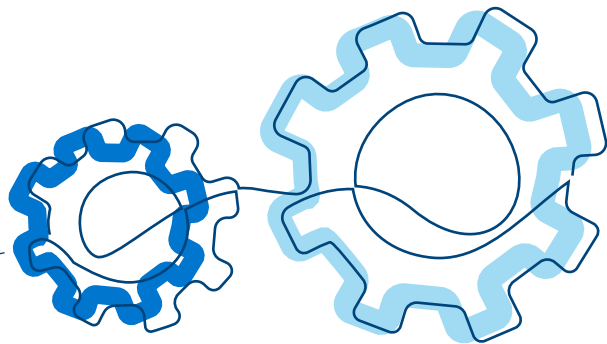# From Ad-hoc to Operationally Mature

WITH UNSTRUCTURED DATA INFRASTRUCTURE **AS CODE**
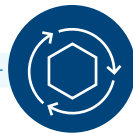
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Growing Need for Automation

If you look at what is driving automation more so today than ever before:

Manage Large Scale Operations Across the Hybrid Cloud (without expensive errors)

The sheer scale of IT operations with a rapidly growing digital footprint: number of new applications, the enormous amount of data they are producing and of course the analytical engines to make sense of all that data and generate insights.

Support DevOps Cycles with Infrastructure as Code

A key driver is the pace at which new applications and services are built and the emergence of DevOps as a completely automated paradigm for continuous application deployment.

Deliver Cloud-like Self Service Experience

Another key driver is the need for a cloud like self-service for the various users of IT infrastructure and services. Self-service of IT resources can rapidly accelerate time to market for new applications and operational initiatives.
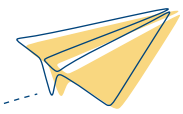
Let's take a deeper look at these ❯

IT Operations at Scale

Growing scale of IT operations means a tight collaboration between multiple functions like the teams for application development, build and test, deployment and IT infrastructure teams.

The challenge here is to run operations in a consistent and repeatable way without expensive manual errors that can be catastrophic when they affect business critical services. And when it comes to data and system security, variation in the policies is at the root of potential loop holes that are exploited in cyber attacks. Adopting automation tools is essential for IT Management in making sure governance models and best practices are uniformly implemented across all these dimensions of modern IT operations.

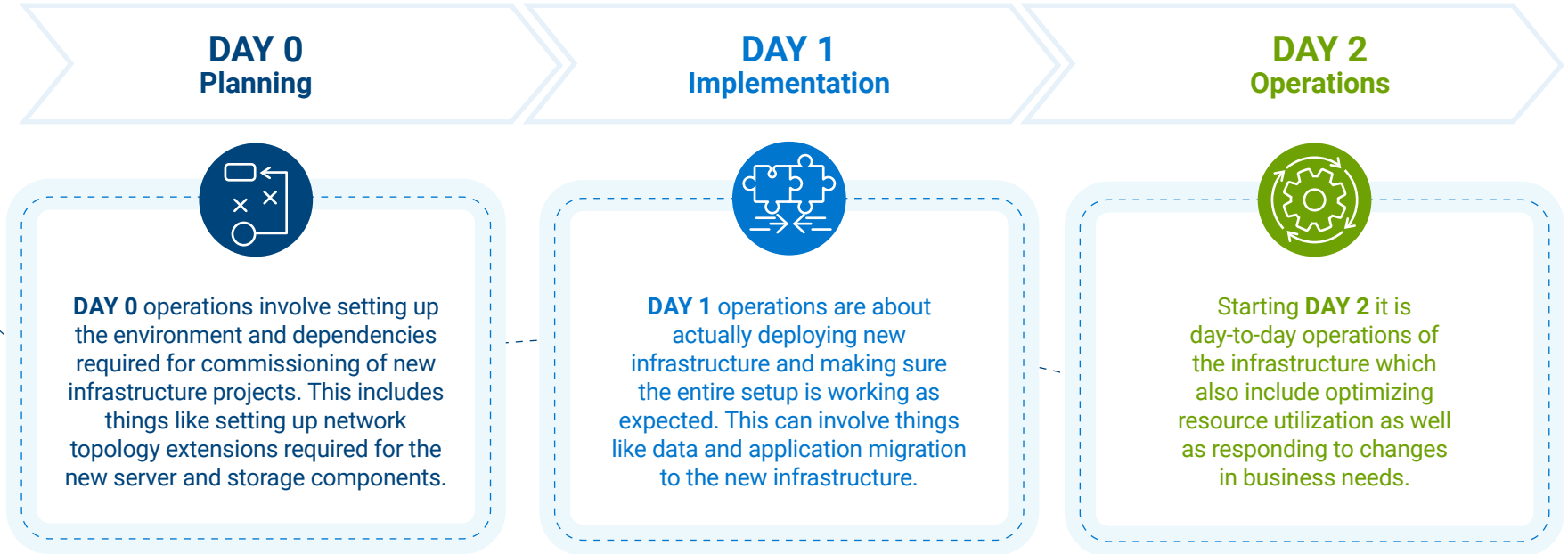**Consistent**   **Error-free**   **Secure**

Modern disruptors have mastered scale.

In fact scale has been a key ingredient for disruptive technologies to dominate entire categories. The good thing is the architectural principles and the platforms that enabled these success stories have become mainstream with infrastructure as code platforms. E.g.: 12-factor applications, pub-sub architecture, CI/CD pipelines, Kubernetes for rapid application deployment, Ansible and Puppet for configuration management, etc.

NETFLIX — Streaming at scale disrupted media consumption.

zoom — Reliable video at scale helped rapid growth in a crowded marketplace.

slack — Collaboration at scale enabled by pub-sub architecture.

When we talk about IT Ops automation there are mainly three stages of infrastructure lifecycle.

DAY 0
Planning

DAY 1
Implementation

DAY 2
Operations

DAY 0 operations involve setting up the environment and dependencies required for commissioning of new infrastructure projects. This includes things like setting up network topology extensions required for the new server and storage components.

DAY 1 operations are about actually deploying new infrastructure and making sure the entire setup is working as expected. This can involve things like data and application migration to the new infrastructure.

Starting **DAY 2** it is day-to-day operations of the infrastructure which also include optimizing resource utilization as well as responding to changes in business needs.

Automation platforms like Ansible enable automated workflows throughout the infrastructure lifecycle by driving consistent, secure and most efficient operations.
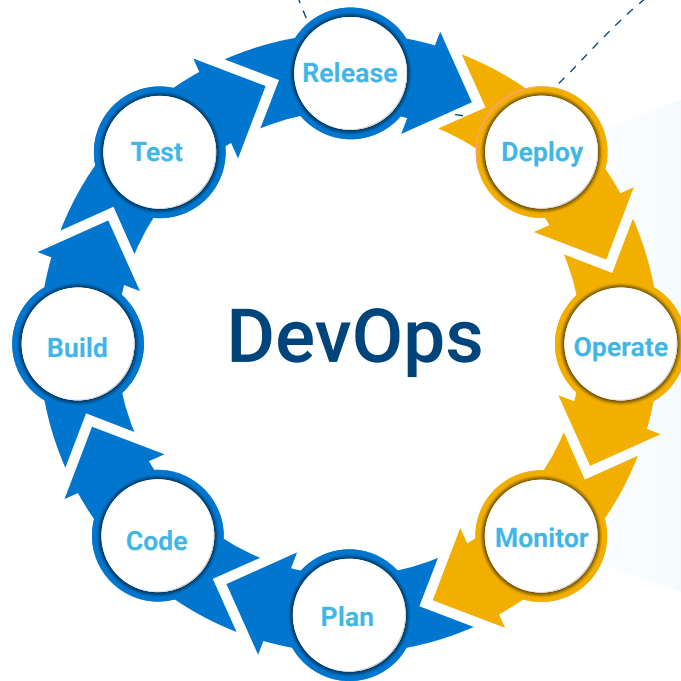
DevOps Automation

Continuous Integration | Continuous Deployment.

Today's DevOps processes and tools aim to achieve a model of continuous pipeline of software features. This requires an unbroken chain of processes that seamlessly feed into each other with shared ownership across multiple functions. In recent times the infrastructure provisioning is also coming into the fold of Continuous Deployment pipelines.
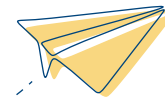
Declarative Infrastructure State

To make this work, infrastructure needs to be available as code, and we are not talking about just a REST API, which is just the starting point for DevOPs integration. Today the industry is moving towards a declarative state-based control of the infrastructure that helps to deploy applications with the exact configuration of the infrastructure including the make up of the compute and network environment as well as the storage.

DevOps

Release
Deploy
Operate
Monitor
Plan
Code
Build
Test

CI/CD orchestration requires infrastructure as </code>

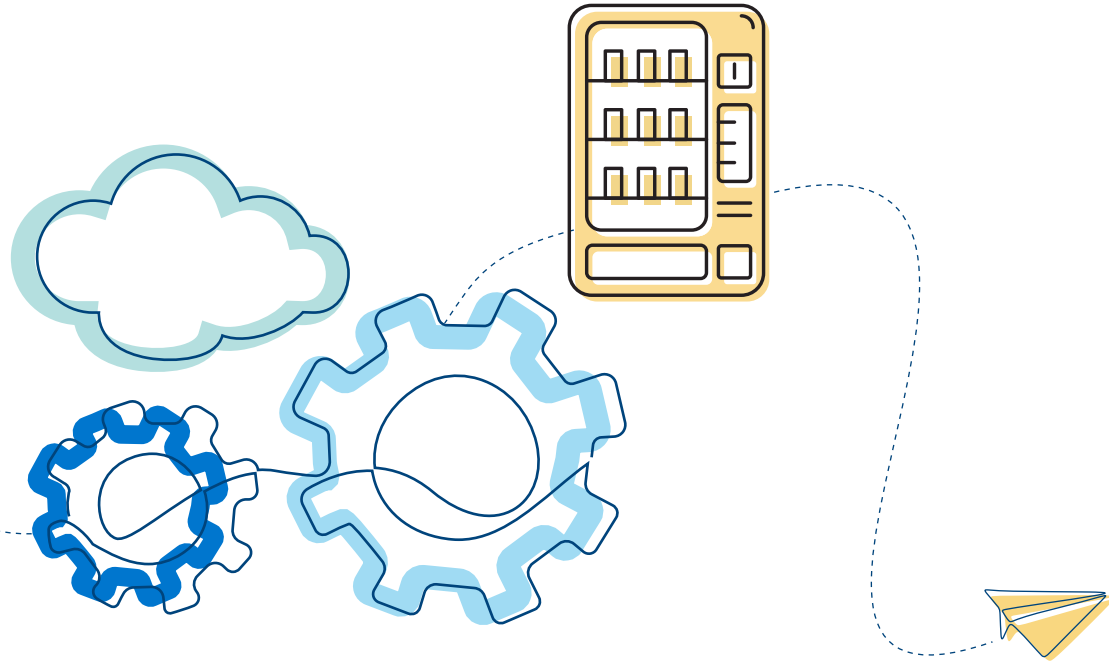Declarative, state-based configuration management of infrastructure

Self Service / Cloud-like Consumption Model

Self service is increasingly the norm when it comes to consumption of IT infrastructure and is at the core of a flexible and agile hybrid cloud experience.

Today if we look at the IT Operations of leading businesses they have invested heavily to build extensive self service catalogs for application development, analytics services, marketing services and so on.

Thanks to some modern automation platforms by VMware and ServiceNow, such self service catalogs can be built with much ease.
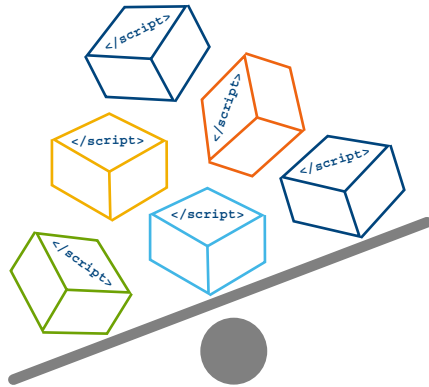
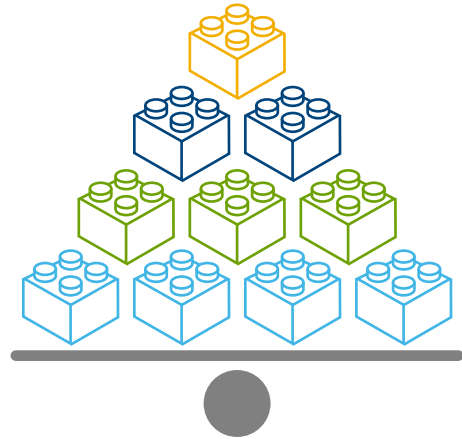# The Best Part: Automation Has Gotten Much Easier.

PROCEDURAL SCRIPTING

» Required a lot of skill
» Time consuming
» Hard to maintain

ASSEMBLING PRE-BUILT MODULES

» Fast to develop
» Scalable
» Declarative
» Easy to maintain

Before, automation meant heavy use of low level programming that requires a lot of skill and there are lot of preferences of programming languages among IT professionals that created automation solutions that don't work with each other, they are not scalable. And such automation tools are hard to maintain as well.

Whereas today's automation platforms require very minimal amount of coding (low-code and no-code platforms) from the end user, thanks to the wide ecosystem support such platforms have garnered, where enterprise software and hardware vendors built integrations into these platforms. Eg.: Ansible, ServiceNow, VMware vRealize Suite, etc.
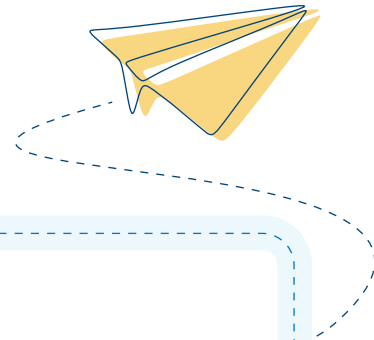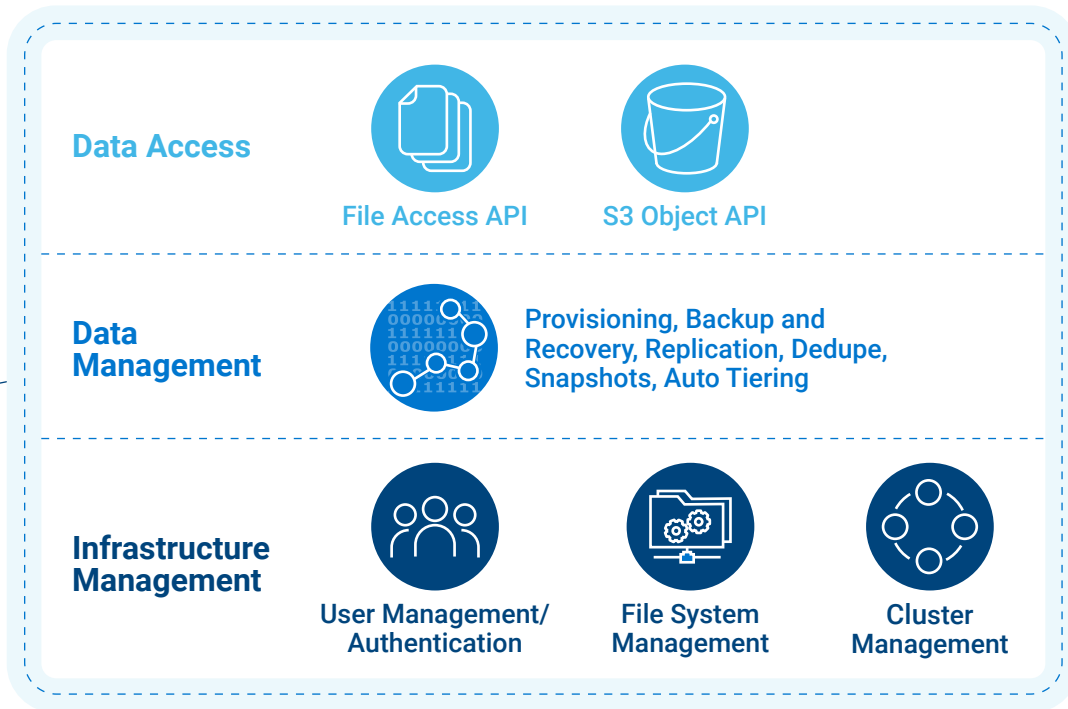
Foundation: OneFS REST API

API is at the foundation of the integrations with DevOps and Automation platforms.

API function calls can be made from practically any programming language. PowerScale OneFS API has a very extensive API interface with which users can:

» Directly access File and Object Data

» Configure data management and data protection

» Manage users, file systems and the storage clusters

Data Access

File Access API

S3 Object API

Data Management

Provisioning, Backup and Recovery, Replication, Dedupe, Snapshots, Auto Tiering

Infrastructure Management

User Management/ Authentication
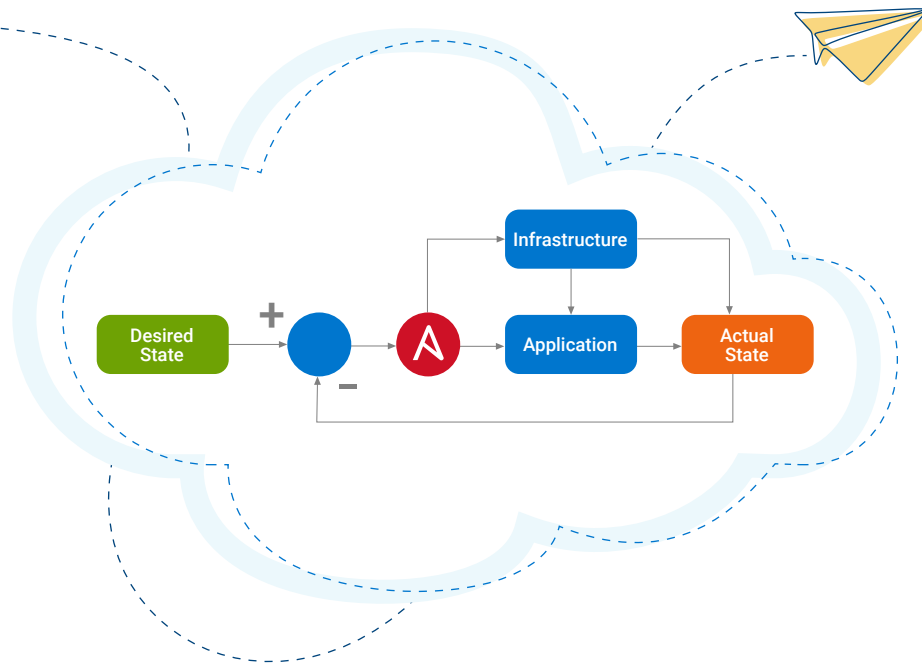
File System Management

Cluster Management
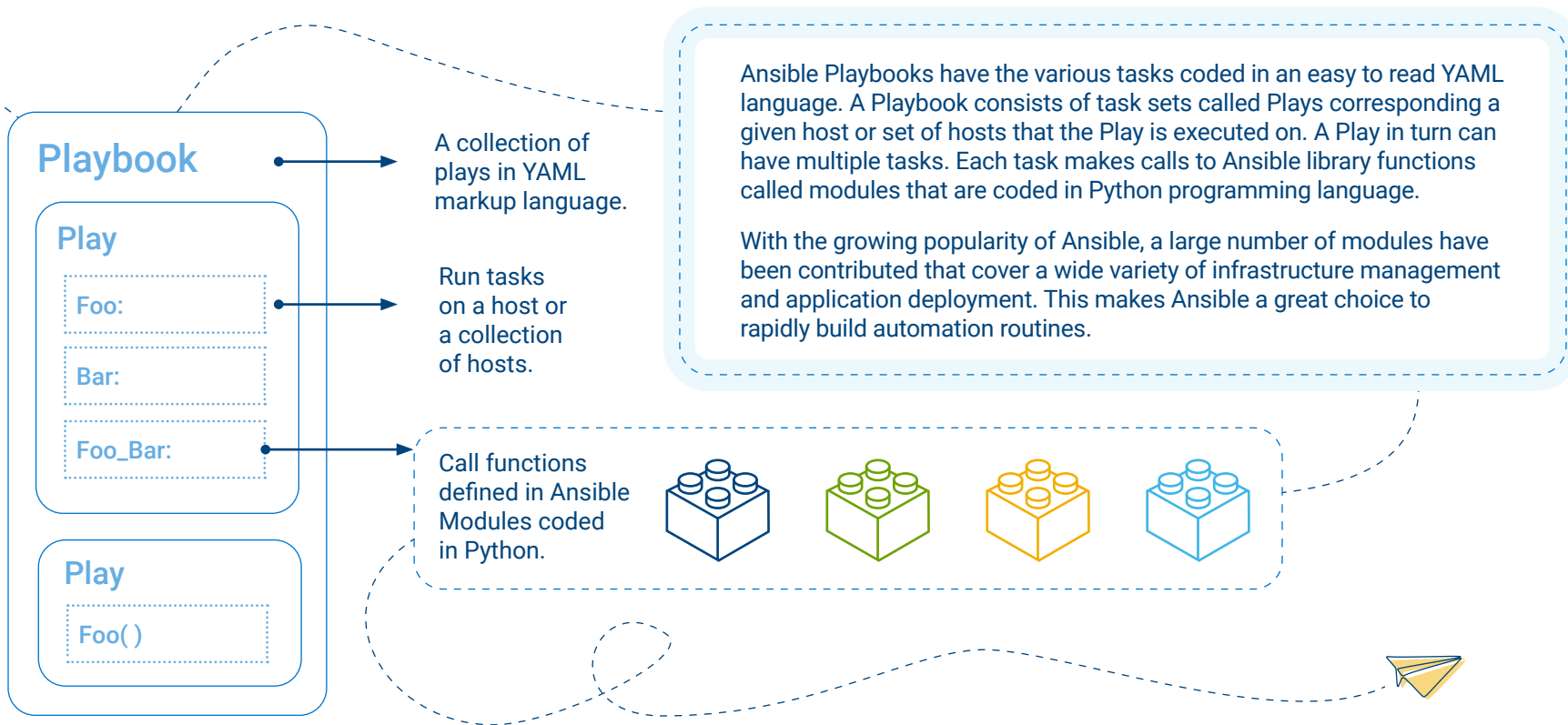
Configuration Management / Ansible

Ansible is a very popular platform to automate IT Operations and modern DevOps workflows across the hybrid cloud.

Ansible implements automation in a unique model that is growing popularity in large scale infrastructure management: configuration management. In the latest sense of the phrase "configuration management", a desired state or configuration of the applications and infrastructure is provided by the user, in a simple markup language called YAML, as the input to the Ansible engine. Ansible's job is to bring and maintain the state of the configuration using the levers it has over the infrastructure and applications.

This is very different from traditional procedural script based automation where tasks are executed mostly without any awareness of the current state of infrastructure. This kind of rote automation can lead to a drift in the configuration because of repeated execution of the automation sequences. Whereas in Configuration Management tools like Ansible, the required tasks are executed only when the current configuration does not match the specified desired configuration. This state-aware execution of tasks is what gives Ansible operations the property of idempotency.
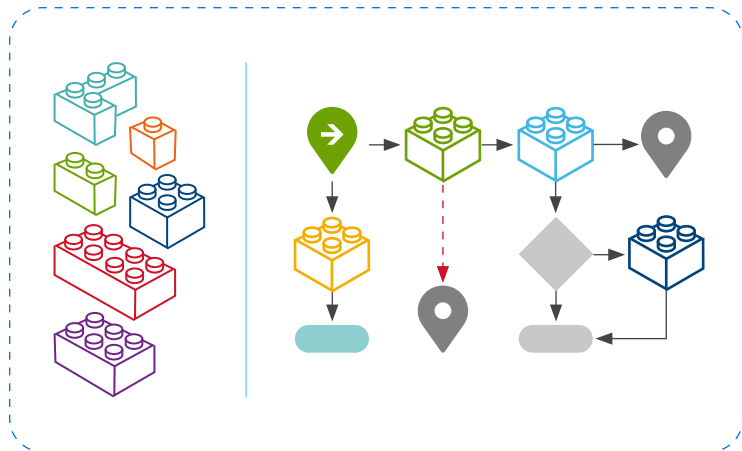
Ansible Playbook Structure.

Playbook

A collection of plays in YAML markup language.

Play

Foo:

Bar:

Foo_Bar:

Run tasks on a host or a collection of hosts.

Call functions defined in Ansible Modules coded in Python.

Play

Foo( )

Ansible Playbooks have the various tasks coded in an easy to read YAML language. A Playbook consists of task sets called Plays corresponding a given host or set of hosts that the Play is executed on. A Play in turn can have multiple tasks. Each task makes calls to Ansible library functions called modules that are coded in Python programming language.

With the growing popularity of Ansible, a large number of modules have been contributed that cover a wide variety of infrastructure management and application deployment. This makes Ansible a great choice to rapidly build automation routines.

DELLTechnologies

VMWare vRealize Orchestrator

Drag and drop your world.

VMware vRealize Orchestrator (vRO) is an IT process automation tool that allows automated management and operational tasks across both VMware and third-party applications. With vRO IT admins can create automation routines for elaborate workflows using a simple drag and drop approach. The workflows can span across different pieces of infrastructure and scale to very large task volume.
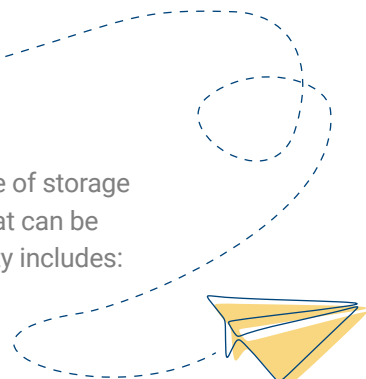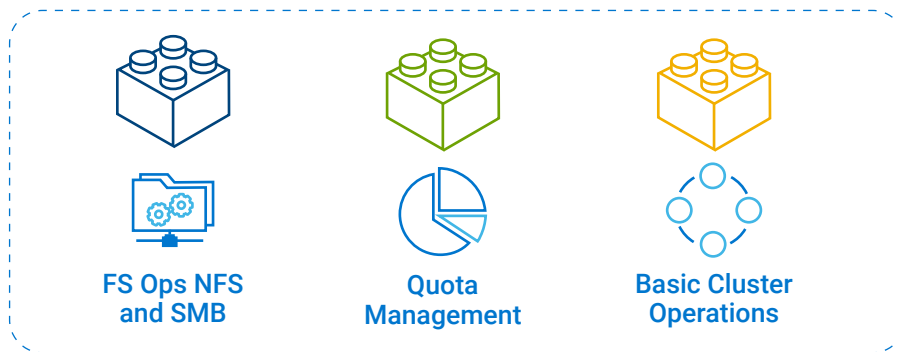

PowerScale workflows with vRO plugin.

vRO plugin for PowerScale brings an extensive range of storage functionality in the form of programmable blocks that can be dropped into a workflow's process map. Functionality includes:

» File System Operations for NFS and SMB
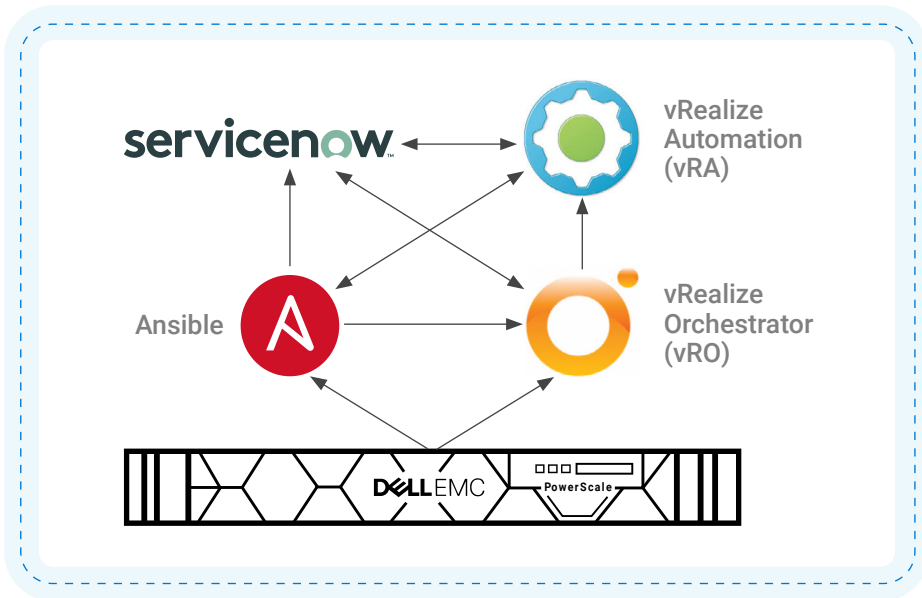
» Quota management

» Cluster operations

The different tasks under the above categories form the basic building blocks that can then be used together with any of the compute and networking tasks to form an end to end operation that is easy to read, maintain and build on.

FS Ops NFS and SMB

Quota Management

Basic Cluster Operations

Multiple upstream automation paths to choose from

Thankfully ITOps platforms are highly interoperable. This means Operations admins can continue to use their tool of choice: like vAdmins using vRealize and higher level integration admins using something like ServiceNow and still be able to collaborate and integrate their automation projects.
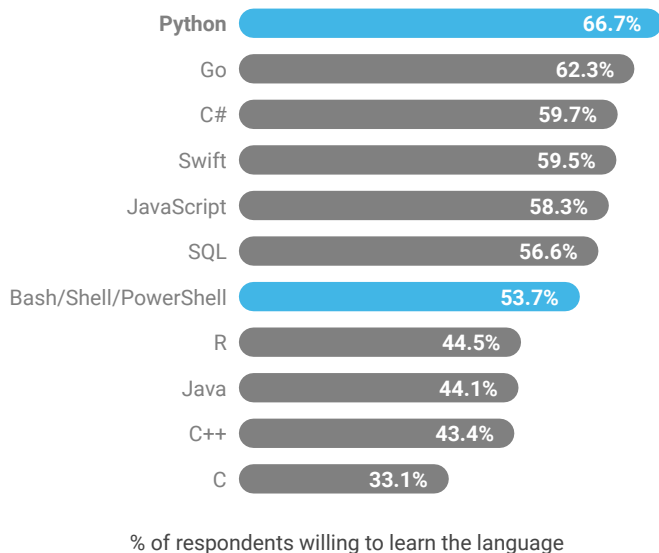
For example automation routines built on Ansible and vRealize Suite can be embedded in platforms like ServiceNow so that you can reuse the process automation that is already developed and don't have to reprogram entire sequences in ServiceNow.
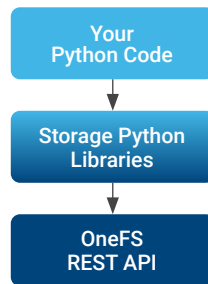
DELLTechnologies

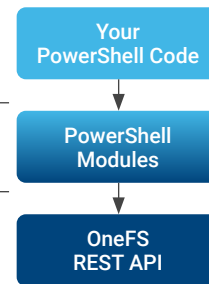# If You Really Need to Code

Data from Stack Overflow Developer Survey 2020

Language	%
Python	66.7%
Go	62.3%
C#	59.7%
Swift	59.5%
JavaScript	58.3%
SQL	56.6%
Bash/Shell/PowerShell	53.7%
R	44.5%
Java	44.1%
C++	43.4%
C	33.1%

% of respondents willing to learn the language

Python Integration

Your Python Code
↓
Storage Python Libraries
↓
OneFS REST API

PowerShell Integration

Your PowerShell Code
↓
PowerShell Modules
↓
OneFS REST API

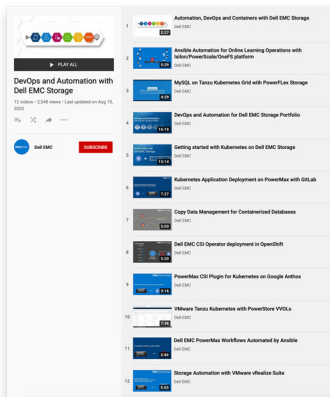Storage functionality available as code building blocks

If your team prefers a particular programming language you can always use the OneFS REST API to code infrastructure operational and monitoring routines. The API also easily lends itself to create modules for other automation platforms like Chef and Puppet. Given the popularity of Python in general and PowerShell in Windows Server and SQL Server database environments we have created libraries and modules that you can use as building blocks in your code.
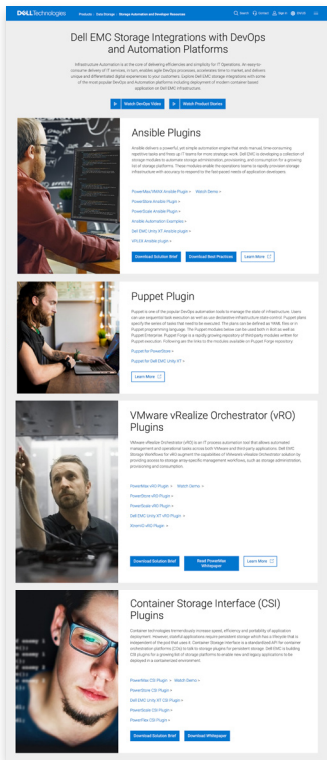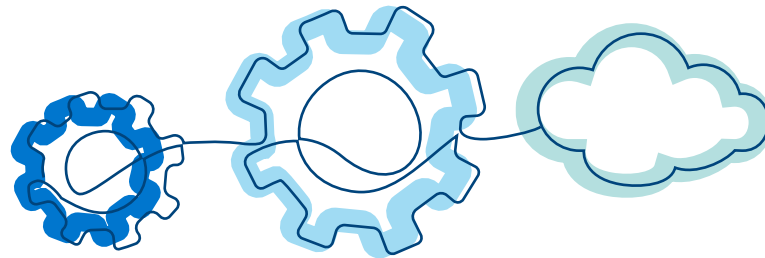
Resources

[click any image or caption to navigate]

YouTube Demo Gallery: DevOps and Automation with Dell EMC Storage

Dell EMC Storage Automation and Developer Resources

API reference for OneFS/PowerScale

API reference for ECS Object Storage

VMware vRO Plugin for PowerScale

Ansible Plugin for PowerScale

PowerShell Plugin for PowerScale (Community-contributed)

Python SDK for PowerScale