Leaders in Industrial Automation
Control Engineering and
IIoT Enablement

Industrial Internet of Things

A Glossary of IIoT Terms

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API (Application Programming Interface)—Sets of requirements that govern how one application can communicate and interact with another. In the simplest terms, APIs are set of protocols, routines, and tools that software can use to communicate with other software. For example, when a Google map is embedded on a web page, that web page is calling the Google Maps API to pull the data from Google Maps and display it on a web page.

API Management—The supervision of tasks related to publishing, documenting, and maintaining application programming interfaces (APIs). A company that publishes an API needs to maintain it in a scalable and secure environment for developers to use. Companies like Google and Facebook are supporting a growing open API movement based on lightweight JSON and REST services.

Big Data—Any huge amount of data that must be managed, stored, or processed by computer systems. The term doesn't refer to a specific quantity but is often used with regard to petabytes (1000 terabytes) and exabytes (1 million terabytes) of data. Big data is often described by 3 Vs: volume, variety, and velocity. Volume is the quantity, variety the different types of data, and velocity the speed at which it must be managed.

CSS (Cascading Style Sheets)—A file used to tell a web browser how to format a web page. A link to the file is embedded in the web page or processed inline, and the browser uses the information in this file to format attributes of the web page such as fonts, colors, border positioning, and so on.

Cloud Computing—Generally, the delivery of hosted computing services over the Internet rather than on an individual computer or at an individual organization's location. A variety of computing services may be "in the cloud," from network servers to software applications.

DevOps—The blending of tasks traditionally performed by an organization's separate development and operations teams. As operations become more programmable (and especially as the IoT demands a change in operations programming from proprietary to open languages and protocols), these two teams must work together. New jobs may blend both development and systems engineering skills into one position.

Edge Computing—The "edge" is where the physical world meets the digital world. In IoT terms, the edge is where a sensor's or machine's data in voltage or current is turned into the ones and zeros that a computer needs to process it. Edge computing means filtering or processing that data directly in devices like programmable automation controllers (PACs) located at the edge, so that intermediary gateways and software are not required. Processing data before it is sent to the cloud reduces traffic on networks and the Internet by reducing the amount of data sent. It also increases efficiency, security, and compliance.

Ethernet—A local-area networking (LAN) technology used to digitally connect computing devices. Typically deployed over Category 5 or 6 twisted-pair copper cables with RJ45 connectors at each end, and composed of transceivers to control the passing of bits over the wire while avoiding data collisions. See IEEE 802.3, CSMA/CD.

Fog Computing—Similar to edge computing, fog computing takes the analogy of the cloud and brings it down closer to the physical world: fog. Typically fog computing is using computing power in a fog node or IoT gateway to filter or process data and then send only the required data to the cloud.

GitHub—An open-source version-control and collaboration platform for software developers. GitHub was started in 2008 and was founded on Git, an open-source code management system created by Linus Torvalds to make software builds faster.

HTML (Hypertext Markup Language)—A web language used by web servers and web browsers to present information to users. HTML pages are served to web browsers (clients) from a web server. HTML code served on an HTML page tells a web browser how and where to display text and other resources on a web page.

HTTP and HTTPS (Hypertext Transfer Protocol & HTTP Secure)—An application protocol used for distributed, hypermedia information systems, and the foundation of data communications on the World Wide Web. HTTP is a text-based protocol, is based on a command/response model, and is easily identified by the preface "http://" in communications, such as in the address bar of your web browser. HTTPS is HTTP communications on a connection encrypted by transport layer security to prevent eavesdropping of transmitted data.

IP Address—An Internet Protocol address, which is a numerical identifier for a networked device on a TCP/IP network. Typically made up of four 3-digit numbers separated by decimal points (IPv4), with a newer version made up of six 3-digit, decimal-separated numbers (IPv6).

Information Technology (IT)—Hardware, software, infrastructure, and processes used to create, secure, process, and communicate all types of electronic data. Also the department or group within an organization that installs, programs, and maintains these systems.

Internet of Things (IoT)—A network of physical objects—devices, vehicles, buildings, machines, and other items—embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. In its simplest terms, the IoT is about physical "things" with the ability to sense, actuate, and communicate. The IoT works across existing Internet-based network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, or cyber-physical systems, resulting in improved efficiency, accuracy, and economic benefit.

JavaScript—An object-oriented, cross-platform scripting language developed by Netscape that's generally easier to use and faster to code than structured or compiled languages like C and C++. JavaScript code can be embedded into HTML pages, and virtually all web browsers provide JavaScript engines to run the code on the client's computer rather than on the server. (Running the script on the client reduces the load on the server.) Initially JavaScript provided interactivity in web pages viewed in a web browser, but with node.js, JavaScript can now also run on a server when required.

Java—A general purpose, high-level programming language developed by Sun Microsystems, Java is an object-oriented language similar to C++, but simplified to eliminate language features that cause common programming errors. Java source code files are compiled into a format called bytecode which can then be executed by a Java interpreter. Compiled Java code can run on most computers because Java interpreters and runtime environments, known as Java Virtual Machines (JVMs), exist for most operating systems.

JSON (JavaScript Object Notation)—A lightweight data-interchange format that is easy for humans to read and write, and for machines to parse and generate. JSON is based on the object notation of the JavaScript language. However, it does not require JavaScript to read or write because it is a text format that is language independent.

JSON notation contains these basic elements:

- Objects: Objects begin and end with curly braces ({}).
- Object Members: Members consist of strings and values, separated by colon (:). Members are separated by commas, commonly referred to as name/value pair.
- Arrays: Arrays begin and end with braces and contain values. Values are separated by commas.
- Values: A value can be a string, a number, an object, an array, or the literals true, false or null.
- Strings: Strings are surrounded by double quotes and contain Unicode characters or common backslash escapes.

Machine-generated data (MGD)—Information produced by mechanical or digital devices, either single-function devices or industrial control systems. Devices that generate machine data are increasingly able to talk with each other and connect with the IT infrastructure that transfers, houses, and analyzes an organization's data.

MQTT (Message Queuing Telemetry Transport)—A lightweight, simple messaging protocol originally designed for low-bandwidth, high-latency communication over TCP/IP connections. MQTT is based on a publish/subscribe model rather than a command/response model like HTTP. MQTT requires a broker to facilitate publishing and subscribing to data topics, whereas HTTP is client/server.

node.js—An open-source, cross-platform runtime environment that executes JavaScript applications on servers. Allows programs written in JavaScript to be run across many different server platforms including Windows, OS X, Linux, and Unix.

Node-RED—an IBM-developed, open source, dataflow visual programming tool that can be used as a human-machine interface (HMI) for node.js. Node-RED is ideally suited for IoT because it easily connects heterogeneous distributed systems. This web-based, visual tool is ideal for wiring together hardware devices, APIs, and online services in new and interesting ways.

Operational Technology (OT)—Hardware and software that monitors and controls how physical devices perform. Also the department or group that installs, programs, and maintains this hardware and software; industrial automation (IA). Traditionally, OT systems are proprietary and closed, and not networked with an organization's computer system. These systems may even be mechanical rather than automated.

OT/IT Convergence—As the Internet of Things develops, increasingly the operational technology (OT) and information technology (IT) groups within organizations will need to work together to capture and communicate data required for business decisions.

REST (Representational State Transfer)—A set of architectural constraints used to develop web applications. Designed as a common development standard for applications used on the Internet, REST confines developers to a specific set of rules, or architectural style, to follow.

RESTful Architecture—When a web site or API is conforming to the constraints of the REST architecture, it is said to be a RESTful system.

SSL/TLS (Secure Socket Layer/Transport Layer Security)—Protocols to encrypt data transmissions over networks. TLS encrypts communication using symmetric keys that are generated uniquely for each connection.

TCP/IP (Transmission Control Protocol/Internet Protocol)—The most widely used communication protocol of the Internet and local area networks (LANs); broadly responsible for establishing and maintaining connections, formulating data packets to send, and reordering packets on receipt. Noted for its ability to be routed through many different networks.

Wireless—Commonly referred to as Wi-Fi, used in applications as a wireless alternative to a copper-based network such as Ethernet. Wireless uses ultra-high-frequency radio waves to communicate and transmit data.

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