

# Smart Communications Platform

## Introducing RPMA Communications Technology



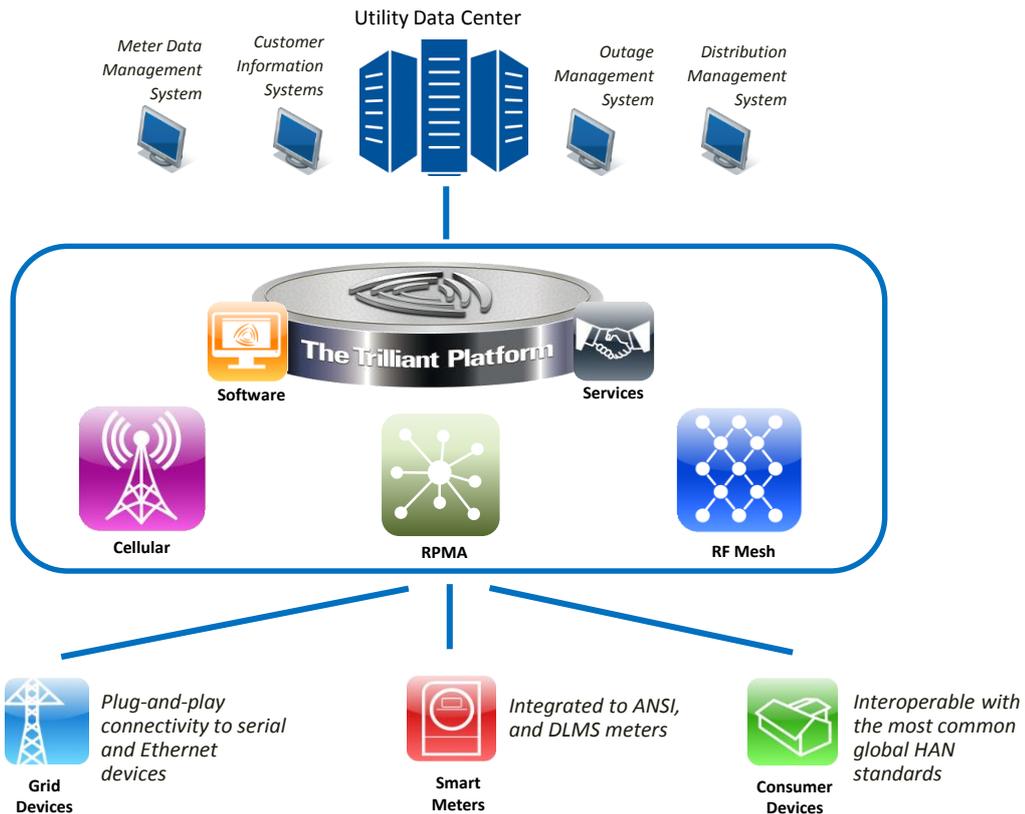
Trilliant helps leading utilities and cities around the world achieve their “smart” visions through the Trilliant Smart Communications Platform, the only communications platform purpose-built for the industry that helps utilities and cities securely and reliably deploy any Smart Grid – AMI, DA and DSM, and Smart City applications, on one powerful network. Trilliant has worked with leading utilities and cities worldwide who collectively serve more than 100 million customers. The Trilliant Platform helps utilities and cities enhance energy efficiency, improve reliability, lower operating costs, integrate renewable energy resources and electric vehicles, empower consumers, and enhance public safety.

### The Platform

Trilliant’s Smart Communications Platform has its origins in Trilliant’s vast domain expertise in the Smart Grid communications and applications space. It is comprised of Trilliant’s UnitySuite™ Head-End System (HES) software, application knowledge, and services. UnitySuite™ enables utilities to operate and control their Smart Meter and Smart Grid network infrastructure and applications. It is capable of controlling millions of endpoints, including multiple device types from meters to fault circuit indicators to intelligent grid devices over multiple communication networks. The Trilliant Platform is highly scalable, supporting millions of devices in deployments worldwide. The Platform supports the necessary ingredients for scalability, like virtualization, clustering, and redundancy.

### Support for Multiple Communication Technologies

Existing, new and emerging applications for Smart Grid, Smart Metering and Smart City deployments are placing increasing demands on communications platforms and it is becoming increasingly apparent that with respect to communications technologies, no one size fits all. There is great variation in the factors that make for a positive business case for different utilities. For example, the ability to go after targeted high-value AMI customers first, or address difficult but critical applications like underground fault circuit detection, or address battery power applications, all could be vital factors that make or break a business case.



With this in mind, Trilliant's Smart Communications Platform allows the utility to make the decision as to which communication technology is best suited to meet their needs. Therefore, underlying the Platform, Trilliant supports a number of mature communications technologies, like RF Mesh, Cellular, and now, **Random Phase Multiple Access, or RPMA®**. With its unprecedented link budget that is many orders of magnitude higher than other radio systems, RPMA can cost effectively support a whole range of new applications - whether it's allowing for targeted smart meter deployments with the lowest total cost of ownership (TCO), or monitoring and controlling deep underground circuits using battery-powered devices.

Trilliant has added RPMA technology into its leading multi-technology Smart Communications Platform at several key integration points including the head end system (HES), network infrastructure and end-point devices. RPMA communications modules will be integrated into various end-point devices leveraging Trilliant's applications development and expertise. The end-point devices will communicate with RPMA access points which will become part of Trilliant's network infrastructure offering. Like all Trilliant network infrastructure, the RPMA access points will be fully managed by the Trilliant UnitySuite™ HES application via its SecureMesh® WAN transport, cellular or other IP-based backhaul options.

The addition of RPMA technology to the Trilliant Smart Communications Platform ideally complements Trilliant's existing multi-tier RF mesh and cellular solutions, all leveraging Trilliant's fully integrated comprehensive network management and UnitySuite™ Smart Metering Head End System. This multi-technology approach enables utilities to choose the right combination of technologies that best fit their needs today, and allows for the evolution of communications systems in the future – all with consistent business processes.

## RPMA Technology

RPMA, which is IEEE 802.15.4k compliant, is quickly becoming the benchmark for connecting M2M/IoT devices. Utilizing universally available unlicensed spectrum, RPMA's properties of robust interference tolerance, wide geographic coverage, high network capacity, and low power support, allow devices to be connected more efficiently than ever before.

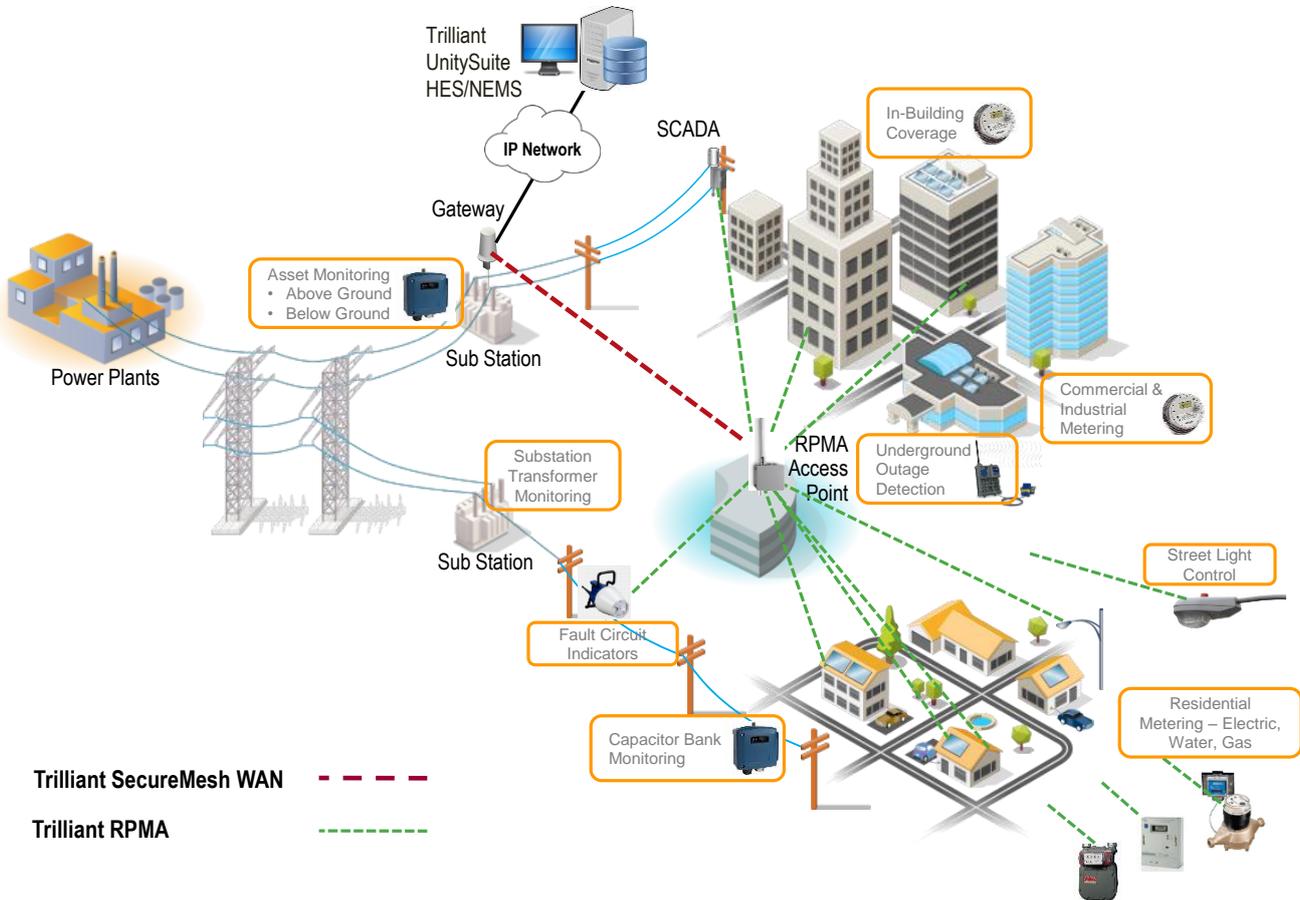
RPMA is an advanced communication system employing

direct-sequence spread spectrum (DSSS) modulation with uniquely high processing gain, along with a high capacity multiple access scheme, a feature which enables over one thousand endpoints to communicate simultaneously. RPMA technology employs tight transmit power control and orders of magnitude more receiver processing gain than ever has been achieved before, resulting in an additional 40 dB of RF link budget. This additional RF budget enables coverage areas supported by a single network access device to be greater than 300 square-miles – reducing the amount of necessary network infrastructure by more than 90% compared to other technologies. Additionally, the enhanced RF link budget can be used to provide deep coverage support in hard to reach areas like large buildings and underground vaults.

RPMA uniquely satisfies the requirements of high capacity, high coverage, and low network TCO due to the following fundamental aspects of the technology:

- **Extreme Coverage.** Based on key fundamental innovations and the advancement of silicon technology, RPMA has the highest industry link budget in all global regions, up to 172 dB of link budget, which minimizes density of infrastructure by orders of magnitude relative to any other approach. An inexpensive, small form factor RPMA Access Point can cover up to 300 square miles with 100% connectivity in non-line-of-sight (NLOS) conditions.
- **Extreme Capacity.** RPMA has extremely high capacity, which allows for the building of multiple million-node networks. Underlying this capacity is the unique multiple access scheme – allowing over a thousand nodes to simultaneously talk to an RPMA Access Point.
- **Stringent Security Standards.** RPMA uses standards-approved security algorithms and provides for mutual device authentication, message authentication, message confidentiality, and secure over the air firmware upgrades.
- **Low Endpoint Power Consumption.** Endpoint power consumption can be a significant cost driver for battery-powered devices. RPMA has been optimized for ultra-low battery consumption.
- **Lowest TCO.** RPMA networks, due to their extreme coverage, and extreme capacity, have a low network

planning and deployment cost, and a very low ongoing operational cost.



- **Use of Global Free Spectrum.** RPMA uses global 2.4 GHz free-spectrum, which means no spectrum costs.

### RPMA Applications and Benefits

As shown above, RPMA represents a significant breakthrough in wireless signal processing technology. This allows for unprecedented signal range and penetration, thereby enabling a whole host of new applications and use cases in Smart Grid and Smart Metering. The addition of RPMA to Trilliant's existing portfolio of cellular and RF mesh technologies make for a complete and broad platform solution that delivers the highest value to customers.

### Rich Partner Ecosystem

The RPMA technology comes with a rich set of Trilliant enabled partners that offer devices and systems with fully embedded hardware and software integration:

- ANSI and IEC meters for the global market
- Devices and systems for fault monitoring and control
- Pressure and flow monitoring
- Transformer monitoring
- Intelligent RTUs, etc.

This, in turn, enables many additional applications that were not well-suited to existing communication technologies like:

- **Targeted Rollouts.** Utilities can decide whether they wish to deploy smart meters, or even grid devices, in a targeted fashion, without being forced to deploy entire neighborhoods or towns, as would be required, for example, with RF mesh. This allows a utility to initially target high-value customers, residential or commercial and industrial that drive a more positive business case.

- **Unprecedented Underground and Hard to Reach Coverage.** RPMA enables below ground distribution and transmission outage detection, resulting in increased reliability and lower service costs for the utility.
- **Remote Feeder Monitoring.** With the use of overhead distribution fault circuit indication using RPMA devices that are line powered using CT clamps, line feeders in the remotest areas can be monitored, reducing the time to isolate and repair outages.
- **Ultra-Low Power Consumption,** allowing up to a 20-year battery-life, for water meter applications, gas pressure sensors, etc.

In summary, the addition of RPMA technology to the Trilliant Smart Communications Platform ideally complements Trilliant's existing multi-tier RF mesh and cellular solutions, all leveraging Trilliant's fully integrated comprehensive network management and UnitySuite™ Smart Metering Head End System. This multi-technology approach enables utilities to choose the right combination of technologies that best fit their needs today, and allows for the evolution of communications systems in the future – all with consistent business processes. RPMA represents a significant breakthrough in wireless signal processing technology. This allows for unprecedented signal range and penetration, thereby enabling a whole host of new applications and use cases in Smart Grid and Smart Metering. The addition of RPMA to Trilliant's existing portfolio of cellular and RF mesh technologies make for a complete and broad platform solution that delivers the highest value to customers.