ADVANTECH
Enabling an Intelligent Planet

Anterix® aws Kalkitech

Seamless DER Data Aggregation on AWS IoT Greengrass

Advantech, Anterix, and Kalkitech Collaborate to Deliver a Secure Edge-to-Cloud Solution Integrated with AWS Greengrass for Fast, Secure, and Reliable Grid Infrastructure

The energy landscape is evolving. The rapid integration of distributed energy resources (DERs)—like renewables and electric vehicles (EVs)—is transforming utility operations. This paradigm shift is driving utilities to seek advanced solutions that not only improve grid reliability but also support regulatory compliance.

Data Aggregation and Overcoming the Challenges of DER Data Management

Effective grid management begins with data. DERs rely on seamless communication with grid systems, making standardized data aggregation essential for success. The IEEE 2030.5 standard enables seamless communication between DERs and the grid. This integrated data flow enhances grid stability, while also empowering utilities to meet regulatory demands and unlock operational efficiencies.

The rise of DERs, however, also introduces significant complexities. Some key challenges include vast data volumes, reliable remote transmission, regulatory & operational needs, and ownership & transparency.

Key Benefits

1. **Energy Management** reducing costs by enabling optimized time-of-use pricing.
2. **Reliable Off-Grid Operation** for remote areas without interruptions.
3. **Grid Security & Resilience** by generating power closer to where it's consumed.
4. **Microgrid Stability** even during outages.
5. **Environmental Sustainability** cuts emissions, improves fuel efficiency with renewables.
6. **Efficient Demand-Side Management** balances grid demand via smart control.
7. **Market-Based Demand Response (DR) Aggregation** eases capacity constraints with consumer load shifts.

Managing vast data volumes from diverse DER sources presents a significant challenge, requiring robust systems for collection, storage, and analysis. Secure and reliable data transmission, particularly from remote locations, is crucial to maintaining grid stability.

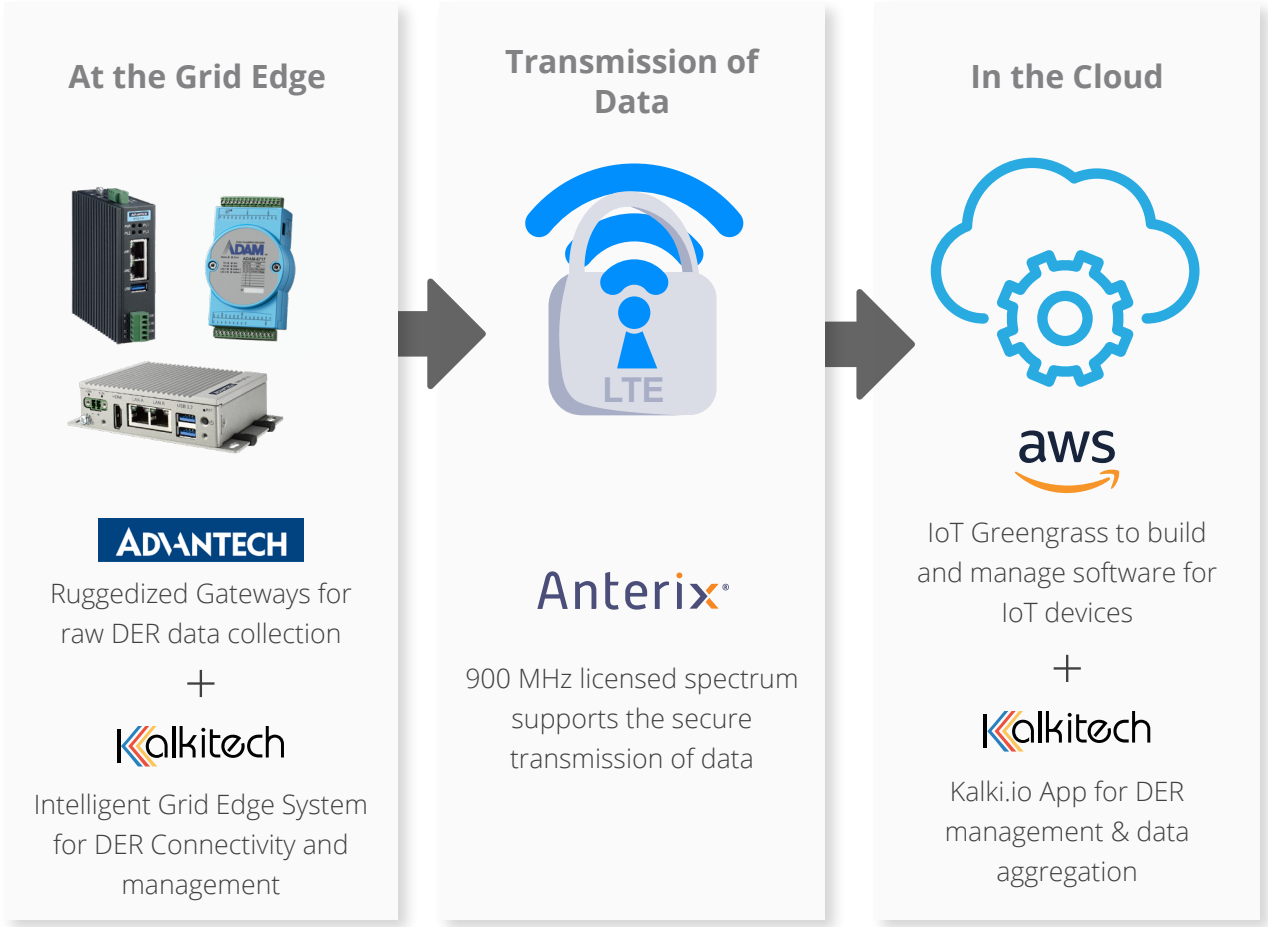
Additionally, utilities must efficiently aggregate generation data to meet both regulatory requirements and operational needs. Finally, as virtual power plants (VPPs) become more prevalent, concerns around data ownership and access must be addressed to ensure auditable and fair management of DER assets.

The Solution for Fast, Secure, and Reliable Grid Infrastructure

Anterix, Advantech, and Kalkitech have collaborated to redefine how utilities modernize their grids. By integrating edge-to-cloud data aggregation on AWS IoT Greengrass, this solution addresses both today's challenges and tomorrow's opportunities.

- **Speed:** Real-time data processing and communication enable rapid decision-making.
- **Security:** Robust security protocols and encryption protect data from unauthorized access.
- **Reliability:** The combination of Anterix's 900 MHz spectrum, Advantech's hardware solutions, and Kalkitech's data management capabilities supports a solid foundation for grid operations.

Solution Architecture



Advantech for Rugged Edge Hardware for Data Collection

Advantech provides rugged hardware tailored to the demands of energy applications, which frequently encounter extreme temperatures at the edge. Not only are these devices scalable, but they also facilitate data collection, secure transport, and reliability at the edge.

The Hardware:

UNO-2271G V2 is a ruggedized pocket-size edge IoT gateway, featuring Intel® Celeron® Dual core N6210/ Pentium® Quad core N6415 processor. Embedded LTE module with Anterix Band 8 and supports APIs such as AWS Greengrass for enhanced intelligence at the edge. It offers a robust, fanless, and cable-free system with high stability for device management.

ECU-150 is a high-performance IoT gateway with an NXP i.MX8M Quad Core processor and open platform design. Robust connectivity with two isolated RS-232/485 serial ports, two 10/100/1000 Ethernet ports, and a USB 3.0 port.

ADAM-6717 is a Linux-based gateway with versatile analog and digital I/O modules. It provides reliable data acquisition, process control, and alarm/event handling for industrial systems.

Anterix 900 MHz spectrum supports secure DER

Anterix's 900 MHz private spectrum provides a robust, secure, and low-latency solution for DER communications. By enabling real-time grid visibility and control, this private LTE enhances the integration of Distributed Automation (DA) and DER applications. Its ability to support high-bandwidth, low-latency applications enable a future-proof infrastructure for evolving utility needs, including DER integration and backhaul for existing metering infrastructure.

The Anterix Active Ecosystem Program brings together over 125 leading technology providers, supporting utilities in deploying and managing private LTE networks. This Ecosystem fosters interoperability among vendors, allowing seamless integration of DER solutions, grid endpoint devices, and network infrastructure. With private LTE, utilities can support secure, real-time communications, improve fault identification, accelerate outage response, and streamline DER management, all while reducing network complexity.

AWS for Scalable Cloud Aggregation and Management

AWS IoT Greengrass offers a scalable and secure solution to DER and grid infrastructure challenges. As an open-source edge runtime and cloud service, it enables seamless deployment, management, and security for DER-connected devices. Greengrass-integrated devices automatically inherit AWS IoT security, leveraging X.509 certificates and mTLS authentication for robust data protection.

Utilities can manage device software updates, deploy edge applications, and scale without concern for capacity limitations. AWS IoT Core ensures secure data ingestion, while AWS Identity and Access Management (IAM) enforces strict access controls.

With AWS Direct Connect, utilities can establish a single high-bandwidth, encrypted connection to the cloud, simplifying access to DER data across thousands of sites.

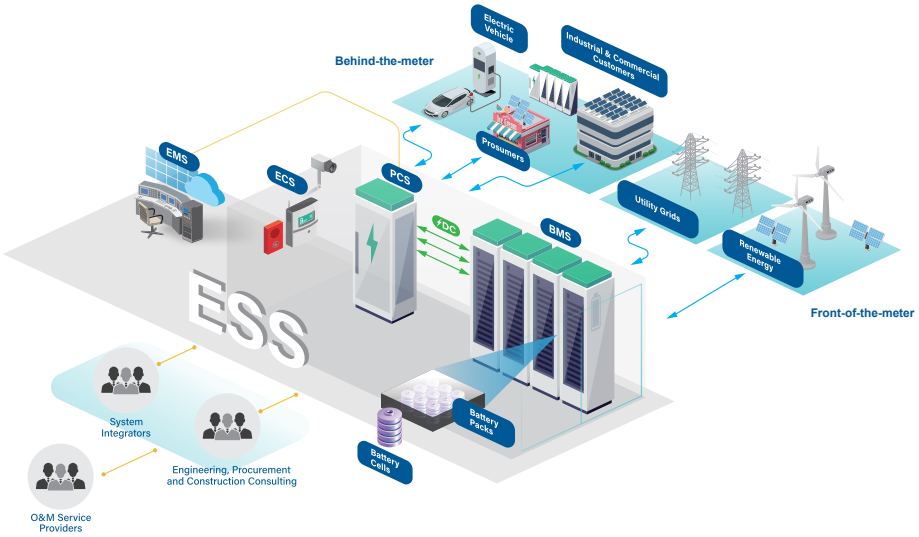
Kalkitech: DER Management and Data Aggregation Through Grid Edge Integration

ASE/Kalkitech's Grid Edge Software is essential for integrating and managing diverse DERs within the intelligent DERs solution. This technology converts multiple DER protocols, aggregates data for regulatory compliance, and enhances grid operations. integrated with AWS Greengrass, the DER gateway provides seamless protocol conversion, data aggregation, and cloud integration. It connects to various DERs, aggregates data at the field level, standardizes it as per IEEE1547 requirement either IEEE2030.5, DNP3.0 or SunSpec, and transmits it to the Kalki.io cloud-based DER Interconnection and orchestration platform. From there, utilities can efficiently manage and analyze DER data while ensuring secure and compliant grid integration. Beyond grid operations, Kalki.io enables DER assets to participate in energy markets, opening opportunities for capacity and ancillary services.

Kalkitech provides next-generation capabilities that enhance real-time insights and decision-making for grid operations. With robust support for multi-protocol conversion, data normalization, and edge computing, Kalkitech ensures seamless interoperability, strict regulatory compliance, and significant improvements in grid efficiency. These capabilities empower utilities to streamline DER integration, while maintaining critical security, scalability, and operational intelligence.

Use Case: Battery Energy Storage Systems (BESS)

Battery Energy Storage Systems (BESS) store excess energy from renewable sources like solar and wind, improving energy efficiency and reducing loss. These systems rely on precise HVAC control and data management, supported by Advantech's ADAM-6717 I/O gateways for HVAC control and alarm handling, ECU-150 edge gateways for managing battery banks, and UNO-2271 edge computers for system monitoring.



Anterix's 900 MHz private wireless connection supports secure and reliable communication, while AWS Cloud and Greengrass provide scalable cloud services and edge computing capabilities for advanced analytics and control. Kalkitech's protocol enables seamless data integration across diverse devices and systems, creating a robust and connected BESS infrastructure.

Unlock Grid Modernization with Trusted Experts

The future of energy demands solutions that are innovative, reliable, and scalable. The collaboration between Anterix, Advantech, AWS, and Kalkitech offers utilities a comprehensive, secure, and scalable solution for DER integration. By leveraging private LTE, rugged edge computing, cloud-based analytics, and standardized protocol conversion, utilities can enhance grid reliability, meet regulatory requirements, and optimize operational efficiency.

Next Steps for IOUs:

- Explore deployment options to modernize grid infrastructure.
- Leverage AWS IoT Greengrass for scalable, secure data aggregation.
- Leverage Kalkitech's DER Management and Aggregation platform to harmonize and optimize DER assets
- Deploy Anterix 900 MHz Private LTE spectrum.

For further insights on grid modernization, visit: www.advantech.com

Anterix

Anterix is helping utilities lead the way to a resilient clean energy future through innovation and connected technologies.

Visit www.anterix.com for more information.

Kalkitech

Kalkitech delivers cutting-edge, standards-based solutions for utility and renewable digital transformation, leveraging deep expertise in communication, optimization, power systems, engineering, and technology.

Visit www.kalkitech.com for more information.

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