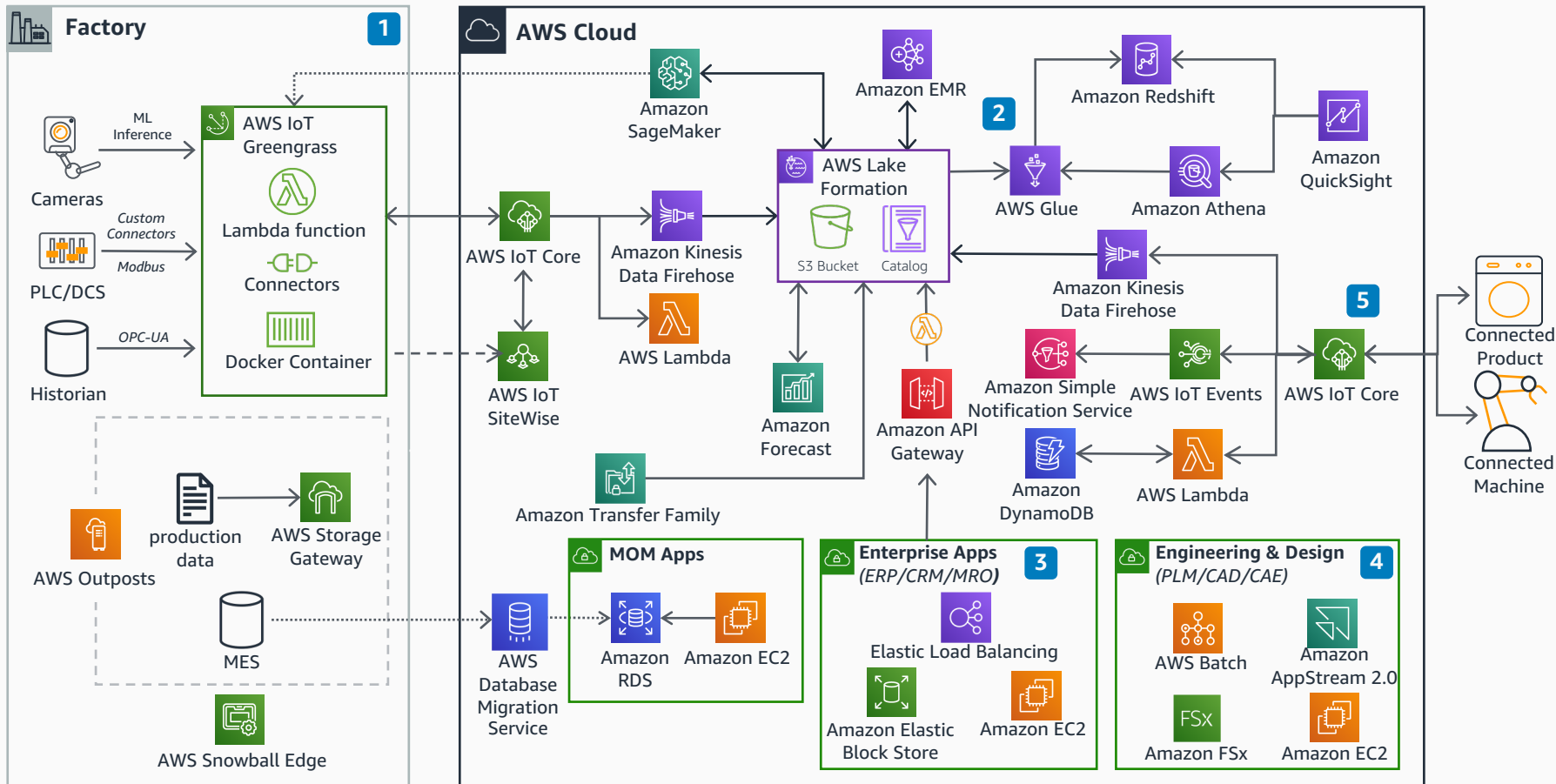


Manufacturing on AWS

This architectural blueprint shows how the AWS Cloud can enable digital transformation for manufacturers, and highlights how a smart factory, smart products, enterprise applications, and engineering and design workloads can be integrated using a data lake.



1 Establish your smart factories by connecting industrial Internet of Things (IoT) devices to the cloud, and host your production applications on a hybrid cloud infrastructure.

2 Central to the architecture is the manufacturing data lake, which enables analytics and machine learning for use cases like production optimization and predictive maintenance.

3 Host your enterprise application in the cloud with a cost effective, resilient, and scalable architecture that integrates with the data lake.

4 Utilize Spot and GPU based instances for computer aided and high performance compute workloads.

5 Build smart products to provide additional function and features for your connected products and machines, and enable product-as-a-service.

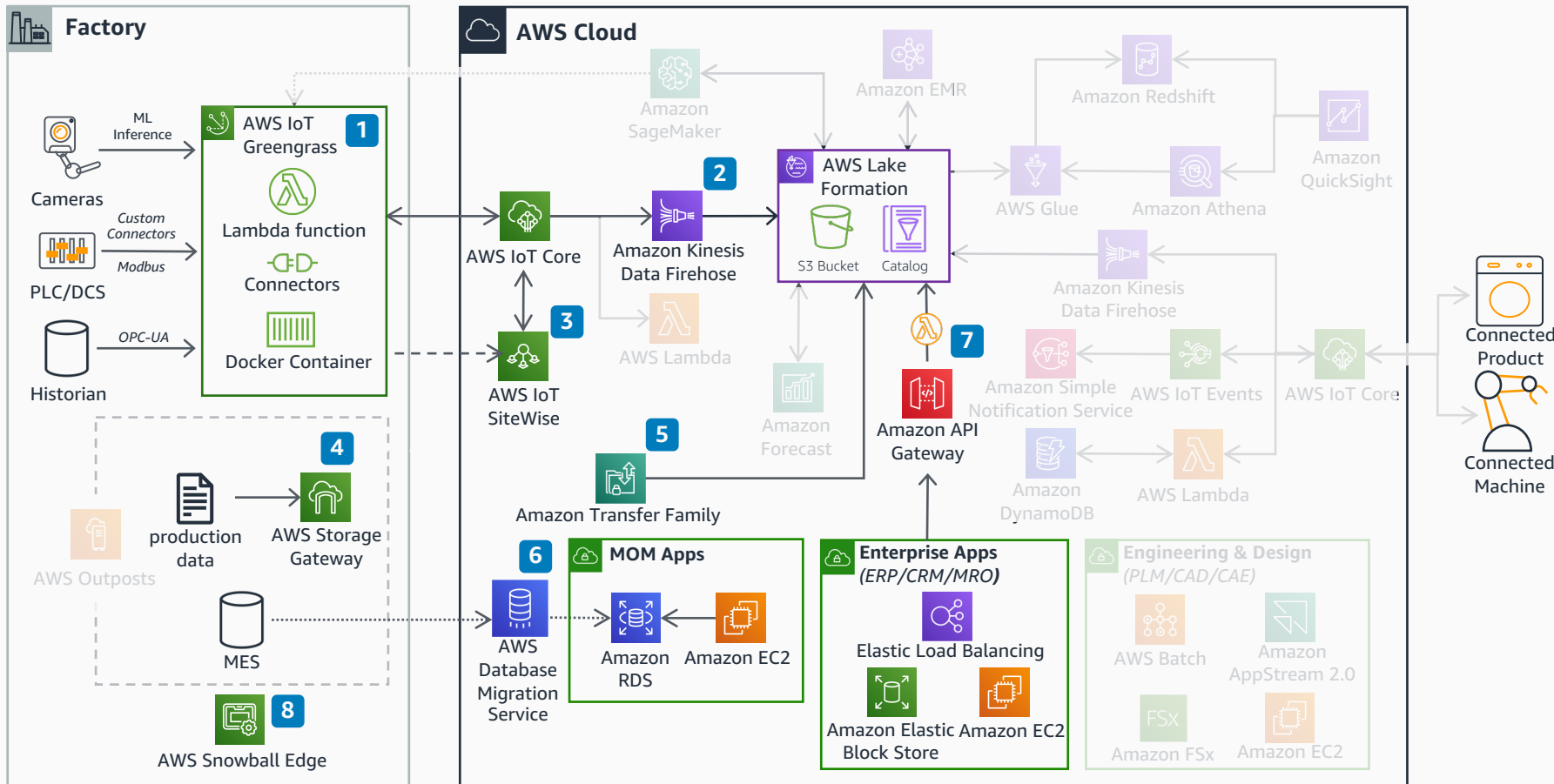
- Key**
 ML - Machine Learning
 PLC - Programmable Logic Controller
 DCS - Distributed Control System
 MES - Manufacturing Execution System
 MOM - Manufacturing Operations Management
 ERP - Enterprise Resource Planning
 CRM - Customer Relationship Management
 MRO - Maintenance Repair Operations
 PLM - Product Lifecycle Management
 CAD - Computer Aided Design
 CAE - Computer Aided Engineering



Manufacturing on AWS

Data Ingestion

Architectural view of data ingestion from industrial and automation devices in the factory, and contextualization with data from manufacturing and enterprise applications.



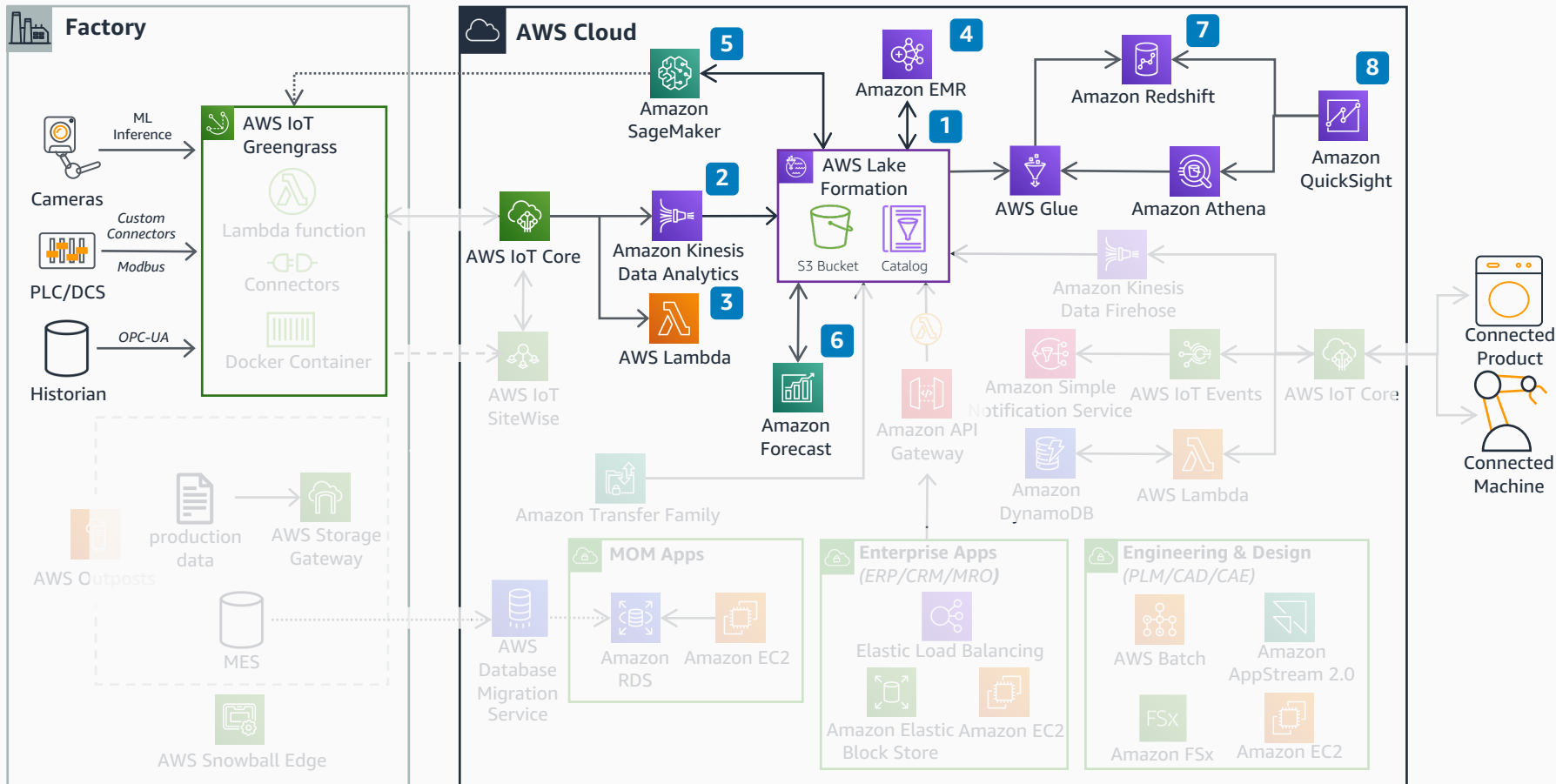
- 1 Connect your industrial devices with **AWS IoT Greengrass** running on an Edge gateway to the cloud.
- 2 Stream your industrial data into your data lake using **Amazon Kinesis Data Firehose**.
- 3 With **AWS IoT SiteWise**, model your industrial assets, calculate metrics from telemetry data, and visualize the data using **AWS IoT SiteWise Monitor**.
- 4 Unstructured manufacturing data can be synchronized into the data lake using **AWS Storage Gateway**.
- 5 For manufacturing application interface, use **Amazon Transfer Family** to transfer files into the data lake.
- 6 For manufacturing databases, use **AWS Database Migration Service** to synchronize the data into **Amazon RDS**.
- 7 For enterprise application, use **Amazon API Gateway** and **AWS Lambda** functions to build interfaces to import and export data into the data lake.
- 8 For migration of large data sets, use **AWS Snowball Edge** to migrate the data into your data lake or run your manufacturing applications at the factory Edge.



Manufacturing on AWS

Data Lake and Analytics

Architectural view of a data lake to enable analytics and machine learning for manufacturing use cases.



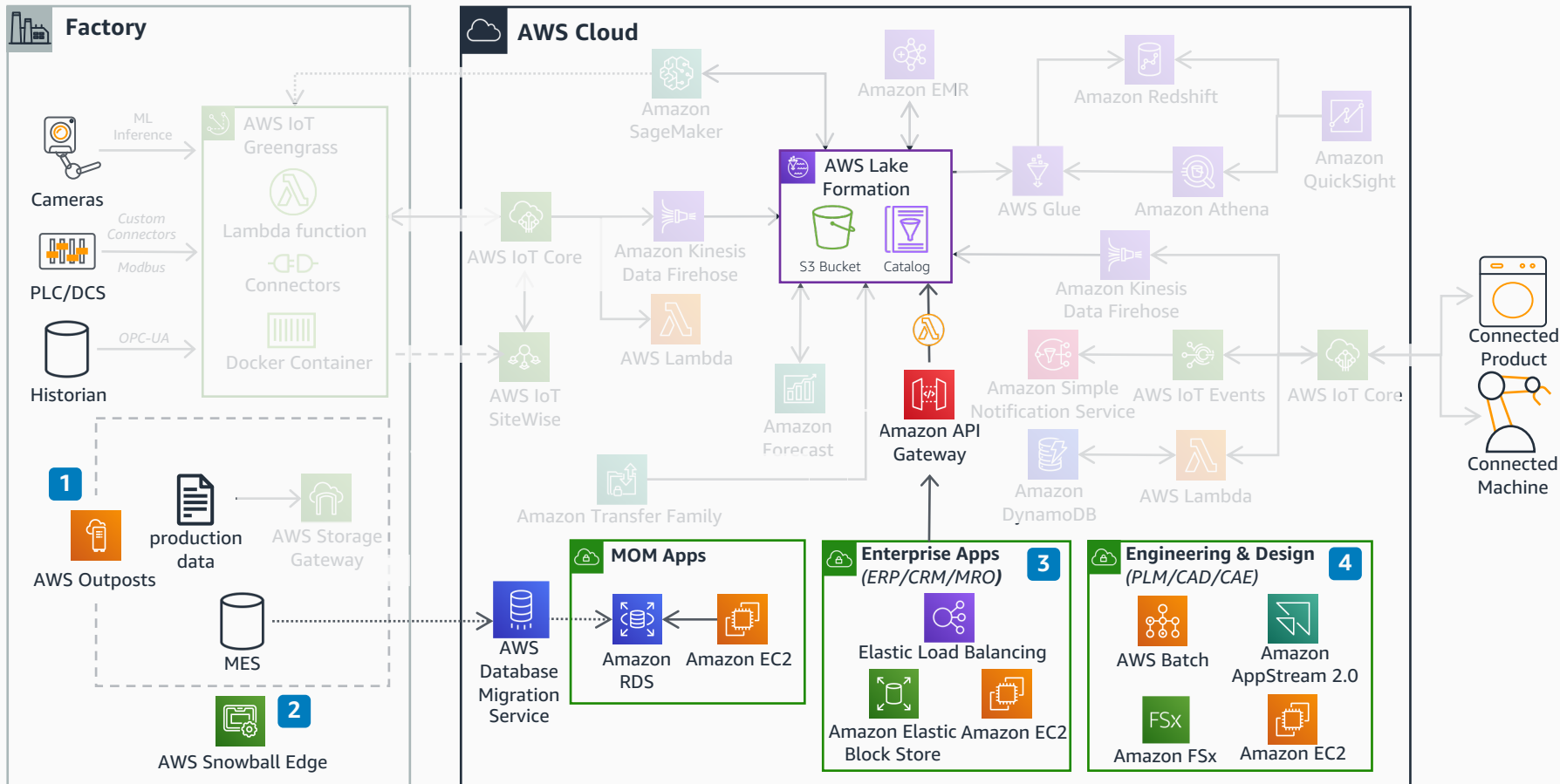
- 1 Utilize **AWS Lake Formation** or **Amazon Simple Storage Service** to establish a data lake structure.
- 2 For industrial IoT and automation equipment data ingested through **AWS IoT Core**, use **Amazon Kinesis Data Analytics** for streaming analytics such as anomaly detection.
- 3 For near real-time analytics, use **AWS Lambda** to run analytical functions.
- 4 Process, transform and analyze data in the data lake using **Amazon EMR**.
- 5 Develop, train, and deploy machine learning models with **Amazon SageMaker**.
- 6 For demand forecasting use cases, use **Amazon Forecast**.
- 7 Store structured data sets and analytics results in a data warehouse using **Amazon Redshift**.
- 8 Create business intelligence reports and visualize data with **Amazon QuickSight** from **Amazon Redshift**, and from **Amazon S3** using **Amazon Athena**.



Manufacturing on AWS

Application hosting

Architecture view for hosting application on an integrated, resilient, and scalable architecture that connects AWS to an on-premises environment..



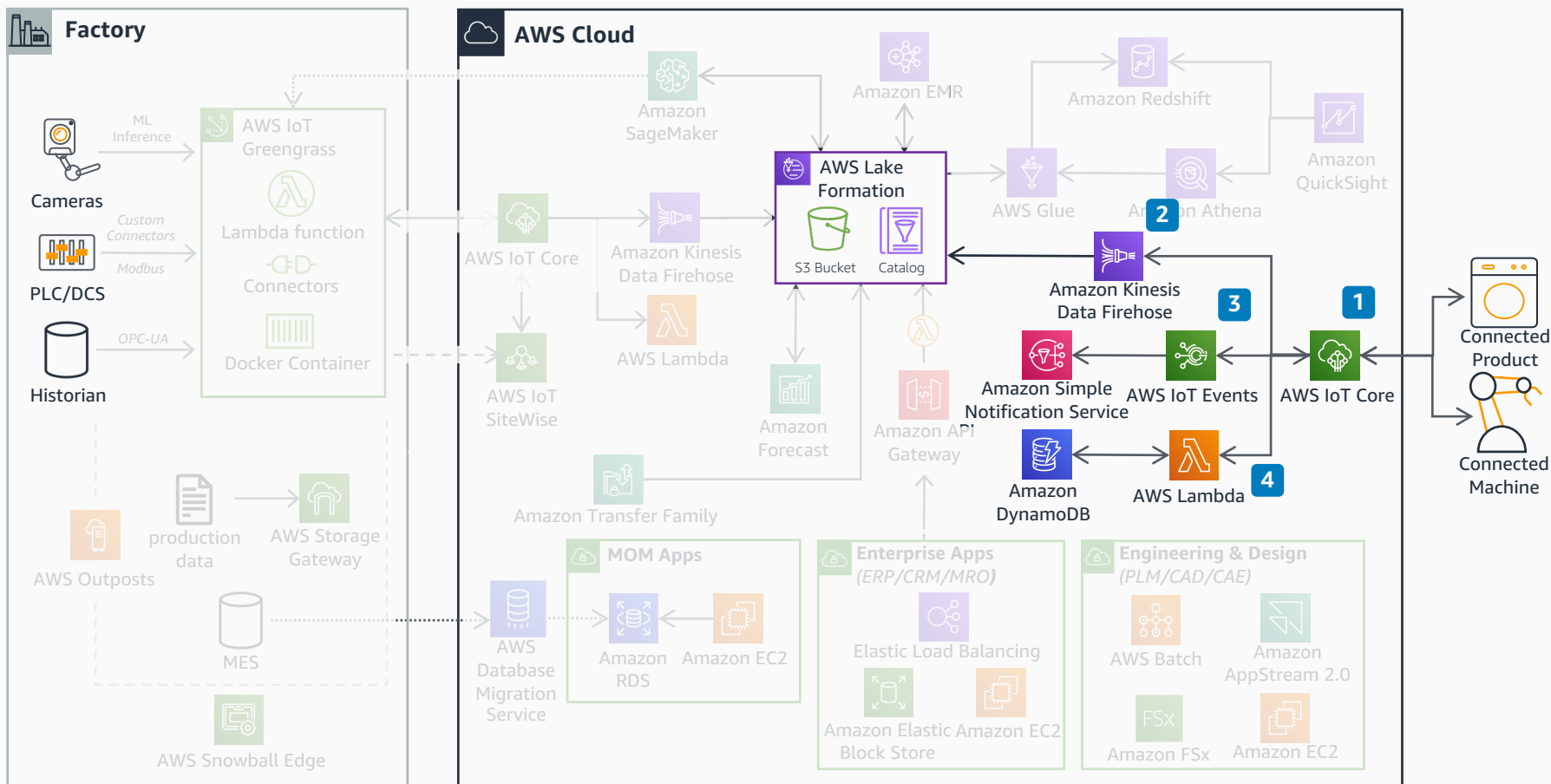
- 1 For latency sensitive and high data processing cloud-native workloads, extend the AWS Cloud into on-premises data centers with **AWS Outposts**.
- 2 For use cases that have a disconnected state or need ruggedized hardware, use **AWS Snowball Edge** to host the application.
- 3 Host your enterprise application on **Amazon EC2** instances within a virtual private cloud (VPC) using **AWS Auto Scaling** and **Elastic Load Balancing** to provide availability and scalability.
- 4 For high performance computing (HPC) workloads, utilize **Amazon FSx** and **Amazon EC2** instances with **Amazon AppStream 2.0** to run computer-aided engineering (CAE) and computer-aided design (CAD) applications in the cloud.



Manufacturing on AWS

Smart Products

Architectural view of how smart products can be built on AWS and integrated into a manufacturing data lake.



- 1** Use **AWS IoT Core** to connect to products and machines using Message Queuing Telemetry Transport (MQTT), ingest telemetry data, and send commands.
- 2** Ingest telemetry data into **Amazon S3** using **Amazon Kinesis Data Firehose** from **AWS IoT Core**.
- 3** Define event based logic and actions for connected devices using **AWS IoT Events** and **Amazon Simple Notation Service**.
- 4** Build micro service applications for connected products and machines using **AWS Lambda** functions and **Amazon DynamoDB**.

