Gartner predicts that large enterprise exclusive use of AIOps and digital experience monitoring tools to monitor applications and infrastructure will rise from 5% in 2018 to 30% in 2023.
... a few numbers...

- worldwide, Huawei Cloud has 45 availability zones across 23 regions (June 2019)
- more than 180 cloud services and 180 solutions for a wide range of sectors
- Customers include European Organization for Nuclear Research (CERN), PSA Group, Shenzhen Airport, Port of Tianjin, …
HUAWEI CLOUD
Success Stories

Huawei Desktop Cloud Helps Hong Kong Airlines Flies High
HKA purchased Huawei’s proven cloud-desktop technologies to reduce operating costs, improve work...
Learn More

Serverius Data Centers Get Huawei AntiDDoS
Huawei enables Netherlands Serverius data centers to protect customers against DDoS attacks.
Learn More

New Large Data Center in Sweden with Decreased Environmental Footprint
Huawei helps Ilhavo raise its infrastructure reliability and lower its environmental footprint by...
Learn More

Qatar Airport Adopts Secure Cloud Storage
OceanStor 9000-based video cloud solution securely manages video for Hamad International Airport.
Learn More

Huawei CloudCampus Helps Honda Agency Grow
Huawei Cloud Campus Solution enables Dongfeng Honda to lower cost of network, expand dealerships
Learn More

Huawei Helps COFCO Coca-Cola Build an Enterprise Private Cloud Platform
You probably didn’t know that, in China, when you drink Coca-Cola, produced by COFCO Coca-Cola...
Learn More

Huawei Cloud Streamlines Beijing Services
Huawei’s Distributed Cloud Data Center helps Beijing government speed services for citizens
Learn More

NHS in the UK Constructs an End-to-End Private Cloud Data Center
Huawei helps Avon and Wiltshire Mental Health Partnership NHS Trust (AWP) build an End-to-End (E2E)...
Learn More

TF1 Finds Performance in Secure Cloud Media
With Huawei’s media cloud, TF1 gets secure, high-performance video editing on low-cost terminals.
Learn More

Huawei Data Center Network Solution Assists Ikoula for Cloud Hosting Services
Huawei Data Center Network Solution reduces service deployment complexity, improves system reliabilit...
Worldwide Trends
Clouds, transformations, edges, scale and complexity

Trend: 5 big clouds (GAAVI), 100+ industry clouds, 500+ regions, 5000+ edge sites. The average business runs 38% of workloads in public cloud and 41% in private cloud

Distributed Cloud

| Static processes | Edge and cloud |
| Hierarchic architectures | Adaptive processes |
| Static network topology | Fog/leash architectures |
| Edge and cloud | Dynamic network topology |
| Distributed cloud to the edge |

Digital Transformation

As digital transformation initiatives start to be implemented, IT infrastructure has become exponentially more complex.

1. Real-time monitoring
2. Prediction optimization
3. Control and decision making

Trend: digital transformation initiative is expected to grow 20% per year until 2025. Intelligent monitoring market is expected to grow b/year until 2025

Cloud Edge Applications

- Video/CDN
- Cloud Gaming
- Industrial IoT
- Smart Venues
- Automotive
- AR/VR

Not only monitoring tools are important, the velocity of code deployments also becomes key
- Automation of 10k deployments/year
- >50 monitoring tools
- Trillions metrics/day
- Service availability?

Trend: Digital Transformation increases the number of managed servers 10x, 10k deployments/year, >50 monitoring tools, trillions metrics

Overwhelming number of alarms and monitoring data, makes it impossible to know where to focus during incident resolution.
Intelligent Cloud Technologies Lab

R&D Direction: The Cloud-Edge-Device Continuum

- AI for DevOps
- DevCoud
- Next-Gen Build System

IoT
- Real-time Analytics
- Digital Twins Framework

Data Quality

EI
- Online Traffic Optimization
- Universal RT Data Processing

Data Lake
- OA
- HRM
- ERP

IaaS
- Computational Storage
- Intelligent Virtualization
- Heterogeneous Computing

Device

Edge

Cloud

AIOps Algorithms
- Anomaly Detection / RCA
- Recommendations
- Self Recovery

ModelArts

Data Lake

ModelArts

CloudScope

CloudAutoChange

CMDB

AIOps for Networks

AIOps for IaaS (compute, storage)

AIOps for Edges

AIOps Platform
- Data Access & Proc.
- Pipelines & Infra.
- Services

AI for IaaS
Research Fields
AIOps for SRE, Edge AI and AI for Networks

AIOps for SRE

- Edge AI
- AIOps for SRE
- AI for Networks

FIGURE 2
Telecom edge compute, or the “far edge network,” brings computing to within 30 miles of its data source

Cisco

## R&D Direction

**AI-driven autonomous systems**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Use AI/ML to transform the cloud, IT operations and infrastructure by processing massive amounts of data to trigger <strong>automated actions 24/7</strong>, with <strong>higher reliability, higher operational efficiency and cost savings</strong></th>
</tr>
</thead>
</table>

### Research Fields

<table>
<thead>
<tr>
<th>AI for IT Operations</th>
<th>Edge AI</th>
<th>AI for Network</th>
<th>AI for DevOps</th>
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</thead>
<tbody>
<tr>
<td>Anomaly detection</td>
<td>Intelligent Container Tracking</td>
<td>Formal Verification</td>
<td>Log Recommendation</td>
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<tr>
<td>Root-cause analysis</td>
<td>Computing Models</td>
<td>SmartNICs &amp; Troubleshooting</td>
<td>Code Analysis</td>
</tr>
<tr>
<td>Failure Prediction</td>
<td>Federated Learning</td>
<td>Intent-Based Networks</td>
<td>Structured Logging</td>
</tr>
</tbody>
</table>

### Methods

### Scenarios

### Fundamental Research

AIOps, DataOps, MLOps, federated learning, deep learning, formal verification methods
CloudScope provides operators with an end-to-end automated O&M platform to manage cloud data centers and cloud services.
AI-driven Network Automation
Intent-Based/Driven Networking (IB/DN)

**Intent-Driven Platform**

- **Intelligent network brain**
  - Self-planning and self-verification
  - Self-discovery and self-inspection
  - Self-analysis and self-diagnosis
  - Self-optimization and self-repair

- **AI model layer** (network model, algorithm description, and intent translation)

- **Intelligent monitoring & diagnosis**
  - Full flow analysis
  - Intelligent dialing test
  - Packet loss diagnosis
  - Traffic scheduling
  - Failover
  - Network change

- **Automatic control platform**
  - Incremental configuration generation

**Network management and control** (executing controllers and monitoring probes)

**Network Configuration Model**

- Automatic generation of configuration model definitions and configurations based on network architecture and device layer to support full lifecycle management of network configurations

**Network Verification**

- Traditional configuration
- Network object model
- Abstract data plane

- Large-scale real-time continuous verification, full end-to-end support, Stateful, network and virtual networks, and timely discovery of network events on the entire network

**Network Programmability**

- Design decomposition, logic simulation, and logic synthesis are designed to improve the automation efficiency and accuracy of network design.

**Objective:** The network configuration model is standardized
The configuration of a single device evolves to the service rule configuration
High-Level Research
Key Contributions

**Goal:** Achieve worldwide recognition by 2021/22
Attract high-level PhD researchers and experts in the fields of AI and CS

Several AIOps Papers at A and A* ranked conferences
- Self-Attentive Classification-Based Anomaly Detection in Unstructured Logs, ICDM 2020 (Rank: A*)
- Self-Supervised Log Parsing, ECML PKDD 2020 (Rank: A)
- Anomaly Detection and Classification using Distributed Tracing, IEEE CCGrid 2019 (Rank: A)
- ...

10 AIOps Patents
- Apparatus and Method for Detecting an Anomaly Among Successive Events
- Automated Root-case Analysis for Distributed Systems Using Tracing-data
- Span Categorization for Microservice Applications
- ...

ULTRA-SCALE AIOPS LAB
HUAWEI CLOUD
Ai for Networks

WE'RE HIRING

PhD Student in Cloud Datacenter Networks (m/f/d)
Intelligent Cloud Technologies Lab - Munich, Bavaria, Germany - Temporary - JC

Description
Huawei is a leading global information and communications technology (ICT) solutions provider. Driven by a commitment to operations, ongoing innovation, and open collaboration, we have established a competitive ICT portfolio of end-to-end solutions in Telecom and enterprise networks, Devices and Cloud technology and services. Our ICT solutions, products and services are used in more than 170 countries and regions, serving over one-third of the world’s population. With 180,000 employees, Huawei is committed to develop the future information society and build a Better Connected World.

Huawei's Munich Research Center is responsible for advanced technology research, architectural development, design and strategic engineering of our products.

The size of our cloud platform is gaining momentum and it is already planet scale. Huawei Cloud is one of the largest and fastest-growing platforms in the world. It has strong presence with over 40 availability zones located across 4 continents and 23 geographical regions, covering locations such as Germany, Hong Kong, South Africa, or Brazil, among others.

Now we are looking for:
Senior Cloud Network Architect (m/f/d)

As a network expert of HUAWEI CLOUD, you will build and lead a team that is responsible for reliable operation, research and engineering, and evolution of data center networks. You will be part of the Ultra-scale AIoPS Lab and the Computing and Network Innovation
Thank you.