≥ Cat. 5e

Gigabit Ethernet Cabling Fallout

Gigabit Ethernet has restored the mystery to network cabling.

- **1000BASE-X**
  - Fiber optic bandwidth vs distance ??
  - Multimode?? Single mode??
  - Mode-conditioning patch cord ??
- **1000BASE-T**
  - What copper Category ???

Summary

- A useful standard is a living document that grows to meet the needs of the industry it serves
  - TIA TR-42 is motivated to advance the state of the art for telecommunications cabling
  - cabling evolution is driven by new applications and the ever increasing demand for bandwidth
  - The more we progress, the more we realize how little we know and the more there is know