+AI, iMaster NCE Enables Autonomous Driving Network for Enterprises
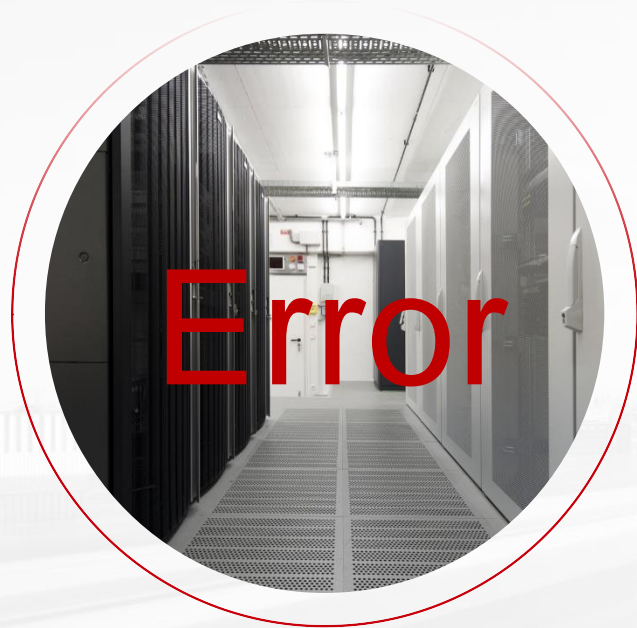
Wang Hui

Director of Huawei Enterprise Network NCE Software

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Manual Configuration and Network O&M Are Insufficient in an Intelligent World

Error

Slow

Difficult

In DCNs, about 40% of faults per year are caused by misconfigurations.
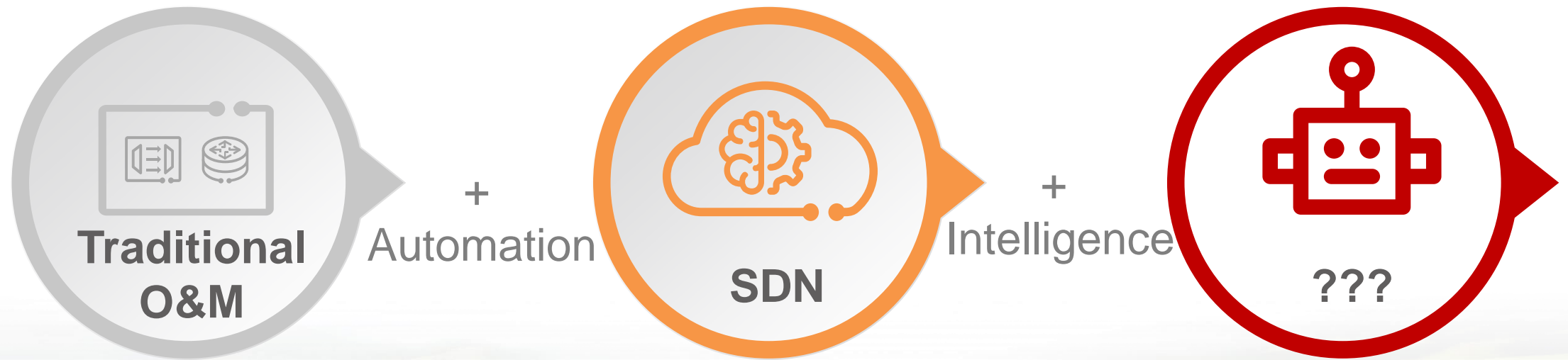
Network departments have to arrange 500+ person-day per month for network design and modification.
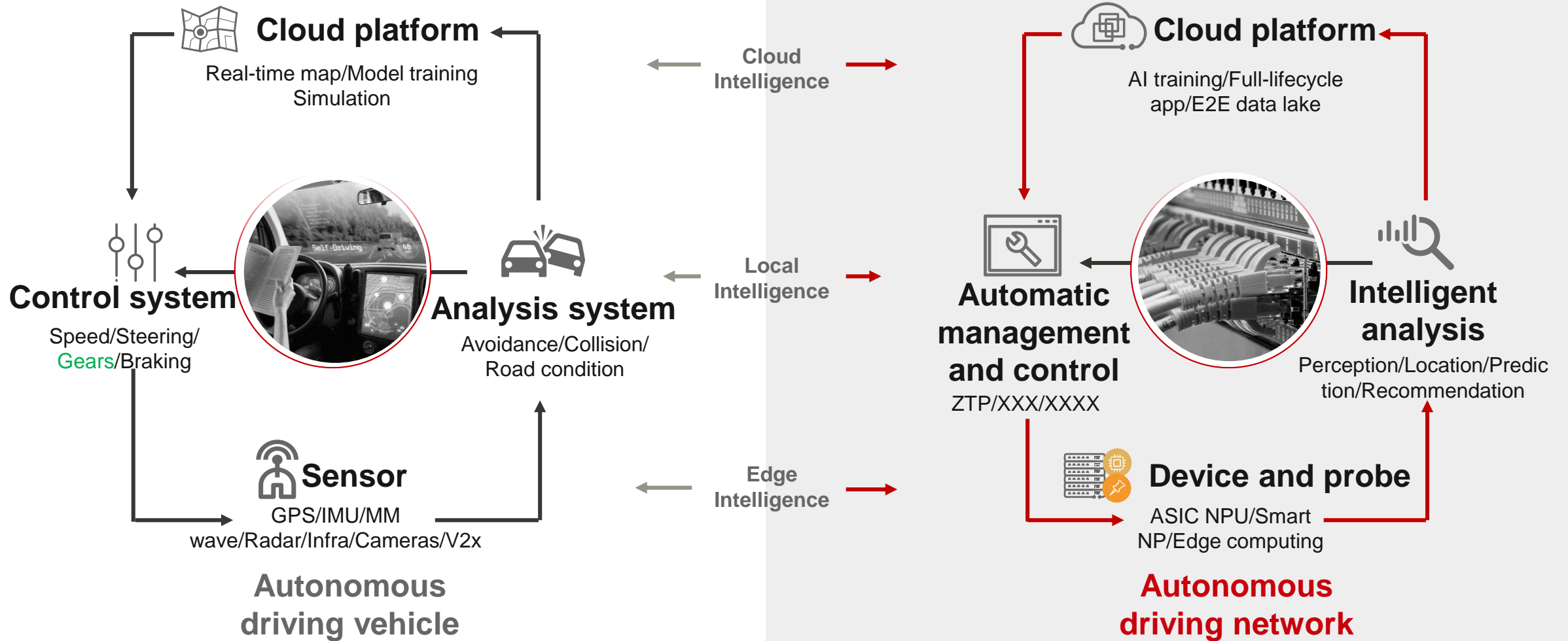
90% of faults are not detected until complaints are reported. Fault location heavily depends on expert experience.
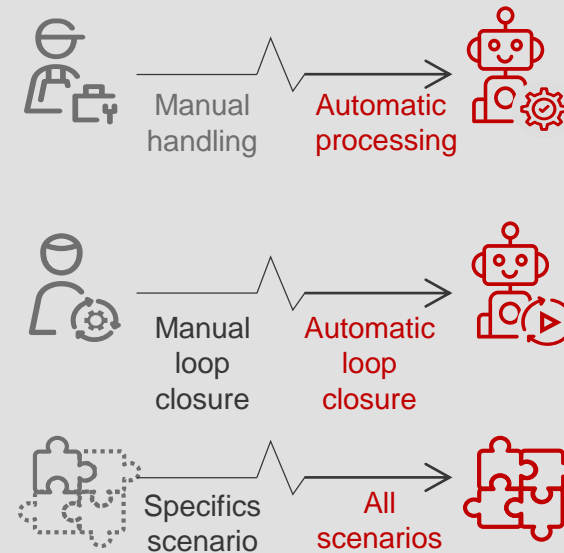
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SDN Insights

Traditional O&M + Automation **SDN** + Intelligence **???**

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Autonomous Driving @ Vehicles and Networks

Cloud platform
Real-time map/Model training
Simulation

Cloud
Intelligence

Cloud platform
AI training/Full-lifecycle
app/E2E data lake

Control system
Speed/Steering/
Gears/Braking

Analysis system
Avoidance/Collision/
Road condition

Local
Intelligence

**Automatic
management
and control**
ZTP/XXX/XXXX

**Intelligent
analysis**
Perception/Location/Predic
tion/Recommendation

Sensor
GPS/IMU/MM
wave/Radar/Infra/Cameras/V2x

Edge
Intelligence

Device and probe
ASIC NPU/Smart
NP/Edge computing

**Autonomous
driving vehicle**

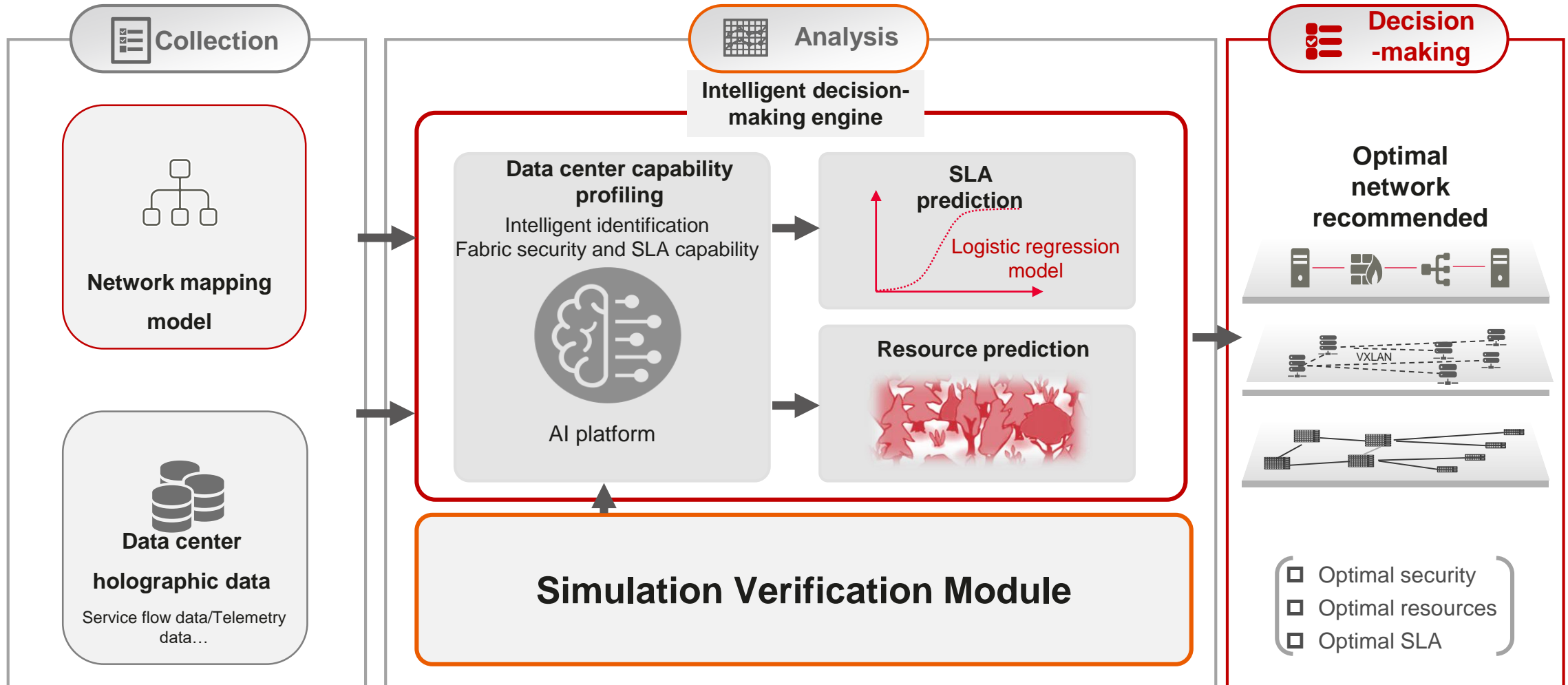**Autonomous
driving network**

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Five Levels of Autonomous Driving for the Mobile Network

Level Definition	L0: Manual Operation & Maintenance	L1 Assisted Operation & Maintenance	L2 Partial Autonomous Network	L3 Conditional Autonomous Network	L4 Highly Autonomous Network	L5 Fully Autonomous Network
Execution	Person	Person/System	System	System	System	System
Awareness	Person	Person	Person/System	System	System	System
Analysis	Person	Person	Person	Person/System	System	System
Decision-making	Person	Person	Person	Person/System	System	System
Intent/Experience	Person	Person	Person	Person	Person/System	System
Application scope	N/A	Specific scenarios				All scenarios

Key Feature

Manual handling → Automatic processing

Manual loop closure → Automatic loop closure

Specifics scenario → All scenarios

5

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L2–L3: Transform Decision-Making from Manual to Machine-based

Collection

Network mapping model

Data center holographic data

Service flow data/Telemetry data…

Analysis

Intelligent decision-making engine

Data center capability profiling

Intelligent identification Fabric security and SLA capability

AI platform

SLA prediction

Logistic regression model

Resource prediction

Simulation Verification Module

Decision-making

Optimal network recommended

VXLAN

☐ Optimal security
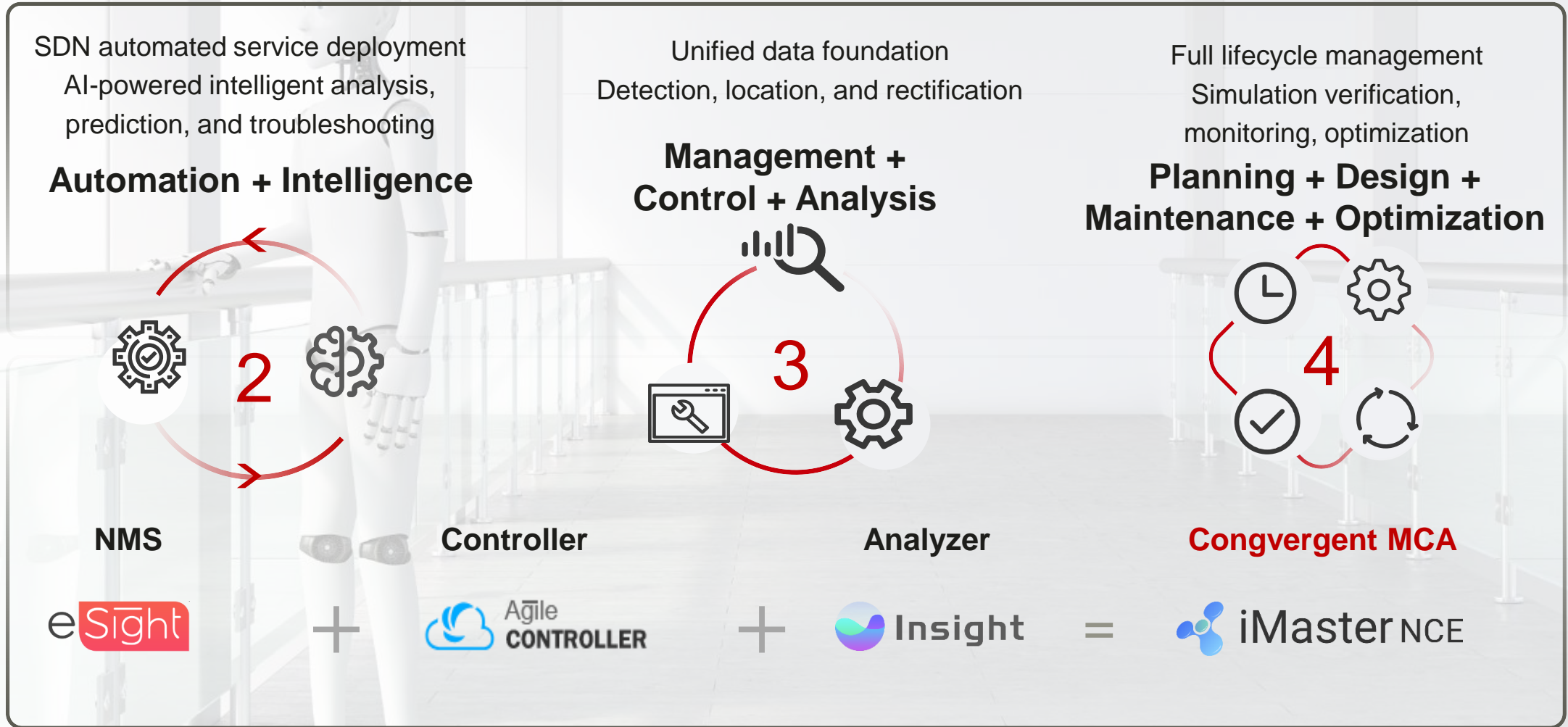☐ Optimal resources
☐ Optimal SLA

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What Is an L3 Autonomous Driving Enterprise Network?

L3: Conditional autonomous network

The system can sense real-time environmental changes and, in certain domains, optimize and adjust itself to the external environment to enable intent-based closed-loop management.
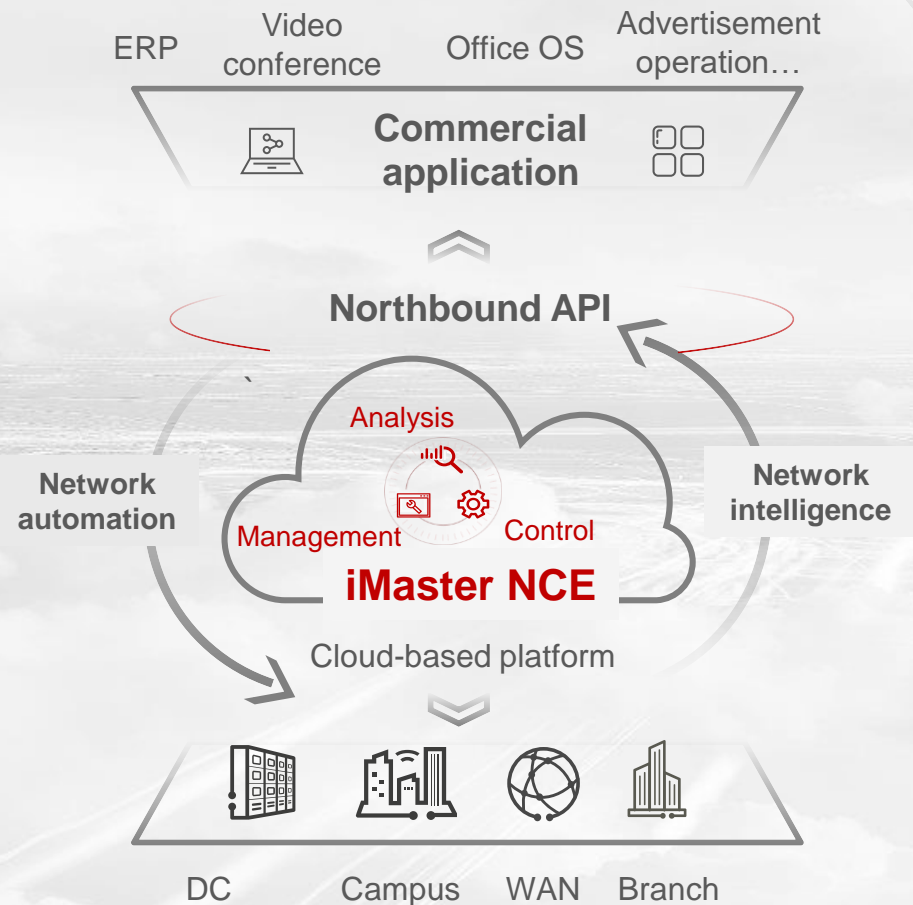
Planning

- Generates insight analysis indicators and planning parameters, and requires manual acknowledgement of them.
- Obtains historical data and performs automatic predictions based on this data.
- Offers online planning, digital survey, and semi-automatic design.
- Provides simulation verification and assisted decision-making.

Design

- Automatically prepares network parameters and SLA assurance policy data.
- Automatically delivers SLA assurance policy configurations.
- Automatically commissions the system, which displays exceptions that are then corrected manually.
- Automatically verifies services and generates acceptance reports.

Maintenance

- Automatically identifies exceptions and locates faults.
- Automatically analyzes root causes of some faults, which are acknowledged manually.
- Automatically generates a specific rectification solution.
- Automatically queries and allocates resources and defines solutions.
- Automatically delivers SLA assurance policy configurations.
- Automatically performs testing and attendance, and detects exceptions.

Optimization

- Automatically converts indicator rules.
- Automatically and accurately identifies exceptions.
- Automatically monitors the environment.
- Automatically locates faults.
- Automatically analyzes faults, which are acknowledged manually.
- Assists decision-making through simulation.
- Automatically adjusts parameters.

Branch — CPE — SD-WAN — DC Fabric — SD-WAN — CPE — AP — Enterpise Campus

Data Center

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Key Changes Brought by iMaster NCE

SDN automated service deployment
AI-powered intelligent analysis,
prediction, and troubleshooting

Automation + Intelligence

2

NMS

eSight

+

Unified data foundation
Detection, location, and rectification

**Management +
Control + Analysis**

3

Controller

Agile CONTROLLER

+

Full lifecycle management
Simulation verification,
monitoring, optimization

**Planning + Design +
Maintenance + Optimization**

4

Analyzer

Insight

=

Congvergent MCA

iMaster NCE

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iMaster NCE Enables Autonomous Driving Network for Enterprises

Industry's First Full-Scenario Intelligent Network Management and Control System with Converged Management, Control, and Analysis

Self-understanding of service intents

Abstract an **intent model** and extract **6 simplification elements** based on a library containing DCN solution deployment experience for Huawei **600+ customers**

Self-recommendation of the optimal network

Intelligent decision-making engine based on the **AI model**, recommending the optimal network specific to service intents

Self-evaluation of change risks

Configuration-plane simulation verification based on the Formal Verification approach, better evaluating network change risks and impacts

Self-optimization of change risks

Based on **dynamic baseline and machine learning,** intelligently identifying exceptions, providing optimization suggestions, and **ensuring optimal experience**

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iMaster NCE Product Series

iMaster NCE
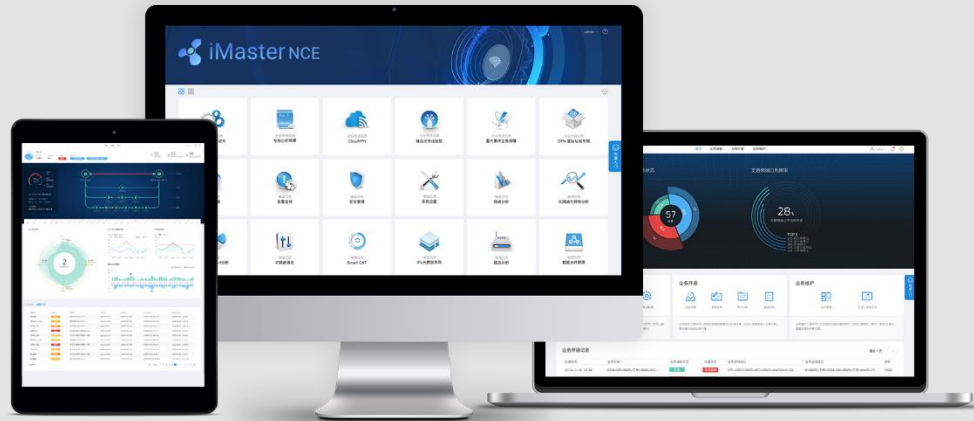
🖥️	Data Center	**NCE-Fabric ***
🏢	Enterprise Campus	**NCE-Campus ***
☁️	SD-WAN	**NCE-WAN ***
⚙️	Transport	**NCE-T**
🌐	IP WAN	**NCE-IP**

Notes: NCE-Fabric, NCE-Campus, and NCE-WAN are available in 2020 Q1.

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Autonomous Driving @ Data Center Networks — Online Banking

Self-understanding of business intent: "The online banking system needs to be provisioned at a high speed."
The iMaster NCE identifies the intent of online banking provisioning and forms the intent-to-network mapping model through the knowledge graph and inference.

Optional network recommendation: "Select the optimal SLA solution and deploy it on the AI Fabric."
Based on the DCN capability profile, the iMaster NCE provides web, app, and database deployment solutions from the aspects of security, SLA, and resources.

Network change self-verification: "Implement refined security isolation and simulate service changes."
The iMaster NCE prevents a specific VM on which a database runs from proactively accessing external networks, as well as verifying resources, connectivity, and impact on original services through simulation before service delivery.

Automatic fault rectification and closure: "Recommend the intelligent handling plan of TCP SYN flood attacks."
The iMaster NCE automatically detects and locates TCP SYN flood attacks, analyzes and evaluates faults based on the fault training AI platform, and provides the optimal troubleshooting plan for customers.

Autonomous Driving @ Enterprise Campus Network — Store Wi-Fi

Intelligent service understanding: "I want to deploy a Wi-Fi network for the new flagship store."
The iMaster NCE identifies the networking intent of the store, matches the expert experience library based on factors such as the area and customer flow, and provides the **optimal networking solution.**

Automatic service deployment: "I want to deploy the guest Internet access service."
The iMaster NCE abstracts service models based on 400+ experience model libraries, **orchestrates and delivers service models online in real time**, and simulates and verifies guest Wi-Fi connectivity and security in advance.

Key service experience assurance: "I want to ensure zero waiting time for cashier services."
The iMaster NCE identifies unknown industry applications based on the AI algorithm and uses HQOS to dynamically schedule traffic on the entire network to ensure optimal experience for key users and applications.

Intelligent radio calibration: "I want to ensure optimal Wi-Fi experience."
AI-boosted intelligent radio calibration intelligently detects environment differences and people flow changes, intelligently predicts user loads, and intelligently optimizes Wi-Fi experience by adjusting power or radio angles.

Thank you.

把数字世界带入每个人、每个家庭、每个组织，构建万物互联的智能世界。

Bring digital to every person, home and organization for a fully connected, intelligent world.