

IoT products in predefined IoT ecosystems



IoT solutions have huge potential if implemented correctly. Data generated by an IoT system can form new services that add a new dimension to an old issue or create a completely new paradigm. There are many good reasons for developing and implementing new IoT solutions, but it needs to be done properly, with thorough consideration of the issues involved. Otherwise, it may introduce new problems and costs, and it could end up not solving the problem better than the original solution.

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The development of IoT products presents a wide range of challenges for the technology, the process, and the financial picture. While IoT products should also be able to interact with existing IoT systems, there is certainly a risk of delays and higher costs. Therefore, it is important, in the design phase of an IoT solution, to base it on tried and tested methods to ensure that the product works optimally at the first attempt.

In a world where the number of products that can be described as 'IoT' is growing explosively, this issue becomes more relevant because we want to be able to choose products with the right functionality for our application without worrying about whether they can interact with our existing IoT systems.

The requirements specification is a key tool

One of the tools that are highlighted in both the development and procurement phases is the requirement specification. This is probably the most important tool we have, especially in the development process. The requirements specification is essentially a description of the product that one wants to develop for a given application, and here it is essential both to be able to describe the functional requirements and to do it in such a way that the requirements can be communicated to and understood correctly by the recipient.

In FORCE Technology, we see a large number of products that fail in the approval process, and when the cause is sought, it often is found to reside in errors and deficiencies in the requirements specification. Either because a requirement was misunderstood in the development process or a requirement was not described at all in the requirements specification.

One way to ensure a more systematic review of functional and interoperability requirements for an IoT product is to use standards - e.g. "ISO / IEC 30141 Internet of Things - Reference Architecture" - to define

new IoT products. This standard contains tools for defining elements such as sensor types, identification, users and much more, and it is divided into domains such as functionality, communication, usage, etc.

Use standards to define new products

There are several benefits of using a standard to define new products. In a development process, it can help to ensure that everyone 'speaks the same language' and thereby minimize the risk of misunderstanding in the interpretation of requirements.

At the same time, there will presumably be a prototype being developed. There are many ways to develop a prototype, and many of them are very good. The challenge with IoT solutions is that prototypes are most often tested in limited numbers, and when the product progresses from prototype to final solution, it will still not have been tested in a real-world scenario. At this point in the development process, there is no documentation or certainty about how the product will actually perform when it is installed at the customer's site.

When rolling out a new IoT product as a component of an IoT ecosystem, one must ensure that it is performing correctly. If the product does not perform correctly, then the requirements specification is not being met. The prototype has been able to fulfil the requirements satisfactorily, but the introduction of many new variables, dependent on the installation environment and the necessity of coexistence with the installed base, can, in the worst case, cause such a dramatic deterioration in performance that the product is completely useless. Therefore, it is important, before product roll-out, to test the IoT product in a way that reflects a realistic use scenario.

In which environment will the product be installed?

There can be huge differences in the dynamics found in the different environments where an IoT product may end up being installed, and this makes the initial requirements specification even more important. For example, when designing wireless systems, it is important to consider how much margin is needed in a link budget, as there is a large difference in attenuation in a system that is on a roof and a system that is in a basement in an industrial environment.

Similarly, it is important to include requirements of the product's resistance to climatic influences, such as temperature and humidity. Successfully designing for such considerations can ensure the product's reliability throughout its lifetime, thereby avoiding the need to send a technician out to each system several times a year - an undesirable situation if you have thousand of IoT units installed.

Developing IoT products for existing IoT systems is very much an exercise in communicating and defining what a product shall be and not least what it shall not be. If during the development process, the scope or functionality of the product is changed, it is important to reevaluate the reliability requirements.

How should data be handled?

Good data handling is also critical for how well an IoT system delivers the desired result. When you build an IoT network with several thousand devices, huge amounts of data may potentially be generated. Here, it is important to specify well-defined methods for entering data into the system and for how the data will be accessed from internal systems.

It is also a good idea to define methods for providing access for other systems to the data that your system generates, so that you can build the data infrastructures that will help drive the big visions for IoT systems.

Collaboration and mutual understanding

In general, the development of IoT products is an exercise in collaboration. This applies both to cross-disciplinary collaboration, but also potentially to collaboration between multiple organisations and industries. Here, it is critical to be able to communicate about elements of an IoT system to ensure a common understanding and - not least - a common set of expectations about what is being developed. This will ensure that the end-result match the desired result as much as possible and the development team avoid having to go back and change the design because a requirement that was forgotten or misunderstood.

Redesign when you are at the end of the development process is something you definitely want to avoid. Adding a missing requirements may destroy the business case for the IoT-system - often it will not make sense to develop a new design because the cost of changing a product in the test phase is about 1000 times more expensive than during the requirements specification phase. The consequence may be that a project must be completely discarded because it does not make financial sense to make a new design.

For many product developers, there is nothing new about this. There are new IoT technologies to implement, but, overall, the processes used in development projects is no different. However, there may be challenges in how to handle the diversity of the types of IoT products one produces. Similarly, in the environments where the products will be installed, there may be a huge number of details that are critical for the success of the IoT system. One must, therefore, be able to handle a wide range of challenges and demands that are not necessarily obvious or, for that matter, easy to deal with.

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