How to Integrate Grid Management Solutions with Itron

Before we explain how to deliver your grid management solution to utilities on Itron's communications networks, let's first touch on why you should consider integrating with Itron.

Typically, utilities roll out grid modernization initiatives in stages, beginning with priority use cases, like fault location isolation & service restoration (FLISR) or conservation voltage reduction (CVR), that easily justify the investments in new equipment and processes. These investments are often deployed as single-purpose solutions, with dedicated communication networks for each application. This siloed approach to grid modernization can be costly to deploy and complicated to manage. By contrast, Itron's multi-application network is purpose built to enable a variety of grid management use cases, delivering the performance required for mission critical applications such as outage response while providing the flexibility to enable future applications such as Volt/VAr optimization and distributed energy resource (DER) integration.

Leading utilities are beginning to implement a broader range of grid management use cases, and the rest of the market is following in their footsteps. According to a recent report by the Northeast Group, the U.S. market for grid management solutions in 2017 was more than $21 billion and is projected to grow by a CAGR of 23.7 percent through 2022 to reach more than $61 billion. As intelligent devices continue to proliferate throughout the grid, the smart grid will transform into an Active Grid that coordinates millions of connected grid devices harmoniously with real-time measurement and control.

The Active Grid will leverage significant recent advancements in grid management technology to deliver an entirely new level of visibility into the state of the distribution network. These technologies include distributed intelligence, machine-to-machine communications, cloud computing, data analytics, and a new generation of battery-powered edge devices and sensors. Itron is supporting the development of the Active Grid with multi-application networks that are both open and secure, reliable, resilient, and interoperable. Our networks are capable of connecting everything from utility smart meters, distribution sensors and control devices, to urban infrastructure like EV charging stations and rooftop solar.

Itron is the leading network provider for electric, water and gas field area network communications, with 77 percent of the market among top utilities in the U.S utilities. Furthermore, 75 percent of power in the U.S. touches Itron technology. Our utility customers are actively pursuing grid modernization, and we want to work with partners and solution providers like you to develop a diverse ecosystem of breakthrough solutions that unlock the Active Grid for our customers. Already, our Partner Ecosystem supports a broad range of applications in smart grid, smart street lighting and consumer services.

Our vision is to leverage widely adopted industry standards to enable an open ecosystem of solution providers on our proven, multi-application network platform. If you're a grid management solution provider interested in integrating smart devices with Itron's network, we can provide you access to an engaged customer base and the tools you need to accelerate time-to-market. This document will explain the basics of our network technology as it's used by leading utilities and cities worldwide. It will tell you how to get started evaluating the integration process on your own, and when to reach out to Itron for assistance.

THE BASICS

Itron's Gen5 Platform is an open, standards-based, IPv6-enabled wireless network that provides ultra-reliable, fast, and ubiquitous connectivity for real-time grid management use cases. The Gen5 platform is a suite of intelligent devices that lays the foundation for the Active Grid through proven, standards-based solutions that are secure, flexible and reliable.

By leveraging widely adopted industry standards such as Wi-SUN, solutions that integrate with the Gen5 platform will support full interoperability with existing Wi-SUN-based devices already deployed in the field as well as future Wi-SUN-based devices that utilities will deploy over time.

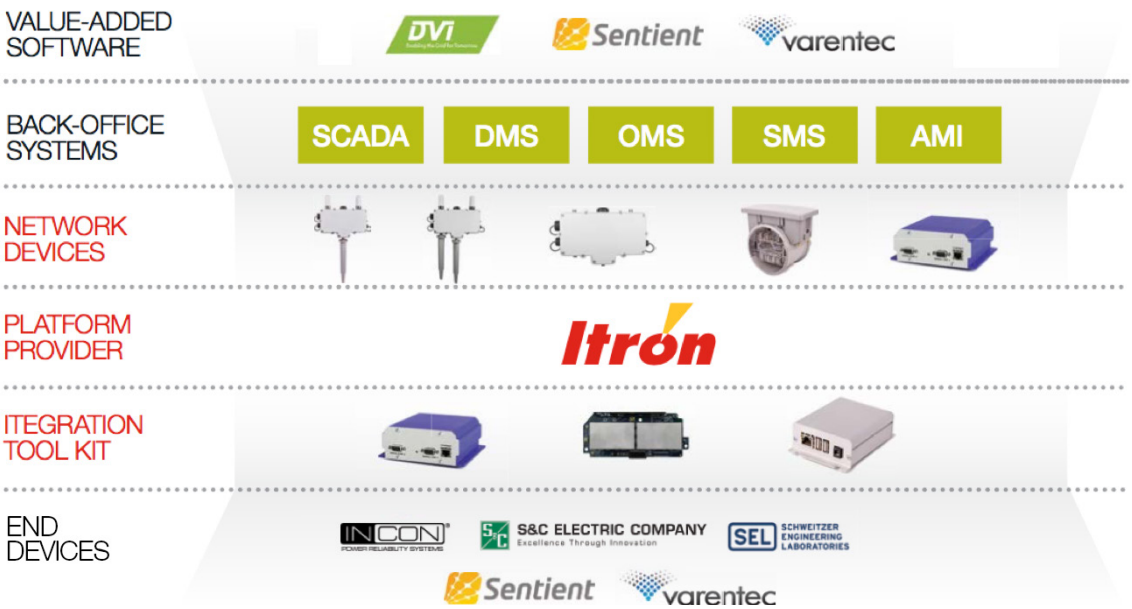
Utilities have two options for Network Takeout when designing grid management networks on Gen5.

- Access Points (AP) provide a single takeout point that connects all field area network (FAN) devices to the wide area network (WAN). This creates a unified network that supports all grid management applications. Access Points work with Relays to communicate with edge devices, providing seamless network coverage.
- Master Bridges provide dedicated takeout for critical grid management applications. These come in a ruggedized form factor and are purpose-built to connect directly to existing SCADA backhaul. Master Bridges support dedicated, stackable bandwidth for grid management takeout to the WAN. A typical architecture configuration for grid-management use cases utilizes Master Bridges as the network gateway.

ENDPOINT CONNECTIVITY

Intelligent endpoint devices connect to the FAN via Remote Bridges or embedded communications modules. Remote Bridges are versatile RF-based communications devices that pair with reclosers, feeder switches, capacitor bank controllers and other distribution automation (DA) equipment via serial or Ethernet interfaces to support low-latency SCADA communications. The low latency, high data rate, and quality of service allow mission-critical control processes while delivering cost-of-ownership advantages of a unified network.

FIGURE 1. THE ITRON GRID MANAGEMENT ECOSYSTEM



This document addresses the portion of the Itron ecosystem represented in the bottom three rows of the diagram.

[1] ADD Northeast Group citation here.
[2] Top U.S. utilities as measured by endpoint count

Embedded communications modules are integrated into high-volume devices, like line sensors, which often have size constraints or limited access to power supply. Deploying high volumes of these devices helps to create a scalable and resilient RF mesh layer for the FAN.

The Itron network as a whole uses widely adopted open standards to create a common platform that supports a wide range of grid management use cases including Distribution Automation (DA), Distributed Energy Resources (DER), and Advanced Metering Infrastructure (AMI) systems (Fig #2).

GETTING STARTED WITH ITRON

Our Developer Program is open to third-party solution providers and Itron's utility customers—anyone building the next generation of sensors, actuators, devices and applications. Our Technology Partners leverage Itron's proven platform to enable robust, reliable and secure connectivity with intelligent grid devices, and to deliver insight with value-added software applications.

When you register for the Developer Program on our Developer Portal and navigate to the Gen5 development path, you'll gain access to hardware and software development kits, as well as the support your need to ideate, iterate and implement breakthrough solutions for utilities.

If you're pursuing a specific Itron utility customer, let's talk right away. Contact us at IC-developerprogram@itron.com. But if your aim is to prepare your solution for the broadest possible market, this document will get you farther down the road before we need to talk.

CHOOSING PLUG-AND-PLAY OR DEVICE-EMBEDDED

Itron's Gen5 Network offers several options to integrate endpoint devices. This document describes the process for solution providers who want to integrate grid management devices with Itron's Gen5 communications network via the plug-and-play Bridge 5 or embedded communications modules.

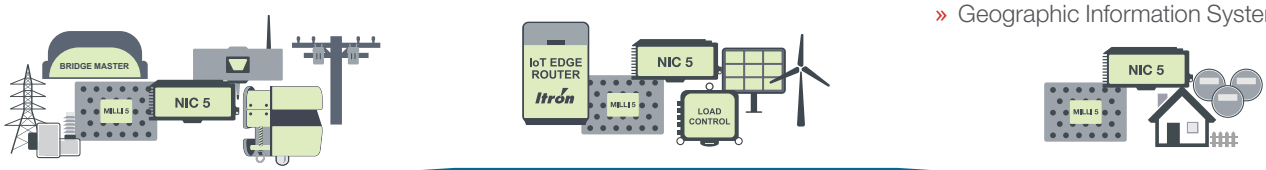
Fig. #3 lays out the specifications needed to determine which Itron integration option is appropriate for your grid management application. But when choosing between plug-and-play or device-embedded communications, two factors stand out: cost and physical footprint. If your solution requires a high volume of deployed devices, an embedded communications module will be much more cost-effective. Similarly, if your device is relatively small, like a line sensor, you will need to use an embedded module, since the larger Bridge will be incompatible with the form-factor constraints.

Key Advantages of Partnering with Itron

- Proven technology delivered at scale: >190M connected endpoints delivered worldwide.
- #1 Market share: 77% of the market for edge device communications among top utilities in the U.S..
- Robust Partner Ecosystem: We're committed to supporting a collaborative ecosystem that leverages open-protocol standards and our proven technology to deliver breakthrough outcomes to utilities and cities.
- Superior bandwidth and latency: Up to 2.4 Mbps and 10 ms per hop.
- Ultra-reliable communications: Engineered with redundancy and failover.
- Multi-layer security for critical infrastructure: Itron's entire solution architecture incorporates best-in-class protections for devices and communications.

FIGURE 2. ONE PLATFORM, MANY APPLICATIONS

DA	DERs	AMI
Back Office Software	**Back Office Software**	**Back Office Software**
» Outage Detection System	» HAN Communications Manager	» Advanced Metering Manager
» Gridscape	**Third Party Data**	» SensorIQ
Third Party Data	» Distributed Energy Resource Management System	» Outage Detection System
» SCADA	» Demand Response Management System	**Third Party Data**
» CVR/VVO	» SCADA	» Outage Management System
» Outage Management System		» Meter Data Management System
		» Geographic Information Systems



USE CASES

- **Storm Response**
- **Renewables Integration**
- **Optimization & Efficiency**

Multi-application connectivity supports a range of grid management use cases.

PRODUCT DEVELOPMENT LIFECYCLE FOR EMBEDDED NIC INTEGRATIONS

Figure #4 shows the steps to integrating and commercializing a grid management solution on Itron's Gen5 platform with an embedded communications module. The length of time required to complete the process will be different for each partner, and there is no required timeline. As a Technology Partner, you're free to move at the pace that's right for your business. If there is a business need to quickly demonstrate an application in parallel with completing your embedded integration, it may be possible to use Bridges to achieve this.

Evaluation

- Prototyping

Market Assessment

- Discuss target customers & gauge customer interest
- Discuss development costs
- Execute non-disclosure agreement
- Execute development and NIC resale agreements

Specification

- Gather customer requirements
- Develop product requirements documentation
- Draft functional specifications

Development

- Finalize functional specifications
- Execute project plan
- Manufacturing process integration

Verification

- Hardware/software/firmware testing
- Product approval

Product Launch

- Sales enablement and planning
- Initial shipments
- Beta trials

Sustain

- Forecast volume shipments
- Quarterly business reviews
- Product roadmap alignment

THE HARDWARE BREAKDOWN

Plug-and-Play Connectivity (Bridge)

- A weatherized, rugged, standalone device for connecting high-value assets, such as switches and reclosers.
- Can be readily installed within a control box and interface to the controller using serial or Ethernet.
- Provides IP-based aftermarket interoperability with remote terminal units (RTUs) and can be tested and deployed with minimal support.
- Delivers up to 2.4 Mbps of wireless data transfer, and 10 ms per hop latency.
- Increases performance for critical devices using bandpass filters
- Bridges are procured directly by the utility.

Embedded Communications

A module to be embedded into continuously powered and power-harvesting, third-party devices.

- Suitable for lower cost, higher volume grid devices and/or devices with size constraints.
- Helps to create a scalable and resilient RF mesh layer for the FAN.

FIGURE 3. CHOOSING A CONNECTION

Bridge and Integrated Connection Options

	Bridge 5	NIC 5
Intended Use	Low volume devices	Integrated high volume
Integration Type	Plug-and-play	Embedded-module
Availability	Currently available	Currently available
Dimensions	150L, 140W, 42H (mm)	109L, 47W, 7H (mm)
Radio	1W, bandpass filters	1W
Date Rate	50k–2.4Mbps	50k–2.4Mbps
Latency	As low as 10ms/hop	As low as 10ms/hop
Physical Interface	Ethernet, 2 serial	Serial & GPIO (12-pin header)
Environment	IP50, -40°C to +85°C	-40°C to +85°C
Power	10-60 VDC	4 VDC
Device Management	Gridscape/AMM	Gridscape/AMM
Provisioning	AMM	AMM
IPv4 Networking	Managed by Gridscape	Managed by Gridscape
Peer-Peer Support	Yes	No

PROTOTYPING WITH THE DEVELOPER KIT

See Fig. #5 for a set-up diagram of the development environment based on the NIC developer kit. The kit includes:

- Network Interface Card 5 (NIC 5): A communications module that is embedded in your endpoint devices to provide connectivity to the Itron network platform.
- Field Service Unit (FSU): A portable tool used by field technicians to communicate with NIC-equipped devices for configuration, troubleshooting and other operations. It also can be used in a laboratory or meter shop to test and pre-configure devices before installation at customer sites.
- Communications Tester Software (CATT): A PC-based software tool used to configure/query NIC communications modules with an FSU.
- Bridge Configurator: A PC-based software tool that, in conjunction with a field service unit (FSU), creates networks of Bridges, remote terminal units (RTUs), and intelligent endpoints The tool supports several different grid management deployment scenarios and network configurations.
- Master Bridge: A communications device that provides high-performance, reliable, and secure Distributed Network Protocol 3 (DNP3) transport between intelligent endpoints and data centers. Master Bridges provide the connection or take-out point to the SCADA system for any DA device with which it communicates.

FIGURE 4. ITRON INTEGRATION STEPS

Below is an outline of the tasks associated with each step of the Itron integration process. This paper provides a guide to complete the evaluation phase. The remaining steps in the integration process will be done in collaboration with the Itron team.

After you've successfully prototyped your grid management solution, the remaining steps in the integration process will be done in collaboration with the Itron Technical Enablement team.

GOING TO MARKET WITH ITRON

Upon completing the technical verification of your product, Itron is ready to help with your go-to-market efforts. Building on our initial market assessment, we'll work closely with your sales team to develop a list of targeted accounts and provide references to established Itron customers who have expressed interest in your solution (and in many cases have been waiting for availability). We'll also promote our technology partnership with press releases, sales and marketing collateral, and introduce you to potential customers through **Itron's DA User Group** and the annual **Itron Utility Week**, a premier networking event with more than 800 attendees from leading global utilities.

Itron recognizes the sales cycle can be long, so we hold monthly sales calls with partners in support of go-to-market strategies. Topics for these meetings include lead and deal creation, sharing of contact information and recent account activity, and planning for customer meetings. All of these efforts are coordinated with Itron's extensive network of account teams, which include sales engineers, client delivery executives and on-site customer engagement teams. In short, we want our Technology Partners to succeed, and we'll provide you with a wealth of resources and support to help make it happen.

CONCLUSION

We appreciate your interest in forming a Technology Partnership with Itron. We hope this document helps to clarify the process and encourage you get started right away by registering on the Developer Portal and purchasing the appropriate Developer Kit. Get in touch with us once you've prototyped your grid-management solution, or if you already have a specific customer opportunity to act on. We look forward to working together.

GLOSSARY

Grid Management	A holistic solution suite encompassing a wide range of intelligent grid devices, such as smart meters, distribution automation equipment, and distributed energy resources that enable utilities to improve the reliability and efficiency of the grid.
Active Grid	Utilizes four key components —a multi-application communications network, edge intelligence, data analytics, and peer-to-peer collaboration—to enable smarter smart distribution of water, electricity and gas, and smart city infrastructure.
Distributed Intelligence	When complex computing tasks are delegated to multiple, distributed edge devices.
Cloud computing	The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.
Outage Detection System (ODS)	A grid management application that manages outage-related messages from electricity meters—including last gasp and power restore messages—and makes them available to the outage management system.
Gridscape	An application that supports out-of-band and in-band management for polling, event management, diagnostics, real-time visualization, auditing, and security measures in a distribution automation network.
Han Communications Manager (HCM)	A demand-side management application that enables utility companies to manage demand response programs and customer engagement. Also bundled with HCM is HCM WS-Route, an Itron ESB component that is the basic HCM web services routing application.
Advanced Metering Manager (AMM)	A grid management application that provides meter device lifecycle management. AMM's web-based interface allows utilities to configure groups, schedules, and exports across a variety of electricity and gas devices, which enables the collection, management, and analysis of consumption, time of use, interval data, power quality measures, and status logs.
SensorIQ (SIQ)	A back-office application used for collecting high-resolution data from Itron GenX-enabled devices.

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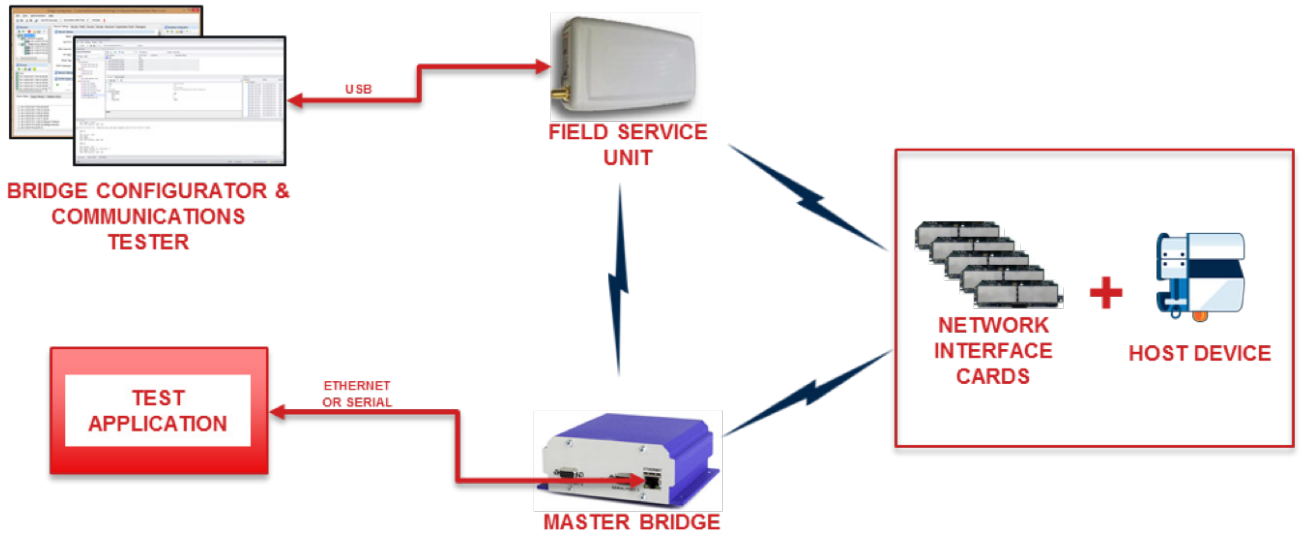
Itron
2111 North Molter Road
Liberty Lake, WA 99019 USA

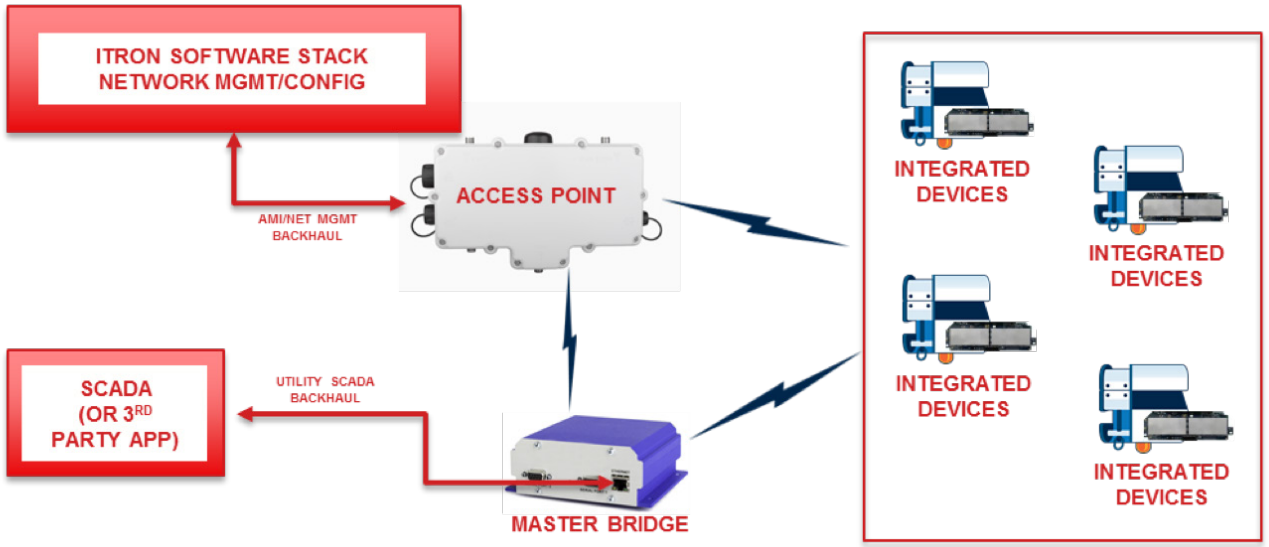
FIGURE 5. CONNECTIONS FOR THE DEVELOPER KIT



The developer kit is for Technology Partners to create a self-contained lab environment for prototyping.

Fig. #6 provides a simple view of a utility production environment with field-deployed integrated devices communicating to SCADA or a third-party application via Master Bridges. Itron's network management system separately communicates with embedded NICs via Access Points.

FIGURE 6. UTILITY PRODUCTION ENVIRONMENT



This figure shows how NIC-embedded devices communicate in a typical utility environment.

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2111 North Molter Road
Liberty Lake, WA 99019 USA