

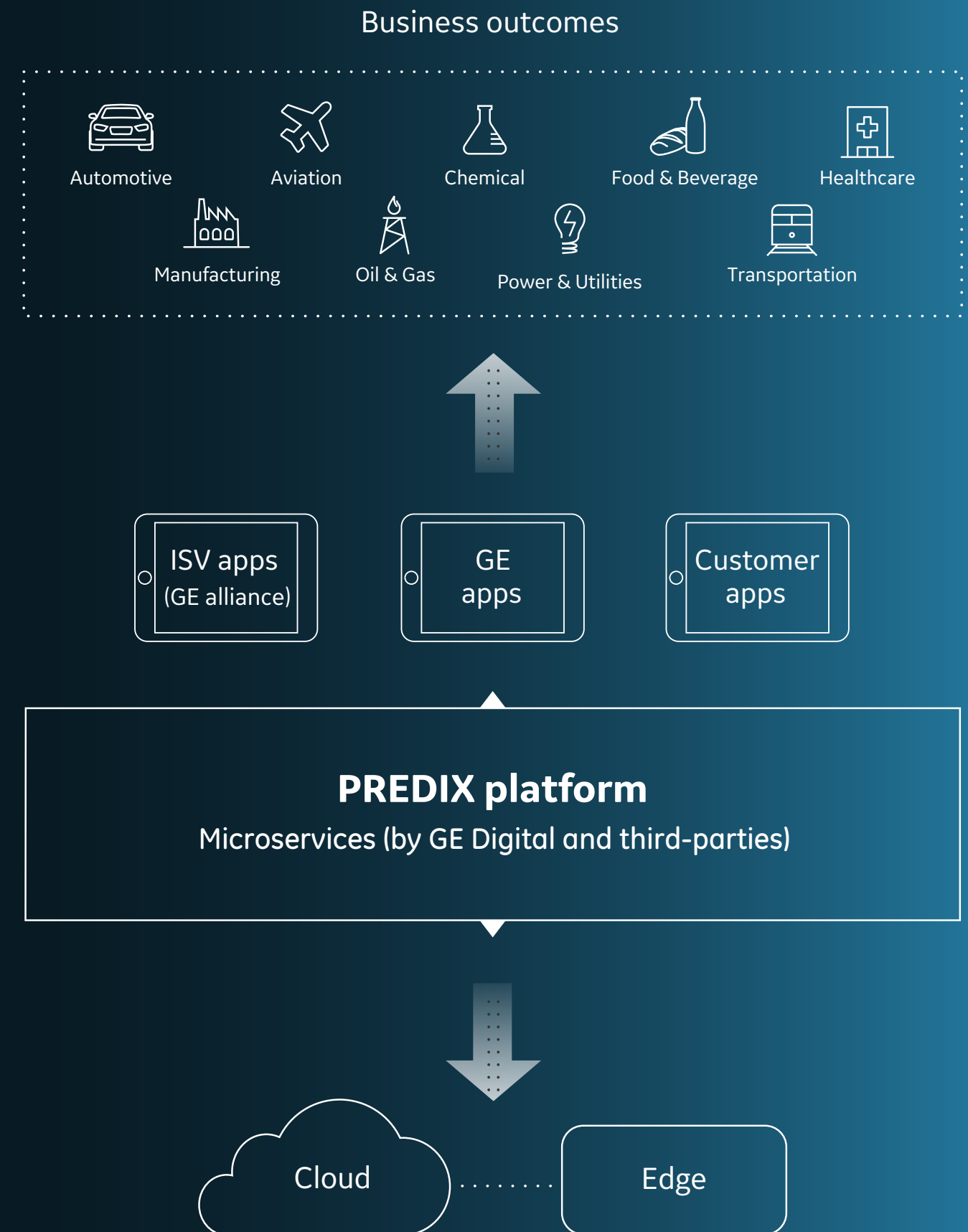
# PREDIX

## The platform for the Industrial Internet

Predix is the platform for the Industrial Internet. Purpose-built for industry, it empowers organizations to develop, deploy, and operate industrial apps—driving outcomes such as reduced unplanned downtime, improved asset output, and greater operational efficiency.

GE Digital and its partners offer a complete portfolio of products, solutions, and services that help leading industrial enterprises drive digital transformation.

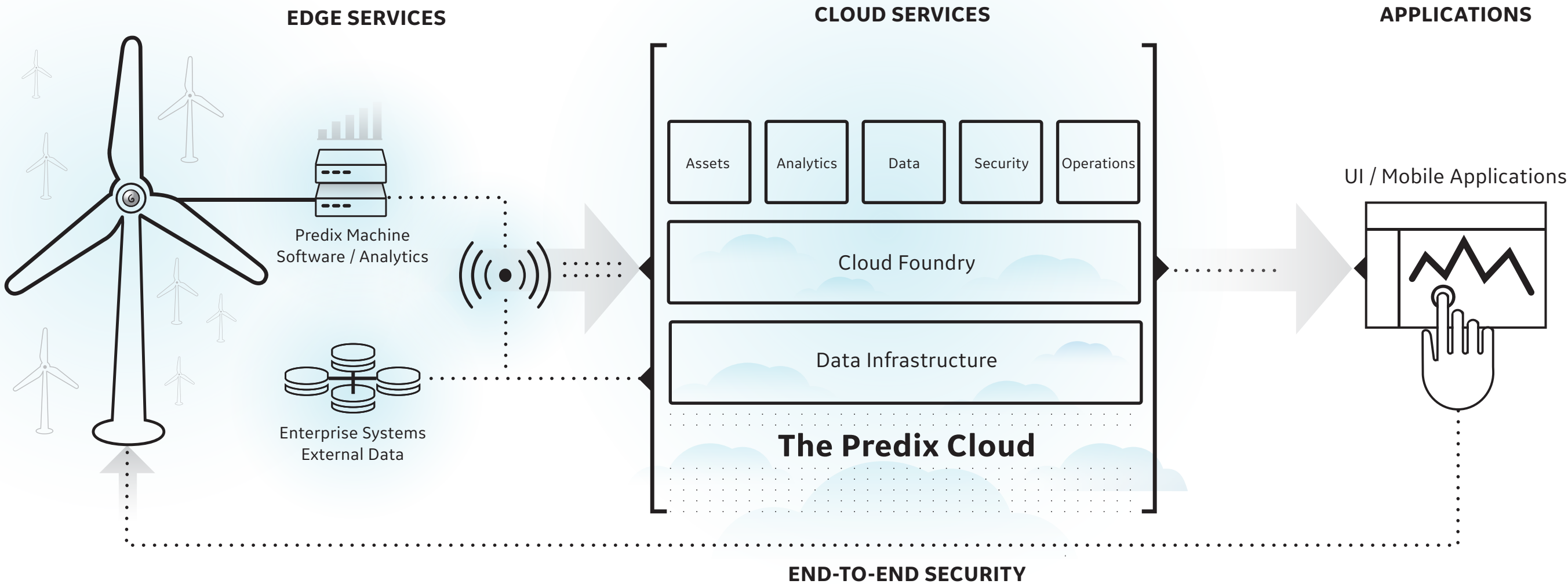
At the heart of this portfolio is Predix, the platform for the Industrial Internet.



# Predix platform overview

Delivered as a platform-as-a-service (PaaS), Predix combines GE's industrial domain knowledge with proven technology, tools, and best practices to help companies:

- Capture and analyze the velocity, volume, variety, and complexity of industrial data
- Meet the demanding needs for industrial grade, end-to-end cyber, informational, and operational security
- Innovate faster by eliminating the barriers to entry to develop industrial apps for new business outcomes
- Take advantage of an industry-wide ecosystem of partners to extend capabilities through integrated software, hardware, and services



# Getting started with Predix

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## EDGE SERVICES

Connect your asset using Edge Services

2

## DATA MANAGEMENT SERVICES

Model the asset, get and store data using Data Services

3

## ANALYTICS FRAMEWORK

Get insights by building analytics using Analytics Services

4

## VISUALIZATION SERVICES

Visualize using views or Mobile Services

5

## SECURITY

Multi-tenancy, User Management, Access Control

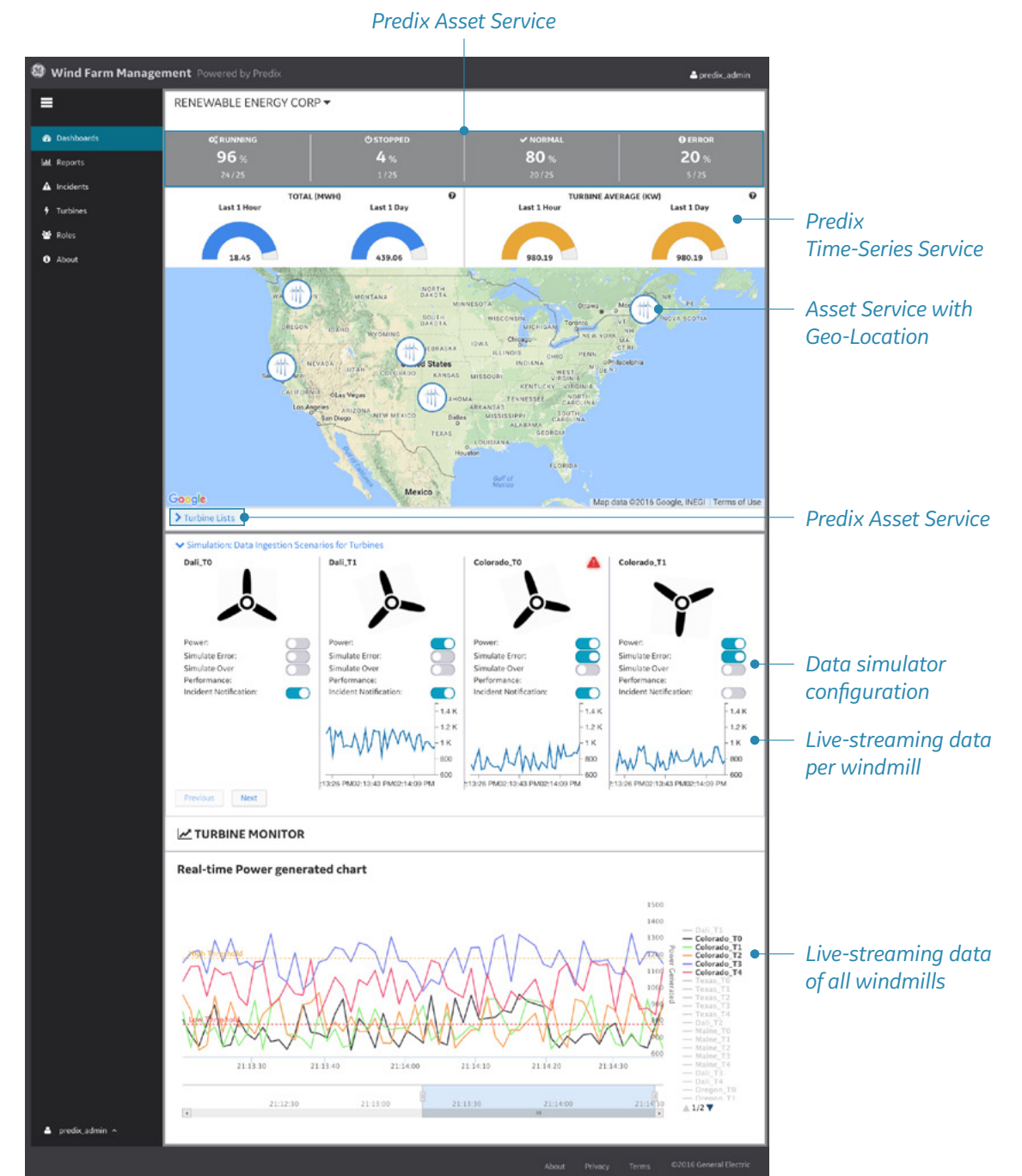
# Essential industrial-grade services

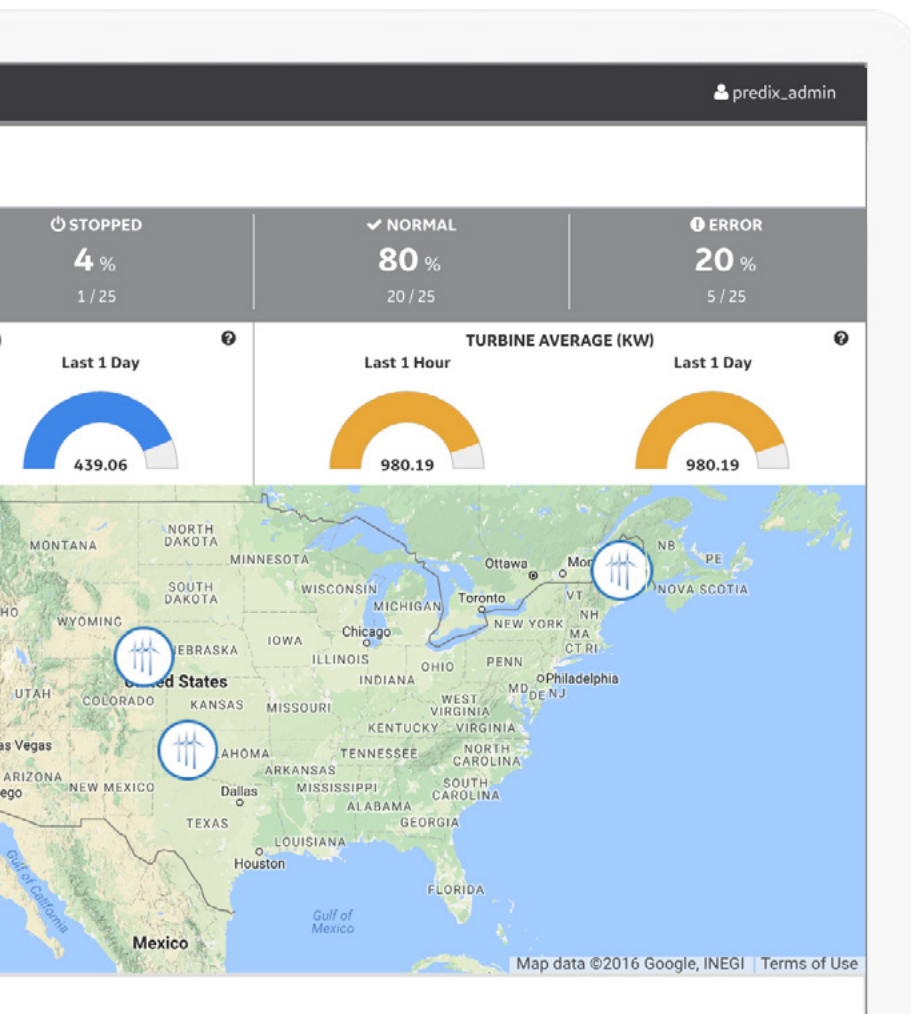
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## EDGE SERVICES

Predix Machine, Connectivity, and EdgeManager are services that are used to connect and manage GE and non-GE assets, analyze, then feed data into Predix.

- **Predix Machine** can collect sensor and asset data, analyze it at the edge, then securely respond to changes based on that data.
- Predix Machine uses **Predix Connectivity** to transfer edge data to Predix Cloud for further analysis. It provides a secure and global plug-and-play network over various access networks, including cellular, fixed line, and satellite communication.
- **Predix EdgeManager** provides a single pane-of-glass view of edge devices providing insights into device connection and network health. It significantly eases managing edge devices, and also allows administering apps and configuration files both at a device and fleet level.
- Predix Machine supports SSH, HTTPS, MQTT, WebSocket, OPC-UA, Modbus, and TCP.
- Predix Connectivity is built on strategic partner networks (IP QoS, Policing, Metering, ACL, NAT), and provides remote access via VNC, RDP, SSH, and HTTP.





## 2 DATA MANAGEMENT SERVICES

Data services are used to describe the asset, persist data generated by the asset, and provide data storage.

- **Asset Data** provides REST APIs to support asset-modeling to create, update, and store asset model data that defines asset properties as well as relationships between assets and other modeling elements. For example, you can create an asset model that describes the logical component structure of all pumps in an organization, and then create instances of that model to represent each individual pump. You can also create custom modeling elements that meet your unique domain needs. Predix supports: REST API layer, representation layer, query engine, and a graph database.
- **Blobstore** provides a way to store large byte arrays in the cloud indefinitely. Benefits include reliability (once uploaded, your data will be securely stored), scalability (add and remove resources when needed), high availability, multi-tenancy support (users in each tenant have specific privileges for accessing resources), and S3 API compatibility. Predix is S3 compatible and securely stores byte arrays up to 10 GB indefinitely.
- **Time-Series** is a sequence of data points (discrete units of industrial device information) collected at set time intervals over a continuous period of time. You can use Time-Series to efficiently manage, distribute, ingest, store, and analyze data points from a continuous stream of sensor information by maintaining the arrival time of each stream and index it for faster queries. With millisecond precision, it is horizontally scalable, has high availability, and is accessible from anywhere via HTTP.
- **SQL database.** Predix offers PostgreSQL as a service object-relational database management system to store data securely for retrieval at the request of other software applications. The database can handle workloads ranging from single-machine apps to Internet-facing applications with many concurrent users.

## 3 ANALYTICS FRAMEWORK

Analytics services simplify the development of advanced business analyses, then deploy them to business operations.

- **Analytics Catalog** provides a software catalog for sharing reusable analytics across development teams. Analytic developers upload their custom analytics and supporting files to the Analytics Catalog service for easy management and reuse. This service facilitates deploying analytics into production on the Predix platform. Predix supports a REST API for managing entries in the catalog, log retrieval API, and a template file to support integration with Time-Series.
- **Analytics Runtime** is a cloud-based framework on which developers can implement, test, and deploy new combinations (orchestrations) of analytics. You can perform analytic orchestration through the framework's configuration and parameterization capabilities, reducing the need for custom coding and point-to-point integrations. As business needs evolve and new analytics are developed, these configurations can be readily updated and redeployed. The framework is an efficient, scalable, cloud-based approach for both the development and production use of advanced business analyses. Predix supports analytics developed in languages such as Python, Matlab, or Java.
- **Analytics User Interface (UI)** provides a web application for data scientists to upload and test analytics using a convenient web interface instead of using the command line to call REST API endpoints directly. It works in conjunction with the Analytics Catalog and Analytics Runtime services to manage analytics stored in the Analytics Catalog.



## 4 VISUALIZATION SERVICES

Services to build browser based and native mobile device user interfaces.

- **View** is the visual summary of the information that is displayed in a web application. A developer uses the View service database to share and recreate saved cards, as well as to send the context of a deck object (including cards and associated components), to render as a View in a web browser using a Predix UI component. This deck-based modular view framework gives a user the flexibility to select a specific View at run time to grasp information intuitively and make time-critical decisions.
- **Mobile** provides a backend-as-a-service to Industrial Internet mobile applications built using the Predix Mobile SDK. The Mobile service supports applications that require offline support and integration with the data domain, including enterprise systems, third-party services, and Predix microservices such as Machine, Asset, Analytics, and Security. Predix Mobile is available on the iOS, MacOS, and Electron for Windows platforms.
- **Mobile SDK** includes Reference App Containers for Apple iOS, MacOS, and Windows Electron. A Mobile Reference App Container is a native application that includes the Predix Mobile Client Core Services framework to load, display, and run your Predix Mobile applications.

## 5 SECURITY

Security services secure asset data as well as handles users and access management.

- **User Account and Authentication Service (UAA)** helps developers authenticate their application users. As a Predix platform user, you can secure access to your application by obtaining a UAA instance from the Cloud Foundry marketplace and configuring it to authenticate trusted users.  
  
The UAA features include Identity Management, OAuth 2.0 Authentication Server, and Login/Logout for UAA authentication, and SAML federation capabilities to meet third-party SAML identity provider requirements.
- **Tenant Management Service.** In multi-tenancy, the tenants are logically isolated but physically integrated. That means even if the tenants use the same underlying resources, their data is isolated from each other. All users of a tenant have specific privileges to access the resources associated with that tenant.

- **Access Control Services (ACS)** helps application developers add granular authorization mechanisms to access Web applications and services without having to add complex authorization logic to their code. ACS works in conjunction with the User Account and Authentication (UAA) service in a Cloud Foundry. Benefits include the ability to maintain access-decision data as policies and attributes, exclusive security for multiple clients using the service since the ACS services are tenant-aware, and support for fine-grained authorization policies.



# PREDIX

## Learn more

Predix offers many more services, including services from third parties.

### Intelligent environments

#### Traffic planning

Optimize operations and planning with vehicle traffic data.

#### Parking planning

Optimize operations and planning with vehicle parking data.

#### Public safety

Obtain media such as photos and video to enhance safety awareness.

#### Indoor positioning

Capture mobile device indoor locations with 10cm accuracy.

### Geospatial

#### Smallworld intelligent mapping

Enhance your asset and analytical data by visualizing and aggregating the data on a map.

#### Location intelligence

Enhance every process, transaction, and decision with the power of location intelligence.

### Operations

#### Logging

Manage all your app logs and save, search, and visualize them.

#### Business operations

Measure and monetize your service with subscription management, entitlements control, metering, and revenue management.

### List of analytics

#### Anomaly detection

#### Data exploration and pre-processing

#### Machine learning

#### Feature preparation

Visit [www.predix.io](http://www.predix.io) to access our full catalog of microservices.

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