Item	Feature	Subclause	Status	Support	Value/comment
12	Organizationally Unique Identifier Message Code	28C.6	NP:M		Followed by 4 Unformatted Pages. First Unformatted Page contains most significant 11 bits of OUI (bits 23:13) with MSB in U10; Second Unformatted Page contains next most significant 11 bits of OUI (bits 12:2), with MSB in U10; Third Unformatted Page contains the least significant 2 bits of OUI (bits 1:0) with MSB in U10, bits U8:0 contains user-defined code specific to OUI; Fourth Unformatted Page contains user-defined code specific to OUI
13	PHY Identifier Message Code	28C.7	NP:M		Followed by 4 Unformatted Pages. First Unformatted Page contains most significant 11 bits of PHY ID (2.15:5) with MSB in U10; Second Unformatted Page contains PHY ID bits 2.4:0 to 3.15:10, with MSB in U10; Third Unformatted Page contains PHY ID bits 3.9:0, with MSB in U10, and U0 contains user-defined code specific to PHY ID; Fourth Unformatted Page contains user-defined code specific to PHY ID
14	Auto-Negotiation reserved code 2	28C.8	NP:M		Transmission of M10 to M0 equals 1, not permitted

28.6 Auto-Negotiation expansion

Auto-Negotiation is designed in a way that allows it to be easily expanded as new technologies are developed. When a new technology is developed, the following things must be done to allow Auto-Negotiation to support it:

a) The appropriate Selector Field value to contain the new technology must be selected and allocated.
b) A Technology bit must be allocated for the new technology within the chosen Selector Field value.
c) The new technology's relative priority within the technologies supported within a Selector Field value must be established.

Code space allocations are enumerated in annexes 28A, 28B, and 28C. Additions and insertions to the annexes are allowed. No changes to existing bits already defined are allowed.

29. System considerations for multi-segment 100BASE-T networks

29.1 Overview

This clause provides information on building 100BASE-T networks. The 100BASE-T technology is designed to be deployed in both homogenous 100 Mb/s networks and heterogeneous 10/100 Mb/s mixed CSMA/CD networks. Network topologies can be developed within a single 100BASE-T collision domain, but maximum flexibility is achieved by designing multiple collision domain networks that are joined by bridges and/or routers configured to provide a range of service levels to DTEs. For example, a combined 100BASE-T/10BASE-T system built with repeaters and bridges can deliver dedicated 100 Mb/s, shared 100 Mb/s, dedicated 10 Mb/s, and shared 10 Mb/s service to DTEs. The effective bandwidth of shared services is controlled by the number of DTEs that share the service.

Linking multiple 100BASE-T collision domains with bridges maximizes flexibility. Bridged topology designs can provide single bandwidth (figure 29-1) or multiple bandwidth (figure 29-2) services.

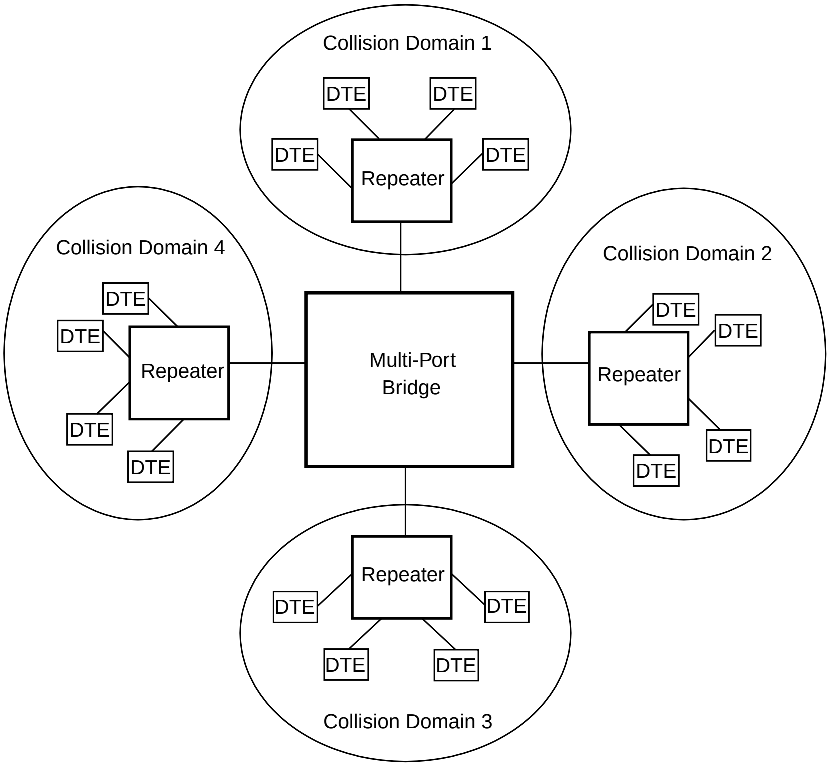

Figure 29-1—100 Mb/s multiple collision domain topology using multi-port bridge

Individual collision domains can be linked by single devices (as shown in figures 29-1 and 29-2) or by multiple devices from any of several transmission systems. The design of multiple-collision-domain networks is governed by the rules defining each of the transmission systems incorporated into the design.

The design of shared bandwidth 10 Mb/s collision domains is defined in clause 13; the design of shared bandwidth 100 Mb/s CSMA/CD collision domains is defined in the following subclauses.

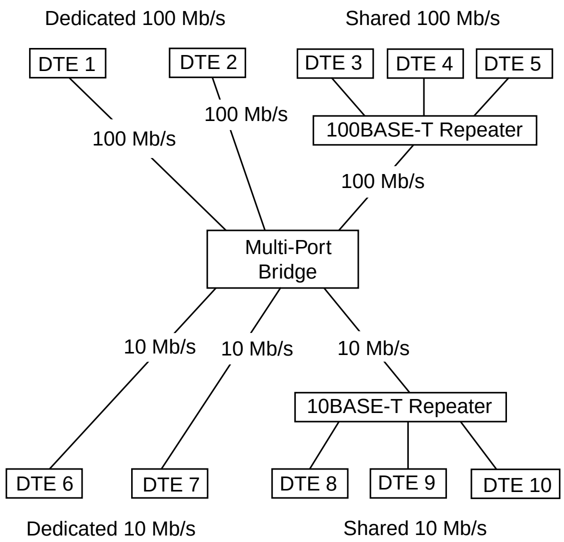

Figure 29-2—Multiple bandwidth, multiple collision domain topology using multi-port bridge

29.1.1 Single collision domain multi-segment networks

This clause provides information on building 100 Mb/s CSMA/CD multi-segment networks within a single collision domain. The proper operation of a CSMA/CD network requires the physical size and number of repeaters to be limited in order to meet the round-trip propagation delay requirements of 4.2.3.2.3 and 4.4.2.1 and IPG requirements specified in 4.4.2.1.

This clause provides two network models. Transmission System Model 1 is a set of configurations that have been validated under conservative rules and have been qualified as meeting the requirements set forth above. Transmission System Model 2 is a set of calculation aids that allow those configuring a network to test a proposed configuration against a simple set of criteria that allows it to be qualified. Transmission System Model 2 validates an additional broad set of topologies that are fully functional and do not fit within the simpler, but more restrictive rules of Model 1.

The physical size of a CSMA/CD network is limited by the characteristics of individual network components. These characteristics include the following:

a) Media lengths and their associated propagation time delay
b) Delay of repeater units (start-up, steady-state, and end of event)
c) Delay of MAUs and PHYs (start-up, steady-state, and end of event)
d) Interpacket gap shrinkage due to repeater units
e) Delays within the DTE associated with the CSMA/CD access method
f) Collision detect and deassertion times associated with the MAUs and PHYs

Table 29-1 summarizes the delays for 100BASE-T media segments. For more detailed information on the delays associated with individual 100BASE-T components, see

MII:	annex 22A
100BASE-T4:	23.11
100BASE-TX:	annex 24A
100BASE-FX:	annex 24A

Repeater: 27.3

Table 29-1—Delays for network media segments Model 1

Media type	Maximum number of PHYs per segment	Maximum segment length (m)	Maximum medium round-trip delay per segment (BT)
Balanced cable Link Segment 100BASE-T	2	100	114
Fiber Link Segment	2	412	412

29.1.2 Repeater usage

Repeaters are the means used to connect segments of a network medium together into a single collision domain. Different physical signaling systems (e.g., 100BASE-T4, 100BASE-TX, 100BASE-FX) can be joined into a common collision domain using repeaters. Bridges can also be used to connect different signaling systems; however, if a bridge is so used, each system connected to the bridge will be a separate collision domain.

Two types of repeaters are defined for 100BASE-T (see clause 27). Class I repeaters are principally used to connect unlike physical signaling systems and have internal delays such that only one Class I repeater can reside within a single collision domain when maximum cable lengths are used (see figure 29-4). Class II repeaters typically provide ports for only one physical signaling system type (e.g., 100BASE-TX but not 100BASE-T4) and have smaller internal delays so that two such repeaters may reside within a given collision domain when maximum cable lengths are used (see figure 29-6). Cable length can be sacrificed to add additional repeaters in a collision domain (see 29.3).

29.2 Transmission System Model 1

The following network topology constraints apply to networks using Transmission System Model 1.

a) All balanced cable (copper) segments less than or equal to 100 m each.
b) Fiber segments less than or equal to 412 m each.
c) MII cables for 100BASE-T shall not exceed 0.5 m each. When evaluating system topology, MII cable delays need not be accounted for separately. Delays attributable to the MII are incorporated into DTE and repeater component delays.

29.3 Transmission System Model 2

The physical size and number of topological elements in a 100BASE-T network is limited primarily by round-trip collision delay. A network configuration must be validated against collision delay using a network model. Since there are a limited number of topology models for any 100BASE-T collision domain, the modeling process is quite straightforward and can easily be done either manually or with a spreadsheet.

The model proposed here is derived from the one presented in 13.4. Modifications have been made to accommodate adjustments for DTE, repeater, and cable speeds.

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