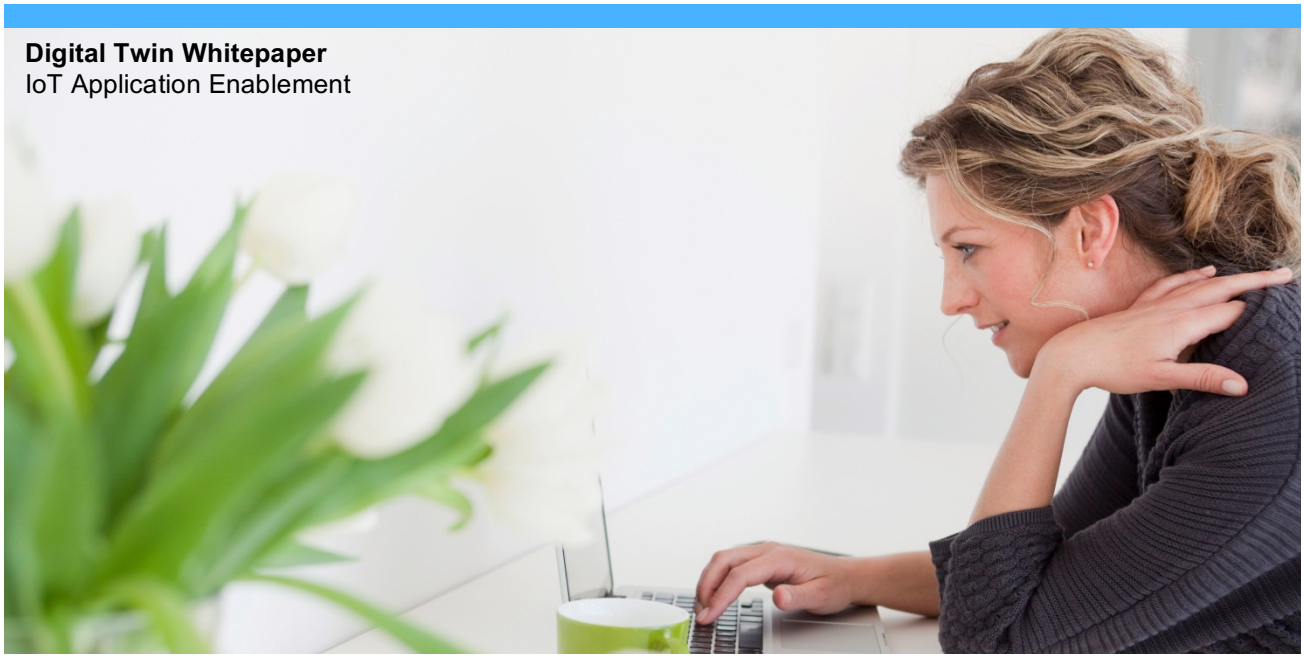
Digital Twin Whitepaper
IoT Application Enablement



Demystifying the Digital Twin

What is a Digital Twin?

A digital twin is a virtual representation of a process, product or service. While companies have been using digital twins for years, the Internet of Things (IoT) has made it cost-effective to apply this concept to a much broader array of less expensive assets.

Using software on a cloud-based platform, digital twins pull together and analyze data companies can use to monitor assets and prevent repairs and other problems before they occur. They can simulate scenarios to uncover new opportunities or risks. The data can be both deep and broad, encompassing business content like a customer's name, exact street location of the physical twin and service level agreements. Information is also contextual and of course, from sensors. The digital twin replicates everything about the machine's operation history, from level of usage, to machine performance and deviations from expected operation.

Think of digital twins as a combination of your smartest product technician coupled with advanced machine monitoring capabilities plus predictive and preemptive analytics. The measurable gains for companies are astounding. By 2018, IDC predicts companies investing in IoT-based operational sensing and cognitive-based situational awareness will see 30 percent improvements in the cycle times of impacted critical processes.

How to get started?

"Digital twins are becoming a business imperative, covering the entire life cycle of an asset or process and forming the foundation for connected products and services" – Thomas Kaiser, SVP of IoT at SAP. "Companies that fail to respond will be left behind. Those that embrace digital twins have the opportunity to better understand customer needs, continuously improve their products and services, and even identify new business models that give them competitive advantage."

Here are four steps to get started with digital twins, noting that while these steps are easy to list, they can require significant effort to achieve.

1. Integrate smart components into new or existing products.
2. Connect the products/services to a central (cloud-based) location with streaming, Big Data, in-memory and analytics capabilities to capture sensor data and enrich it with business and contextual data.

3. Constantly analyze the data to identify areas for improvements, new products or even new business models.
4. Use digital insights to create new services that transform the company — disrupt before your business is disrupted.

How SAP Can Help?

SAP IoT Application Enablement solution a part of the SAP HANA Cloud Platform for the Internet of Things facilitates the digital representation (the "digital twin") of real-world things (physical objects such as machines or products) and the persons and organizations that manufacture, monitor, control, or distribute these objects. It also provides automated, dynamic big data storage. Insights become actionable by integrating IoT Applications with business processes.
SAP IoT Application Enablement provides several groups of services. The most important of these groups are Business Partner, Thing, Location, Authorization, Configuration, Event, and File. The most differentiated among these services are the Business Partner and Thing Model services, which are used to represent the digital twin.
The key functions and features of SAP IoT Application Enablement can be broken into 3 major areas:

Build your IoT application with IoT-Tailored Development Environment

- *App Development Templates* are available for use through the SAP HANA Cloud Platform WebIDE. These templates enable you to create your own application by selecting UI patterns (e.g. a map, a list of things, a thing info card, etc.) and connecting these UI elements with data sources using the IoT Application Services. The generated code can then be modified or enhanced to fit the customer use case.
- *Reusable, pre-defined APP UI Content* is available to jump start building your application. Currently the following UI content is available: Map, thing list, thing info card and thing modeler.
- *Integration with Fiori Launchpad* makes your application easily accessible for your users

Enable your application with comprehensive API Services

- *The Semantic & Hierarchical Thing Model* allows customers to create a digital representation of a physical object such as a specific machine type. Components of the machine description (e.g. groups of sensors) can be reused when modelling additional thing types. In particular, the properties that are associated with a thing type as well as the semantics of time series that need to be captured can get defined freely.
- *The Thing Registry* contains all things that have been created. Each thing is an instance of a particular thing type.
- *The Thing Shadow* represents the latest state of a thing. Thus it contains the latest set of data that has been stored for a given thing.
- *Event Management* is used to monitor and control changes in a thing's status. If for example certain thresholds are exceeded events are created and can be queried. Event creation must be implemented as part of the application.
- *Business Partner Management* is used to define business partners such as employees, partners, customers, etc.. Business partners are used to grant role-specific access to data.
- *The Thing Authorization Model* provides services to define object groups and roles as well as assign roles to business partners and authorize access to particular object groups.

Act on IoT data by connecting to business processes

- Hana Cloud Integration can be used to connect IoT Application Enablement to SAP and non-SAP business suite applications to make IoT insights actionable

Where to learn more:
Check out Susan Galer's video interview with Thomas Kaiser about Digital Twin technology
Click here to learn more about the HANA Cloud Platform for the Internet of Things

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