

PREDIX

The application platform
for digital industrial
solutions



Predix Platform is the application platform designed for digital Industrial Internet of Things (IIoT) solutions

It enables applications that help transform the way industrial organizations monitor, manage, and optimize their assets and operations.

Based on a distributed application and services architecture and delivered as a platform-as-a-service (PaaS), companies can use Predix Platform to build, run, and operate applications. As a result, new insights can be generated that lead to business outcomes such as reduced downtime, improved productivity, and increased operational efficiency.

Predix Platform incorporates decades of operational domain expertise into essential industrial services that are specifically designed for the unique requirements of industrial companies, such as:

- Data volume, variety, and velocity to support multi-terabyte streams of time series data
- Latency and bandwidth for near real-time response

- Security and compliance that meets a wide range of industry governance requirements
- Harsh and distributed physical environments
- Integration with industrial controls systems and environments

The fast path to innovation

Predix Platform allows companies to simplify their approach for digital transformation and focus on driving innovation by leveraging the deep domain expertise of GE and its ecosystem of partners.

Predix Platform is built from the ground up to meet the needs of distributed, challenging, and complex industrial environments. Research has shown that adopting a platform can accelerate innovation and enable traditional businesses to manage such a transformation. However, customers that typically use their own homegrown business systems or non-industrial platforms face many challenges. Because valuable resources are tied up in building and maintaining their own platform, very few achieve significant outcomes.

80% of industry executives believe that IIoT will be transformational for their industries.

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Turn asset data into value

Predix Platform is grounded on a simple premise: collecting and analyzing industrial machine and environmental data significantly increases the value of those machines and environments.

Applications that run on Predix Platform and harness this data can generate new insights to produce new value, such as improved equipment efficiency, reduced operating costs, improved maintenance operations, and new data-driven services for customers.

Digital twin technologies

Digital representations of physical assets and systems leverage Predix Platform's industrial-grade analytics to model and optimize those assets.

Edge-to-cloud distributed computing

Predix Platform comprises a cloud stack and edge stack that work together to support distributed computing.

Industrial data fabric

Flexible options for ingestion, workload execution, and storage for streaming and batch data.

Analytics and machine learning

Rich and robust industrial-grade analytics capabilities provide insight across the entire life cycle of industrial assets.

Security

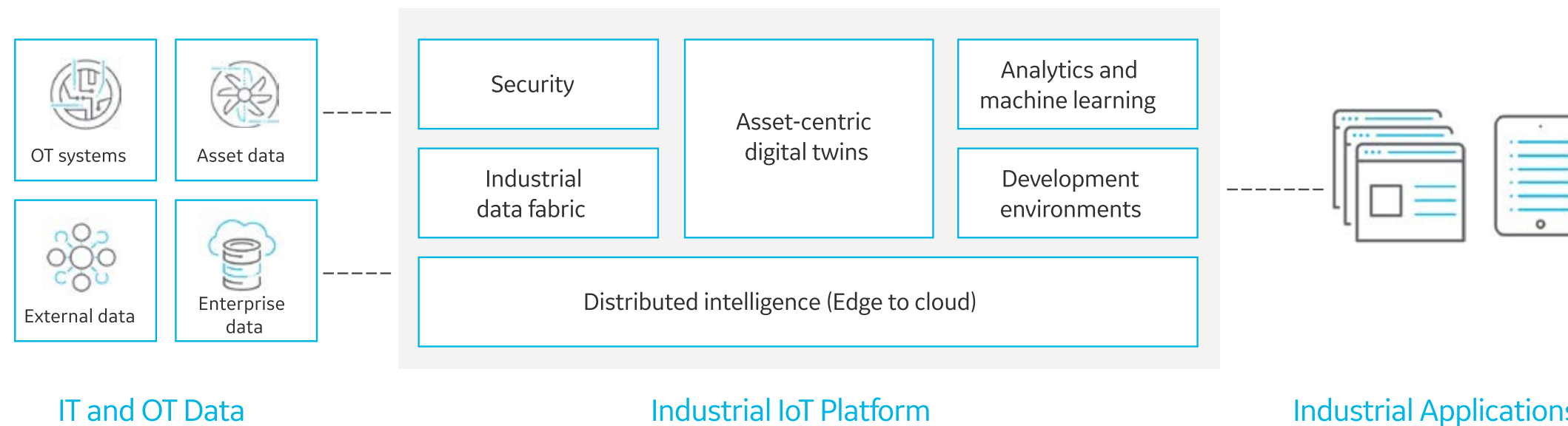
Stringent security measures are designed into Predix Platform, forming a continuously monitored, protected platform for operators and developers.

Application development

Predix Platform provides a high-control and high-productivity environment for application development.

Asset connectivity and management

Predix Platform can collect, process, and securely transfer data from assets to analytics and applications in the cloud.



Predix Platform's industrial capabilities

Delivering asset-centric insights

Industrial IoT applications need to model, analyze, and optimize the physical world of assets. Designed for asset-centric applications, Predix Platform does just that.

The Predix Platform asset model is a critical platform component that drives the differentiated functionality of applications. It describes the structure of subsystems, subassemblies, and components of a unique asset. Thus, the asset model provides a unified construct to turn asset data into intelligence, that can be utilized across multiple systems and applications.

Because the asset model can be extended and reused through digital twin technology, it provides a single source of truth about the asset which can be analyzed with other contextual data related to that asset.

Digital twin technology

Digital twins are built on Predix Platform's asset model and provide software representations of physical assets. Digital twins enable companies to understand, predict, and optimize the performance of each unique asset. A digital twin can represent an individual asset, an integrated system of assets, or a fleet of assets (e.g., a jet engine, an entire airplane, or a fleet of planes).

In Predix Platform, a digital twin has three elements:

- An asset model that describes the asset structure and components
- Analytics that predict, describe, and prescribe the behavior of the asset
- A knowledge base of asset data and derived insights

Developers can create digital twins using asset and analytics workbenches. For asset manufacturers and operators, Predix-powered digital twins can also represent the asset throughout its lifecycle, including the assets' design, build, run, operate, and service phases.

Edge-to-cloud distributed computing

Industrial operations are often located in harsh and remote environments. Connecting assets can be challenging, and securely transferring data is even more

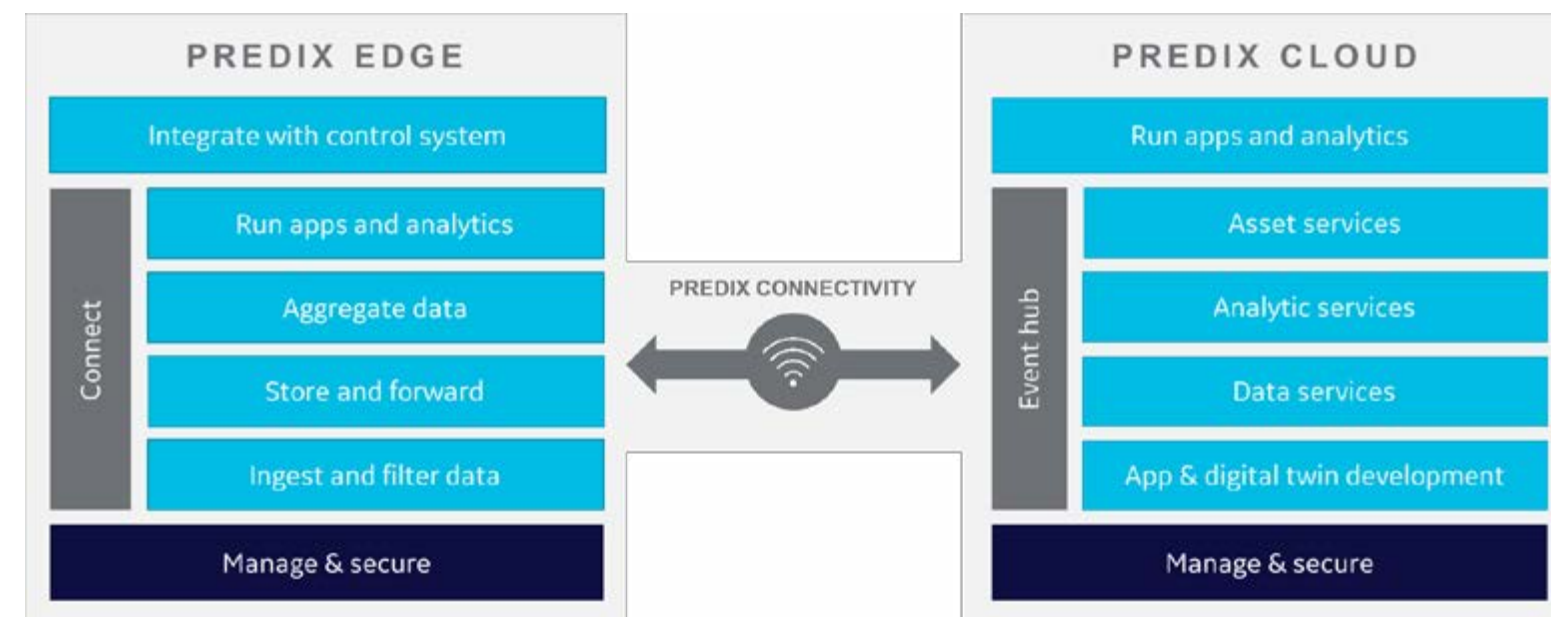
By 2022, 75% of enterprise data will be created and processed outside the data center or cloud.

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difficult. However, merely aggregating and filtering data prior to sending to the cloud isn't enough.

Predix Platform is comprised of two complimentary software stacks: one for edge computing and one for cloud computing. These stacks work together to optimize workload execution using a variety of deployment options: on an intelligent connected asset, controller, gateway, edge server, or in the cloud, all of which can be integrated together or used independently.

Predix capabilities span edge and cloud systems



Asset connectivity and management

Predix Edge provides the necessary capabilities to connect to an asset, securely transfer data to Predix Cloud, and manage the lifecycle of devices.

Predix Machine technology is at the heart of Predix Edge. Delivered as a software-stack that is typically embedded within an intelligent device, it enables bidirectional data and control flow between industrial assets and Predix Cloud services using a variety of industrial protocols.

Predix Edge Manager offers a unified view for operators to manage the lifecycle of hundreds of thousands of Predix Machine devices. Edge Manager enables tasks such as provisioning, monitoring, configuration, update, and deployment of applications and analytics across the entire device fleet.

The result is smart, connected machines—a critical component for digital transformation.

Industrial data fabric

Industrial data is growing faster than any other sector, and yet less than 3% of that data is tagged and used in a meaningful way.

Industrial data is also messy and fast moving—arriving as multi-terabyte streams in different formats and from

multiple sources such as equipment sensors, assets, and control systems. Furthermore, data is captured in repositories and systems that are typically siloed, making it difficult to analyze and reuse.

Predix Platform features an industrial-grade data fabric encompassing data ingestion, big data processing, and flexible storage. It supports ingestion of virtually any streaming or batch data source; execution of streaming/batch analytics, and workloads using standard, in-memory, or serverless runtime engines; and a full range of structured and unstructured storage options.

Analytics and machine learning

Today's industries must be data-driven. Predix Platform supports a comprehensive approach to uncovering the relationships in your industrial data by providing a rich, industrial-grade analytics library and framework to create machine learning analytics. When applied to data at the edge, operational analytics ensure the efficient operation of assets by detecting and acting upon anomalies. Those analytics can be improved over time based on historical analysis in the cloud to direct prescriptive controls and signal predictive maintenance alerts.

With Predix Platform, you can:

- Choose from pre-built Predix industrial analytics
- Build, test, and deploy machine learning models

- Leverage in-house expertise and open source algorithms and tools
- Deploy self-learning analytics at the edge or in the cloud

GE offers data science services to complement its analytics technology. This team offers flexible, rapid engagement packages to help customers analyze data, set analytic objectives, and develop custom analytics that can be deployed on Predix Platform.

Cyber security and governance

Digital industrial companies demand a high level of security and data governance. From the moment data leaves the asset to the moment it is used in a cloud application, ensuring the availability, validity, and integrity is a primary concern. That's why security is embedded at every layer within Predix Platform.

Predix Security follows three principles:

- Building security into the design of the platform
- Extending the security into the application development process
- Executing a 24x7 security operations center program for continuous monitoring and response

Support for various data governance, federation, and privacy needs are included, as well as stringent security practices that encompass perimeter security, data security, and access control. At the edge, Predix Machine provides security, authentication, and governance services for endpoint devices. In the cloud, Predix Platform offers identity and access management. At the network layer, Predix Platform restricts access and continually monitors for network intrusion.

Developing smarter to innovate faster

Application productivity and control are key for developer teams to deliver industrial outcomes on time and on budget. Predix Platform provides two environments for application development and runtime, enabling traditional full-stack developers, as well as OT citizen developers to create innovative applications using their preferred approach.

Predix Studio: Low-code development environment

Predix Studio is a low-code, high productivity 4GL application development environment. It was designed with the OT citizen developer in mind, such as control systems, reliability, or production engineers.

Unlocking new value with Predix Studio.

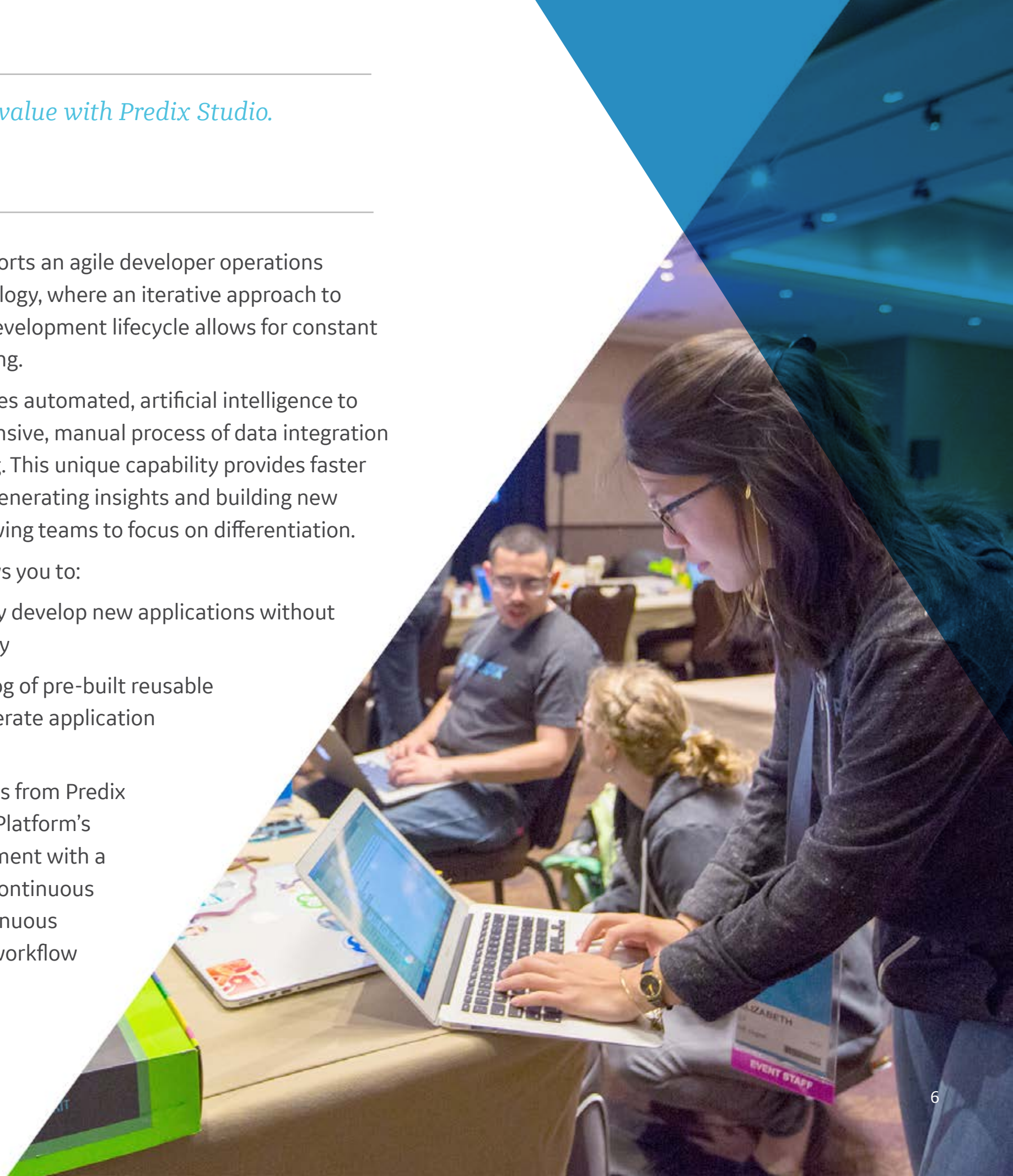
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Predix Studio supports an agile developer operations (DevOps) methodology, where an iterative approach to the full software development lifecycle allows for constant feedback and testing.

Predix Studio applies automated, artificial intelligence to the otherwise intensive, manual process of data integration and data wrangling. This unique capability provides faster time-to-value for generating insights and building new applications—allowing teams to focus on differentiation.

Predix Studio allows you to:

- Quickly and easily develop new applications without coding complexity
- Leverage a catalog of pre-built reusable services to accelerate application development
- Easily deploy apps from Predix Studio to Predix Platform's runtime environment with a fully integrated continuous integration/continuous delivery (CI/CD) workflow



Predix.io: Full-stack development environment

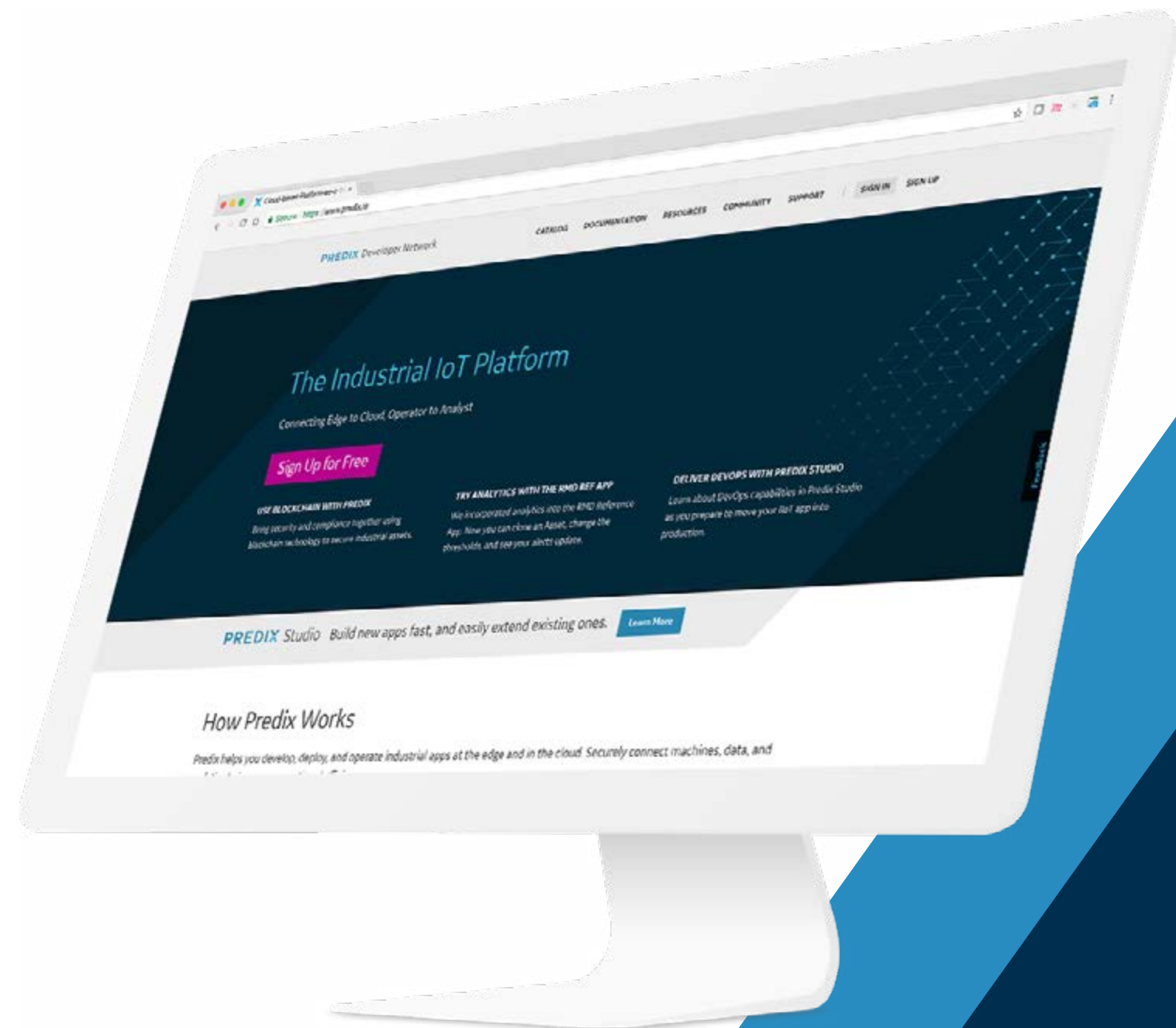
Predix Platform also offers a full-stack, high-control development experience. Application developers can use a growing catalog of pre-built GE and third party industrial microservices to build, test, and deploy industrial applications. Developers can integrate their own DevOps tools to provide a continuous development workflow. The Predix Platform catalog of microservices and analytics include:

- Asset services: Create, import, and organize asset models
- Data services: Ingest, clean, merge, and store data in the appropriate storage technology
- Analytics services: Create, catalog, and orchestrate analytics
- Security services: Meet end-to-end security requirements, including authentication and authorization
- Visualization services: Build browser-based and native mobile device user interfaces

In an era when developers make or break digital strategies, even the most successful industrial companies can't afford to ignore what their software people are telling them.

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As the destination for industrial developers, [Predix.io](#) offers SDKs, tutorials, reference apps, training, certification, forums, and a community code exchange that can help everyone accelerate their industrial app development experience.



Get started with Predix Platform

In addition to Predix Platform, we offer a wide array of services to support your IIoT implementation and adoption needs. We can help you:

Build a roadmap for digital transformation

Discover a clear ROI and vision for what is possible through deep technical and operational workshops.

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Tap into data science expertise

Work with GE Digital's data science experts to turn your industrial data into outcomes.

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Kick start your Predix Platform projects

Learn about the Predix Platform catalog and sign up for a free account to create apps today.

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Build expertise

Leverage Predix training and certification.

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Partner with GE Digital

ISVs and resellers can take advantage of the Predix Platform ecosystem.

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Solve your asset challenges with Predix APM apps

Learn about our software and service solutions designed to help optimize the performance of your assets.

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Predix delivers results

"GE's—edge to cloud—IIoT strategy, which features the Predix platform and solutions ... represents a significantly expanded go to market initiative for GE Digital."

Dick Slansky | Senior Analyst, ARC Advisory Group

"Like GE, Pitney Bowes is in the midst of its own physical and digital transformation. With APM apps running on the Predix cloud, we're able to extract and analyze data from our assets faster than ever, and use that insight to drive real business outcomes for Pitney Bowes and its clients. GE knows industrial machines and related data analytics better than anyone."

Roger Pilc | Chief Innovation Officer, Pitney Bowes

"With Predix, we can accurately forecast wind production and deliver energy more efficiently."

Brian E. Hoff | Head of the Exelon Corporate Innovation team

"Schindler's partnership with GE is a game changer—it will boost Schindler's digitization strategy and reaffirm our innovation leadership."

Mr. Alfred N. Schindler | Chairman, Schindler

"GE is driving the Industrial Internet globally powered with Predix, while leveraging NEC's vast business experience in IT systems development and its advanced technology capabilities in Japan."

Takaaki Shimizu | Executive Vice President, Chief Marketing Officer (CMO) and Member of the Board, NEC

"We are excited to collaborate with GE to help Spirit achieve our goals. With thousands of machines located around the globe, visibility on asset usage and predictive maintenance will improve Spirit's operational effectiveness on the shop floor."

Jim Cocca | Vice President of Manufacturing Strategy, Spirit AeroSystems





About GE Digital

GE Digital connects streams of machine data to powerful analytics, providing industrial companies with valuable insights to manage assets and operations more efficiently. World-class talent and software capabilities are driving big gains in productivity, availability and longevity. For more information, visit ge.com/digital.

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1. GE estimates: <http://gereportsasean.com/post/128822053685/ge-predix-article-the-industrial-cloud-is-here>

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