
JUNIPER
NETWORKS
JUNIPER DAY
16 октября 2018 | Москва


JUNIPER NETWORKS
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16 октября 2018
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Automation: It’s changing life around us

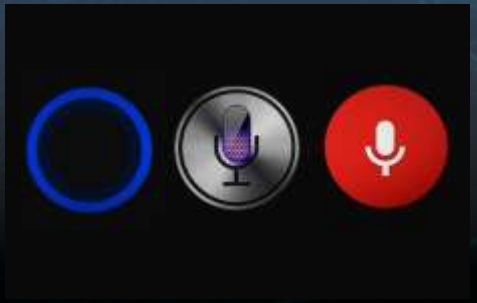
HOMES

SMARTHOME RUSSIA

CARS

SHOPPING

ASSISTANTS

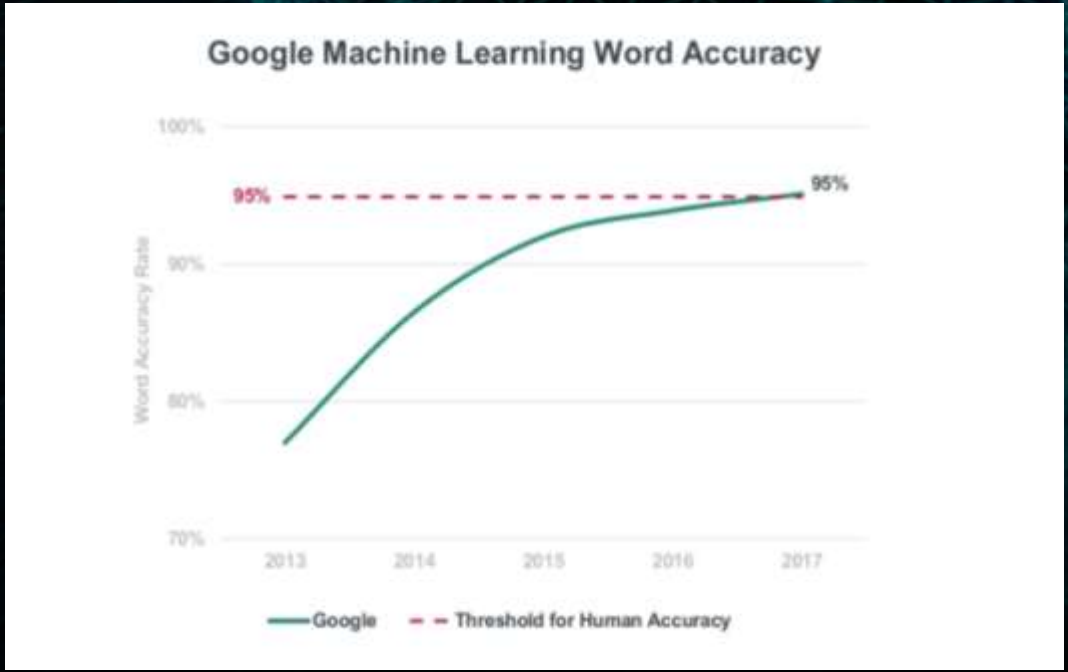


LANGUAGE

Яндекс
перевод

GAMES

Automation: Getting it right



Source: Kleiner Perkins Internet Trends 2018

Automation: Setting the context

WHAT?

“Using machines to run machines”

Peter F Drucker 1955

WHY?

Agility! Delivering outcomes fast. Dealing with scale. Reacting to change.

HOW?

Technology, Culture, and Process

An Example: The Self-Driving Car
More Than Just Point A to Point B

Is it a Car…

Is it a Computer?

THE PROMISE

Ownership: Own vs. Use
Safety: Human errors cause 94% of car crashes
Planning: No traffic lights? Better road capacity?
Logistics: Self-driving delivery vehicles

THE IMPACT

~~Don't need drivers:~~ Need programmers
Don't need cops: Cars can (will) self-police
Don't need witnesses: Cars are more objective
What about insurance? Who pays for glitches?

Disruption

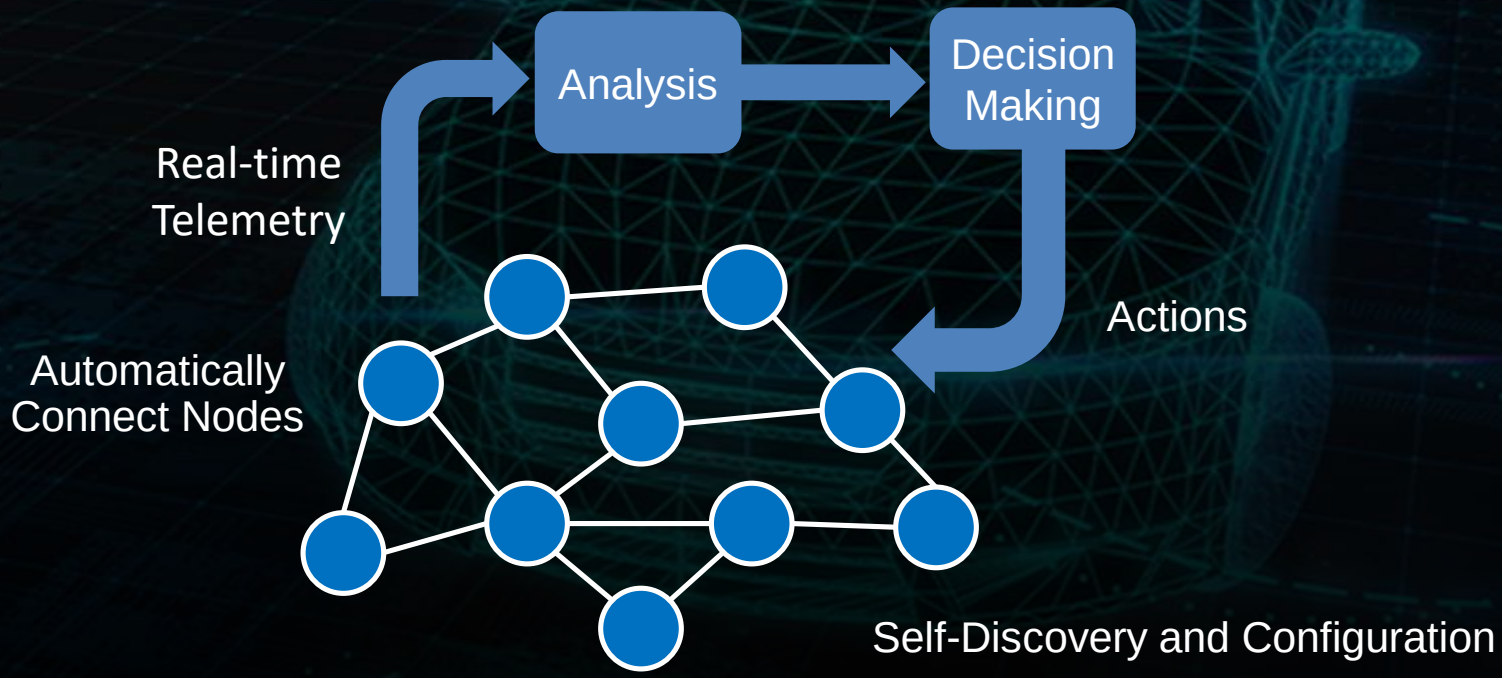
Evolution

The Self-Driving Network: What It Does

A self-driving network will:

- **Accept "guidance" from a network operator**
- **Self-discover** its constituent parts
- **Self**-configure
- **Automatically** connect nodes
- **Self**-monitor using probes and other techniques
- **Automatically** monitor and update services and SLAs
- **Auto**-detect and **auto**-enable new customers or users
- **Self**-analyze using machine learning
- **Self**-report to humans

Schematic of a Self-Driving Network

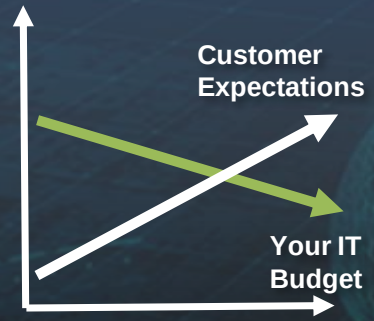


So what ? Numbers from “our” world…

- By 2020, 90% of the world’s population over six years old will have a mobile phone
- By 2020 , 26 billion devices will be connected to the internet
- A self driving car generates 1 GB of data per second (that‘s 2 Petabyte per car per year – to do the math ;-
- By 2020, more than 25% of identified enterprise attacks will involve IoT

Why Do We Need The Self-Driving Network?

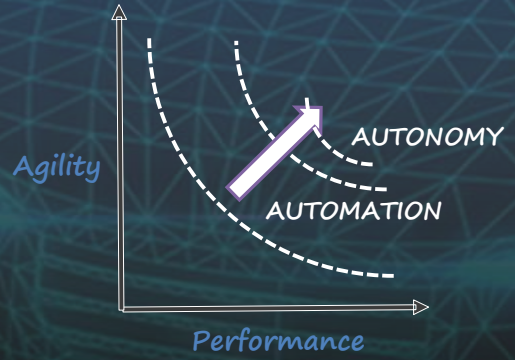
1 Economics



Reduce net management complexity and costs

Satisfy increasingly demanding customers

2 Agility



"Push out" the Performance / Agility tradeoff curves

3 Security

Baseline of normal activity

Detect anomalies

Automatically remediate

Your Journey to a Self-Driving Network™

The Self-Driving Network

Human-Driven Automation

- Standard-based network interfaces and data models
- Automate network provisioning and management
- Simplify network operations

Event-driven Automation

- Telemetry for Actionable Information
- Integration with Full IT infrastructure (Orchestration, etc)
- Rule-based Actions driven by events

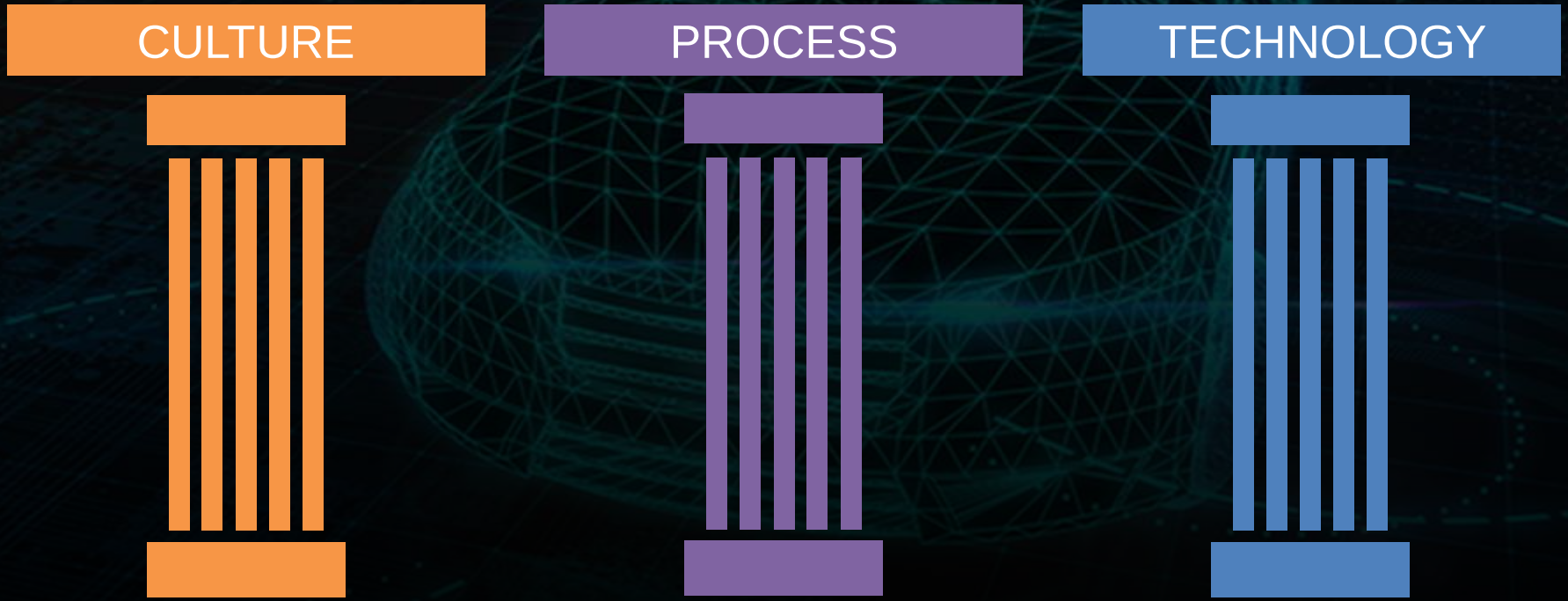
Machine-Driven Automation

- Use sophisticated algorithms (statistics)
- Pre-programed machines makes decisions and drives network change
- Humans make decisions where machines cannot

Autonomy

- Integrated machine-learning algorithms into the system
- Adaptive machine decisions drive network change
- Human supervision, no active intervention

The Three Pillars of Success



The Three Pillars of Success

CULTURE

- Lead the change from CLI to software mentality
- Create cross-functional teams
- Encourage and reward skills development
- Fail fast, fix fast, scale fast

PROCESS

- Build an Agile-DevOps environment
- Train up staff
- Follow the processes
- Don’t allow exceptions
- Leverage, engage and contribute to the community

TECHNOLOGY

- Identify focus areas
- Start small, iterate often
- Leverage tools across the infrastructure
- Embrace & encourage open-source
- Five key technologies

FIVE TECHNOLOGIES FOR SELF DRIVING

1. AUTOMATION
2. TELEMETRY
3. MULTIDIMENSIONAL VIEWS
4. DECLARATIVE INTENT
5. DECISION MAKING

1 AUTOMATION

NOW

- Discovering topology
- Computing paths, bandwidth, fast reroute
- Updating software
- Auto VLANs and firewalls as VMs are spun up, torn down
- Fault detection, trouble ticketing
- Root cause analysis

SOON

- Smart auto-bandwidth
- Automatic service placement, service motion
- Specific upgrades based on configured services
- Inductive network action via machine learning

2 **TELEMETRY** - CARS

The usual: speedometer, gas gauge, tire pressure sensors

More recent: radar, lidar, sonar (for parking assist), cameras

2 TELEMETRY - NETWORKS

NOW

- SNMP info + traps
  - Interface stats, flaps
- Routing info
- Netflow/sflow/jflow/…
- DPI, IDS
- Some streaming telemetry
- Some correlation across silos

SOON

- Real-time deep telemetry: device state, customer state, packet state
- Much more info gathered, processed on-box, streamed in real time
- Active telemetry: zoom in as needed, zoom out again
- Correlated telemetry across time, geography, network layers

3 MULTIDIMENSIONAL, MULTI-MODAL VIEWS

NOW

- Neighbors, links
- Exit points, peers
- Layer 0-1 devices
- Global topology, traffic, flows
- Server and application performance
- Hackers, flash crowds, DDoS

SOON

- Correlation of information across geographies, layers, peers, clouds
- Root cause analysis via supervised learning
- Time-based trending to establish and adapt baselines
- Optimal local decisions based on global state

4 DECLARATIVE STATEMENT OF INTENT - CARS

SAY WHERE YOU WANT TO GO…

Hints:

- Fastest time
- Least distance
- Most scenic
- Most efficient use of battery

Even better: the car can simply talk to your phone, figure out where you need to be, and take you there

4 DECLARATIVE STATEMENT OF INTENT - NETWORKS

NOW

- Give path constraints: bandwidth, diversity, # LSPs (Northstar)
- Say which “virtual network” (VN) a VM belongs to, and inter-VN policies (Contrail)

SOON

- Say what you want the network to do
  - Economic hints: valued customers, priority applications, peering costs
  - Objective functions describing the end results you want

5 DECISION MAKING - RULE-BASED VS. MACHINE LEARNING

RULE-BASED LEARNING

If X happens, do Y:
- "If this then that"

+ Straightforward programming
+ Easy to predict and refine
- Slow, painstaking work
- At scale, hard to manage

MACHINE LEARNING

"Essence of artificial intelligence"
- Alan Turing

+ Can become "creative"
+ Fastest way to learn complex behavior
- Can come to strange conclusions
- Hard to know what it knows

The Self-Driving Network will combine both

You can start today

The Self-Driving Network

Human-Driven Automation

Data models – NetConf, Yang

Config templates network and security

Puppet, Ansible, Chef, OpenConfig JSNAPy/PyEZ

Event-driven Automation

Juniper Event-Driven Infrastructure (JEDI)
Contrail Svc Orchestration
Network Director
Security Director
Juniper Extension Toolkit
Juniper Telemetry I/F
NITA
Service Now
Service Insight
SaltStack
Python

Machine-Driven Automation

Software Defined Secure Networks

AppFormix

Contrail

NorthStar

Autonomy

Certain features eg. Auto-Bandwidth

A vision worth pursuing: Self-Driving Networks!

A compelling vision, both meaningful and realizable

- **Economic imperative:** attack the biggest cost in networking – operations
- **Efficiency imperative:** spin up resources as needed and optimize their use
- **Agility imperative:** bring up new services quickly; predict, anticipate and adapt
- **Security imperative:** quickly detect, diagnose, isolate, and mitigate threats

Self-Driving Network ™

БОЛЬШОЕ СПАСИБО !