

HITACHI
Inspire the Next



- "Always-on," high availability architecture
- Reduced CAPEX through hybrid connectivity
- Robust applications for critical smart cities



Hybrid wireless architecture for smart cities

Tropos TRO600 Series

 **Hitachi Energy**

TRO600 hybrid wireless architecture for smart cities

No single communication technology is perfect for every operational need.

Some reach long distances yet provide very low bitrate. Others, while delivering broadband speeds, can only do so at short range. Large public networks provide capacity; however, it is not dedicated. Fully dedicated private networks may not be economical in future proofing coverage and capacity.

In smart city operating environments, there is a growing range of application requirements – some are time critical, others bandwidth intensive and everything in between. What is certain is that the number of devices requiring connectivity is growing exponentially. The challenge facing the city administrator becomes – how to maintain high reliability and resiliency for mission critical operations while expanding the network and adding ever increasing numbers of devices and applications?

Public cellular networks

Public mobile network operators provide cities with rapid time to market, ready to use infrastructure and fast track to new generation technologies. Public cellular networks have a superior geographical reach with minimal CAPEX from cities and charge based on usage (OPEX based). Despite the relatively large spectrum asset utilized, mobile networks are shared and often subject to congestion and sometimes to outages, which may impact mission critical services.

Private cellular networks

Private LTE networks offer fully self-owned and operated, dedicated infrastructure with a forward looking Industrial IoT approach. They can be deployed in both licensed and unlicensed spectrum, which present capacity challenges. Private LTE networks in licensed spectrum are CAPEX intensive due to spectrum cost. As a result, bandwidth is often insufficient to serve the growing richness of applications needed in a city's operations. Unlicensed LTE spectrum on the other hand, can be subject to contention and power restrictions challenging the reliability of the OFDMA architecture.

Mesh networks

Advanced mesh networks provide robust self-optimizing, self-healing and self-organizing architectures. Fully dedicated and private, mesh networks utilize unlicensed spectrum to deliver high reliability communications, ensuring critical communication grade latency and performance. Due to power restrictions and high contention, unlicensed spectrum may present a distance challenge rendering mesh networks expensive in large geographical deployments though it may prove to be the ideal communications network in dense urban environments.

Hitachi Energy Tropos TRO600 hardware delivers “always-on” high availability, high performance wireless network, specifically designed for critical smart city applications. By leveraging multiple communication technologies, hybrid backhauling endeavors to reap the best of cellular and mesh networks, while mitigating their weaknesses.

The Tropos TRO600 series delivers a solution that can take advantage of long-haul cellular links, thus reducing intensive CAPEX. Through its signature mesh capability, the product will continue to deliver a high bandwidth/ low latency backhaul option, circumventing cellular disruptions and ensuring key smart city communications remain reliable and resilient. Where smart city assets fall outside cellular coverage, a mini mesh can economically provide a localized service extension, leveraging the nearest wired or wireless backhaul interconnect. In addition to the hybrid wireless architecture, Tropos TRO600 series provides a robust mission critical wired backhaul through a selection of gigabit Ethernet and fiber interfaces.

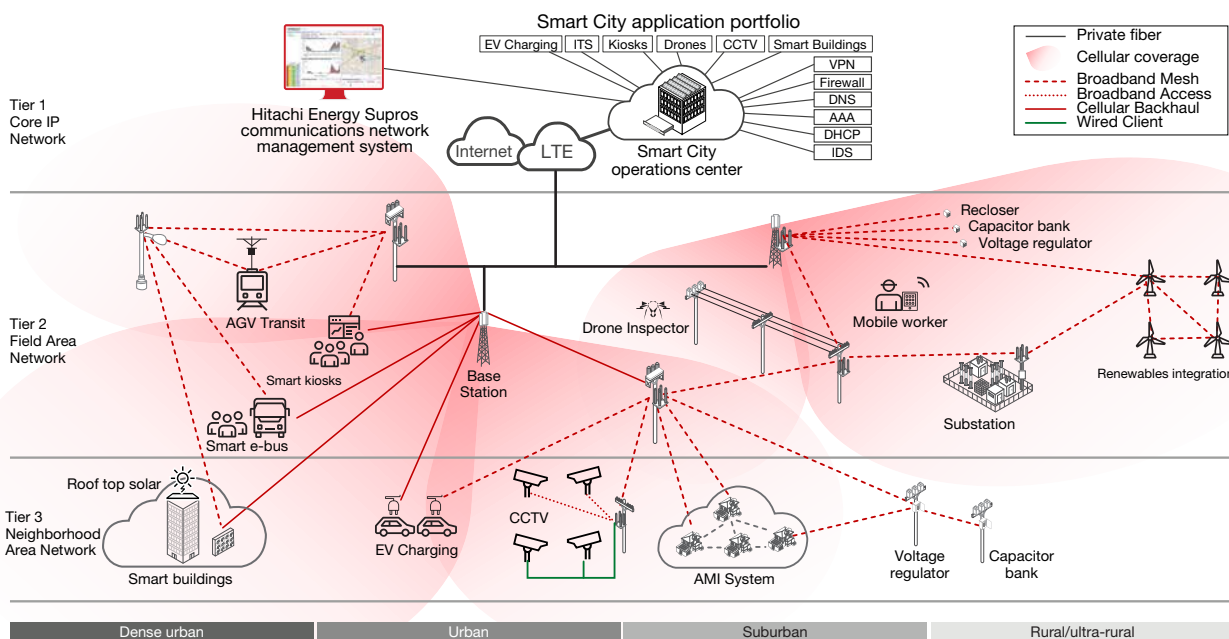
Tropos remains committed to backwards compatibility and providing connectivity to legacy devices within a smart city network by offering a range of serial and contact interfaces. For harsh environments, TRO offers a galvanized, IP67, ATEX Zone 2 ruggedized option.

In order to avoid non-essential communication and allow for future distributed compute requirements the TRO600 family offers an edge compute platform, ready to host custom applications. By bringing decision making closer to the network edge, the volume of data traversing a network is reduced, thus reducing OPEX (through public segments) and contention end to end.

Through Hitachi Energy specialized wireless network management system Supros, smart city networks can be configured, monitored and managed throughout the deployment and operations lifecycle. Whether a node is purely mesh, purely cellular or carries the more robust hybrid capability, Supros provides zero-touch integration for scalable Hitachi Energy wireless networks.

For municipalities with responsibility for electric, water or gas distribution services, the Hitachi Energy Hybrid Network can integrate multiple use cases and operating requirements into a single unified communication network.

Tropos TRO600 Portfolio Overview:



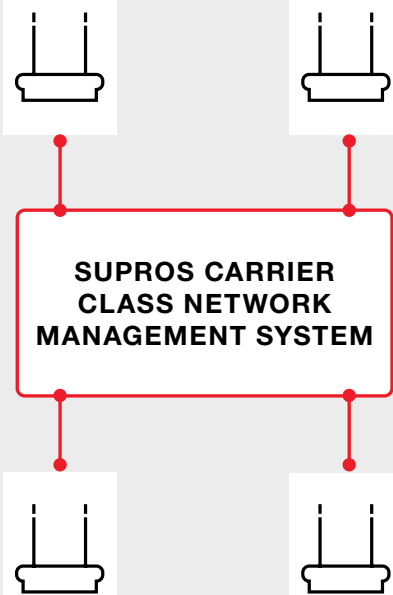
AGV Automated Guided Vehicle; EV Electric Vehicle; ITS Intelligent Transportation System; LTE Long Term Evolution; VPN Virtual Private Network; AAA Authentication Authorization and Accounting; DHCP Dynamic Host Control Protocol; IDS Intrusion Detection System; PTMP Point To Multi Point; FCI Faulted Circuit Indicator; DNS = Domain Name System

TRO670

- Outdoor router, removable antennas
- Highest environmental options
- AC and DC power options
- Optional integrated battery backup
- Dual-band Tropos mesh, LTE and target platform for third-party gateway radio integrations

TRO640

- In-vehicle installations, rolling stock, vibration resistant
- Fast roaming
- Dual-band Tropos mesh and LTE
- Seamless handover mesh <> LTE (future)



TRO660

- Outdoor router, integrated antennas
- Ease of deployment; lightweight
- Dual-band Tropos mesh, LTE

TRO620

- DIN rail cabinet/indoor installations
- Integrated solutions
- Dual-band Tropos mesh, LTE and target platform for third-party endpoint radio integration
- Richness of interfaces and connectivity
- Adaptable to mobile and outdoor applications with available accessories

TO REMAIN ECONOMIC YET FLEXIBLE, ALL PRODUCTS ARE AVAILABLE IN MESH ONLY, CELLULAR ONLY OR HYBRID RADIO VARIANTS

