End to End IoT Testing Capabilities and the Importance of Multistage Validation

by **Jin Markov** | February 27, 2020

Internet of things is a network of devices, people, software, and data, working together for smart functionality. It is contributing to building smart cities across the world.

As described, IoT testing is far more complicated compared to software testing as IoT involves hardware, software, network, and data. Managing each of these components of IoT has its own sets of difficulties. And, the interconnectivity of so many dissimilar components is an added challenge in IoT systems. Thus, IoT testing is a huge responsibility.

End-to-end testing capabilities in IoT are challenging to achieve but mandatory to be able to get a functional IoT system. If we concentrate on testing only certain components, no matter how perfectly these components are performing, the other parts of the system will act as weak links affecting the performance of the system as a whole.

Broadly, IoT has components such as application (web or mobile), cloud infrastructure, network, devices, sensors, etc. So, multistage validation involves end-to-end testing at the level of each component, and in the network.

Another challenge in multistage integration is about integrating third-party hardware, software, etc. Furthermore, it also means validating the integration across the system.

The end-to-end IoT testing involves considering key factors such as usability, data, and network security, scalability, performance, reliability, etc. Let's see how each of the areas of testing affects the system.

1. Interoperability

The biggest challenge in a system with so many dissimilar devices or software is about interoperability. For example, one technology and framework that works with certain devices, may not work for the others in the same system.

To exist as part of the same network, and work together, these devices have to be made interoperable. Moreover, it is important to integrate every device to other devices and facilitate communication of each device with the IoT network.

Some standards and protocols help in a seamless integration of IoT components for interoperability. Also, multistage validation helps to manage complex IoT systems without worrying about the interoperability of different types of devices and software.

2. Security

IoT systems have large spans. More the devices, software, and bigger the network, security becomes tough to achieve and maintain. There can be security threats at each end, and even in the channels of their communication.

So, to maintain security in an IoT environment, we must use secured frameworks and technologies in developing the network. Also, as large volumes of data are involved, it is also crucial to encrypt data and store it securely so that it is not vulnerable to damage or loss.

Data should also be encrypted during transmission or transfer in an IoT as breaches can happen even over the channels.

3. Scalability

IoT connects multiple devices and software. Making such a complex, smart system is costly and time-consuming. So, it is feasible only when it can benefit a large number of users. Thus, scalability is a major factor in the development of IoT.

The way it is for any system, scalability comes with its own set of challenges. This includes maintaining connectivity over a wide range, and of high speed so that the network doesn't fail or underperform during operations.

More scattered the network, the higher will the problems with scalability. So, scalability testing is a crucial component of IoT testing.

4. Performance

Any system that doesn't perform is not worth the time and resources used to build it. Since the resources required in IoT are enormous, this is particularly applicable to IoT systems.

Performance is a broad term, and it includes everything that makes the system robust, functional, and fool-proof. Performance testing thus ensures that the IoT system keeps functioning as desired.

Performance testing includes load testing, connectivity testing, and checking whether the pace of different components matches for perfect real-time experience, etc.

Moreover, if the network is perfect, but a device fails, the system should be capable of isolating that device and alerting the authority or department responsible for maintaining that device. Also, the system must still carry on regular functions at other parts of the network.

5. User Experience

Systems are now becoming user-centric. The user experience and usability determine the performance of an IoT system. So, testing the system for usability and user experience is mandatory.

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Wrapping Up!

IoT testing is a comprehensive task. It involves various sub-tasks at different sections of the IoT network. Without missing a single front, testing should be carried out at each level to make the system efficient and useful.

Multistage validation is important in IoT, as it is a huge network, and there is a possibility of failure at each end. Only the best IoT developers will take care of all your testing needs! Contact us now!

Author Bio

Jin Markov is a Content Writer with GoodFirms, a research firm in the USA. He loves reading about IoT while sipping his favorite cup of coffee.