



Industrial Internet of Things (IIoT) and Plastic Optical Fiber (POF)



Industrial Internet of Things, IIoT, is communication beyond the traditional Machine to Machine (M2M) model that operates in today's factories, machines, and processes. It is a world of connected devices collecting data on how machines are operating and then using that data to provide greater efficiency. It is the stepping stone to deeper technology automation such as Artificial Intelligence (AI).

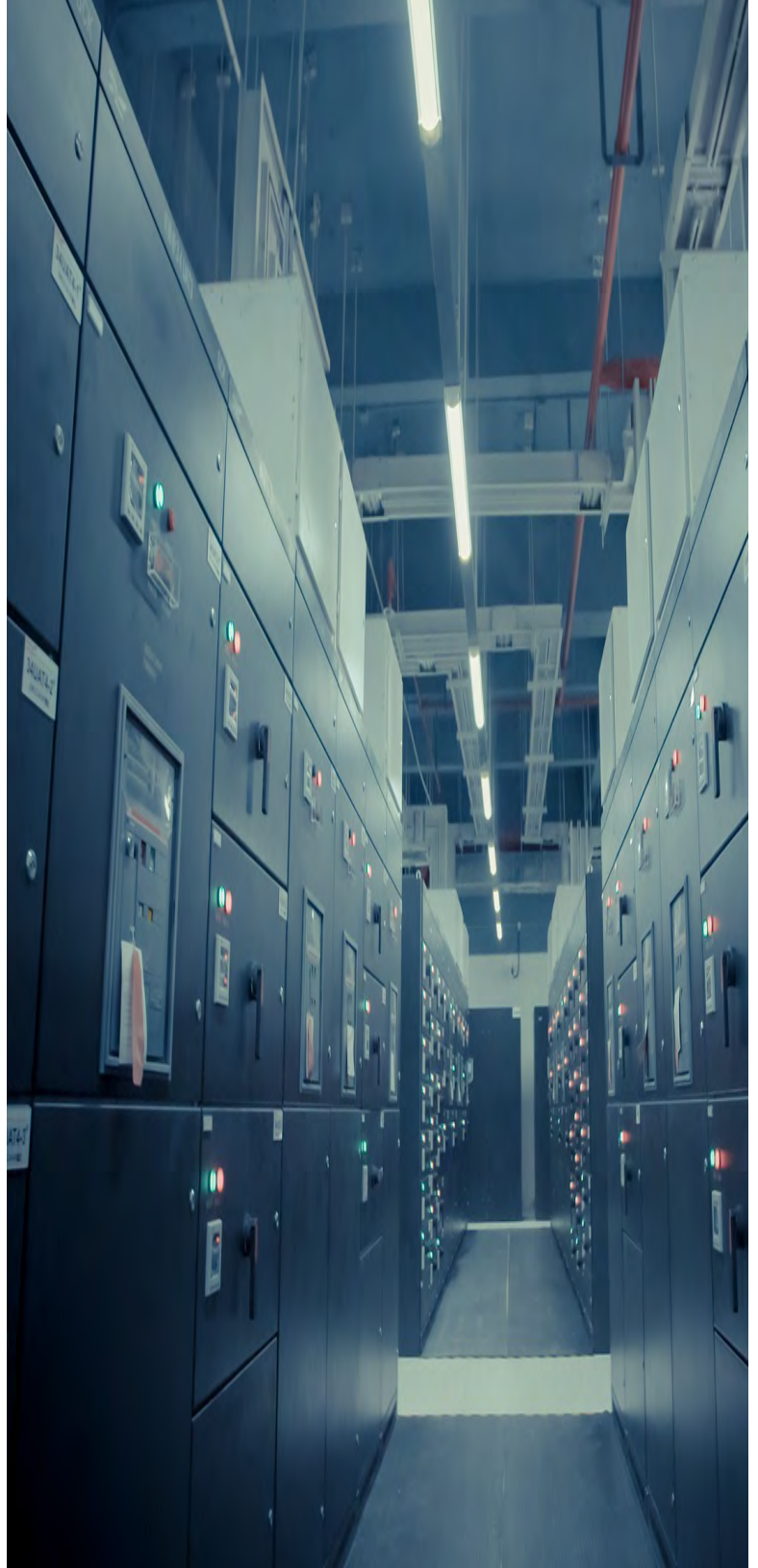


Why use Plastic Optic Fiber in IIoT ?

Firecomms Optical OptoLock® and LC transceivers for Plastic Optic Fiber (POF) combined with either POF or, for very high temperatures or longer distances, Hard Clad Silica fiber (HCS) are a traditional M2M technology providing fiber optic links in robust industrial environments. From low speed command and control links running for example HVDC switching systems at less than 1 MBd to high speed EtherCAT, Profinet or 8B10B encoded 250 Mbps links between networked FPGA devices, POF links are already today an industrial work horse.

Where does IIoT fit into this picture? The answer lies in the simple sensor output called RSSI that is available in every optical receiver. Receiver Signal Strength Indicator, RSSI is a very common feature of all WiFi devices and often used to provide a 'health-check', in wireless networks.

What has been forgotten is that this feature is also available in Optical networks. The RSSI output from an optical receiver allows engineers to monitor the Average Optical Power (AOP) in a fiber link. By measuring RSSI and logging the data, an engineer or supervisory system can learn about the behaviour of an optical link over time. Tracking the optical power provides the ability to implement both predictive maintenance and the ability to pin point a network outage in a staff media alert such as a txt or tweet.



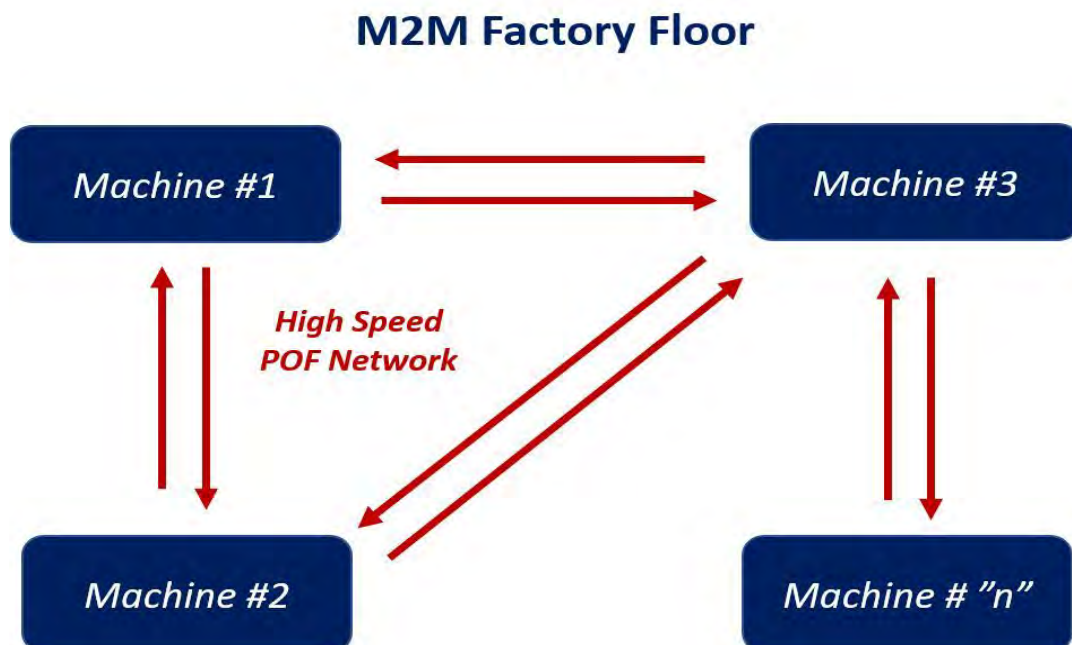
As the RSSI output is a simple voltage it can be measured by a typical IIoT micro-controller. This sensor can be used to monitor and tag a link in a factory independent of the link itself. Therefore, a high-speed link dedicated to for example, real time networked drive control in a milling machine or blade controllers in a windmill can carry on without interruption while the RSSI output can feed a 'health-check' on that link back to a local or cloud based server where the maintenance team can monitor, log and set alarm levels on the data.

As RSSI is a small amount of data it is ideal for use with a low power wireless network using for example the ISM band. An example is the ADI micro-controller ADuCRF101. This low power IC can measure a range of variables and transmit them out on the ISM band for central logging, storage and analysis. Thousands of links can then be monitored with little investment in infrastructure. A true IIoT can be realised by combining the traditional M2M link over fiber with a wireless monitoring network acting as the

system health-check providing cost saving and efficiency from remote monitoring of the link.

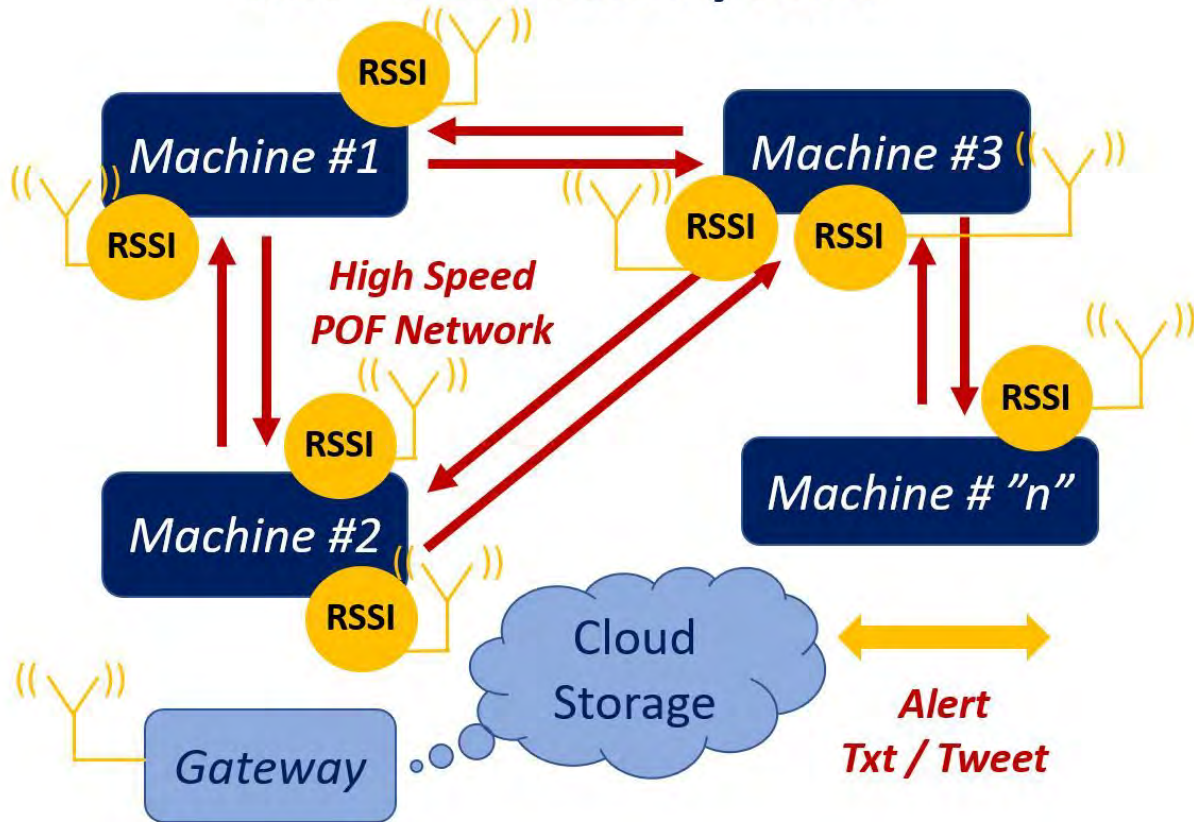
Firecomms leaders in plastic optic fiber transceiver solutions have partnered with an edge to edge IoT solutions provider to demonstrate a high-speed plastic optic fiber network with a low-power wireless monitoring health-check network called, 'Link-View'. The optical transceivers output RSSI to the ADI ADuCRF101 wireless enabled micro-controllers who send the optical power measurements to a data collection point which relays the data to a cloud server.

The server logs the data and compares it to key alarm levels. Maintenance staff arriving on shift can get live updates to their mobile phones telling them what links need attention, with a critical list allowing them to plan their work. As each link is tagged it is simple to identify the location of a problem link and guide staff directly to the problem. With data logging, component lifetime can be monitored and measured more accurately. This will help to bring efficiency to stocking levels for spare components.



Firecomms IIoT solution has security, scalability and proven robustness in Industrial environments.

IIoT - M2M Factory Floor



RSSI is one measure, however, the scope to enhance the perception-action cycle is significant. Adding local temperature measurements and current consumption would enable an accurate calculation for transmitter lifetime. In a locomotive drive application, it would be helpful to measure the vibration exposure. Expanding the number of parameters is limited only by the choice of micro controller and the number of available wireless channels. The more information gathered the more powerful the control policy can be for predictive maintenance. Logging and feeding back this data to the component supplier will also allow them to drive their process improvement activity to give you a

better part. Real world data always provides insight beyond what can be tested for in the laboratory. Gathering all of this data into a machine model will also allow opportunity for development of AI machine learning where the interaction of M2M behaviour can be monitored, adjusted and tuned without human intervention.

Traditionally fiber and wireless communication would have been seen as competing technologies. The joint Fiber-Wireless IIoT network demonstrates that knitting these technologies together brings a new level of knowledge, efficiency and cost saving to a traditional M2M application. Excellence is found in this

demonstration from selecting the best features of each technology to solve individual challenges efficiently and then mapping them together.

To quote Caroline Dowling, Business Group President at Flex Communications & Enterprise Compute (NASDAQ: FLEX), "The next big thing is actually a trillion small things." The small thing for POF is the often forgotten RSSI sensor on Firecomms OptoLock® and LC transceivers which will tell you the optical power on a link. The next jigsaw piece is a low power consumption, micro-controller with wireless from ADI and the third piece is efficient, secure and scalable software from Wishbone, to read the data and transfer it to cloud storage, log it, check it and action on it when necessary. From these 3 simple pieces of technology you can build reliability and maintenance with efficiency beyond anything available today.

IoT is fundamentally shifting the way we interact. Optical Transceivers for POF already have features to feed IoT and enable, 'Link-View'. The M2M link using POF is ready to embrace an IIoT network.



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Firecomms POF Connectors

OptoLock® Transceiver

FB2M5KVR



LC Transceiver

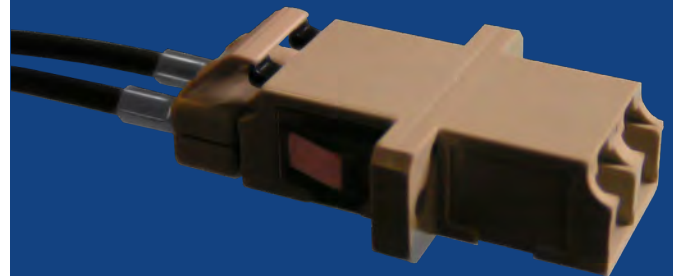
FB2M5LVR



Firecomms POF Interconnects

LC panel mounted adaptor

FP-00C-LX0



OptoLock® bulkhead adaptor

FA-BFC-KXD

