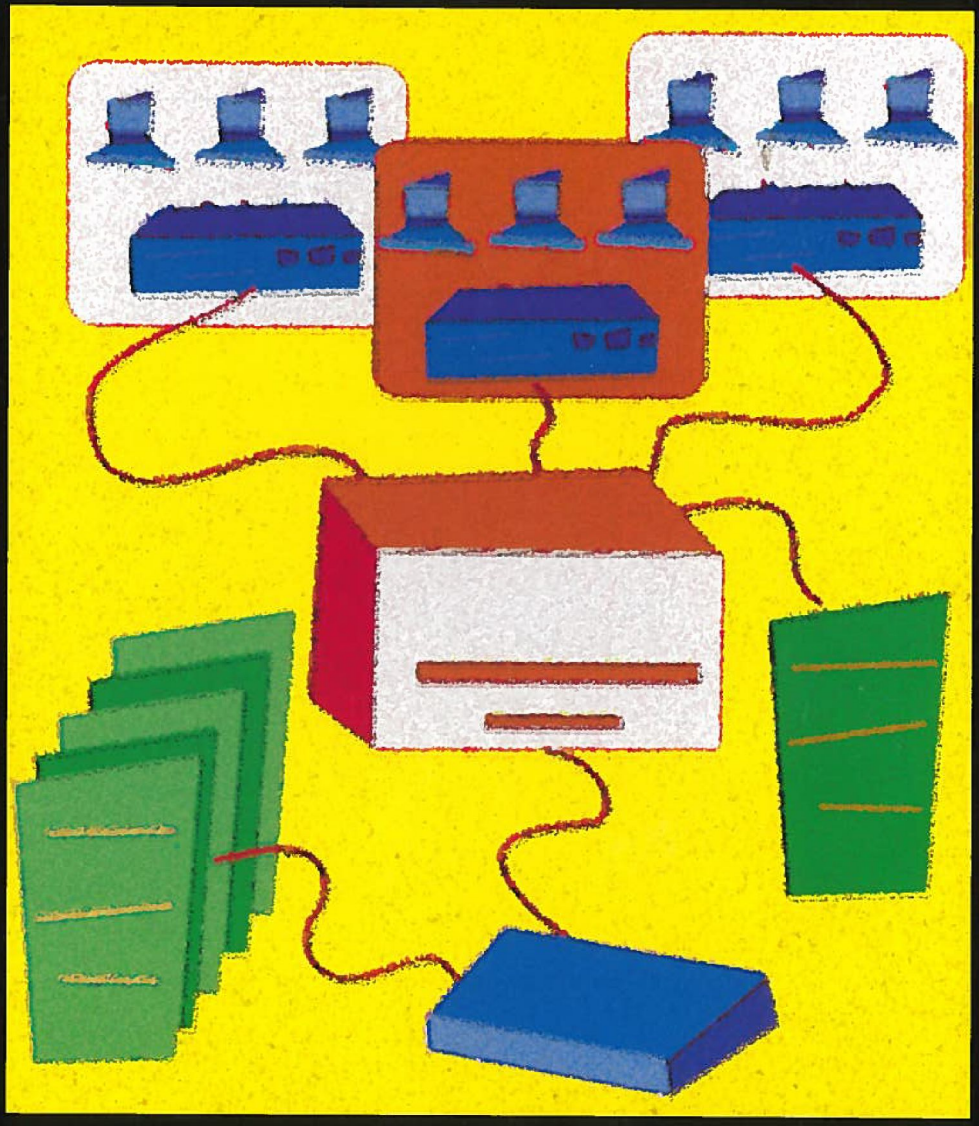
TECHNOLOGY AND APPLICATIONS FOR HIGH-SPEED LANS

GIGABIT ETHERNET



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Technology and Applications for High-Speed LANs

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Addison-Wesley
An imprint of Addison Wesley Longman, Inc.
Reading, Massachusetts • Harlow, England • Menlo Park, California
Berkeley, California • Don Mills, Ontario • Sydney • Bonn
Amsterdam • Tokyo • Mexico City

Library of Congress Cataloging-in-Publication Data

Seifert, Rich, 1952–
Gigabit Ethernet: technology and applications for high-speed LANs / Rich Seifert.
p. cm.
Includes bibliographical references and index.
ISBN 0-201-18553-9
1. Ethernet (Local area network system) I. Title.
TK5105.8.E83S45 1998
621.39'81—dc21 98–9357
CIP

ISBN 0-201-18553-9
Text printed on recycled and acid-free paper.
1 2 3 4 5 6 7 8 9 10-MA-0201009998
First printing, April 1998

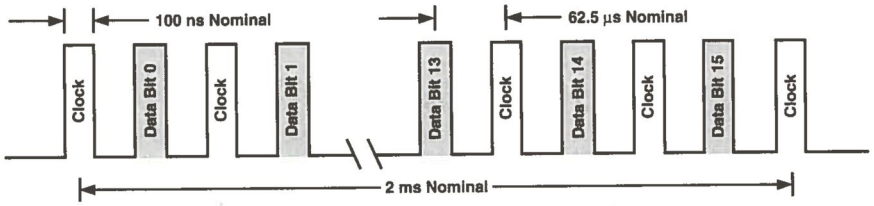

Figure 8–3 Auto-Negotiation signaling.

The entire message is repeated, nominally at 16-ms intervals, until the negotiation is complete.

8.2.4.3 Automatic Configuration without Auto-Negotiation

A device can easily detect whether the signals it is receiving were generated using 10BASE-T, 100BASE-TX, or 100BASE-T4. In the case of 10BASE-T, every device emits characteristic "link pulses" every 16 ms when the link is idle; this constitutes an unmistakable signature.[11] In the case of 100BASE-TX and 100BASE-T4, the signal levels, timing, and encoding used are sufficiently different that determination of the link's nature can be made without the use of Auto-Negotiation. This is often called "parallel detection."

Thus it is possible to automatically configure to any of these three signaling methods without implementing the negotiation protocol. Doing this is fairly common, and it slightly lowers the cost of a product.

However, a great deal of flexibility is lost by not using Auto-Negotiation:

- It is not possible to implement automatic dual-speed capability (for example, 10 Mb/s and 100 Mb/s).
- It is not possible to determine duplex mode.
- It is not possible to determine flow control capability.

The default assumption if Auto-Negotiation is not employed is that the link is operating in half-duplex mode, without explicit flow control. Thus devices not implementing Auto-Negotiation are generally those with only a single mode of operation, for example, a 100BASE-TX (only) repeater hub or a 10BASE-T (half-duplex-only) controller, where there is nothing to be gained by implementing Auto-Negotiation.

11. Also called "link beat," these pulses are used to ensure that the link is physically connected. It is the detection of this pulse that usually enables a "Link LED" on a 10BASE-T controller or hub port.

requires that there be some minimum number of logic transitions in the code stream in order to provide clocking information. In the case of Gigabit Ethernet, the block code used guarantees this transition density.

NRZI—Non-Return-to-Zero, Invert on Ones—is a variation of NRZ that leaves the signal unchanged for a logic zero and inverts the signal from its previous state for a logic one. NRZI is used in FDDI and 100BASE-FX; the 4B/5B block code guarantees a sufficient "ones density."

- **Manchester code.** This code, used in all 10 Mb/s Ethernet systems, eliminates the need for any transitions or one's density in the data stream—at the expense of increasing the maximum transmission frequency by a factor of 2.
- **Multilevel Threshold-3 (MLT-3).** This code uses three signal levels. The maximum transmission frequency is reduced by half (relative to NRZ), at the expense of reduced noise margin. The code leaves the signal unchanged for a logic zero and moves the signal to the "next state" for a logic one, where the states are zero voltage, high voltage, zero voltage, low voltage, zero voltage, and so on.

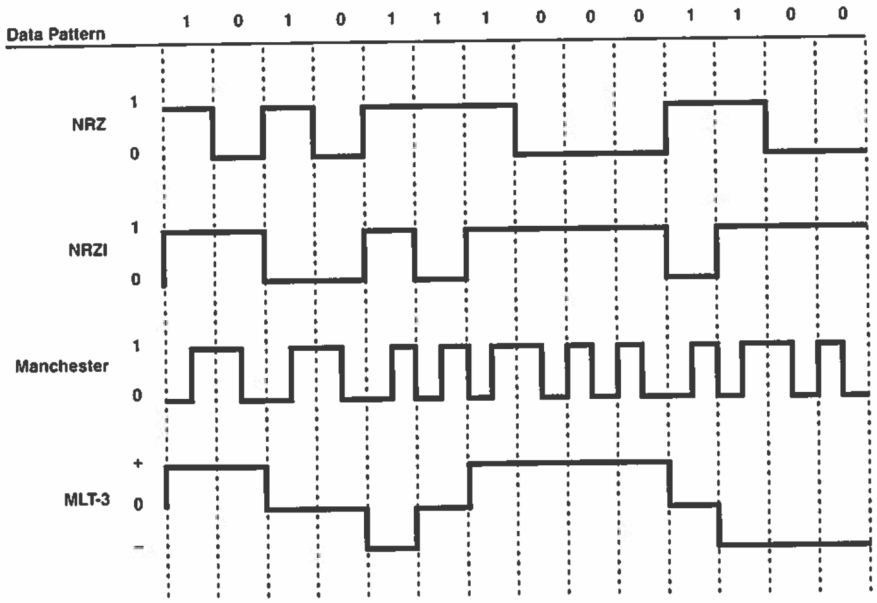

Figure 12–3 Line coding.