Automation

Michael Pergament, Senior Consultant EMEA (JNCIE^3)

Automation: It’s changing life around us

HOMES

CARS

SHOPPING

ASSISTANTS

LANGUAGE

GAMES

© 2016 Juniper Networks, Inc. All rights reserved.

Automation: Setting the context

What?

"Using machines to run machines"

-- Peter F Drucker'1955

Why?

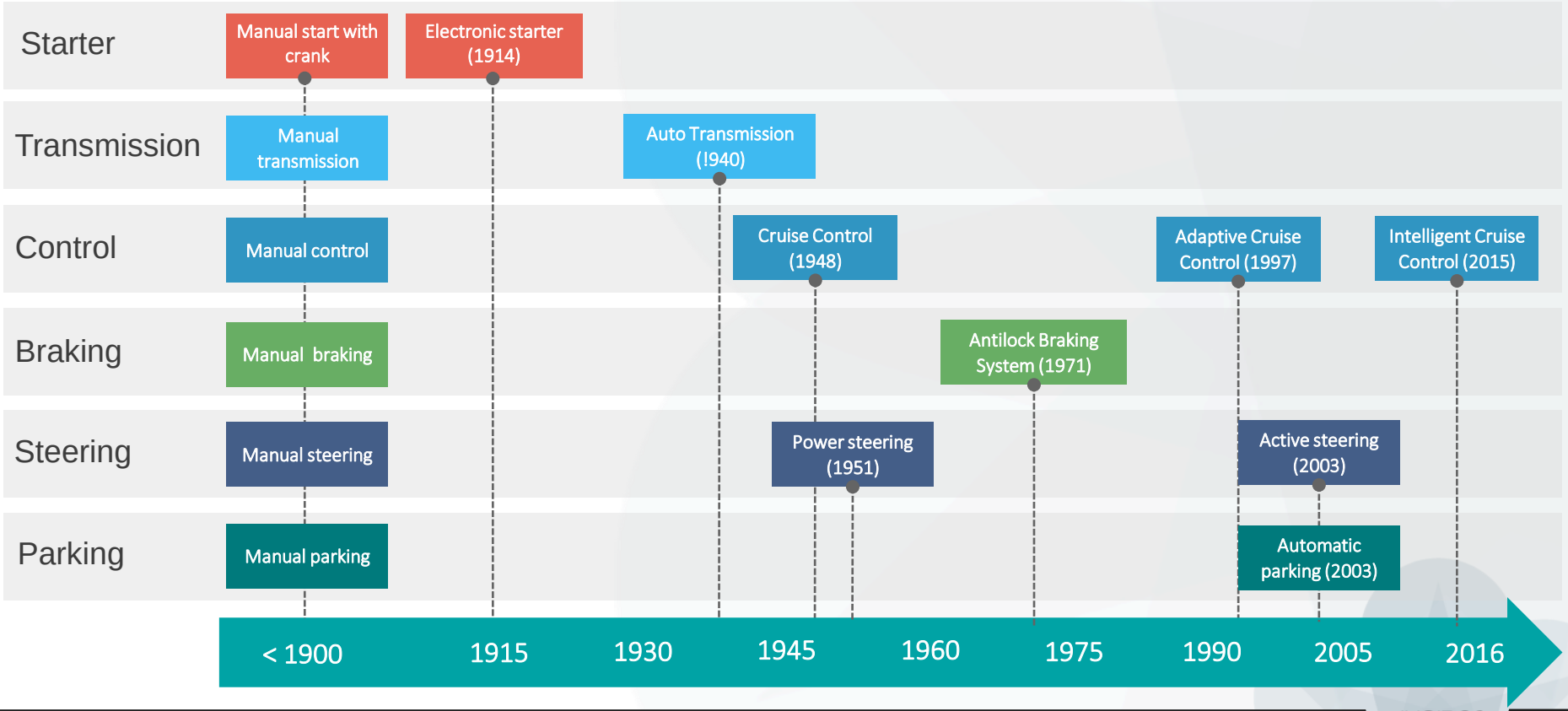
Agility! Delivering outcomes @ speed

How?

Technology, Culture and Process

© 2016 Juniper Networks, Inc. All rights reserved.

Evolution of the automobile



© 2016 Juniper Networks, Inc. All rights reserved.

Disruption of the automobile

Not just an incremental improvement, a disruptive change

The Self-Driving Car

Is it a Car….Is it a Computer?

The Promise

- **Ownership:** Delineate ownership & usage. Uber++, ZipCar++
- **Safety:** Human errors cause 94% of car crashes
- **Planning:** No more traffic lights? Triple highway capacity?
- **Logistics:** Self-driving trucks to revolutionize package delivery

The Impact

- **Don't need drivers:** Need programmers, operational folks
- **Don't need cops:** Cars can (will) self-police
- **Don't need witnesses:** Cars will be the most objective witnesses
- **How does insurance work:** Who pays for the glitches?

© 2016 Juniper Networks, Inc. All rights reserved.

Volocopter

Unterwegs in der Taxi-Drohne

Autonom fliegende Lufttaxis sollen bald Menschen transportieren. Ein chinesisches und ein deutsches Unternehmen arbeiten an den Fluggeräten. Wer wird der Erste sein?

© 2016 Juniper Networks, Inc. All rights reserved.

Disruption of the Network

Self-Driving Cars '*need*' Self-Driving Networks

A self-driving network would

- Accept *"guidance"* from a network operator
- Self-discover its constituent parts
- Self-configure
- Self-monitor using probes and other techniques
- Auto-detect when a new service is needed and auto-enable it
- Automatically monitor and update services to optimize service delivery
- Use machine learning for introspection (self-analysis)
- Self-report periodically or when an unexpected situation arises

Self-Driving Networks: A vision worth pursuing

© 2016 Juniper Networks, Inc. All rights reserved.

Automation @ scale

WEB 2.0 COMPANIES

Reduce DC cooling bill by 40%

2014: Machine-learning algorithms used to predict Power Usage Effectiveness (PUE) of the datacenters with up to 99.6% accuracy

2016: Google DeepMind AI uses *historical data, telemetry & deep neural networks* to reduce Datacenter cooling bills by 40%

1 Engineer = 25,000 servers

2011: Facebook Auto Remediation (FBAR) to proactively detect and address production problems on *individual servers*.

2016: Automated Maintenance Handlers to safely automate maintenance on *multiple servers*. Dapper to co-ordinate both *automated and manual processes*

Helping developers sleep better

2013: Atlas, a sophisticated home-grown telemetry tool that collects up to *1.2 Billion data points per minute*

2016: Winston, outsources *repeatable diagnostics and remediation* tasks. Run automatically in response to events from Atlas

© 2016 Juniper Networks, Inc. All rights reserved.

LARGE ENTERPRISES

TARGET

Handling 10-fold traffic increase

Black Friday and Thanksgiving have a unique load profile

Simultaneous testing of all APIs using version-controlled test scripts

Historical data as an indicator of expected load

Capture meaningful metrics. Measure everything

Capital One

Predictive analytics for sales and service

Adopting Agile, DevOps and Lean principles to improve banking services

Big data analytics for pricing, fraud detection, predictive sales, customer retention

Determine the topic of a customer's call within 100 milliseconds, with 70 percent accuracy

Contributing to Open-source: Cloud-custodian, Hygieia

© 2016 Juniper Networks, Inc. All rights reserved.

TELCO PLAYERS

Software-centric networking

ECOMP: Enhanced Control, Orchestration, Management and Policy platform

- AT&T's framework to adopt cloud and network virtualization technologies in carrier-scale, real-time workload environments.

Focus areas:

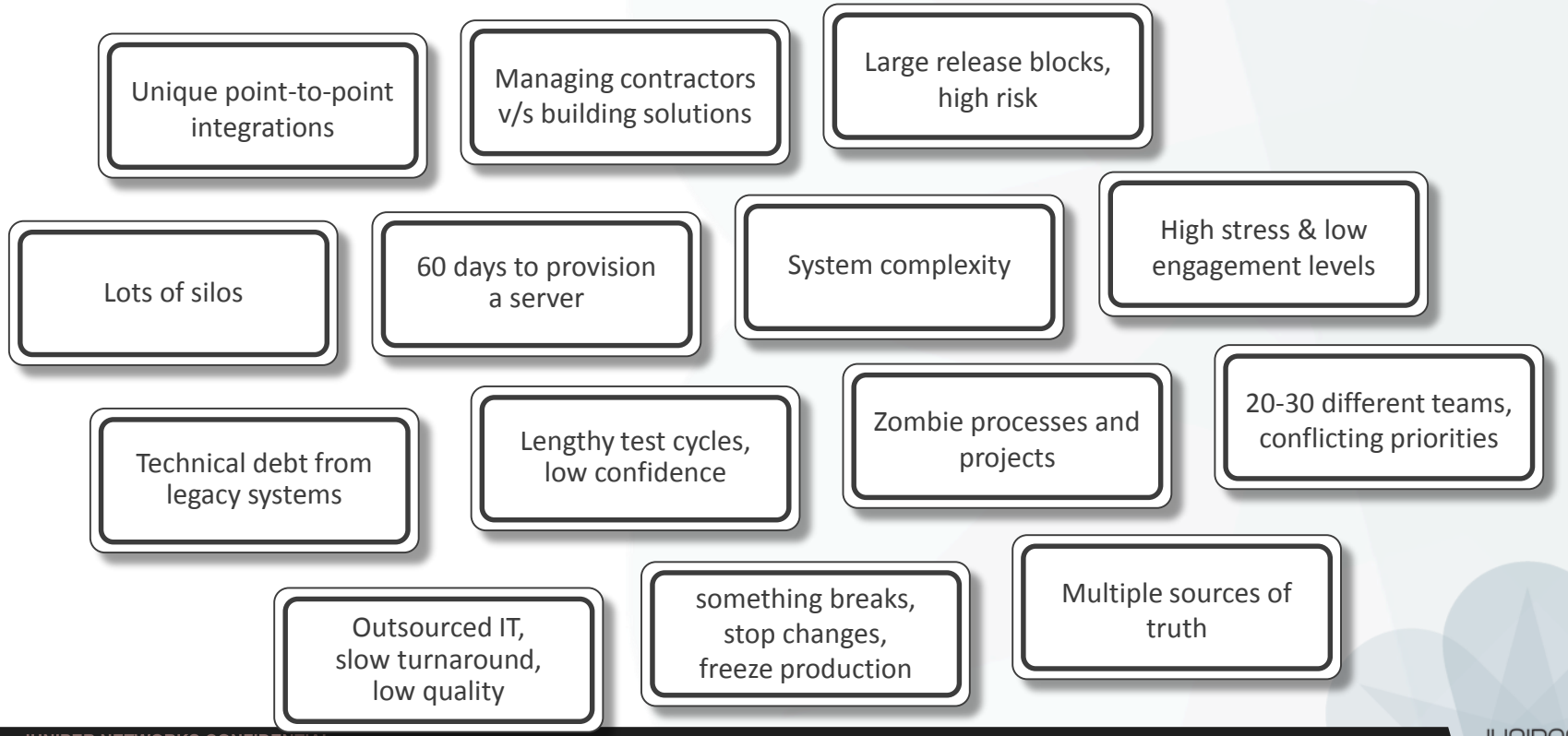
- Design framework for uniform platform on-boarding using industry-standard initiatives
- Real-time, closed-loop automation of service/network/cloud delivery
- Data Collection, Analytics and Events correlation

Open-sourced for wider industry adoption and collaboration

© 2016 Juniper Networks, Inc. All rights reserved.

Charting the course for Automation

Identify, acknowledge and target your roadblocks



© 2016 Juniper Networks, Inc. All rights reserved.

Charting the course for Automation

Identify, acknowledge and target your roadblocks

TECHNOLOGY

- System complexity
- 60 days to provision a server
- Unique point-to-point integrations
- Technical debt from legacy systems
- Multiple sources of truth

CULTURE

- High stress & low engagement levels
- Lots of silos
- 20-30 different teams, conflicting priorities
- Managing contractors v/s building solutions

PROCESS

- Outsourced IT, slow turnaround, low quality
- Lengthy test cycles, low confidence
- Zombie processes and projects
- something breaks, stop changes, freeze production
- Large release blocks, high risk

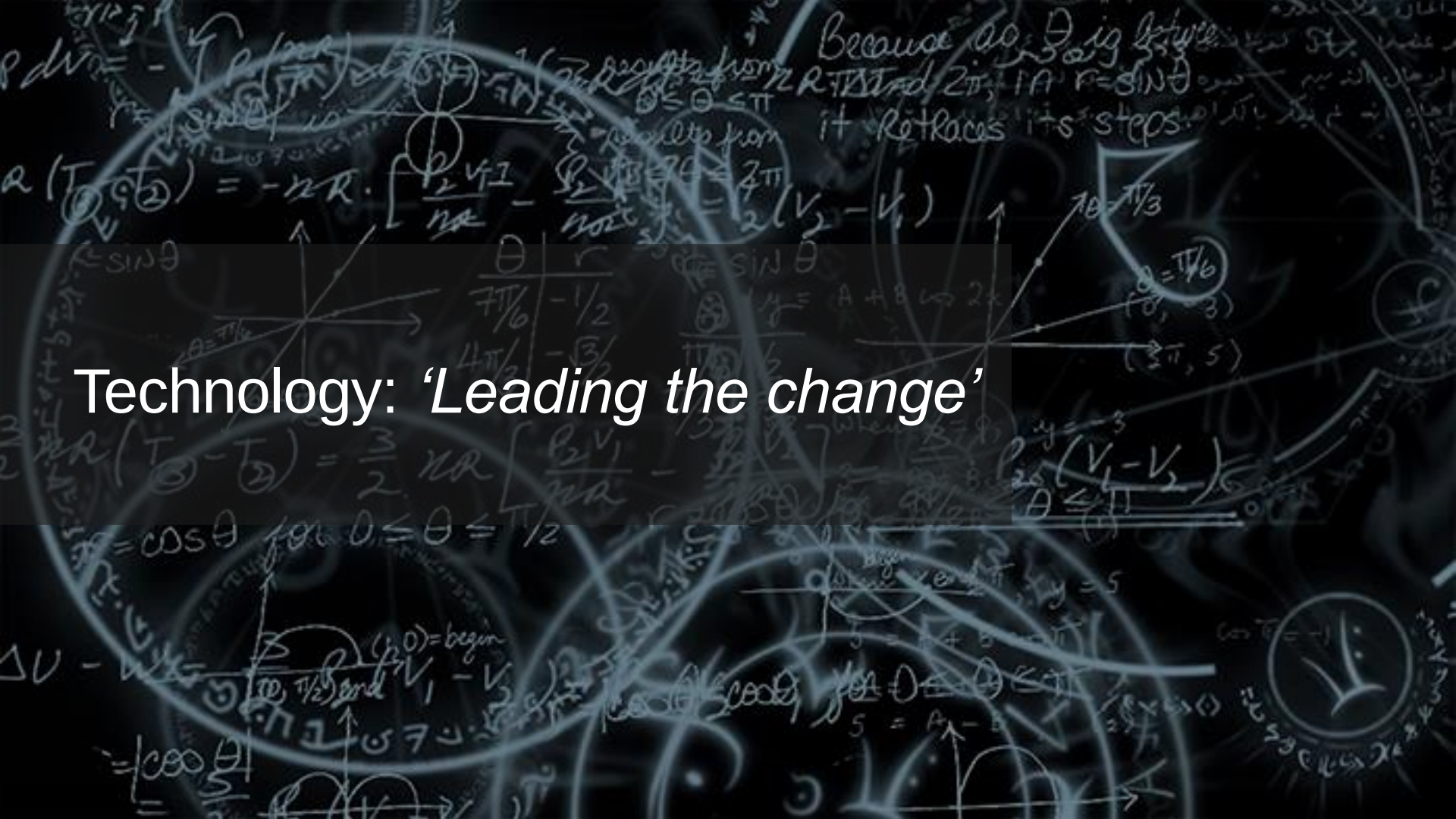
© 2016 Juniper Networks, Inc. All rights reserved.

Charting the course for Automation

Three building blocks of Automation

Find the right balance

© 2016 Juniper Networks, Inc. All rights reserved.



Technology: *‘Leading the change’*

Network Automation: How do we get there?

Build an evolution path to fuel disruption

Day 0

Human-driven automation

Establish standard-based network interfaces and data models

Automate network provisioning & management

Simplify network operations

Day 1

Event-driven automation

Gather network information (Telemetry)

Use network information to make decisions

Rule-based action on network events (Closed loop automation)

Day N

Machine-driven automation

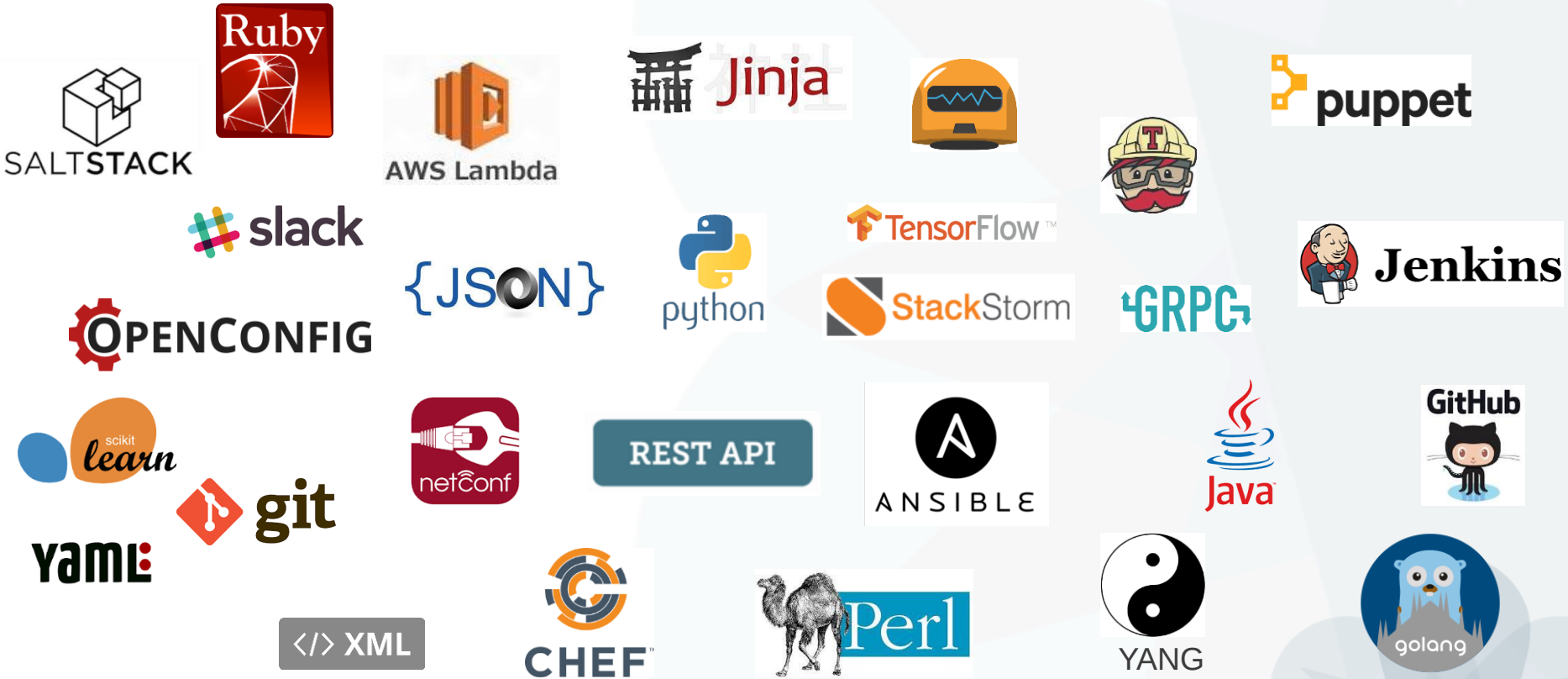
Use machine-learning tools to train the system

Machines makes decisions and drives network change

Humans make decisions where machines cannot

© 2016 Juniper Networks, Inc. All rights reserved.

Automation Technologies - Landscape



© 2016 Juniper Networks, Inc. All rights reserved.

Automation Technologies - Landscape

© 2016 Juniper Networks, Inc. All rights reserved.

Day 0 - Human-driven Automation

Day 0

Human-driven automation

Establish standard-based network interfaces and data models

Automate network provisioning & management

Simplify network operations

Standards-based network interfaces and data-models

netconf

YANG

OPENCONFIG

Automate network provisioning & management

CHEF

puppet

ANSIBLE

PyEZ

Simplify network operations

JSNAPy

© 2016 Juniper Networks, Inc. All rights reserved.

Day 1 – Event-driven Automation

Day 1

Event-driven automation

Gather network information (Telemetry)

Use network information to make decisions

Rule-based action on network events (Closed loop automation)

Gathering Network Telemetry

OPENCONFIG

GRPC

JVision

Rule-based actions on network events

SALTSTACK

python

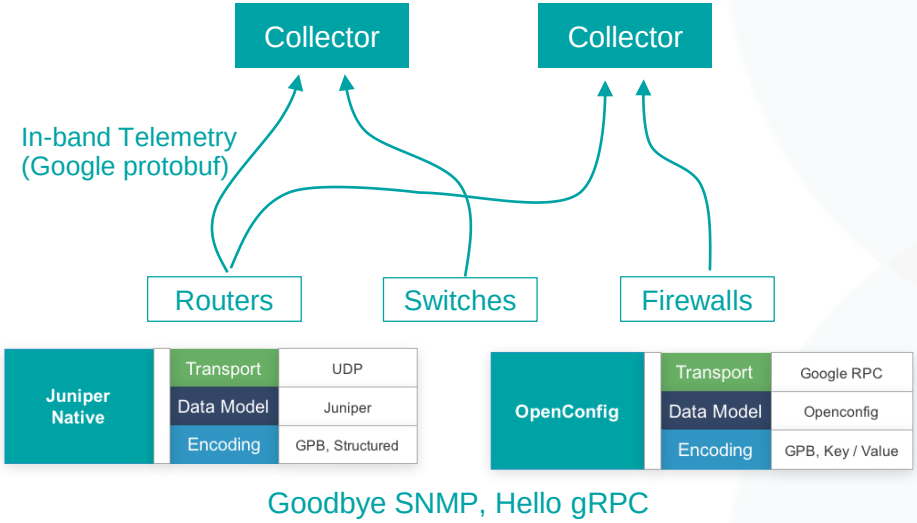
SLAX

JET

© 2016 Juniper Networks, Inc. All rights reserved.

Gathering Network Telemetry

What gets measured, gets managed



Goodbye SNMP, Hello gRPC

gRPC & JVision

Push-based telemetry model (v/s pull-based SNMP)

Continuous streaming of Network telemetry data based on subscriptions

Observe network state through time-series data stream and take action.

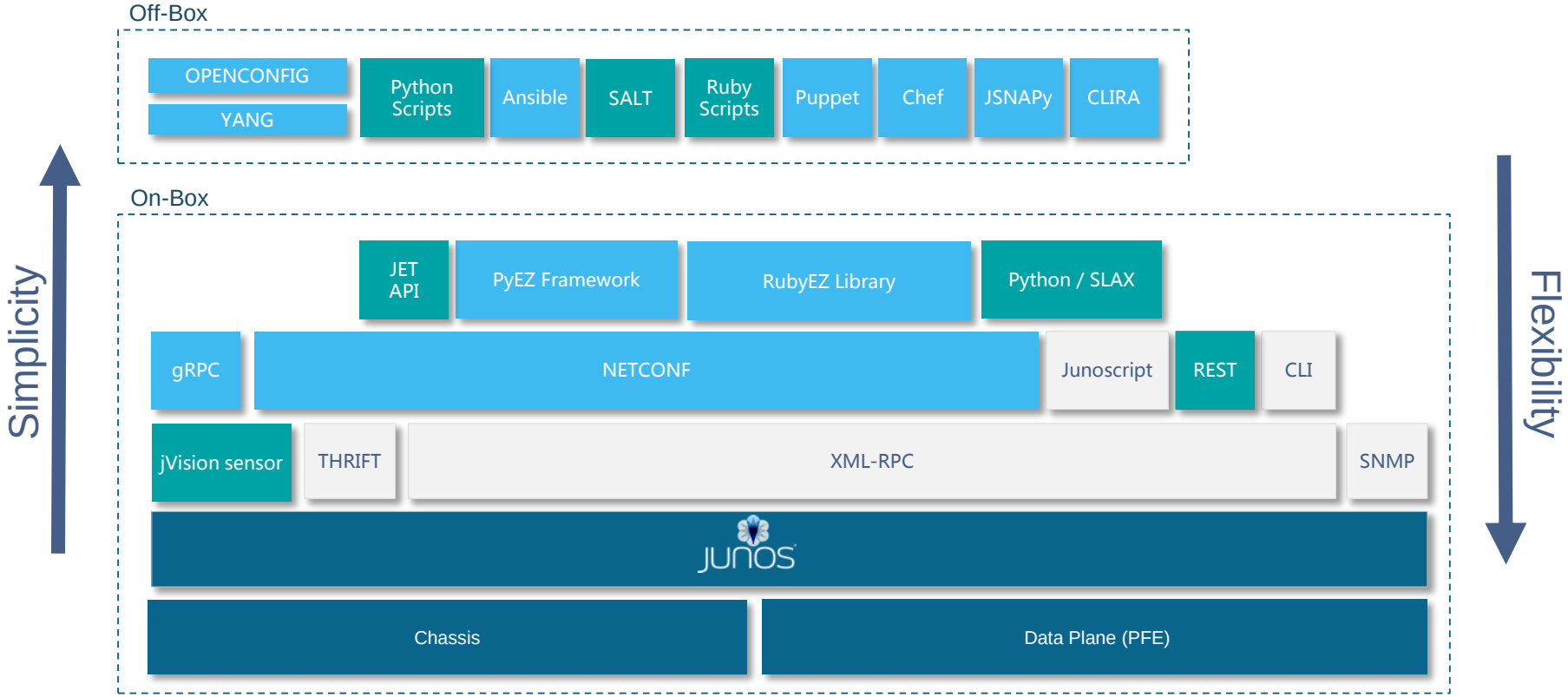
Uses Google protocol buffer encoding format

Juniper support

Supported on Juniper MX and PTX platforms JUNOS 15.1F3 onwards

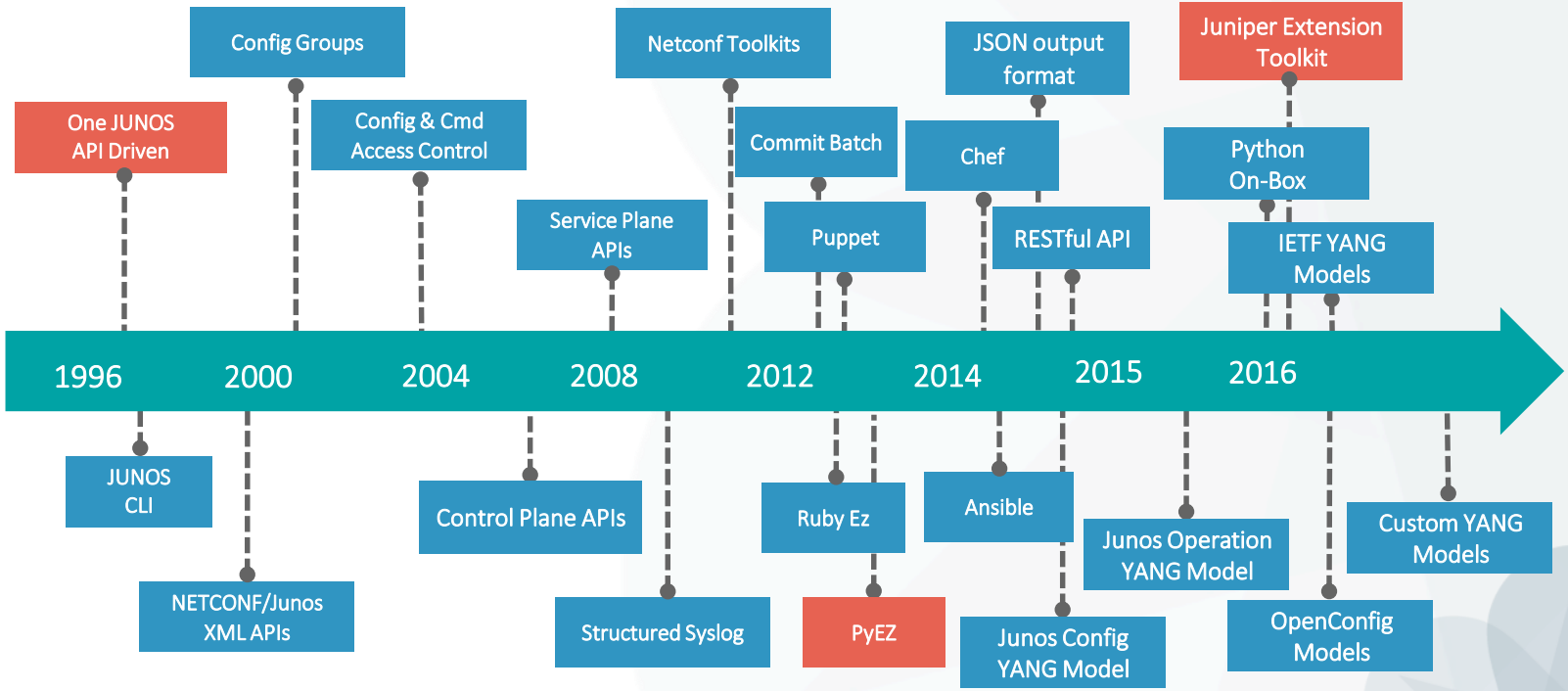
© 2016 Juniper Networks, Inc. All rights reserved.

JUNOS AUTOMATION STACK



Automation @ Juniper: It's in our DNA

Built with an *'Automation-first'* mindset



© 2016 Juniper Networks, Inc. All rights reserved.

Network Automation: Leading the pack

Third-party perspective on platform-vendor capabilities for Network Automation

1 On-device APIs to read / write configuration and operational data ✓ Juniper Networks: PASS	2 Structured operational data for easy programmatic analysis ✓ Juniper Networks: PASS	3 Structured device configuration data for easy programmatic analysis ✓ Juniper Networks: PASS	4 Atomic configuration changes to avoid partial updates ✓ Juniper Networks: PASS
5 Configuration rollback to minimize risk ✓ Juniper Networks: PASS	6 Full configuration replace that makes templates easy to use ✓ Juniper Networks: PASS	7 Configuration difference analysis to simplify manual approvals ✓ Juniper Networks: PASS	8 Industry standard data models for configurations ✓ Juniper Networks: PASS

READ THE BLOG

http://blog.ipspace.net/2016/10/network-automation-rfp-requirements.html

© 2016 Juniper Networks, Inc. All rights reserved.

Juniper Openlab

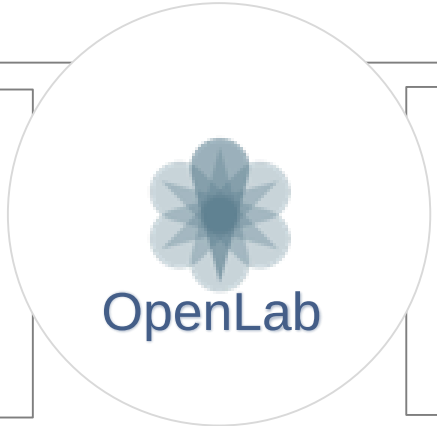
Accelerate Network and skills transformation

Technology Training

- Technology/Platform Training
- Automation, SDN, Others
- University Automation Throw downs

Globally Accessible Software-Centric Lab

- Application Development
- Platform ‘Sandboxes’ for Exploratory and Educational Purposes
- Solution Demonstrations

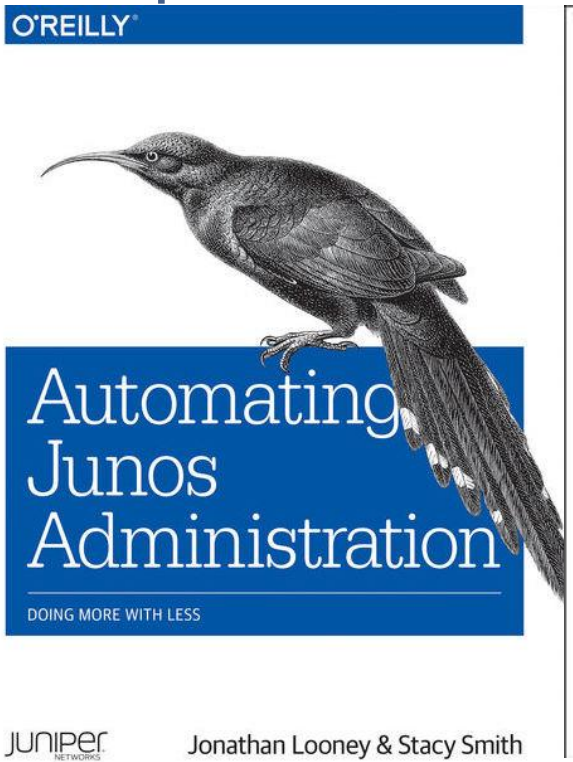


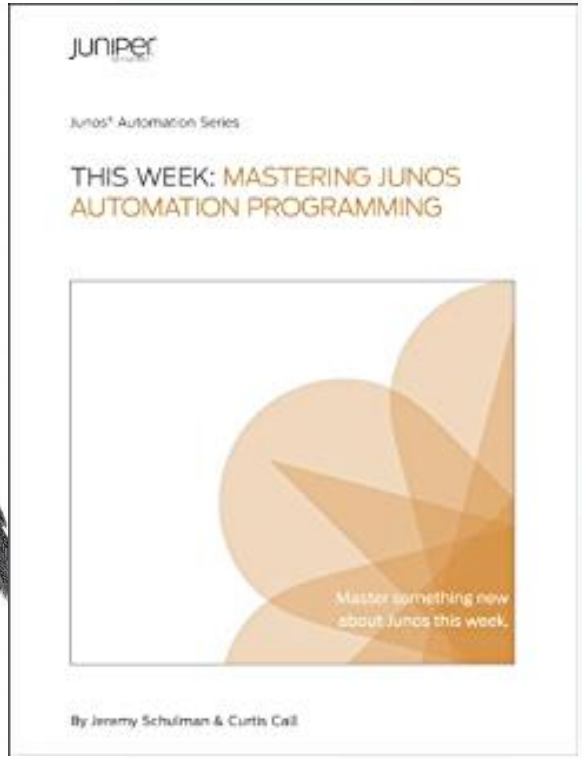
Solution Incubation

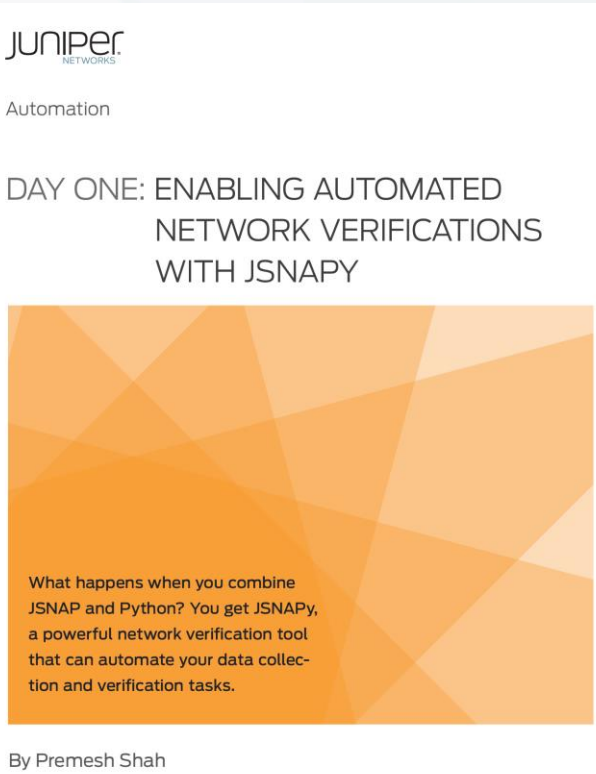
- Assist in development of new SDN and network automation solutions
- Resources to build, test, and promote solutions that leverage Juniper’s SDN and programmable networking assets

7 global locations: New Jersey, Sunnyvale (US), Amsterdam, London (EMEA), Singapore, Sydney, Tokyo (APAC)

Juniper Books On Automation







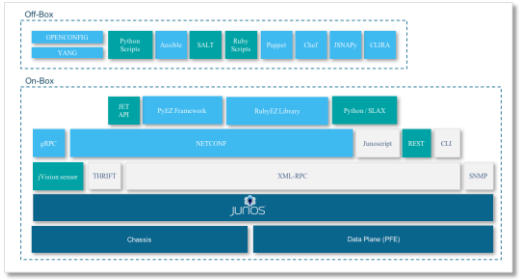
© 2016 Juniper Networks, Inc. All rights reserved.

Juniper Value Proposition

Network Automation? No one does it better than us!

TECHNOLOGY

Industry's most comprehensive & mature Automation Stack



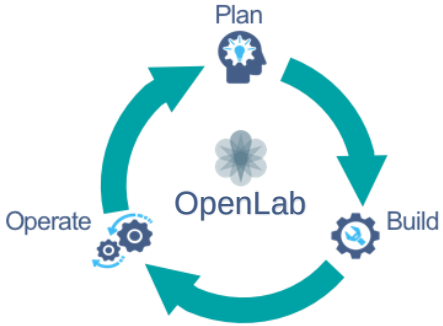
CULTURE

That's you!

(we are...
….your extended team)

PROCESS

Excellence in execution



© 2016 Juniper Networks, Inc. All rights reserved.