White paper
Cisco public

Predict Problems Before They Disrupt: IoT Anomaly Detection for Proactive CX

AI to the Rescue: Detecting IoT Anomalies at Scale

Contents

Smart meters experienced widespread failures during Europe's 2022–2023 winter energy crisis, producing inaccurate readings that led to inflated bills and customer distrust. Cisco's IoT Control Center Anomaly Detection uses AI to monitor networks and detect issues early. This proactive solution helps businesses identify and resolve problems before customers are impacted, improving service reliability and satisfaction.

In the winter of 2022/2023, Europe faced an energy crisis as costs soared due to supply disruptions. Households struggled to pay exorbitant energy bills. At the same time, millions of smart meters malfunctioned across the continent. These devices are intended to accurately measure and communicate energy usage data to consumers and providers. However, many smart meters gave wildly inflated readings, resulting in shockingly high bills. Upset customers disconnected the faulty devices in response. The failure of smart meters caused significant stress for European households already burdened by skyrocketing energy costs.

While the majority of smart meters deployed offer a smooth experience to the customer, there are instances where these meters encounter issues. These issues can range from the failure of their smart functionalities and disconnection from the smart meter network to complete cessation of operation. From a consumer point of view these problems can result in massively distorted invoices. During the 22/23 winter in Europe when energy costs were already rising, consumers were hoping to rely more on technology to manage their expenses. But the technology failed them, resulting inflated energy costs.

An irate consumer wrote this in a letter to the Guardian newspaper in the United Kingdom: “I eagerly await my fourth visit from British Gas to un-dumb my meters. At present my ‘in-house display’ clocks my gas consumption at £47,662.06 per hour – this being an improvement on the £1.5m it reached last month. I have requested that my old meters be put back in.”[1]

The problems with smart meter deployments

In the deployment and operation of smart meters in Europe, including during the winter of 22/23, several challenges and issues were reported. While the specifics may vary across countries and regions, some common themes emerged:

1. **Communication interference:** Severe weather conditions, such as heavy snowfall or storms, led to communication interference between smart meters and utility companies. This interference resulted in delayed or incomplete data transmission, affecting accurate billing and real-time monitoring.
2. **Meter accuracy:** Cold temperatures impacted the accuracy of smart meters. Freezing temperatures affected the performance of meter components, leading to deviations in energy measurement. Utilities companies were scrambling to ensure that smart meters were properly calibrated and maintained to mitigate this issue.
3. **Power outages:** Extreme weather conditions, such as winter storms, resulted in power outages, which led to smart meters losing connectivity. This caused gaps in data collection and disrupted the overall functionality of the smart meter system.

[1] “Smart meters are not just ‘dumb’ but a scandalous waste of money,” Letters. www.theguardian.com/environment/2022/jun/10/smartmeters-are-not-just-dumb-but-a-scandalous-waste-of-money.

IoT was not supposed to play out like this. Smart meters were designed to make customers lives better not worse and increase a businesses' efficiency rather than spend millions on customer dissatisfaction issues.

Let us take the United Kingdom as an example. There are about 28.8m smart or advanced meters across the nation. Out of these, only 3.6m are functioning (in "traditional mode") according to the Department for Business, Energy, and Industrial Strategy (BEIS), because consumers have either switched to a provider that cannot manage a smart meter or because of networking issues impacting the smart meter. [2]

When the tools provided to a consumer are either broken or malfunctioning and resulting in increased customer dissatisfaction, it creates numerous questions and problems for governments and service providers in the energy sector.

In a world where an IOT solution is looked upon as one of the pillars of cost efficiency, how do service providers ensure that consumer confidence is not impacted? Creating efficiencies is useless if the underlying problems tend to increase costs and customer dissatisfaction.

Cisco's IoT early warning system for better customer experiences

Here at Cisco, we know IoT better than anyone in the world, and we understand the frustration stemming from the use cases mentioned above. A few years ago, when we began to build our AI and machine learning tools to detect network and device anomalies, we saw countless examples of partners failing to identify outlier events on their network and failing to react in time to resolve device and connectivity issues.

The key question was, how can we help ensure our customers are able to manage and track the usage consumed by every single one of their devices while maintaining continuous cost satisfaction amongst their consumers? The solution we found was in AI and machine learning.

We understand that AI/ML can make people eager and yet a little shy. So rather than diving into the theory behind machine learning or the various forms of cluster analysis, let us address AI/ML in IoT through easy and practical use cases.

Demystifying AI/ML through anomaly detection

Now imagine again that it is the middle of winter, and you are managing one hundred million smart meters across Europe. Due to the winter, you expect usage on those devices to spike substantially, and at the same time you are weary of those smart meters failing due to the issues highlighted earlier. You are also wary of vulnerabilities that will open due to the winter crises, which will give opportunities for malicious actors to attack your network and customers. At the same time, you are getting customer complaints that their smart meters are breaking down.

What Dollar or Euro value would you put on a solution that would help you protect not just your network but the millions of devices and customers using them?

What if you had a simple way to analyze your network and all your millions of devices in one dashboard? A tool that would allow you to monitor 24/7 all your enterprises, your network, and your devices without needing manual intervention. This is where Cisco® IOT Anomaly Detection comes in.

[2] Energy bills: why are so many smart meters in Britain turning dumb?," by Zoe Wood. www.theguardian.com/money/2022/jun/04/whyare-so-many-smart-meters-turning-dumb-great-britain.

Cisco IoT Control Center Anomaly Detection

Cisco's new proactive IoT solution, Anomaly Detection, is a game-changer in the world of data analytics that will empower our service providers and their customers to harness the true potential of their data like never before.

Using AI learning models, Anomaly Detection uncovers hidden patterns, detects outliers, and identifies invaluable insights for our users in a complex IoT environment. This enables users to proactively identify problems before they impact customers.

It is an AI-based early warning system that can help CX teams deliver white-glove service by pinpointing issues hidden in massive amounts of device and connectivity data so you can resolve them quickly—before they affect customers' business.

By using our anomaly detection tool, our customers can identify abnormal behavior on their network that often indicates security issues or malfunctioning equipment, enabling troubleshooting sooner and resulting in faster time to remediation. The benefits are immense, from controlling costs to proactively alerting customers to potential problems across thousands of enterprises and millions of devices.

Some time ago, a service provider received an escalation from one of their enterprises, complaining that their monthly bill was excessive. Upon researching this, it was revealed that the root cause for this was a Firmware Over-The-Air (FOTA) update gone wrong. During a recent FOTA update, a bug was introduced, and as a result, a single file was downloaded multiple times that resulted in substantial data overages. In this case, if our anomaly detection solution were deployed, we would have caught the excessive usage sooner. The correlation between detecting anomalies sooner (and taking quick action) and the invoice cannot be missed.

By looking at months of historical data and then cross-referencing it with various filters like sessions, data, SMS, and voice usage, we can take a much deeper look into every aspect of an IoT deployment. This allows us to identify clearly whether an event on a network is actually an anomaly or not.

We are also able to identify devices that are contributing most to the outlier event, which helps us hone in on rogue devices. Examples like these are common in the IOT world. Apart from FOTA updates going wrong, we see devices malfunctioning constantly, which leads to increased operations costs when technicians must be deployed to fix the issue or when systems are exposed by malicious attacks due to their own vulnerabilities.

All of this does not need to be hidden and exposed only when the problem becomes out of control. With our solution, we can identify anomalies as soon as possible and offer our customers peace of mind. Plus, that peace of mind is worth it when excessive data usage has a direct impact on the bottom line.

Generally, the classical machine learning models are reliant on constant human intervention, and this comes at a cost. Our AI model is completely autonomous and does not require any manual course correction.

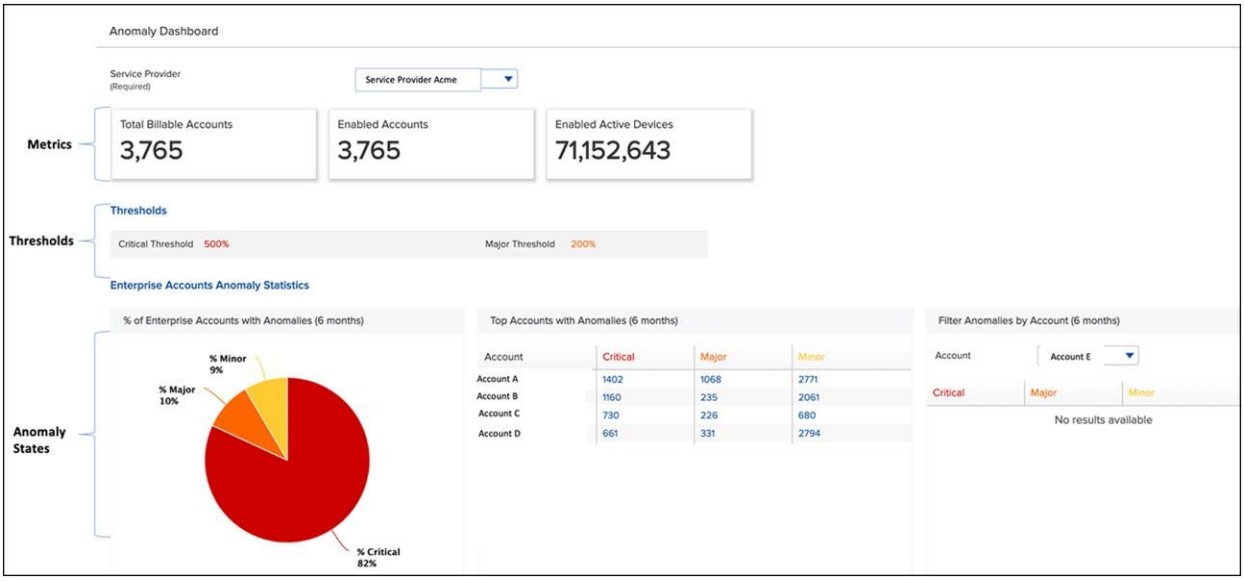

Figure 1.
Cisco's new proactive IoT solution, Anomaly Detection, is a game-changer in the world of data analytics that will empower our service providers and their customers to harness the true potential of their data like never before.

IoT device data and scaling challenges

IoT generates huge volumes of data per hour, exceeding any human's ability to process and understand this data. This vast amount of data also creates new challenges around usage or connectivity issues.

When the number of devices grow, service provider support problems worsen exponentially and therefore trust in IoT systems and data falls. Thus, it is that much more important for IoT businesses to proactively know what customer problems exist well before the customer calls with complaints.

Why Anomaly Detection?

Cisco knows IOT and we have been in the business for years. Our IOT footprint is truly global, and we work with over fifty service providers and over 220M+ devices around the world.

Given our standing in the industry, our history, and the amount of data that runs through our systems, we are in a perfect position to comprehend IOT problems and develop the right solutions to address the numerous problems faced by our partners. Our goal is simple: identify outlier events on a network and a device as early as possible so businesses can stay clear of that point of no return where operations, value, and goodwill can be impacted.

Think of our solution as insurance on your network because we monitor and identify outlier events stemming from network outages, rogue devices, and malicious attacks. The benefit of having this coverage on your network is that you can rest easy knowing that at any point of time Cisco is actively monitoring any organic or inorganic behavior. After all, we buy insurance for our homes, our cars, our vacations. So why would we not want peace of mind for our multibillion-dollar mobile IOT network?

Can you use machine learning and AI in data analytics to automate IoT management? The short answer is yes!

Keep them happy: Proactive service for high-value clients

To build a profitable and enduring IoT business, you must deliver excellent customer service while controlling expenses. An intelligent solution is needed. IoT Control Center Anomaly Detection utilizes AI and machine learning to provide an early alert system for potential problems with customers' IoT devices and connections.

This allows you to identify network and security issues within massive amounts of data before they impact customers. Rapid resolution prevents alienating users and hikes in support costs from delayed responses. With Anomaly Detection, you can boost service reliability, strengthen device security, and reduce overhead. The outcome? Happy customers and optimized operations.

Learn more

To learn more on how Cisco IoT Control Center with Anomaly Detection can help satisfy IoT users and avoid disruption with AI-driven insights, please read the Solution Overview.

To see how to scale your business faster with Cisco IoT cellular connectivity management, please visit the Cisco IoT Control Center website.

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