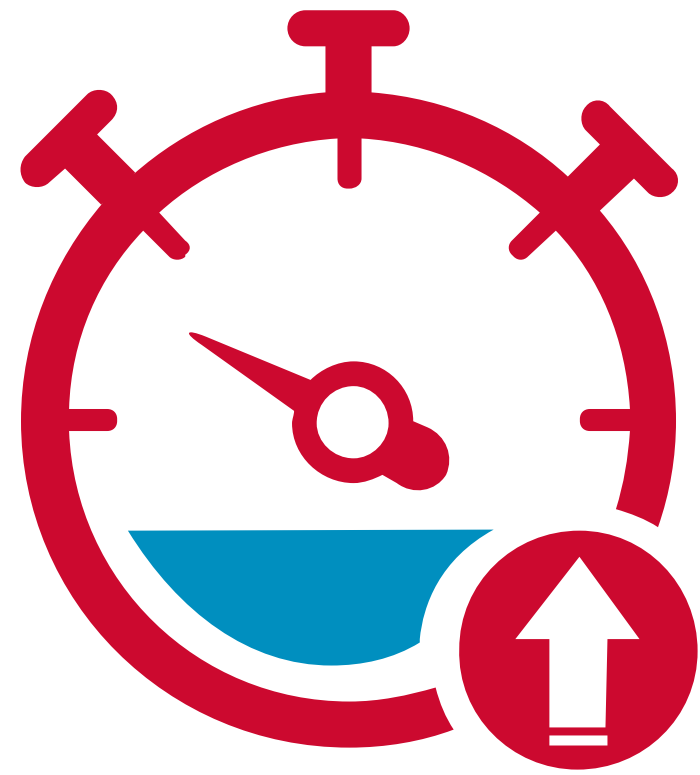# Automating the SAN Fabric

David Schmeichel, Director Architecture & Technology
April 25th, 2019

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Why The Need For Automation?

47%

Of time is spent on configuration, provisioning and troubleshooting tasks

Source: IDC Converged Systems Survey, August, 2014

90%

Of network problems can be traced to configuration errors

Source: (Dennis Drogseth, Vice President of IT)

68%

Of organizations say IT is more complex than it was 2 years ago

Source: ESG Whitepaper, Automating The Fibre Channel Data Center, January 2018

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What is Brocade Automation?

POWERFUL
for **DEVOPS**

Deploy applications faster, manage systems more easily, and eliminate complexity more quickly

SIMPLE
with **ANSIBLE**

Eliminate repetitive tasks, simplify management, and orchestrate across all infrastructure

OPEN
for **COMMUNITIES**

Leverage REST APIs to build solutions, share best practices, and get to production faster

Automate

| REST API | PyFOS | Ansible |

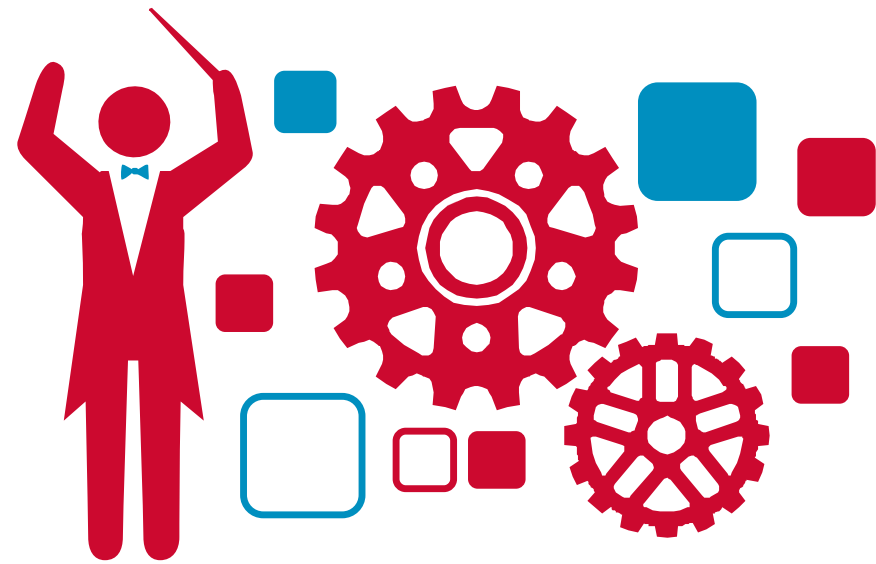**MANAGEMENT** **PERFORMANCE** **MONITORING** **TROUBLESHOOTING** **REPORTING**

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What Does Brocade Automation Offer:

Provisioning

- Switch
- Access Gateway
- Port
- Zoning
- SAN Extension
- Workflow

Monitoring

- Port State
- Port Statistics
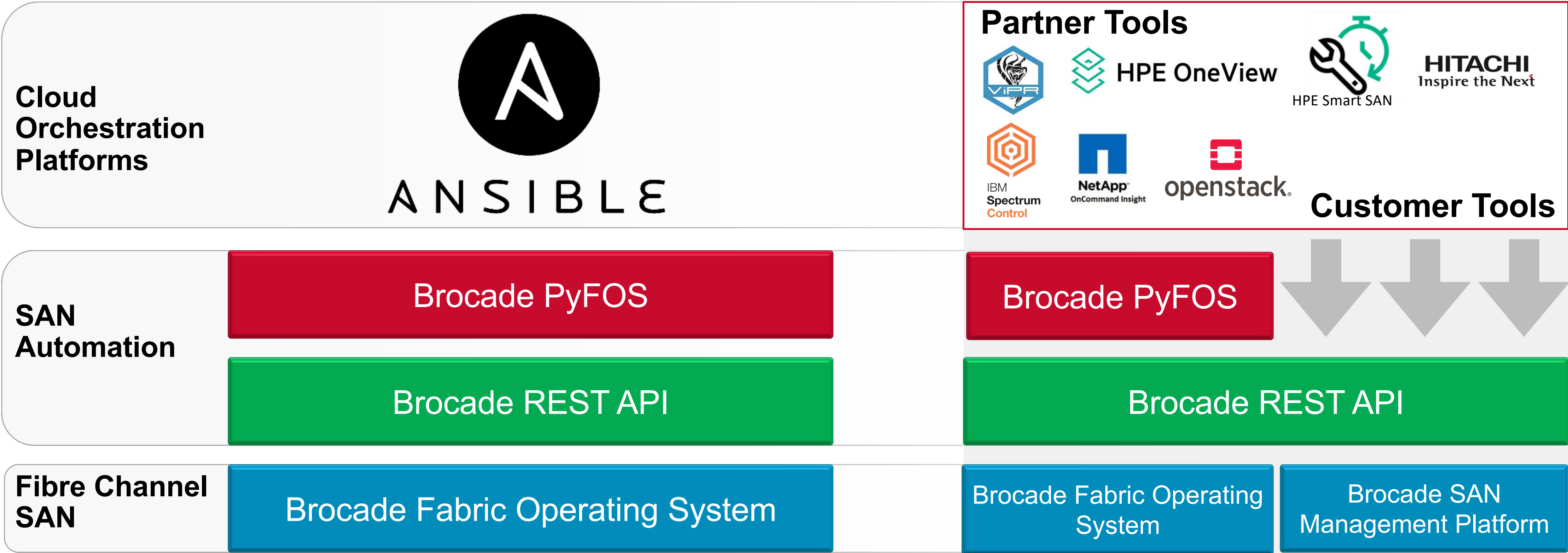- Port Errors
- Violations
- MAPS

Inventory

- Configuration to XLS
- Compare to SAN Health
- Reporting
- Fabric
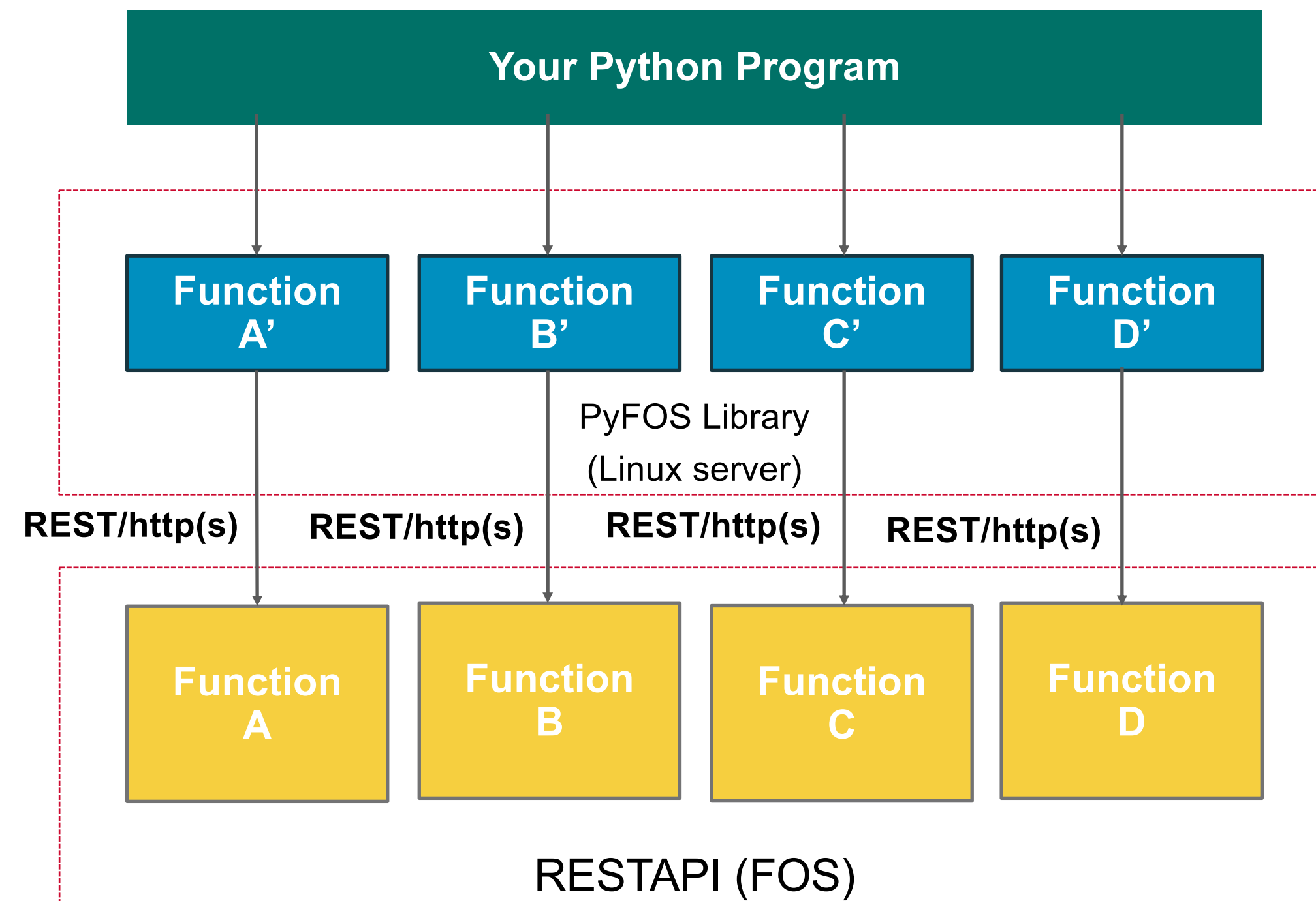- Switch
- End devices
- Access Gateway

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Automation Architecture Made Simple

Adopt SAN Automation Easily with PyFOS

- **PyFOS Library**
  - Python binding to REST API on Fabric OS
  - Output in popular JSON format
  - Open source release sponsored by Brocade
  - Community best effort support
  - Release to https://github.com/brocade/pyfos

- **PyFOS Utility**
  - Fully functional scripts for switch, port, and zoning common management tasks
  - Useful toolbox for daily operational activities
  - Leverage Brocade SAN expertise

Your Python Program

| Function A' | Function B' | Function C' | Function D' |

PyFOS Library
(Linux server)

REST/http(s)   **REST/http(s)**   **REST/http(s)**   **REST/http(s)**

| Function A | Function B | Function C | Function D |

RESTAPI (FOS)

Sample Python Scripts that use PyFOS Library

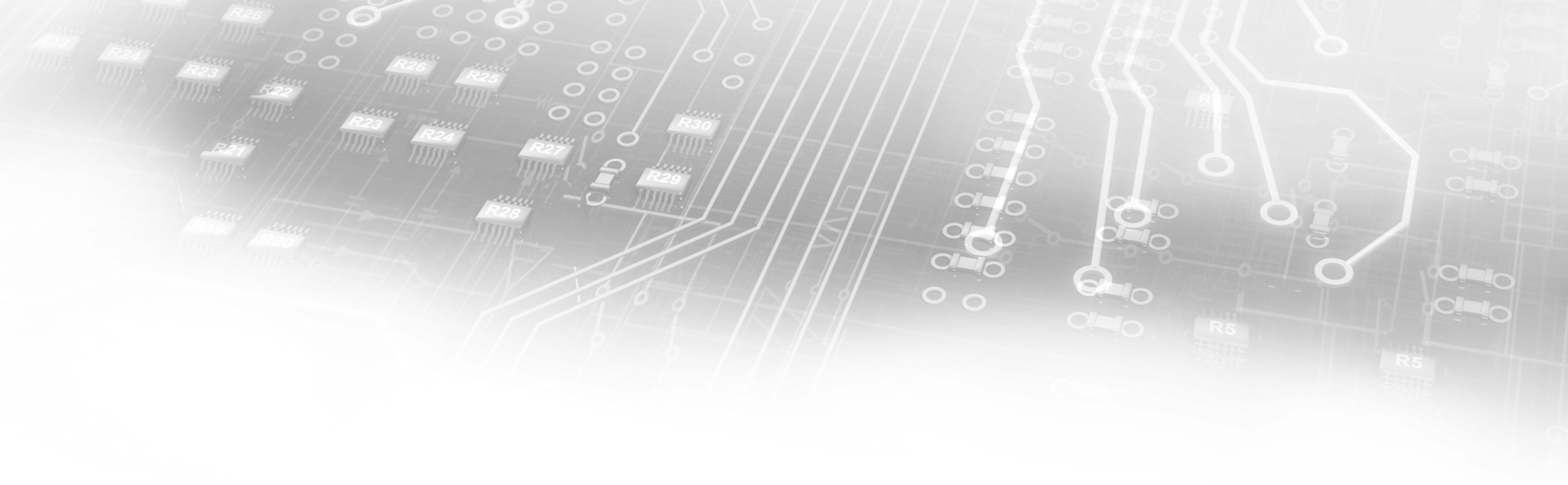|	
aliascreate.py	aliasdelete.py
aliasremove.py	aliasupdate.py
cfgclear.py	cfgcreate.py
cfgdelete.py	cfgdisable.py
cfgenable.py	cfgremove.py
cfgsave.py	cfgshow.py
cfgupdate.py	defzone.py
fabricshow.py	findme.py
portavailshow.py	portdportrun.py
portnameset.py	portshow.py
portstate.py	portstateset.py
portstatsmon.py	portstatsshow.py
pzonecreate.py	pzonedelete.py
pzoneremove.py	pzoneupdate.py
switchnameset.py	switchshow.py
zonecreate.py	zonedelete.py
zoneremove.py	zoneupdate.py

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SAN Automation Using Ansible

Ansible is a agent-free, open-source automation engine

- ## SAN Ansible workflow

  - Playbooks run on Ansible server

  - Execute Ansible modules

  - Modules invoke PyFOS library

  - PyFOS library makes REST API calls to FOS/FC switches

  - REST API perform configuration or get statistics or state information

- ## Brocade provide Ansible playbooks as examples

- ## Sample playbooks cover common configuration use cases

- ## Open Source Release at:
  https://github.com/brocade/ansible

Ansible Server/Control machine

Ansible Module

PyFOS Library

REST/http(s)   REST/http(s)   REST/http(s)

FC Switch   FC Switch   FC Switch

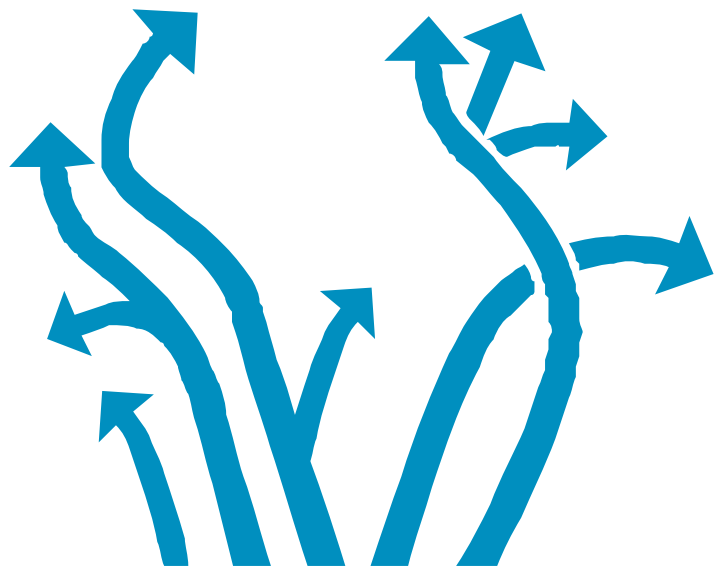**Nodes being configured**

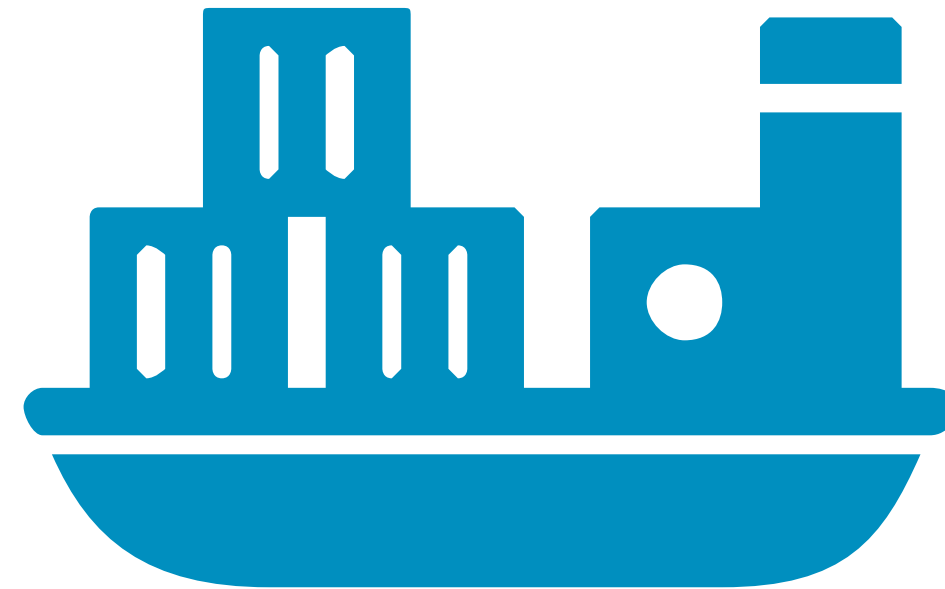**BROADCOM**®

Use Cases

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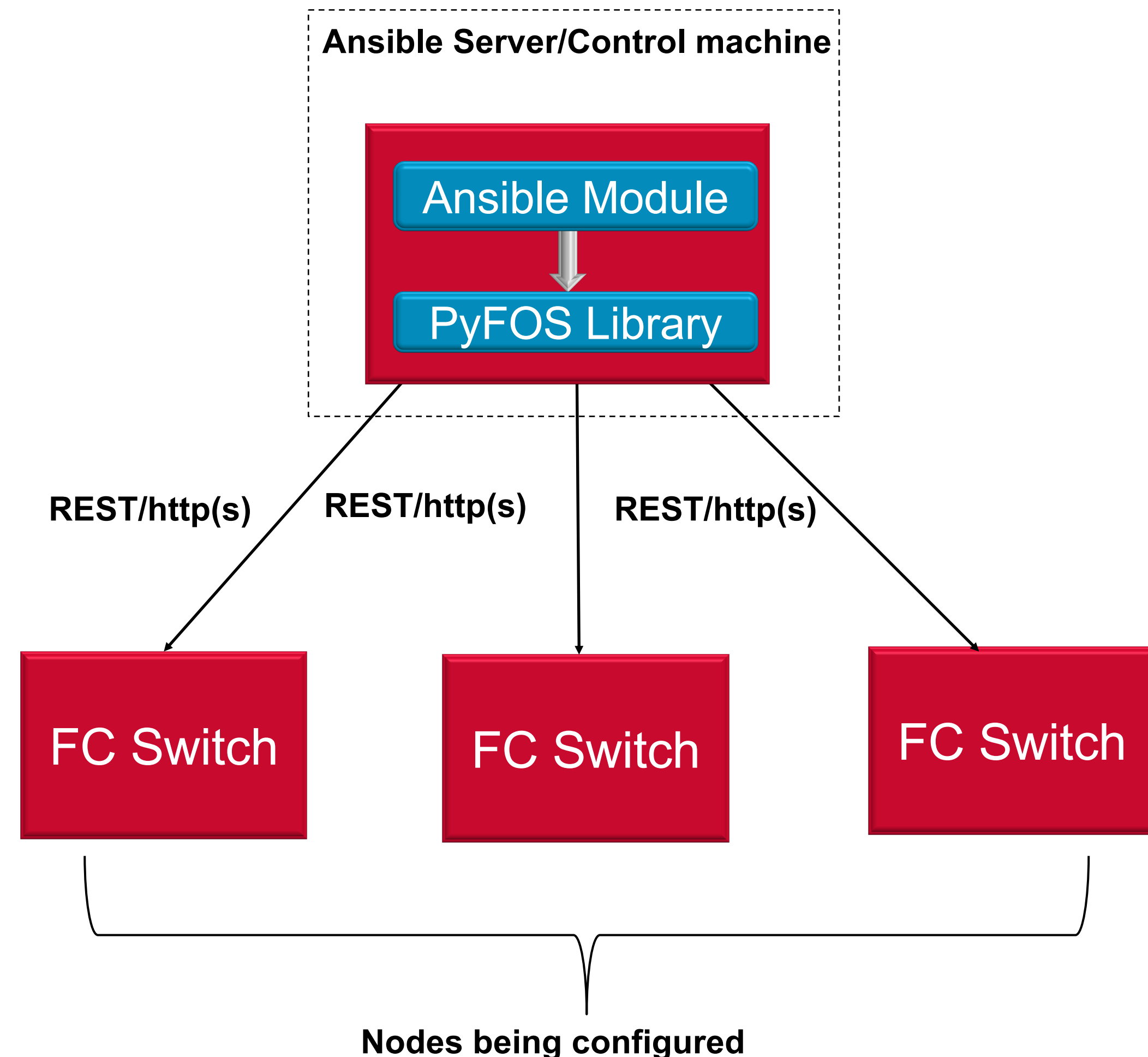
Turnkey Automation for the Non-programmers

Challenge

- I don't know where to start with automation
- I don't have time to learn programming
- Not familiar with the multiple developer tools

Solution

- Everything needed to deploy the automation tool kit within a Docker container
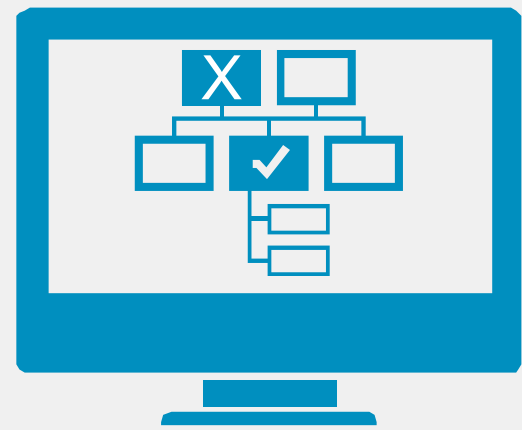- Streamlining deployment of use cases

Benefits

- Zero DevOps or programming knowledge needed
- Utilizes open-source toolkits
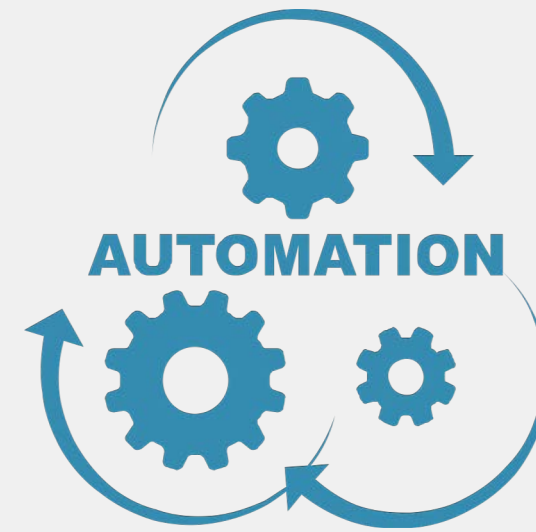- Consumable outputs (word, xls)

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Automated Monitoring of Configuration Drift

Challenge

- Fabric settings changing out of acceptable ranges
- Some verticals auditors want proof points for compliance against changes
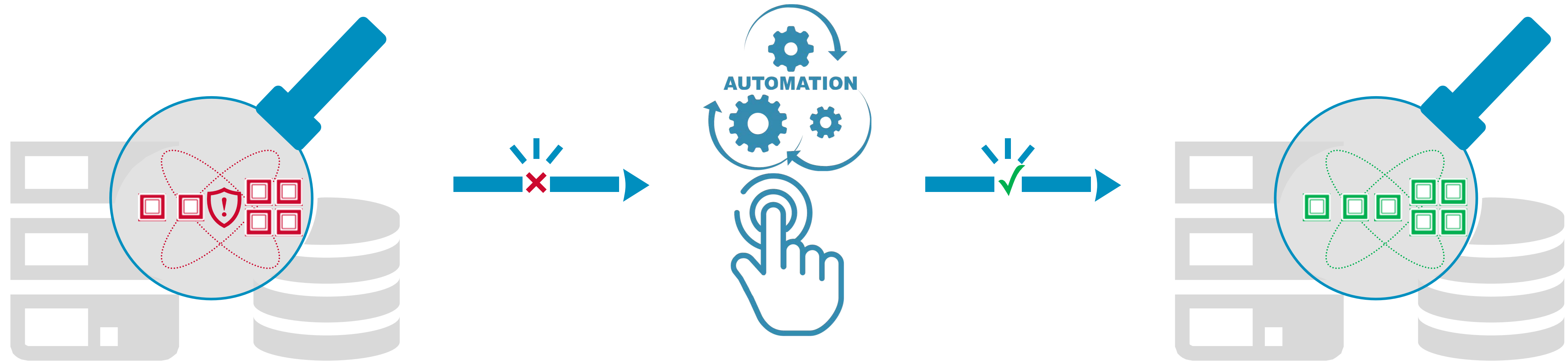
Solution

AUTOMATION

- Package REST/PyFOS utilities for switch baseline
- Produce a report of anything that has changed or drifted from the baseline

Benefits

- Solves challenges against regulators and auditors
- Provides verification tool for tracking modifications

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Automated Golden Configuration Recovery

Challenge

- Consistent deployment of switch or director configurations
- Error prone or lack of consistency between locations
- Needed for auditing

Solution

- Package REST/PyFOS utilities
- Guarantees uniformity and compliance
- Automate manual steps into one automation app

Benefits

- Solves a practical task for every customer
- Safe path to use automate in a non-production
- Alternative to traditional deployment solutions

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Spreadsheet-Driven Zoning

- The world runs on spreadsheets
- SAN zoning is a perfect example

Initiator Alias	Initiator Alias WWN	Target Alias	Target Alias WWN	Active Zone CFG	Zone Prefix	Zone Name
AIXHOST_FCS0	10:00:00:00:c9:c6:1d:56	VMAX01_SN1234_8F0	50:00:09:72:08:34:39:5c	CFG_FABRIC_A	Z	auto
AIXHOST_FCS2	10:00:00:00:c9:c6:12:b2	VMAX01_SN1234_9F0	50:00:09:72:08:34:39:60	CFG_FABRIC_A	Z	auto
AIXHOST_FCS4	10:00:00:00:c9:c6:1a:5c	VMAX01_SN1234_5E0	50:00:09:72:08:34:39:10	CFG_FABRIC_A	Z	auto
AIXHOST_FCS6	10:00:00:00:c9:c6:1b:2e	VMAX01_SN1234_12F0	50:00:09:72:08:34:39:54	CFG_FABRIC_A	Z	auto
AIXHOST_FCS0	10:00:00:00:c9:c6:1d:56	VMAX01_SN1234_8F0	50:00:09:72:08:34:39:5c	CFG_FABRIC_A	Z	Z_AIXHOST_FCS0_VMAX01_SN1234_8F0
AIXHOST_FCS2	10:00:00:00:c9:c6:12:b2	VMAX01_SN1234_9F0	50:00:09:72:08:34:39:60	CFG_FABRIC_A	Z	Z_AIXHOST_FCS2_VMAX01_SN1234_9F0
AIXHOST_FCS4	10:00:00:00:c9:c6:1a:5c	VMAX01_SN1234_5E0	50:00:09:72:08:34:39:10	CFG_FABRIC_A	Z	Z_AIXHOST_FCS4_VMAX01_SN1234_5E0
AIXHOST_FCS6	10:00:00:00:c9:c6:1b:2e	VMAX01_SN1234_12F0	50:00:09:72:08:34:39:54	CFG_FABRIC_A	Z	Z_AIXHOST_FCS6_VMAX01_SN1234_12F0

- Zones can be understood by non-storage experts
- The same documents that are used for planning can be used for implementation
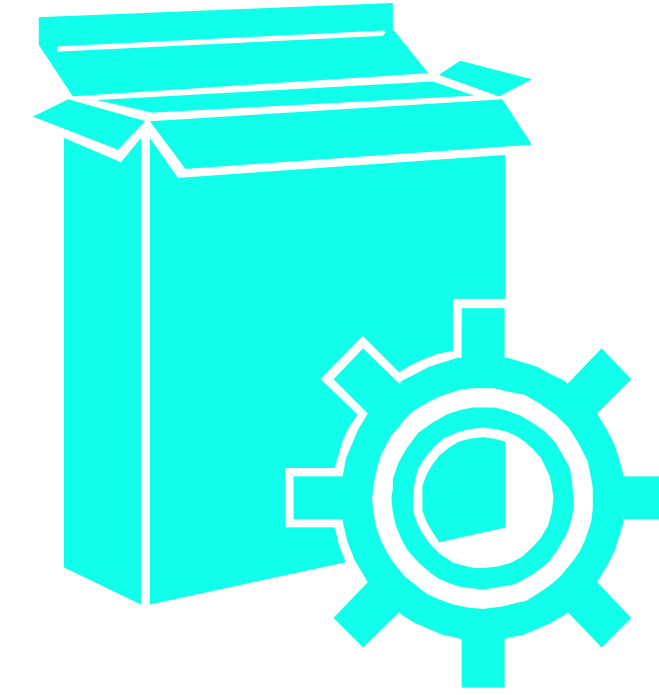- Sample of bulk zoning at http://github.com/brocade/pyfos-contrib

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Resources

Use Case Examples on GitHub

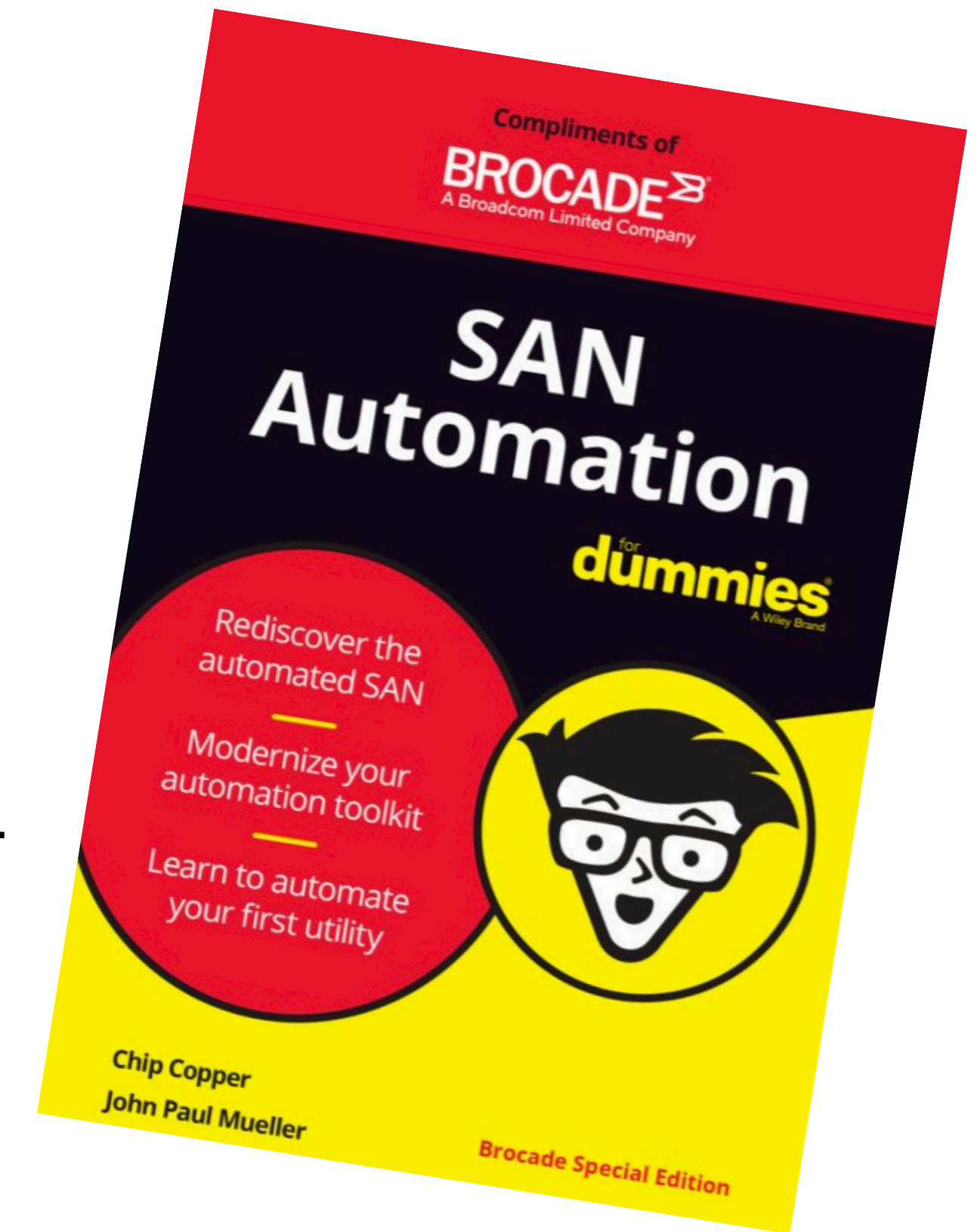https://github.com/brocade/pyfos

https://github.com/brocade/pyfos-contrib

- genSheet - Simple script that generates a fabric configuration spreadSheet
- bulkZoning - Contains the output of sample runs of the bulk_zoning utility
- VMaxDrivenZoning- A set of scripts to build SAN zones driven by VMax arrays
- PureDrivenZoning- A set of scripts to build SAN zones driven by Pure arrays
- ZoningHangingZoneCleanup - A script to display and delete zones without online devices

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SAN Automation for Dummies Book

- https://docs.broadcom.com/docs/SAN-Auto-Dummies

- 48 pages

- Written for the non-programming SAN administrator

- Familiarizes a non-storage admin with SAN concepts

- Includes:
  - Overview of automation in general including advantages of CLI scripting
  - Discussion of RESTful APIs and data definitions with Yang and XML
  - Sample traces of data exchanges between an app and the fabric
  - Helpful CLI samples with explanations
  - Code examples written in Python using the PyFOS library
  - Samples of Ansible playbooks and play runs
  - Pointers to GitHub repositories and Brocade communities

For More Information, Visit

https://www.broadcom.com/products/fibre-channel-networking/

Thank You!

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