

SOSCON 2018

Edge Computing

Smart Home | Smart Factory | Smart City

Samsung R&D - India | IoT | Ashok Babu Channa

Date : October 17-18



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Technology Innovation wave

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Devices

Extracting signals from Sensors and Things and connect to network

Cloud

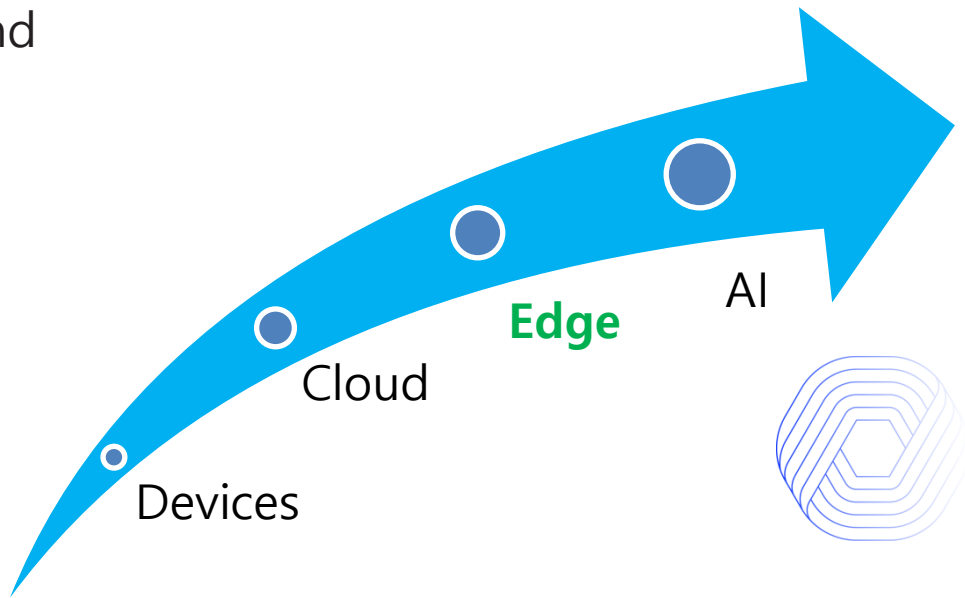
Global access and unlimited computing

Edge

Logical extreme of network for Intelligent computing

AI

Intelligence and inference at cloud or edge



Why Edge ? Need

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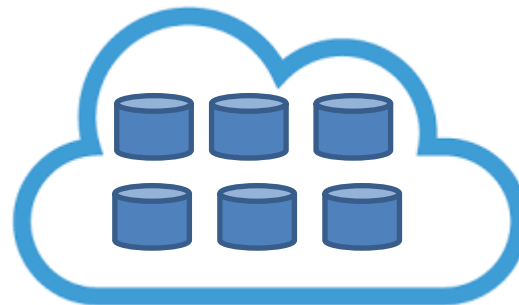
Data Privacy ?

- Data Security
- Regulations



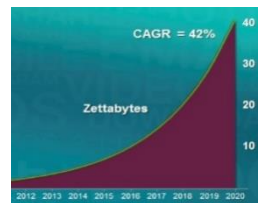
Slow response time ?

- Network Latency
- Encrypt/Decrypt



Too much Bandwidth ?

1.5 GB for one person per day



(1ZB = 10^{21} bytes)



	Energy Utility Co.	.5TB/day
	Offshore Oil Field	.75TB/week
	Large Refinery	1TB/day
	Airplane	10TB/30 min of flight

Low Latency	Satisfy requirements from mission-critical apps (< a few tens of ms)
Data Locality	Prevent unnecessary exposure of privacy data as firewall for IoT data
Save Bandwidth	Save the required BW by IoT Data Analytic at Edge instead of Cloud
Disconnected Operation	Improve usability by Masking against disconnection of public network

IDC: By 2020, **45%** of IoT data used and stored **@Edge**

Requirements	Cloud	Edge
Geo-distribution	Centralized	Distributed
Distance client and server	Multiple hops	One hop
Latency	High	Low
Delay Jitter	High	Very low
Location awareness	No	Yes
Support mobility	Limited	Supported
Location of service	Within the Internet	At the edge

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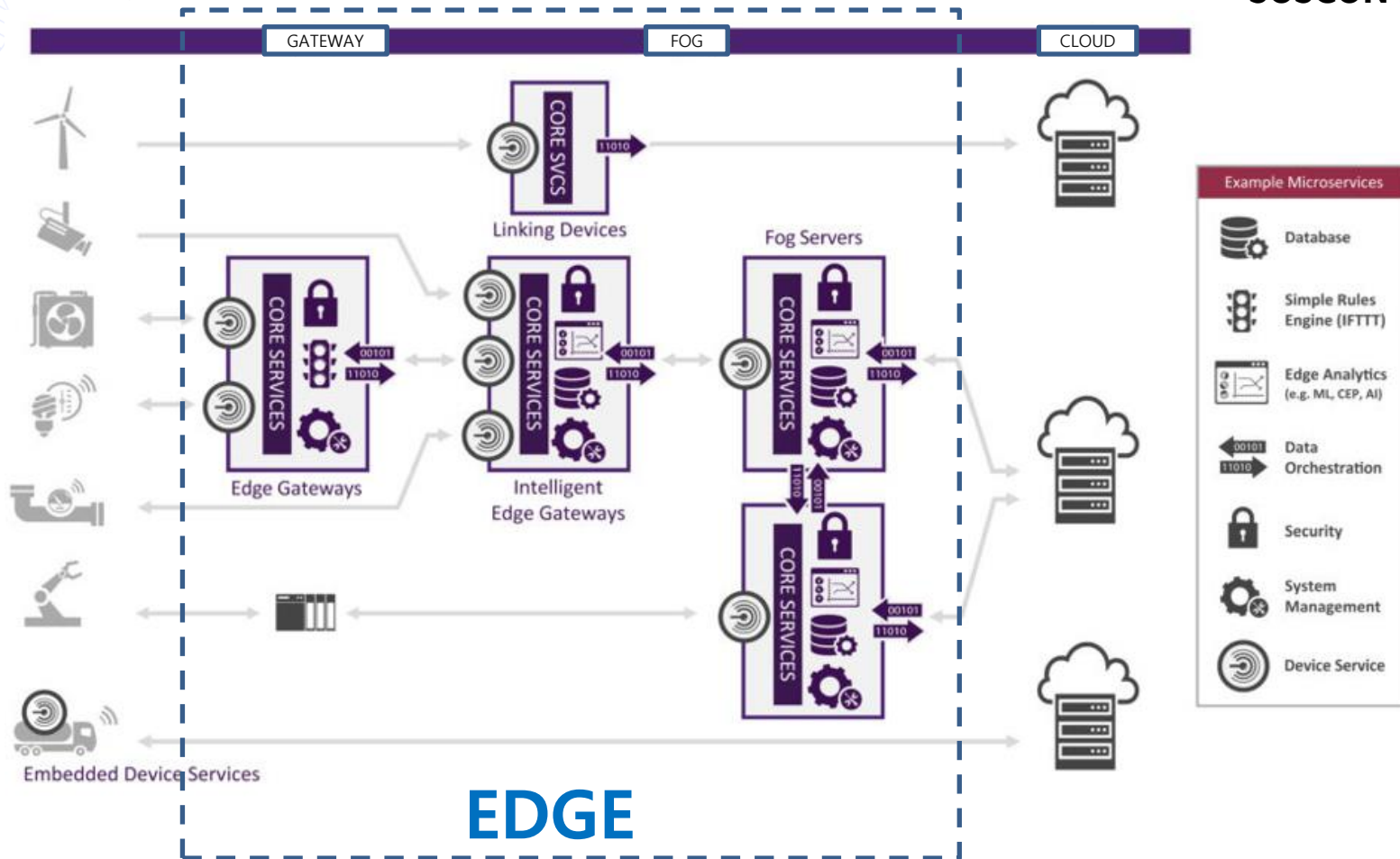
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Edge Platform | Schema

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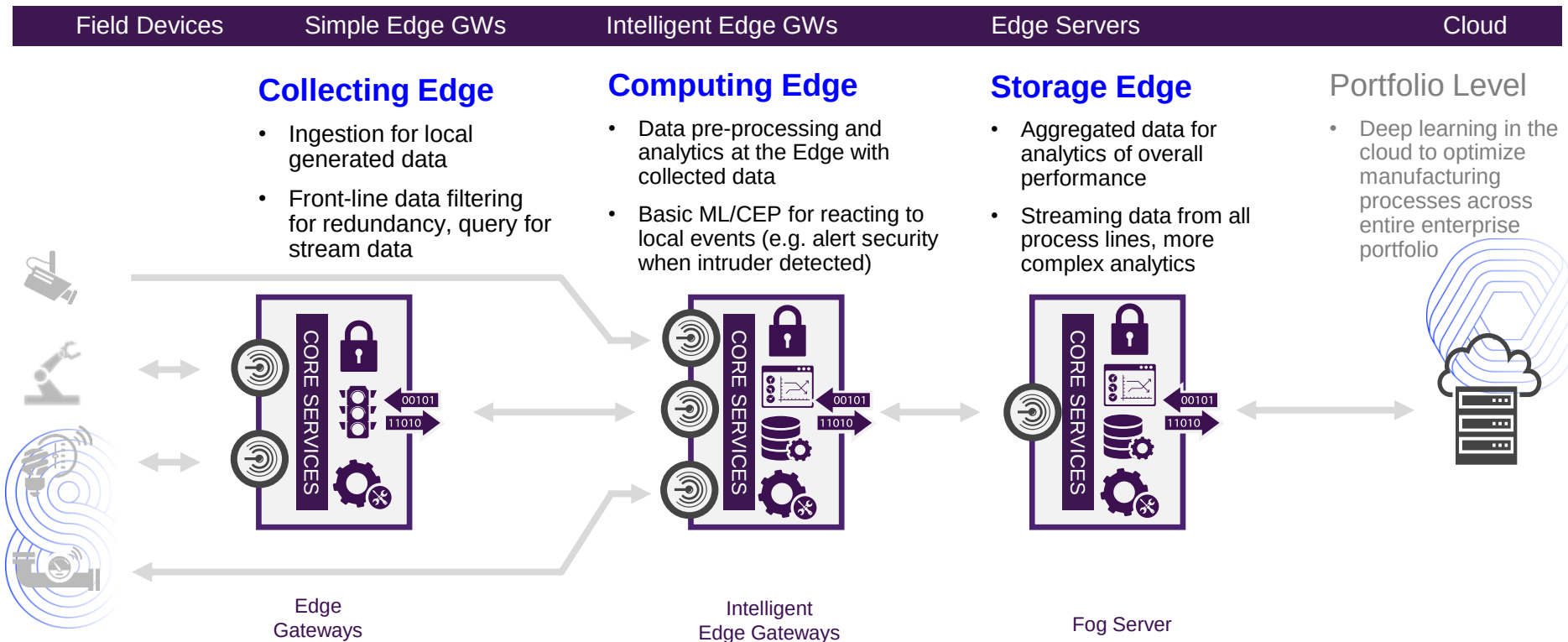


Edge Platform | Schema

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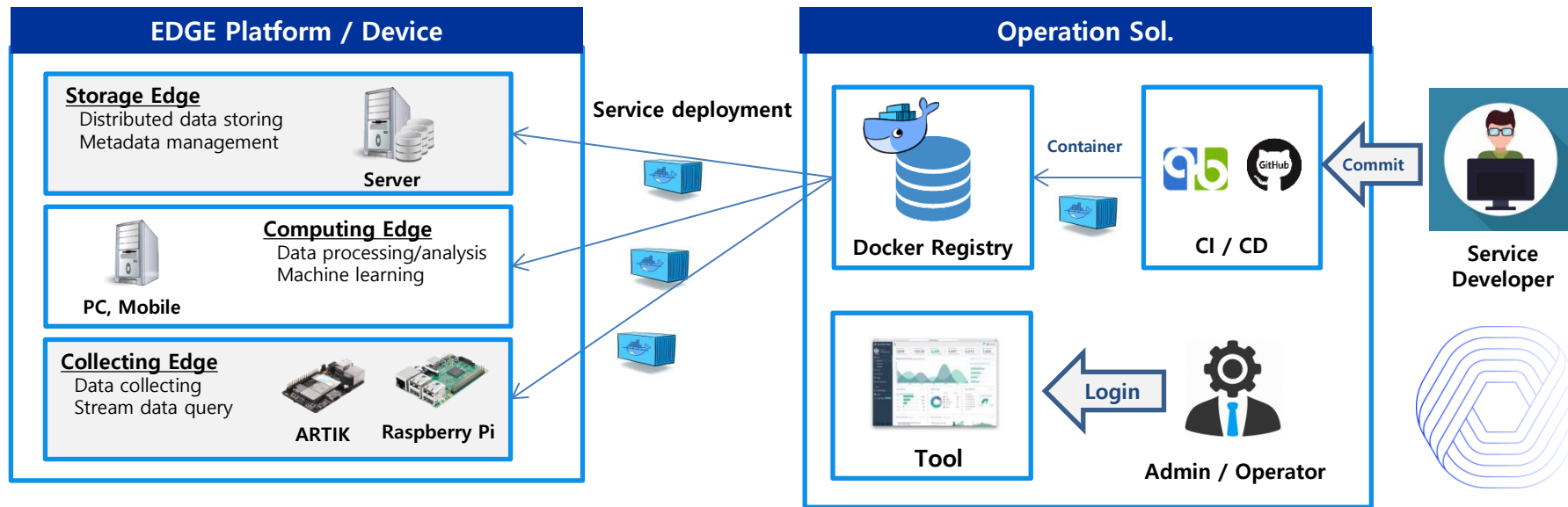
- **Multi-Tier Edge :**

- Number of deployed services and functionality increases higher in Tier
- An operator is able to constitute their optimized Edge under given use cases and requirements.



Edge Platform | Coverage

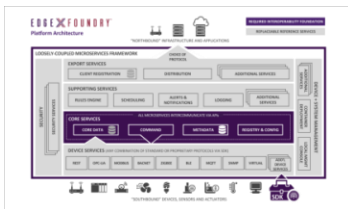
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Microservice Architecture

- ☐ **Docker-based Microservice** Architecture for Platform-agnostic service dev. And legacy service employment
- ☐ **Lightweight Edge device** for establishing testbeds powered by Samsung Edge P/F

Examples :



Data Collect/Transfer/Storage Tech.

- ☐ Securing **Standardized data modeling** for data transferring analytics improvement
- ☐ **Real-time data streaming and message framework** for collection/analytics of large-scale data

Examples:

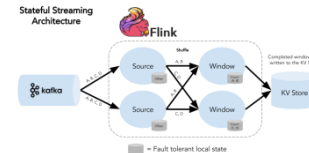
<AutomationML/>



Data Analytics at Edge

- ☐ **Data Processing Framework** for Quality/ Process from generated Data through devices
- ☐ **Stream data query tech.** for real-time data filtering & event processing for analytics and inference

Examples:





Edge Platform | Functions

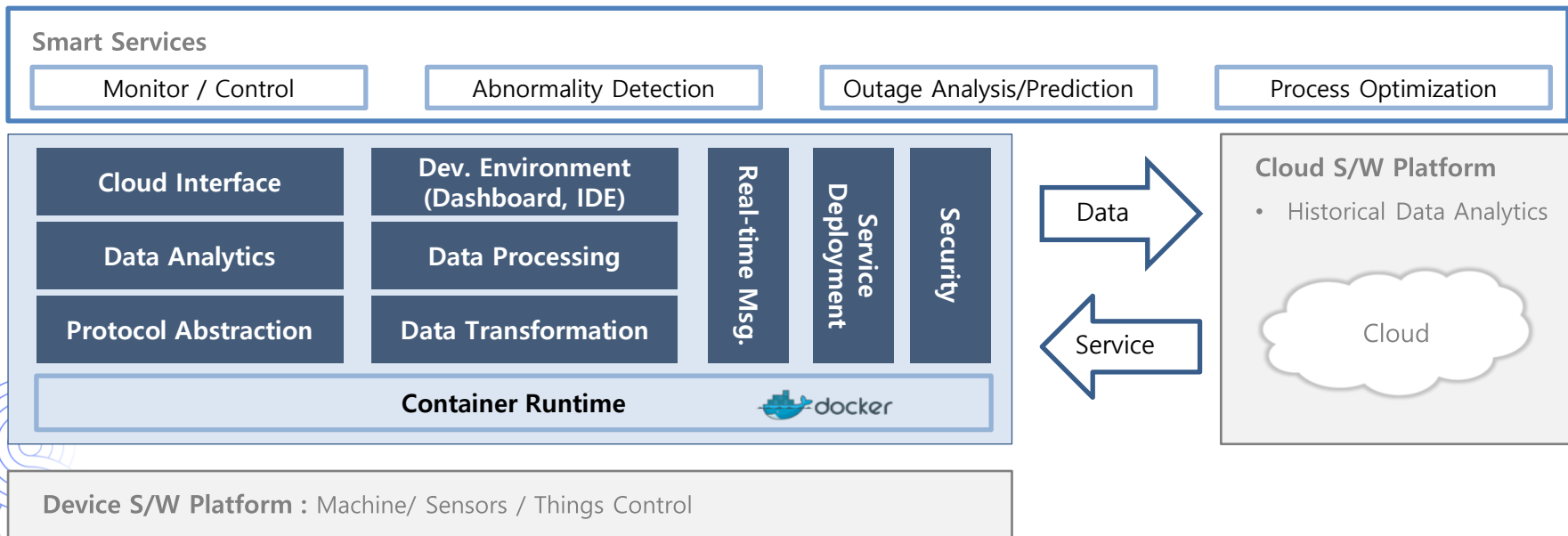
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- **Edge S/W Platform for real-time data analytics and collection**

- “One Total Platform” that be able to run on **Multi-Tier Edge devices** → Dev. Efficiency ↑

- * All-in-One PC, VISA, Local Server, etc.

- Data analytics at Edge → Save the cost of data management, real-time operation, security ↑



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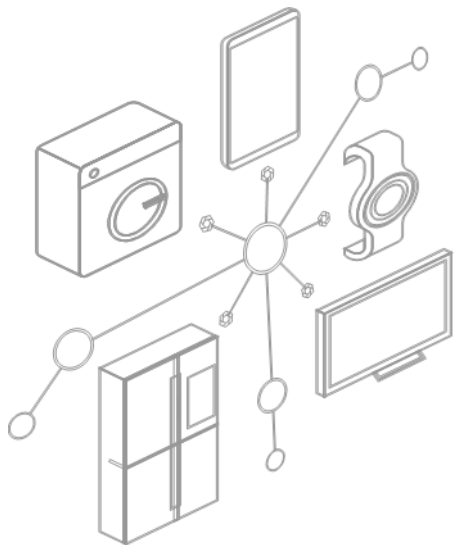
Messaging Framework

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EdgeX Open Source & Samsung Contributions





EDGE X FOUNDRY™

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EdgeX Foundry™ is a vendor-neutral open source project hosted by The Linux Foundation building a **common open framework for IoT edge computing**.

At the heart of the project is an **interoperability framework** hosted within a full hardware- and OS-agnostic reference software platform to enable an **ecosystem of plug-and-play components** that unifies the marketplace and accelerates the deployment of IoT solutions.

Architected to be agnostic to silicon (e.g., x86, ARM), OS (e.g., Linux, Windows, Mac OS), and application environment (e.g., Java, JavaScript, Python, Go Lang, C/C++) to support customer preferences for differentiation





EDGE X FOUNDRY™

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- Project progress since its launch from April in 2017
 - Considerable Momentum, now over 65 ecosystem members with most recent additions of Samsung at Platinum and Thales, Cavium, and Wanxiang Group at Silver. More in flight.

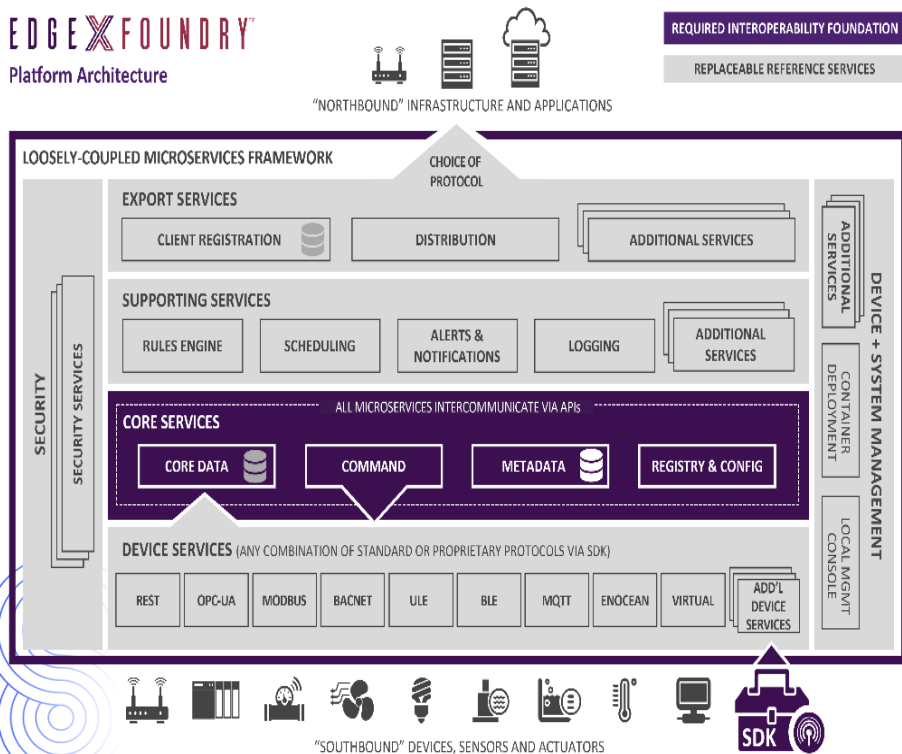


Official Mascot of EdgeX



Containerized architecture : A common open framework for Edge Platform

EDGE X FOUNDRY™
Platform Architecture



- **Device** : Defines common means to create device interfaces using preferred connectivity protocols
- **Core** : Ensures interoperability between northbound and southbound micro services through common APIs
- **Supporting** : Provide edge analytics and intelligence, from logging, scheduling, and data clean up (scrubbing)
- **Export** : Interface with cloud services with client registration and off-gateway management
- **Security** : Protect the data and command of devices, sensors, and other IoT objects managed by EdgeX
- **System Mgmt** : Provide the installation, upgrade, start, stop, and monitoring of micro services and BIOS , OS, and other gateway-related S/W

- **Best set of combination** for achieving the maximum "Data Intelligence"

Real-time Messaging
Framework Service



Micro Service based

EDGE X FOUNDRY™

<AutomationML/>

AutomationML
Representation Service



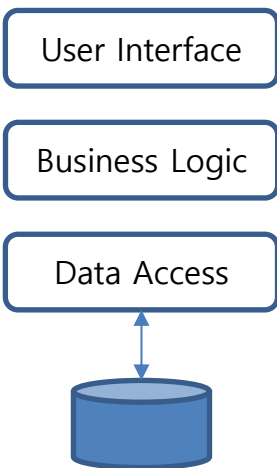
Container Runtime
Engine



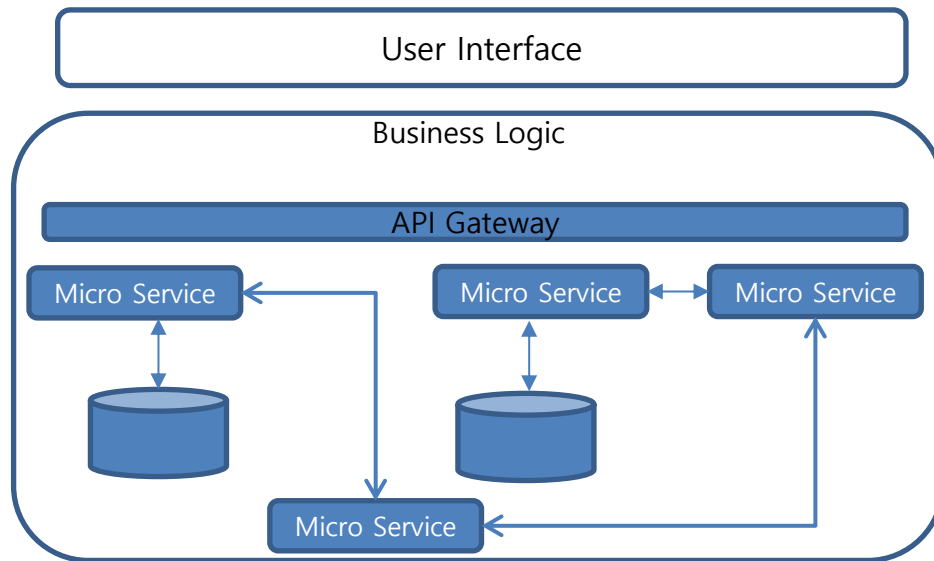
Micro Services | Server architecture

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Monolithic



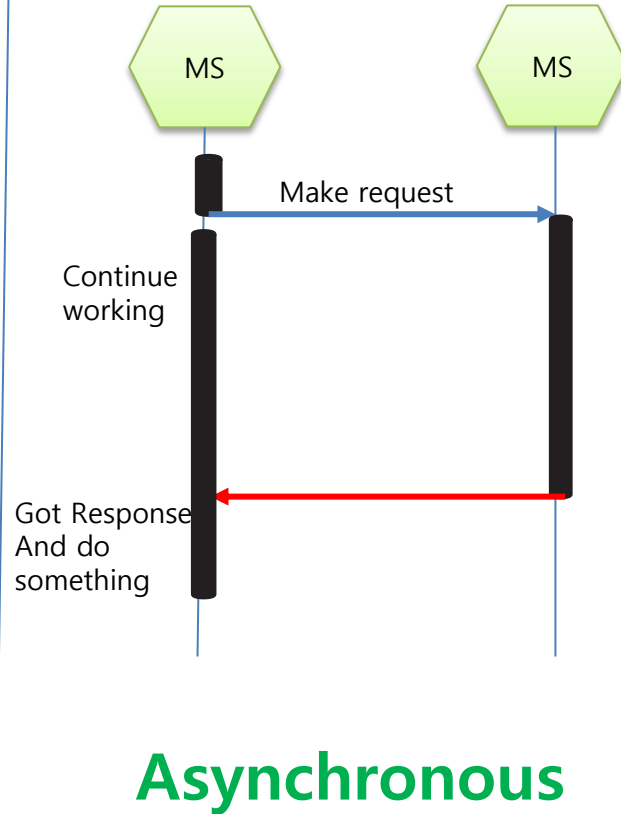
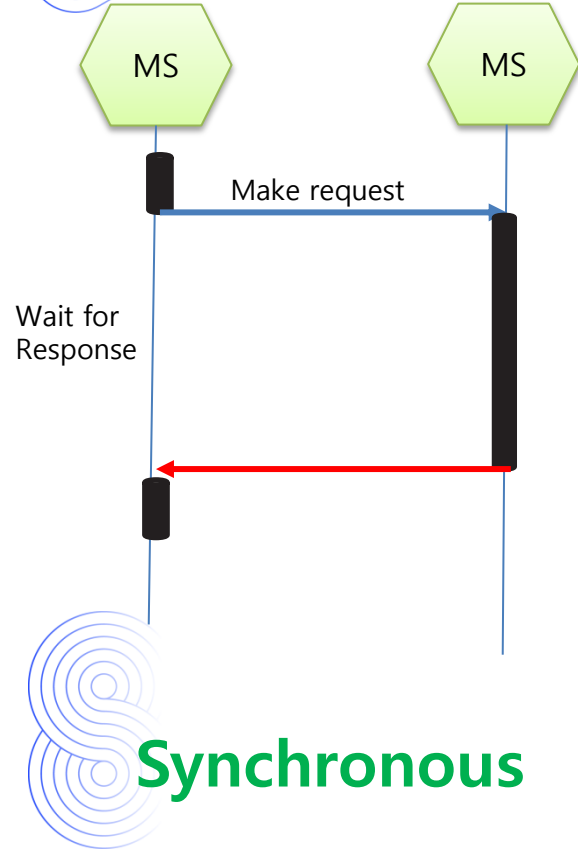
Micro Services



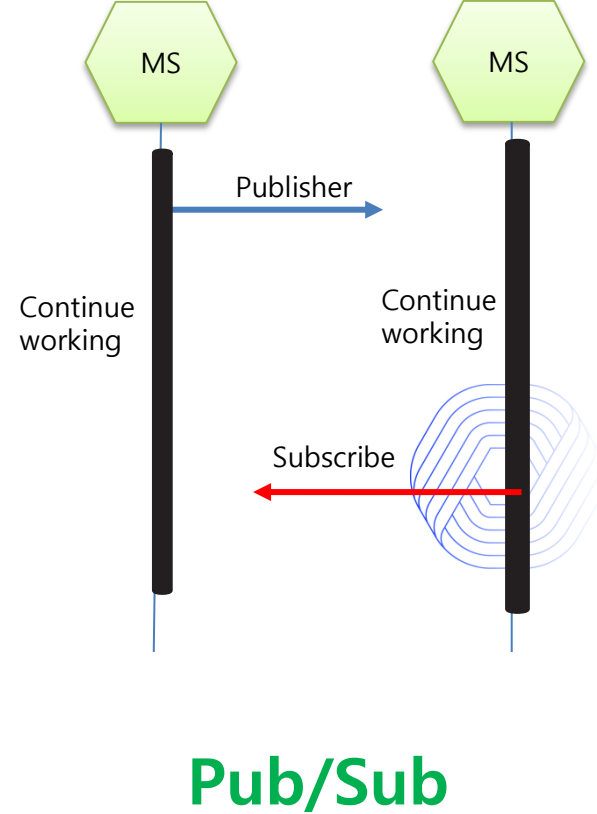
Advantages : **Scalability , Availability and Easy deployment**



Messaging @ Edge

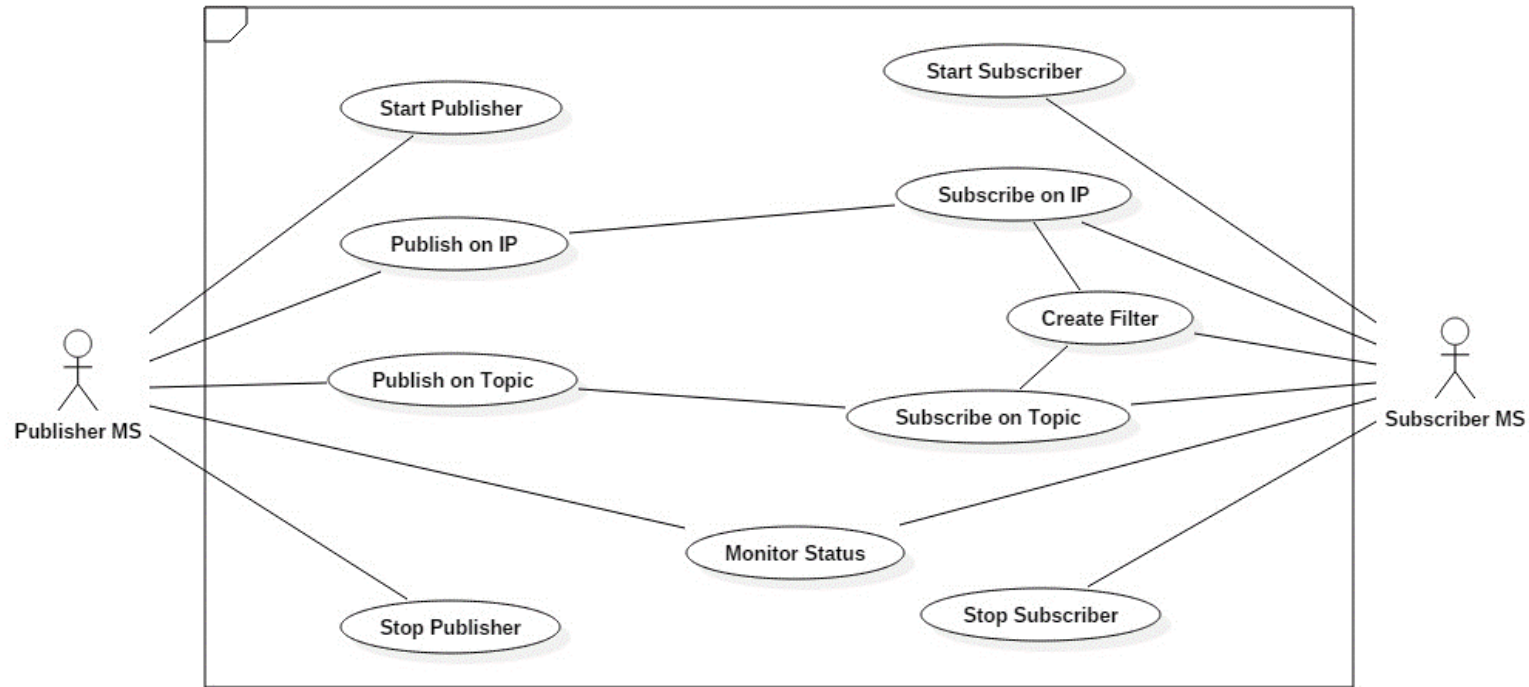


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Messaging | Pub-Sub | Use-Case

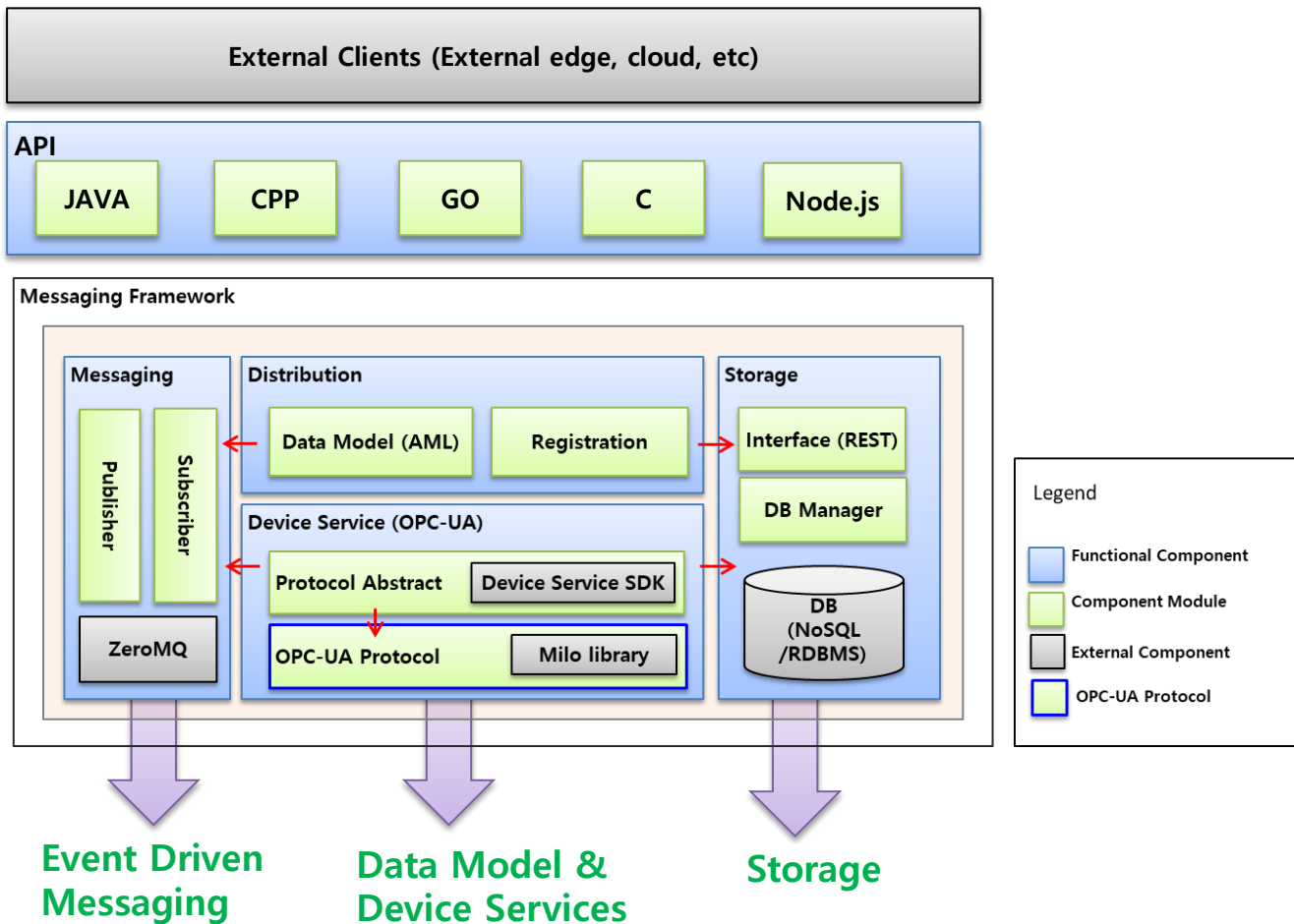
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Messaging Framework| Architecture

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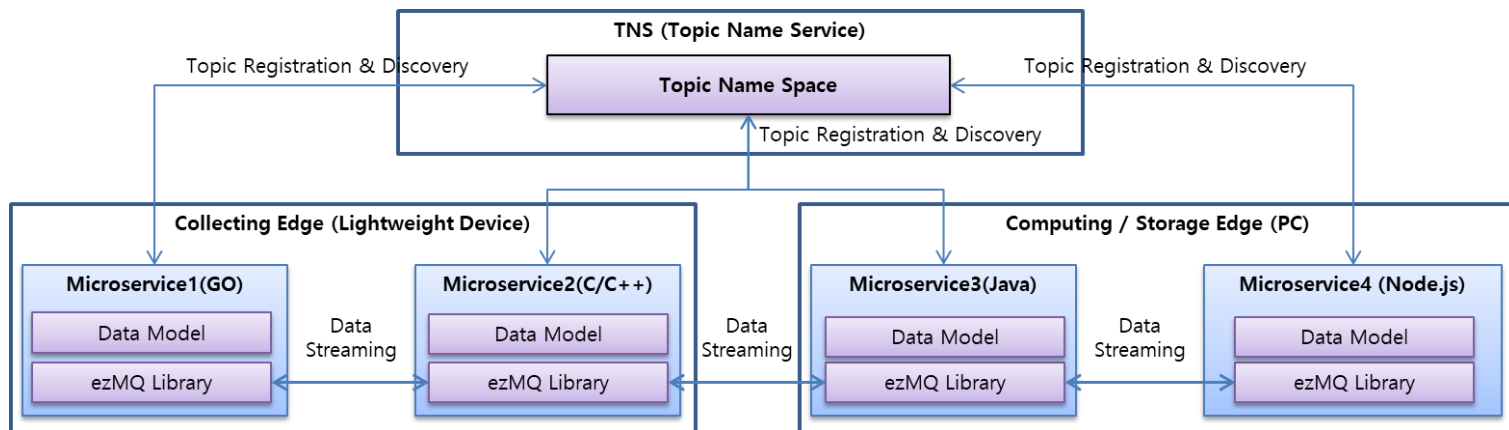




Messaging Framework| Scenario

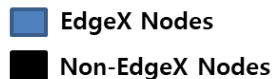
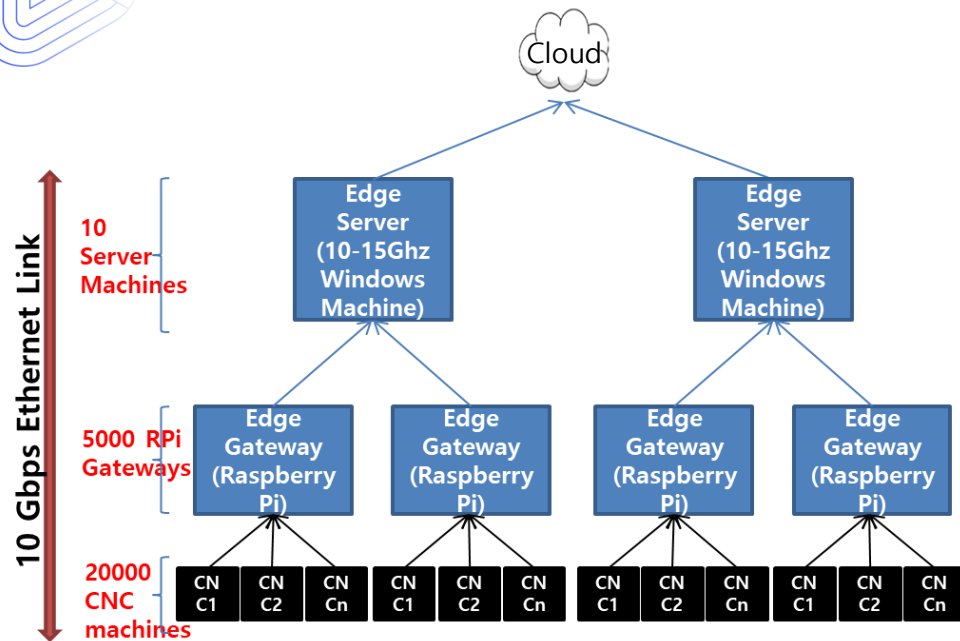
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- Micro services (Publish) Topic name and endpoint info to Topic Name Service.
- Micro services (subscriber) can discover topic names via Topic Name Service.
- Topic based data streaming between micro services using ezMQ
- standard data model (AutomationML) can be transferred

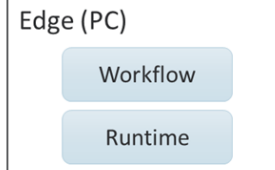


Messaging Framework| Deployment Model

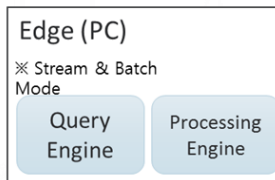
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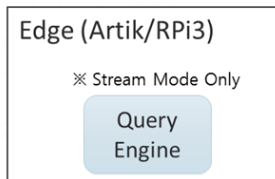
Edge Server



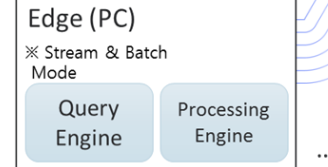
Processing Edge



Collection Edge



※ Artik HW Spec.
- CPU : ARM7 (Dual Core)
- RAM : 512 MB



※ PC HW Spec.
- CPU : i5~7
- RAM : 4~16GB

Edge :

- ✓ Why Edge - Need | Expectations
- ✓ Edge Schema – Multi Edge and 3- Tier
- ✓ Edge Platform – Goal | Functions

EdgeX & Samsung OS Contribution

- ✓ Edge Architecture – Micro Services
- ✓ Edge Messaging – Architecture | Deployment





References

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EDGE X FOUNDRY™

<https://www.edgexfoundry.org/>

Samsung Smart Factory @ EdgeX

<https://wiki.edgexfoundry.org/display/FA/Smart+Factory+Project>

Samsung Open Source for EdgeX

<https://github.com/mgjeong/>



Questions ?



THANK YOU

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