Engineering technology open access Journal
ISSN: 2641-8185

Juniper Publishers
key to the Researchers

Opinion
Volume 1 Issue 3 - March 2018
DOI: 10.19080/ETOAJ.2018.01.555561

Eng Technol Open Acc
Copyright © All rights are reserved by Vladlen Shapo

Brief Industrial Networks Data Transfer Protocols Characteristics Analysis

Vladlen Shapo*

Department of Engineering, National University, Ukraine

Submission: February 02, 2018; **Published:** March 29, 2018

*Corresponding author: Vladlen Shapo, National University, Odessa Maritime Academy, Ukraine, Email: vladlen.shapo@gmail.com

Keywords: Industrial networks; Protocols; Tunnelling; Internet; Control Networks

Abbreviations: IoT: Internet of Things; IIoT: Industrial Internet of Things; ACN: Architecture for Control Networks; AYIYA: Anything In Anything; CIP: Common Industrial Protocol; ODVA: Open Device Net Vendors Association; DNP3: Distributed Network Protocol Version 3

Opinion

During last 5-7 years in industry, at the different kinds of transport, in energetic field, etc. are very actively implementing data exchange technologies between separate devices, device groups and networks. These technologies based on Industry 4.0 (4th industrial revolution), IoT (Internet of Things), IIoT (Industrial Internet of Things) concepts. In accordance with these concepts a lot of different devices became smart, possessing of own CPUs, memory and different wired and wireless interfaces for external data exchange. Some of them (like complex PLCs) allow to unite different industrial network segments, having sufficient productivity and much lower cost compared to computers [1].

From the beginning of 90th years of 20th century in industry are very popular some protocols and data transfer technologies, most known are ASi, ProfiBus, Field Bus, HART, Mod Bus, CAN, BAC and so on. But in connection with Internet development and forth coming of absolutely new challenges were created some protocols, based on TCP/IP. These protocols allow to perform remote control of complex technical systems for enhancement of control quality, decreasing response time for force majeure situations and cost for control and exploitation of such systems. Protocols ProfiNet, Mod Bus/TCP, Ethernet/IP, Ether CAT became well known; they are compatible with previous generations, but allow to solve fundamentally new tasks. But in some situations by cost/productivity ratio win protocols and technologies, which don't have wide spread, but firmly hold theirs niche. Some of them are described below.

ACN (Architecture for Control Networks) is network control protocol, initially destined for entertainment industry [2]. It has open source code and maintains some subordinate protocols (Table 1).

Table 1: ACN protocols family and corresponding standards.

Protocol	Standard
Root Layer Protocol, Session Data Transport	ANSI E1.17
Protocol, Device Description Language, Device Management Protocol	
Service Location Protocol (SLP)	RFC 2609
Simple Network Time Protocol (SNTP)	RFC 2030, ANSI E1.30-3-2009
Trivial File Transfer Protocol (TFTP)	RFC 1350
Streaming ACN (sACN)	ANSI E1.31
RDM Extension (RDMNet)	ANSI E1.33
Remote Device Management (RDM)	ANSI E1.20

AYIYA (Anything In Anything) is network protocol for tunnelling between IP-networks and controlling there [3]. Very often it's used for IPv6 packets transit through the networks based on IPv4 protocol. Network security is provided with absence of addresses and content of tunnelled packets falsification possibility. At least one of two tunnel endpoints allows mobile devices connecting.

CIP (Common Industrial Protocol) is the set of standards [4], which are maintained by Open Device Net Vendors Association (ODVA). CIP extensions are CIP safety, CIP Sync and CIP Motion protocols. CIP contains full set of requirements and possibilities

for complex automation systems and their subsystems development from following sides: control, information security, motion organizing, informing. Some most important protocols and industrial data transfer technologies are based on CIP as well and briefly described below.

EtherNet/IP is open industry protocol, which uses standard Ethernet chips and cable systems, based also on IEEE 802.3 standard, and serve for input/output real time data exchange and information messages in Device Net and Control Net industrial networks. CIP provides common application level between networks, which doesn't depend on media (cable system). It allows to perform direct routing CIP messages in Ether Net/IP, Control Net and Device Net networks.

Depending on application requirements EtherNet/IP network may be stand alone or combined with Device Net or Control Net networks for additional flexible information and control services realization. EtherNet/IP transfers big user, configuration and input/output data volumes in the same high speed network; tightly associates technological and corporate operations; facilitates technical maintenance expenses decreasing thanks to existing network resources and technical facilities using; allows to commercial and industrial technological levels to coexist in the same network; works with TCP/IP and HTTP protocols.

DNP3 (Distributed Network Protocol, version 3) is a set of communication protocols [5], which are used for data transfer between components in automation systems. It's developed for communications between different types of equipment for data acquisition and control and described in IEEE 1815 standard. In SCADA systems DNP3 is used by SCADA master stations (control centers), Remote Terminal Units (RTU) and different Intelligent Electronic Device (IED). It uses 3 levels of OSI model (data link, transport and application) and contains Secure Authentication v5 mechanism, which allows to master or remote DNP3-system uniquely determine, that connection is established with legitimate user or host, but not with malicious user.

HART-IP (Highway Addressable Remote Transducer) protocol [6] based on standard Ethernet IEEE 802.3 hardware and cable systems (twisted pair and fiber optics) and with Wi-Fi IEEE 802.11 equipment, that's why it's possible to use it with standard network switches, routers, access points, cables and connectors. It may be used in redundant mesh or ring topologies and with PoE (Power over Ethernet) power supply standard by twisted pair. Possible data transfer rates are 10Mbps, 100Mbps and 1Gbps. HART network, including devices working with Wireless HART protocol, is compatible with office and industrial LAN-switches, fiber optics media converters, Wi-Fi access points and equipment. Compatibility with classic HART protocol allows to put corresponding gateways into action and to work with classic analogue 4-20mA technologies. Using IP as base interaction protocol allows HART-IP to work in the same network together with multiplicity of protocols, based on IP and Ethernet (Figure 1).

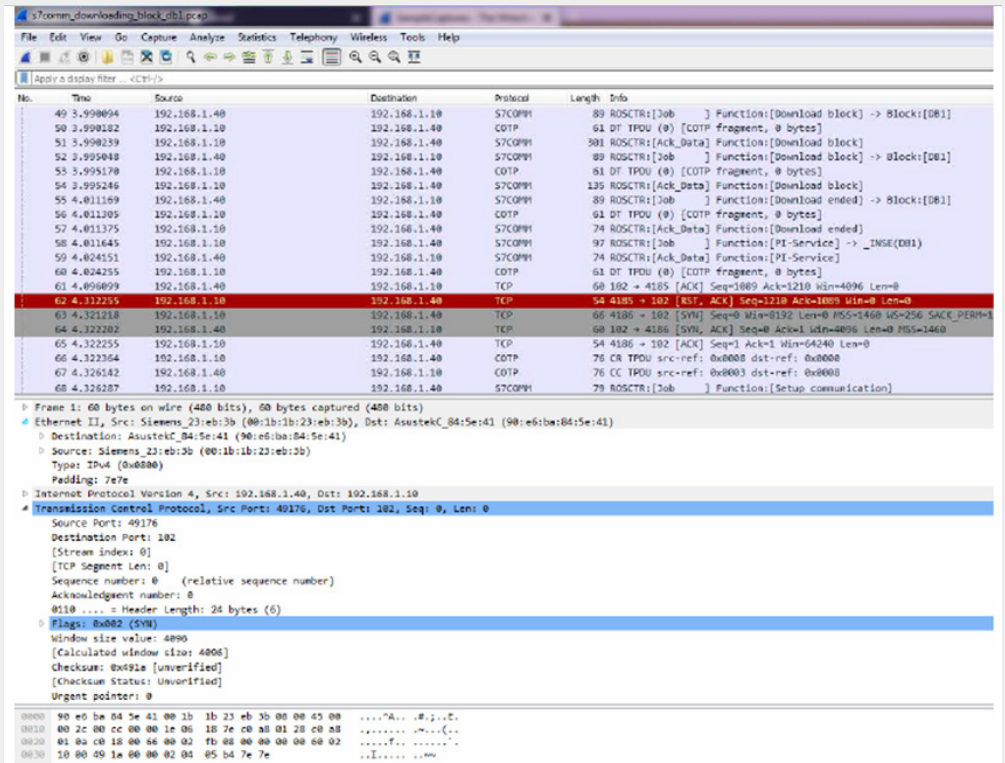

Figure 1: Viewing packets transferred using Siemens S7COMM industrial protocol in Wire shark network analyzer.

How to cite this article: Vladlen Shapo. Brief Industrial Networks Data Transfer Protocols Characteristics Analysis. Eng Technol Open Acc. 2018; 1(3): 555561. DOI: 10.19080/ETOAJ.2018.01.555561

More than 60 millions devices with HART protocol supporting are installed in the world. HART over Ethernet or HART-IP widen HART accessibility in local internal industrial networks with interconnection with corporate networks and ERP (Enterprise Resource Planning) software.

Variables and diagnostic data in HART are encapsulated in HART-IP packets. It allows to realize real time processes in existing corporate networks and to use corporate VPN (Virtual Private Networks).

References

1. Shapo V (2017) programmable Logic Controllers Applying for Multi Segment Industrial Data Transfer Networks Developing, International Robotics & Automation Journal 3(4).
2. Architecture for Control Networks (2017).
3. Six XS - IPv6 Deployment & Tunnel Broker.
4. The future of industrial automation.
5. Distributed network protocol.
6. Instrumentation tools.

This work is licensed under Creative Commons Attribution 4.0 License
DOI: 10.19080/ETOAJ.2018.01.555561

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
  (Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
https://juniperpublishers.com/online-submission.php

How to cite this article: Vladlen Shapo. Brief Industrial Networks Data Transfer Protocols Characteristics Analysis. Eng Technol Open Acc. 2018; 1(3): 555561. DOI: 10.19080/ETOAJ.2018.01.555561