

HUAWEI CLOUD EI Overview

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Objectives

- After completing this course, you will be able to:
 - Understand the ecosystems of HUAWEI CLOUD Enterprise Intelligence (EI).
 - Understand the capabilities of HUAWEI CLOUD EI service products.
 - Understand the service scenarios and solutions of HUAWEI CLOUD EI.



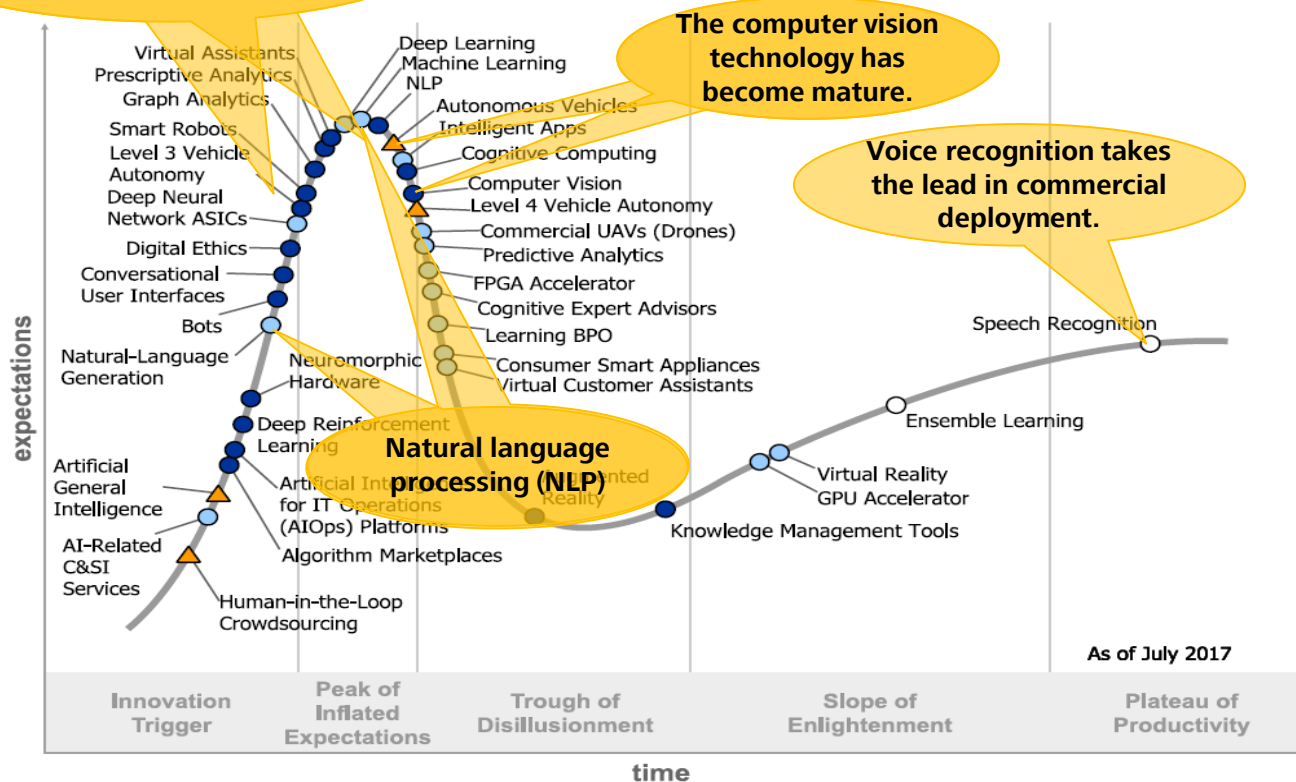
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- 1. Concept of AI and Origin of EI**
2. Details About HUAWEI CLOUD EI

Trend of Artificial Intelligence (AI) Technologies

The hype around enterprise-level machine learning, deep learning, and graph analysis platforms will come to an end.

Figure 1: Gartner Hype Cycle for Artificial Intelligence, 2017



Plateau will be reached:

○ less than 2 years ● 2 to 5 years ● 5 to 10 years ▲ more than 10 years ✗ obsolete before plateau

Huawei AI Development Roadmap

Research on Basic Theories

- Noah's Ark Laboratory: AI
- Russell Laboratory: Big Data
- Norman Laboratory: map
- Shannon Laboratory: algorithms

Internal Practice

- GTS: intelligent site survey, intelligent review, network design, and intelligent customer service
- Supply chain: intelligent loading, path optimization, and intelligent warehousing
- Huawei Device: intelligent album, risk control, and recapture detection
- Process and IT: intelligent O&M and machine translation

External Enablement (EI)

- Heterogeneous computing: CPU, GPU, and dedicated AI chip
- General service: vision and voice
- Basic platform: machine learning, deep learning, graph computing
- Industry enablement: intelligent logistics, intelligent Q&A, and intelligent recommendation



Chip

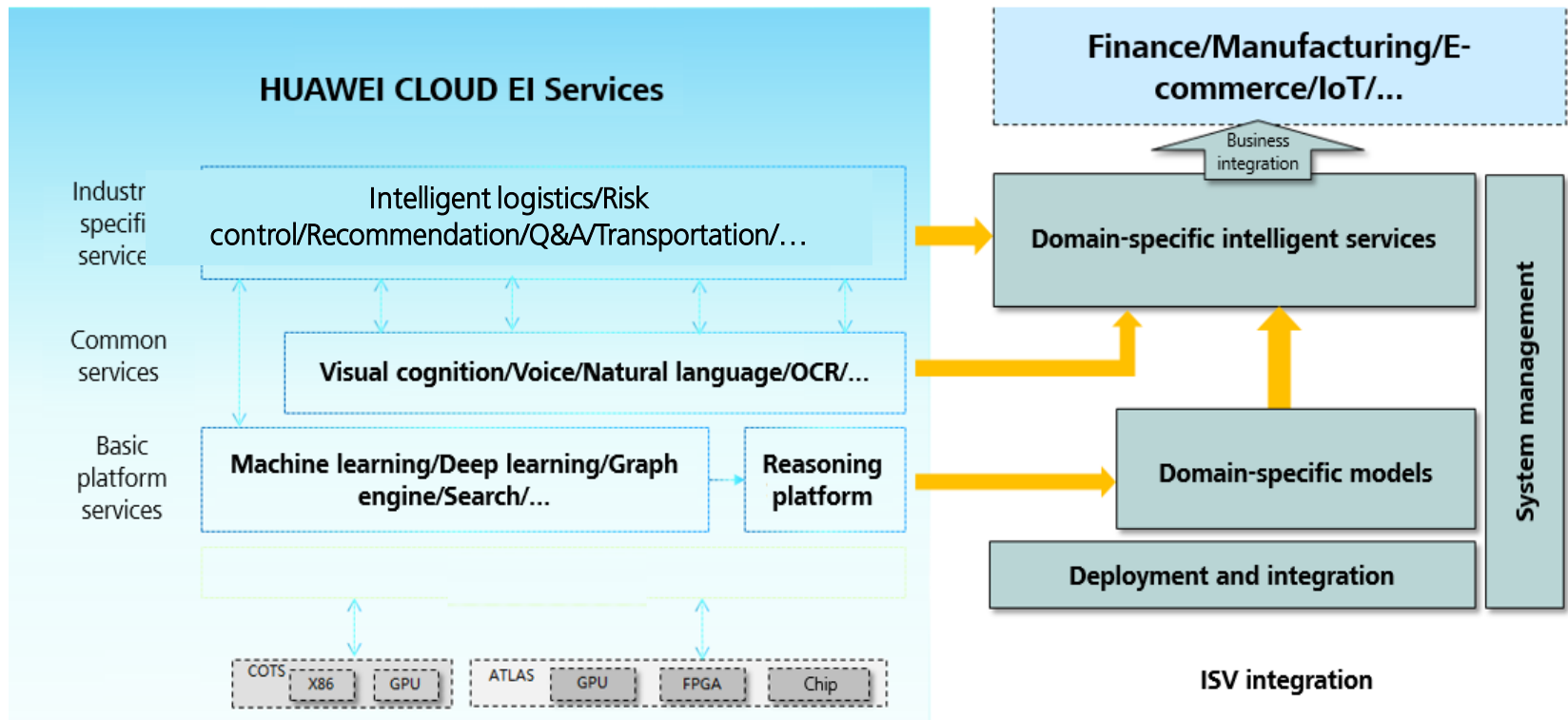


Terminal



Cloud

HUAWEI CLOUD EI: Making Enterprises Smarter



Global Practice of HUAWEI CLOUD EI



60%

Top 10 financial
enterprises in China

25%

Top 50 carriers
around the world

30%

Construction of Safe
Cities in China



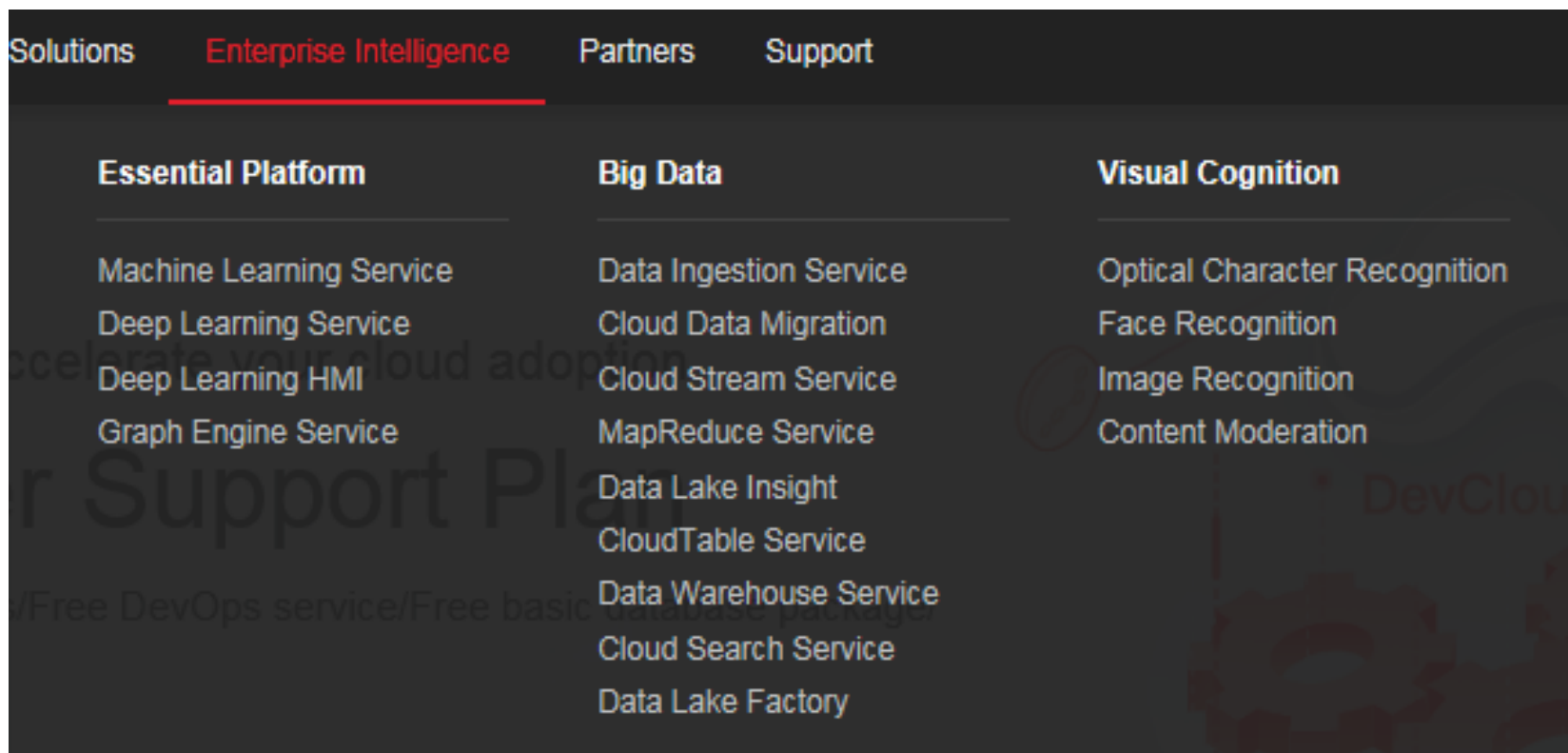
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1. Concept of AI and Origin of EI

2. **Details About HUAWEI CLOUD EI**

- Basic Platform Services
- Common Services
- Industry-specific Services

HUAWEI CLOUD EI Service Panorama



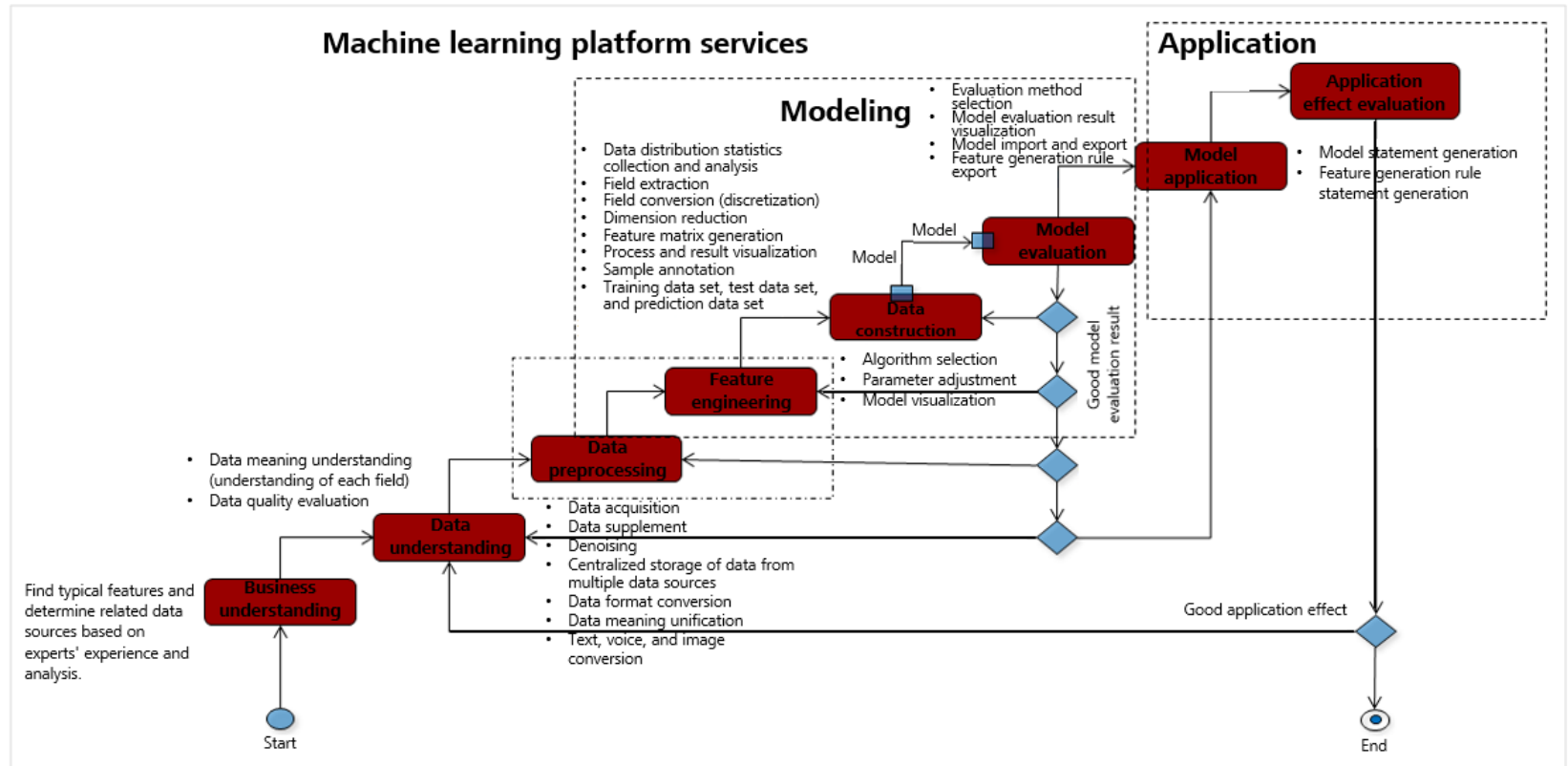
Basic Platform Services (1)

- **Machine Learning Service (MLS)** enables users to quickly discover data rules, build a prediction model, and deploy the prediction analysis solution.
- **Deep Learning Service (DLS)** is a one-stop deep learning platform service powered on the high-performance computing capabilities of HUAWEI CLOUD. With various built-in neural network models, DLS allows you to easily implement model training, evaluation, and inference all with the flexibility of on-demand scheduling.
- **Graph Engine Service (GES)** provides capabilities for searching and analyzing relationship-based graphs. It is widely used in scenarios, such as social relationship analysis, recommendation, precision marketing, public opinion and social listening, information spreading, and anti-fraud, where there are a large amount of relationship data.

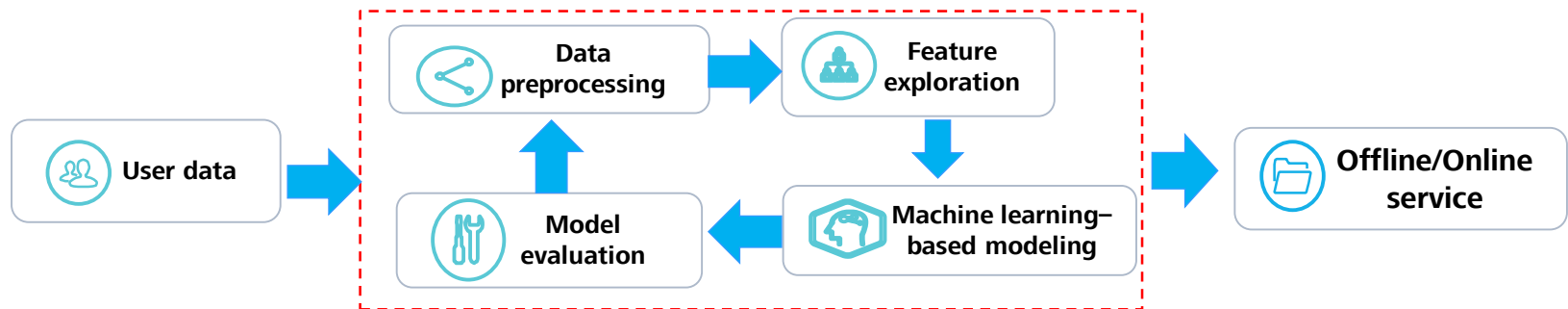
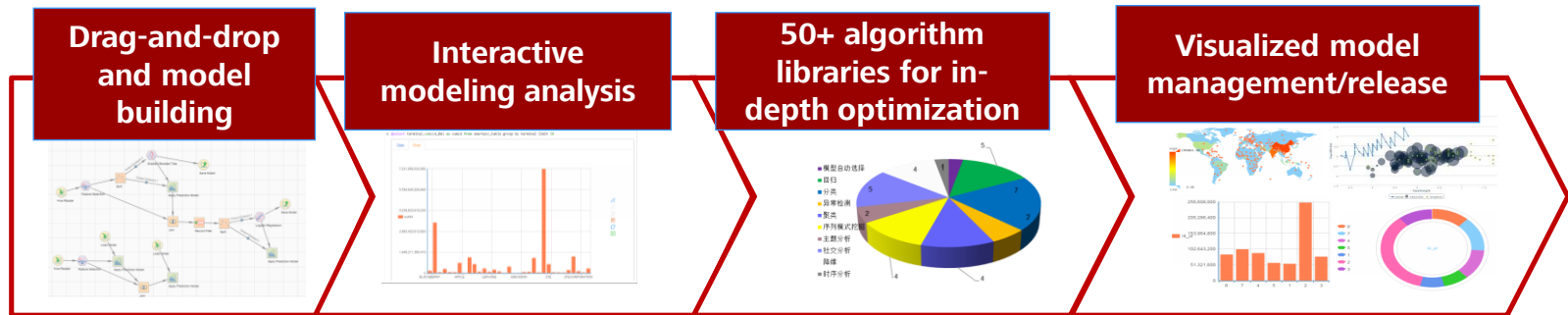
Basic Platform Services (2)

- **Deep Learning HMI** provides the infrastructure and tools needed to accelerate cloud computing-based deep learning. It enables users to quickly create Huawei ECS instances with pre-installed popular deep learning libraries (such as the TensorFlow, MXNet, CNTK, Caffe, Caffe2, Theano, PyTorch, and Keras), facilitating training of sophisticated custom AI models.
- **Batch Service** is a distributed cloud computing service used to run a large number of parallel batch jobs. It supports automatic scheduling, resource management, and data loading for massive tasks, and can be widely used in large-scale parallel computing scenarios such as deep learning, gene detection, and video analysis.

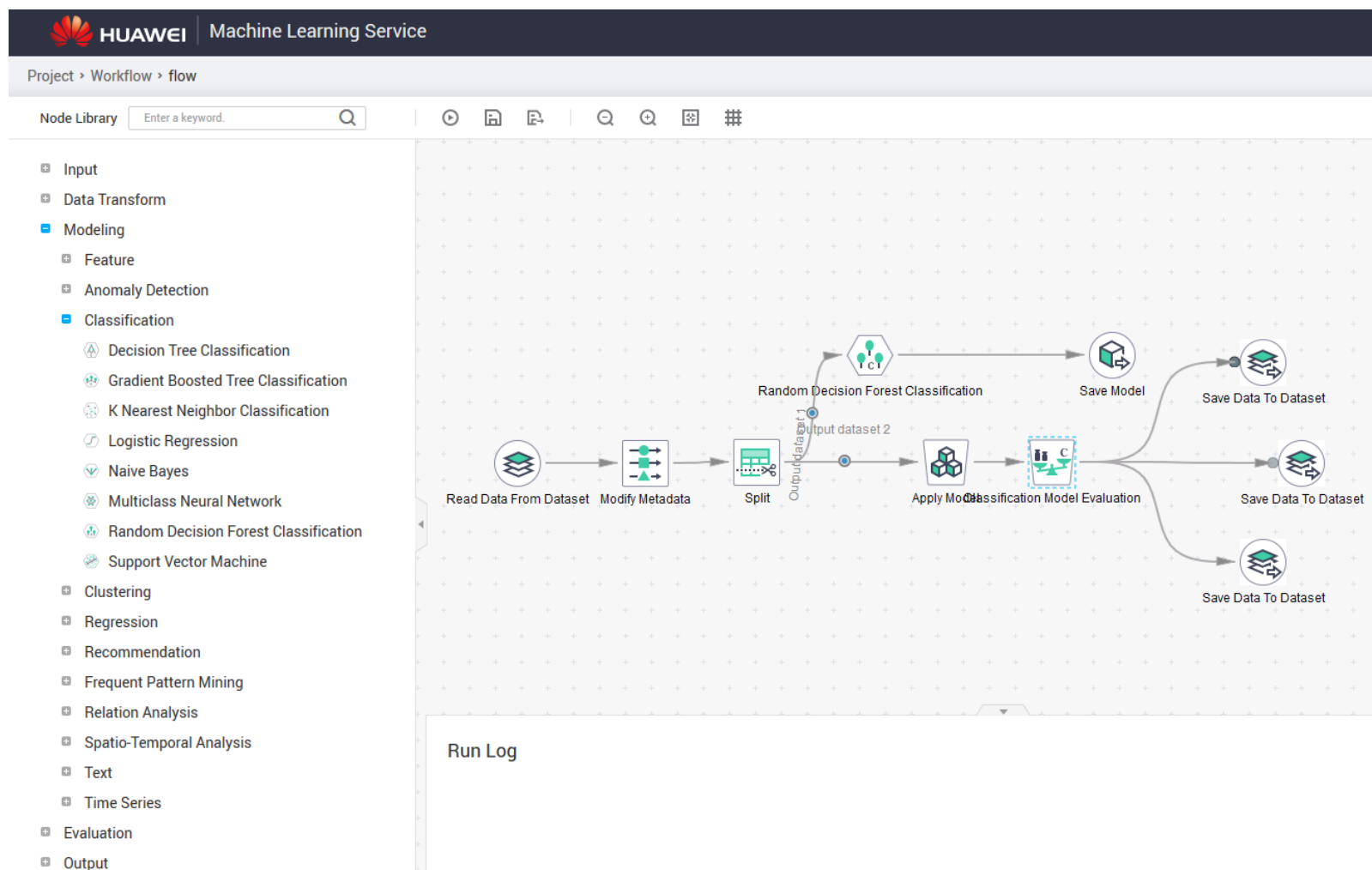
MLS: Converting from Features to Model Applications



MLS: One-Stop Platform That Supports the Entire Data Analysis Process



MLS: Drag-and-Drop and Model Building



MLS Success Stories

Application recommendation



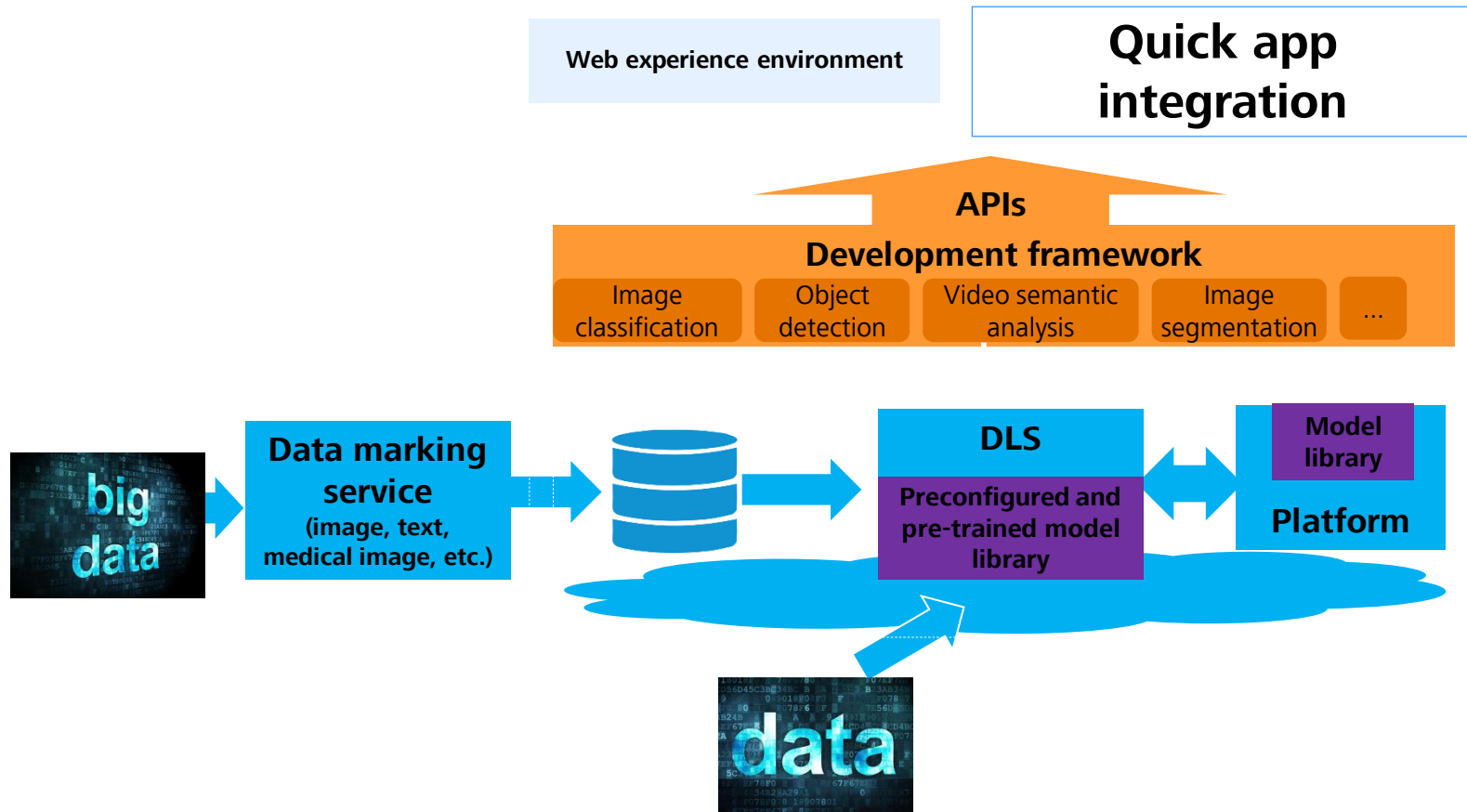
Recommends application market, music, news, and game services; improves the CTR by 30%.

IoV analysis



Builds a predictive maintenance model to reduce the possibility of fault occurrence and reduce maintenance costs.

DLS: Preconfigured Model Development Framework, Facilitating Service Development Through Deep Learning



Abundant models, superb performance, and one-click development environment greatly reduce the threshold for developing deep learning models and support quick service rollout.

DLS Success Stories (1)

- Identify dumb devices and review acceptance images.

Quality image identification object model

EHS: 15 intelligent object models (gradually expanded to about 50 models)

Person
Safety helmet
Warning board
Gloves
Warning board
First-aid kit
Safety helmet
Pulley
...

TE: 25 intelligent object models (gradually expanding)

Cabinet
Battery
DCDU
BBU
RRU
Antenna
GPS
Waterproof
...

OSP, CW, and energy (to be expanded)

Manual image annotation

EHS: 15 types of recognition objects, annotating 6000+ images (first partner: Adecco)



Scenario-specific rules

EHS intelligent review rules

No.	Object to Be Annotated	Standard definition	Business Review Rule	Accuracy
1	Person	person	There is one person.	> 80%
2	Safety helmet	helmet	There is one safety helmet.	> 80%
3	Head + safety helmet	helmet_on_head	Every person has a safety helmet.	> 80%
4	Fluorescent clothing	high_visible_vest	Every person has fluorescent clothing.	> 80%
5	Gloves	glove	There are two gloves.	> 70%
6	Rigger	person	There are two hooks.	> 80%
		hook		> 80%
7	First-aid kit	first_aid_box	There is a first-aid kit.	> 80%
8	Fire extinguisher	extinguisher	There is a fire extinguisher.	> 80%
9	Warning board	warning_board	There is a warning board.	> 80%
10	Warning sign	warning_sign	There is at least one warning sign.	> 80%
11	Warning tape	warning_line	There are some warning taps.	> 80%
12	Toolkit	toolkit	There is a toolkit.	> 80%
13	Safety shoes	safety_shoe	Every person has two safety shoes.	> 70%
14	Pulley	pulley	There is a pulley.	> 80%
15	Insulation gloves	insulated_glove	There are two insulation gloves.	> 70%

TE, OSP, CW, and energy rules (to be expanded)

Model training



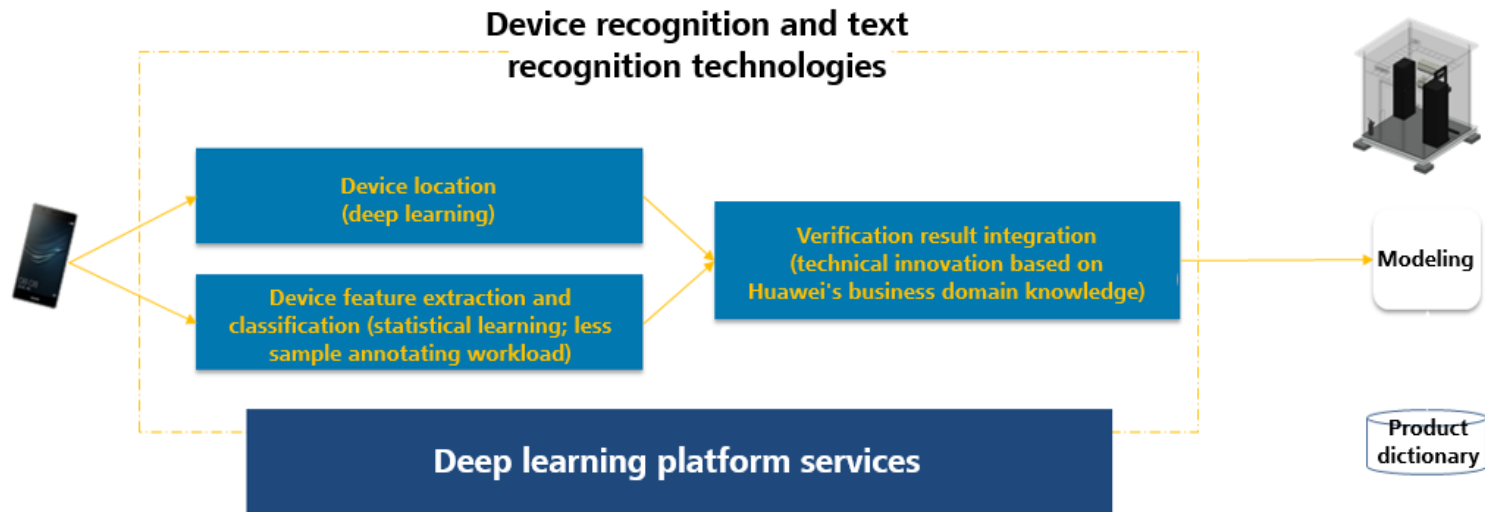
Recognized:
1. Person
2. Fluorescent vest
3. Safety helmet

Recognized:
1. Warning board
2. 12 warning signs

No.	Recognition Item	Accuracy	Recall Rate
1	Person	100%	98.60%
2	Warning board	100%	98.36%
3	Fire extinguisher	95.24%	97.56%
4	Fluorescent vest	100%	97%
5	Helmet on head	100%	93.30%
6	Warning tape	100%	92.85%
7	First-aid kit	100%	90%
8	Warning sign	99.75%	88.89%
9	Toolkit	92.83%	76.47%
10	Helmet	97.70%	69.40%
11	Hook	85.18%	46.94%
12	Glove	96%	41.94%
All		98.71%	84.91%

DLS Success Stories (2)

- Identify indoor devices in surveys based on deep learning and statistical learning.



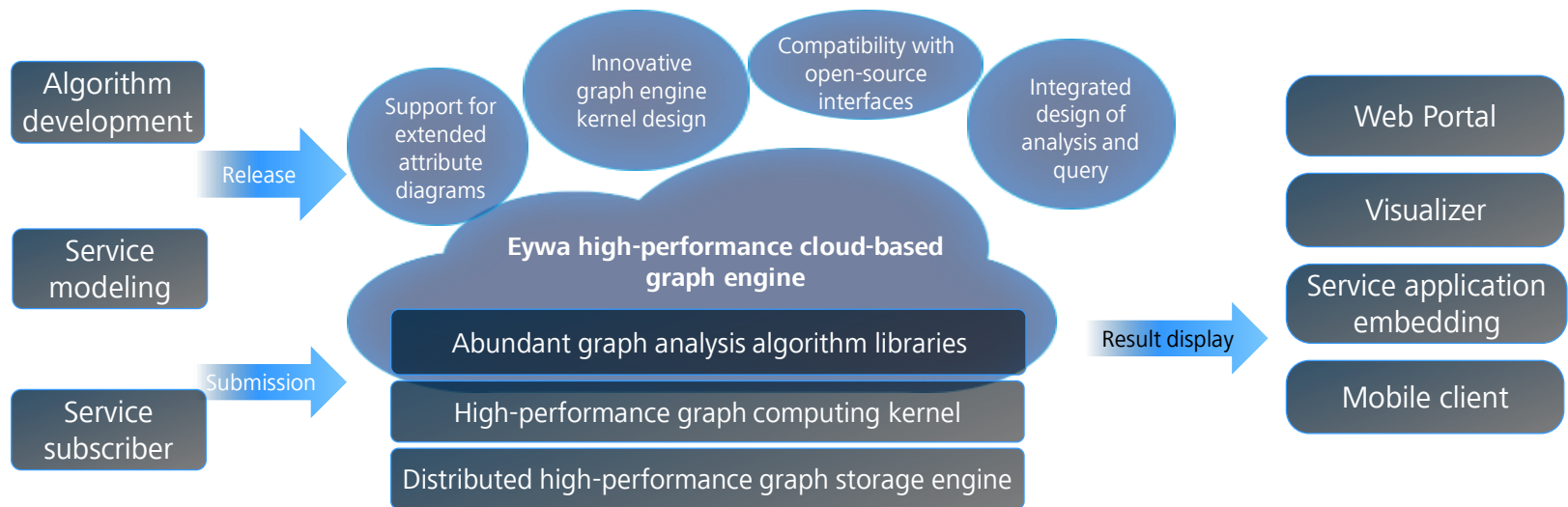
Achievements: identified indoor and dumb devices, reduced the single-site survey duration from 2 hours to 10 minutes, improved the survey accuracy from 67% to 90%, avoided repeated site visits, and sped up the project progress. (DLS reduced human-caused errors and improved efficiency.)

GES: Hyper-Scale and Integrated Graph Analysis and Query

GES provides integrated platform capabilities, such as associated data query and relationship analysis, and related service applications. It features **large scale, high concurrency, and low latency**.

Second-level query response for graphs with **1 billion** nodes and **over 100 billion** edges

GES supports **graphs with standard attributes** and extended graphs, provides powerful model description capabilities, and is compatible with mainstream **graph computing frameworks and graph query interfaces**.



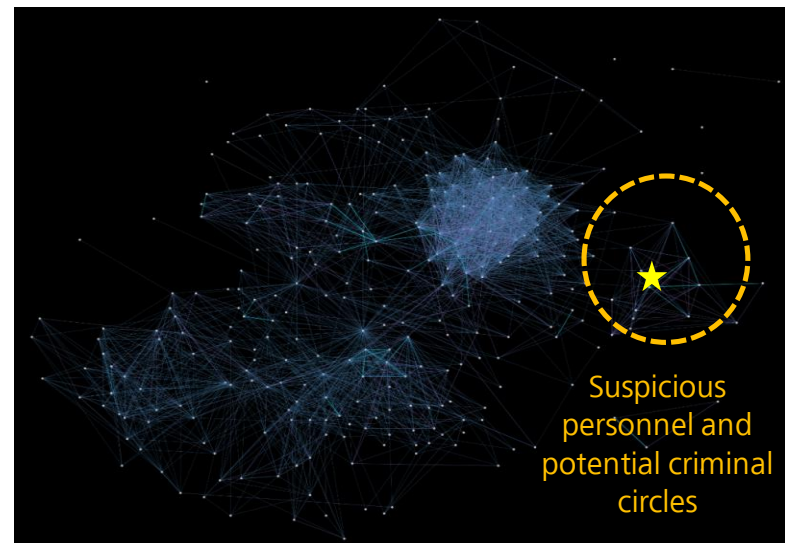
GES Success Stories

Route planning



**Duration for planning
hundreds of
thousands of routes:
6.8 hours -> minutes**

Vehicle warranty fraud prevention



**Hundreds of millions
of nodes and billions
of edges: saving
US\$N for enterprises**



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EI Visual Cognition

- **Face Recognition Service (FRS)** can quickly detect faces in images, analyze facial key point information, obtain facial attributes, and implement precise comparison and retrieval of faces. This service is perfect for identity authentication, e-attendance, trace tracking, and passenger flow analysis.
- **Image Recognition Service** is an advanced deep learning technology that can accurately identify visual content in images and recognize up to 23,000 objects, scenarios, and concept tags. It provides the target detection and attribute recognition functions to help customers accurately identify and understand image content.
- **Optical Character Recognition Service** is used to convert characters in images and scanned copies into editable text. It can replace manual recording to improve business efficiency. It can be used to identify text from ID cards, driving licenses, vehicle licenses, invoices, Chinese and English customs forms, general tables, and general text.
- **Content Moderation Service** adopts cutting-edge image, text, and video detection technologies to automatically detect pornographic content, advertisements, terrorism- and terror-related content, and sensitive political information, helping customers reduce non-compliance risks in their business.
- **Deblur Service** adopts signal processing and advanced deep learning technologies to deliver tools like 'Dark Enhance', 'Defog', and 'Super Resolution'. It enhances images taken in low light conditions or with excess backlight, removes haze in images, and reconstructs low resolution images to transform blurred images into HD images.

EI Voice and Semantics

- **Machine Translation Service** is dedicated to providing enterprises and individuals with fast translation capabilities between different languages. APIs are invoked to implement automatic translation from source language text to target language text.
- **Text To Speech Service** is a service that converts text into lifelike voices. It provides speech services with customizable timbres, volumes, and speeds for enterprises and individuals. (The core capabilities of this service are provided by iFlytek.)
- **Automatic Speech Recognition Service** allows you to convert audio recordings into text. APIs are invoked to recognize real-time audio sent from different audio sources or uploaded audio files. This service can recognize Mandarin Chinese. (The core capabilities of this service are provided by iFlytek.)
- **Natural Language Processing Service** provides natural language-related APIs such as word segmentation, naming entity identification, keyword extraction, and short text similarity. It is applicable to scenarios such as intelligent Q&A, conversational bot, public opinion analysis, content recommendation, and e-commerce evaluation and analysis.
- **Conversational Bot Service** helps enterprises quickly build, release, and manage intelligent Q&A systems. It intelligently parses enterprises' documents to form Q&A knowledge bases, and connects to service systems to implement self-service robots, for example: e-commerce intelligent customer service, call center self-service reply, and intelligent voice assistant.

OCR: High-Precision, Optical, and Automatic Character Recognition Capability

Original images

High-precision OCR engine

Structured text



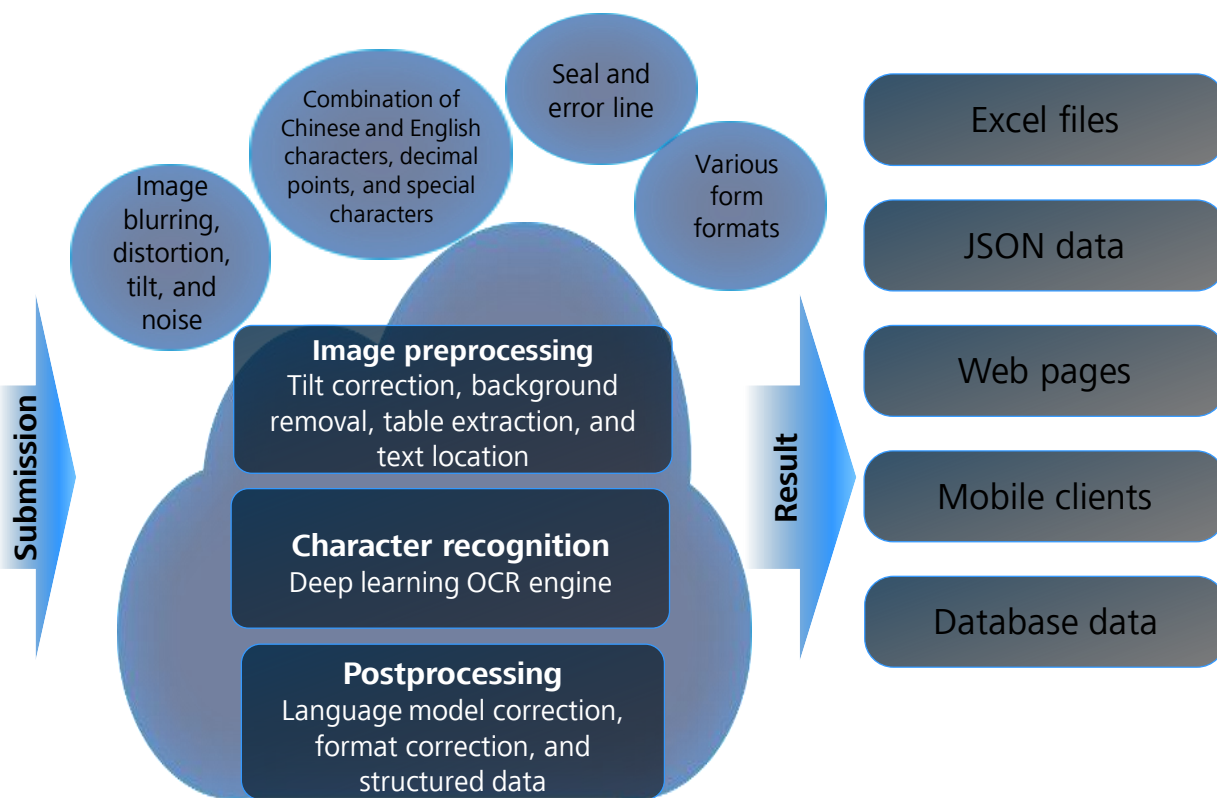
General documents



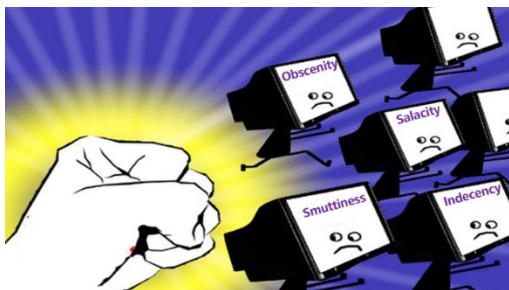
ID cards and business cards



Natural scenarios and general text



Moderation: Automatic Content Detection



Porn identification for text and images

Accurately identifies pornographic content in text, images, or video, and filters text, images, and video, reducing review personnel's workload.



Sensitive political information identification

Identifies text files involving sensitive political events and anti-government speeches.



Violence and terror identification

Accurately identifies images containing information including bloodshed, terror attacks, and terrorist organization banners.

Deblur: Dark Enhance and Defog

Low-illumination image



Multidimensional histogram equalization algorithm vs. Huawei



Dark Enhance

Brightness disorder error rate: **< 3%**

Foggy image



ECCV 2016 vs. Huawei



Defog

Actual **luminance retention**



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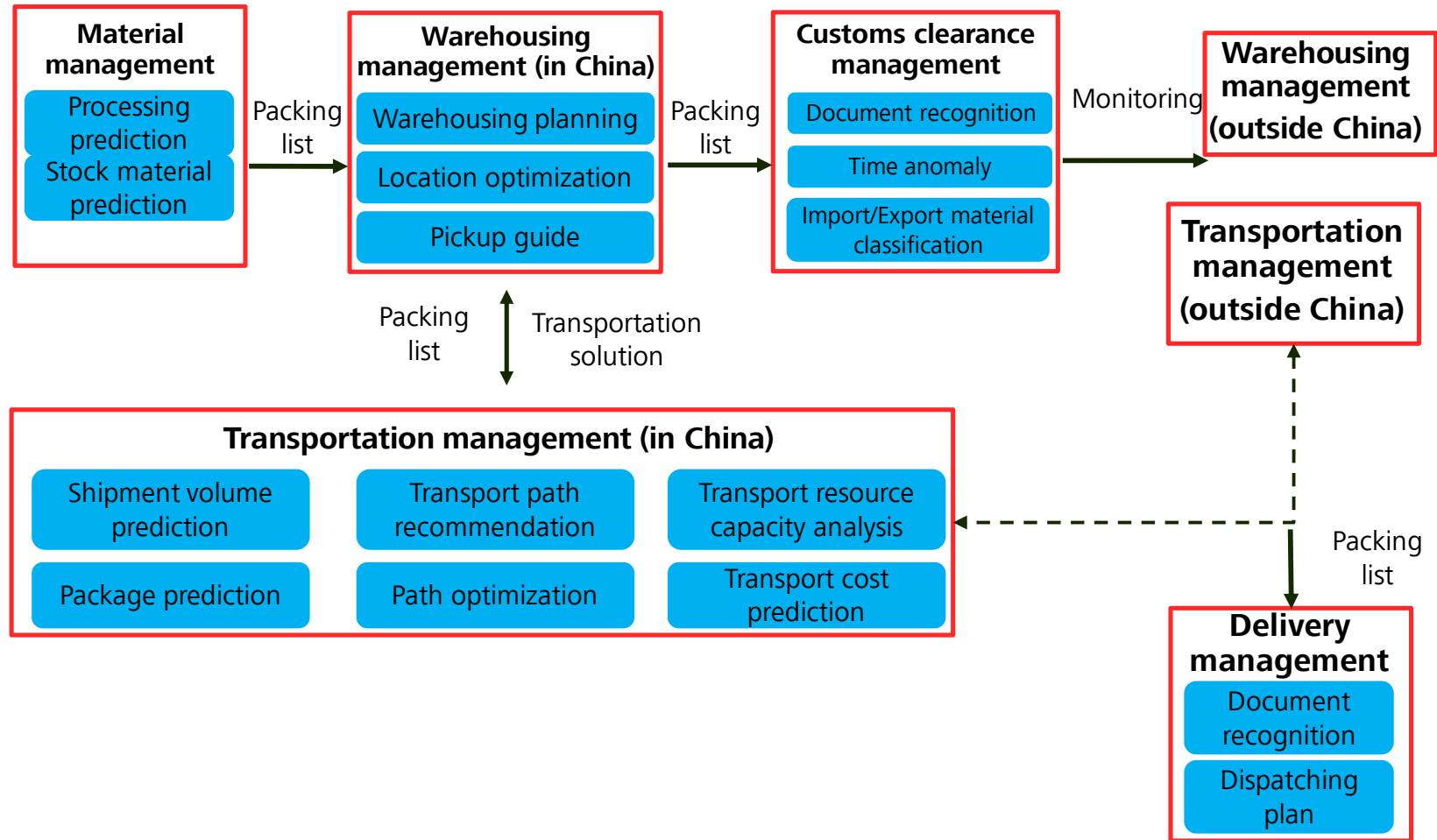
EI Industry-specific Services (1)

- **Intelligent Logistics Service** leverages the power AI and optimization technologies to enable the transformation to digital and intelligent enterprise logistics, reducing logistics operation costs and improving logistics operation efficiency. It provides the Pickup Path Plan, Dispatching Plan, and Bin Packing sub-services in storage and transportation during logistics.
- **Intelligent Manufacturing Service** uses Big Data and AI technologies to provide a full series of services covering design, production, logistics, sales, and service. It helps enterprises mine value from mass data and leverage new technologies to build the leading position in the manufacturing industry.
- **Intelligent Finance Service** leverages Big Data and AI technologies to help financial customers quickly build secure and compliant intelligent financial solutions, facilitating transformation towards digital and intelligent financial enterprises.
- **Intelligent Retail Service** uses AI technologies to help new retail enterprises quickly build intelligent platforms. It provides an intelligent E2E solution for the customer-centric and data-driven extensive retail industry.

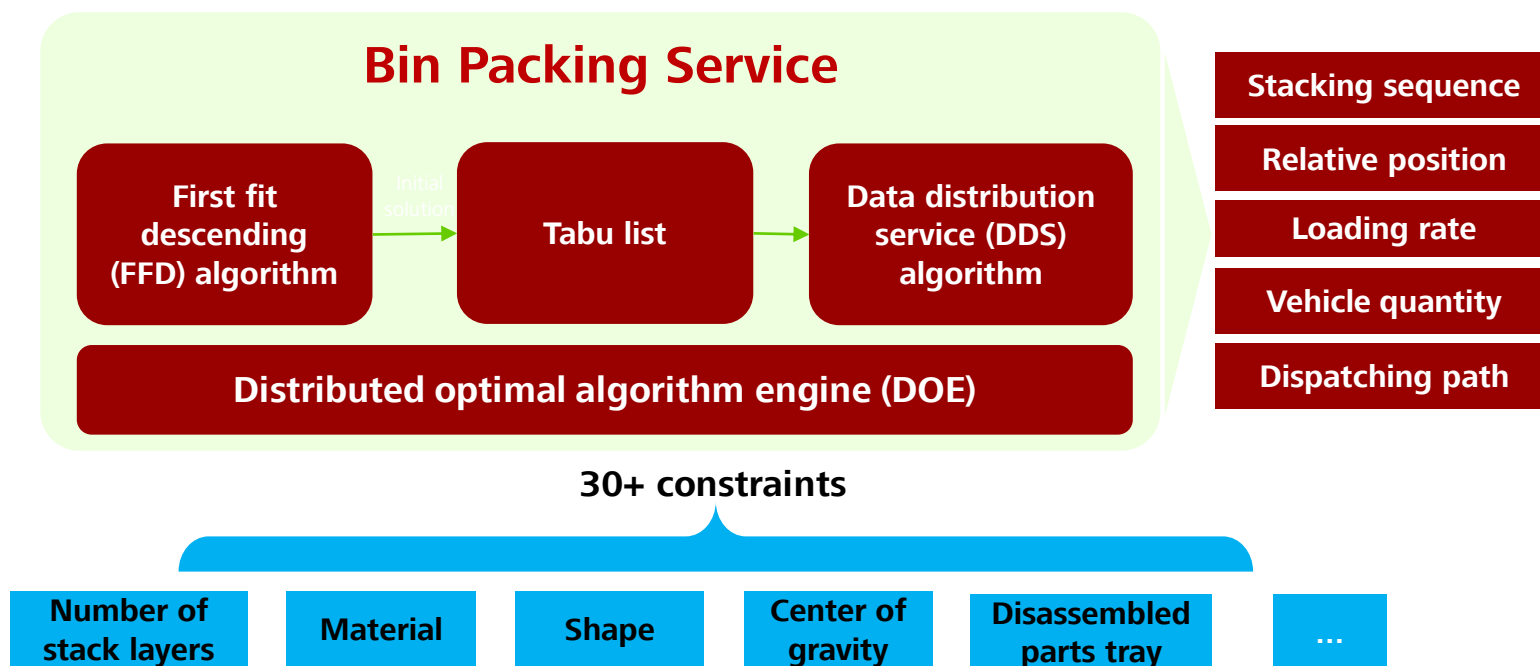
EI Industry-specific Services (2)

- **Intelligent Power Service** combines with Big Data and AI technologies to help electric power companies quickly build platforms. It provides intelligent solutions for power generation, power sales, power charging, and energy efficiency scenarios, covering power station site selection, device fault prediction, power generation and consumption prediction, and charging pile management.
- **Intelligent Transport Service** uses Big Data and AI technologies to provide functions such as illegal behavior identification, smart signal lights, and spatial-temporal retrieval. It applies to scenarios such as intelligent identification of illegal behavior, intelligent control of signal lights, and intelligent detection of cloned license plates, reducing traffic management costs and improving urban traffic efficiency.
- **Intelligent Water Service** leverages Huawei's IoT platform as well as Big Data and AI technologies to help water supply companies achieve intelligent transformation, reduce energy consumption, and improve operation efficiency.

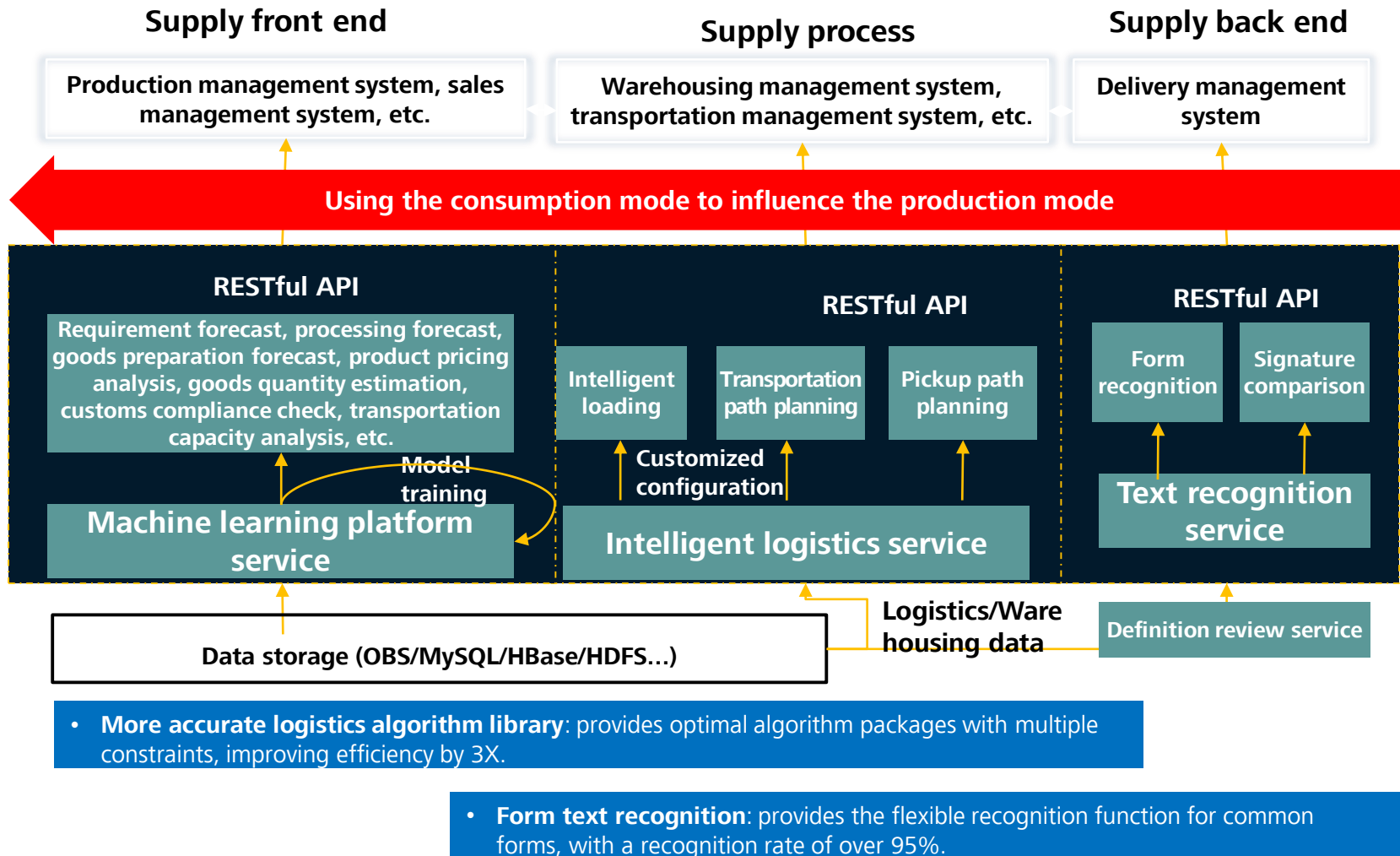
Panorama of the Intelligent Logistics Solution



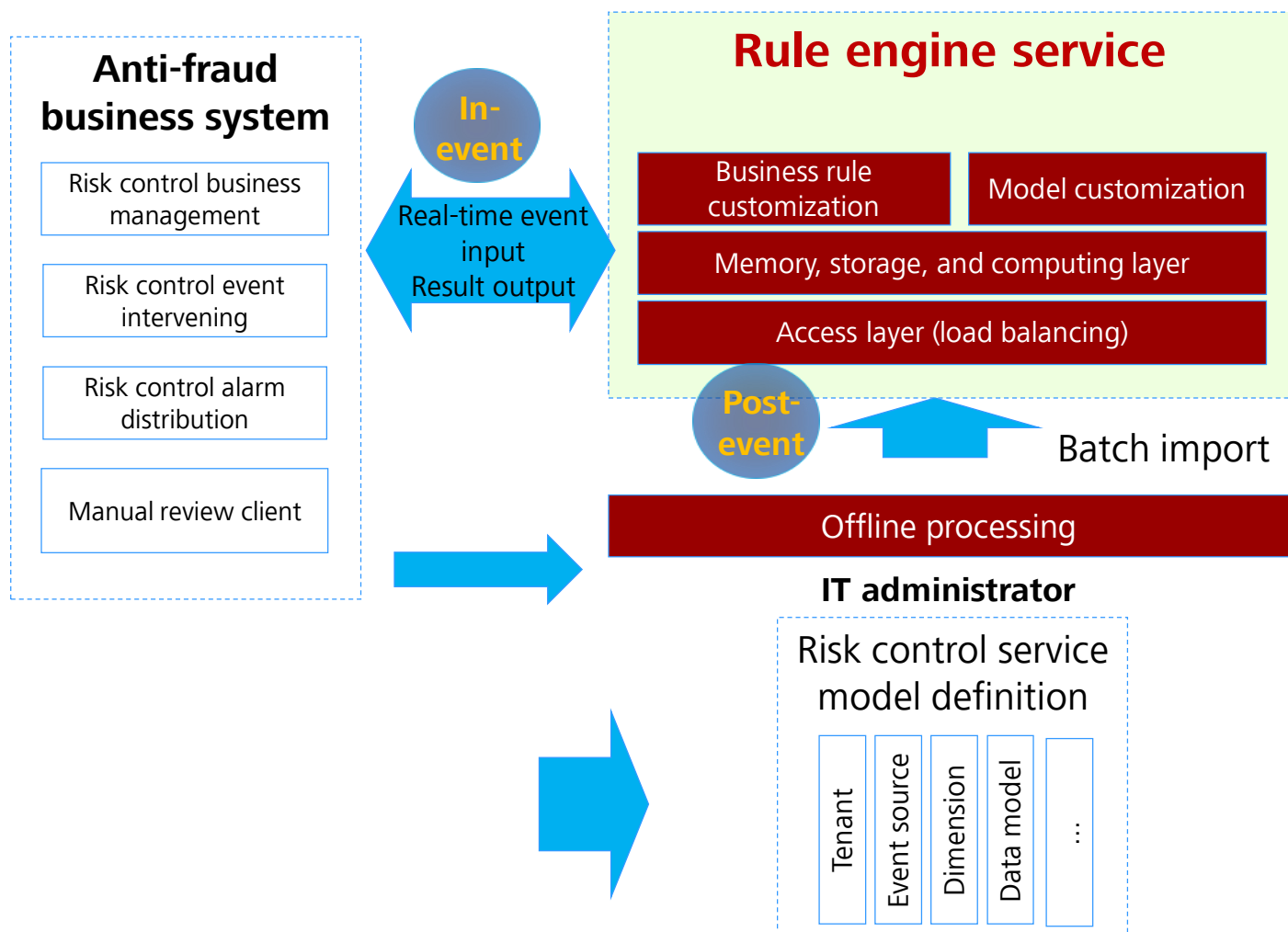
Bin Packing Service



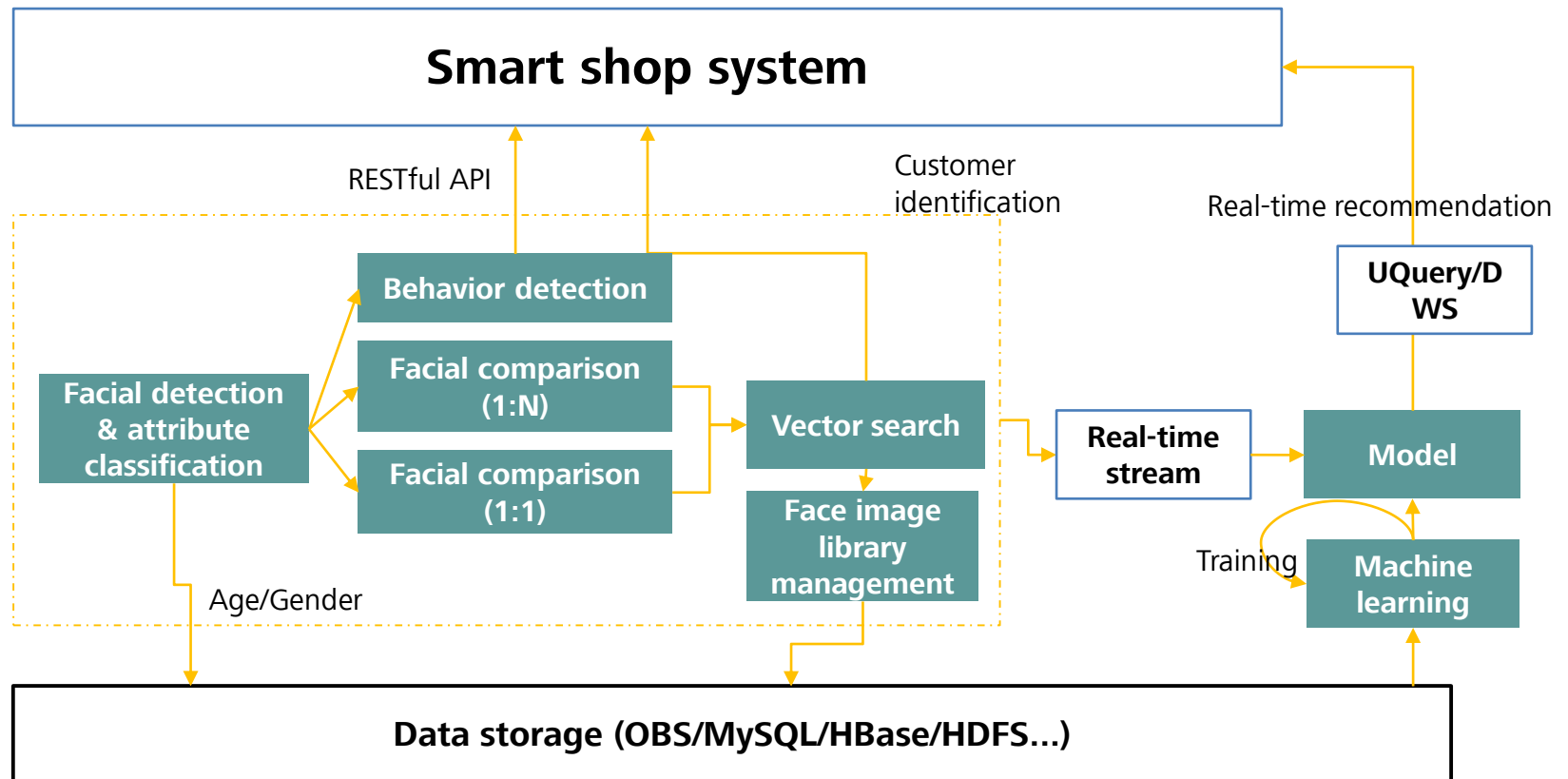
Cloud-based Intelligent Manufacturing Solution



Intelligent Risk Control

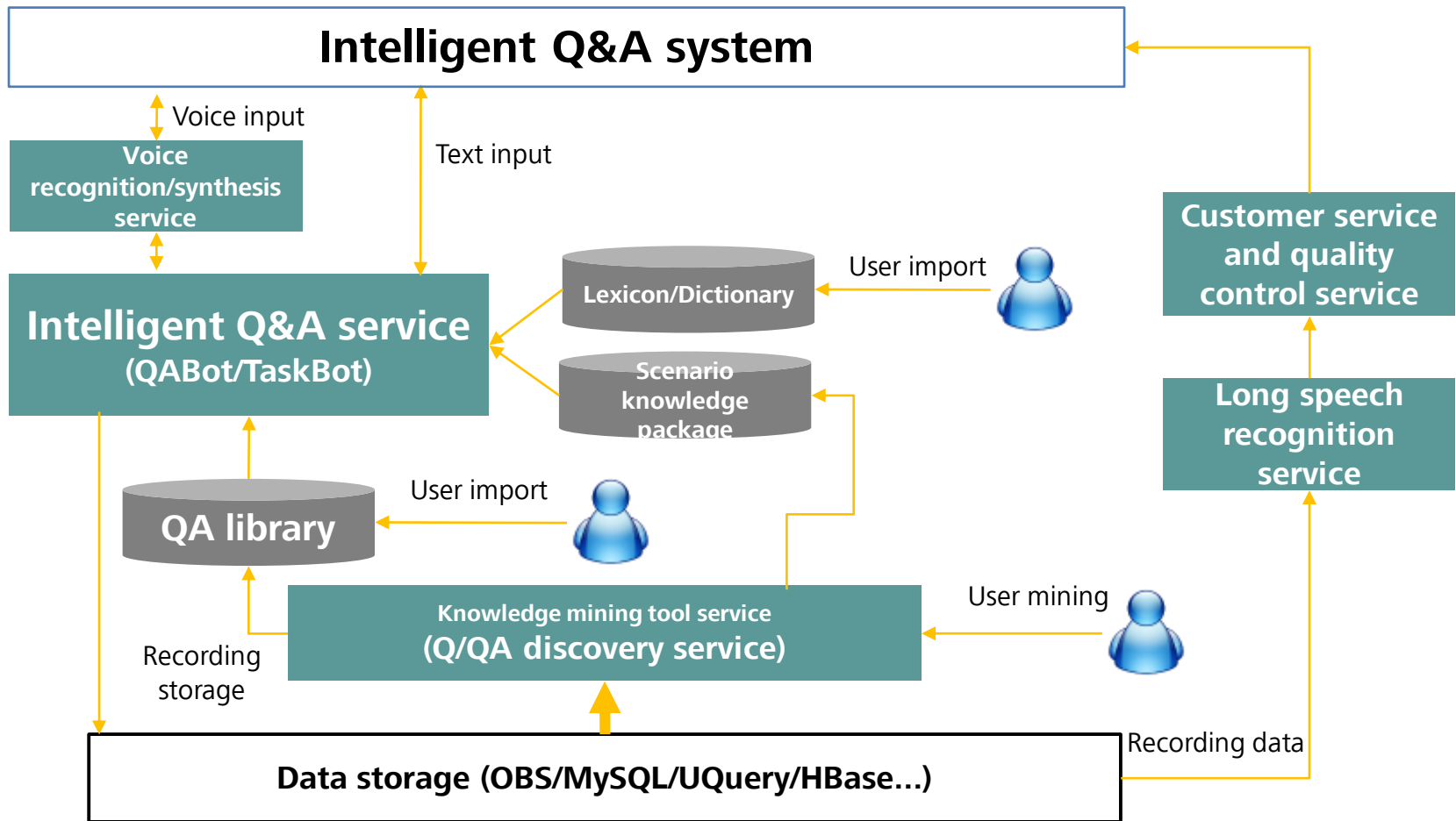


Cloud-based Intelligent Shop Solution for the Retail Industry



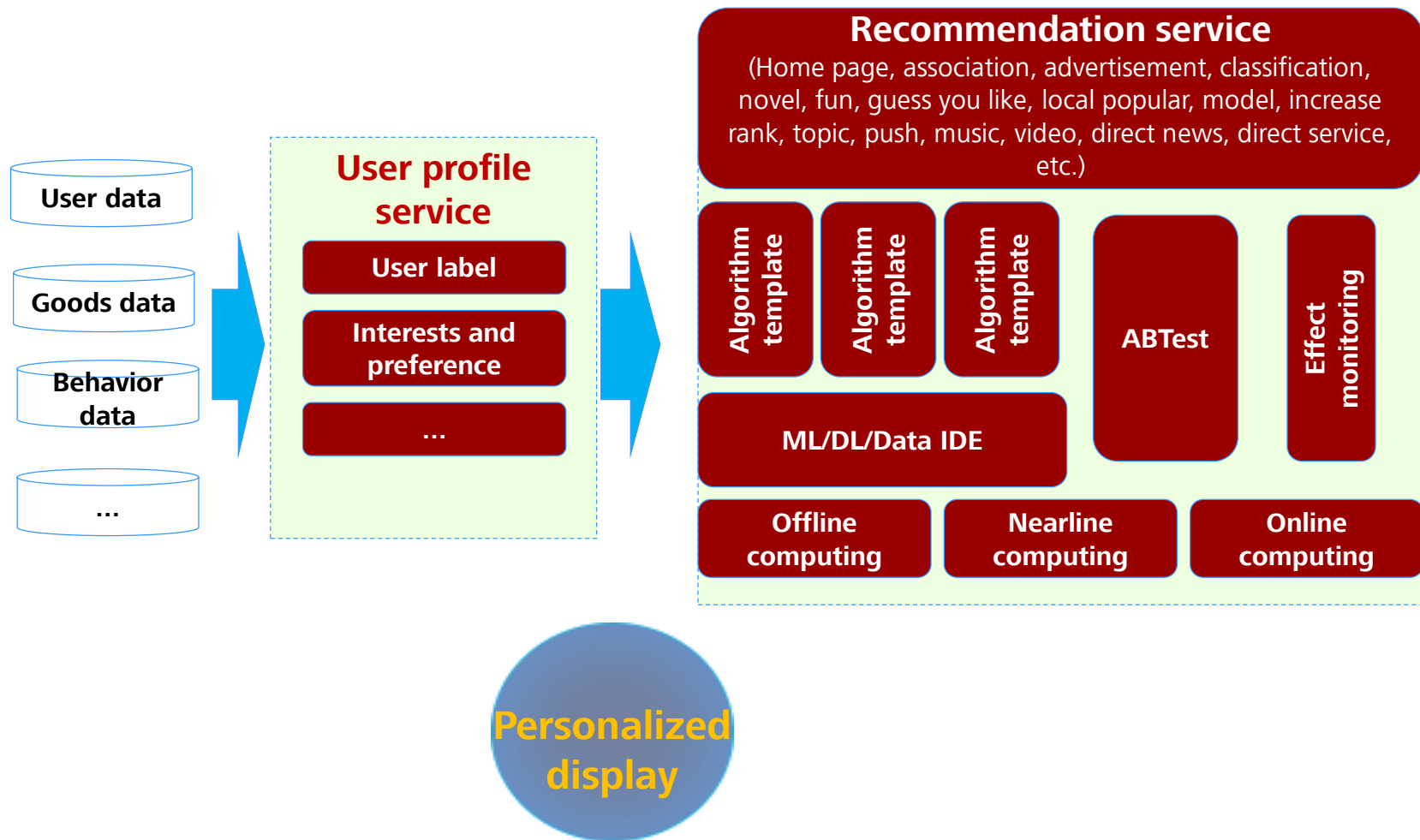
- Facial recognition service: facial recognition AUC: > 99%; search hit rate: >85% (under non-constraint conditions)

Cloud-based Intelligent Customer Service Solution

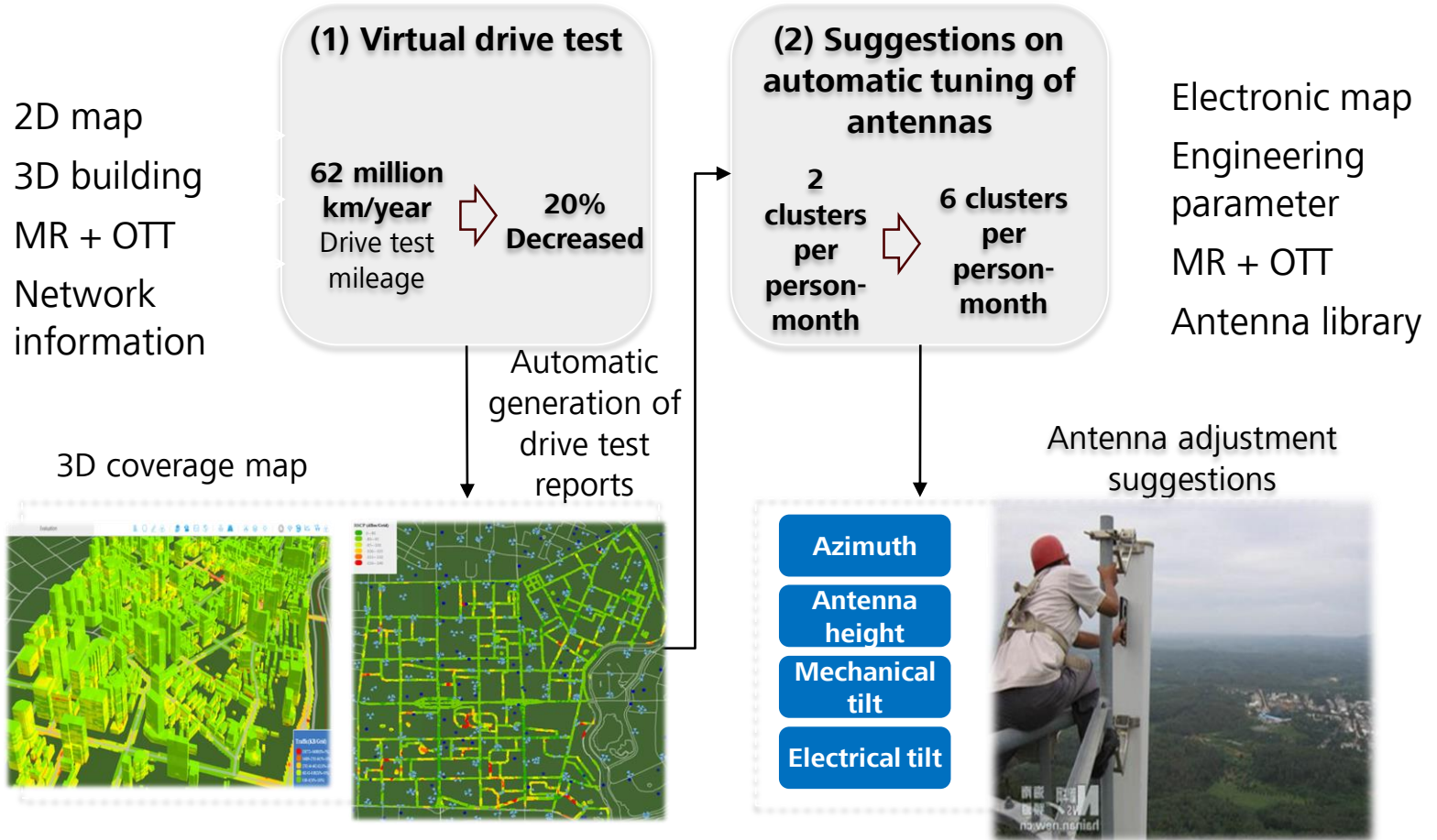


Intelligent Recommendation:

Personalized Recommendation



Parameter Adjustment for Intelligent Cell Planning



EI Big Data Services (1)

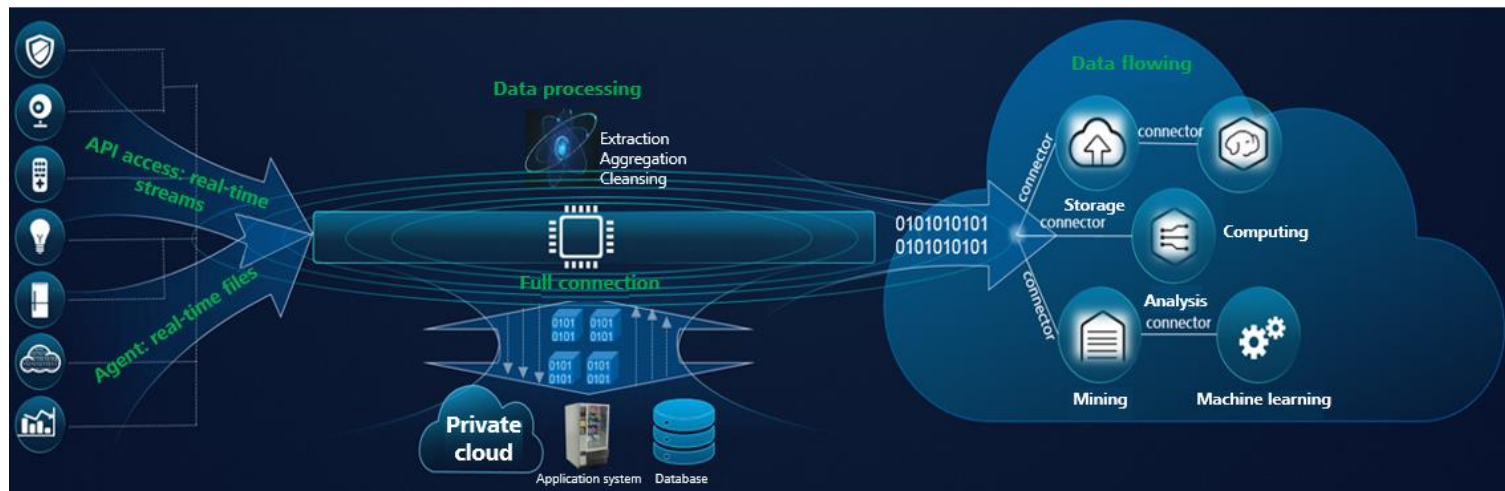
- **Data Ingestion Service** is a service provided by HUAWEI CLOUD to ingest large amounts of data in real time. With its flexible data collection, efficient data transmission, and real-time data distribution features, you can easily build applications capable of processing or analyzing streaming data.
- **Cloud Data Migration Service** implements data mobility by enabling batch data migration among homogeneous and heterogeneous data sources. It supports on-premises and public-cloud-based data sources, including file systems, relational databases, data warehouses, NoSQL, Big Data cloud services, and object storage.
- **Cloud Stream Service** provides full-stack capabilities for processing streaming Big Data in real time. It is easy to use. You can execute StreamSQL statements instantly or customize jobs without caring about computing clusters or learning programming skills. This service is fully compatible with Apache Flink jobs and Spark APIs.
- **MapReduce Service** provides enterprise-level Big Data clusters on the cloud. Tenants can fully control clusters and easily run Big Data components such as Hadoop, Spark, HBase, Kafka, and Storm.
- **Recommendation Engine Service** offers a readily-available and standard platform for setting up personalized recommendation systems. With built-in recommendation templates for various industries like e-commerce and news, recommendation has never been easier.

EI Big Data Services (2)

- **Data Lake Insight Service** is a fully hosted data analysis service that frees you from ETL. It delivers analysis on cloud data in multiple data formats and from various data sources. It also supports both SQL and Spark interfaces.
- **CloudTable Service** is a fully hosted NoSQL data storage service on HUAWEI CLOUD. Based on the Apache HBase, it integrates the OpenTSDB and GeoMesa to offer millisecond-level random read and write capabilities, making it a great fit for storing structured and semi-structured data. This service can be widely used in industries such as IoT, IoV, finance, and Smart City.
- **Data Warehouse Service** is a scalable, fully managed, and out-of-the-box analytic database service that is developed based on the enterprise-class FusionInsight LibrA data warehouse kernel. It is compatible with the PostgreSQL ecosystem and supports standard SQL statements and BI tools to help you economically and efficiently mine and analyze massive volumes of data, greatly reducing your cost.
- **Cloud Search Service** is a fully hosted distributed search service powered on Elasticsearch. It provides users with structured and unstructured data search, statistics, and report capabilities. In addition, it is fully compatible with Elasticsearch APIs.
- **Data Lake Factory** is a one-stop Big Data collaboration development platform, enabling operations such as data modeling, data integration, script development, job scheduling, and job monitoring. Thanks to this service, Big Data is more accessible than ever before, helping you quickly build Big Data processing centers.

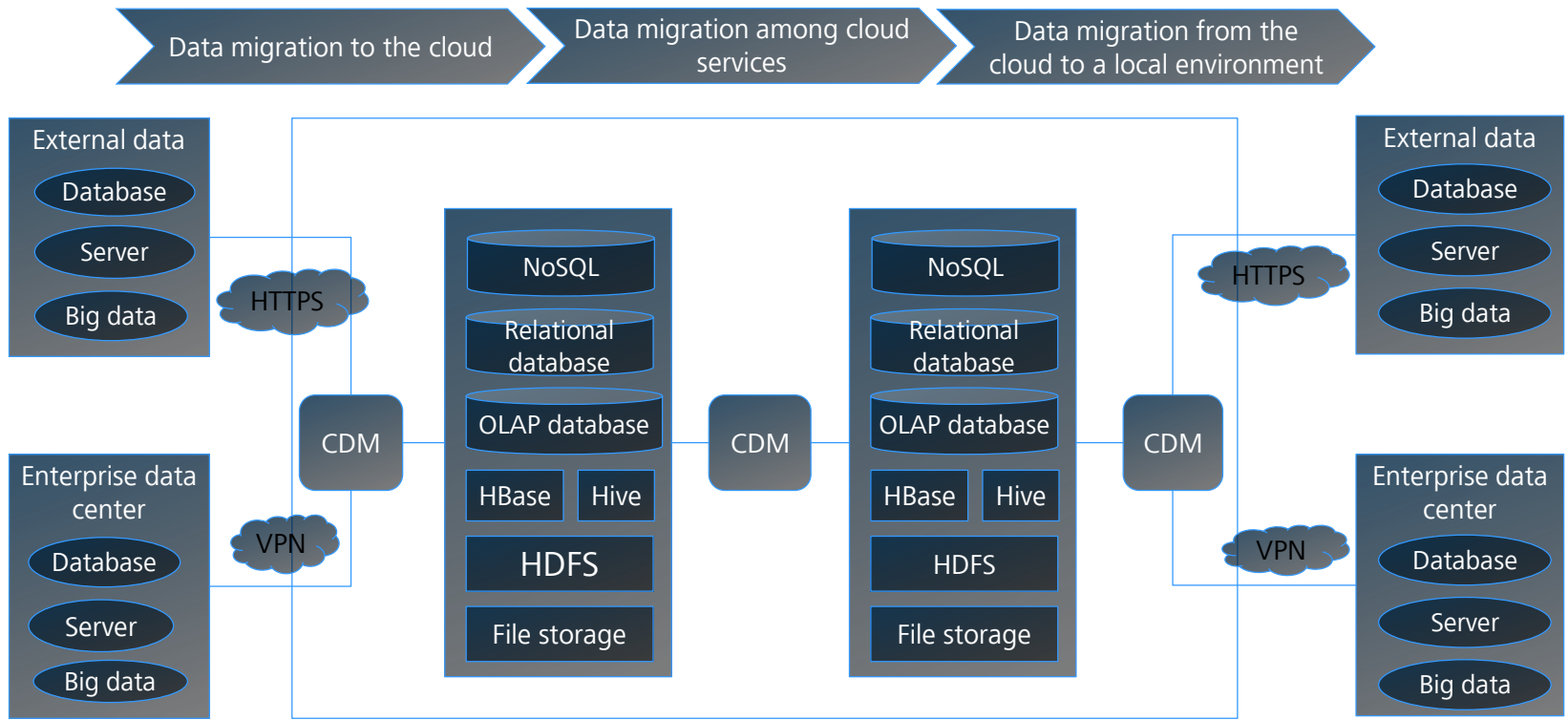
DIS: IoT Real-Time Full Data Connection Pipe

- **Data collection:** connects to multiple data sources through RESTful APIs and agents, is **compatible** with open-source Kafka APIs, and **collects** offline data **in real time**.
- **Data transmission:** transmits data in real time with **high concurrency, high reliability, and low latency**.
- **Data flowing:** connects to various services such as data **storage, computing, and analysis** on the cloud, allowing free and real-time data flowing.
- **Intelligent data processing:** provides preconfigured **data extraction, format conversion, and data compression** operators, and allows users to **customize** operators.



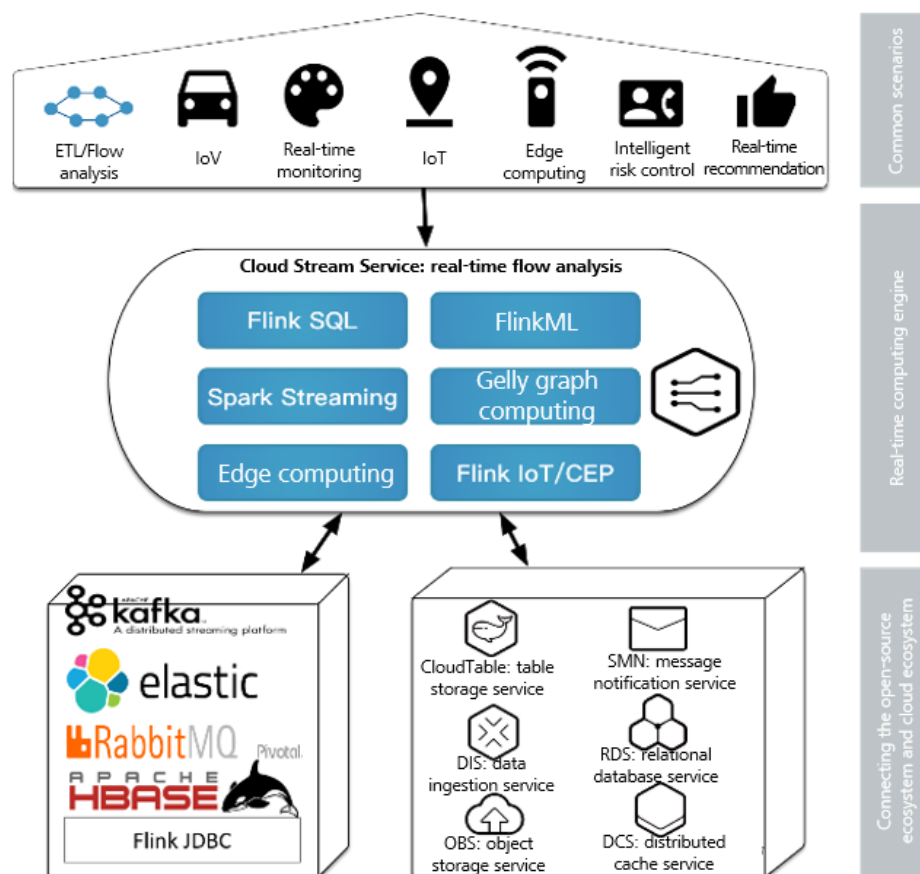
CDM: Efficient Batch Data Migration

Based on the distributed computing framework, CDM implements efficient batch data migration and supports common data sources such as relational databases, OLAP databases, NoSQL databases, big stored data, and stored files. It provides on-cloud and off-cloud E2E data migration solutions to meet various data migration requirements in Big Data scenarios.

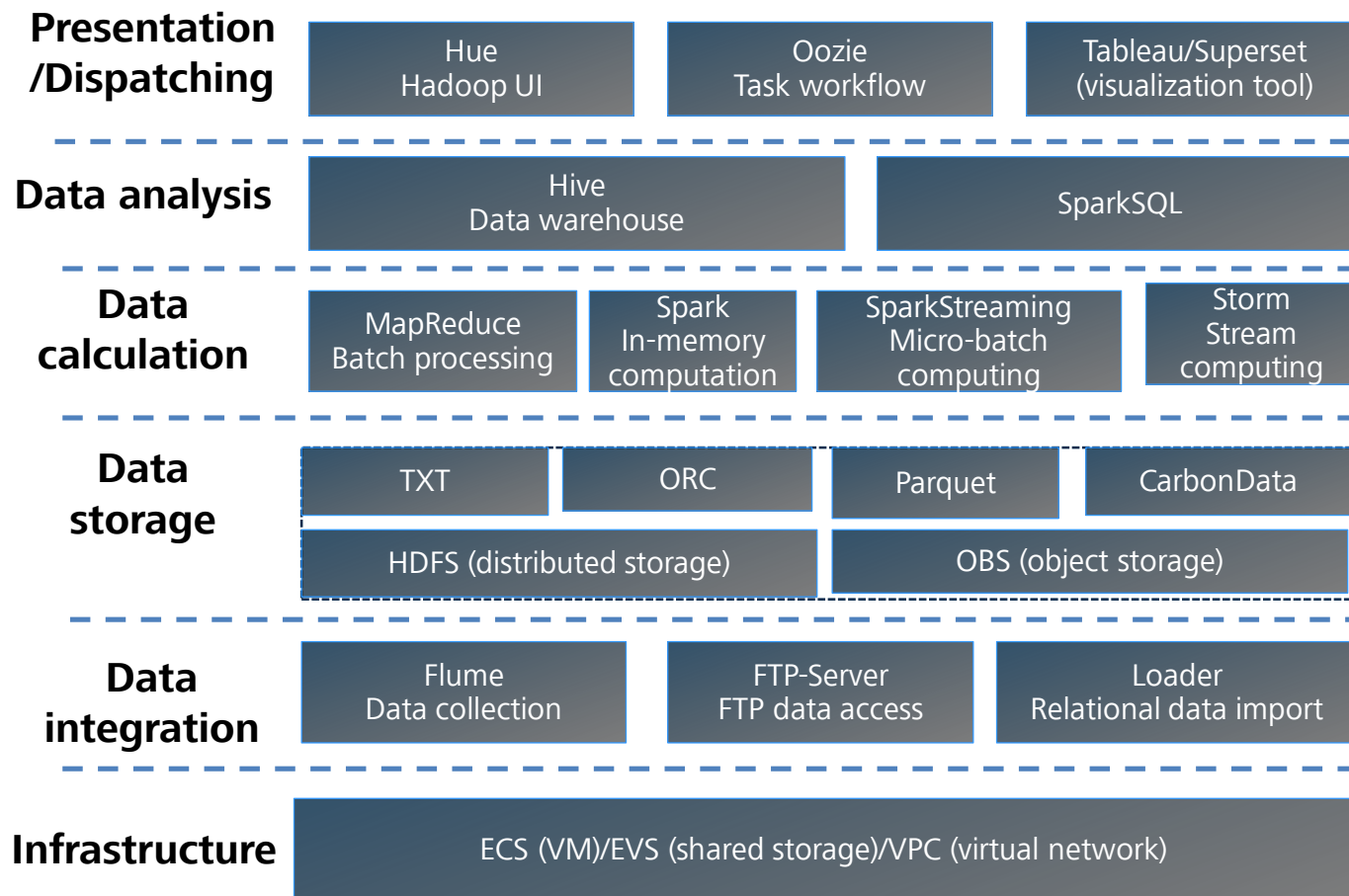


Cloud Stream Service: IoT Core Service

- Application scenarios:
- IoT and IoV: yaw, electronic fence, real-time alarm reporting for detected exceptions, and CEP
- Finance/Securities/E-commerce/Game/Advertising: intelligent risk control, real-time rule engine, graph computing, anti-fraud, real-time recommendation, and real-time monitoring
- Key competitiveness:
- Dual-engine + dual-service mode: supports logical multi-tenant and physical multi-tenant, reducing the usage threshold and meeting the security requirements of VIP customers; supports dual engines: Flink and Spark streaming; industry-leading
- Easy to use: abundant streaming SQL capabilities, support for window and CEP, scenario-based templates, and zero threshold
- Intelligent flow: ML parameter extraction function, IoT geographic location function, FlinkML, Gelly graph computing, GraphX, and interconnection with AI service (planning)

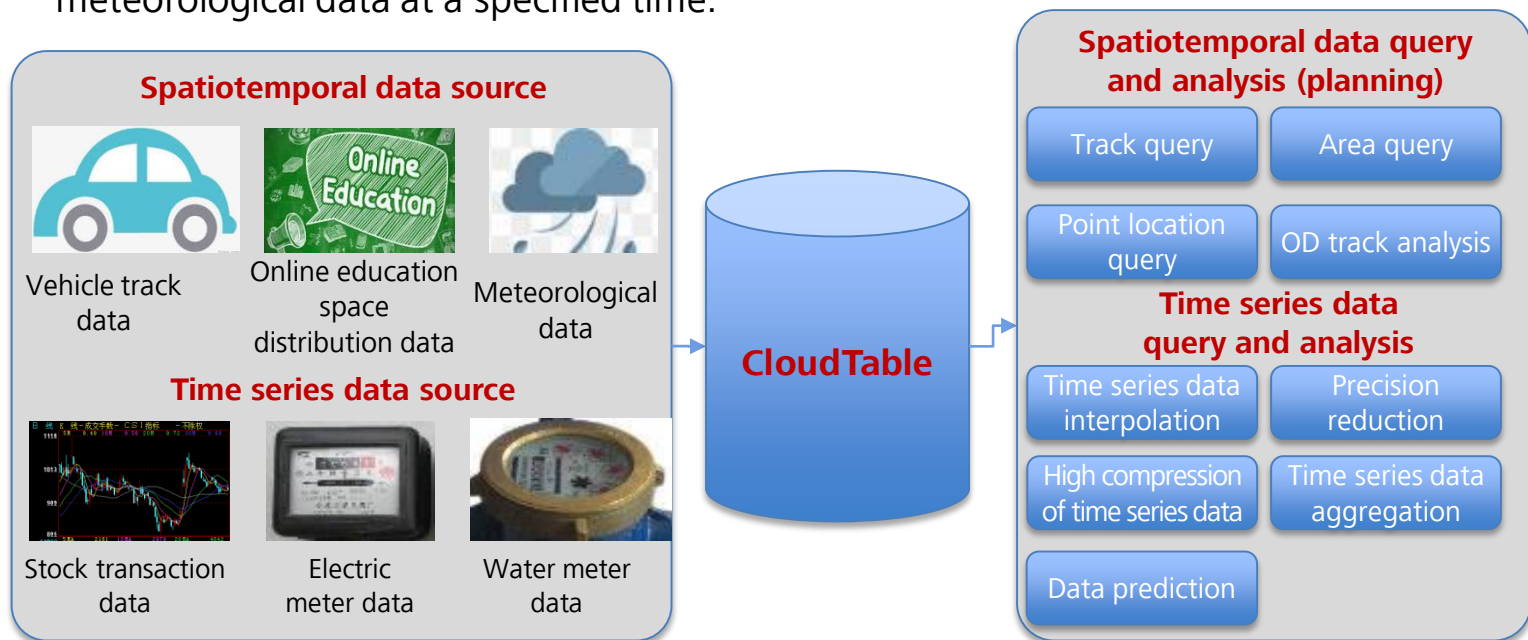


MRS: Enterprise-Level Big Data Cluster Cloud Service

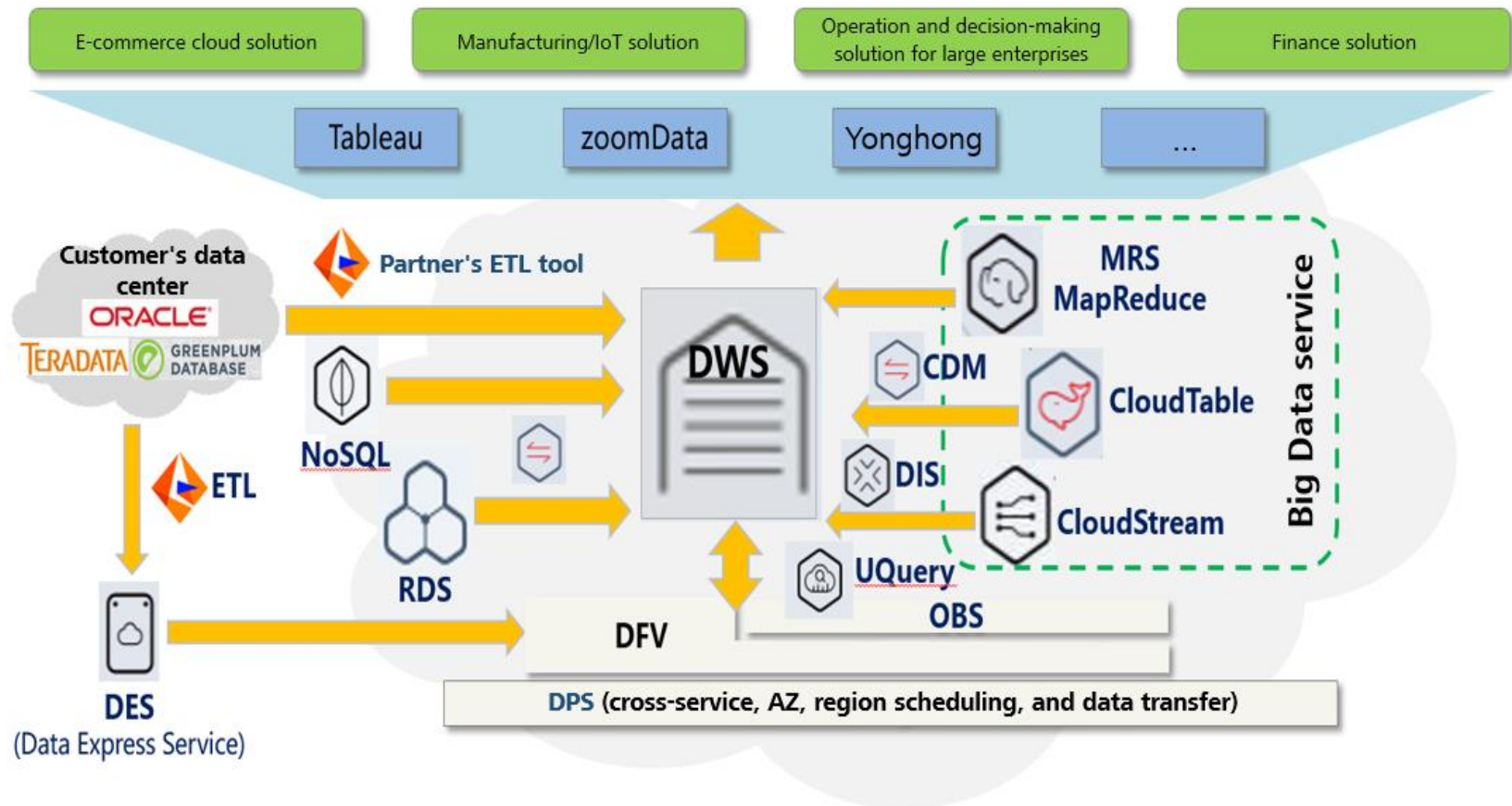


CloudTable: Millisecond-Level NoSQL Database

- **IoV**: stores attribute data and geographical location change data generated by vehicles.
- **IoT**: monitors and analyzes IoT devices in the gas, water, electricity, chemical, computer, and smart home fields.
- **Online education/Retail/Tourism**: analyzes regional sales and provides decision-making support for regional sales promotion.
- **Weather**: stores, queries, and analyzes the three-dimensional meteorological data as well as meteorological data at a specified time.



DWS: Enterprise-Level Cloud Data Warehouse





Section Summary

This document introduces the HUAWEI CLOUD EI ecosystem, development trend of Big Data and AI technologies, capabilities of HUAWEI CLOUD EI service products, and service scenarios and solutions of HUAWEI CLOUD EI.

Quiz

1. What is AI?
2. What services are provided by HUAWEI CLOUD EI?

Quiz

1. (Multiple answer question) When did Huawei provide cloud services and work with more partners to provide a wider variety of AI practices? ()
 - A. 2003
 - B. 2012
 - C. 2015
 - D. 2017
2. (True or false) MLS is a data mining and analysis platform service. It enables users to quickly discover data rules, build a prediction model, and deploy the prediction analysis solution. ()
 - A. True
 - B. False



Recommendations

- Huawei e-Learning website:
 - http://support.huawei.com/learning/NavigationAction!createNavi?navId=_16&lang=en
- Huawei Support case library:
 - <http://support.huawei.com/enterprise/servicecenter?lang=en>

Thank You

www.huawei.com