SOLUTION BRIEF

Energy Industry

# Acquiring and Processing Data at the Edge of the Energy Grid

Utility-grade platform helps utilities improve business operations and asset health

Solving the "connect the unconnected problem" in the utility sector.

## Energy Grid Challenges

Utilities are collecting an enormous amount of grid data, but is it providing a complete picture or being analyzed properly? Often, useful information is missing because some intelligent devices at the grid edge, like meters and transformers, are "unconnected" due to the considerable effort and expense in developing interfaces to them. A challenge for utilities is these edge devices use a wide variety of standards-based and proprietary communication protocols that increase the time and complexity for product vendors to develop technology to convert data. Once the data has been collected, it should be aggregated and analyzed in ways that facilitate a utility's decision making, and ultimately increase distribution grid reliability and efficiency.

## Putting Energy Grid Data to Work

What is needed is a major improvement in situational awareness, achievable with real-time monitoring and a control infrastructure. However, this requires utilities to gather data from the edge where many of the Distributed Energy Resources (DERs) are located; and until recently, this has been a difficult and expensive undertaking.

Today, operational technologies, like the Internet of Things (IoT), are making it easier to collect and analyze data in a flexible, secure, and cost-effective manner. The IoT connects field sensors, devices, equipment, and field workers to head-end systems, where utilities can improve real-time decision making, solve critical problems, and enhance productivity and efficiency. By acquiring and processing data at the grid edge, IoT solutions reduce response time and send filtered data to the utility's data

center, thereby improving reliability and efficiency while consuming less network bandwidth. Forecasts indicate more than 40 percent of general IoT data will be stored, processed, and analyzed at or near the network edge by 2019, as shown in Figure 1.

## Improving Business Operations and Asset Maintenance

With the means to distill and analyze data efficiently and in a timely manner, utilities have the intelligence to make more informed decisions related to operations and asset maintenance:

**Increasing distribution grid uptime and problem resolution:**

- Respond more quickly to incidents
- Reduce operations costs with self-healing systems
- Repair systems faster with remote diagnosis
- Provide operators with more in-depth data and analysis to accelerate problem resolution

**Enabling predictive and preventative asset maintenance, and improving grid reliability:**

- Predict and avoid failures
- Minimize downtime
- Optimize maintenance schedules for service, spare parts, etc.
- Reduce truck rolls and outages, and increase system reliability

## Hurdles to Collecting Grid Edge Data

It is not an easy time for utilities as they face falling revenues and rising infrastructure costs. Less money is coming in as more people and organizations take steps to conserve energy. As a result, utilities have less budget for grid modernization projects such as collecting grid-edge data from substations, transformers, relays, etc.

A major challenge that can escalate the cost and complexity of grid automation projects is the collection of data from field devices. Often utilities have deployed devices from multiple vendors that use a combination of proprietary and standards-based protocols, resulting in an onerous lack of data communications interoperability that must be overcome. Moreover, each of these communications links must be secured in order to safeguard the overall grid.

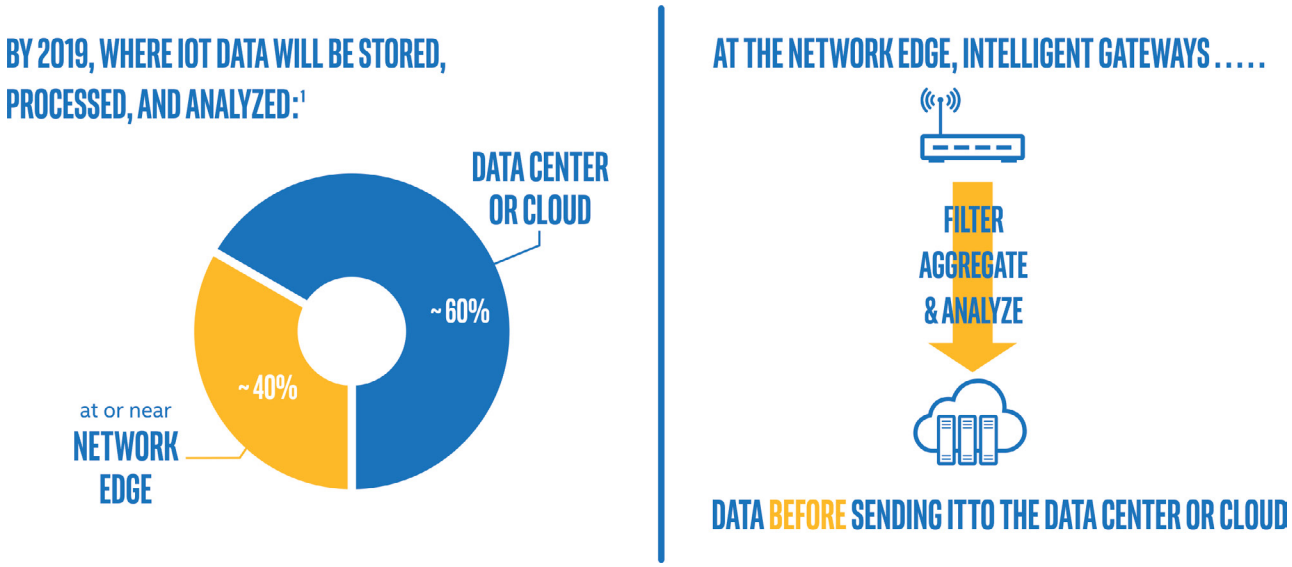


**Figure 1.** A significant amount of IoT data is stored, processed, and analyzed at or near the network edge. Source: IDC FutureScape[1]

## Digitizing the Grid

Intel and Kalkitech developed an IoT gateway solution used to connect to, and collect data from, all types of energy grid equipment and devices that use a variety of protocols. The gateway solution can locally aggregate and analyze the data, as well as send filtered data to a utility's data center for business intelligence, analytics, dashboards, and other applications. This utility-grade platform is a key element in energy distribution infrastructures and at power customer sites, as shown in Figure 2.

## Solution Overview

This IoT gateway solution from Intel and Kalkitech makes it seamless for utilities to connect existing and next-generation energy grid devices to a data center or cloud. It integrates technologies and protocols for communications, networking, embedded control, enterprise-grade security, and easy manageability on which application-specific software can run.

The gateway solution enables:

- Connectivity upstream to the utility data center or cloud
- Connectivity downstream to grid equipment, devices, and sensors
- Pre-processing of selected data for upstream delivery
- Local decision making
- Local computing for grid-edge data analytics

### Hardware Components

The hardware portion of the solution is based on IoT gateways from manufacturers such as ADLINK, Advantech, Axiomtek, and IEI. These gateways are based on the Intel Atom® processor E3800

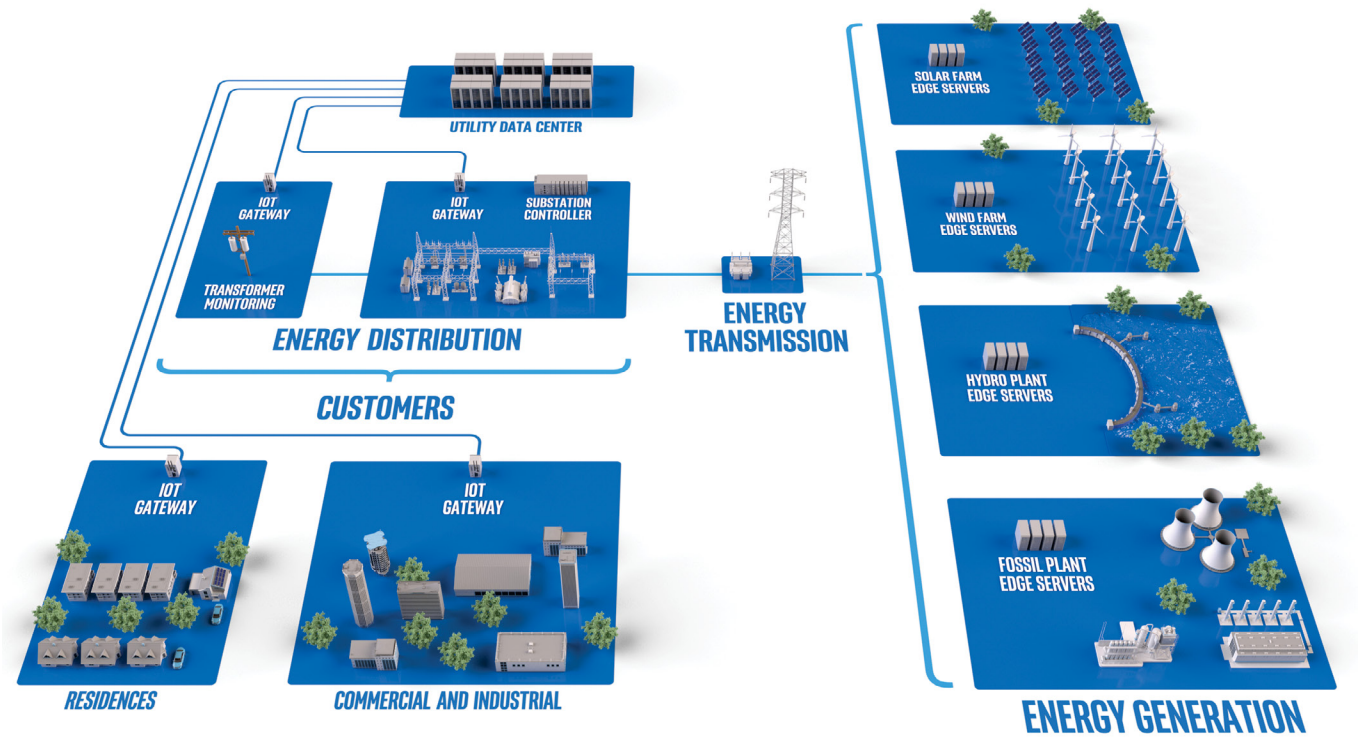


**Figure 2.** Energy grid deployment example for IoT gateways

product family that delivers single-core, dual-core, and quad-core performance.

### Software Components

The gateway platform is a combination of two key elements: the Intel® Data Management Middleware and the Kalkitech SYNC Connect* multiprotocol data collection engine.

Intel's data management middleware organizes and enhances field data with system models and context. It provides storage, data filtering, event generation services as well as an OPC UA server for publishing data to various clients within a utility's infrastructure with a compact encoding and integrated security to communicate over a variety of networking technologies and topologies. The Intel middleware also has an API, enabling integrators and application developers to land applications on the gateway.

The SYNC Connect multiprotocol engine from Kalkitech simplifies the collection, aggregation, and conversion of field data, accelerating access to grid-edge data from both legacy and new devices. SYNC Connect is a robust and proven product, supporting more than a 100 industry standard and vendor-specific protocols, including Modbus*, DLMS, IEC 61850, DNP3, and IEC 60870. SYNC Connect, shown in Figure 3, supports many-to-many data conversions and normalizes the data into a common format, thus assuring it can be easily and securely accessed by other applications. It offers an interface to enable additional protocols. For a complete list of protocols supported, click here.

The Intel Data Management Middleware, combined with the Kalkitech SYNC Connect Protocol Middleware, gives system integrators, OEMs, and independent application developers a flexible, secure, and cost-effective platform for driving new applications that generate new insights with edge intelligence.

## Solution Benefits for Utilities

The IoT gateway solution developed by Intel and Kalkitech provides utilities with the useful grid-edge data they need to improve business operations and asset maintenance. In addition to these important areas, the solution can help utilities increase distribution grid reliability in a variety of ways, for example:

- Optimize line voltage to minimize energy losses and line damage
- Locate the source of sags, surges, and outages

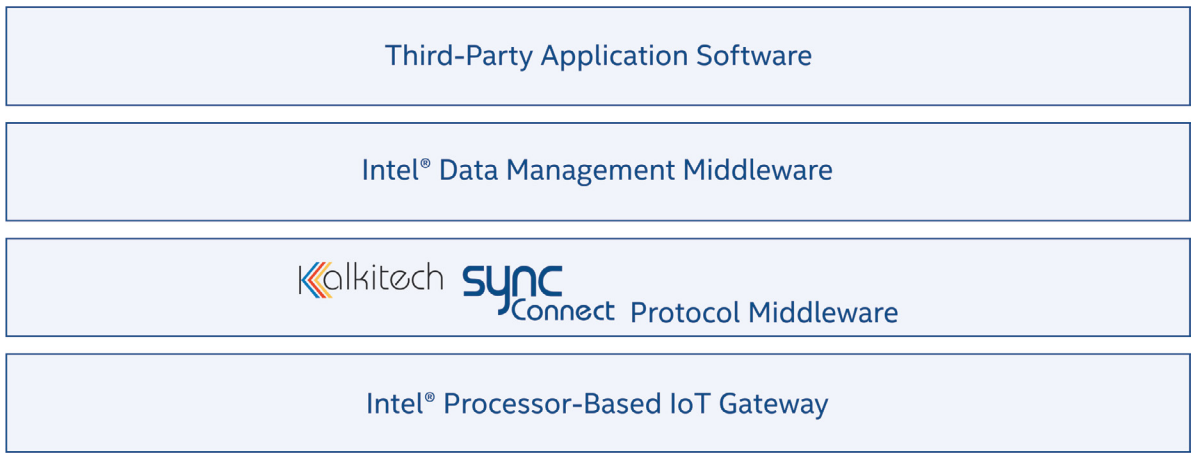


**Figure 3.** Solution architecture

### Benefits for Solution Providers

OEMs, software developers, and systems integrators can accelerate their time to market with the robust, Intel-Kalkitech gateway solution, which eases the integration and support for a broad range of SCADA protocols. The solution also implements standards-based, layered security infrastructure that provides protection against cyberattacks. The gateway can be purchased from Intel ecosystem partners, including Advantech, ADLINK, Axiomtek, and IEI, giving utilities and system integrators many options.

To meet the diverse and fast-growing demands of grid automation and intelligence, the Intel-Kalkitech gateway solution supports a large assortment of Intel® processors, thereby delivering a high-level of scalability and operating system choice. The gateway's extensive set of features, shown in Figure 4, can help solution providers gain a competitive advantage by reducing their development cost and time, and enabling the development of an exceptionally high-quality product.

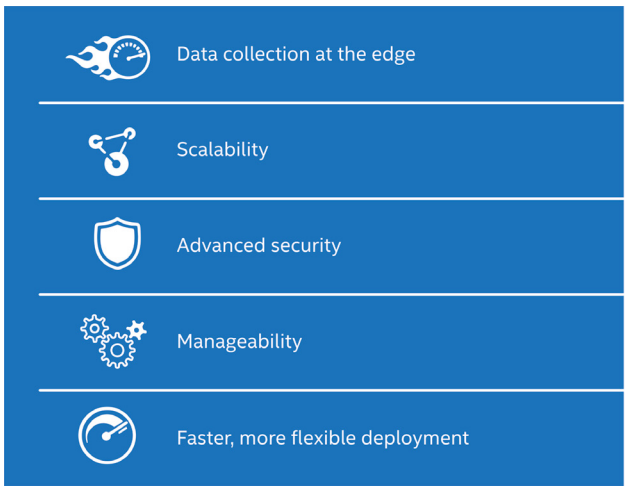


**Figure 4.** Features of Intel® IoT Gateway Technology

- Improve load balancing, restore services faster, and make safer override decisions
- Identify the source of technical and non-technical losses
- Lower outage investigation time by isolating fault locations

### Connecting the Unconnected in the Energy Industry

Today, many utilities are missing out on opportunities to advance their business operations and asset maintenance because they are unable to collect and utilize the grid-edge data essential for timely and informed decision making. With access to this data, combined with analytics, utilities can reduce operations cost and increase grid reliability, among other benefits. Using IoT technology, Intel and Kalkitech are demonstrating how to collect, aggregate, and analyze this information in a way that is more flexible, economical, and secure than ever before.

For more information about Intel solutions for the energy industry, visit https://www.intel.com/energy.

To learn more about products from Kalkitech, visit https://www.kalkitech.com.

[1] Carrie MacGillivary, IDC FutureScape: Worldwide Internet of Things 2017 Predictions, November 8, 2016, Prediction 8. https://www.idc.com/research/viewtoc.jsp?containerId=US40755816