

IP-ONE Hybrid Connector:

Empowering the Internet Of Things

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Contents

4	Executive Summary
5	IP-ONE Hybrid Connector provides remote power & ultra-fast fiber connectivity to Access Points & Devices
7	IP-ONE Hybrid Connector Applications
7	CASE 1: Small Cells and DAS Access Point Connectivity
8	CASE 2: POE substitute for High Definition CCTV and Wi-Fi APs
9	Conclusion
9	References
9	Biography

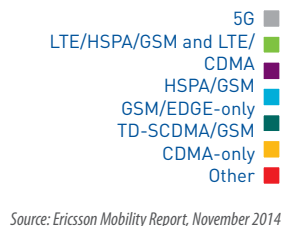
Executive Summary

As we approach the end of the 2020s, we will be able to look back in recent years and see how, for what used to be basic Internet connectivity to today's Internet of Things (IoT) where we truly live in a 'connected' world of people and things. The number of mobile-broadband subscriptions alone reached 2.3 billion globally by the end of 2014, which translates to a global penetration rate of 32%. This is double the penetration rate in 2011 and four times higher than 2009 and continuing to grow at a rate of 30% year-on-year.

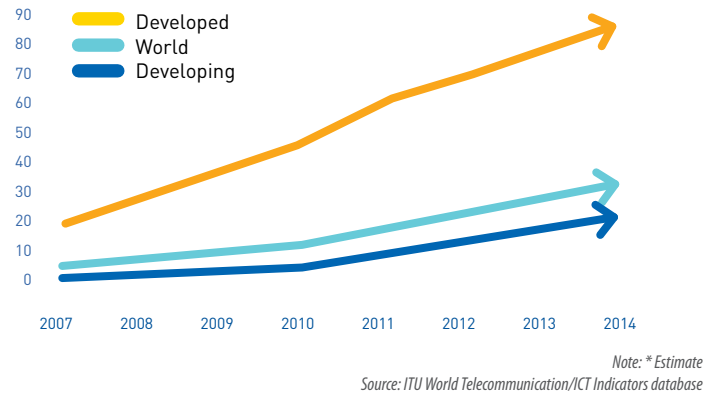
In addition to the growing number of mobile-broadband subscription, the data usage per subscription also continues to increase. Global mobile traffic data grew by 69% in 2014; reaching 2.5 Exabyte per month at the end of 2014. This increase in data usage is fuelled by more HD and UHD video content being pushed through faster networks. On average, up to 55% of mobile data traffic is from video streaming in 4G-dominated networks. This increase in mobile data traffic is expected to increase when 5G is commercially deployed, potentially in the year 2020. One of the major mobile equipment manufacturers forecasted 90% of the global population over 6 years old will have a mobile phone by 2020 with the number of mobile broadband subscribers reaching 8.4 billion. 42% of the mobile broadband subscriptions is expected to be on LTE networks.

The number of people and connected devices adopting high-capacity and high speed mobile wireless devices such as laptops, smartphones and tablets is increasing. At the same time, there is a surge in the introduction of connected devices, evident from every CES event, ranging from wearable devices, smart home appliances to connected cars. The number of wireless access points (for small cell, DAS and Wi-Fi) needs to increase to cope with the growth. This is especially important in large, enclosed spaces such as high rise apartments, office buildings, sport stadiums, hospitals, convention centers and shopping malls. In addition, access points are also needed in outdoor spaces where large numbers of people gather such as university campuses and railway stations.

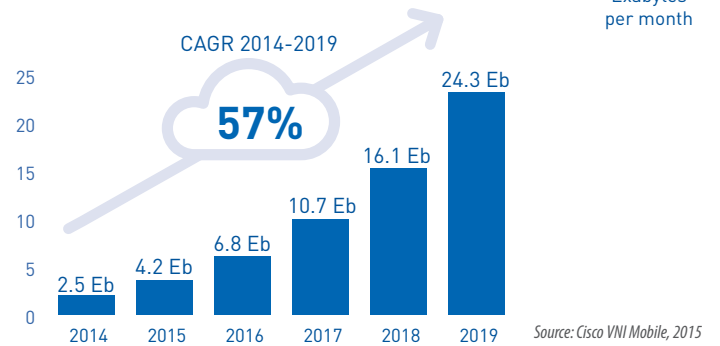
**3.5 billion
LTE subscriptions
by the end of 2020**



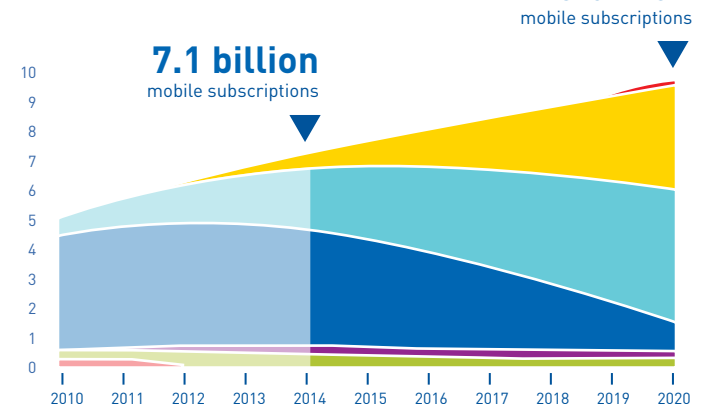
Active mobile-broadband subscriptions per 100 inhabitants 2007-2014



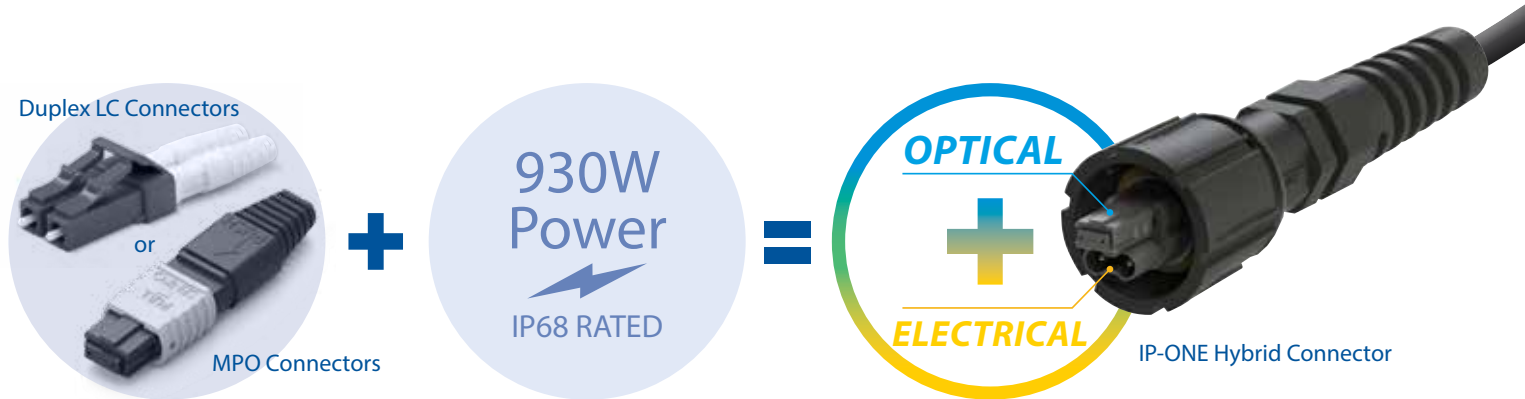
Forecasted Mobile Traffic Growth



Outlook of Mobile Subscriptions by end of 2020



IP-ONE Hybrid Connector provides remote power & ultra-fast fiber connectivity to Access Points & Devices



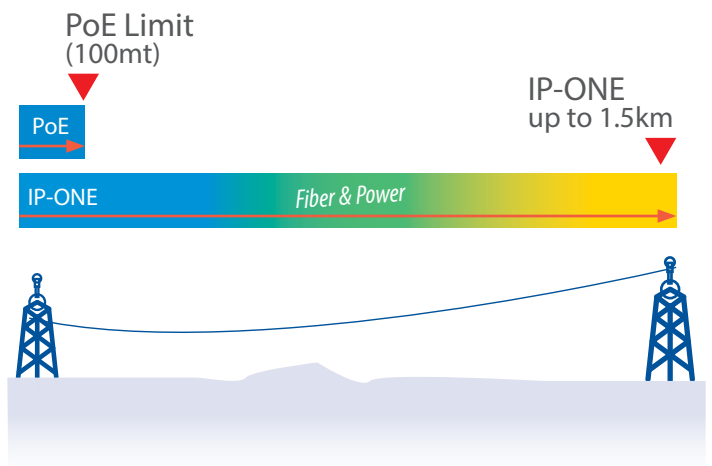
With the exponential increase of Access Points to cater for the impending demand, remote power such as POE is a cost effective solution to provide connectivity to a structure without extensive structured cabling which requires a high capital investment. However, existing POE equipment capability which uses UTP cables to provide both power and connectivity to access points has a maximum distance limitation of 100m. In addition, the power delivery capability is also stretched to the limit with higher bandwidth equipment with more features demanding greater power levels.

Anticipating this, SENKO has developed an 'all-in-one' connector that combines the unlimited bandwidth capability of optical fiber over a large distance with large gauge copper cables to deliver electricity of up to 1.5km, way exceeding the 100m range limit of POE over UTP cables. The IP-ONE Connector.

The IP-ONE Hybrid Connector is designed to provide both fiber and power within a single connector. The fiber section can house a duplex LC connector for 2 fiber applications or an MPO connector for up to 24 fiber applications. The power section houses two 12 gauge copper conductors which can provide up to 930W of power which is much higher than any conventional UTP cable can deliver.

The ability to deliver substantial power over a long distance brings a range of advantages such as:

- Single cable installation for both fiber and power, thus reducing deployment cost
- Enables local power supply from a centralized source, thus removing the need for local power
- Removes complexity in civil work to access remote power distribution terminals
- Removes potential need to engage multiple power supply companies



IP-ONE Hybrid Connector provides remote power & ultra-fast fiber connectivity to Access Points & Devices

With all high value connection, security is a critical part of the network. An additional secondary lockable ring provides extra security and reduces the opportunity for tampering

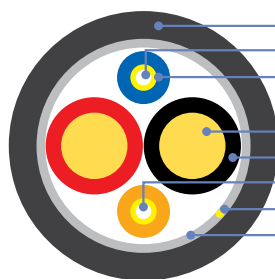
The Key Features of the IP-ONE Hybrid Connector include:

- IP-68 Environmentally sealed and hardened connector suitable for direct outdoor connection
- Push-fit design enables simple plug and play installation with a pre-connectorised hybrid cable
- Fiber connector interchangeable between LC duplex and MPO connector
- Cable gland design enables easy integration into standard enclosure
- High quality and low loss factory fitted fiber connectors

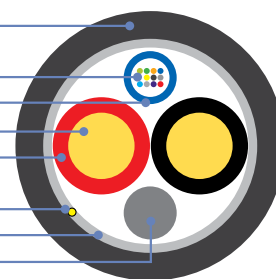


The full potential of the IP-One Hybrid Connector can be maximized when deployed as a pre-connectorised jumper cable to enable a fully plug and play installation. Globally there are many major cable manufacturers capable of supplying hybrid cables perfectly fitting the capability of the IP-One Connector. The crimp set and boot of the connector is designed to accommodate various cable sizes between 4.5mm to over 10mm whilst providing an Ingress of Protection rating of 68 for flexible integration with any cable manufacturer.

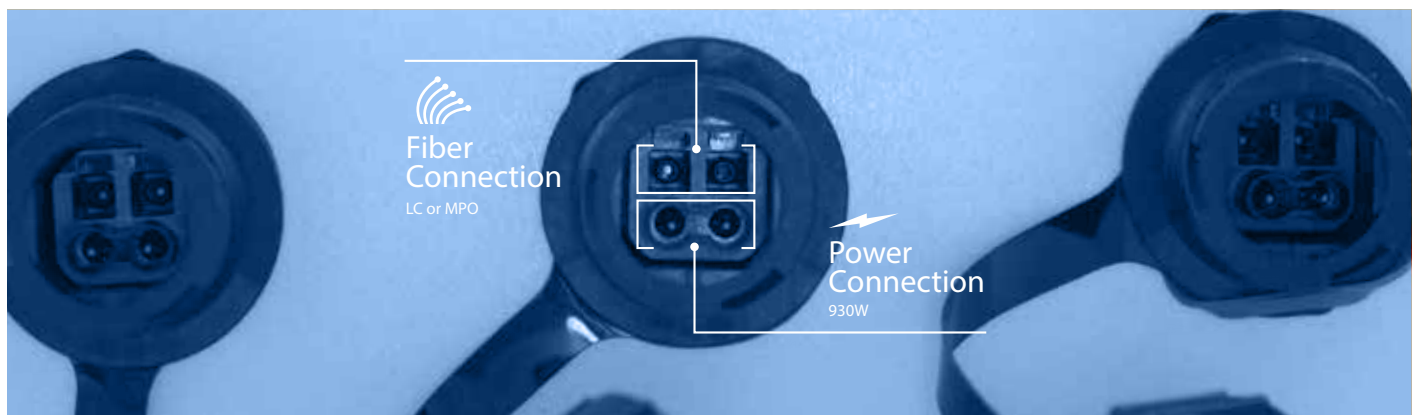
2F Hybrid Cable



12F Hybrid Cable



Outer Sheath
Buffered Optical Fiber
Optical Fiber Unit
Loose Tube
Copper Conductor
Insulation Layer
Aramid Yarn
Ripcord
Water Blocking Tape
Filler



IP-ONE Hybrid Connector Application

CASE 1

Small Cells and DAS Access Point Connectivity

It is important for a wireless access point to be able to simultaneously provision to multiple wireless service providers, technologies and frequencies to accommodate 2G, 3G and 4G systems. Small cells and DAS network are solutions which can be configured to provide wireless connection.

Small Cells such as Femtocells, Picocells and Microcells are stand-alone radio units that are mounted in strategic locations to provide mobile services to the immediate vicinity. DAS network is usually designed to scale with a dedicated backhaul with a large coverage area through its distributed node design fed from a central hub location.

In the design of either a small cell or a DAS network, antennas are installed in areas with poor signal coverage or insufficient capacity to distribute RF signals. The placement of the antennas are usually installed in elevated positions such as on poles and side of buildings thus a significant upfront capital investment is required to provide fiber optic and power cabling. A hybrid fiber/power easy to install pre-connectorised plug-and-play solution simplifies installation and the overall deployment cost. The ability to provide local power transmission to distributed antennas reduces cost of power connection as well as simplifies power supply arrangements with power lines companies.

In addition, the efficiencies of Small Cells and DAS network are further enhanced with the deployment of Cloud-Radio Access Network (C-RAN) based on the Common Public Radio Interface (CPRI) fronthaul technology. This enables the consolidation of Baseband Unit (BBU), simplifies mobility management and sharing of fiber in the access network.

The IP-ONE Hybrid Connector enables the connectivity to the remote nodes to be made through a single Hybrid Power/Fiber cable thus improving cable management.

The advantages of a hybrid connector are:

- Dedicated cable and connector to a node reducing the need for splice enclosures for fiber distribution
- Enables local equipment power transmission to simplify power supply distribution
- Plug-and-play feature enables easy power and fiber connection at height
- A single hybrid cable installation to replace multiple cable runs
- Significant reduction in cable installation cost



IP-ONE Hybrid Connector Application

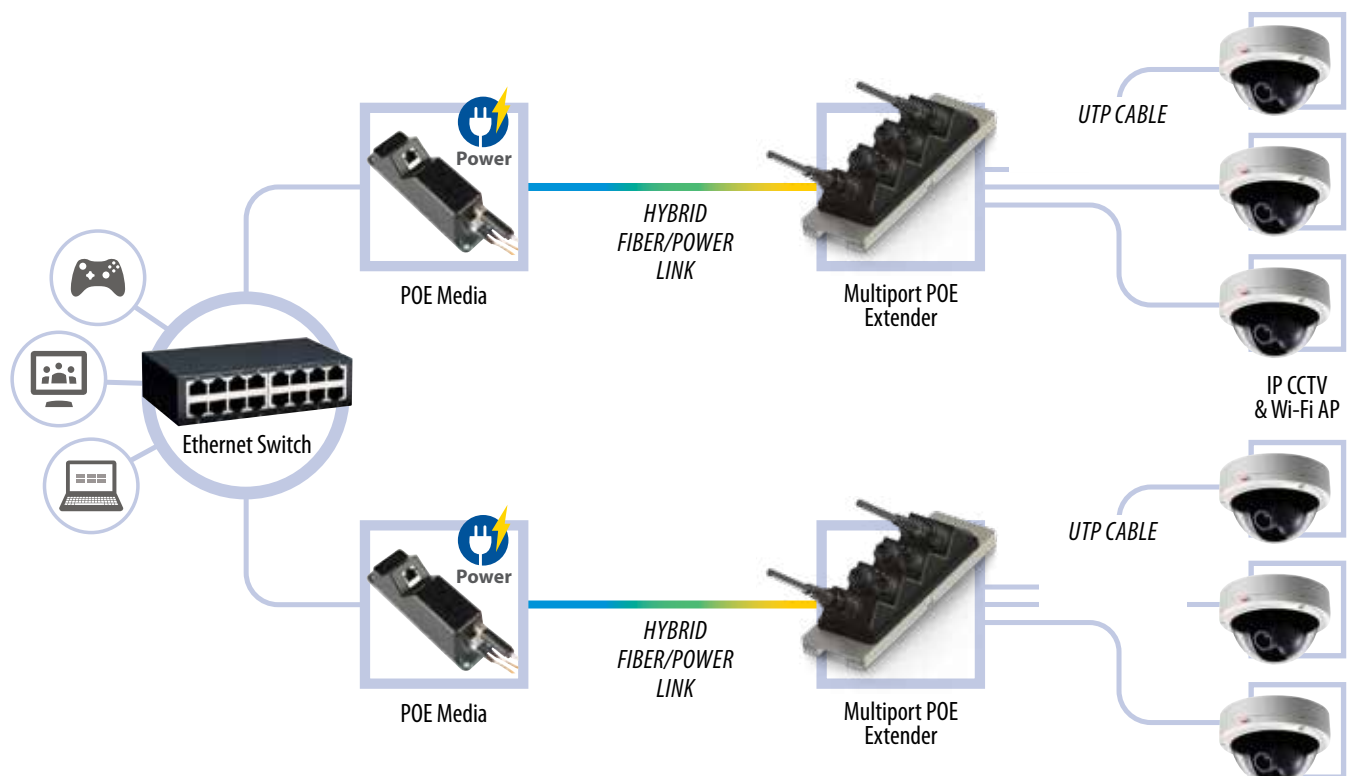
CASE 2

POE substitute for High Definition CCTV and Wi-Fi APs

Power over Ethernet (POE) is usually the technology of choice for the deployment of CCTV systems. POE technology enables a quick and low cost deployment of a distributed Ethernet system such as IP CCTV cameras and Wi-Fi AP. In POE systems, DC power and data are sent through the same UTP cable using separate copper pairs. The UTP cable connects to network devices through an RJ45 port that provides power from a POE switch or injector. Distance is a limitation to the POE system where according to the ITA/EIA 568-5-A standard, the maximum length for a cable segment is 100m over a standard Cat5e cable. In addition, there is limited power that can be fed through a UTP cable with a max of 22 AWG where only 2 copper pairs are used for power transmission.

Fiber optic cabling is the answer to overcome this distance limitation. In addition, a fiber network improves bandwidth, is immune to electromagnetic interference and have multi-channel capability. One method to extend the reach of a POE network over 100m is by using POE media converters with optical fiber as the link back to the main switching hub. However there is a limitation of deploying fiber, which is its inability to transmit DC power to the POE media converters which are usually located in remote sites.

A hybrid power/fiber cable pre-connectorised with the IP-ONE connector is the ideal solution to provide the required fiber to provide data transmission to the POE media converter. In addition, the capability of the IP-ONE connector of transmitting up to 930W of power is essential as there may be multiple devices feeding off the POE media converter which also need a power source. The use of the IP-ONE solution eliminates the need to run separate power cables to feed such devices.



Conclusion

With the growing number of mobile broadband subscriptions and increasing bandwidth consumption, more deployment of Small Cells and DAS network needs to be deployed. In addition, many establishments are deploying private networks for such as control systems and CCTV security systems.

The IP-ONE solution offers an integrated power/fiber connectivity to enable fast and easy installs for significant savings on installation and increased network integrity. The hybrid solution provides significant advantage in removing any need for local power supply.

The hardened connector is designed for use for both indoor and outdoor environment thus reducing inventory requirements. The IP-ONE is the ideal solution to provide an efficient and reliable fiber optic network to any remote active equipment.

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Biography



Bernard HL Lee is currently the the Regional Technology Director at SENKO Advanced Components. He started his career in optical communications when he was appointed as a Senior Research Office for the European Union IST project known as DAVID in 2000. In 2003, he joined Telekom Malaysia R&D where he has held various technical and management positions there including the Head of Photonic Network Research and also Head of Innovation and Communications. Bernard then joined the parent company, Telekom Malaysia (TM) in 2010 as the Assistant General Manager of the Group Business Strategy Division where he oversees the company's business direction. Bernard is also a member of the International Electrotechnical Commission (IEC) that looks into the international standardization on optical components and also a member of the Institute of Engineering and Technology (IET). Bernard has been an active member of Fiber-To-The-Home Council APAC and currently a member of the Board of Directors

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