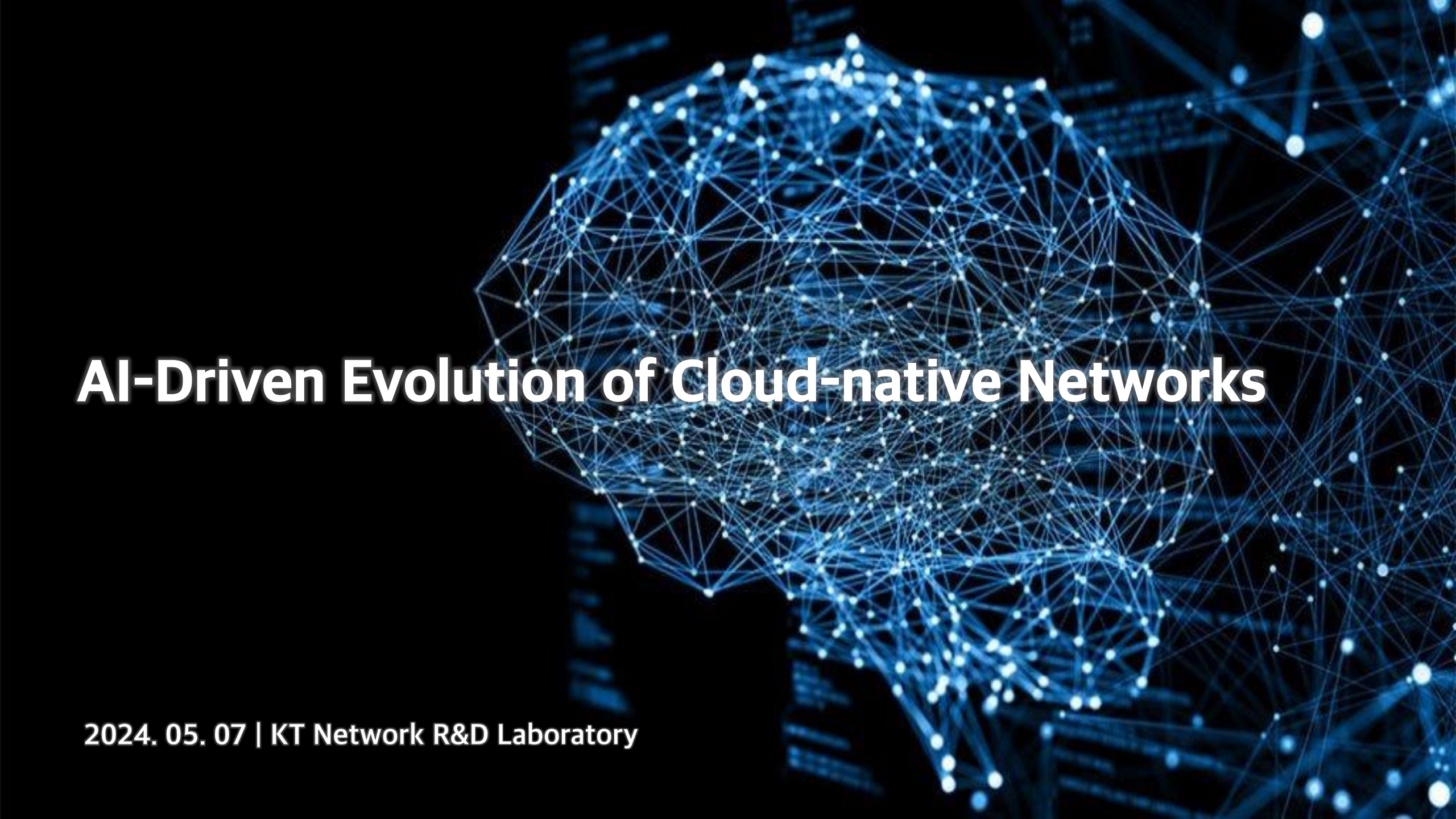
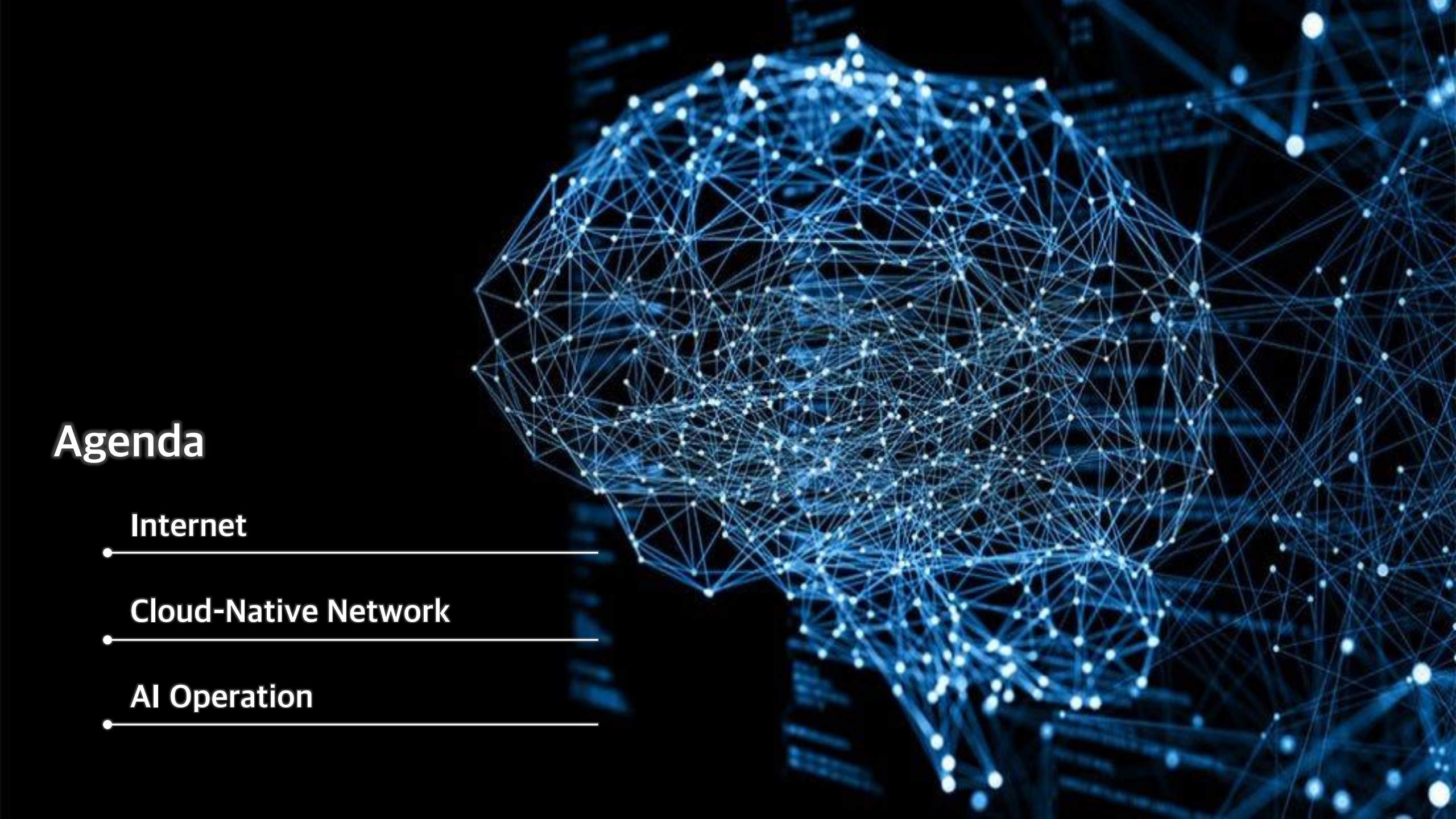


AI-Driven Evolution of Cloud-native Networks

2024. 05. 07 | KT Network R&D Laboratory



Agenda

- Internet
- Cloud-Native Network
- AI Operation

Internet History

The Advert of New Technologies and Trends with the change of Internet generations

1980s

Dial-up Internet

Simple Data Exchange

(about 128kbps)

2000s

High Speed Internet

High Volume Data Exchange

(over 100Mbps)

2010s

Mobile Internet

From Laptop To Phone

(Beyond Speed, UX changes)

Network Evolutions

Innovative Network Technologies and Architecture along with New Needs & Service Requirements

High Speed & Quality

〔ADSL〕	〔VDSL〕	〔Ethernet〕	〔GiGA Internet〕
640Kbps	50Mbps	100Mbps	1Gbps → 10Gbps
ATM Network		IP Network	PON Technology

Mobile & UX

〔2G〕	〔3G〕	〔4G〕	〔5G〕
50Kbps	144Kbps~	~1Gbps	~10Gbps
Voice+SMS	2G+**Data**	3G+**OTT**	4G+**α**
	Mobile Revolution		

"Generation Evolution involves Replacement of Hardware with new Technologies"

What'll be Future Service & Network

Imagine Services First and then Consider Network Architecture for Service

Mixed Reality

Time-Machine

Hologram

【 Service Requirements 】

Large Volume

Dynamic & Changeable

Fast Interactive

.
.
.

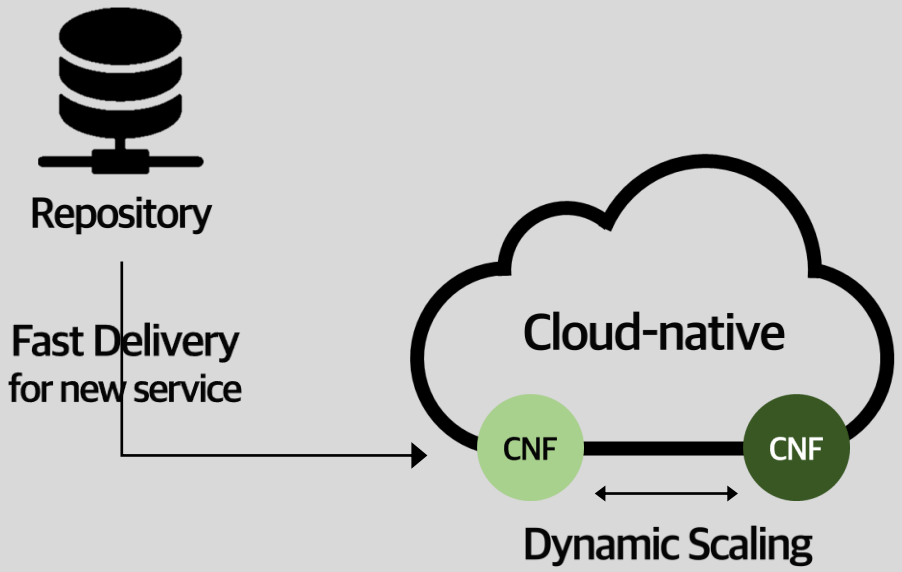
Very Difficult or Impossible
@HW-centric Network Architecture

" Software-Centric ? "

What is Software-Centric Network ?

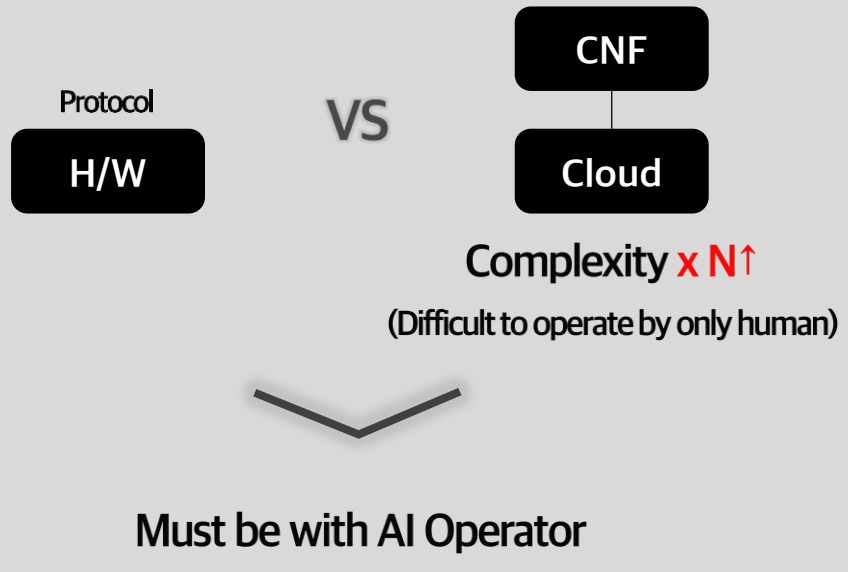
Cloud-Native Networks

"Everything as much as possible, on the Cloud"



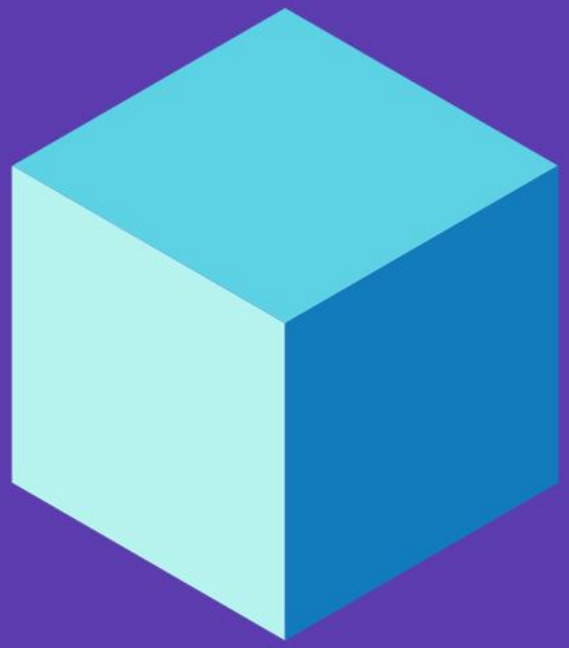
AI Network Operations

"AI Operator assists Human Operator"



Cloud-Native Phase-in @IT Industry

IT Industry with Rapidly Changing and Growing → “To Be, or Not To Be”



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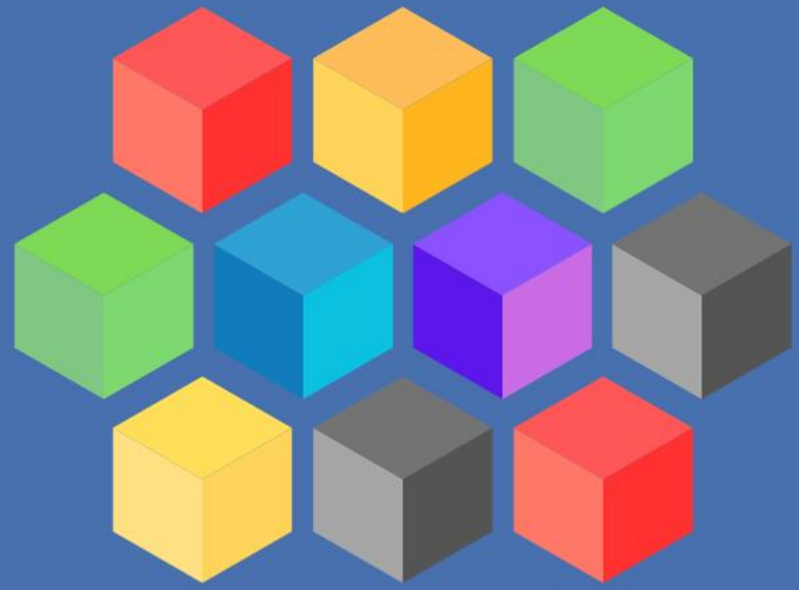


Monolith

Microservices

Cloud-Native Reference @IT Industry

NETFLIX

7 Years for Cloud Migration *(2008 ~ 2016)*

√ 8 times as many streaming members than in 2008

√ Monthly streaming hours 1,000 x growth

amazon

MSA + Thousands of DevOps

√ 190 Million Deploy Per Year (6 / Sec) @2020

√ Fast Build & Deploy with CI/CD Pipeline

Why Cloud-Native for Telco ?

Network Infrastructure also can be fast and Dynamic along with Fast and Dynamic Future Service.

Traditional Network	Network Softwarization
HW Dedicated Equipment	Container-based Cloud Infra
All-in-One Monolithic	Functional & Modular
Inefficient HW Expanding only	Efficient Dynamic Scaling

Global Telco Trend & Eco Trends

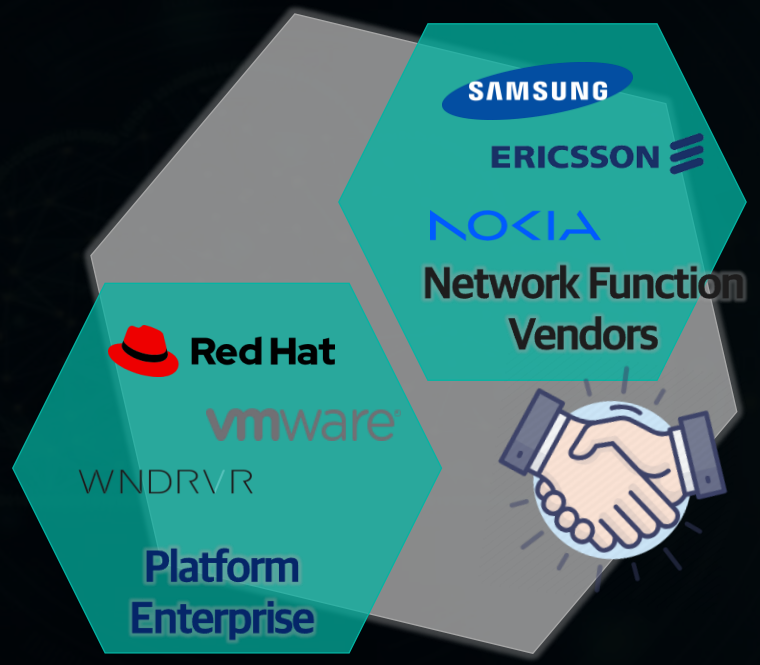
Evolving Already Container-based Cloudification @5G and Consolidating Eco among Vendors

verizon
Telefónica
KDDI
Jio

5G Core Network
UPF, SMF, AMF…

Container-based

Deploy Container-based Infra @5G



Collaborate Network & Platform Vendors

Cloud-native for Telco

1 Split Network Functions into MSA

Flexible, Agile and Resilient

2 Improve Resource Efficiency

Scale up or down depending Network state

3 Expand easily new Domain

Integrate CT and Vertical IT Industry

Then, How will the Operation Transform ?

AI-Driven Operations Directions at Cloud-Native Era

Heading for AI-assisted Autonomous Network In a Complex Network Architecture

SDN

Automated Operations

+

Network AI

Predict, Decide & Energy Saving

〔Reference〕 Autonomous Network Level

Autonomous Network Level defined by TM Forum and ETSI

[Source] TM Forum 2021 Autonomous Network Whitepaper

KT Status

Goal

Autonomous Level	〔L0〕 Manual Operations & Maintenance	〔L1〕 Assisted operations & Maintenance	〔L2〕 Partial autonomous network	〔L3〕 Conditional autonomous network	〔L4〕 Highly autonomous network	〔L5〕 Fully autonomous network
	Support Monitoring and operate manually	Improve Efficiency - Conduct by system Specific Repetitive task	Closed-loop O&M for specific operations task(with AI model)	Intent, closed-loop management - real-time - Optimization & adjustment	Prediction and closed-loop management based decision making	E2E Closed-loop automation for Multi-service/domain
Execution	P	P/S	S	S	S	S
Awareness	P	P/S	P/S	S	S	S
Analysis	P	P	P/S	P/S	S	S
Decision	P	P	P	P/S	S	S
Intent/Experience	P	P	P	P	P/S	S

AI Operations 1.0 and 2.0 @KT

	1.0	2.0
AUTOMATION	Repetitive & Massive Operational Tasks	All Operational Tasks
INTELLIGENCE	Reactive (RCA)	Proactive (Prediction)

Challenges ① Network Outages by Human Error

② Actions after Network Outage

SDN 2.0 ① Low-code Platform : Template + Workflow

SOP

Standard Operating Procedure
For Network Operations

Decomposition

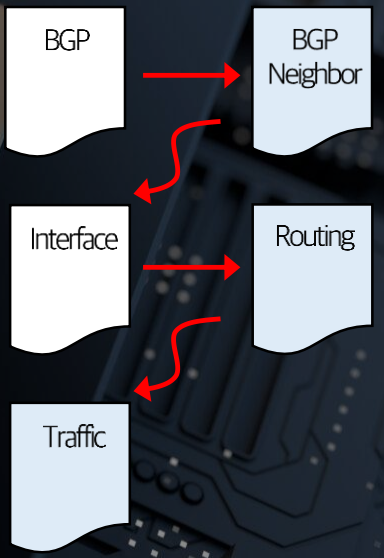
Templates

Configuration

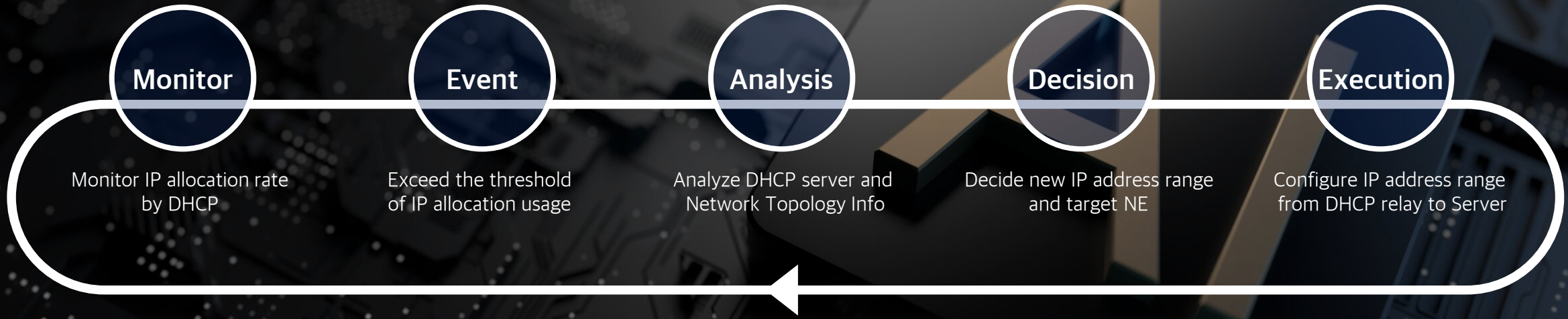
Monitoring

Drag & Drop

Workflow

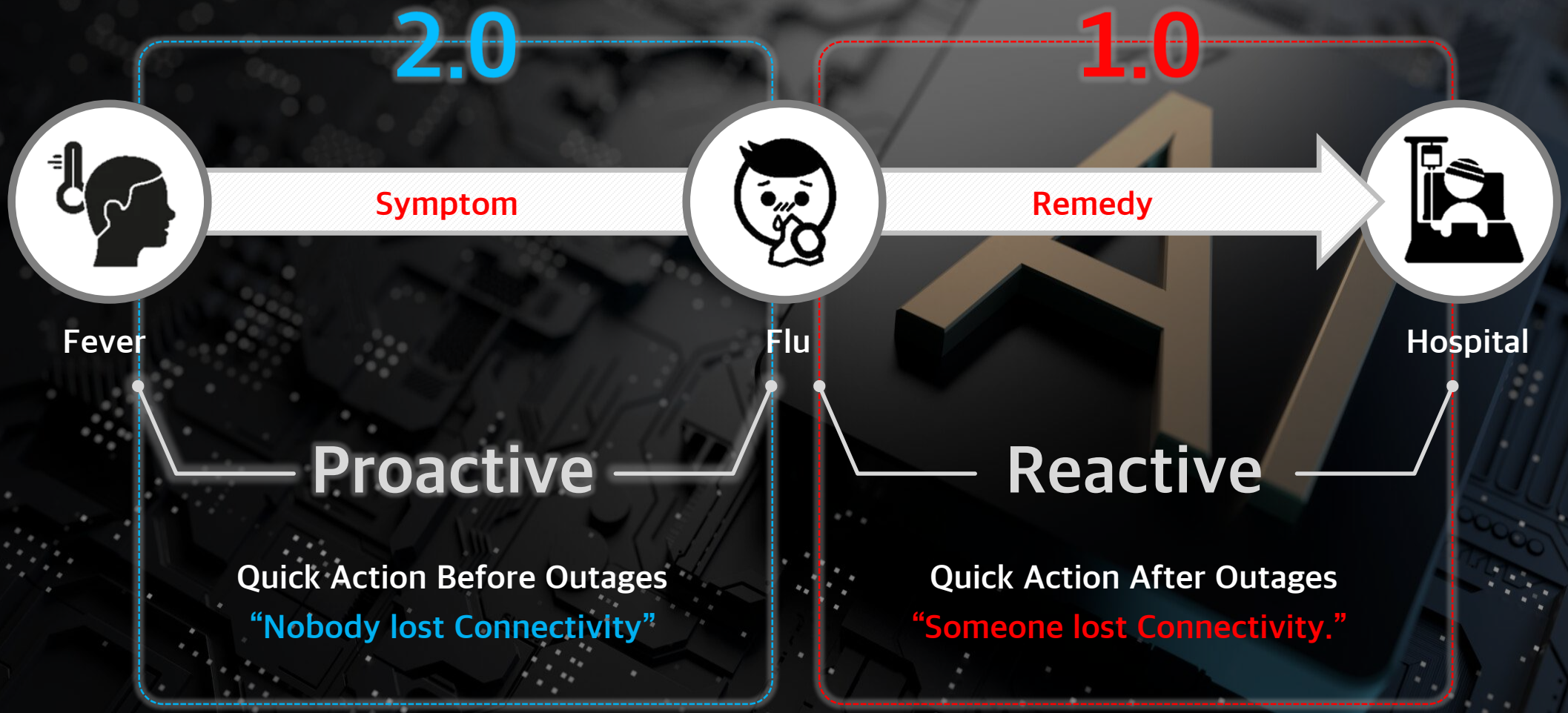


SDN 2.0 ② Closed-loop Control



End-to-End Automation & Intelligence without Human Intervention

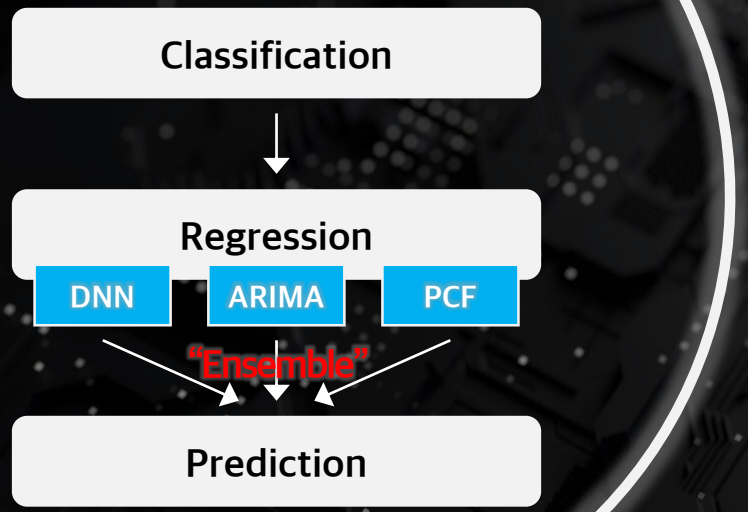
Network AI 2.0 Concept

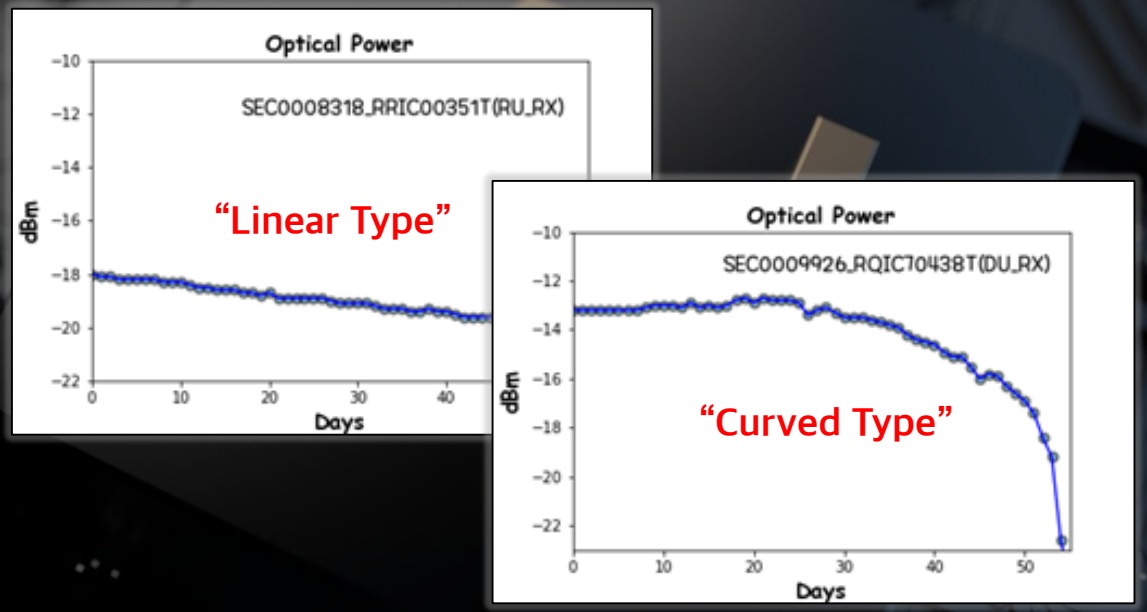


Network AI 2.0 Optical Module Degradation

AI Prediction Model

Ensemble-based Algorithm

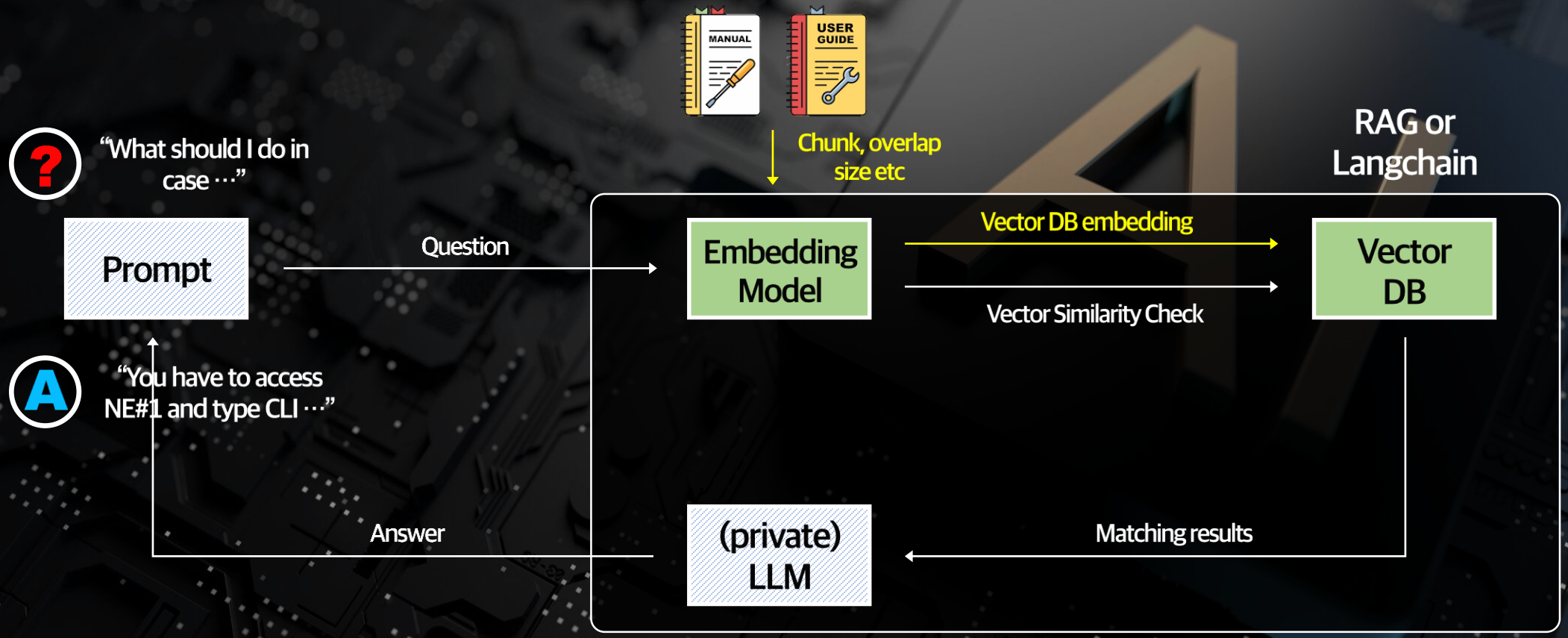




AI Detect 14 Days before
the optic power level drop threshold reached.

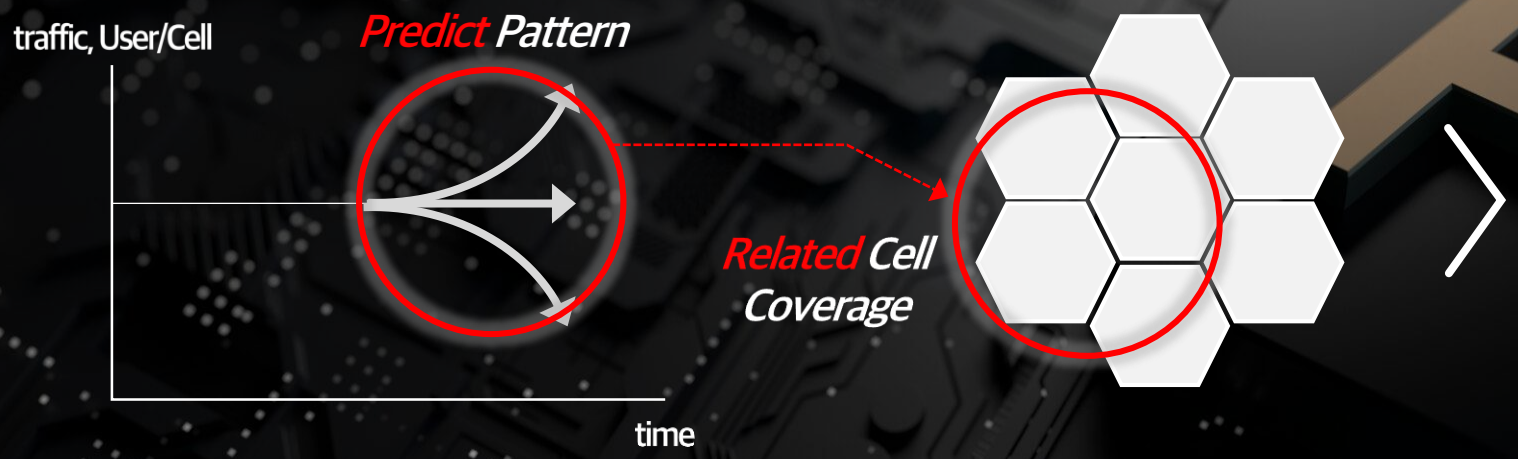
Network AI 2.0 AI Meister

AI Meister can help Non-Experts to operate cloud-native network. *Just Question and Answer.*



Network AI 2.0 Mobile Network Energy Saving

Telco around the world is making efforts to reduce power costs by applying AI technology.



① RAN Optimization

Ex) Cell Off, Path Off etc

② Core Optimization

Ex) CNF Scale-up or down

Via AI-Driven Network Operations 2.0

“Ready for Telco Cloud-Native Transformation”

〔SDN 2.0〕 Automation

End-to-End

From Cloud-Stack To NF

〔AI 2.0〕 Intelligence

AI-Assisted

From Reactive To Proactive

For Evolution beyond AI Operation 2.0

AI Operation 2.0 "Level 3"

LLM @Network

『 Level 5 』
Autonomous Network

[Intent] Generate Automatically Human's Thoughts
[Conversational AI] Act Easily even Non-Experts
.....


Thank you.