The **Digital Factory**

Gain the agility to integrate your manufacturing systems in the cloud

Modern manufacturers face many challenges. How is it possible to increase agility, reduce time to market when integrating new services, improve resiliency during times of great volatility, and act on data-driven decisions? In answer to these questions, moving to the cloud is no longer an option, it's an imperative. And manufacturing lags behind other industries in completing, or even starting, a digital transformation, which usually requires cloud computing.

Investigating cloud computing will entail questions such as the following, but the longer a digital transformation is postponed, the more time your competitors have to increase their agility, offer new services, and position as leaders.

- Is my information secure enough?
- Where is my data stored, and will that location satisfy all the regulations I have to meet?
- Can my data be stored in-region to comply with regulations?
- Does the Cloud process real-time machine-generated data?
- Will I lose control of my on-premises services and datacenter?
- What about multi-cloud? Is the cloud mature enough to support all my edge cases?
- How fast can I move my on-premises systems to the cloud?

IT On-site Challenges

While business has questions and doubts about Cloud, IT is under pressure to quickly provision new environments needed for new line-of-business projects.

On-premises data centers are often too slow, too costly, and don't meet the necessary capacity and scalability to run new applications that support innovation. Scaling is achieved only by adding more hardware and resources, adding to management workload and overhead.

In addition, business users are demanding faster integration of new services and perceiving IT as too slow in developing the necessary APIs, resulting in slower time-to-market of new solutions. With more and more integration at the edge, traditional on-premises architectures used to create monolithic applications don't allow for new paradigms like serverless function-as-a-service (FaaS) computing, again slowing innovation and agility.

The Cloud Architecture Solution

With proliferation of cloud providers over the past few years, nearly every country has one or more virtual data centers. While there are some exceptions, by selecting a best of breed provider with multiple private and public cloud offerings, you can deploy your applications in a way that avoids vendor lock-in, supports all your edge cases, and complies with requirements or regulations. Cherry-picking the best solutions with a vendor-agnostic integration mesh can give you the competitive advantage you need.

Many manufacturers have taken the necessary steps towards digital transformation with an API-first approach to integrating their core on-premises systems. Some are creating a hybrid architecture, and others have started to dismantle their on-premises data centers and are moving their operations entirely to the cloud.

A cloud-based data center of some kind is the new imperative as we've said — and not only because it helps increase agility, reduce time to market, improve resiliency, and act on data-driven decisions. The cloud also lowers the manufacturing carbon footprint and reduces TCO. In addition, moving to the cloud lets manufacturers free up precious resources and concentrate on the core business.

A cloud service, such as MS Azure, is 98% more carbon-efficient than a traditional enterprise data center.[1]

AWS customers reduce their carbon emissions by 88% by moving to the cloud.[2]

1   https://azure.microsoft.com/en-us/global-infrastructure/

2   https://aws.amazon.com/about-aws/sustainability/

Integrating, Creating, and Deploying New Services for Faster Integration

The key to success is speed and innovation. Today that requires integrating a wide variety of systems — on-premises and in the cloud. SaaS applications, databases, and business applications including CRM, ERP, SAP, logistics services, and marketing automation systems can all be quickly integrated using a leading integration platform as a service (iPaaS) like the TIBCO Cloud Integration platform. Using TIBCO, you can connect and design the business logic through a browser-based, drag-and-drop interface. This low-code approach speeds time-to-market of new services and applications for faster innovation.

In addition, data virtualization software can unify multiple data sources, allowing data in multiple locations to appear as one unique data source that can be seen, accessed, and profiled, achieving a so-called data-as-a-service (DaaS). DaaS can include direct API calls to back-end services via integration and API management as well as data virtualization.

Further, because protecting data with your own resources can leave you vulnerable to a wide range of security violations and hacking attempts, some corporations are investing in security-as-a-service (SECaaS) from providers on a subscription basis, a more cost-effective option than what they can provide on their own.

Using agile APIs, the TIBCO Cloud Integration platform offers a wide range of adapters to connect and integrate DaaS and SECaaS, as well as Salesforce, SAP, Marketo, Siebel, SugarCRM, ServiceNow, Twilio, MS Dynamics 365, Workday, Zuora, and many others. In addition, a number of specific systems are supported such as OSIsoft PI, Oracle Tuxedo along with messaging solutions like Apache Kafka, MQTT, Apache Pulsar, IBM MQ Series, TIBCO Cloud Messaging software, as well as a large variety of databases or data formats like RPG and PL/1.

The Digital Manufacturer: Scalability, Visibility, and Digital Twins

In the Cloud, horizontal scaling based on the load is provided out-of-the-box, so more resources can be allocated when needed. Multiple production sites can be integrated to create an operational 360° view of the entire manufacturing site to determine your overall OEE, monitor productivity, and alert when critical conditions arise.

To create a virtual representation of your physical factory, a so-called digital twin can be created using all available data sources, with machine learning and big data technologies applied for understanding how to optimize business performance. An integration mesh provided by the TIBCO iPaaS has a key role in combining the necessary data from data silos.

> **"With more partners offering REST APIs for their services, it's easy to quickly integrate with them. API-based supply chain integration is rapidly replacing the old-fashioned B2B gateway using file transfer."**
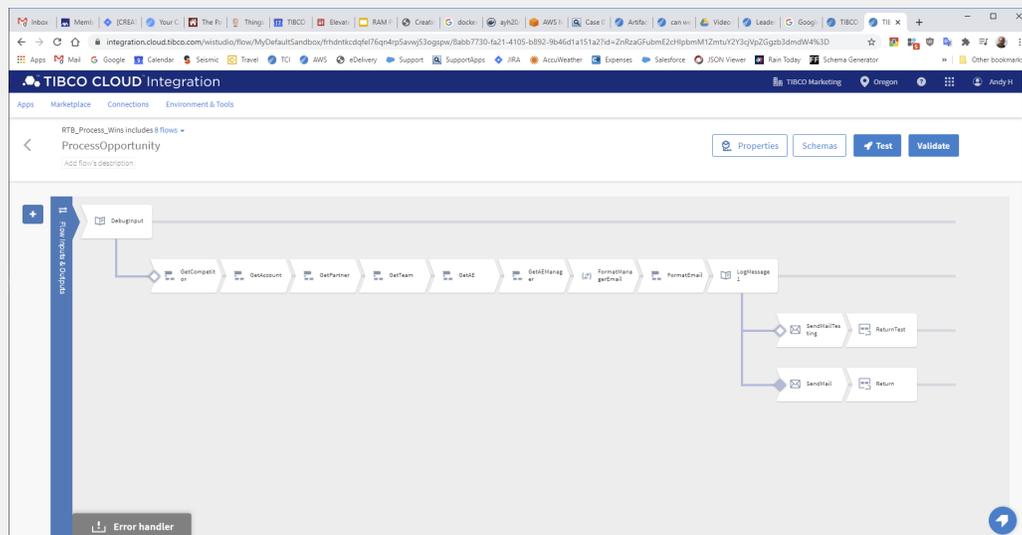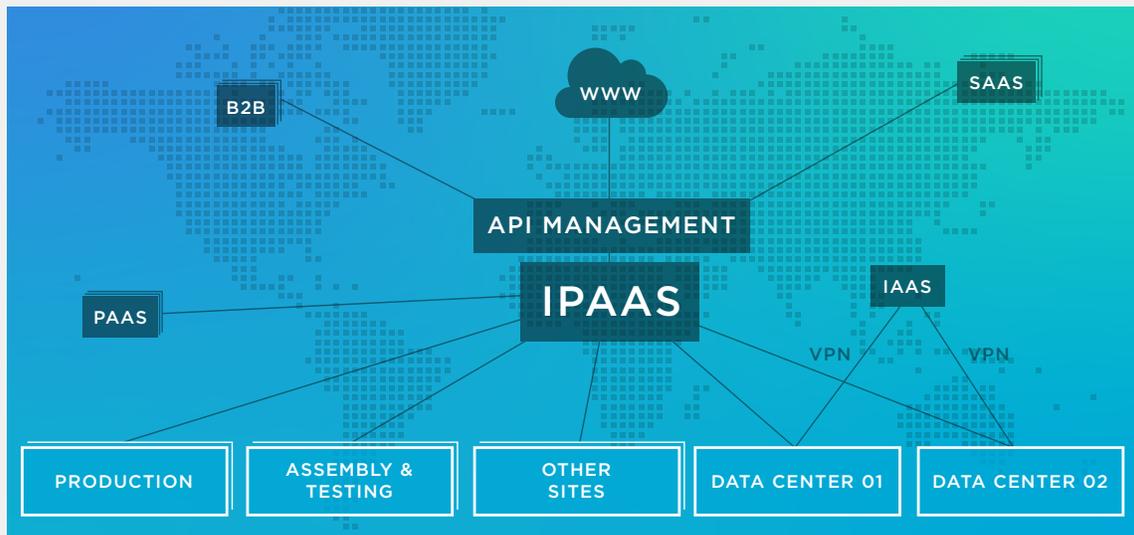>
> —Alain Martens, TIBCO Solution Engineer

Collecting, Processing, and Analyzing IIoT Data

With more and more IIoT devices on the shop floor, retrofitted machines can become Industry 4.0 ready. The latest generation of machines are natively capable of connecting to the Internet, so real-time data can be collected and preprocessed at the edge. Relevant data is then sent to the cloud for further processing. With emerging 5G technology, reliability and performance are granted even without a physical Ethernet connection. New business models are resulting from the capabilities provided by IIoT devices.

Once production and operational data has been collected, data science can be applied to get the necessary insights to make informed decisions for optimizing operations, preventing degraded quality, and reducing waste. Logistics and inventory can benefit from advanced data analysis including AI. Predictive maintenance is another area where machine learning on real-time data can determine the optimal time to intervene before equipment breakdown and to keep or increase OEE.

Connect, Unify, and Predict for Faster, Smarter Decision-making

TIBCO helps manufacturers unlock the potential of real-time data for making faster, smarter decisions. Our Connected Intelligence platform seamlessly connects any application or data source; intelligently unifies data for greater access, trust, and control; and confidently predicts outcomes in real time and at scale.

Seamlessly *connect* any application, device, or data source across the full manufacturing data spectrum

Integrate across equipment, processes, data, and people for comprehensive control over operations. Combine instrumented systems and the IIoT to create an intelligent, digital factory ecosystem that turns your factories into real-time situationally aware, predictive, and optimized "machines."

Intelligently *unify* data to provide great access, management, and control of complex datasets and systems

Decision-makers need access to accurate, model-driven views of customer, supplier, product, process, and machine data. Without a logical and integrated view of data across the organization, faster, smarter decision-making is not possible.

Confidently *predict* the future to optimize experience and profitability in every aspect of the business

Whether you're focusing on cost reduction, operations improvement, defect reduction with anomaly detection, statistical process control, optimal design of experiments, overall process optimization, or predictive analytics, they all help guide manufacturing.

With a cloud-native integration platform, you're ready to adopt a responsive architecture that supports maximum agility and operationalizes by focusing on people, processes, and technology. The TIBCO Responsive Application Mesh is exactly this: a prescriptive framework that uses cloud-native microservices to break down monolithic applications and create many highly scalable and loosely coupled services with a data-driven approach.

Reimagine your business models and transform digitally today for tomorrow's challenges. Become agile, hardened, and resilient.

Campari

Campari, one the largest spirit beverage producers in the world, has recently embraced a digital transformation. Since 1995, Campari has made 27 acquisitions, each time challenged to integrate new systems to minimize the time to market of the acquired products. Only by moving to the cloud and adopting the TIBCO Cloud Integration iPaaS, was Campari able to gain the necessary business agility, a crucial factor to its success in bringing new products to market and delighting its customers.

Learn more about the TIBCO Cloud Integration platform at https://www.tibco.com/ products/cloud-integration.

More information on our products for manufactures can be found at our dedicated webpage at https://www. tibco.com/solutions/ manufacturing-intelligence