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Avoid IoT Project Failure with Better Simulators

One of the most critical moments in an IoT project is the shift from proof-of-concept to a deployment-ready design. There are many pitfalls at this stage, but one is often overlooked: the impact of scale on performance.

Proof-of-concept projects aren't always subjected to realistic network environments. In the lab, engineers may be limited to testing a handful of devices, whereas real-world applications often have hundreds or even hundreds of thousands of nodes.

As the number of devices attached to a network scales up, previously hidden problems rear their heads. End-to-end latency and bandwidth bottlenecks can appear that didn't exist when traffic was lower. Mission-critical messages may be lost or delayed. It's far more difficult to coordinate traffic among thousands of sensors across a building or a continent than a proof-of-concept demonstration.

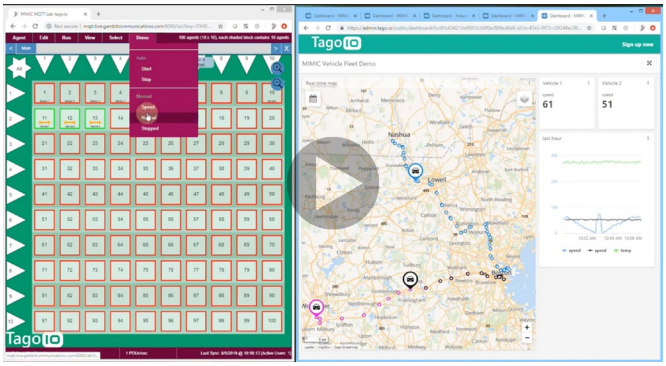
Simulators Sidestep IoT Project Failure

The recent report Why IoT Projects Fail by Beecham Research echoes this point and emphasizes that proper network simulation is essential to a successful scale-up. The complexity and massive network connectivity of a full-fledged IoT deployment make simulation an essential part of the prototyping process. And if the only way to model an expansive IoT network is to simulate it, it therefore follows that end users need a simulator capable of doing the job.

One solution in this space is Gambit's MIMIC IoT Simulator. This environment provides a web-based browser UI, extensive documentation, and support for a wide range of IoT scenarios – including large-scale deployments across different parts of the country.

Rather than attempting to simulate physical hardware, MIMIC simulates the traffic that IoT devices generate when they communicate across the network with IoT platforms. This allows customers to design test scenarios that meet their needs. **Video 1** shows how the tool can simulate multiple vehicles moving along delivery routes, including unexpected stops or other problems.

MIMIC IoT Simulator can simulate both devices and gateways. It is designed to support testing for IIoT deployments, smart city technology, and smart agriculture, with an event-driven architecture that can scale up to handle any IoT testing needs.



Video 1. The MIMIC IoT Simulator can re-create the behavior of a delivery vehicle fleet, among other use cases.

Open-Source vs. Commercial Simulators

Of course, there are other ways to simulate network traffic, including open-source tools. So why bother with commercial tools?

The advantage of a simulator like MIMIC is that it offers the promise of regular updates, with new features like support for MQTT5 constantly rolling in. Ease of use is another factor. Beyond the intuitive UI, Gambit offers an ever-growing library of useful blog posts and video tutorials. Most important, Gambit supports a wide range of highly capable Intel®-based hardware suitable for both PoC development and real-world deployment.

The various open-source efforts in this area, while free, are also more difficult to use, do not always scale to the necessary network sizes, and are irregularly updated. And they may not even support your production hardware, making the PoC-to-deployment transition all the more challenging.

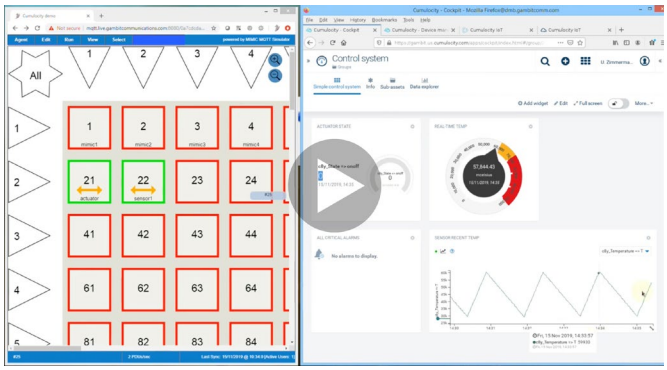
Create Corner Cases

As noted earlier, one of the major problems with scaling IoT solutions to full production is the difficulty of anticipating what might go wrong. Gambit deals with this problem by giving the end user an extensive set of tools to simulate how equipment will perform in non-optimal conditions. Engineers can program their simulated scenarios to fail in certain ways or to encounter specific problems to observe how the application copes with the situation.

In a control system scenario, sensors generate dynamic telemetry, and actuators accept commands to effect real-world changes—for example, relays that open and close to turn on/off equipment depending on environmental conditions.

Video 2 shows such a bidirectional scenario with a typical IoT control system that implements a steady-state feedback loop. Sensors report temperature, which if too hot causes the control system to turn on a cooling system actuator. This causes the temperature to fall, until the actuator is turned off. But what happens if the temperature does not cool down. Is the control system designed to handle this emergency?

Giving end users this kind of flexibility is essential to helping them troubleshoot potential problems before they happen. According to the Beecham report, one of the major pitfalls



Video 2. MIMIC simulates control systems with complex rules.

IoT deployments encounter is that end users assume they need to spend an overwhelming amount of time prototyping hardware and the associated back-end applications. Often, back-end connectivity is treated like a solved issue rather than a complex topic very much in need of its own careful analysis.

Simulation Solves Problems Before They Happen

Deploying IoT at scale can be genuinely difficult. Simulating expected behavior before deployment begins allows network engineers and IT staff to track down problems more quickly and solve other incipient issues before they occur.

Fixing these problems in the lab means not having to deal with them in live production. “Regression testing is another natural feature,” said Uwe Zimmermann, CTO at Gambit Communications. “Deploying a simulator in the QA department is a great way to make sure whatever changes were done in last night’s build don’t break anything.”

Companies that hit roadblocks on the way to deployment are more likely to give up altogether, and no one likes swapping out hardware halfway through a project because they didn’t fully understand what hardware they needed to perform the task at hand. It’s far easier to know what resources and equipment a project will require if end users can more accurately model their network and attached devices before the first sensor is deployed.