Unified Next-Generation Network & Service Management StableNet®

Dr. Stefan Köhler

Infosim GmbH & Co. KG

StableNet®

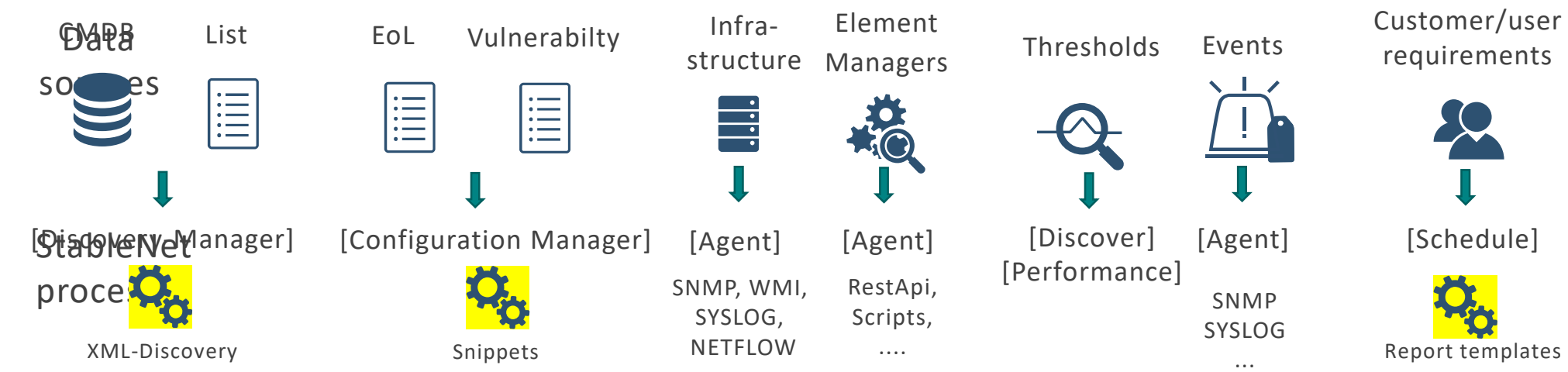
Discovery

Performance

Fault

Configuration

StableNet® Workflow



Management tasks

Quality assurance Investment protection

- Infrastructure
- Inventory details
- Distribution of systems
- Unused Ressources
- Changes of infrastructure
- Datasource (=> CMDB)

Available formation

Automation, Compliance, Security

- Real security
- Network compliance:
- Backups (=>Restore)
- History of changes
- Change management

Reporting/SLA, Active Fault & Service Management, Investment planning

- Reporting
- Troubleshooting
- Planning
- Trending

Single View, Status Reporting, Risk Management

- Root cause analytics
- SLA-Monitoring
- MTTR-Monitoring
- DRG (Dynamic Rule Generation)
- Alarming

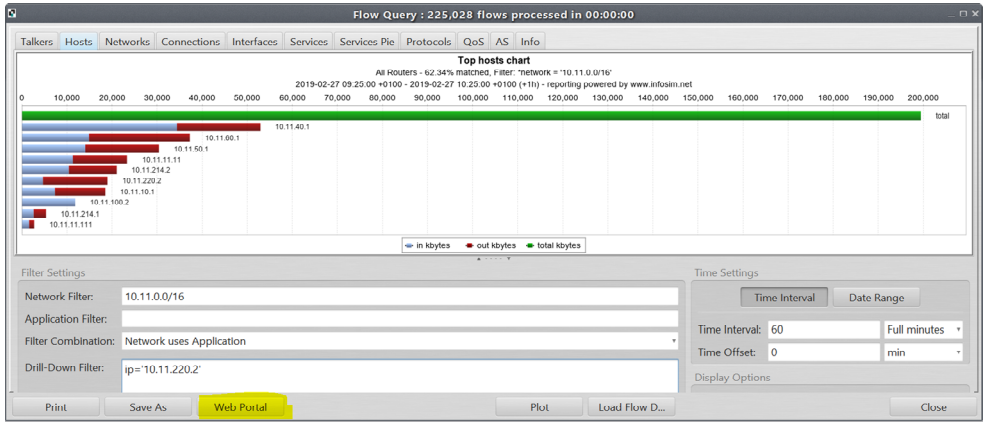
Data Integrity, Business View, SLAs

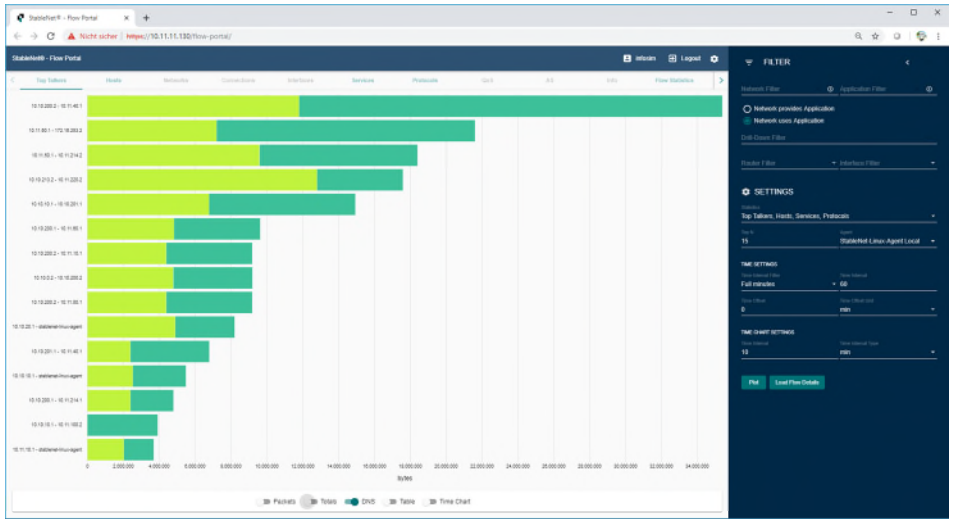
- NOC-View
- Weathermaps
- Dashboards
- Reports

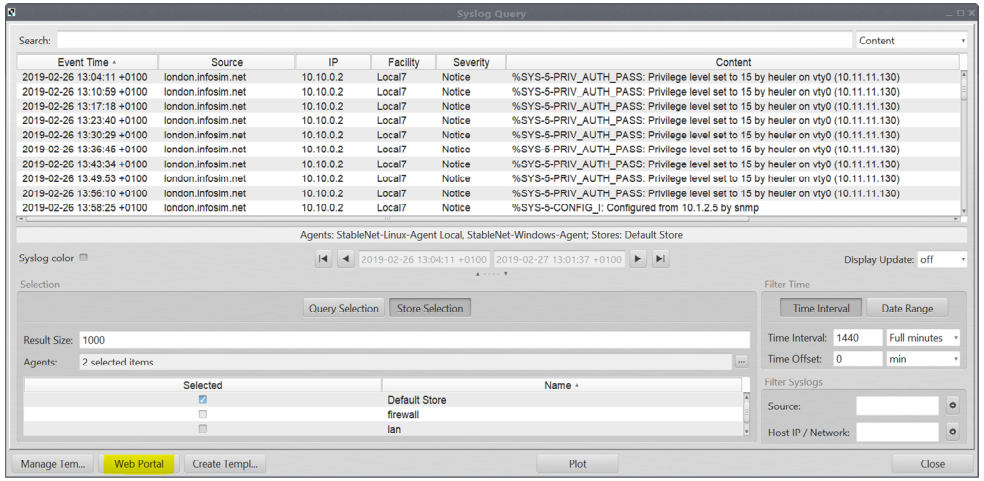
Administrative tasks

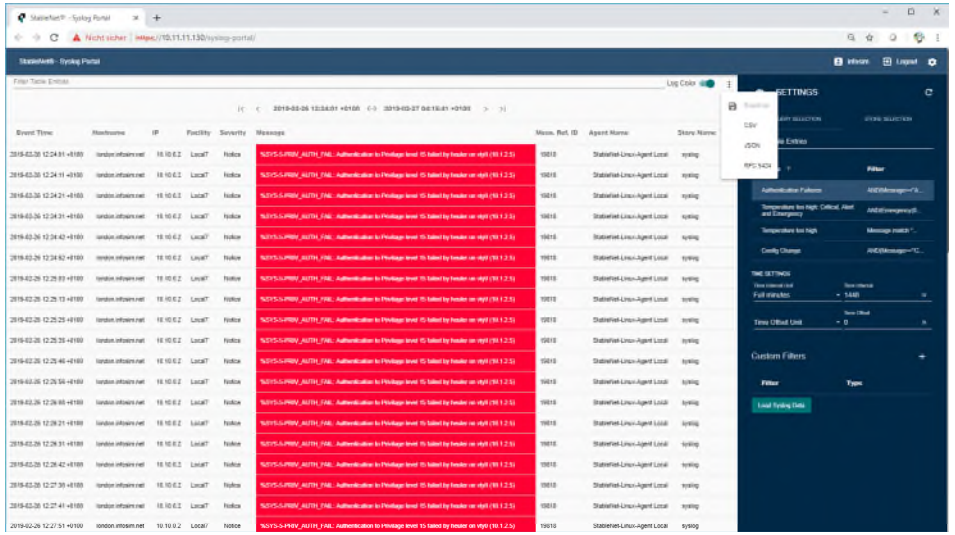
STABLENET® VISUALIZATION

Netflow and Syslog Monitoring/Portal

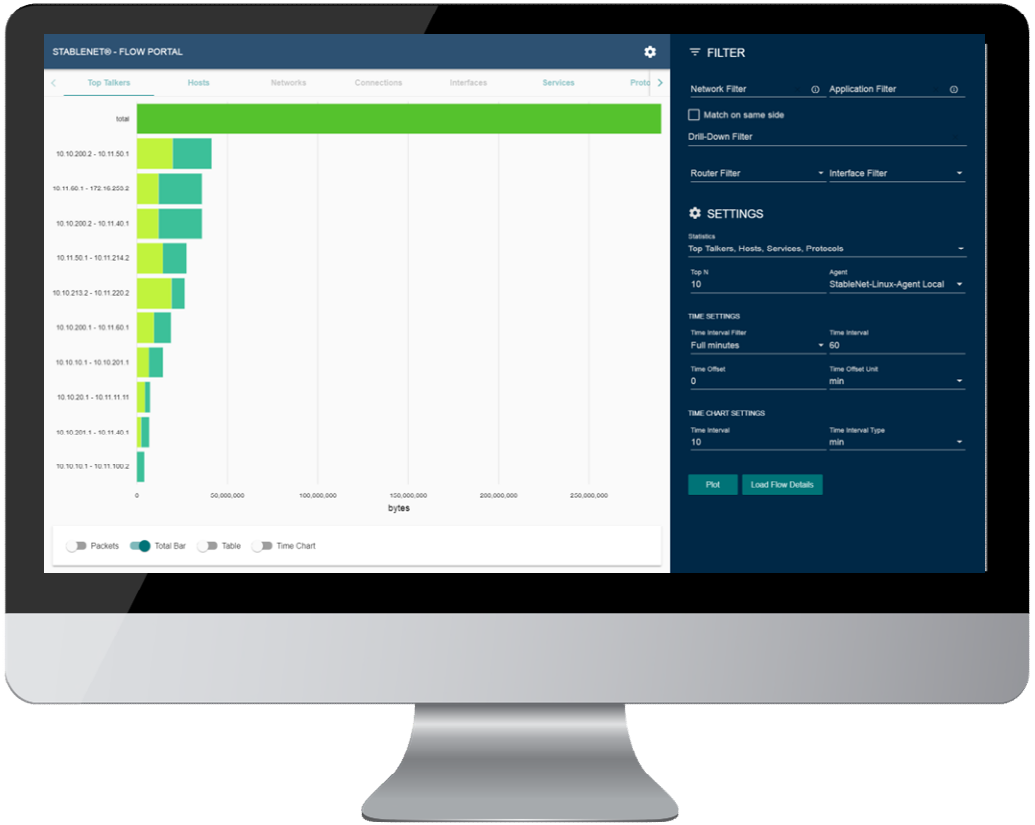


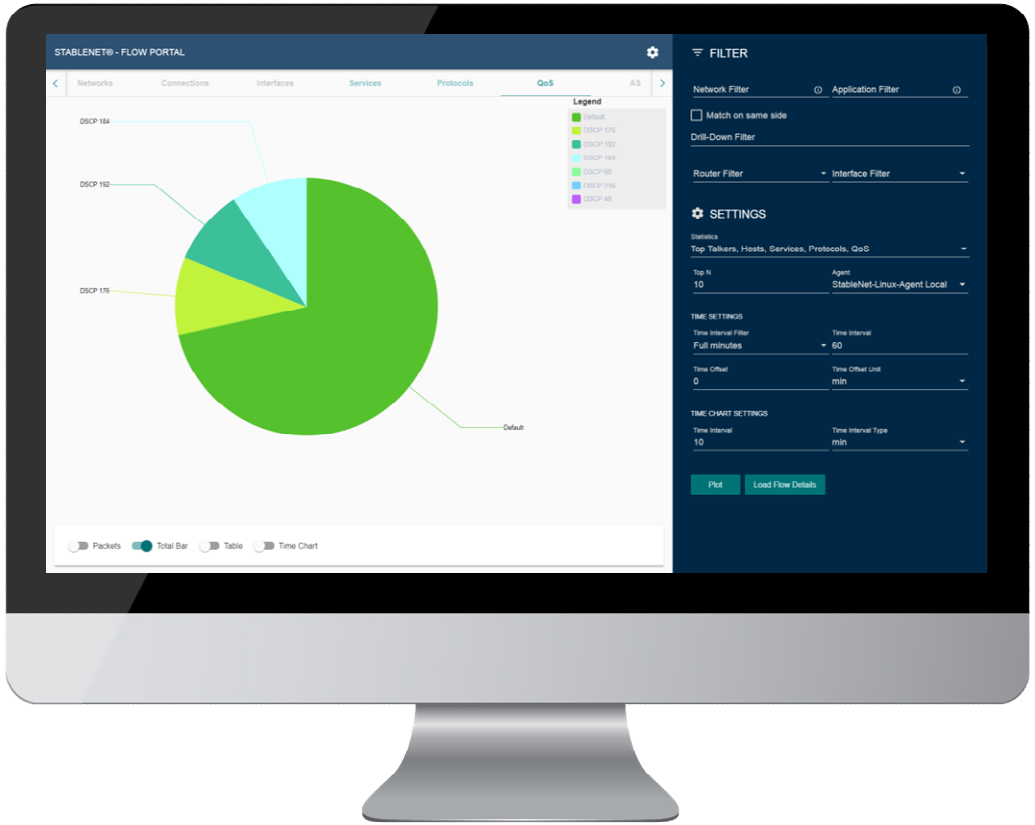






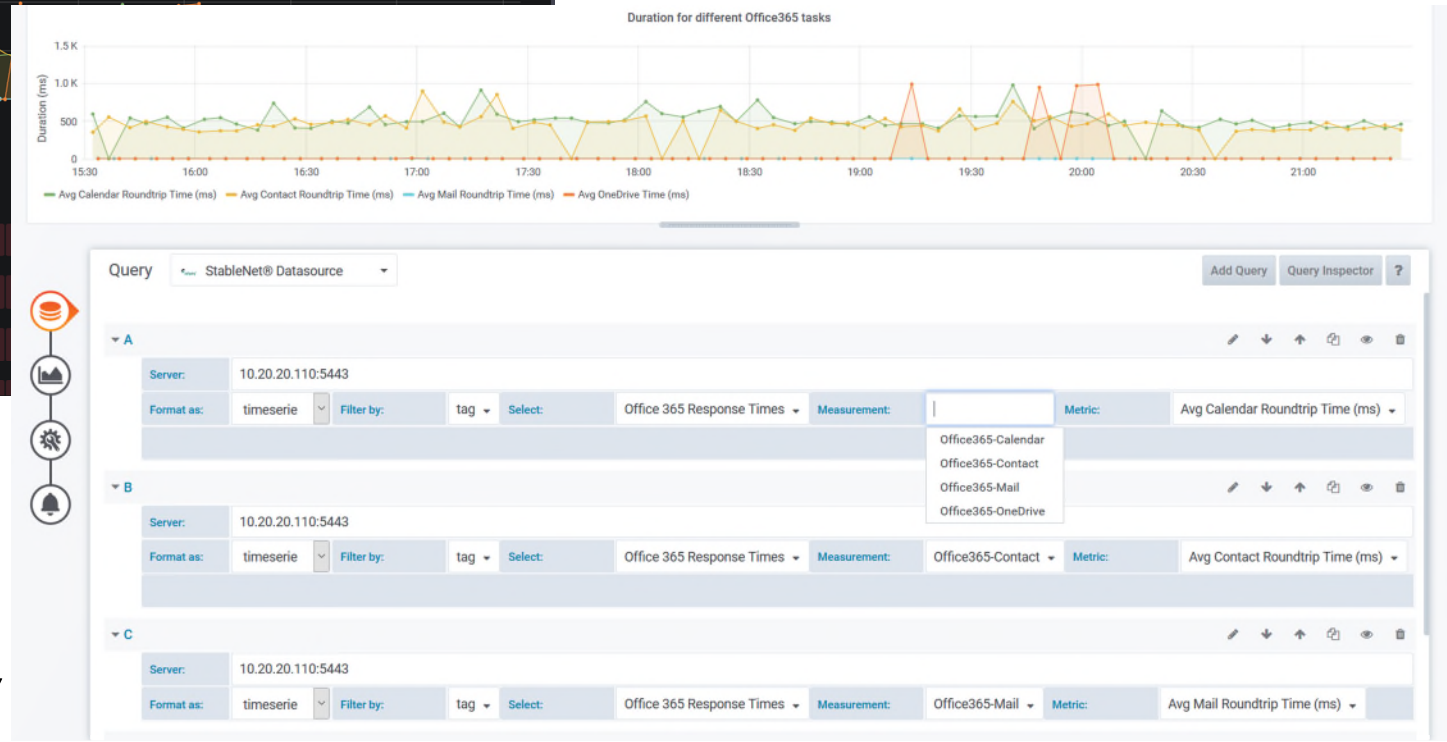
FLOW ANALYSIS - WEB PORTAL



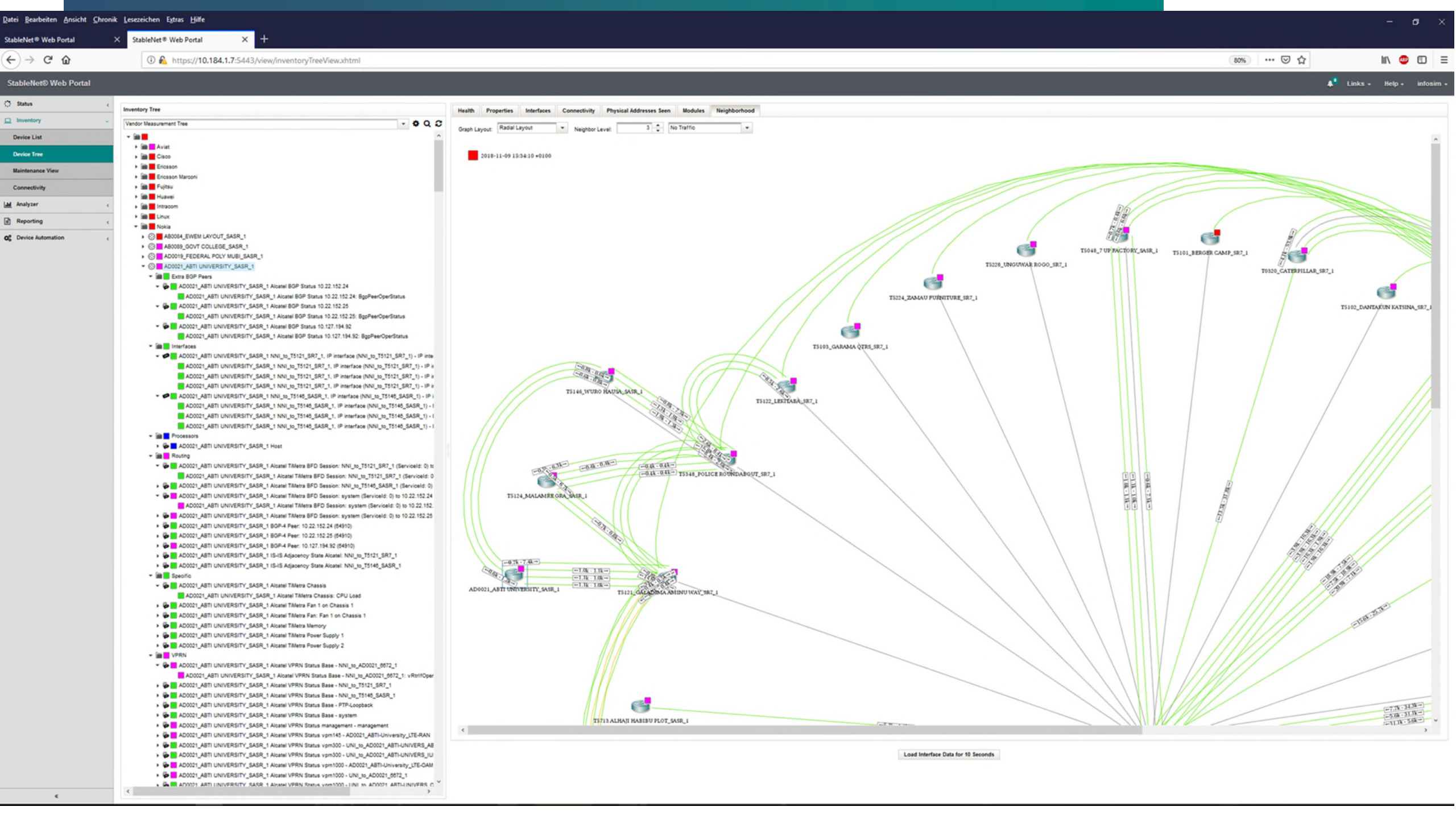


PORTAL INTEGRATION: Grafana

Example 1:
Dark mode (Default), transparent panels,
Edit mode, Drag&Drop Resizing of Widgets

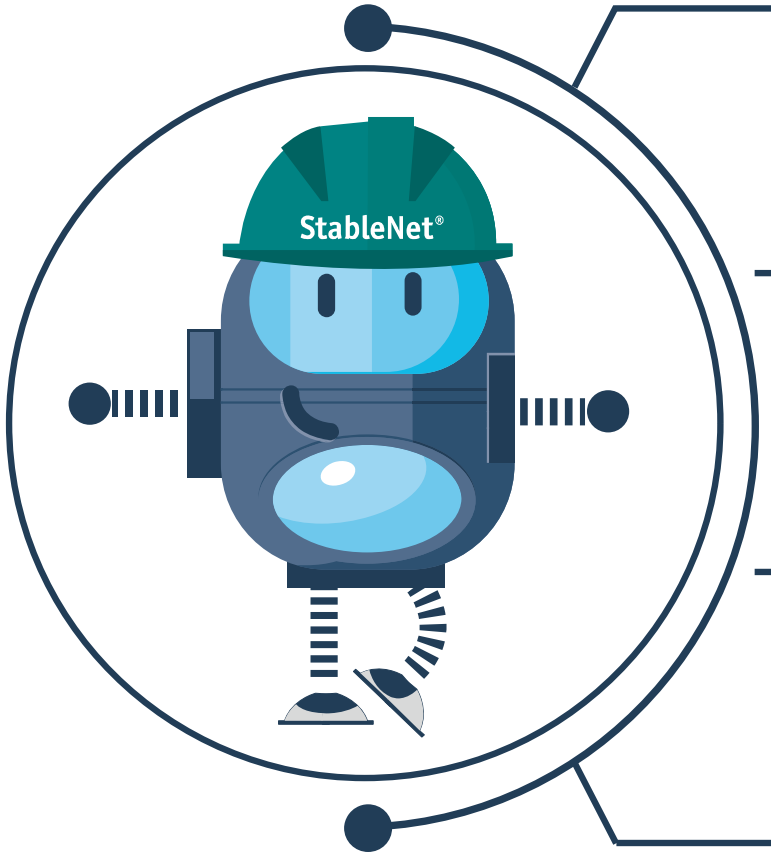


Example 2:
Light mode, opaque panels, Kiosk mode,
Query editor „StableNet® Datasource“


Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe
StableNet® Web Portal
StableNet® Web Portal
https://10.184.1.7:5443/view/inventoryTreeView.xhtml
StableNet® Web Portal
Links
Help
infosim
Status
Inventory
Device List
Device Tree
Maintenance View
Connectivity
Analyzer
Reporting
Device Automation
Inventory Tree
Vendor Measurement Tree
Aviat
Cisco
Ericsson
Ericsson Marconi
Fujitsu
Huawei
Intracom
Linux
Nokia
AB0064_EWEM LAYOUT_SASR_1
AB0069_GOVT COLLEGE_SASR_1
AD0019_FEDERAL POLY MUBI_SASR_1
AD0021_ABTI UNIVERSITY_SASR_1
Extra BGP Peers
Interfaces
Processors
Routing
Specific
VPRN
Health
Properties
Interfaces
Connectivity
Physical Addresses Seen
Modules
Neighborhood
Graph Layout:
Radial Layout
Neighbor Level:
No Traffic
2018-11-09 15:34:10 +0100
TS228_UNGUWAR ROGO_SR7_1
TS048_7 UP FACTORY_SASR_1
TS101_BERGER CAMP_SR7_1
TS320_CATERPILLAR_SR7_1
TS224_ZAMAU FURNITURE_SR7_1
TS102_DANTAKUN KATSINA_SR7_1
TS103_GARAMA QTRS_SR7_1
TS146_WURO HAUSA_SASR_1
TS122_LEKITABA_SR7_1
TS348_POLICE ROUNDABOUT_SR7_1
TS124_MALAMEE GRA_SASR_1
AD0021_ABTI UNIVERSITY_SASR_1
TS121_GALADIMA AMINU WAY_SR7_1
TS713 ALHAJI HABIBU PLOT_SASR_1
Load Interface Data for 10 Seconds


StableNet® GUI - infosim@10.184.1.7(10.184.1.7)
File Themes Options Device Resource Service Templates Jobs Help
Measurements
New Measurement
New Monitor
Modify
Delete
Analyzer
Group Analyzer
Category Analyzer
Status Matrix
Measurement Data
Vendor Measurement Tree
Search: StableNe All Element Ty...
Reg. Exp.
Major
Aviat
Cisco: Major
BEN_VAS_vPC_01: Major
Interfaces: Major
IP SLA
Processors: Marginal
Routing
BEN_VAS_vPC_01 OSPF
Specific
10.234.1.20
BEN_VAS_vPC_01
OJT_DCN_SC_01_MPLS_R
Ericsson: Major
Ericsson Marconi: Major
Fujitsu: Major
Huawei: Major
Intracom: Major
Linux: Major
Nokia: Major
10.195.0.2
10.195.0.3
10.195.0.14
10.195.0.21
10.195.0.37
10.195.0.38
10.195.0.49
10.195.0.50
10.195.0.54
10.195.0.57
10.195.0.58
10.195.0.61
10.195.0.62
10.195.0.97
10.195.0.117
10.195.0.118
10.195.0.126
10.195.1.101: Major
10.195.2.65: Major
10.195.3.129
10.195.3.132
10.195.4.27
10.195.5.101
10.195.5.102
10.195.5.103
10.195.5.105
10.195.5.107
10.195.5.109
10.195.5.114
Nigeria Overall
Region
Abuja
Asaba
Enugu
Kano
Ibdan
Harcourt
Alarm Count 11395 (0) Ack
Highest Severity Major
Major: 5,999
Minor: 5,396
Major: 26
Minor: 44
Transport
Lagos Transport
Abuja Transport
Asaba Transport
Enugu Transport
Kano Transport
Ibdan Transport
Pt. Harcourt Transport
Alarm Count 11963 (0) Ack
Major: 5999.0 Minor: 5396.0
Marginal: 568.0
Microwave
Lagos Microwave
Abuja Microwave
Asaba Microwave
Enugu Microwave
Kano Microwave
Ibdan Microwave
Pt. Harcourt Microwave
Overall: Open Alarms (11395) - Filtered by ALL
Filter: Accept All
Symptoms
Acknowledged
Sort by Time
Severity Filter: ≥ Minor
Time Range: All
Alarm Time Description
Major 2018-10-26 17:04:38 +0200 OG4486_IHS OFFSITE PUNCH_ATN980B_1 Eth-Trunk1 - Via_10G_to_T0387_MORENIKE OLOYEDE_ATN980B_1_0/3/0: op-status: 2 state : down
Major - 15 Symptoms 2018-10-26 17:04:16 +0200 OG2395_ST FRANCIS CLOSE_ATN980B Eth-Trunk2 - Via_10G_to_T0387_MORENIKE OLOYEDE_ATN980B_1_0/4/0: op-status: 2 state : down
Major Noise 2018-10-26 17:03:41 +0200 10.195.254.60: Avg Round Trip Time: -1 ms : device down
Major 2018-10-26 17:01:59 +0200 10.195.162.26: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:59:57 +0200 10.195.88.17: Avg Round Trip Time: -1 ms : device down
Major - 11 Symptoms 2018-10-26 16:59:51 +0200 OTU FACING CORNER OWO: Avg Round Trip Time: 2,650.711 ms
Major Noise 2018-10-26 16:58:09 +0200 10.195.180.170: Avg Round Trip Time: -1 ms : device down
Major 2018-10-26 16:56:34 +0200 10.195.227.66: Avg Round Trip Time: -1 ms : device down
Major 2018-10-26 16:55:45 +0200 10.195.21.84: Avg Round Trip Time: -1 ms : device down
Major 2018-10-26 16:54:11 +0200 T0764_AWOFUWAS_PLOT_ATN980B_1: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:50:17 +0200 10.195.180.3: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:49:20 +0200 10.195.254.38: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:44:15 +0200 10.195.177.129: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:42:17 +0200 10.195.215.17: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:39:11 +0200 10.195.177.10: Avg Round Trip Time: -1 ms : device down
Major - 10 Symptoms 2018-10-26 16:39:03 +0200 T4380_AMAFOR_SASR_1 NNI_to_T4372_SASR_1, IP interface (NNI_to_T4372_SASR_1) - IP interface: op-status: 7 state
Major Noise 2018-10-26 16:38:19 +0200 10.195.177.3: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:36:54 +0200 10.195.177.131: Avg Round Trip Time: -1 ms : device down
Major Noise 2018-10-26 16:29:38 +0200 10.195.215.18: Avg Round Trip Time: -1 ms : device down
Last Update: 2018-10-26 17:06:35 +0200
Freeze View
Close
Open Alarms (11963) - Filtered by ALL
Action Events (15000)
Trap Entries (15000)
Syslog Entries (0)
StableNet Log Entr
Alarm Time
Alarm
Cause
Ack
2018-10-25 15:33:31 +0200 Ok
2018-10-25 15:33:31 +0200 Ok
2018-10-25 15:33:37 +0200 Major Noise
2018-10-25 15:33:52 +0200 Ok
2018-10-25 15:34:05 +0200 Ok
2018-10-25 15:34:15 +0200 Ok
2018-10-25 15:34:28 +0200 Ok Routing T4299_OWERRI SWITCH_SR12_4 BGP-4 Peer: 10.22.155.80 (64908): bgpPeerState: 6 state : esta...
2018-10-25 15:34:32 +0200 Ok Routing T4905_CPT DOWNES ROAD_SASR_1 BGP-4 Peer: 10.46.146.57 (64909): bgpPeerState: 6 state : ...
2018-10-25 15:34:38 +0200 Ok Availability 10.195.215.18: Avg Round Trip Time: 230.020 ms
2018-10-25 15:34:40 +0200 Ok Availability T2323_ATIMBO STR_ATN980B_1: Avg Round Trip Time: 28.674 ms
2018-10-25 15:34:49 +0200 Minor VPRN T4322_OWELLU_SASR_1 Alcatel VPRN Status management - management: vRtrIfOperState: 3 stat...
2018-10-25 15:34:50 +0200 Ok Failure T4239_HANDEL_SASR_1 NNI_to_T4256_SASR_1, IP interface (NNI_to_T4256_SASR_1) - IP interfa... 259039
2018-10-25 15:34:50 +0200 Ok Failure T4239_HANDEL_SASR_1 NNI_to_T4256_SASR_1, IP interface (NNI_to_T4256_SASR_1) - IP interfa... 259039
9941
260645
Agents
Inventory
Reporting
Network Inspection
Device Automation
Agent state: 1/1 up
17:06
26.10.2018

STABLENET® UNIQUE SALES POINTS



- Automation
- Flexibility and Customization
- Unified Solution
- Scalability

CHALLENGES & OUR **STABLENET®** VISION

Services
Virtualization/SDN/NFV

Automation of IT

StableNet® as central management and orchestration system
–
All information at your fingertips

IoT/Industrie 4.0

SERVICES – VIRTUALIZATION/SDN/NFV

Services
Virtualization/SDN/NFV

New Challenges

Alarm with Tagging Integration

Root Cause Analysis

Automation & Provisioning

Unified Management Holistic View

IOT/INDUSTRIE 4.0

IoT/Industrie 4.0

SERVICES – AUTOMATION OF IT

Cloud/SaaS/Automation of IT

New Challenges

- SaaS StableNet®
- OaaS StableNet®
- Integration Outsourcing
- Automation & Provisioning

One step to solve the challenges

Research & Collaboration!

OVERVIEW: **INDUSTRY 4.0 & PLATFORMS**

infosim®

- **ROBOTOP (06/2017 – 05/2020)**
  Modular, open and internet-based platform for robotic applications in industry and service
- **DiHP (08/2017 – 07/2020)**
  Services for the integrated trade of production capacity
- **PimKoWe (10/2018 – 09/2021)**
  Platform for the integrated management of collaborations in value creation networks
- **Di-Link (06/2019 – 05/2022)**
  Digital solutions for industrial plastic circuits

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

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Bundesministerium für Wirtschaft und Energie

APE ENGINEERING · BETTERGUARDS INNOVATIVE ORTHOPEDICS · 3YOURMIND · SIGNAVIO · RWTH AACHEN UNIVERSITY · faizod.
BOSCH · SCHUNK · ICARUS · MAUL-THEET · SKZ · Wuppertal Institut · ...
LPS · RUB · FAPS · IPS · wbk · Julius-Maximilians-Universität Würzburg · HOFFMANN+VOSS TECHNISCHE KUNSTSTOFFE · MKV

OVERVIEW: IoT, SMART CITY, VISUALIZATION

infosim®

- *SENDATE (04/2016 – 03/2019)*
  SEcure Networking for a DATa Center Cloud in Europe
- **SIMPL (07/2018 – 06/2021)**
  Secure Internet-of-Things Management Platform
- **5MART (03/2019 – 02/2022)**
  5G-enabled management of all regional activities
- **iPRALINE (04/2019 – 03/2021)**
  Interactive problem analysis and solution in industrial networks
- *KICK (01/2020 – 12/2022)*
  Artificial Intelligence for Campus Communication

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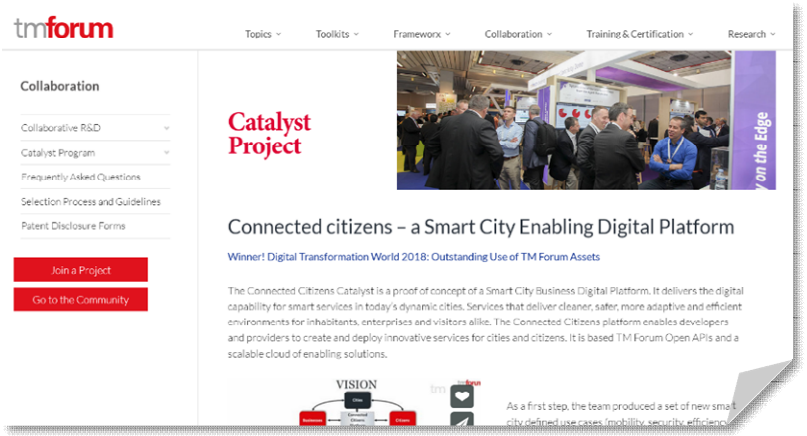
Infineon, NOKIA, ADVA Optical Networking, AIRBUS GROUP, BOSCH, SIEMENS, orange, Fraunhofer Heinrich Hertz Institute, VTT, Fraunhofer AISEC, genua, MIXED MODE, BISDN Berlin Institute for Software Defined Networks, Hahn Schickard, DENKBARES, STADT WÜRZBURG, ...

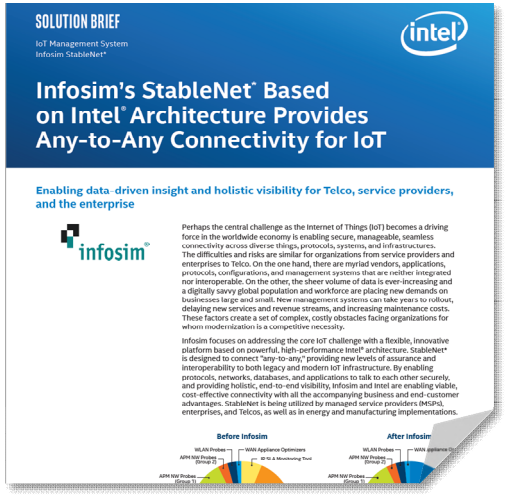
RUHR UNIVERSITÄT BOCHUM, RUB, KIT, Technische Universität Braunschweig, TECHNISCHE UNIVERSITÄT DARMSTADT, TUM, Julius-Maximilians-UNIVERSITÄT WÜRZBURG, DFKI German Research Center for Artificial Intelligence

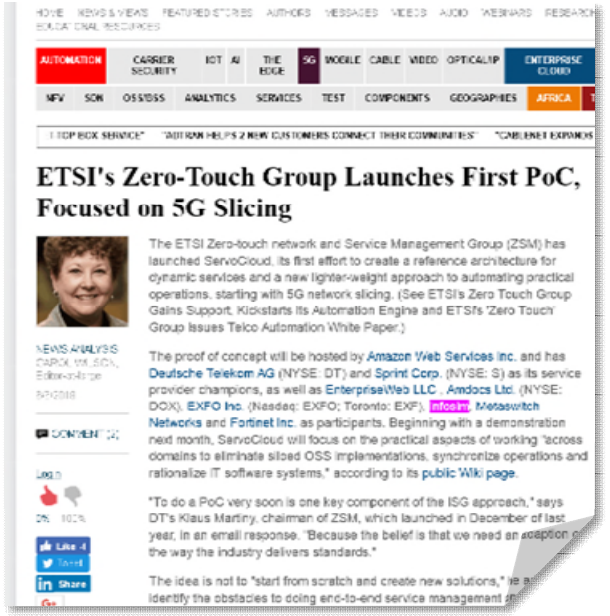
INDUSTRY **COLLABORATION**

Industry collaboration

- TM Forum
- ETSI ISG Zero-Touch Network and Services Management lead by DTAG
- Technological partnerships with Intel® & Extreme Networks
- Vodafone Innovation Lab
-







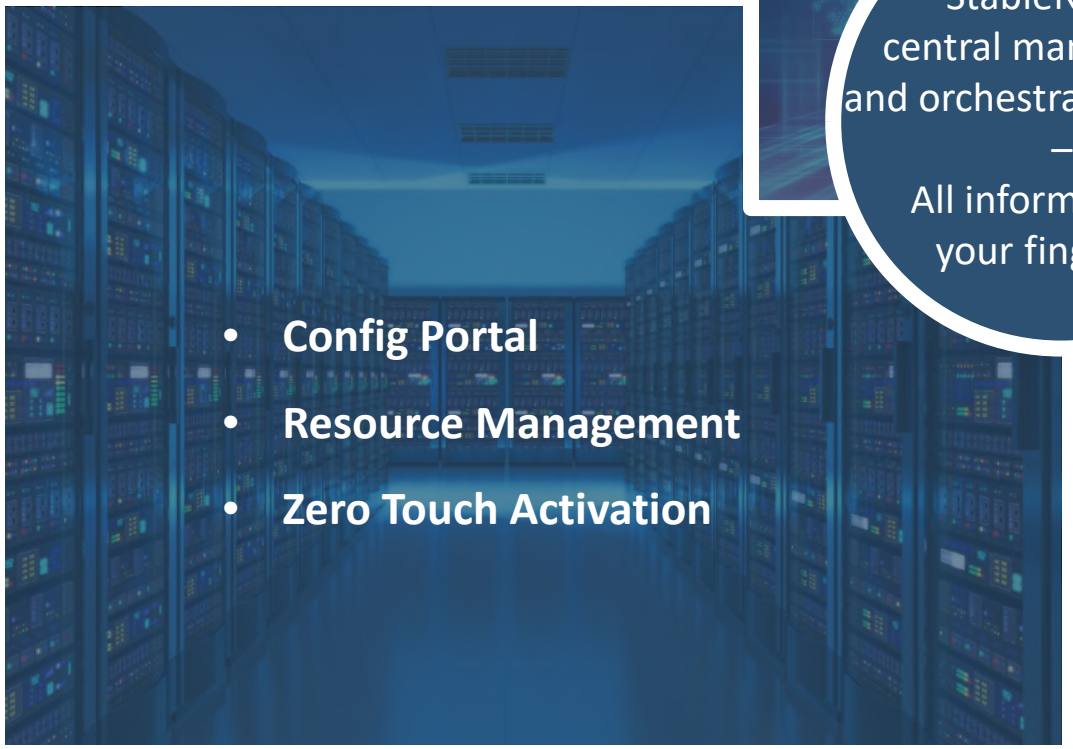
HOW WE TURN THE **VISION** INTO REALITY

infosim®

Services
Virtualization/SDN/NFV

- **SDN Solution Cisco ACI**

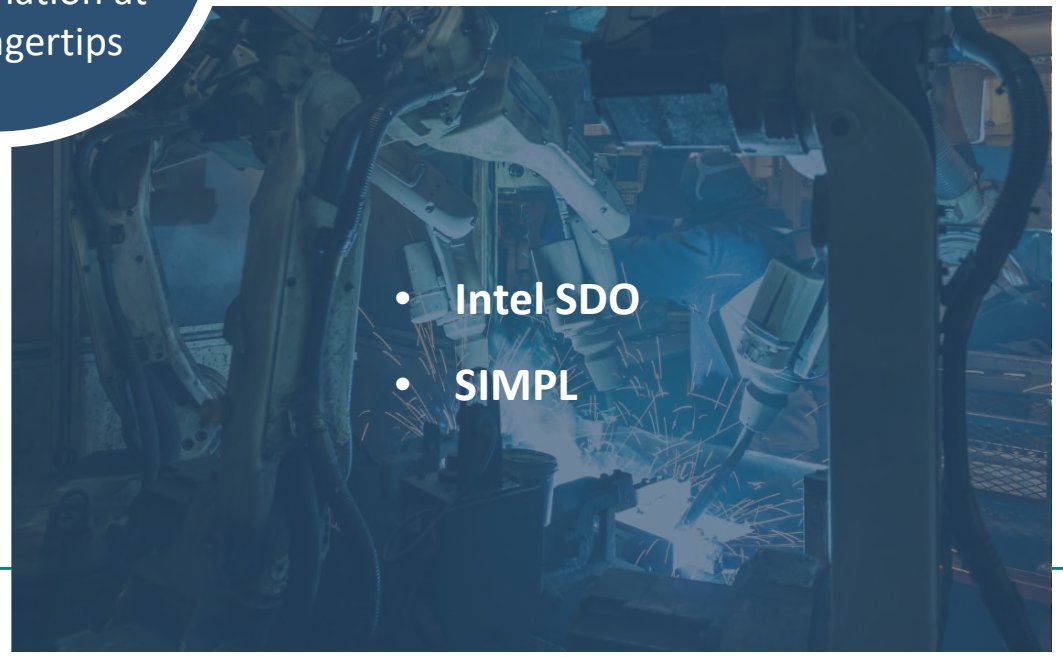
Automation of IT



- **Config Portal**
- **Resource Management**
- **Zero Touch Activation**

StableNet® as central management and orchestration system
–
All information at your fingertips

IoT/Industrie 4.0



- **Intel SDO**
- **SIMPL**

Example - ZERO TOUCH ACTIVATION

- New Deployment:
  - Configuration based on configuration from the StableNet® Config Portal
  - Match of configuration done by serial number or MAC address
  - Update IOS
  - Job result gets tagged with device attributes (e.g. serial number)

- “Break and Fix”
  - Replace broken device with same model, minimize down time
  - Select last backup of old device and place it on new device
  - No IOS update (may take up to 3 hours – too long for replacement)

ZERO TOUCH ACTIVATION - Workflow

New vendor independent support (e.g. Cisco, HP, Juniper, …)

```
ip ssh version 2
hostname ztp
ip domain name muc
crypto key generate rsa mod 3072
line vty 0 15
transport input ssh
login local
…
```

DHCP Request

Download Python Script Request

Execute Deployment Request

```
{
  "ip": "192.168.81.10",
  "serialnumber": "FCW2206G0AD",
  "platform": "C9300-48P"
}
```

Download Config

DHCP Server

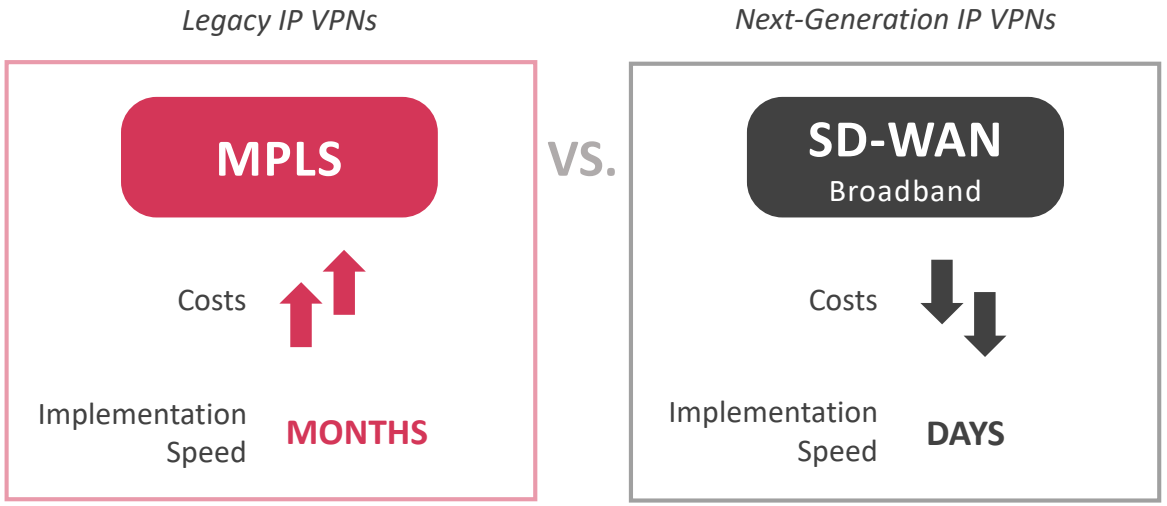
StableNet®

Zero-Touch Server

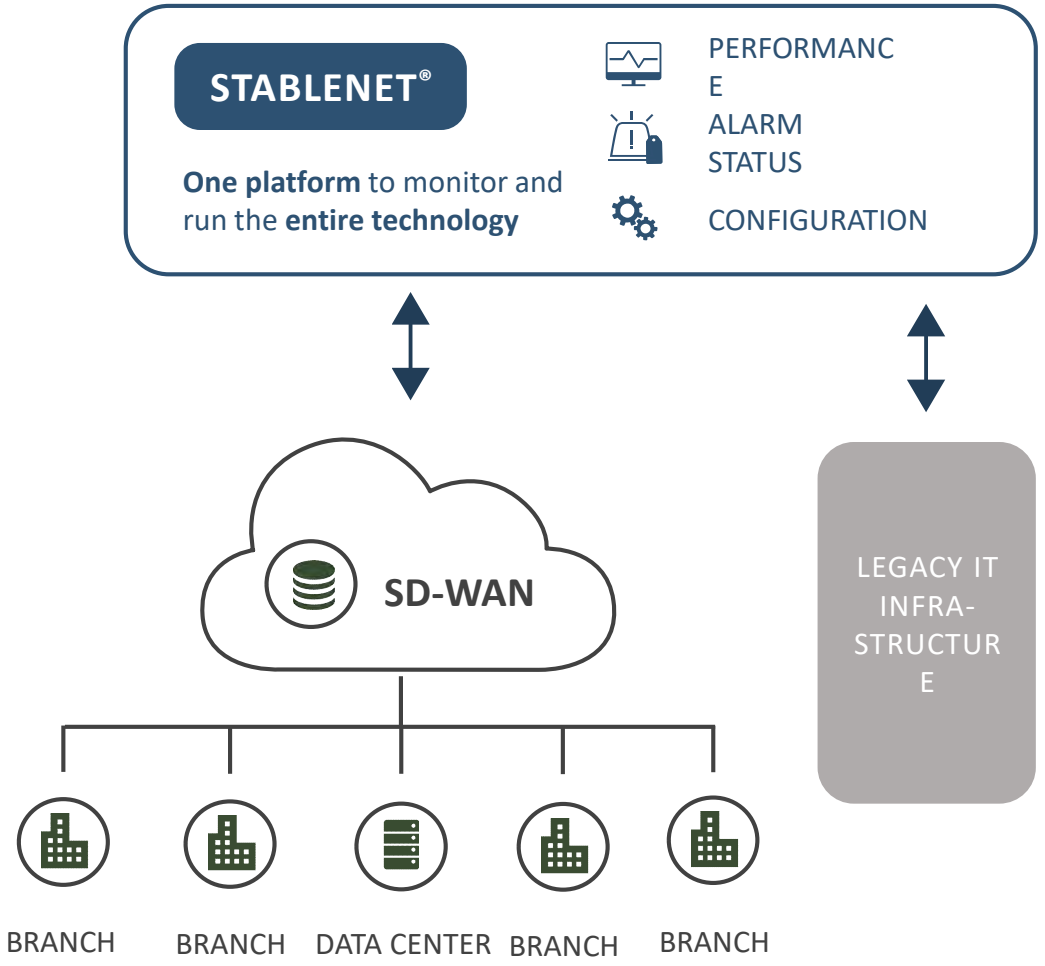
Deployment Server

StableNet® Agent (Default)

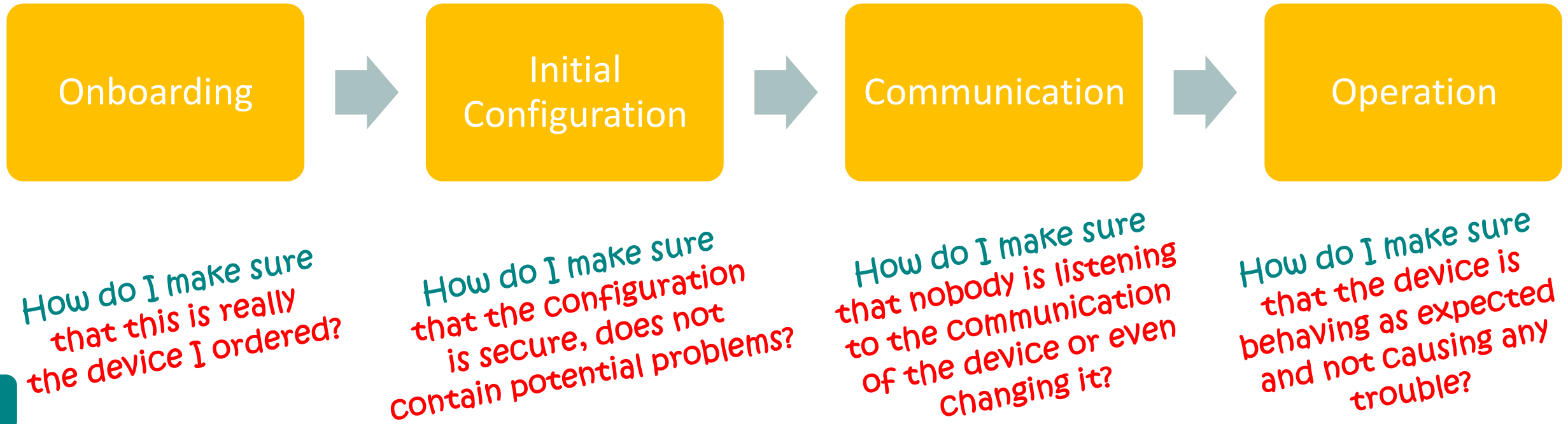
Example - SD-WAN
ANOTHER TECHNOLOGY TO BE OPERATED



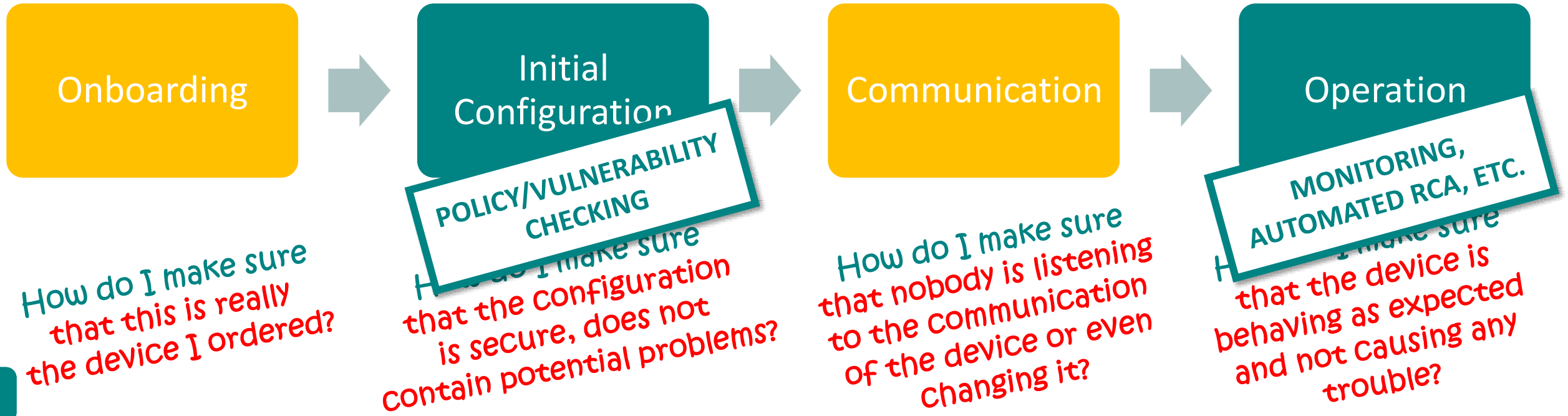
- SD-WAN achieved significance on the market
- Each service provider/enterprise needs to think about an SD-WAN solution to fulfill the market requirements
- SD-WAN is another technology which challenges the operation teams



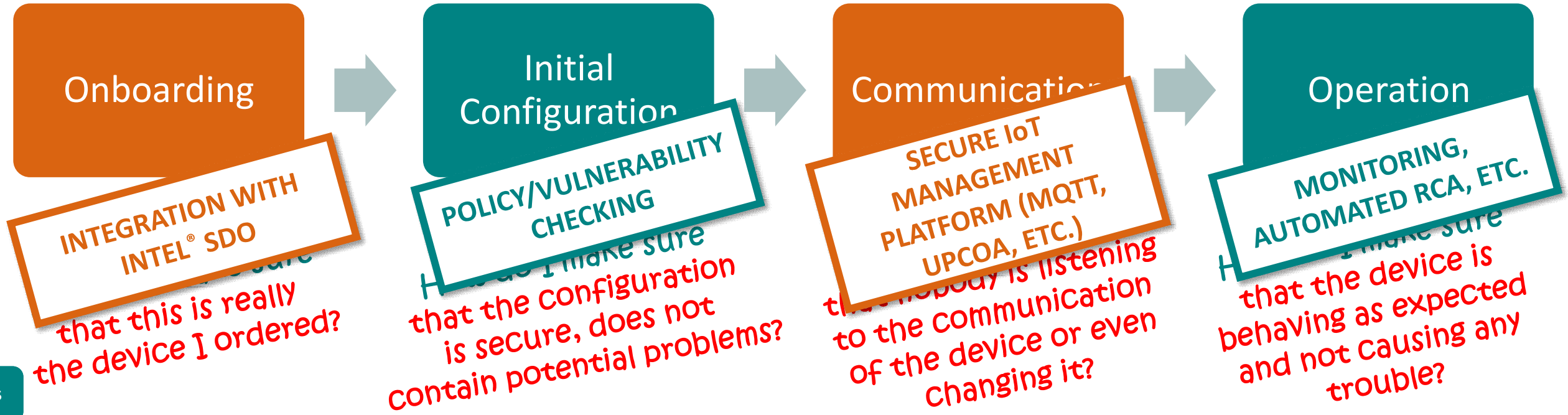
IoT - POTENTIAL **SECURITY PROBLEMS**



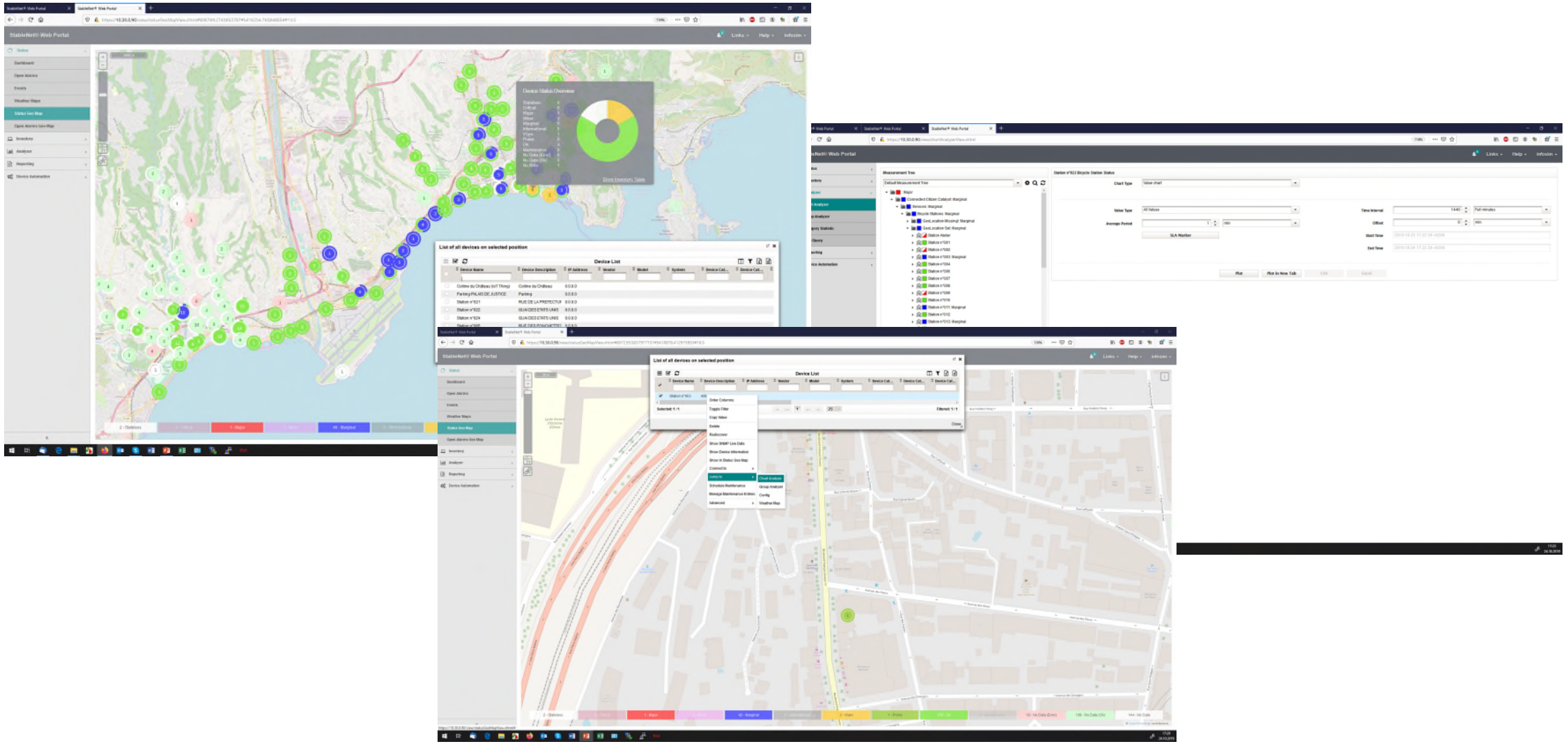
IoT - „CLASSICAL“ FIELDS OF STABLENET®



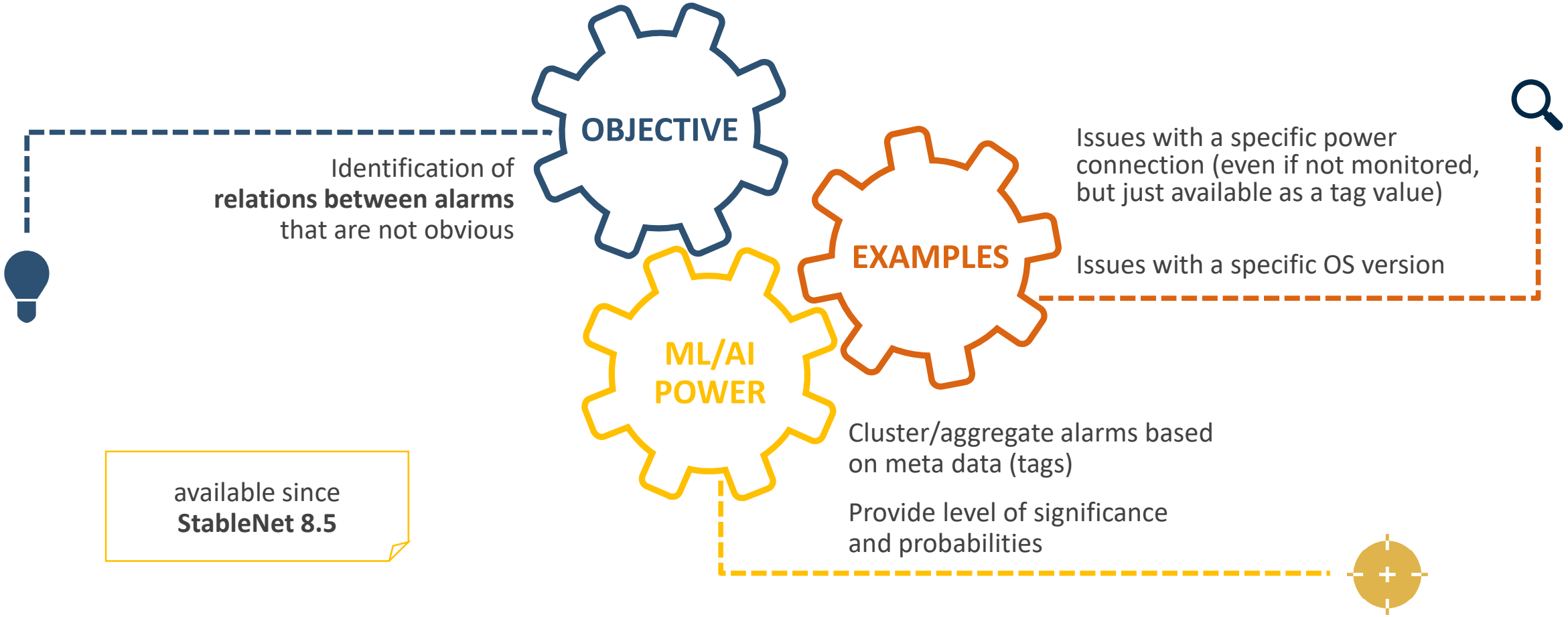
IoT - EXTENDED SECURITY FEATURES



Example **IoT** - METROPOLE DE NICE COTE D'AZUR
SMART CITY ENABLING DIGITAL PLATFORM

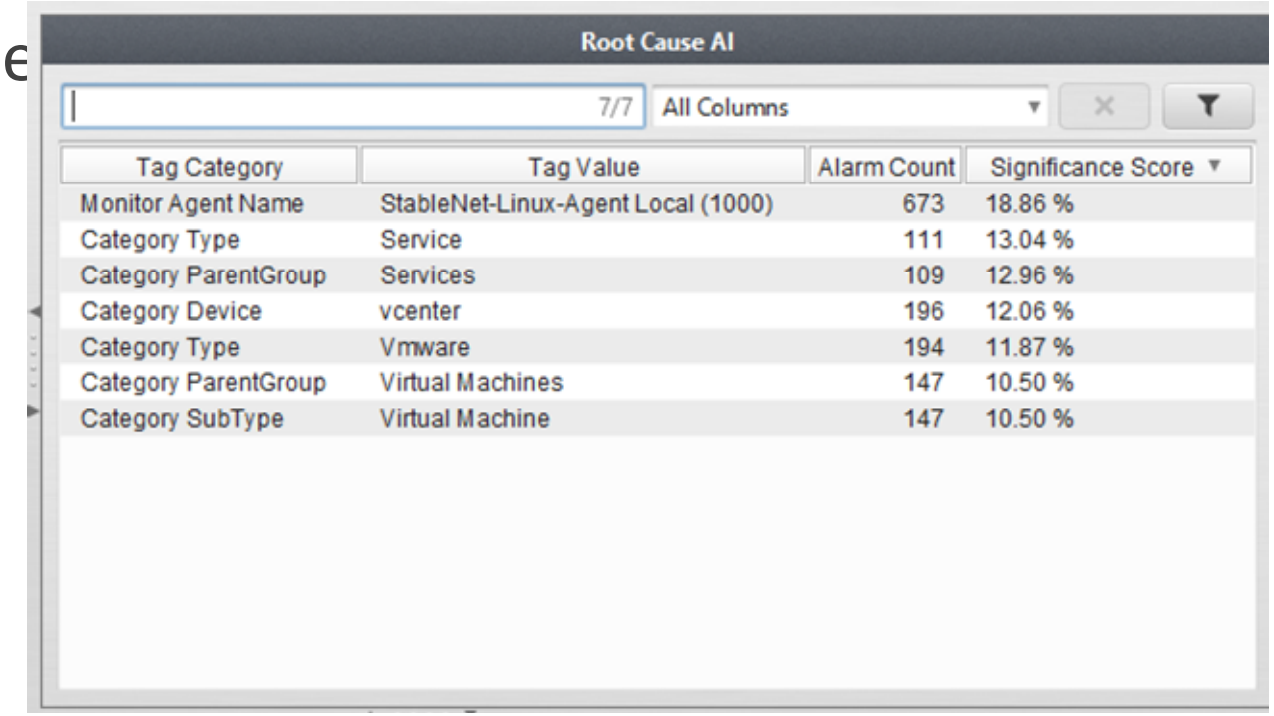


ROOT CAUSE AI – ALARM CORRELATION



ROOT CAUSE AI - TECHNICAL

- Algorithm is based on Tag Values
  (Alarm Tag Categories, all Monitor and Device Tags)
- Determines score for every tag value
- Available as Dashboard and
  in Reports
- In Future enhanced with additional
  algorithms and logic
  based on research results



Tag Category	Tag Value	Alarm Count	Significance Score
Monitor Agent Name	StableNet-Linux-Agent Local (1000)	673	18.86 %
Category Type	Service	111	13.04 %
Category ParentGroup	Services	109	12.96 %
Category Device	vcenter	196	12.06 %
Category Type	Vmware	194	11.87 %
Category ParentGroup	Virtual Machines	147	10.50 %
Category SubType	Virtual Machine	147	10.50 %

FURTHER AREAS FOR ML/AI – ONGOING AND FUTURE ACTIVITIES

+ various partners from industry and academia

- **Performance Monitoring**
  - Baselining / Dynamic thresholds
  - Adaptive distributed monitoring (e.g., dynamic measurement intervals)

- **Fault Management**
  - Improved alarm correlation
  - Outlier/anomaly detection

- **Network Change & Configuration Management (NCCM)**
  - AI-assisted configuration management
  - Extended policy checking

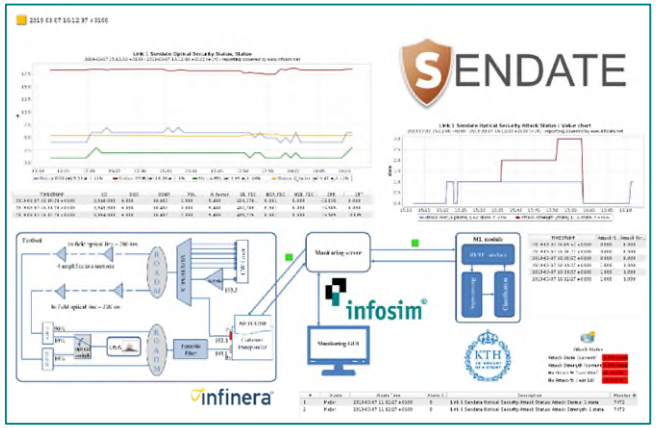
+ many other AI-assisted extensions (e.g., discovery, visualization/layouting, clustering, reporting)

ATTACK DETECTION – OPTICAL NETWORKS

OBJECTIVE

Identify attacks in the optical network based on the evaluation of a complex set of +20 optical metrics

EXAMPLES



ML/AI POWER

Attack detection and identification: supervised learning applied to a classification problem

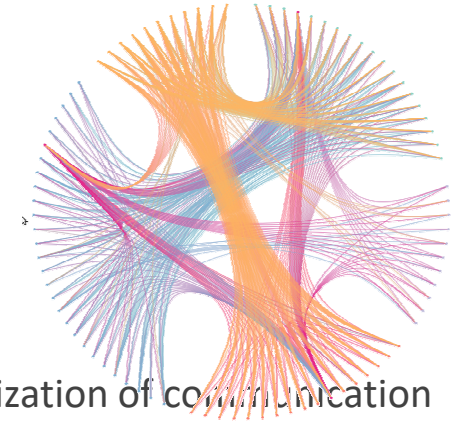
Demo at ECOC DUBLIN 2019

ANOMALY DETECTION – TRAFFIC / FLOW DATA

OBJECTIVE

Detect security incidents
based on traffic / flow analysis

EXAMPLES



Visualization of communication groups

ML/AI POWER

Modelling and clustering of network traffic

Fast and efficient anomaly detection

Demo at

BEIJING
SIGCOMM
2019

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Thank you