Network intelligence—a must for managing 5G-enabled massive IoT

White paper

Imagine your business just launched a new solution that serves delicious frozen drinks to customers at convenience stores across the country. You've given the machines connectivity to report temperature and to monitor consumption and fill level. This application data is managed and monitored in the cloud. You've just enabled IoT, right? What could go wrong?

Connecting your IoT devices with cellular networks can create new opportunities and improve business outcomes. It can give you the ability to respond quickly to changing market dynamics, improve customer experiences, create new revenue streams and ultimately deliver better value to customers. But simply having devices connected to the network doesn't get you all of this.

With IoT application and device data alone, you may be able to answer some of these questions:

- What's the fill level of my dispensers?
- What flavors are customers consuming most?
- How's the health of the dispensers in the field right now?

However, without network-provided insights, it may be difficult to get near real-time answers to other, possibly more important, questions such as:

- Where are my frozen drink dispensers in the field?
- When was the last time they connected to the network? How stale is this application data?
- Is there a weather or network impact where those dispensers are?
- Are my dispensers running the latest firmware? Could newer firmware lead to better performance and security?

In this paper, we will show you how network connectivity context can complement IoT application and device data. This network-based contextual data—available now through Verizon ThingSpace Intelligence—provides you with actionable insights so you can refine business operations, enhance product or service offerings, and reduce business waste.

Hidden challenges can hurt your bottom line.

Unexpected expenses

When organizations first commission IoT solutions, they have to make assumptions about data use and, by extension, monthly recurring operating expenses (opex). When actual costs do not align with these expectations, it causes extra work for both business and technical teams that must then review expenses in more detail.

Chief financial officers (CFOs) are the ones who ultimately receive and review the invoice. It's their job to manage and forecast opex costs. Unfortunately, that is made difficult when IoT devices use data unpredictably. Monthly data use can vary widely due to devices being added or removed, downloading software updates, or malfunctioning. This leads to varying bills, with overage costs that may not surface until the end of the 30-day billing cycle. Some organizations solve this with oversized data plans, but the cost of those plans can quickly erode the return on investment for your IoT solution.

Security risks

Security is paramount in every solution, but the massive scale of IoT can make traditional security monitoring untenable. Yet IoT security breaches can be as serious as any other kind, and lead to lowered credibility, costly remediation, and additional serious breaches or exploits.

The average cost of a cybersecurity breach is $9.05 million per event, by some estimates.[1] Mitigating this risk requires, among other things, keeping devices up to date, tracking the physical location of devices, and monitoring for misuse of the device or SIM card. None of which come easy without network intelligence.

Troubleshooting

Perhaps the biggest hidden challenge in IoT solutions is troubleshooting devices. When IoT devices are not working properly, they not only fail to create business value, but can cause significant burdens for those managing the devices. Operations teams can spend countless hours visiting devices, analyzing data and restoring the service. The costs of truck rolls quickly add up, with estimates ranging from $150 to $500 or more per truck roll.[2]

Part of the troubleshooting challenge is the complexity: The root cause can be at the device, network, platform or application level. Isolating the issue not only burns troubleshooting time but results in downtime or degraded performance for the IoT solution itself. All this may result in unnecessary additional costs, such as reverse logistics, truck rolls and support calls, as well as lost revenue and failure to meet service level agreements.

Other common costs may include:

- Increased power and network costs due to software instability
- Unaddressed security vulnerabilities
- No visibility into operations
- Reduced customer satisfaction

Ultimately, all these hidden surprises translate to tangible business impacts that may be different for each industry but are always costly:

Automotive

- Costly OEM warranty recalls
- Vehicle software vulnerabilities

Retail

- Payments not processed
- Point-of-sale system compromises

Utilities

- Unpredictable and costly outages
- Expensive truck rolls for meter maintenance
- Delayed condition monitoring alerts

Supply chain

- Asset tracking battery drain
- Continuous monitoring risks and costly data overages

If your IoT devices are not working optimally, how would you know? And how would you uncover the hidden business waste?

Stop hidden IoT business waste with network intelligence.

5G is more than just a low-latency, high-bandwidth, dense network technology. Combining 5G with network intelligence can complete the picture of what is really happening in the field with your connected assets. Cellular networks, such as the 5G networks that will power massive IoT, hold a treasure of connectivity intelligence—metadata and insights—that can provide a fuller picture of what is happening to an IoT solution.

IoT solution designers naturally focus on collecting IoT application data such as temperature, vibrations, number of transactions, number of people detected and so on. Implicit in those IoT connections is other valuable network data that IoT solution designers should consider. This network intelligence is collected independently from the application data. In general, this data is device agnostic as long as the device is certified for cellular, meaning the network data doesn't require additional instrumentation on the device.

Network intelligence can provide a variety of insights that can help troubleshoot IoT devices and answer valuable questions about IoT solutions.

Device and connection data:

- When did the device last turn on?
- How often is it retrying?
- How much data is it using? How much data is it expected to use?
- When do we expect the device to be online again?
- When does the device typically communicate with the network? How much data is typically transmitted during those times?

Network context:

- What cell tower is the device connected to?
- Is there a network outage, perhaps due to bad weather?
- What is the signal strength of the device?
- What is the coverage like for this device?
- How well has this device performed compared to others?

Location:

- What is the last known location of the device?
- Is the device moving to a new cell?
- What is the location history?
- Is the device roaming?
- Is it outside of its normal location?
- Did it move to the target destination?

Device management:

- What is the device's battery level?
- Is the device provisioned properly?
- What device is currently assigned to this SIM?
- What firmware version is reported by the device?
- Is there new firmware available for the device?
- When was it last rebooted?

Combining this network data with application data can help avoid unexpected surprises and can help unlock IoT's potential value. Let's look at some specific examples of the benefits this can bring.

Unlock IoT value with actionable network intelligence.

Industrial manufacturing: Machine trouble detection	• **Insight:** Usage dip anomalies • **Benefit:** Learning of usage dips can provide additional troubleshooting signals that can help speed machine diagnosis
Building security: Panel offline detection	• **Insight:** Reachability anomaly • **Benefit:** A security solution provider can issue an out-of-band reboot command and push new firmware to avoid a truck roll or unnecessary return merchandise authorization (RMA) of a panel when the panel application software suffers a fatal error
Retail: Transaction validation	• **Insight:** Location anomalies • **Benefit:** Location data can help identify when equipment is not in the expected location, thus indicating potential fraud and helping protect sensitive financial information from bad actors
Agriculture: Data flow corrupted	• **Insight:** Network retries • **Benefit:** By noticing network retries, operators can identify devices that need to be reset remotely, thus alleviating data issues and avoiding unnecessary deployments
Construction: Earth mover optimization	• **Insight:** Location dwell-time detection • **Benefit:** By learning when valuable earth-moving equipment is sitting idle, construction firms can better plan equipment deployment and lower the cost of moving that equipment from site to site

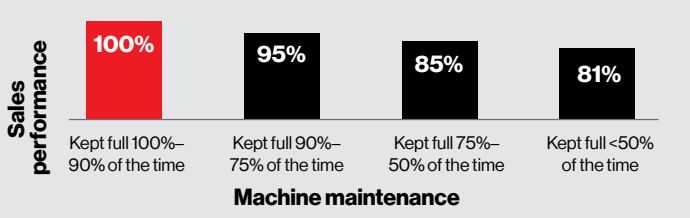
Unlock IoT value with actionable network intelligence.

Rideshare bicycle or scooters: Unexpected overages	• **Insight:** Usage traffic anomaly • **Benefit:** By noting anomalies in data usage, rideshare operators can prevent misuse and lock a SIM to their designated equipment
Utilities: Missing meter data	• **Insight:** Near real-time network coverage • **Benefit:** Reduce unnecessary truck rolls for the smart grid when temporary network outages are the root cause of the missing data
Supply chain: Battery drain on devices	• **Insight:** Retries, signal strength • **Benefit:** By noting how often tracked assets are trying to connect and the signal strength they are experiencing, operators can see the reason for battery drain and design a solution that improves uptime

Condition-based monitoring case study

Frazil is a frozen beverage company that manages slush machines at retail stores across the United States. Prior to retrofitting their machines with an IoT solution, executive management was blind to machine performance and did not know the answer to even simple questions, such as is the machine on? Is it working? Is it full?

Whether a machine is full can matter a lot. The IoT data Frazil now has shows that a machine that's full only 50% to 75% of the time sees 15% lower sales performance on average than machines that are full 90% to 100% of the time.



Frazil now has data-use expectations for its devices. If the IoT solution is working, deviations in data use may indicate physical or cyber misuse of their assets. And if a device is not on or working, Frazil also has methods to analyze the device, the network, the platform and the performance to help speed troubleshooting and ultimately get devices working again faster.

Verizon ThingSpace gives Frazil tools to answer those questions and more, including:

- How is my data use trending?
- Are my devices running the latest firmware? Can I update them cost-effectively without impacting the data-use predictions?
- Which devices are using the most data?
- What is the device's health?

Read the full case study here.

Verizon ThingSpace comes with built-in network intelligence for IoT.

ThingSpace is Verizon's platform-as-a-service offering for IoT connectivity management and network intelligence. It includes functions leveraging artificial intelligence (AI) and machine learning to identify anomalies in connectivity patterns and troubleshoot the service experience on the Verizon network. This allows ThingSpace to provide valuable context to help answer business questions about the IoT solution.

ThingSpace offers cellular IoT connectivity services with global reach, making it simpler for organizations to implement, secure and manage solutions. Millions of IoT devices already operate on our network. Verizon's ThingSpace platform simplifies the model for IoT, making it easier, faster and more accessible to develop IoT solutions.

ThingSpace includes both a management portal and application programming interface (API) access to network insights on the Verizon network. Capabilities include connectivity management, SIM and device management, and AI-powered intelligence analytics. ThingSpace can inform IoT operators—even those with massive IoT implementations—on how their devices are performing on our network. This can help your organization:

- Reduce bill shock and pay for what you use
- Let AI-powered services monitor security on your account to avoid unauthorized access to your data
- Engage intelligent services to troubleshoot devices remotely and get services performing their best sooner

When combined with Verizon's robust network and secure infrastructure, ThingSpace can enable possibilities and help bring your IoT solution to life.

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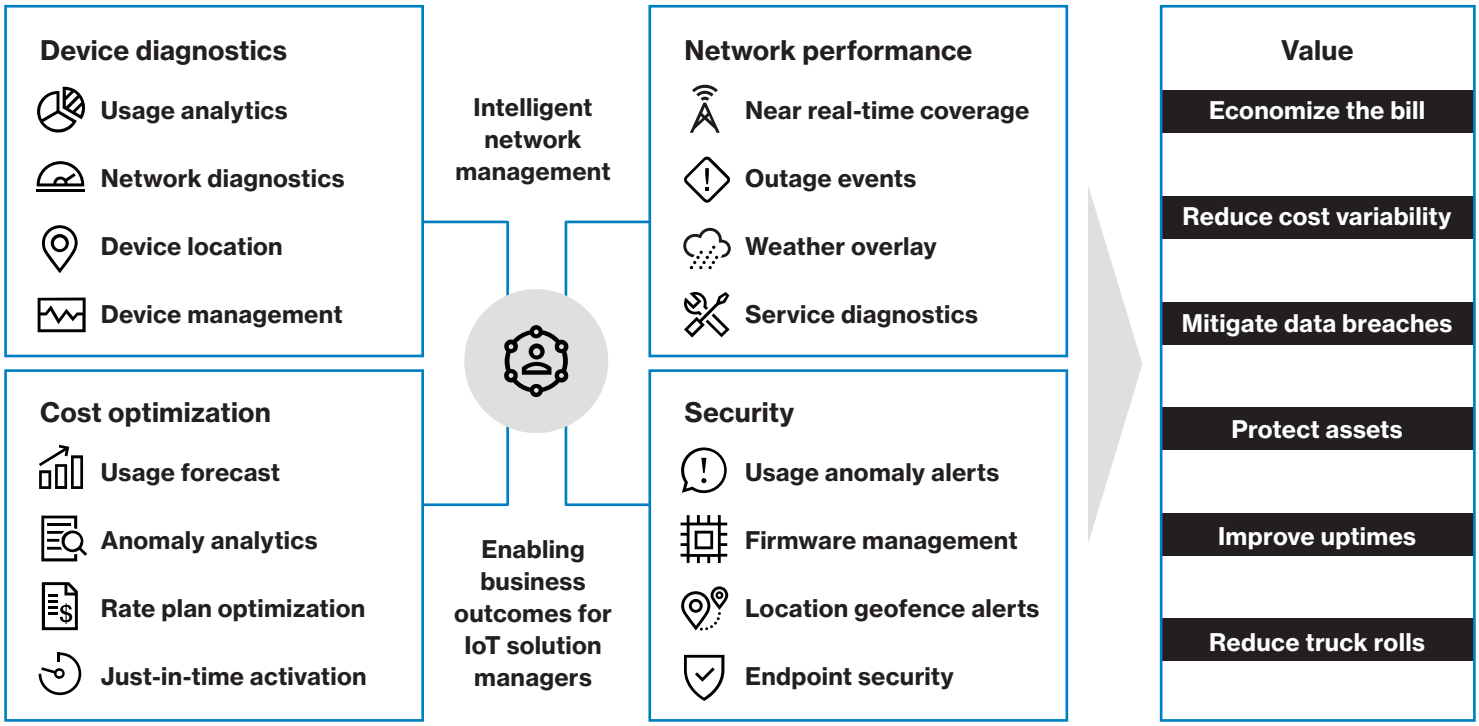
ThingSpace IoT intelligence capabilities



Conclusion

To make smart business decisions, you need actionable intelligence. Today, your organization generates more data from more sources than ever before, but unless you can cost-effectively store, analyze and correlate that data, it isn't actionable. What you need is a way to transform that data into intelligence, and to do that, you need to harness the value of cellular networks such as 5G by combining network intelligence with your IoT solutions.

Regardless of your IoT solution, there is insightful network context that can augment your raw IoT application data. ThingSpace Intelligence turns this raw data into information that you can act upon quickly to enhance productivity, optimize processes and ultimately make better-informed decisions.

Read more about ThingSpace Intelligence here.

If you need help planning or designing your IoT solution, talk to our experts in our Managed Services program.

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1 Cost of a Data Breach Report, IBM, 2021. https://www.ibm.com/downloads/cas/OJDVQGRY

2 Felix Morgan, "How to reduce truck rolls," Sightcall.com, Oct 8, 2021. https://sightcall.com/how-to-reduce-truck-rolls