A Packet of Information BBB (Borrow)
Industrial Ethernet by Perry S Marshall
Reviewed by Nick Sands

Perry Marshall has made a valiant effort to reveal the secrets of both media and protocols in his book Industrial Ethernet. Unlike books like Automation Network Selection, this book focuses just on ethernet and its application in the industrial environment. The book starts with an introduction to ethernet and a tutorial on digital communication, then hardware basics, the basics of protocols, the basic of devices, maintenance and troubleshooting, and ending with other protocols and security.

The tutorial on digital communication is an excellent start, covering encoding, error checking, topology, and collisions. It also explains the important difference between half and full duplex communication. Half-duplex communication is when two or more devices to share the channel of communication, requiring arbitration for control and collision detection. Ethernet was originally based on CSMA/CD which is applicable to half-duplex communication. Carrier Sense, listen for a clear line, Multiple Access, shared by multiple users, with Collision Detection, so that errors can be corrected. Full-duplex communication, where there are separate channels for receiving and transmitting, does not require collision detection.

The basics of hardware of course covers the different cabling, like thicknet, thinnet, and 10Base-T, all the way to gigabit ethernet. The MAC, or media access controller, the PHY, or physical layer line driver/decode, and the magnetic transformer are all located on the NIC, or network interface card. This section also explains the OSI/ISO 7-layer model, essential for understanding today's network communications. There is also an explanation of how the physical distances between nodes and communication rates interact, determining the collision domain.

The protocol basics section contains a map out the content of the ethernet packet. There is a discussion of network addressing, network classes, the importance of ports and which ports are used by the most common TCP (transmission control protocol),IP (internet protocol) and UDP (user datagram protocol) protocols, like FTP, telnet, SMTP, HTTP, and POP3. The differences between TCP and UDP protocols are explained as well.

The next chapters cover the basics of network devices, maintenance, and troubleshooting. Switched networks have advantages over hubs, like the intelligent routing, especially for deterministic ethernet in industrial applications. Industrial networks should be managed for the best performance. Protocols like SNMP and RMON are excellent tools for managing networks. There are also software utilities and diagnostic tools that can help monitor networks and diagnose problems.

After the first chapter I was very excited about Marshall's book. Here finally was the book that could explain how ethernet and TCP/IP work in the industrial environment, I thought. Industrial Ethernet is close, but not quite the book I was looking for. The 107 pages are packed with information, it just is not well organized and there are some gaps. But Industrial Ethernet is well worth reading, especially if you can borrow it. It is available from ISA for $39 (member price).