AI Promoting Smart Network

ZTE

Story

PAST

CURRENT
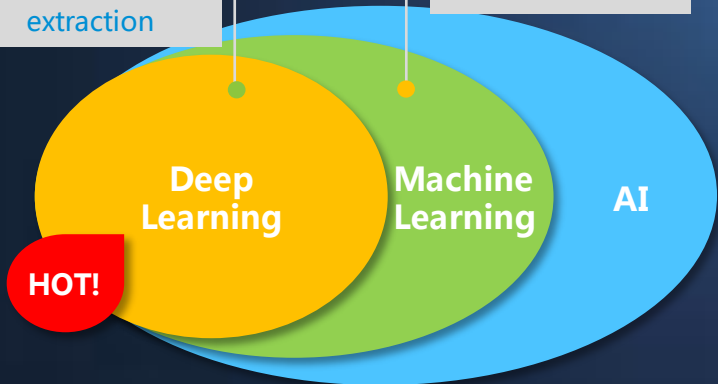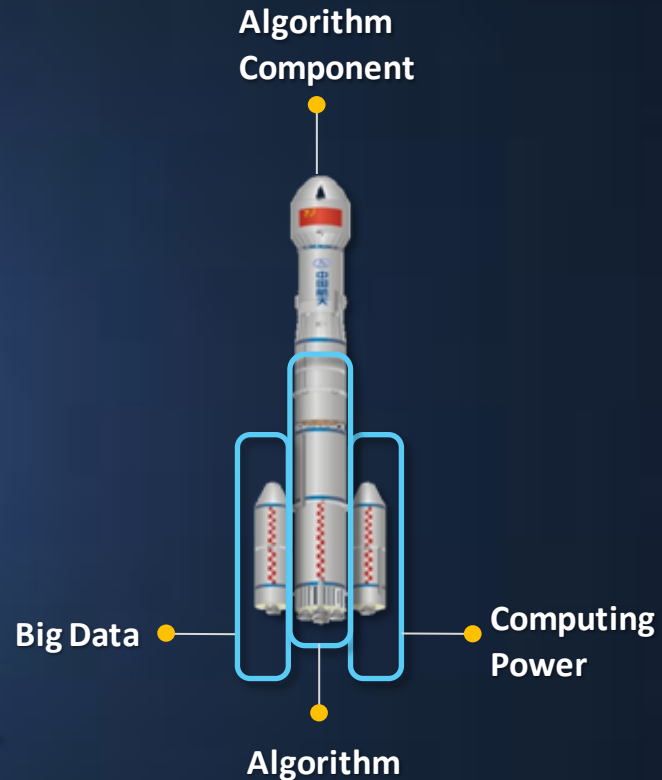
Content

ZTE

What's AI?

Any use of machines instead of humans, to complete the work which usually requires human's intelligence to complete(e.g. cognition, identification, analysis, decision making, etc.), all can be considered to belong to the scope of AI.

cat

input → characteristics → rules → output

DL: auto-characteristic extraction

ML: auto-rule creation

Deep Learning

Machine Learning

AI

HOT!

Input	Output	Application
English text	Chinese text	Machine translation
Voice	Text	Voice recognition
Vehicle camera	Pilot environment	Autopilot
User profile	Repayment ability	Credit approval
Log & alarm	Fault or not	Troubleshooting
BTC parameters	Optimized parameters	Intelligent optimization

ZTE

Key Factors to Accelerate the AI Progress

Smart City Smart Home Smart Networks Smart Operation Smart Robot

Algorithm Tool Kit

Machine Learning

Deep Learning

Reinforcement Learning

Transfer Learning

CPU Computation

GPU Computation

Quantum Computation

Algorithm Component

Big Data

Computing Power

Algorithm

ZTE

Content

ZTE

Open An Intelligent Era of Telecommunication Network

AI
Machine Learning

Big Data

Intelligent O&M

✓Abnormal detection

✓RCA analysis

✓Alarm control

✓Failure prediction

Intelligent Optimization

✓Auto-optimization

✓Intelligent Elastic

✓Dynamically route optimization

Intelligent Operation

✓Smart customer service

✓Customer profile

✓Precision marketing

✓User experience improvement

Intelligent Security

✓Attack and abnormal traffic intelligent analysis

ZTE

AI Based Intelligent Network O&M

History Alarm

Characteristic Extraction

Machine Learning

Library

1

2

3

E.g. event A

Feature1: Call success rate decreased

Feature2: DB access alarm

Feature3: Packet loss rate increased

Event   Feature

R&D Lab

Production Network

2 **Feature matching**

1 **Monitoring**

3 **Analysis & decision**

Networks

4 **Failure handling**
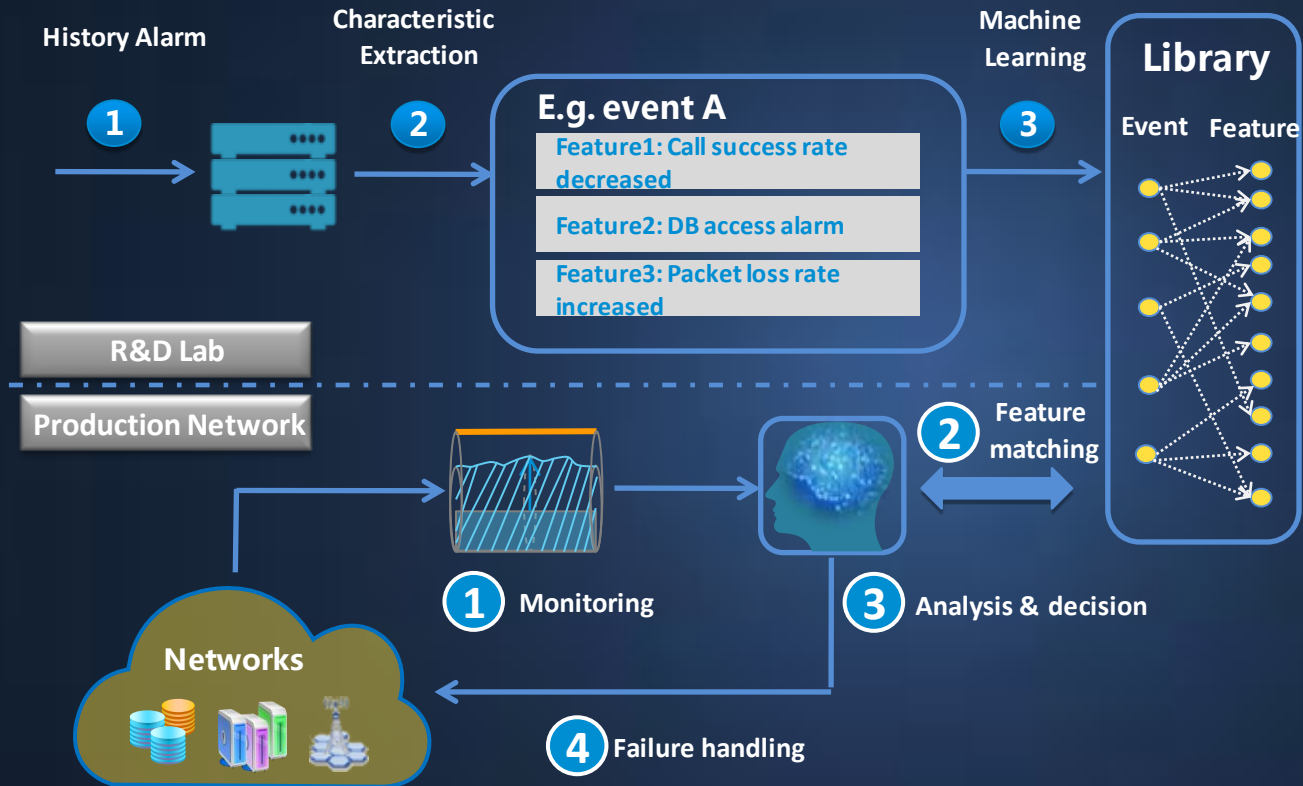
Challenge:

- RCA is more difficult due to the network getting more complex

- Massive apps coming makes the O&M workload increase rapidly

- Passive O&M mode makes the user experience very poor

Solution:

AI + Big Data

- Automatically generate the knowledge library and strategies

- Forward-looking O&M mode
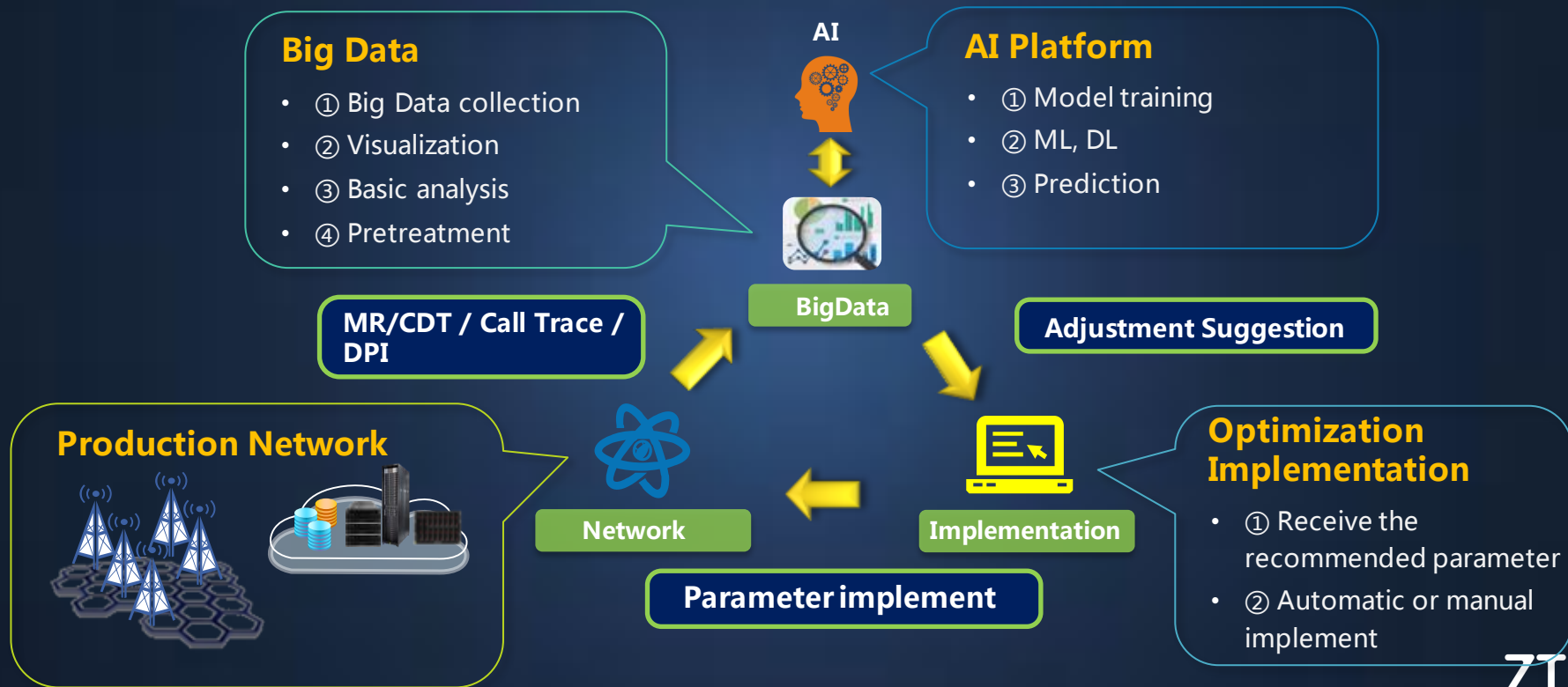
ZTE

Advantage and Benefits of Intelligent O&M

- Health detection
- Alarm prediction
- Smart warning

Before

Intelligent Prevention

Happening

Intelligent Process

- Alarm control
- RCA analysis
- Associate-alarm filtering
- Intelligent dispatch

Benefits

✓ Improve efficiency, accuracy, make O&M easier and faster

✓ Decrease OPEX: manpower cost, vehicle scheduling cost, etc

✓ Reduce user complaints, improve user experience

- Update prediction library
- Self-learning to extract new features

Intelligent Learning

After

ZTE

Intelligent Optimization

Closed Loop Optimization Solution:
Production Network + AI & Big Data + Parameter Optimization Implementation

AI

Big Data
- ① Big Data collection
- ② Visualization
- ③ Basic analysis
- ④ Pretreatment

AI Platform
- ① Model training
- ② ML, DL
- ③ Prediction

BigData

MR/CDT / Call Trace / DPI

Adjustment Suggestion

Production Network

Network

Implementation

Optimization Implementation
- ① Receive the recommended parameter
- ② Automatic or manual implement

Parameter implement

ZTE

Forecast of Human Cost Savings

20% OFF

50% OFF

70% OFF

90% OFF

Introduce SON Technology

Auto-configuration

Introduce Big Data

Introduce AI

ZTE

Intelligent Coverage Optimization

Input from Big Data

- Problem area mining
- Original training data
- Prediction and comparison of optimization results

AI

Production Data

- KPI
- configuration
- Engineering parameter
- MR/CDT
- Call Trace
- MDT

Big Data

Reasoning result output

- Antenna Inclination Suggestions
- Power Parameter Suggestions
- Neighbor Suggestions
- Engineering Suggestions

Implementation

Advantage

- **Automatic coverage optimization:**
  - **weak coverage or over coverage**
  - **Hot or blind area coverage**
  - **Neighbor optimization**
  - **...**

Benefit

- **Reduce:**
  - **Manpower KPI analysis**
  - **Manpower Maintenance**
  - **Complaint handling**
  - **Driving test**
  - **Verification test**

ZTE

Intelligent Capacity Optimization

Input from Big Data

- Target cell mining
- Original training data
- Service type distinction
- Prediction and comparison of optimization results

AI

Production Data

- KPI
- configuration
- Engineering parameter
- MR/CDT
- Call Trace

Big Data

Implementation

Reasoning result output

- Capacity parameter(SR/CQI/SRS) Suggestions
- AC-bar Suggestions
- Load Balance Suggestions
- T/F Interoperability Suggestions

Advantage

- Adaptive Capacity
  - according to the CU changes Learning and Prediction the future trend of CU
  - adjust the cell capacity parameters automatically to guarantee the balance of user access and user experience

Benefit

- Maximize the usage of cell resources
- Reduce:
  - Manpower KPI analysis
  - Manpower Maintenance
  - Complaint handling
  - Driving test

ZTE
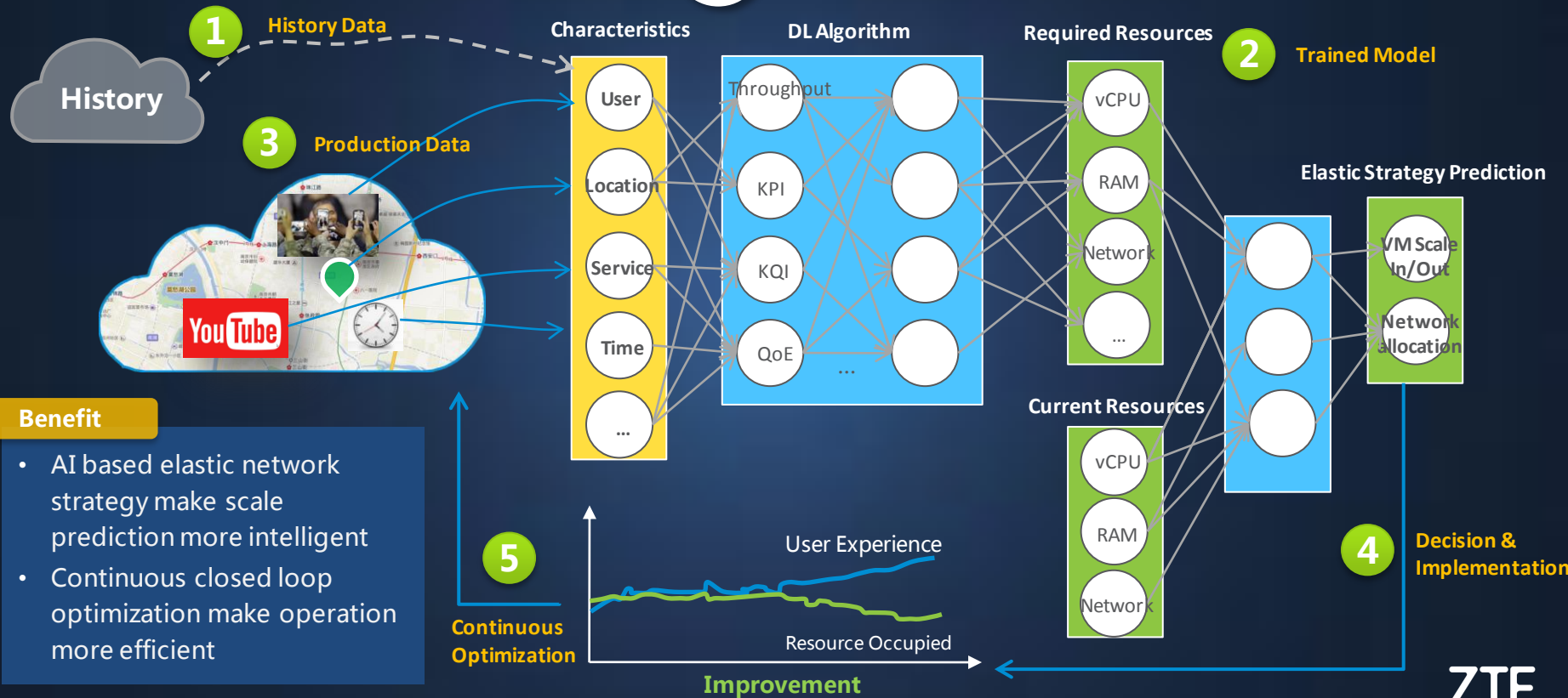
Intelligent Traffic Prediction of Bearer Network

Factor Extraction

Algorithm Development

Global History Data

1

2

Algorithm Library

Linear regression

Random forest

Time sequence

...

R&D Lab

Production

Pretreatment

Training Sample

1

2

Start

Area History Data

Holiday correction factor

Requirement input

4

5 Prediction

3 Algorithm Selection

6

Prediction Result Output

Solution

- Traffic forecasts
  - Forecast the future traffic growth of different service type in different area
- Peak Prediction
  - Daily busy/idle time model, Holiday model, Peak/average traffic model
- Traffic simulation
  - Distribution situation
  - Hot area

Benefits

- Timely expansion prediction
- Bottleneck discovery
- Traffic adjustment recommendations, to avoid waste of resources
- Forward-looking O&M, alarm warning in advance

ZTE

Intelligent Operation

Collection

Big Data

AI

Sale

Creation   lifecycle   Evaluation

Optimization

Service Cloud
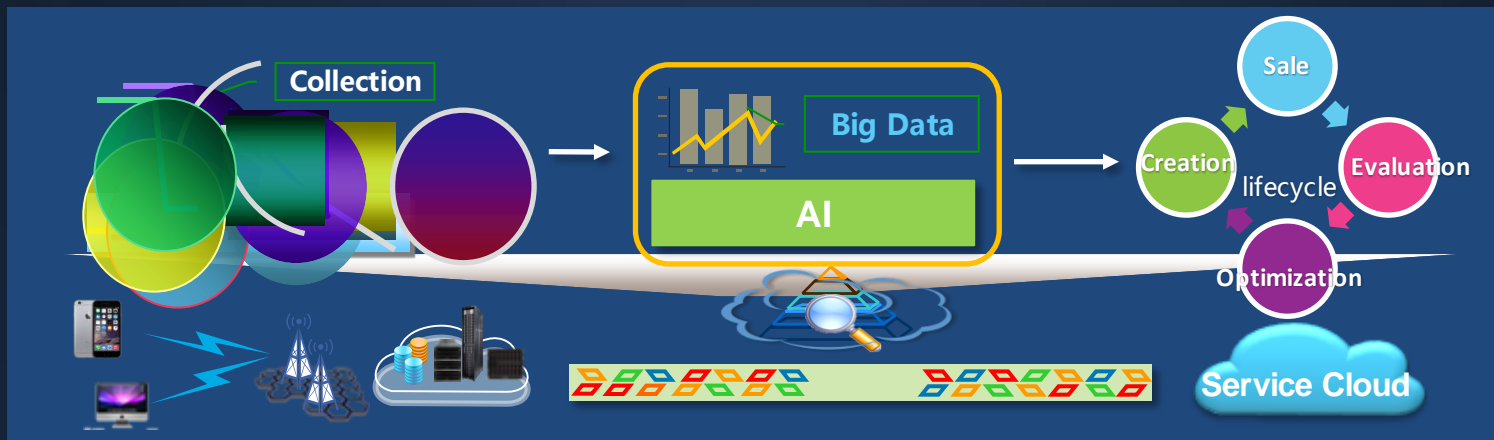
| **Service Creation**	→	**Business Sales**	→	**Experience Guarantee**	→	**Business Optimization**

User behavior analysis

User profile

Audience analysis

Directional push

Experience analysis

Smart customer service

Forward-looking customer care

Intelligent parameter suggestion

Intelligent customer service

AI + Big Data: Support whole life cycle management intelligently, improve operation efficiency.

ZTE

Attack and Abnormal Traffic Intelligent Analysis

Spread

Penetration

Outreach

Office area

Office area

Core office area

Internet
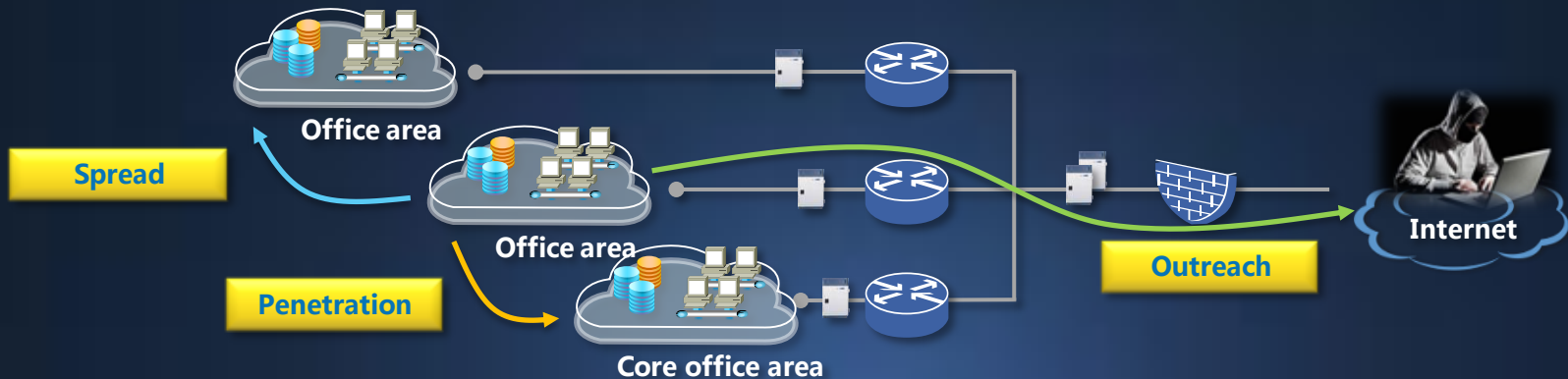
Outreach

- Unknown threat attempts to contact with attackers to receive instructions or send messages

Intelligent security

- DGA detection, periodic detection, stepping detection, reverse connection detection, etc.

Spread

- Unknown threat spreads rapidly in the office area

Intelligent security

- Scanning behavior detection, similarity behavior detection, behavioral association analysis, etc.

Penetration

- Unknown threat attempts to penetrate into the core office area

Intelligent security

- Normal access behavior model, exceptional index, access user group category identification, etc.

ZTE