

HD-PLC Technology:

A New Communication Standard Enabling Future Smart HVAC Systems In Smart Buildings

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Around the world, advanced building automation systems (BAS) in smart buildings are driving demand for smarter HVAC systems. Modern HVAC systems can improve energy efficiency and mitigate potential health problems associated with indoor air quality and ventilation. In fact, HVAC improvements and building controls are expected to be a big U.S. investment in 2021.

But capitalizing on this opportunity will take more than smarter HVAC systems. It'll require a smarter approach to communications and BAS integration.

Increase of data traffic in the network

Over the last few years, the industry has seen a dramatic increase in the bandwidth demanded by building automation systems. More nodes, bigger packets, more security, all of these things increase the amount of data traffic in the network.

Legacy communications technologies like RS-485 struggle to handle all of this data. To compensate, system designers have shortened bus lengths, developed costly gateways, and added complex protocol conversion for BAS integration. Because, in most implementations it's just not practical or cost effective to install new high-speed cabling.

A high-speed wireline communication standard called HD-PLC that is developed specifically for today's industrial IoT

Now, there's a better option: a high-speed wireline communication standard called HD-PLC that is developed specifically for today's industrial IoT and smart building applications. In 2017, after careful evaluation of various technologies, LonMark International adopted HD-PLC as its new channel standard. And last October, the Consumer Technology Association (CTA) ® approved

ANSI/CTA 709.8 LON HD-PLC (High Definition Power Line Communication) as a new standard by the American National Standards Institute (ANSI).

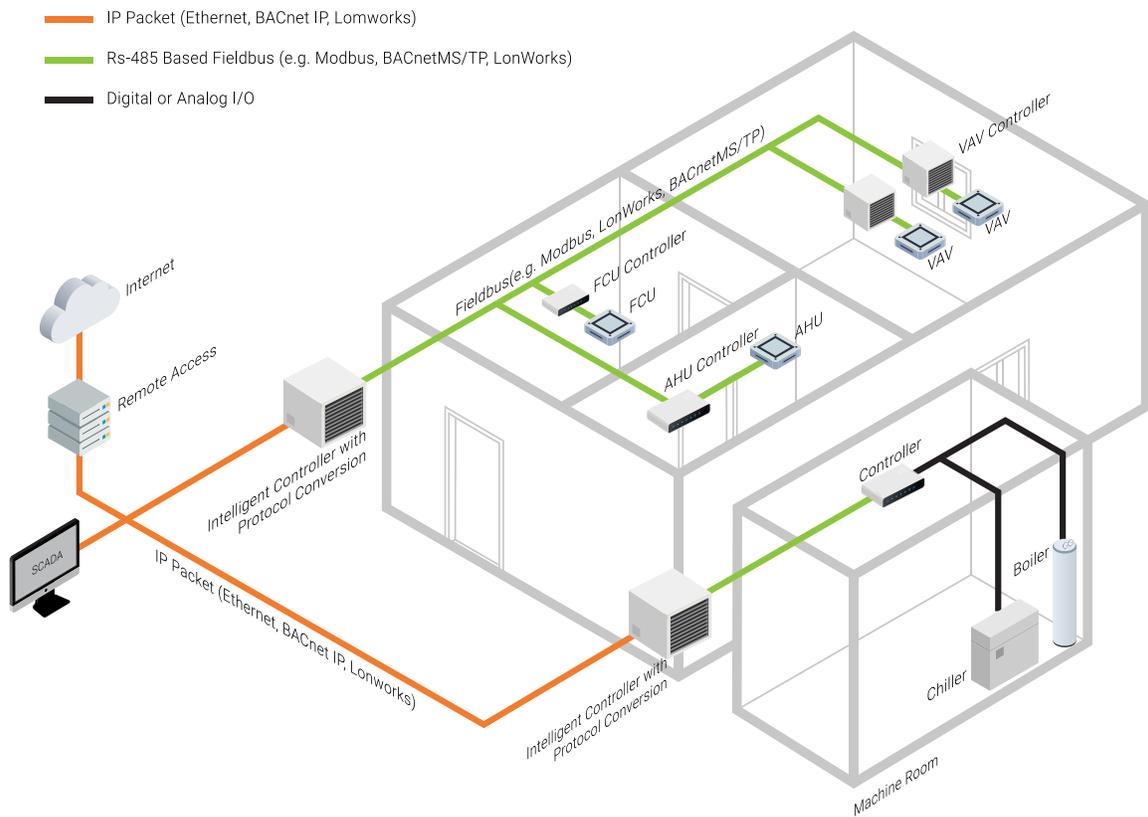
LON HD-PLC technology for smart HVAC systems

In this article, one will learn how LON HD-PLC technology is enabling a new generation of smart HVAC systems, using the existing building wiring.

The Problem: Serial Networks Are Stretched to Their Limits

Traditional building automation systems rely on direct-digital control communication protocols over RS-485 signal levels. However, with a throughput of just 9.6kbps, RS-485 struggles to meet the demands of advanced HVAC applications.

In RS-485-based systems, each platform domain requires a gateway to translate proprietary protocols into IP. As such, the building administrator has limited control over individual devices in the network. To extend the network path from BAS to the digital or analog I/O module, the network wiring needs to be installed to connect a controller device over Fieldbus I/O systems.



Central air conditioning system based on RS-485

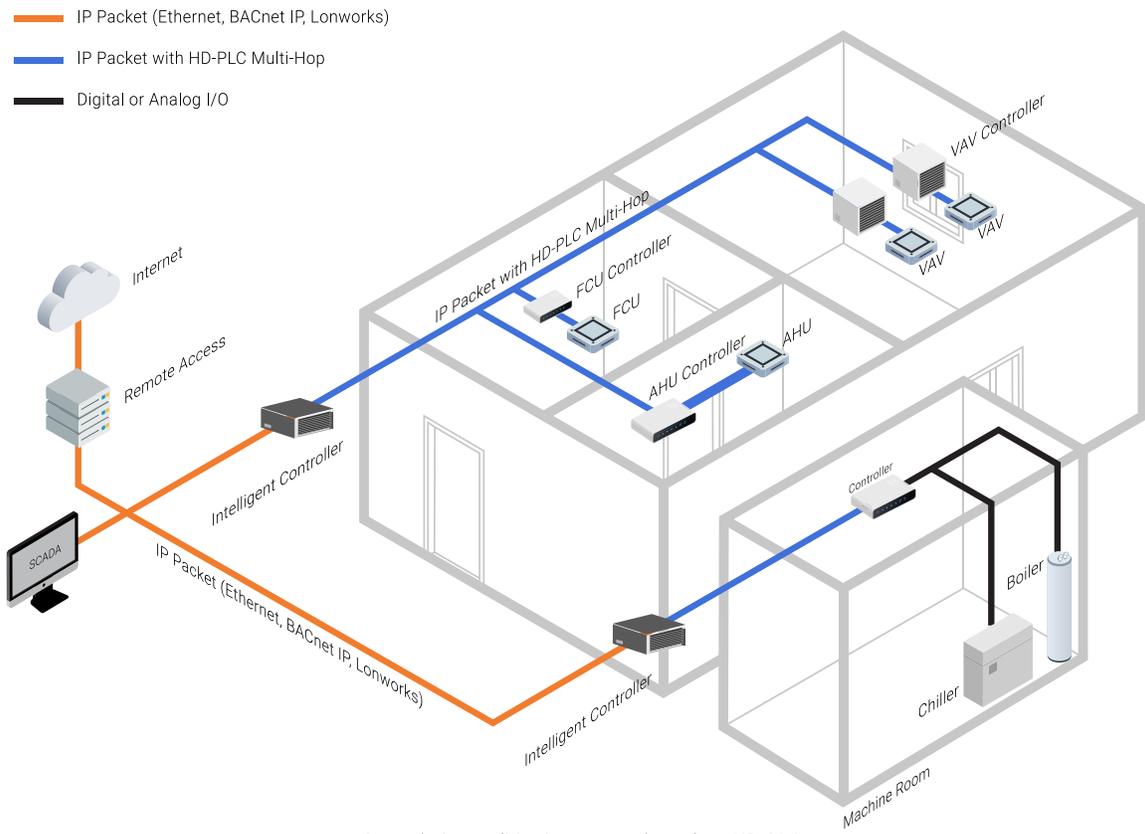
While protocols like BACnet/IP, LON IP, and KNX IP enable system integrators to increase bandwidth and extend IP beyond the gateway; they require the installation of new wiring, which is time-consuming and expensive. System integrators also have to reduce bus lengths and add control equipment to support the high bandwidths required by modern applications. To enable BAS modernization and replace costly gateways, there's a better solution – HD-PLC Bridging to connect Ethernet networks to other wireline (twisted pair, powerline, phone lines, coax, etc.) and wireless networks (WiFi, BLE, etc.).

Megabit data rates for long cable lines

LonMark International adopted HD-PLC as the new channel standard for high-speed wireline networks. Based on the IEEE 1901 and ITU-T G.9905 international standards, HD-PLC combines IP-based broadband communication with an innovative multi-hop technology to reliably achieve megabit data rates over several kilometers of cabling (AC/DC power lines, twisted-pair, coax, etc.). The architecture supports up to 1024 nodes and is packed with innovations such as free topology, mesh networking with dynamic traffic routing, and cryptostrong AES-128 encryption.

LON HD-PLC platform implements an Ethernet-like transmission, wherein devices act as an Ethernet gateway

This new standard enables native LON communication over any IP transport such as Ethernet and Wi-Fi, as well as interoperability with IP-based web services so that building and industrial automation systems can seamlessly and securely interoperate with cloud and IoT applications. LON HD-PLC platform implements an Ethernet-like transmission, wherein devices act as an Ethernet gateway in parallel, enabling double use for all IP-based solutions. It creates a single control system to aggregate data and detects hidden faults in HVAC operations. Plus, IP networks can be used as a native network medium for LonWorks, so the use of LonWorks/IPonly devices is also possible.



Central air conditioning system based on HD-PLC

Instant speed upgrade - from just kilobits to megabits-

Built to seamlessly couple Ethernet and RS-485 devices, the LON HD-PLC Bridge enables system designers and integrators to upgrade to higher speeds, longer ranges, more nodes, and more advanced feature-sets over their existing wiring infrastructure with minimum cost. That way, everything connected to it becomes a part of the Internet of Things – acting as data points, to improve the operating efficiency of smart HVAC controls.

Using IP-based communications (IPv4 or IPv6 multicasting), HD-PLC provides LON systems with an instant speed upgrade- from just kilobits to megabits-without needing to add or replace wiring. Especially designed for building automation, IPv6 provides a cost-effective transport mechanism for complex control systems to communicate with devices. In addition, IP based communication enables the use of existing IP based tools, like Wireshark, reducing the learning curve for system designers and engineers – which means less maintenance and ultimately lower cost.

With this transformative wireline communication technology, manufacturers can effectively build a robust infrastructure into buildings today, ensuring the future-readiness for intelligent HVAC of tomorrow.



Author

[Michael V. Navid](#)

Michael V. Navid is currently the Vice President Business Development and Marketing at MegaChips Corporation. Michael has operated in various domain including IoT, Smart Energy, Home and Building Automation, Consumer Electronics and Semiconductors. Michael has been the original founder of the G3-PLC Alliance. His prior experience saw Michael being the Vice President Sales and Marketing and Business Development at Accent. Michael has formerly worked at develop AG, Maxim Integrated Products to name a few.