



**OPENWORKS**

**BE UNSTOPPABLE**



Samsung SDS is ...

## Cloud service provider facilitating digital innovation for customers

Providing optimized solution for businesses

From transforming/operating service of hybrid/multi clouds based on the largest global cloud center<sup>1</sup> in the country to introduction/operation of SaaS by work process

With abundant experience in global public cloud of various industries

And distinguished source technology on cloud to develop/operate our own cloud platform(SCP<sup>2</sup>)

<sup>1</sup> 17 high-tech cloud centers (4 domestic, 13 overseas) <sup>2</sup>SCP: Samsung Cloud Platform (Samsung SDS Cloud for enterprise)

# Samsung SDS at a Glance

Revenue

#1 in Korea

\$130B in 2022

\$1=1,308KRW, as of 3rd Apr 23

Employees

Worldwide 25,405

Brand Value \* IT Services

Worldwide No. 13

Brand Finance

IT Service M/S

Worldwide No. 21  
#1 in Mfg  
#3 in Asia/Pacific (excl. Japan)

Gartner

Cloud Capacity

Named in

MarketScape

APAC Managed Cloud Services  
Worldwide Managed Cloud Security Services

IDC

CIO100 Customer IT Innovation

7 yrs in a row

IDG

Named in Magic Quadrant

13 reports

Cloud, ERP, RPA, IoT, etc.

Gartner

Global Presence

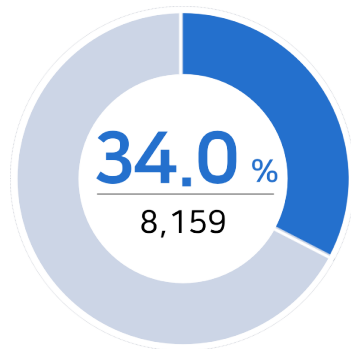
Overseas  
40 countries

59 locaitons

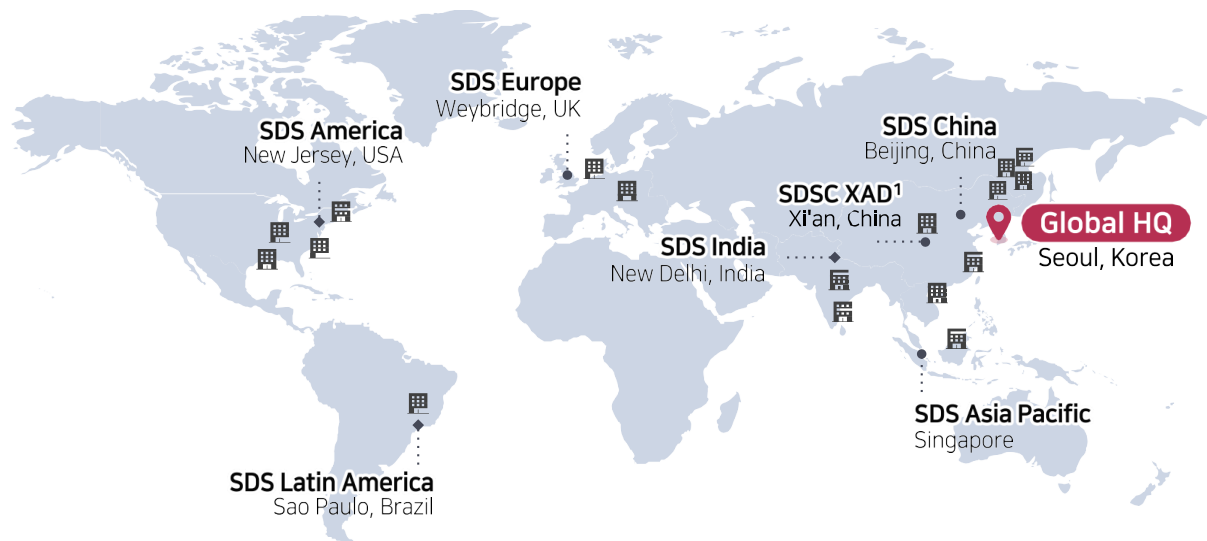
# Global Presence

We operate globally with 62 offices including 43 regional HQs and 17 high-tech cloud centers worldwide

## Overseas Employees('21) ▶▶▶



Total 23,995



<sup>1</sup> SDSC XAD: Samsung SDS Global Development Center Xi'an

- Regional HQ(IT)
- ◆ Regional HQ (IT+Logistics)
- ▣ Cloud Center (4 domestic, 13 overseas)

# Clients around the world

We create successful stories for diverse clients at home and abroad



# Business Portfolio

Samsung SDS offers cloud service for enterprises and digital logistics platform based logistics service

## 1. Cloud Services

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We offer comprehensive **cloud-driven digital transformation services** with transformation/operating **capacity** based on global cloud partnership, technology capacity having developed our own cloud platform, and expertise in various industries



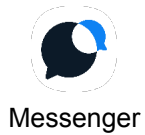
## 2. Platform based Logistics Services

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We offer **import/export logistics services** with digital logistics platform(Cello Square) integrated with innovative IT technology



# Brity Works, the essential engine designed for accelerated **Digital Transformation**



Messenger



Mail



Meeting



Drive



RPA

(Robotic Process Automation)



Assistant

(Chatbot)

## Collaboration

The **collaboration solution** provided by Brity Works seamlessly integrates the collaboration tools into your business's operating system and provide an **intelligent workspace**.

## Automation

The **automation solution** provided by Brity Works implements an **AI-based business automation platform** that can innovate the existing work processes.



# OPENWORKS

**SAMSUNG GROUPWARE (KNOX PORTAL),  
MICROSERVICES-BASED MIGRATION TO  
MARIADB & ZERO DOWNTIME UPGRADE**

HOJEONG KIM, LEAD DATABASE ARCHITECT, SAMSUNG SDS

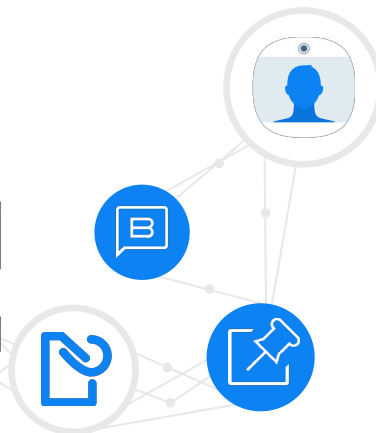
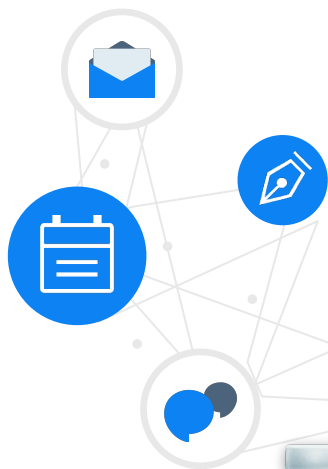


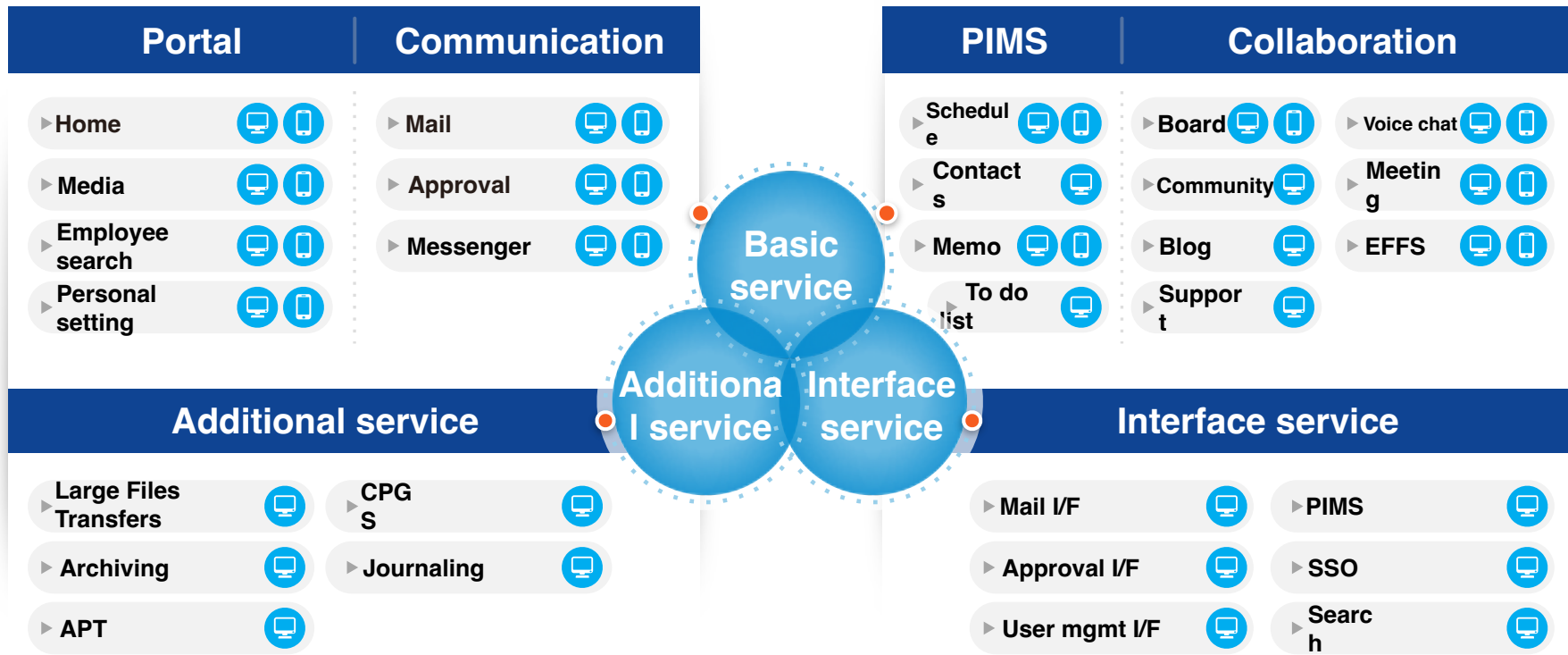
# AGENDA

- Introduction of Samsung Knox Portal
- The numbers of Knox Portal
- Requirements
- Near-Zero Downtime Business Case
- Wrap Up

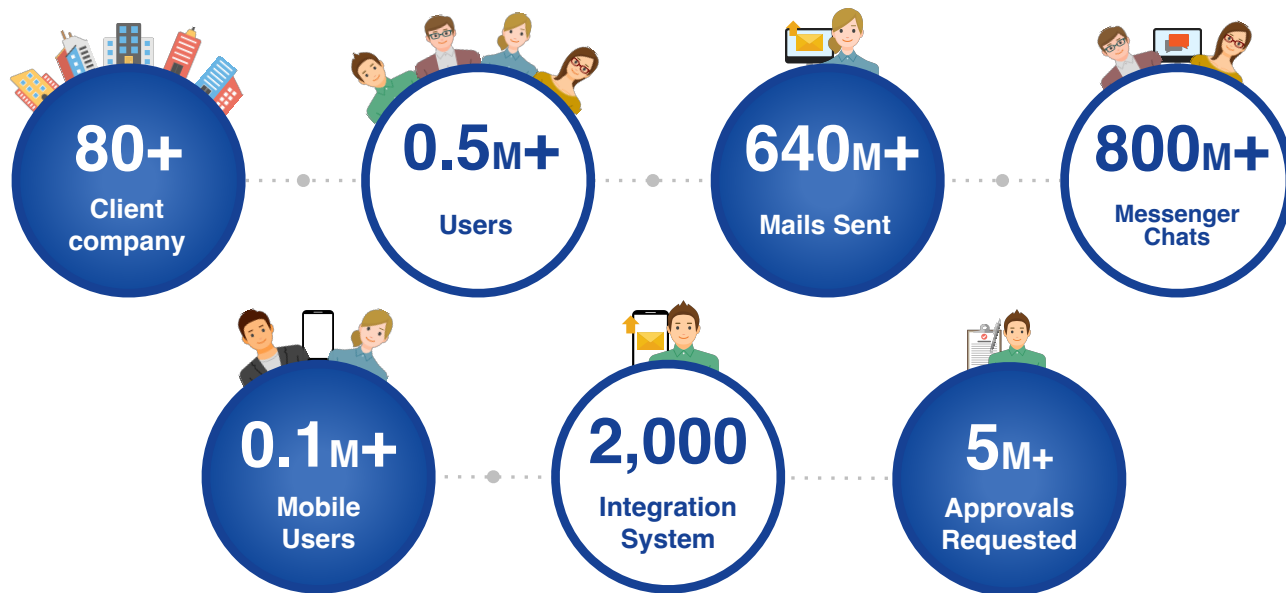
All in One Workspace for Samsung employees

# Knox Portal



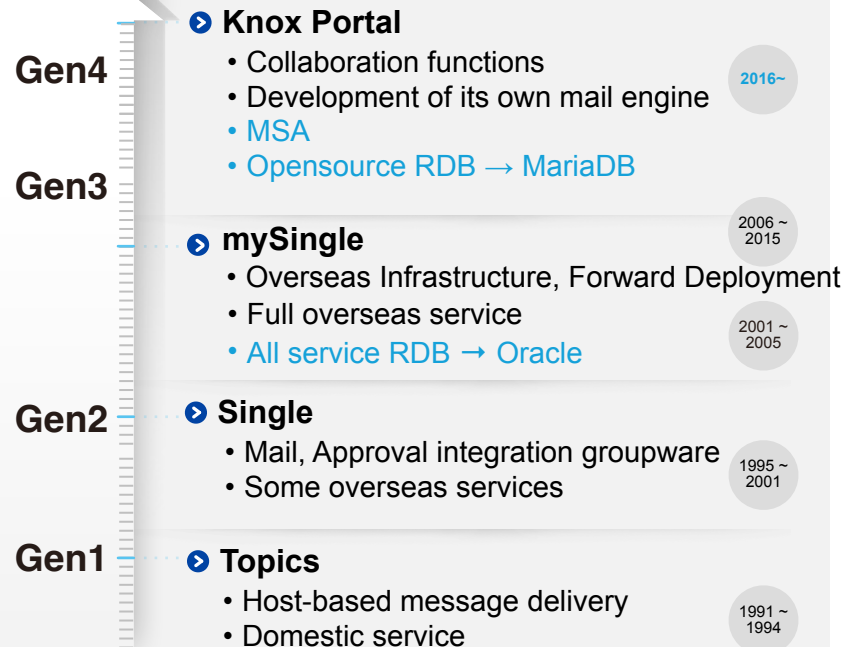
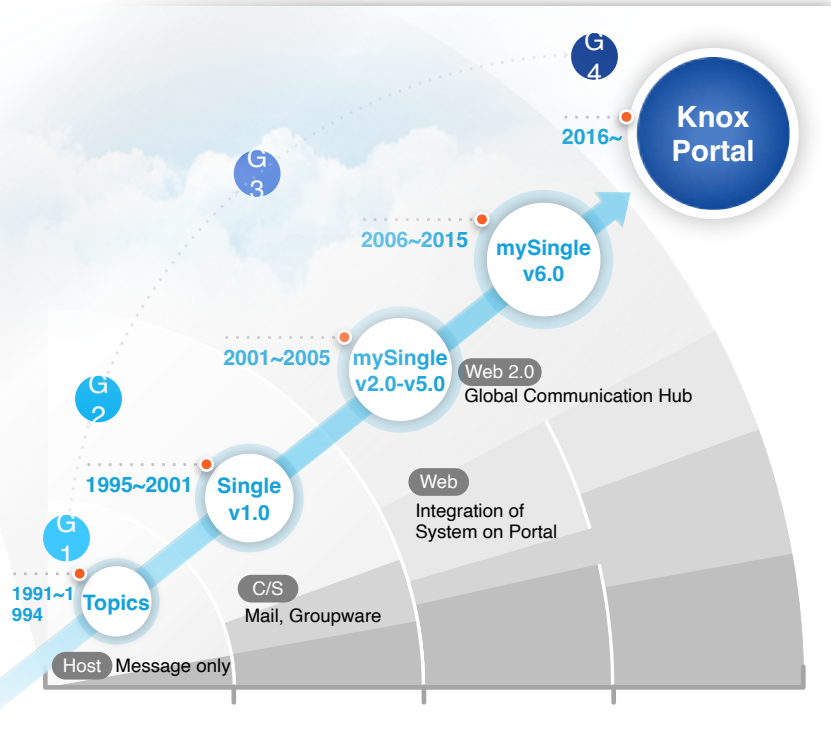


## THE NUMBERS OF KNOX PORTAL

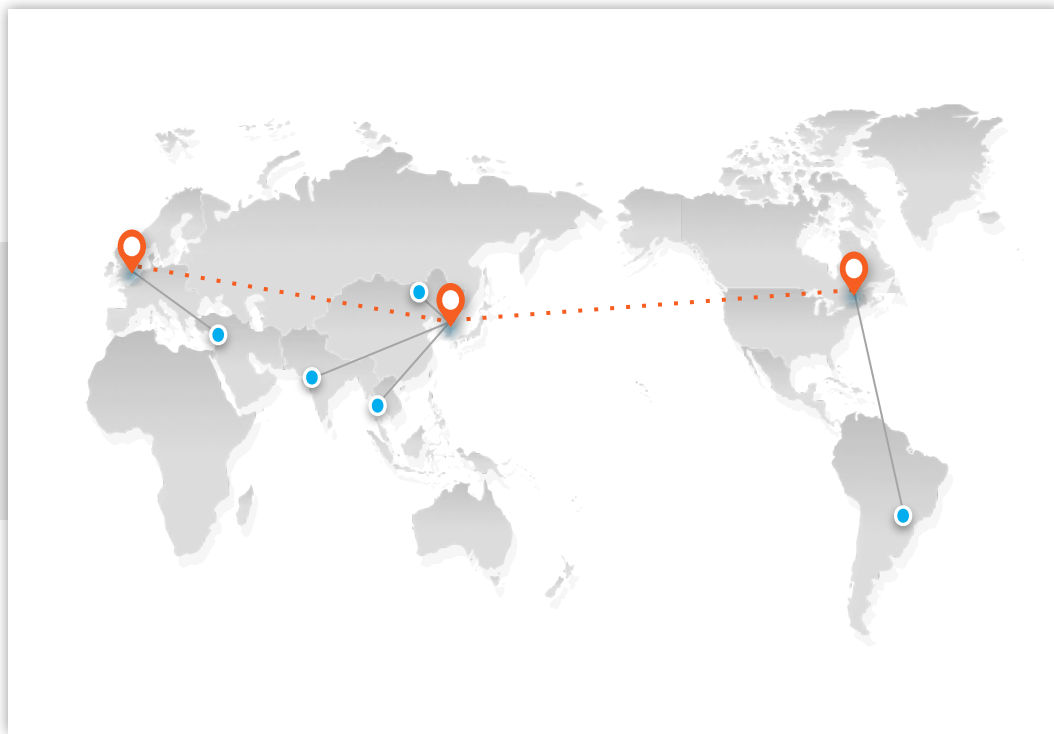


※ Based on ID and usage (As of Jan 2022)

## KNOX PORTAL HISTORY



# GLOBAL INFRASTRUCTURE



**Global  
infrastructure  
centers**

America (USA)  
Europe (UK)  
Asia (Korea)

**2015**

**Oracle 20+**

**2023**

**MariaDB 50+**

# REQUIREMENTS

## WHY ?

Open-source  
conversion

Customer's  
24365 Online  
Service  
Request

## HOW ?

Quick restore  
plan in case of  
issue

Development of  
Change Data  
Capture (CDC)  
solution

# NEAR-ZERO DOWNTIME WORK PLAN (2 CASES)

**#1. Oracle to MariaDB (2018 ~ 2022)**

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**#2. 10.0 MariaDB to 10.3 MariaDB (2020)**



# CASE #1: ORACLE TO MARIADB MIGRATION



- Main review item
  - What is the migration plan?
  - If an issue occurs, what is the action plan?

## CASE #1-1: MIGRATION TOOL

- Try : Test with many kinds of migration tools (Commercial or free tools )
- Problems
  - Slow transfer speed : Parallel work required
  - LOB data: transfer failure or long time required
  - Data loss : Cause cannot be identified
- Conclusion : Not Available

# CASE #1-2: MIGRATION REQUIREMENTS

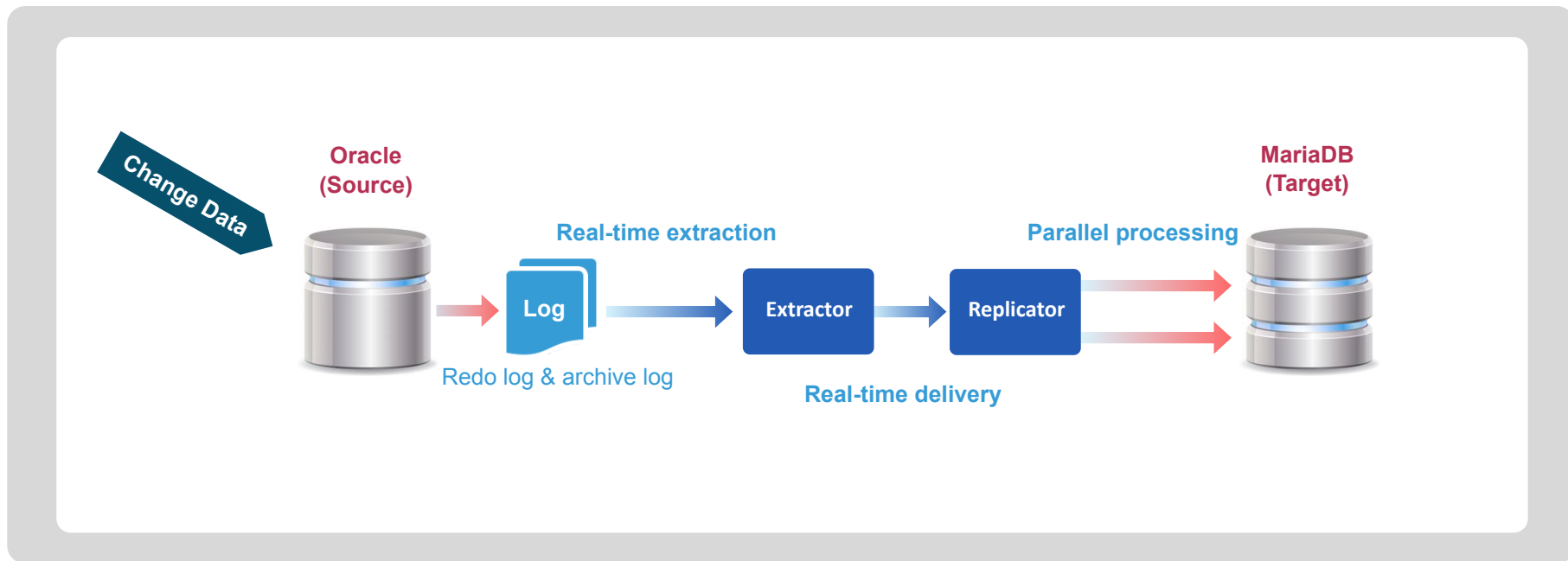
- Requirements
  - Data\_type conversion : timestamp, null data, Auto\_increment processing
  - Check the collation value : in database, table, and column
  - Reduction LOB data , transfer time
- Solution
  - LOB data : Transfer to Storage
  - Reduce Transfer time : ① create table without index ② data transfer ③ create index
  - DB Function development : Data initial loading
  - Real-time data synchronization solution development : Minimize downtime, restore immediately !

# CASE #1-3: DEVELOPING DB FUNCTION

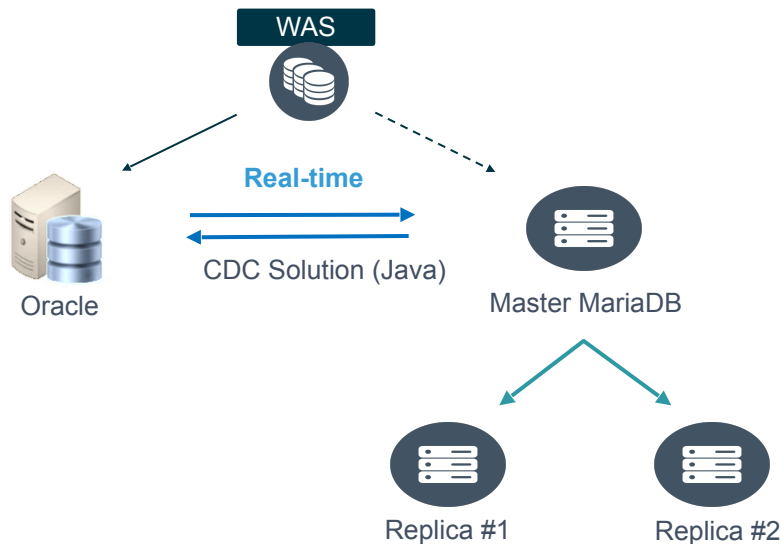
- Key point
  - Data export in a format that can load data to the target DB
    - ex) `TIMESTAMP(6)` → `to_char(FST_REG_TS, 'yyyy-mm-dd hh24:mi:ss')` as ColumnName
  - Execute FUNCTION to create CSV FILE for each table
  - Data import using load data
    - character set designation (`utf8mb4`)
    - Oracle blank data processing : `NULLIF(ColumnName, '')`

## CASE #1-4: DEVELOPING CDC SOLUTIONS (8SYNC)

The extracted data is delivered in real-time to the systems that require modifications and released.



# CASE #1-5: ZERO-DOWNTIME ARCHITECTURE



01

Pre-environment configuration

Oracle ↔ MariaDB (**Bidirectional**)

02

Data Migration

Backup table, timestamp format change,  
CSV file export, file transfer, load data

03

Start sync. CDC Solution (8Sync)

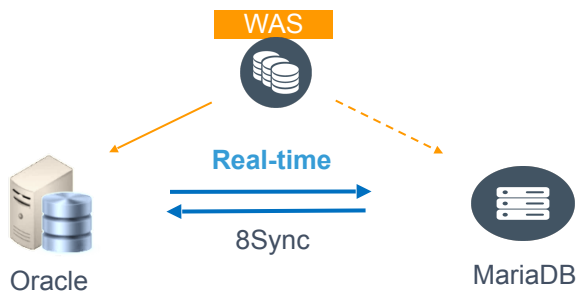
From the SCN value when exported data

04

Change DB Access IP in App.

Quick switch and recovery possible

# CASE #1-6: BIDIRECTIONAL DATA SYNCHRONIZATION



01

## Key Technology

- Setting to prevent data Sync. looping

02

## Processing Method

- Extracting events from the source
- Specify Txname by transaction unit.
- Skip the transaction of the corresponding Txname in the Target DB and extract data

# CASE #2: MARIADB UPGRADE

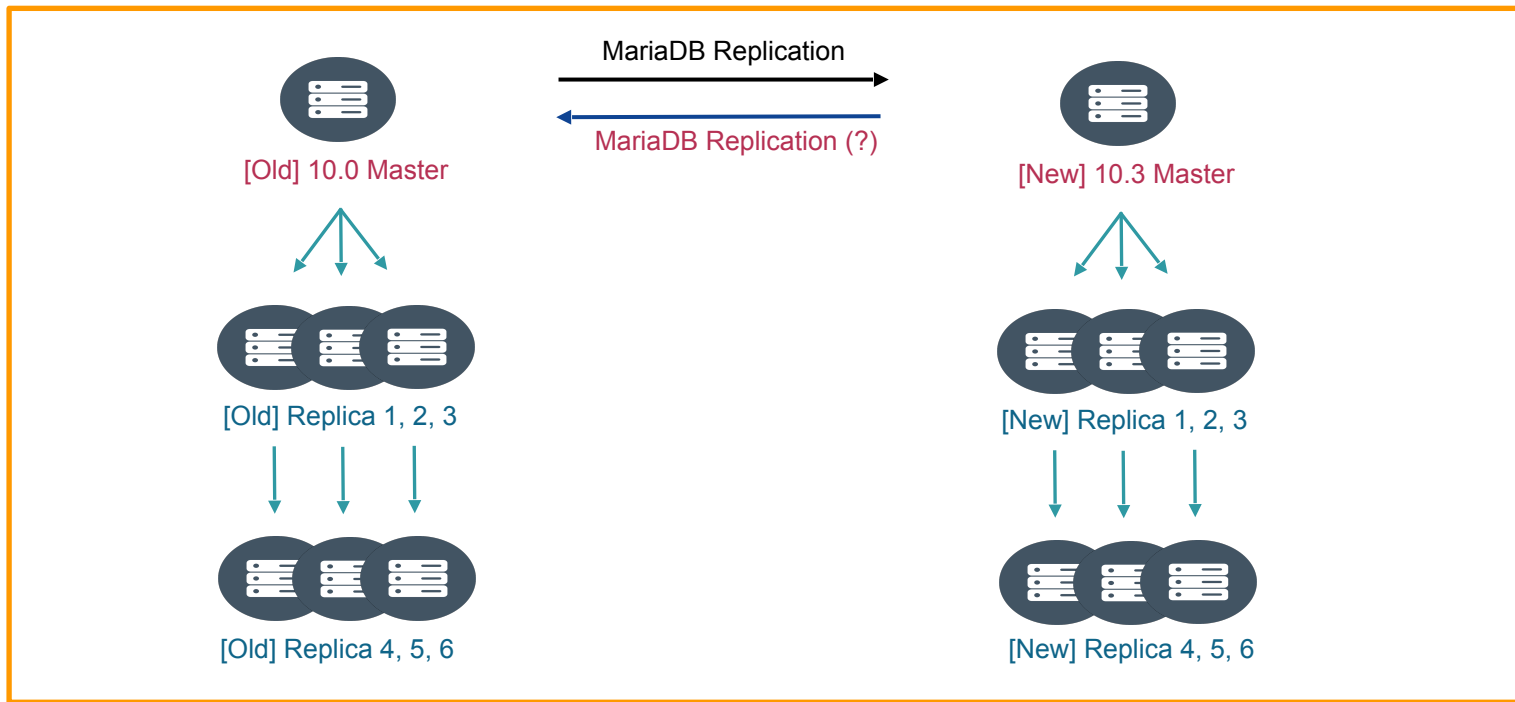
- Main review item



- Is it possible to upgrade MariaDB in operation without downtime?



# CASE #2-1: ARCHITECTURE REVIEW



# CASE #2-2: ISSUE

## Cross-Version Replication Compatibility

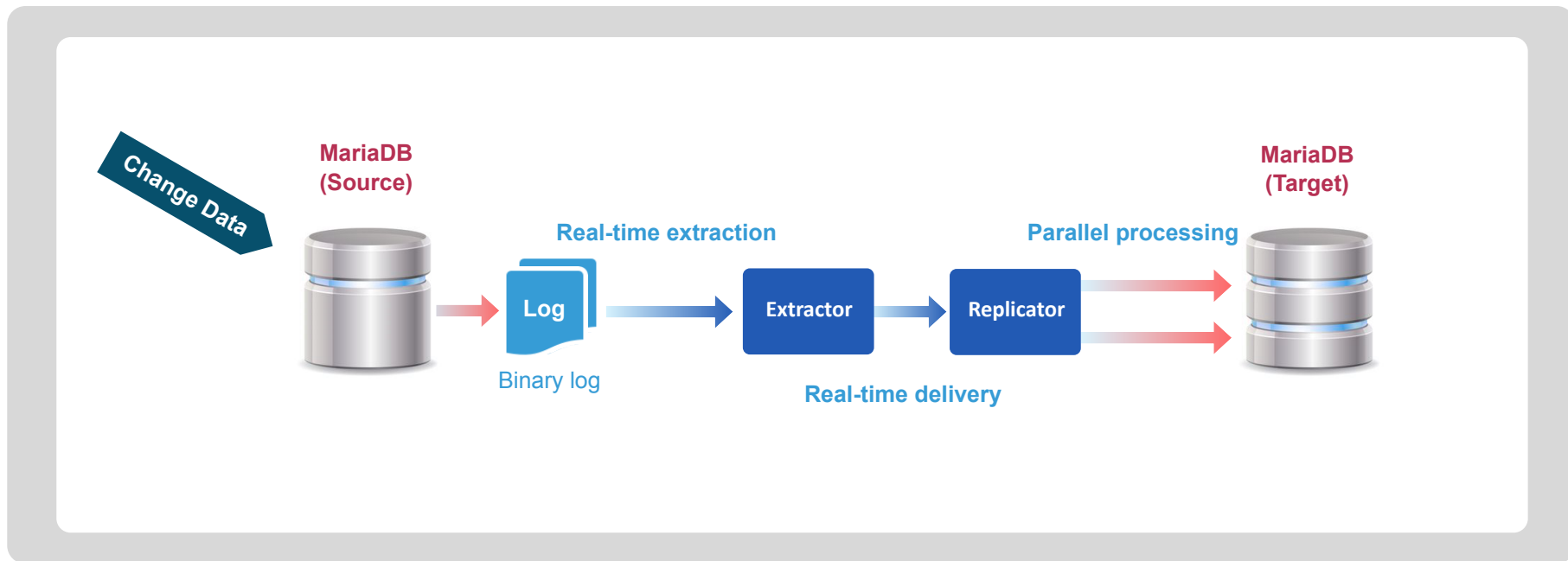
Primary → Replica ↓	MariaDB-10.2	MariaDB-10.3	MariaDB-10.4	MariaDB-10.5	MariaDB-10.6
MariaDB-10.2	✓	✗	✗	✗	✗
MariaDB-10.3	✓	✓	✗	✗	✗
MariaDB-10.4	✓	✓	✓	✗	✗
MariaDB-10.5	✓	✓	✓	✓	✗
MariaDB-10.6	✓	✓	✓	✓	✓

- ✓: This combination is supported.
- ✗: This combination is **not** supported.

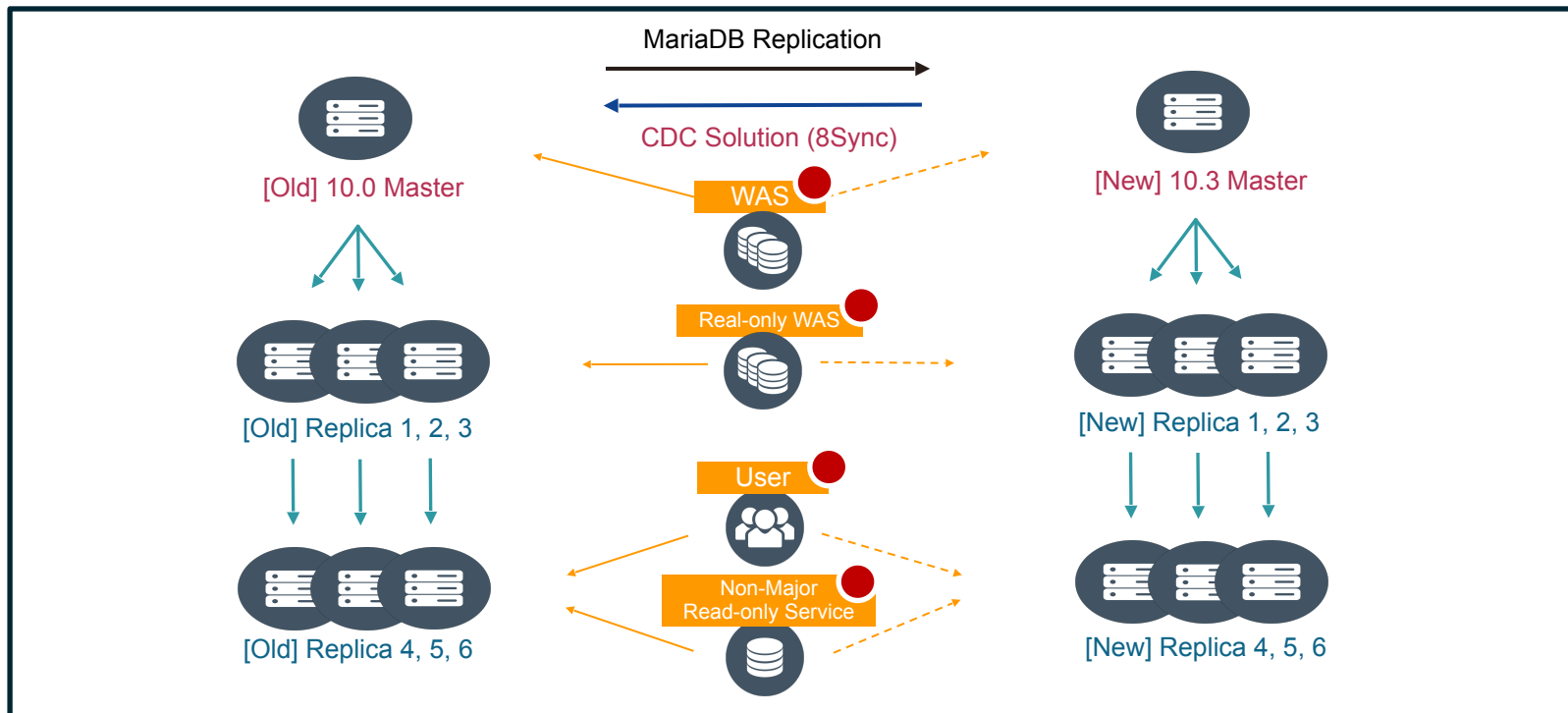
<https://mariadb.com/kb/en/replication-overview/#cross-version-replication-compatibility>

## CASE #2-3: DEVELOPMENT OF MARIADB EXTRACTOR

The extracted data is delivered in real-time to the systems that require modifications and released.



# CASE #2-4: FINAL ARCHITECTURE



Plan for replacing old servers with new one due to server aging.

# WRAP UP

- Improvement
  - Expansion of synchronization services
    - MariaDB, Oracle, MySQL, PostgreSQL, File server, Active Directory
  - Support for synchronization of various topologies
    - One-way, Bidirectional, Broadcast, Hub, Merge
- Difficulties
  - Frequent upgrade schedule according to MariaDB release cycle
  - Check the bug in the development environment before applying the operation service



**THANK YOU**

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8Sync: [esync.score@samsung.com](mailto:esync.score@samsung.com)



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