Industrial Automation

A Microservice Architecture for the Industrial (IoT) Internet-Of-Things Applications

Define an architecture that structures the application as a set of loosely coupled, collaborating services

Introduction

With the introduction of the Internet-of-Things (IoT), the industrial automation sector is undergoing enormous change towards highly interconnected and distributed automation systems. Following the same trend, the industry faces interoperability challenges between devices and systems, which is hard to establish vertical and horizontal integration of heterogeneous devices, protocols and networks within the IoT systems, which is required to enable the reliable, safe and secure exchange of information within these systems. Everything is taken care of by implementing a microservices architecture. The application and service layers rely on middleware technology which provides the functionality, to seamlessly integrate and deploy.

Challenges

- Disconnected or Little or poor visibility with install based

- Due to lack of data not able to scale the service business

- Remote or isolated site locations

- Long response times to service requests

Solutions

NSP develops IoT Solution for Textile Industry, which is used to connect, collect and analyze the Textile machines data and results in functional insights and remote service operations.
It is a centralized on-premise Cloud-based system, where the user can monitor machine health and production, operation parameters remotely.

Microservices software architecture, developed from scratch, has combined ideas from the IoT world, industrial automation systems, modern information technology, and cloud architectures. It is a lightweight and flexible design, along with the support of state-of-the-art development approaches (containerization, continuous integration (CI), continuous deployment (CD) makes the architecture equally suitable for the deployment on on-premises, cloud, and at the edge.

Benefits

1.   Enable Spare and service business along with Remote service operations.

2   Digitally enabled Proactive Services

3.   Improve the reliability of the M/Cs.

4.   Efficiency & Quality improvement.

5.   Predictive Maintenance.

6   Reduce the downtime.

8   Informed Decision making with system

9   Faster response and recovery times improved operational capability

10   Reduced need to travel on-site

11   Shorter operation downtime during process issues

12   Fast deployment of service

13   Deploy only required parts of the software

14   Distributed deployments

15   Handle large number of requests and data processing with managed request queues

16   Data maintenance and Data security

Stories

One of the NSP clients was facing issues with the monolithic implantation. They were facing the problem on initial installations. It's a tedious job when it comes to a software upgrade. Detecting production issues on the huge monolithic application is challenging and requires experts, which is not cost-effective.

In industries, many Internet of things (IoT) devices contribute to the production of goods and services. The data collected from these IoT devices are massive and in different models. Handling these data will be a challenge for monolithic applications because of the diversity and availability of the data type.

Development of the Monolithic application and maintaining is a challenge. In this case, Microservices is one of the best options because each microservice's can take care of the specific part of the work. The particular segment of the code can be verified only when required. Once things are stable, the code will not be affected by further development or any new service development. Microservices helps in debugging the production issues, maintaining any service-related analytics separately. The overall app support can work in a much efficient way.

Architecture Overview
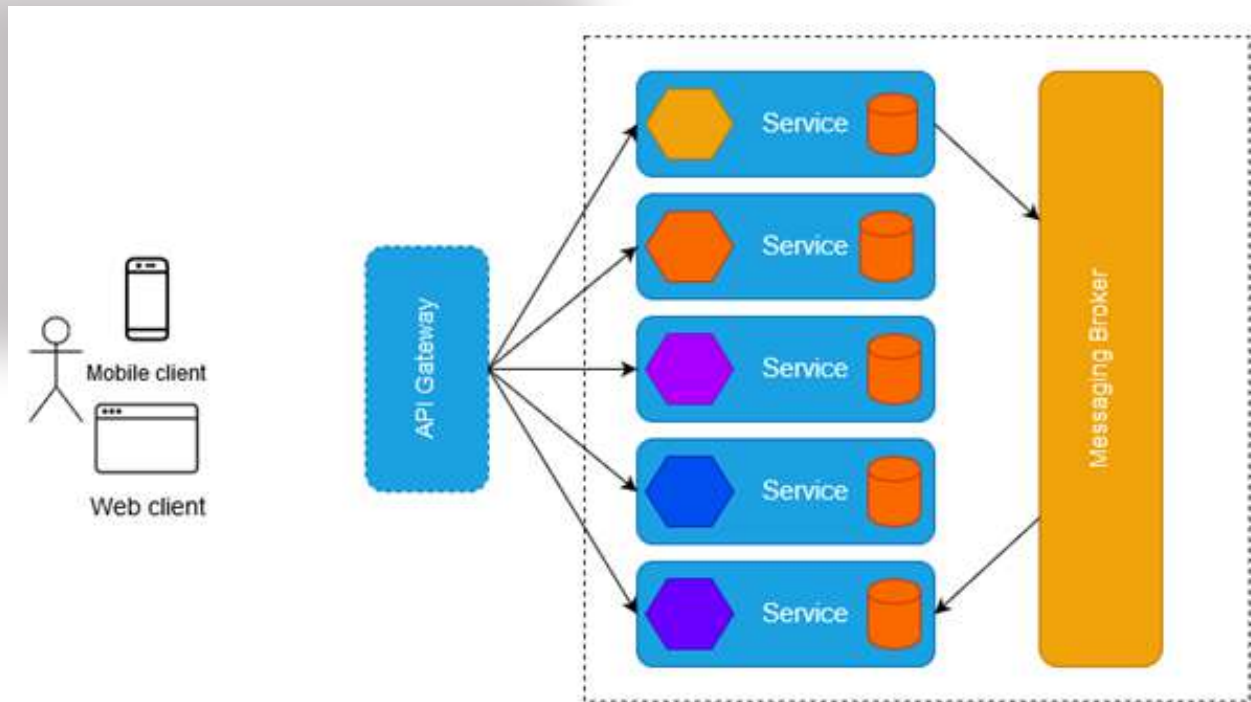
This is a very high-level architecture diagram of how the microservices implementation works. Here API gateway is the single point of contact for any client-facing services. All requests will go through the API gateway.

Message Brocker guarantees that it will make sure which service needs to be notified, with the appropriate data and whether it is delivered or not. The message broker will maintain the failure queues and the request queues.
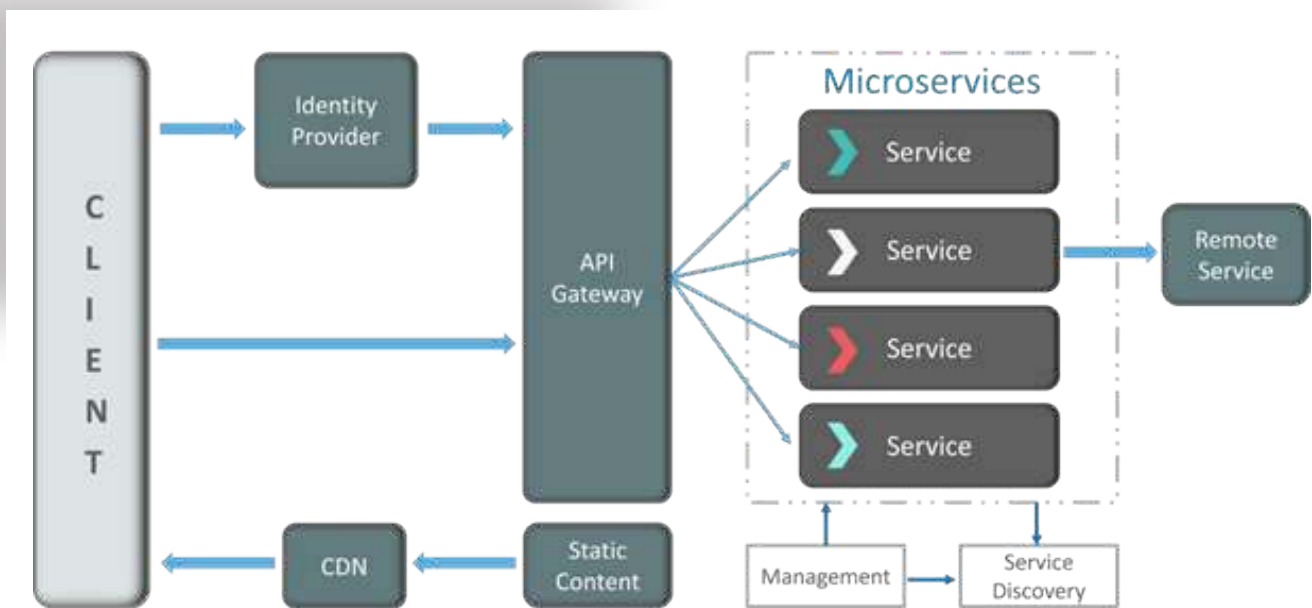
Micro Services
In the industry, many IoT devices are available for providing data. For collecting the data, itself, we can deploy multiple services by categorizing the collection of the data provider devices.

Another set of microservices analyses the data. It also provides a concrete report and controls the representational data classification.

Data analysis and predictive maintenance both are controlled by different services. We have a similar service for different types of ML analysis and predictions.
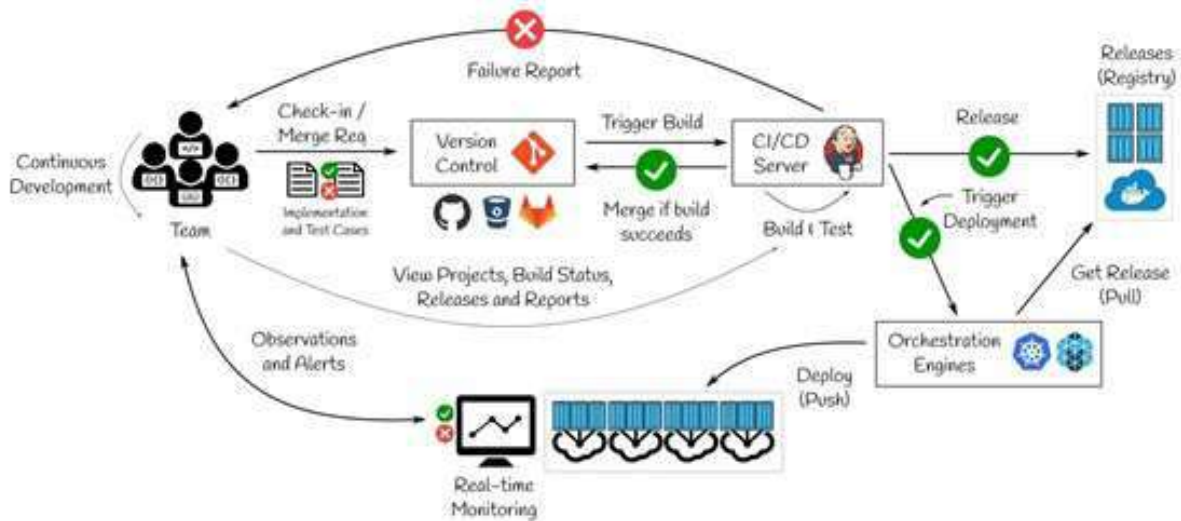
The user-front and the admin-front, are designed, developed and hosted via individual microservices.

Authentication and security:

Identity providers provide the authentication between the microservices. It can store and manage the number of user details and remove the hassle of implementing the user data security and standard.

CI/CD:

In the deployment process, automatic build deployment from the ci/cd pipeline and docker registry of builds will help make the initial installation and upgrading process easier. The server setup task will be a one-time easy process.

Automated tests will ensure that things are not affected due to the new changes.

We successfully made the automated installation script for the Linux deployment system. It reduced 90% of the new deployment problems and reduced time taking processes. Upgradation of the software becomes as easy as just a click of a button.

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