Enabling Advanced Automation with Network-friendly Machine Learning

Applied Machine Learning Days 2019

Laurent Ciavaglia

NOKIA

AMLD

Automation is a "MEGATREND" in the networking industry

„Brutal Automation is the Only way to Succeed"

Arash Ashouriha,
DTAG deputy CTO

„Automated networks: a must for 5G"

Johan Wibergh,
Vodafone Group CTO

„Automation is not a choice, it's a freakin' necessity"

Neil McRae,
BT Managing Director and Chief Architect

„Machine Learning makes networks smarter"
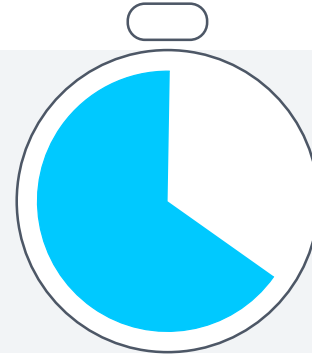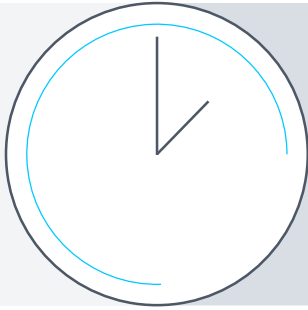
Bruno Jacobfeuerborn,
fmr. DTAG CTO

Simultaneously manage rapid technology change, operation complexity, service diversity…

Machine Learning is a key technology to make it happen

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Challenging the status quo
Create and deploy services more rapidly

Hours & days
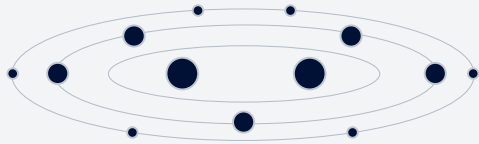
Seconds & minutes

| Planning cycles | Adapting to changes | Response to threats |

How do we get there?

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In the transformation journey, virtualization and network slicing are not enough
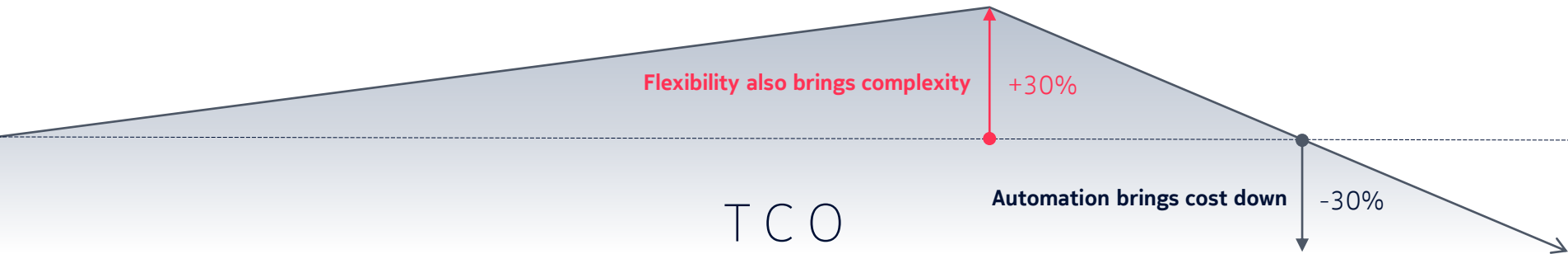## Automation is essential to economics

TRANSFORMATION
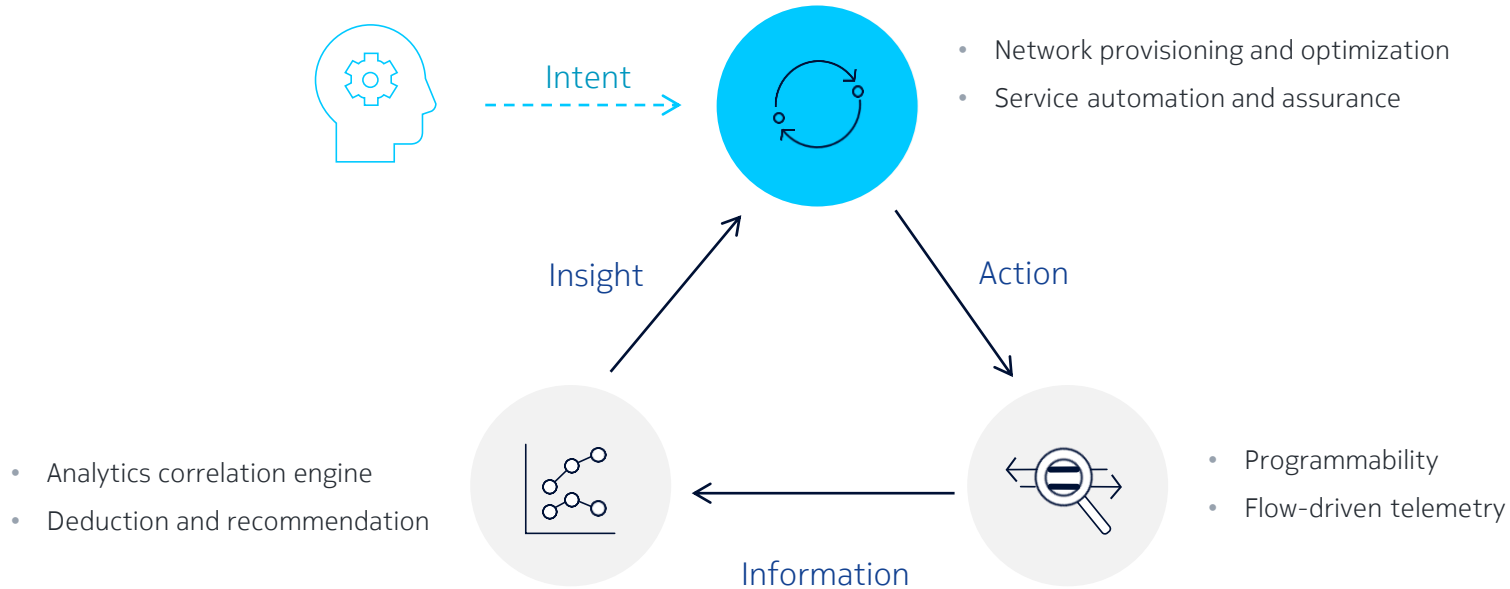
Physical network

Virtualization and network slicing

Automation

Flexibility also brings complexity   +30%

TCO

Automation brings cost down   -30%

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Insight-driven automation
Closing the loop between intent and outcome

Intent

- Network provisioning and optimization
- Service automation and assurance

Insight

Action

- Analytics correlation engine
- Deduction and recommendation

- Programmability
- Flow-driven telemetry

Information

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What we aim for

Machine | Human

Descriptive
What happened

Diagnostic
Why it happened

Predictive
What will happen

Prescriptive
What should I do

Decision

Action

Data

Decision support

Decision automation

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Network automation

1. Equipment configuration
2. Network service delivery
3. Network & service assurance
4. Traffic optimization

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Network and service assurance
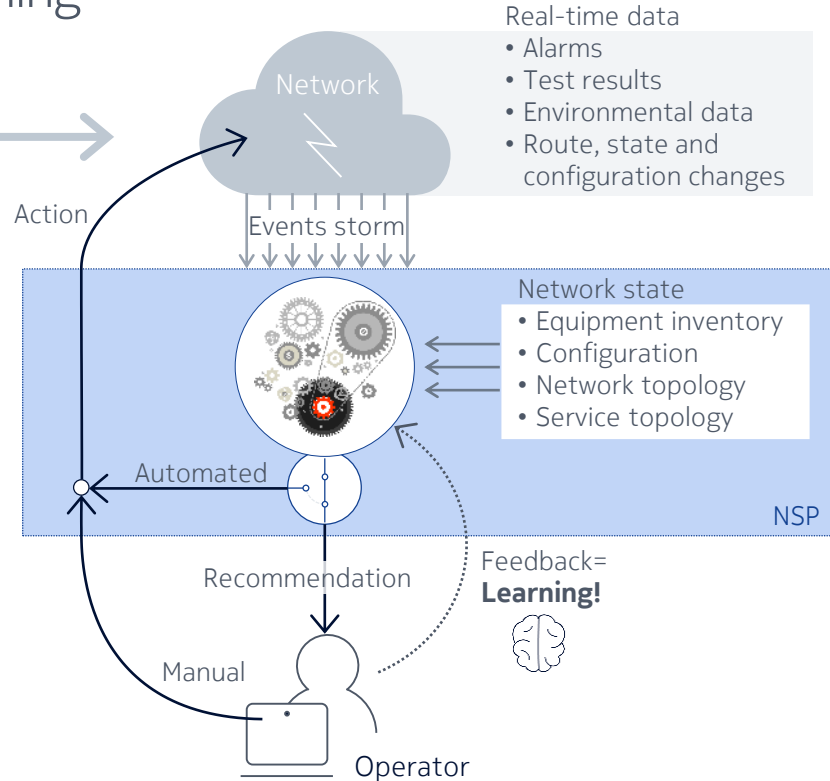## Artificial Intelligence and Machine Learning

Problem

⚠️

It's impossible to process the volume, velocity and variety of streaming data to anticipate or fix network issues

Solution

💡

Let the machine learn how to correlate events to assist in predicting, detecting and solving incidents

Benefits

✓

- Improve network availability
- Fix problems before they arise
- Detect silent failures
- Accelerate troubleshooting

...and get better with time!

Network

Real-time data
- Alarms
- Test results
- Environmental data
- Route, state and configuration changes

Action

Events storm

Network state
- Equipment inventory
- Configuration
- Network topology
- Service topology

NSP

Automated

Feedback=
Learning!

Recommendation

Manual

Operator

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Network automation

1 Equipment configuration

2 Network service delivery

3 Network & service assurance

4 Traffic optimization
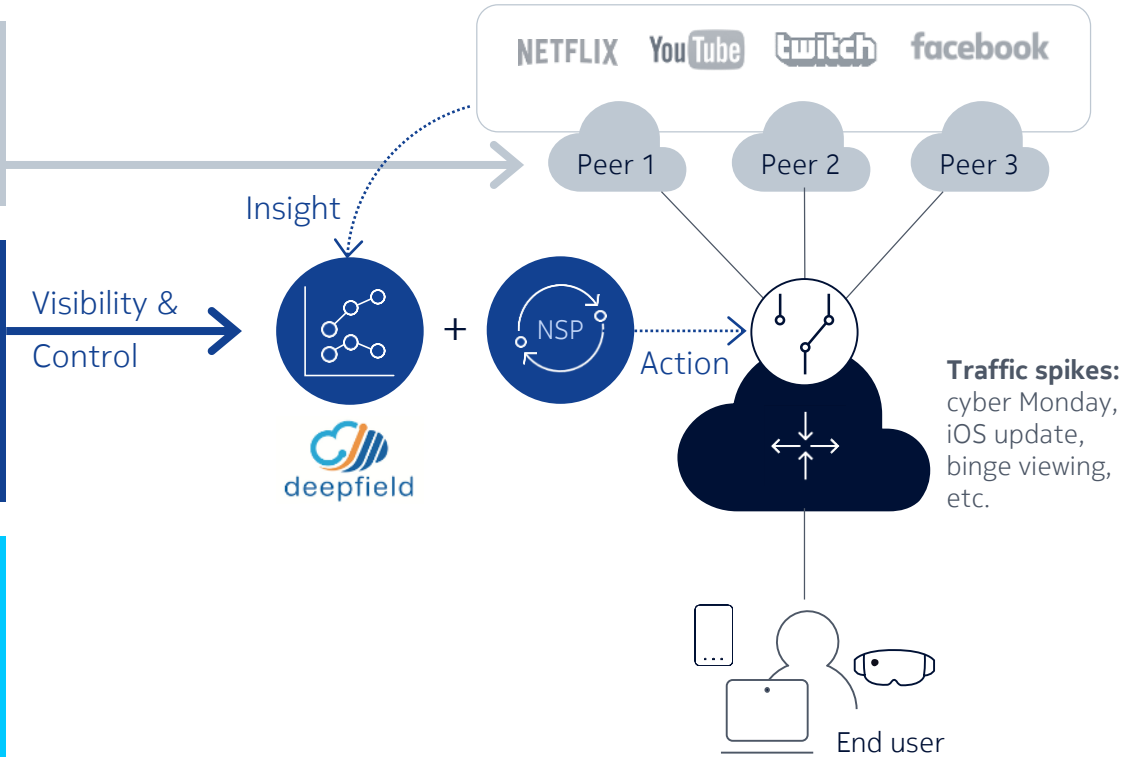
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Traffic optimization
Peer engineering

Problem

⚠️

Peering points with transit providers are source of congestion, performance degradation and cost

Solution

💡

Leverage real-time analytics to dynamically select optimal peer links or transit provider and steer traffic per application flows, per route, AS, or per BGP communities

Benefits

✓

- Avoid traffic congestion and manual misconfiguration
- Optimize performance (latency, packet loss)
- Control peering costs

NETFLIX You Tube twitch facebook

Peer 1   Peer 2   Peer 3

Insight

Visibility & Control

deepfield

+ NSP

Action

Traffic spikes: cyber Monday, iOS update, binge viewing, etc.

End user

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Machine Learning is the way we are going to automate your automation.

Chris Wright, RedHat CTO #RHSummit

How to automate the automation ?

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Developing ideas...
(based on ITU-T ML5G FG)

- **Machine Learning – Meta Language (ML – ML)**

  - Interoperable, declarative mechanism to specify the "intent" of the ML use case

  - Effectively define the ML pipeline

- **ML Function Orchestrator (ML – FO)**

  - A logical orchestrator used to monitor and manage the ML pipeline in the system

  - Operations on ML controlled via ML-FO (e.g. compression, scaling, chaining, updates, optimizations...)

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