



Generic 1-pair Topology considerations

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Background

There are several single pair applications from IEEE 802.3 with different reach objectives as shown below;

Application	IEEE 802.3 TF	Data rate	Distance	No of Conn	Frequency	DOP
10SPE	802.3cg	10 Mb/s	1000 m	10	0.1-20 MHz	June 2019
100BASE-T1	802.3bw	100 Mb/s	15 m	4	1-100 MHz	2015
1000BASE-T1 type A	802.3bp	1000 Mb/s	15 m	4	1-600 MHz	2016
1000BASE-T1 type B	802.3bp	1000 Mb/s	40 m	4	1-600 MHz	2016
PoDL	802.3bu	50 W	15 m (extendable)			2016
NGAUTO	SG	2.5, 5, 10 Gb/s	15 m	4	1-2000 MHz	TBD

While each is a specialized application, TIA/ISO cabling standards generally attempt to specify generic cabling using a common topology

Structured Cabling History

- Structured cabling came into being in 1991 around the same time as the first IEEE 10BASE-T Ethernet application
- Balanced cabling has evolved with the applications to develop Category 5, 5e, 6, 6A, and 8 to keep up to the demands of higher speed applications
- Standardized generic cabling has proved to be a popular stable platform for applications and customers with several billion meters installed around the globe

Desired specifications for Single-Pair

Transmission Specifications

- Insertion Loss
- Return Loss

EMC-related

- Balance (TCTL, ELTCTL)
- Coupling Attenuation

Crosstalk-related

- Alien PSANEXT
- Alien PSAACRF (alien FEXT)

Reach break-down by standard and Category

15m:

- 802.3bw will work with < 100 MHz performance specified
- 802.3bp drives Cat6a-like specifications (~500 MHz specified)
- Multi-gig applications likely to drive from Cat6a (500MHz) to Cat8-like (2 GHz) specifications

40m: 802.3bp “Type B” drives Cat6a-like + enhanced alien crosstalk specs

- Cat6a specifications for alien crosstalk are sufficient
- Shielding likely in harsh environments

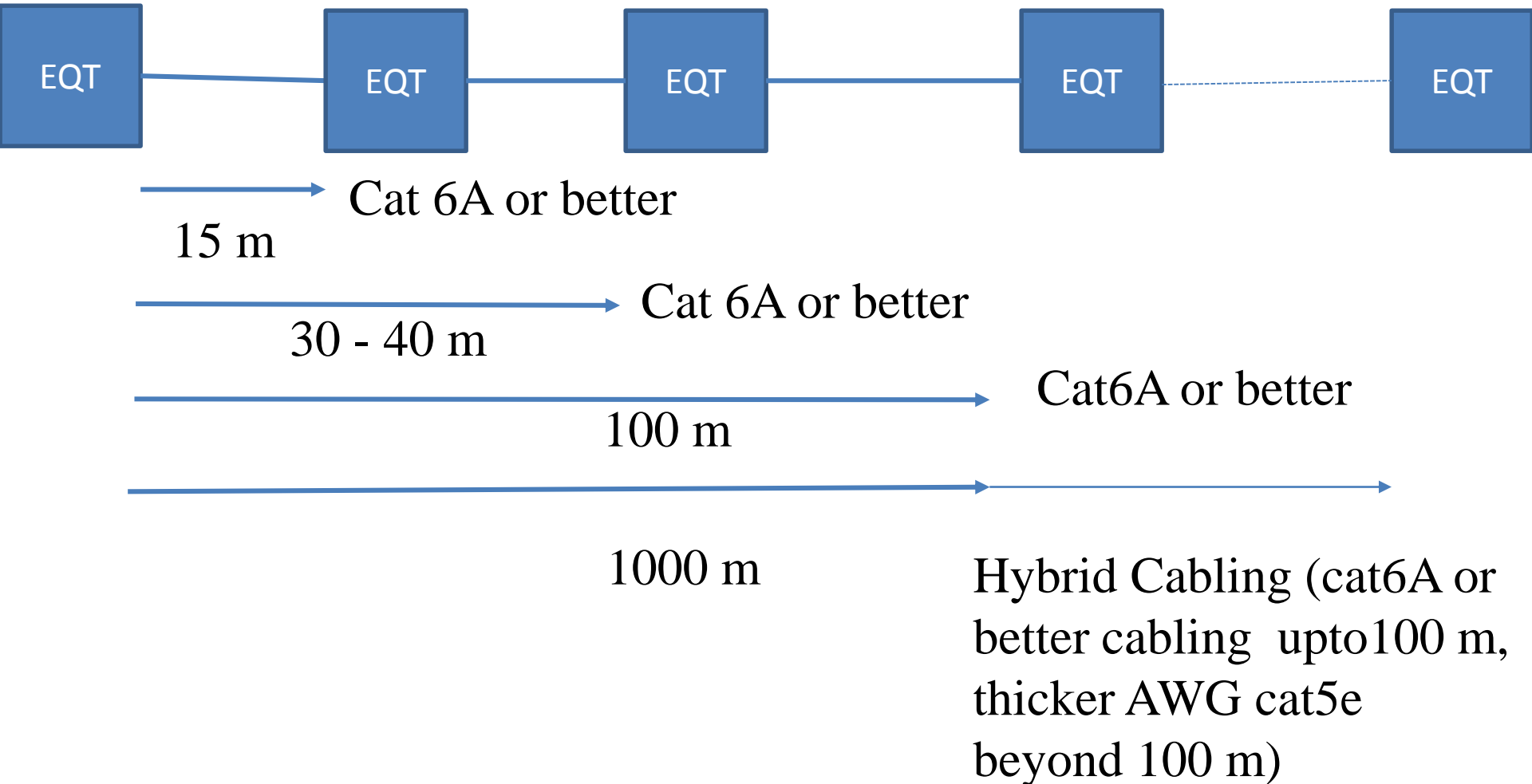
100m: No IEEE single pair applications yet

- 4-pair technology path suggests bandwidth to 500 MHz is useful at this reach

1000m: 802.3cg likely to drive hybrid cabling due to application

- Bandwidth unclear, but likely << 100MHz
- High EMI environment drives good balance and/or shielding

Reach Zone Approach



Impact on IEEE 802.3cg link segment

- Transmission performance of first 100 m inside a building will be improved to Category 6A or better
- The cable will be typical 23 AWG with higher IL to allow for dense and compact installation inside buildings
- The rest of the 900 m link segment will support the current proposal in the task force and improve transmission parameters to Category 5e
- RL of the combined 1000 m link segment will be compliant to current 802.3cg link segment