

HUAWEI CLOUD EI Overview

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Objectives

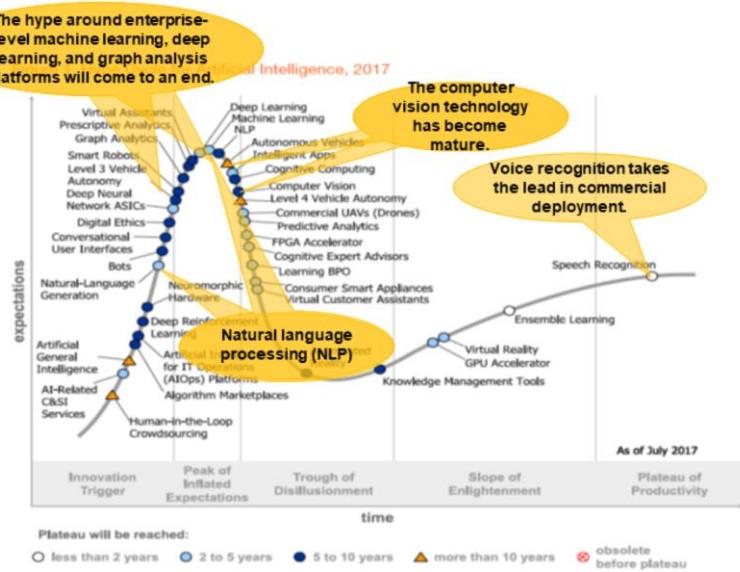
- After completing this course, you will be able to:
 - Understand the ecosystems of HUAWEI CLOUD Enterprise Intelligence (EI).
 - Understand the capabilities of HUAWEI CLOUD EI service products.
 - Understand the service scenarios and solutions of HUAWEI CLOUD EI.



Contents

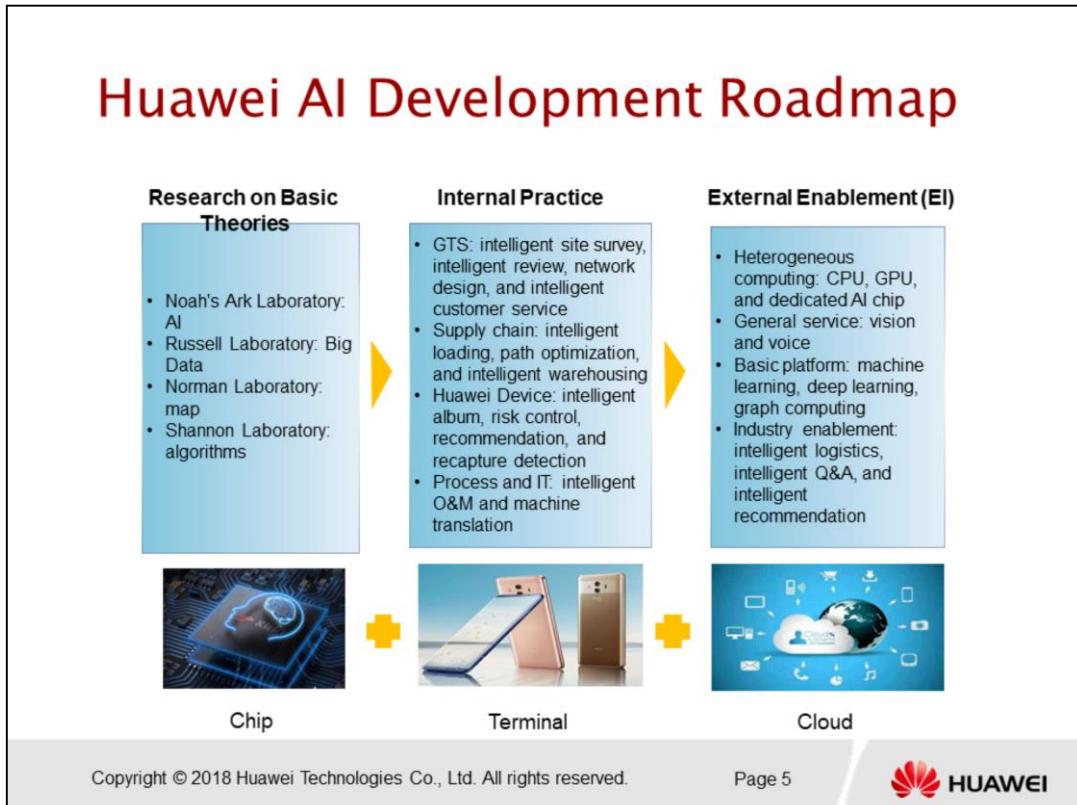
- 1. Concept of AI and Origin of EI**
- 2. Details About HUAWEI CLOUD EI**

Trend of Artificial Intelligence (AI) Technologies



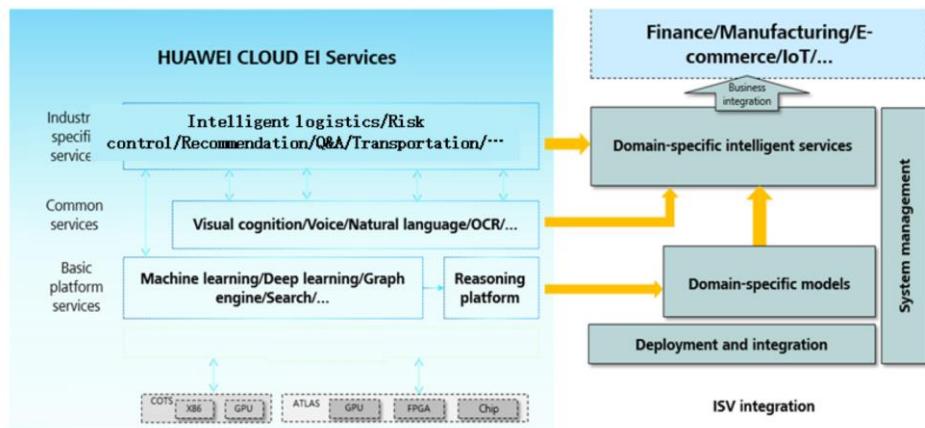
- Voice recognition has taken the lead in scaled commercial use. The computer vision technology has gradually become mature and makes breakthroughs in each field. It will take two to five years for platforms such as the machine learning, deep learning, graph analysis, edge computing, and IoT platforms to reach the plateau. For technologies such as cognitive computing, natural language, deep intensive learning, intelligent robot, and blockchain, it will take five to ten years before they become the mainstream. Natural language generation (NLG) is the weakest link of AI.

Huawei AI Development Roadmap



- Huawei promotes the development of AI from inside to outside. For example, the discussion about intelligent GTS started from the second half of 2006. At that time, a large amount of manpower was required to conduct site survey, form review, network design, and customer service. What's more, forms could be reviewed only by personnel at high levels. Therefore, Huawei engineers discussed about whether these tasks could be conducted by AI. Huawei Device produces mobile phones. The company ranks top 15 among the Internet companies in terms of revenue. The business volume is very large. Huawei implements internal incubation before enabling external enterprises. The cloud, terminal, and chip capabilities follow Huawei's development direction to implement terminal-cloud and software-hardware combination. In this way, differentiated AI is realized.

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

- Migrating the data of these partners to the cloud is a challenge in the future. Huawei's FusionInsight occupies the largest market share in China. It sells well to banks and carriers in China, and receives good feedback from these customers. For example, China Mobile Guangdong adopts more than 1000 high-performance servers in a single cluster.



Contents

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

Solutions	Enterprise Intelligence	Partners	Support
Essential Platform	Big Data	Visual Cognition	
Machine Learning Service	Data Ingestion Service	Optical Character Recognition	
Deep Learning Service	Cloud Data Migration	Face Recognition	
Deep Learning HMI	Cloud Stream Service	Image Recognition	
Graph Engine Service	MapReduce Service	Content Moderation	
	Data Lake Insight		
	CloudTable Service		
	Data Warehouse Service		
	Cloud Search Service		
	Data Lake Factory		

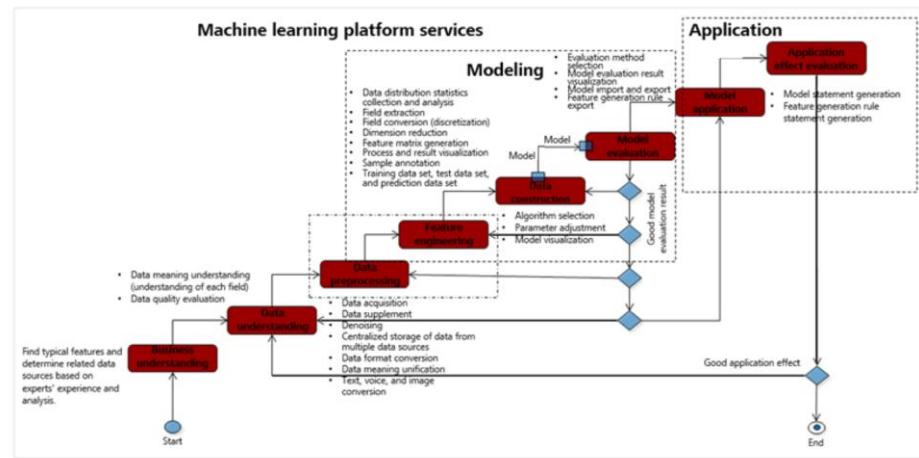
Basic Platform Services (1)

- **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.

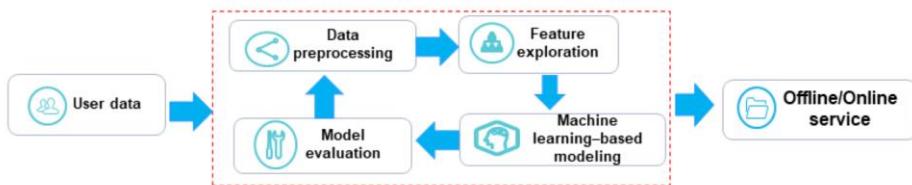
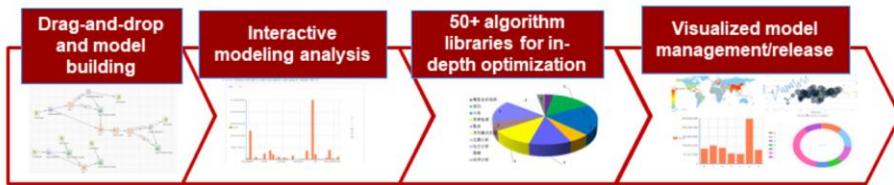
Basic Platform Services (2)

- **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



- Machine learning: simulates or implements learning behavior and improves the performance of specific algorithms through experience learning. It involves subjects such as statistics, probability theory, optimization theory, and algorithms.
- 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.
- MLS provides abundant machine learning algorithms for you to import and process data, as well as training, evaluating, and exporting models, covering end-to-end prediction and analysis services. There are more than 30 algorithms, such as data preprocessing, classification, clustering, regression, recommendation, and relationship analysis.
- Intuitive and easy-to-use machine learning solution: Workflow is a modeling and development interface for common analysts. It provides the drag-and-drop data modeling function on the graphical user interface (GUI). It is specific to data analysts who are familiar with services but unfamiliar with related modeling languages.
- Notebook provides the multi-language interaction and analysis function for data scientists. It provides data modeling based on interactive programming and supports multiple modeling languages, including Python and R.
- Distributed and scalable Big Data computing engine: uses MRS (Huawei's distributed Big Data analytics service) at the underlying layer and adopts enhanced components, such as HDFS, Spark, and Hive, to support Big Data analytics. The built-in algorithms

are optimized to improve the distributed processing performance. Compared with open-source algorithms, these built-in algorithms provide better performance and enable linear acceleration during the processing of a large amount of data.

- MLS mainly applies to market analysis, business forecast, customer classification, targeted recommendation, and predictive maintenance.

MLS: Drag-and-Drop and Model Building

The screenshot shows the HUAWEI Machine Learning Service (MLS) interface. The top navigation bar includes the HUAWEI logo and the text "Machine Learning Service". Below the navigation bar, the title "Project > Workflow > flow" is displayed. On the left side, there is a "Node Library" sidebar with a search bar labeled "Enter a keyword." and a list of nodes categorized under "Modeling": Feature, Anomaly Detection, Classification (Decision Tree Classification, Gradient Boosted Tree Classification, K Nearest Neighbor Classification, Logistic Regression, Naive Bayes, Multiclass Neural Network, Random Decision Forest Classification, Support Vector Machine), Clustering, Regression, Recommendation, Frequent Pattern Mining, Relation Analysis, Spatio-Temporal Analysis, Text, Time Series, Evaluation, and Output. The main workspace displays a workflow diagram with nodes: "Read Data From Dataset", "Modify Metadata", "Split", "Random Decision Forest Classification", "Output dataset 2", "Apply Mo-Classification Model Evaluation", "Save Model", and three "Save Data To Dataset" nodes. Arrows indicate the flow from input to output. A "Run Log" panel is visible at the bottom of the workspace.

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Page 14



- The main commercial application scenarios of MLS are as follows:
 - Financial product recommendation (random decision forest and gradient boosted tree): You can provide personalized service recommendation for customers based on their attributes. For example, you can recommend the customers to buy financial products such as wealth management and insurance products.
 - Predictive maintenance (logistic regression and support vector machine): You can create prediction models for individuals or fleets and provide preventive maintenance suggestions and plans to shorten downtime and reduce fault occurrence probability, which improves efficiency and reduces costs.
 - Telecom customer retention (decision tree and random decision forest): You can analyze customer attributes and behavior, predict the churn probability of telecom customers, and guide carriers to provide retention schemes.
 - Retailer grouping (k-means and AP): You can group retailers based on the inbound and outbound data for targeted management.
 - Network exception detection (PCA-based exception detection and Oneclass SVM): During network device running, you can analyze traffic in real time and predict suspicious traffic or faulty devices.
 - Network topic trend analysis (TF-IDF, WordSegmention, and LDA): You can use text analysis algorithms to analyze text and comments on the network, identify abrupt or sensitive topics, and provide reference and guidance for decision-

makers such as governments.

MLS Success Stories

Application recommendation



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

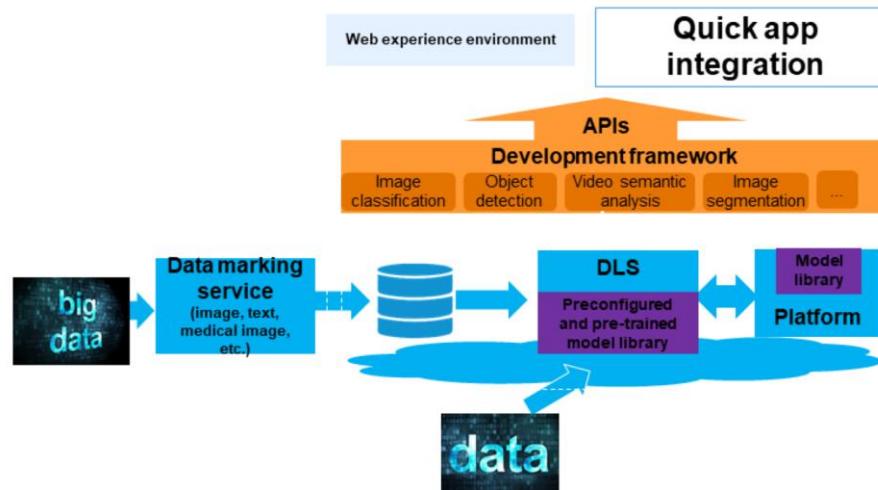
IoV analysis



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

- MLS is used to recommend application market, music, news, and game services, improving the CTR by 30%.
- On the IoV Big Data platform, MLS collects vehicle status data (such as engine rotational speed, temperature, vehicle speed, tire pressure, and historical maintenance information), creates prediction models, and provides predictive maintenance suggestions and plans for enterprises (such as fleets) and drivers to reduce the fault occurrence duration and probability, thereby improving efficiency and reducing 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)

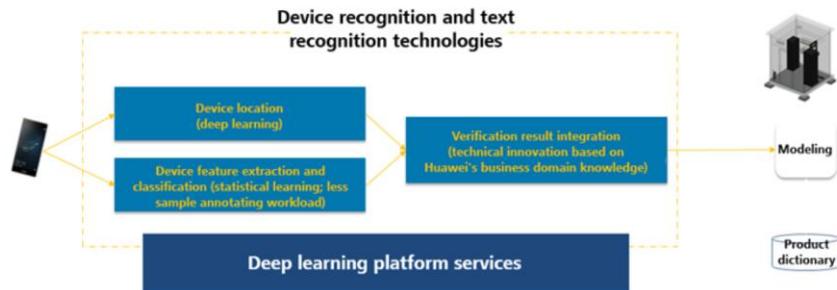
- Identify dumb devices and review acceptance images.

Quality image identification object model																																																																																		
EHS: 15 intelligent object models (gradually expanded to about 50 models)	TE: 25 intelligent object models (gradually expanding)	OSP, CW, and energy (to be expanded)																																																																																
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EHS intelligent review rules <table border="1"> <thead> <tr> <th>No.</th> <th>Object to Be Annotated</th> <th>Standard definition</th> <th>Business Review Rule</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr><td>1</td><td>Person</td><td>person</td><td>There is one person.</td><td>> 80%</td></tr> <tr><td>2</td><td>Safety helmet</td><td>helmet</td><td>There is one safety helmet.</td><td>> 80%</td></tr> <tr><td>3</td><td>Head + safety helmet</td><td>helmet_on_head</td><td>Every person has a safety helmet.</td><td>> 80%</td></tr> <tr><td>4</td><td>Fluorescent clothing</td><td>high_visiblity_vest</td><td>Every person has fluorescent clothing.</td><td>> 80%</td></tr> <tr><td>5</td><td>Gloves</td><td>glove</td><td>There are two gloves.</td><td>> 70%</td></tr> <tr><td>6</td><td>Rigger</td><td>person</td><td>There are two hooks.</td><td>> 80%</td></tr> <tr><td>7</td><td>First-aid kit</td><td>first_aid_box</td><td>There is a first-aid kit.</td><td>> 80%</td></tr> <tr><td>8</td><td>Fire extinguisher</td><td>extinguisher</td><td>There is a fire extinguisher.</td><td>> 80%</td></tr> <tr><td>9</td><td>Warning board</td><td>warning_board</td><td>There is a warning board.</td><td>> 80%</td></tr> <tr><td>10</td><td>Warning sign</td><td>warning_sign</td><td>There is at least one warning sign.</td><td>> 80%</td></tr> <tr><td>11</td><td>Warning tape</td><td>warning_line</td><td>There are some warning tapes.</td><td>> 80%</td></tr> <tr><td>12</td><td>Toolkit</td><td>toolkit</td><td>There is a toolkit.</td><td>> 80%</td></tr> <tr><td>13</td><td>Safety shoes</td><td>safety_shoe</td><td>Every person has two safety shoes.</td><td>> 70%</td></tr> <tr><td>14</td><td>Pulley</td><td>pulley</td><td>There is a pulley.</td><td>> 80%</td></tr> <tr><td>15</td><td>Insulation gloves</td><td>insulated_glove</td><td>There are two insulation gloves.</td><td>> 70%</td></tr> </tbody> </table>			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_visiblity_vest	Every person has fluorescent clothing.	> 80%	5	Gloves	glove	There are two gloves.	> 70%	6	Rigger	person	There are two hooks.	> 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 tapes.	> 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%
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- Dumb devices: devices that cannot be detected by the NMS, such as cabinets, power boxes, and sockets.

DLS Success Stories (2)

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



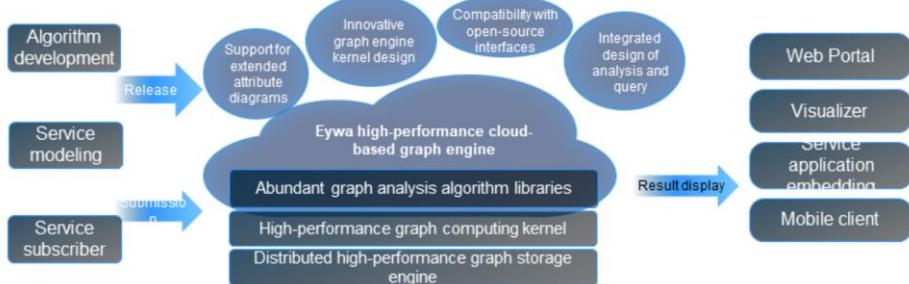
Achievements: identified indoor and dumb devices, reduced the single-site survey duration from 2 hours to 10 minutes, improved the survey accuracy from 67% to 90%, avoided repeated site visits, and sped up the project progress. (DLS reduced human-caused errors and improved efficiency.)

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**.



- We hired an expert from IBM. He was a leader in the IEEE graph computing committee. Therefore, we have leading graph computing capabilities. Graph computing is mainly used for social analysis in the public safety industry. It can also be used for financial risk control. In these scenarios, machine learning and graph computing are conducted, because these technologies can be explained by math and can be used to prevent attacks and ensure high security. Eywa is a graph engine.
- Eywa provides integrated platform capabilities, such as associated data query and relationship analysis, and is used to process and efficiently calculate graphic data structures such as social networks, traffic networks, call detail record (CDR) graphs, user and product networks, cooperation networks, financial transaction networks, and knowledge graphs. Eywa can satisfy various service requirements, such as telecom network planning and optimization (path planning and active/standby path optimization), social safety supervision (community discovery, key person identification, potential relationship discovery, and potential suspect identification), and financial risk control (money-laundering model detection, fake transaction detection, and risk assessment).
- When performing financial risk control, Eywa links the relationships among multiple variables (such as accounts, transactions, and funds) through graphs to analyze the impact on financial security. Typical financial heterogeneous systems, such as money laundering and Charles Ponzi's scam, reflect specific graph structures. For example, loop detection can be conducted on full graphs to effectively identify cyclic transfer and help prevent credit card fraud. Fraud gangs or zombie accounts can be detected

through the analysis of suspicious personnel's neighbors and close friends as well as attribute graph-based community discovery. A knowledge graph reflects the relationships between knowledge concepts and can be used to design the reasoning algorithms. Knowledge graphs are often used to conduct knowledge reasoning, understand users' intention from the semantic level, and improve the search quality. For example, after a member of LinkedIn enters some skills, for example, distributed system and Hadoop, in an explicit manner, the knowledge graph of LinkedIn automatically reasons out other skills, such as product management and NoSQL. In particular, a lot of information composed of entities and relationships needs to be processed in the processes of AI and machine learning. For example, in a recommendation system, users and movies are entities, and their relationships are constituted of users' preferences; search queries and offerings are also entities, and their relationships are constituted of click-through rates.

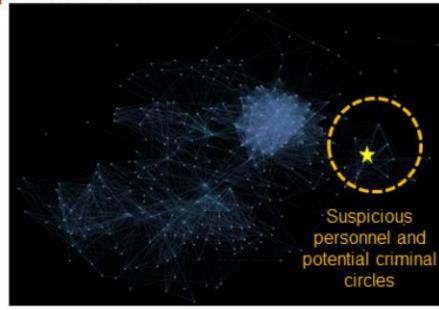
GES Success Stories

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**

- Eywa supports complex attribute management based on the attribute graph model, provides more than 20 built-in topology measurement and basic graph analysis algorithms, and opens the capability of the graph engine through service-oriented APIs to provide all-round relationship network insights. In the telecom network field, Eywa enables us to express the physical communication networks constituted by NEs such as switches, routers, and terminal equipment, as well as the logical networks abstracted from them. On this basis, we can run complex network planning simulation algorithms to greatly improve the service efficiency. In the finance and public security fields, Eywa allows us to express a large number of entities that are associated with each other, such as people, accounts, merchants, and mobile phones, and use the node and edge attributes (such as age, gender, account creation time, and transaction amount between people and merchants) to describe the real world more precisely. Eywa enables customers to efficiently calculate services such as anti-fraud and group discovery, and helps service personnel find valuable information hidden behind a large amount of associated data based on the large scale and high concurrency features, as well as the built-in analysis functions such as shortest path, man-in-the-middle search, loop analysis, and neighbor submap.



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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



General documents



ID cards and business cards



Natural scenarios and general text

High-precision OCR engine

Combination of Chinese and English characters, decimal points, and special characters

Seal and error line

Various form formats

Image preprocessing
Tilt correction, background removal, table extraction, and text location

Character recognition
Deep learning OCR engine

Postprocessing
Language model correction, format correction, and structured data

Structured text

Excel files

JSON data

Web pages

Mobile clients

Database data

Submission
n

Result

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



Foggy
image



ECCV
2016 vs. Huawei



Dark Enhance

Brightness disorder error rate: < 3%

Defog

Actual luminance
retention



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 - Common Services
 - Industry-specific Services

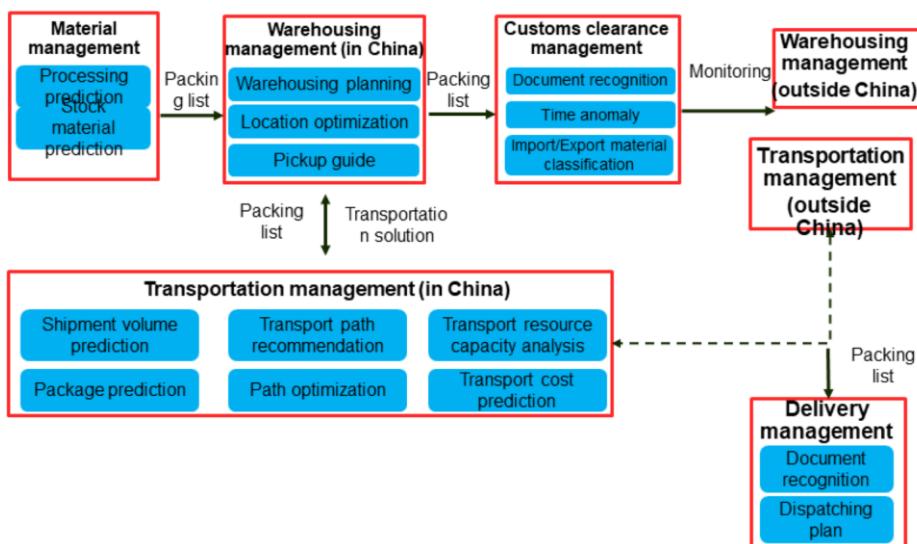
EI Industry-specific Services (1)

- **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

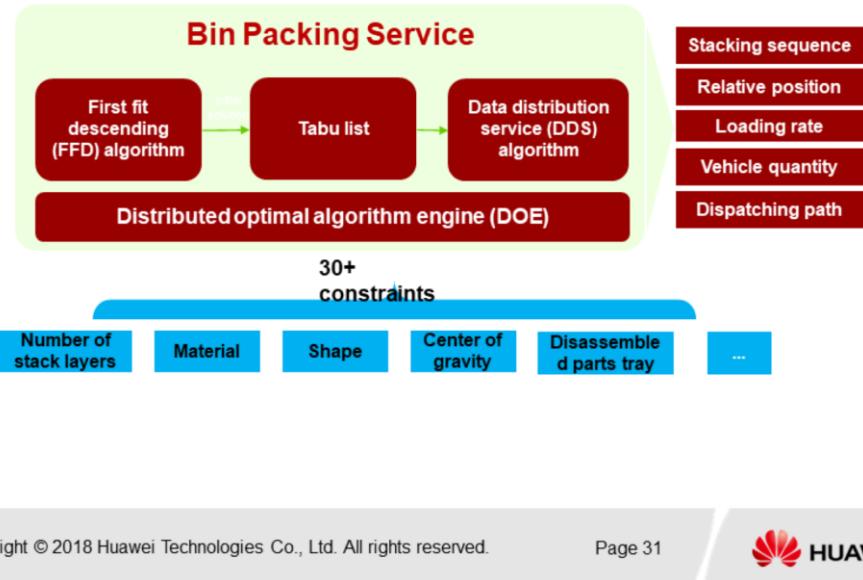


- This solution is optimized based on the E2E process of Huawei's internal supply chain. It streamlines supply forecast, logistics, warehousing, customs declaration, transportation, and acceptance to achieve transformation to smart logistics.
 - Overly frequent transportation: The pickup path optimization algorithm reduces the additional expenses by 30%. The optimal path is obtained based on combinatorial optimization of the 108 supply points of Huawei.
 - Redundant space: Loading simulation improves the loading rate by 6%. It supports multiple container specifications, provides the optimal packing solution based on object features such as the size, shape, weight, and bearing capacity, and enables visualized 3D simulation.
 - Delay or waiting: Quick signature comparison improves the acceptance efficiency.
 - Unnecessary operations: The common form adaptation, segmentation, and tilting problems that occur during form identification are solved. The automatic contour extraction, adaptive combination and segmentation, image tilt correction, and interferential curve clearing algorithms are used to divide and preprocess general forms adaptively. The word library, edit distance, integrated learning technologies are adopted to implement postprocessing correction and improve

recognition accuracy. Automatic entry of customs documents and customs declaration materials greatly saves manpower and material resources, and reduces error line and ghosting issues.

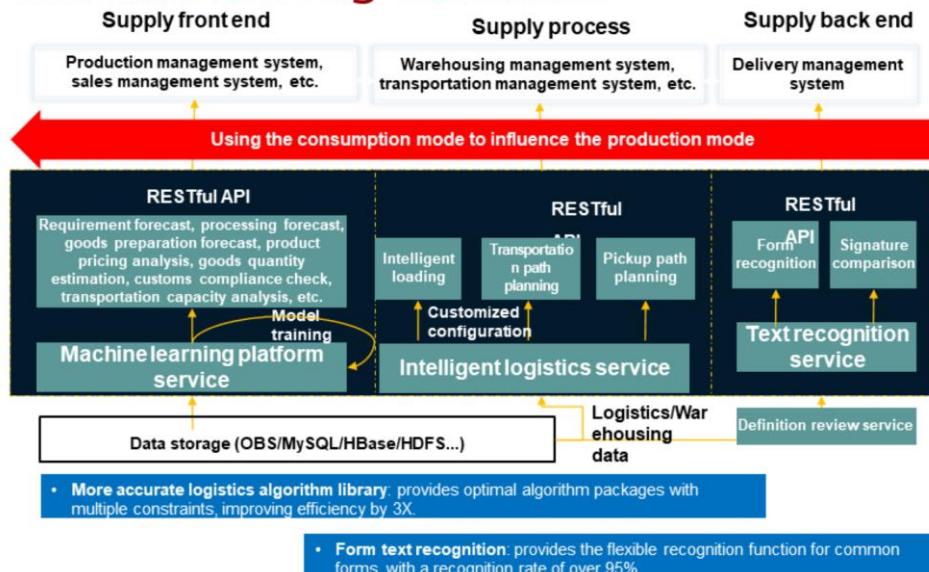
- Errors and challenges: Customs compliance analysis is conducted according to the historical data as well as the exchange rate and market situation of the industry. Alarms are reported for more than 95% of customs data exceptions. In this way, customs declaration can be passed once, reducing the risk of goods overstock.
- Smart warehousing: The warehousing operation efficiency is improved by 10% through optimization of warehousing space, optimal goods classification and placement, and pickup path optimization, saving more than US\$X million each year.

Bin Packing Service



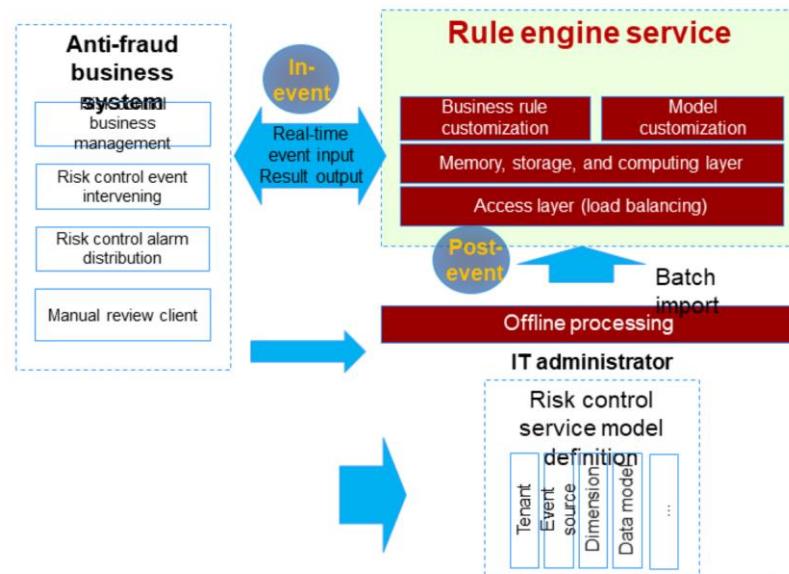
- FFD algorithm: quickly outputs the optimal packing scheme according to the order of box size.
- Tabu list: 30+ complex constraints.
- DDS algorithm: The packing scheme of thousands of boxes is estimated within 2 minutes, improving the estimation efficiency by 10 times, increasing the loading rate by over 6%, and reducing the logistics cost by millions of dollars.

Cloud-based Intelligent Manufacturing Solution



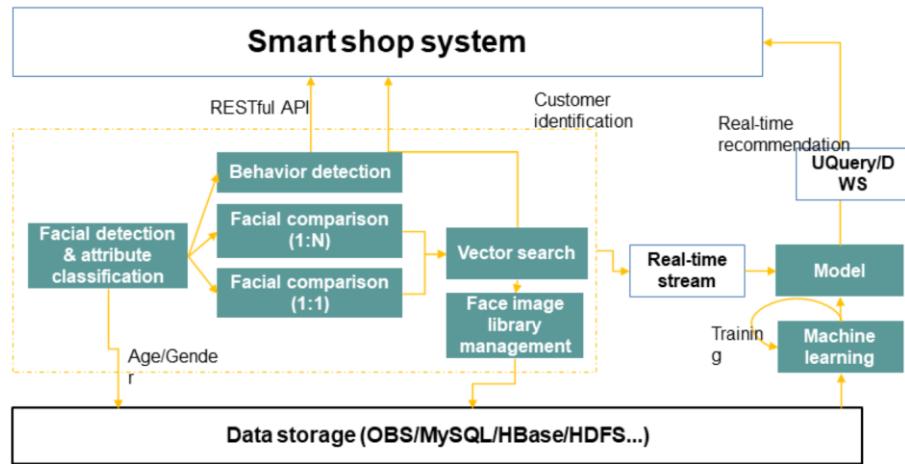
- This solution applies to form recognition and intelligent container loading.

Intelligent Risk Control



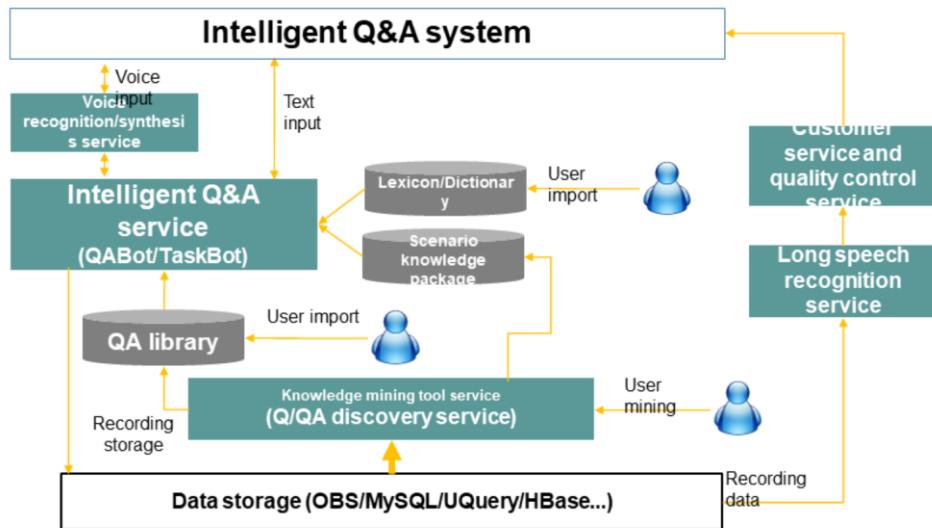
- Number of online running rules: 1000+; delay: < 50 ms; processing performance: 1,000,000+ TPS
- Risk interception rate: > 98%; interception missing rate: <10%; duration required for rule activation: < 3 minutes

Cloud-based Intelligent Shop Solution for the Retail Industry

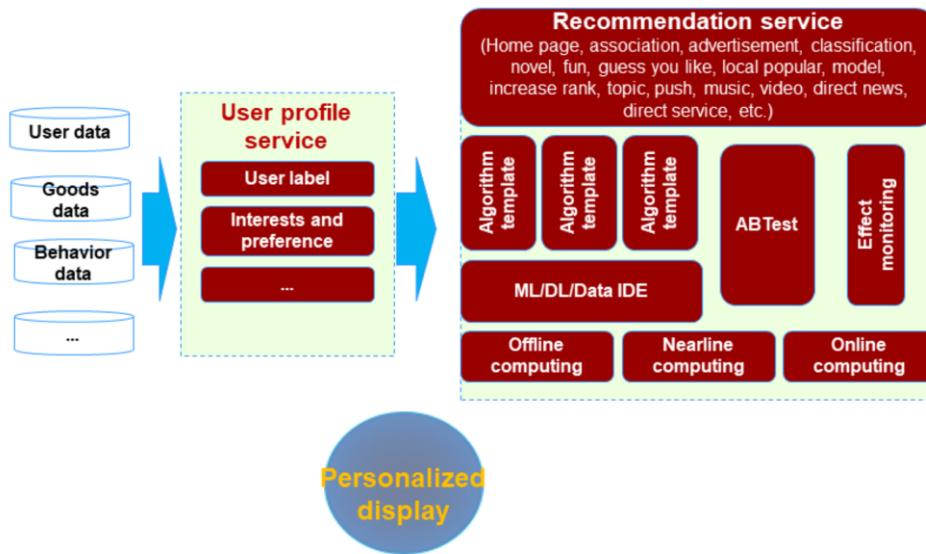


- Facial recognition service: facial recognition AUC: > 99%; search hit rate: >85% (under non-constraint conditions)

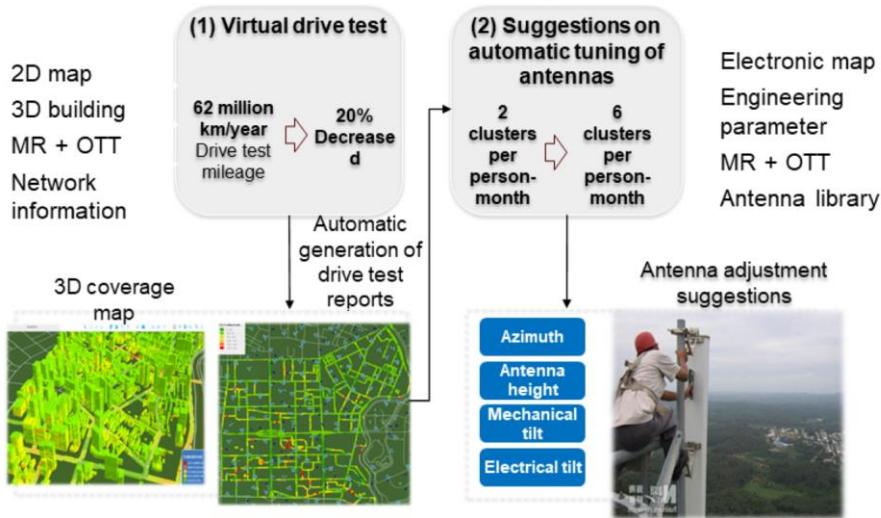
Cloud-based Intelligent Customer Service Solution



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.

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Page 38

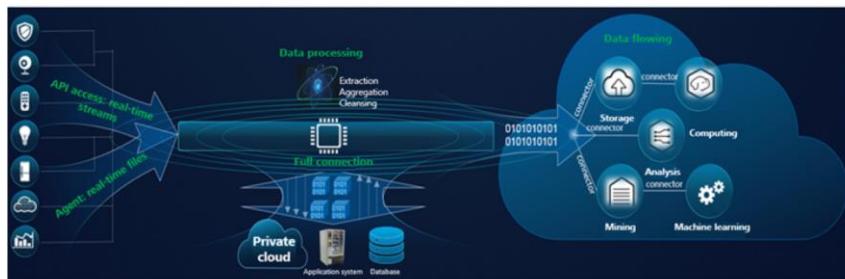


EI Big Data Services (2)

- **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

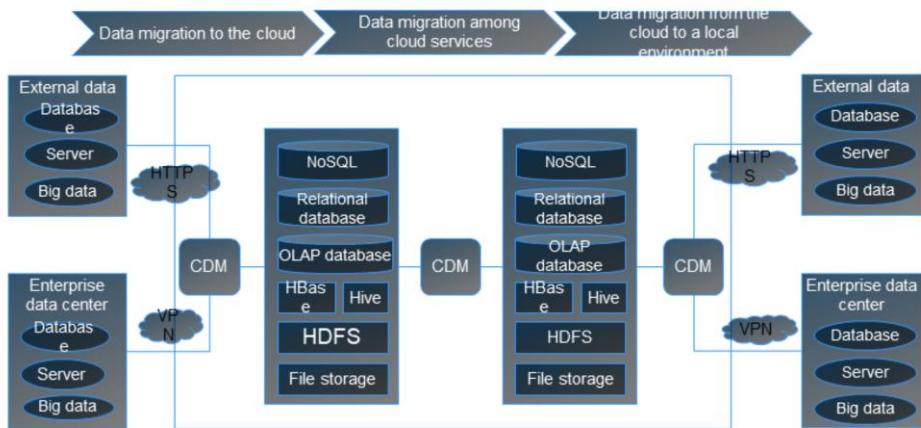
- **Data collection:** connects to multiple data sources through RESTful APIs and agents, is compatible with open-source Kafka APIs, and collects offline data in real time.
- **Data transmission:** transmits data in real time with high concurrency, high reliability, and low latency.
- **Data flowing:** 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.



- DIS is a data collection service. Data from various data sources is transmitted as data flows or files to the OBS or CloudTable for storage. The data can also be submitted to machine learning applications.

CDM: Efficient Batch Data Migration

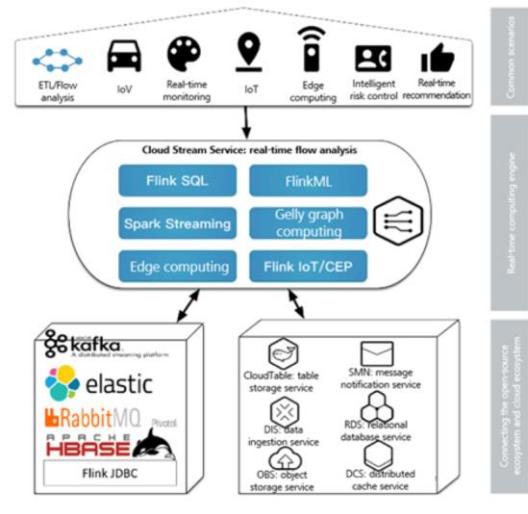
Based on the distributed computing framework, CDM implements efficient batch data migration and supports common data sources such as relational databases, OLAP databases, NoSQL databases, big stored data, and stored files. It provides on-cloud and off-cloud E2E data migration solutions to meet various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



- CDM is applicable to scenarios where real-time data migration is not required. For example, you only need to define the internal and external data sources before migrating data from Alibaba Cloud to HUAWEI CLOUD.

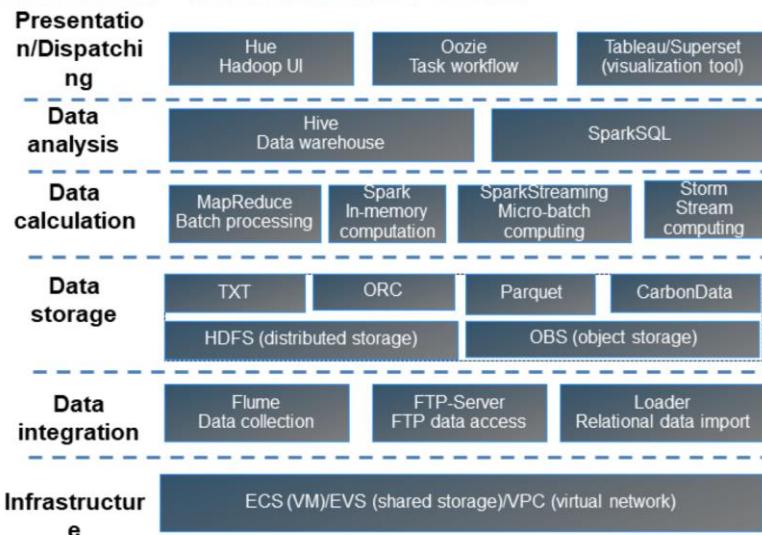
Cloud Stream Service: IoT Core Service

- 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



- Cloud Stream Service is one of the most important services in the future. It is developed based on Flink and Spark streaming. In the open-source community, Huawei has made the most prominent contribution to Flink. A typical application scenario of this service is the IoV field. There are hundreds of thousands of vehicles in a city. Each vehicle reports the GPS location, vehicle speed, gear position (neutral or not), and vehicle running status (whether abrupt acceleration or hard brake is involved) every 5 to 15 seconds. The KPI values need to be calculated through data flows. Alibaba leverages stream computing to monitor data during the Double 11 promotion.

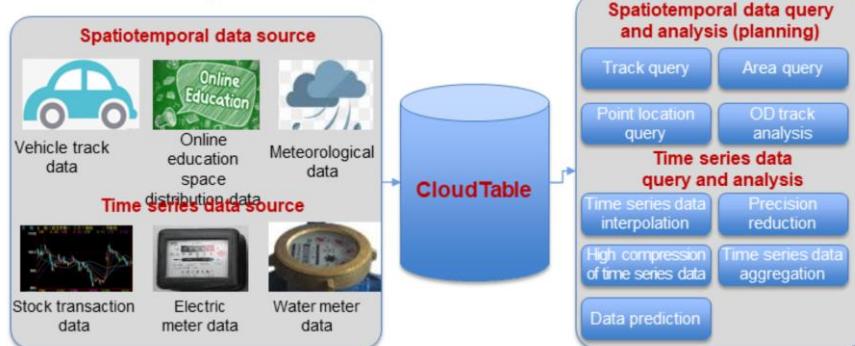
MRS: Enterprise-Level Big Data Cluster Cloud Service



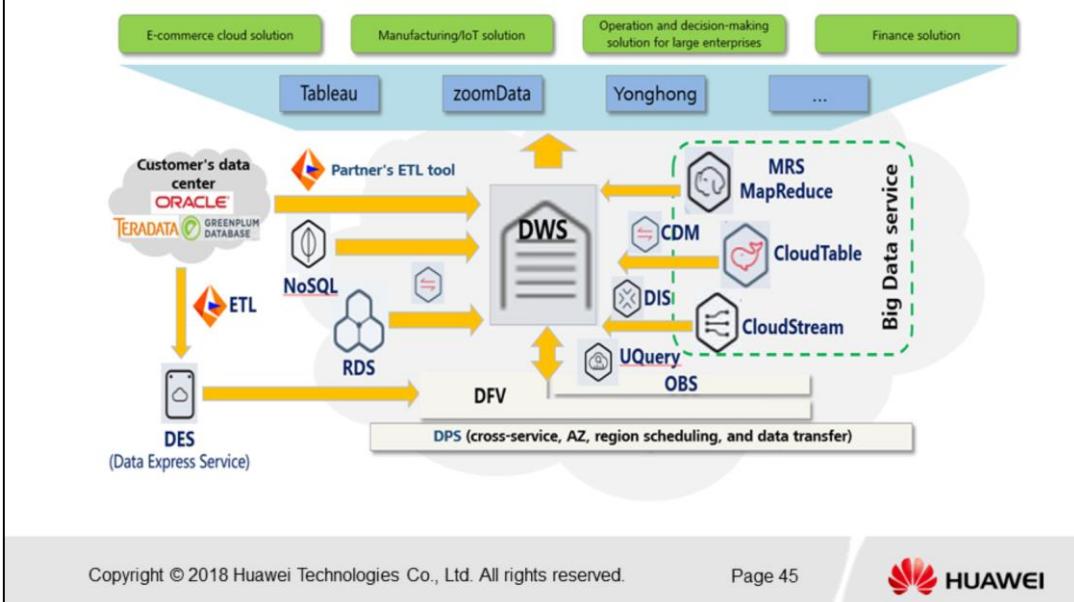
- MRS moves the offline Big Data platform to the cloud.
- Enterprise-level: supports the Kerberos security authentication service to satisfy the high security requirements of enterprises, provides a layer-based tenant model, and allows you to dynamically add tenants.
- Easy to use: provides a reliable, self-tuning, and easy-to-use O&M management platform to simplify O&M management.
- Low cost: isolates computing and storage. In this way, the computing cluster can be created as required and the created cluster can be released after a task operation is completed.
- Open: proactively embraces the open-source Big Data ecology, is compatible with open-source interfaces and easy to interconnect with other services, and provides multiple connection methods such as RESTful APIs and JDBC.

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



- Application scenario: moving traditional enterprise data warehouses to the cloud.
Huawei provides self-developed Oracle or Teradata migration tool. DWS interconnects with mainstream third-party ETL tools to migrate data warehouses such as Oracle, Teradata, Greenplum, and MySQL to the public cloud at a low cost.
- Key competitiveness:
 - Ultimate performance: The performance is two to five times higher than that of HybridDB.
 - Openness and compatibility: DWS is fully compatible with the PG ecosystem and can be interconnected with dozens of third-party ETL and BI tools such as Tableau, Yonghong BI, and Kettle. The SQL capability is better than that of Alibaba Cloud's ADS.



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

- Answers: 1. D; 2. A



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

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