

Accenture Labs

IOT

PLATFORMS

The engines for agile
innovation at scale

The promise of the Internet of Things (IoT) is about realizing new business outcomes. These include improving the efficiency of workers with process automation, creating and delivering new digital products through information-fuelled insights and actions, or scaling the business by enabling an ecosystem that augments individual capabilities by bringing them together in a unified solution.

IoT applications drive outcomes like these by combining devices, data, and analytics to produce new, business-relevant insights. Their development is accelerated through IoT platforms, collections of core reusable components. For IoT applications, scale means more devices, more virtual machines, and higher data volumes. Scale with a platform is all about agility in creating new applications through reuse of components.

A common source of confusion is the assumption that a platform is the same as cloud computing. While an IoT application may use cloud for compute and storage services, it also incorporates higher-level functionality like device management, data and analytical models, business logic, and visualizations, all of which need to work together in a secure and scalable fashion.

A well-designed IoT platform accelerates development of IoT applications through ease of discovery, reuse and configuration, and extension of a library of core data and service components. Implementation of IoT applications is an iterative process. It starts with a singular, sometimes relatively simple, use case which uses a discrete set of capabilities and data complete enough to imagine and capture the initial use case and generate new data. Once operational, it provides insights and knowledge which can be used to expand the use case or spawn new use cases. The platform differentiates itself through its ability to quickly create, capture, learn from, and rapidly adapt and optimize new applications.

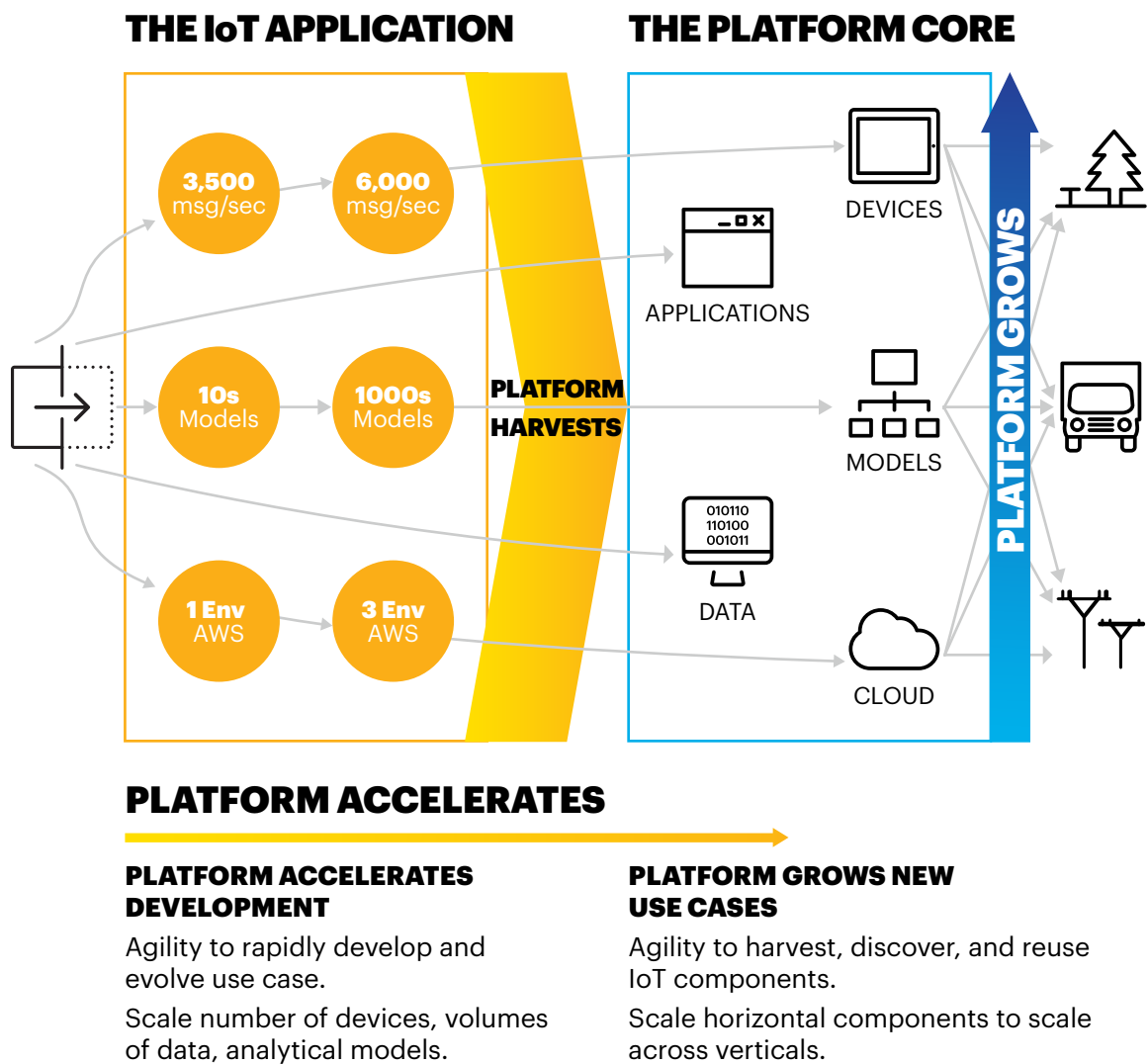


Figure 1: IoT platforms help to enable agility and scale of applications.

A PLATFORM ACCELERATES DEVELOPMENT

The IoT platform can be divided into organizational domains that cover infrastructure, device management, data management, analytics, and business applications. Expertise across them all is needed to realize an IoT application. The platform provides a framework for the interoperation of outputs from each of these domains, leaving each organization free to focus on its specific area of expertise. The components they create can then be leveraged and configured by a non-expert.

What makes these components part of a platform is an explicit design that allows them to work together in harmony. The platform effect relies on each domain adhering to the following capabilities (explained in greater depth below):

- a curated **library of interoperable components** that allows for rapid prototyping
- a semantics-based method for **capturing new components** or adapting existing ones so they are interoperable and
- a mechanism that simplifies the user's ability to **compose, configure and deploy components** to create a new application.

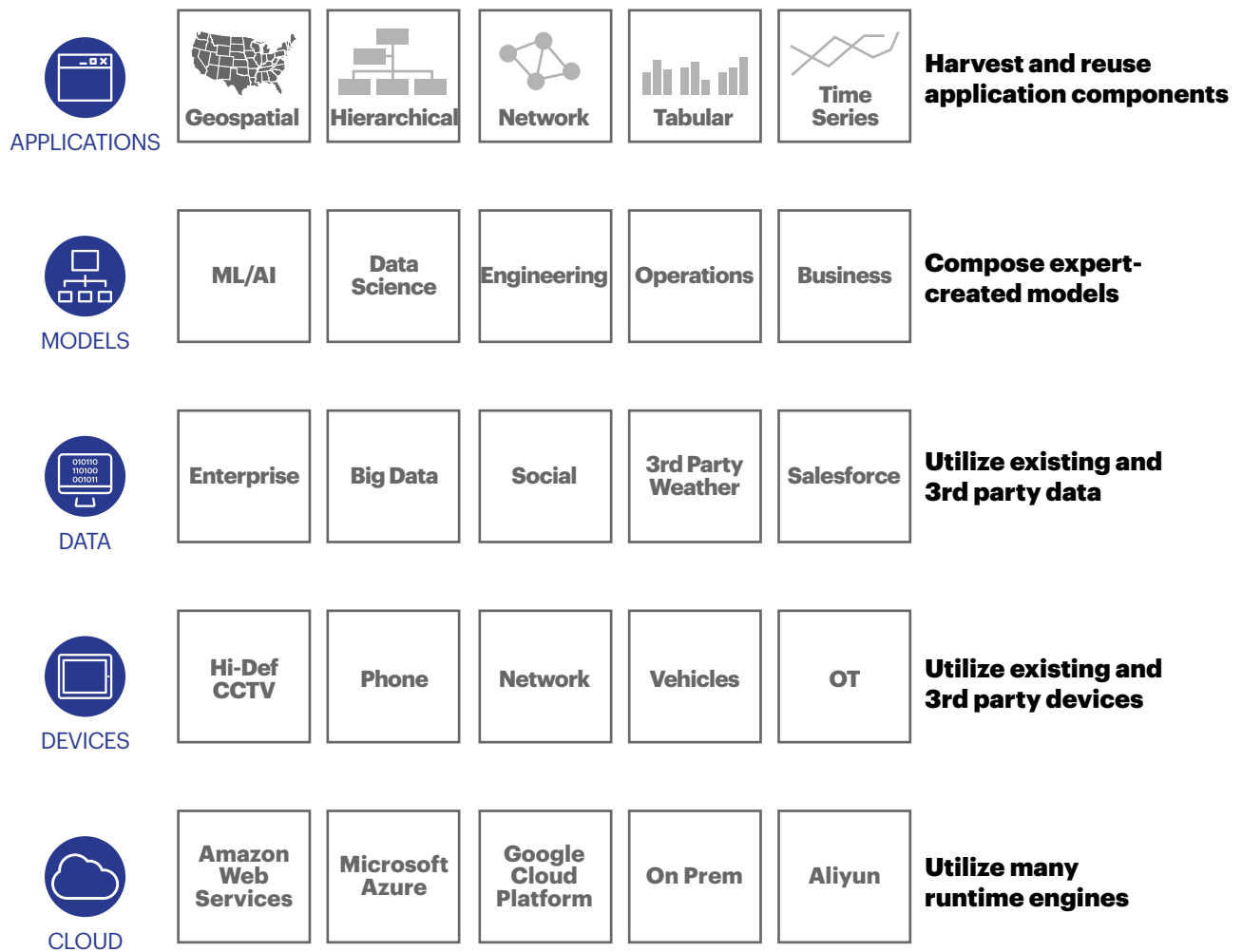


Figure 2: Illustrative component library.

COMPONENT LIBRARY

The opportunity here lies in the fact that many of today's IoT applications are comprised of the same components: for example, the same visualizations on top of a standard workflow engine, deployed on the same lambda architecture-based pattern with the same data type-specific ingestion pipelines, and using the same machine-learning and statistical techniques. Even domain-specific core components like object models, laws of physics, and application logic carry over from application to application. This commonality serves as the basis for reuse and as a foundation on which to build.

The platform differentiates its component library through curation that covers horizontal data-flow and processing patterns (like real-time streaming, batch, secured, edge), as well as by how it focuses on the vertical domain-specific niches like data, data schemas, and analytics models.

COMPONENT CAPTURE

First-time development of an application requires a domain expert—whether that's the first deployment to a new cloud provider, writing data to a new data store, creating an analytics model, or pulling data from a new device. The difference with a platform is that more care is taken to build components for reuse, enabling them to be configured and re-applied by non-experts.

In addition to following a standards- and pattern-based approach, component capture should also include the semantics or “meaning of the component” that defines its context. A semantic layer provides the foundation for internet searches to index and assemble data published by disparate users across the web. In the same way, a semantics-based approach is required for an IoT platform to manage components at scale.

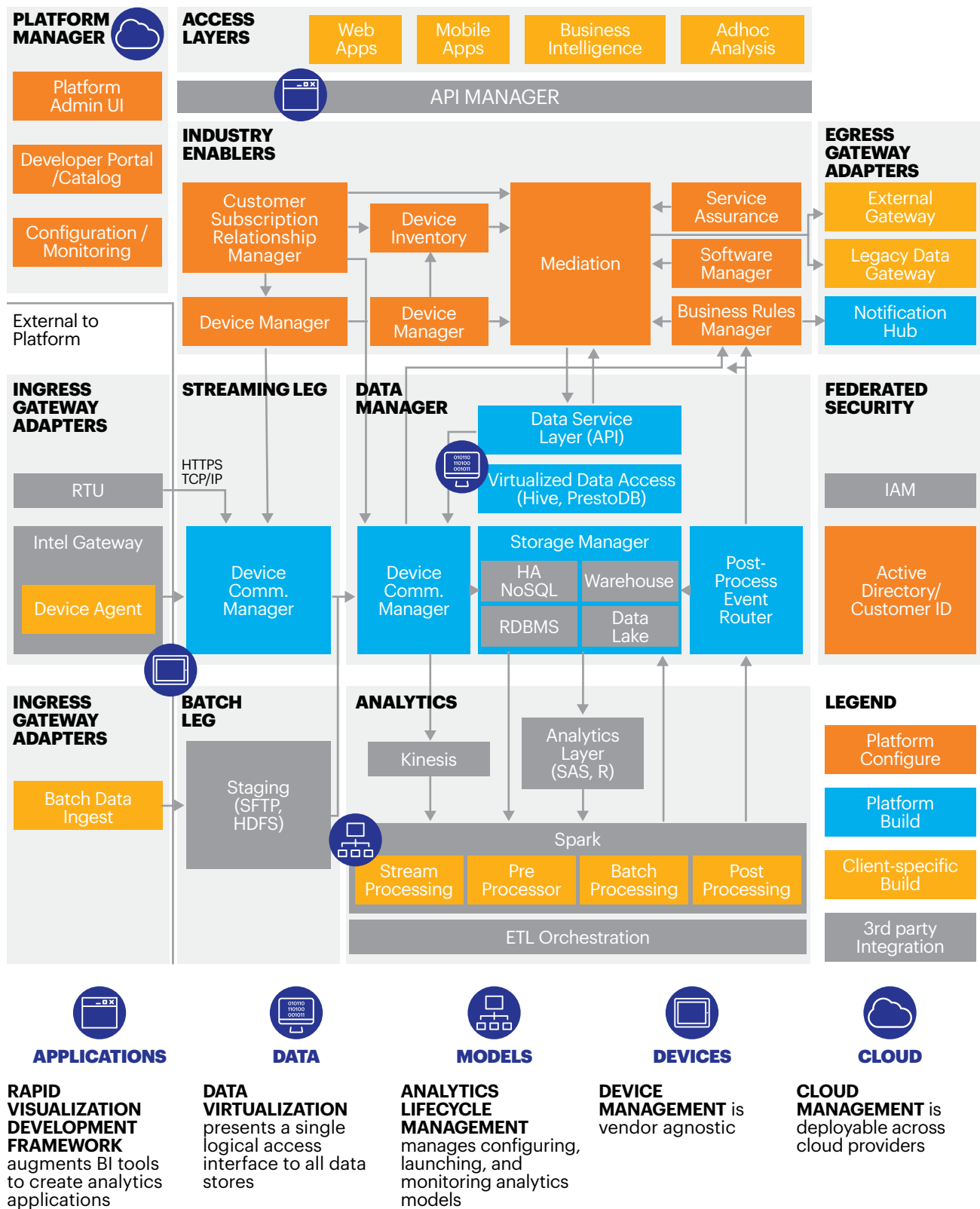


Figure 3: Accenture's own integrated analytics and IoT platforms AIP and CPaaS harvest components grouped into categories like Rapid Visualization Development, Data Virtualization, Analytics Lifecycle Management, Device Management, and Cloud Management.

The platform differentiates its component capture by the engineering rigor in its standardized approach and pipelines, and by its ability to capture context. This context includes details of both the business domain that help a new user to determine when to apply the component, and the technical domain that describes how to apply it. It captures the semantics from subject matter experts, who include engineers, data scientists, and technical architects.

COMPONENT CONFIGURATION

An IoT application requires expertise across business, technology, device, and data-science domains. Helping to enable scale and creation of new applications, users should be enabled with enough self-service to configure and capture the initial use case.

The platform differentiates its component configuration through its ability to be both prescriptive for a business user configuring and deploying a new application, and flexible enough for an expert to customize. The combination of the semantic layer and automation helps to enable not just the initial recommendation of components, but also ongoing optimization that recommends new components as they become available.

A JOURNEY TO PLATFORM

Accenture has created its own IoT platform. During our journey to this capability, summarized below, we harvested the real-time analytics, device management, workflow and visualization capabilities of Accenture Connected Platforms as a Service and Accenture Insights Platform (AIP):

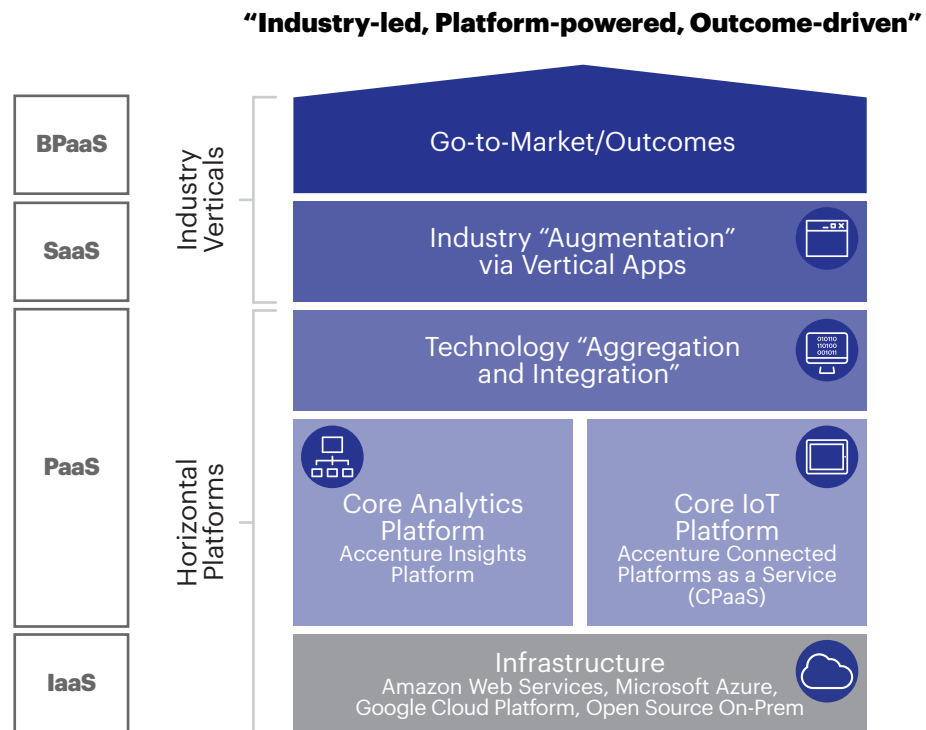


Figure 4: Our integrated approach is a “Platform of platforms”

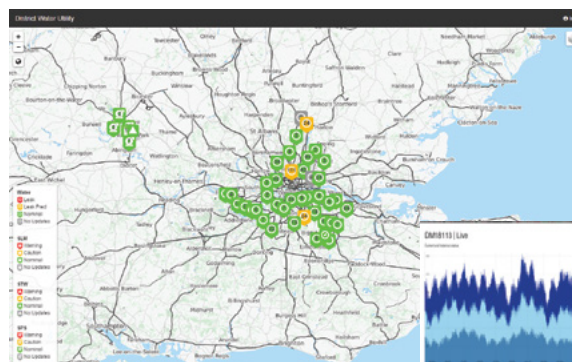


THE FIRST APP

12 WEEKS

We began by building a real-time streaming analytics smart water application that monitored the health of the network based on live views from 190,000 sensors feeding in data at 3,500 readings per second. This app was the first-of-its-kind to deploy and configure a real-time lambda architecture, create and deploy curve-fitting algorithms for predicting trends, and visualize the results.

DEVELOPMENT: THE FIRST APP



SMART WATER

12 weeks

Initial real-time streaming
Base set of components

ILLUSTRATION

Curve-fitting gaps in sensor readings

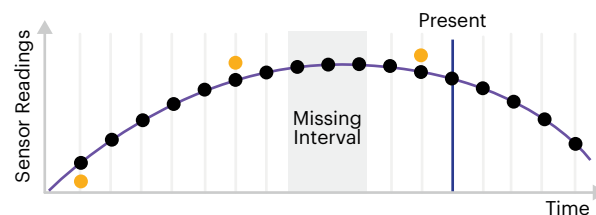


Figure 5: The first app: All components created.

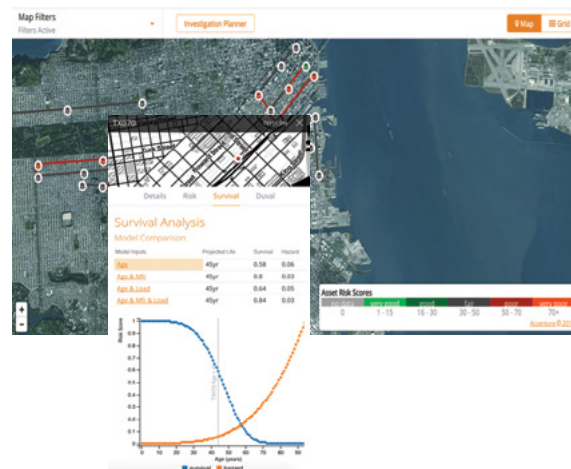


THE NEXT APP

8 WEEKS

Although the subsequent implementation for smart grid was a completely different use case, it was accelerated by the realization that certain components were available for reuse: specifically a geospatial visualization, a real-time streaming analytics architecture pattern, and curve-fitting algorithms. We captured how to reuse these components, a matter of replacing implementation specifics like the parameters used in the curve-fitting, the data schema for the client, and details of the cloud environment.

DEVELOPMENT: THE NEW APP



SMART GRID

8 weeks

Leverage existing base
Contribute new components

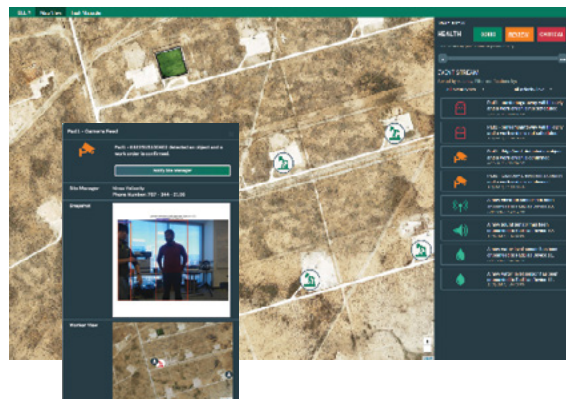
Figure 6: The next app: Configure and reuse harvested components.



THE CONFIGURED APP & THE NEW CAPABILITY 2 WEEKS

Care was taken to make the components easier to configure and deploy through APIs, containerization, and UI support. Changes to an application domain focused on business analyst modeling. As a result, the next implementation (for oil and gas) was accelerated with a focus on creating new components—like video analytics at the edge.

DEVELOPMENT: THE NEW CAPABILITY



OIL & GAS

2 weeks

Main focus on domain specific
Heavy reuse of components

Figure 7: New apps gain agility through configuration and allow focus on creation of new capability.

A “PLATFORM OF PLATFORMS”

Beyond engineering rigor, the platform focuses on the indexing and capture of context needed to scale enablement of non-expert users with “when to use” and “how to use” data, device, analytics, and application components. A focus on interoperability ensures that as new and third-party components are added to the platform, that investment can be leveraged by all applications already onboarded.

Knowing both that technology will continue to change across all parts of the platform and that it is not enough to pick a single approach, it’s important to be agile and resilient—ensuring use of components that have already been onboarded, while plugging in and taking advantage of new components. In this way, the application continues to evolve and can be automatically optimized to deploy leading technologies and to support new use cases and growth into the future.

Because many organizations have set out on the journey to create their own IoT platform, rather than one platform, the next generation of IoT applications will be comprised of a “platform of platforms.” Take just one example: an application that leverages medical-grade data from Qualcomm Life, CRM data from salesforce.com, and third-party device data from AWS IoT. Applications will increasingly leverage third-party components that specialize by leveraging unique data, analytics, or domain insights.

So rather than “your” platform being just “one” platform of services, consider the IoT platform as a “platform of platforms” that simplifies the creation of applications through tapping into an ecosystem of service components across cloud, data, analytics, and applications.

In this ecosystem, our approach is even more critical: to curate a component library of both internal and third-party components. By enabling how these components are used to be captured, together with the logic for when an organization should use them, this simplifies the creation of applications that work across an ecosystem.

The platform structure allows organizations to specialize in creating components differentiated by data, performance, price, and ease of use. The platform then differentiates itself through its ability to create new applications by bringing together the “best” configuration of components, as well as through its ability to continuously monitor how “best” evolves with the introduction of new components (the definition of “best” evolves in step with changes in use-case context, requirements, and data availability).

The platform objective is agility in development. This is achieved by significantly reducing complexity in finding relevant data and services, simplifying addition of new specialized services, and simplifying usage overall. Agility in the platform allows for faster deployment and iteration cycles, which result in improved applications and enhanced business outcomes.



Figure 8: IoT is a Platform of Platforms.

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