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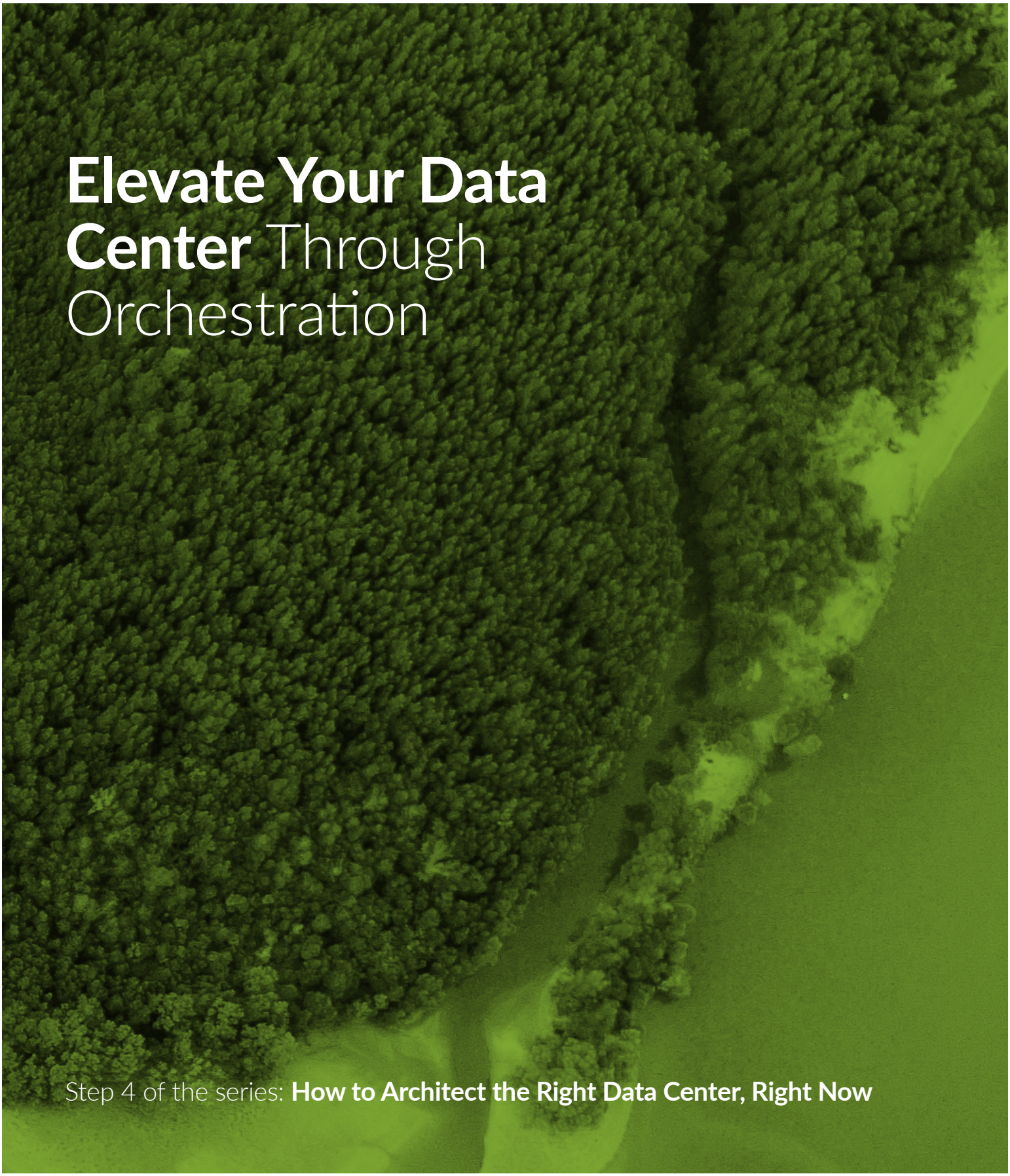
eGuide

Elevate Your Data Center Through Orchestration



Step 4 of the series: **How to Architect the Right Data Center, Right Now**

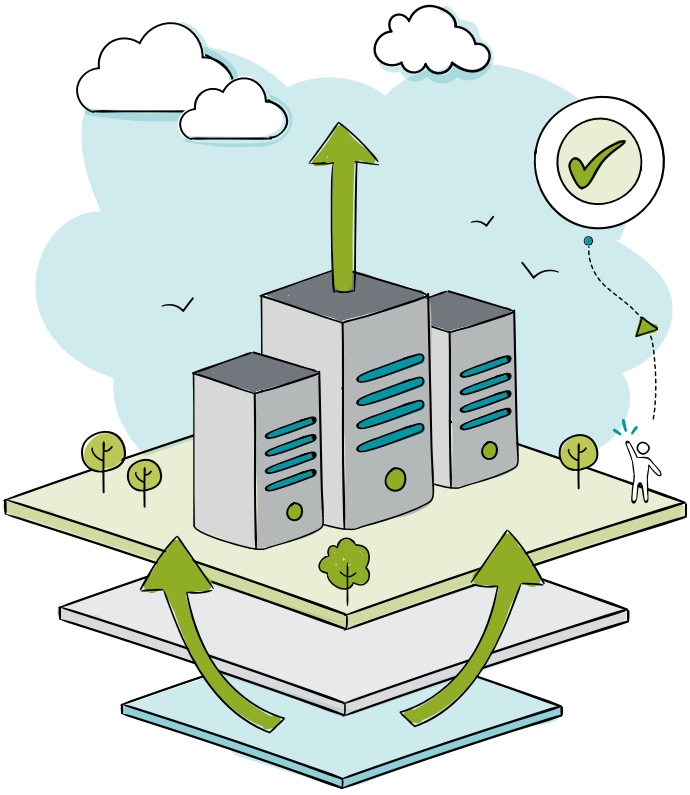
April 2020

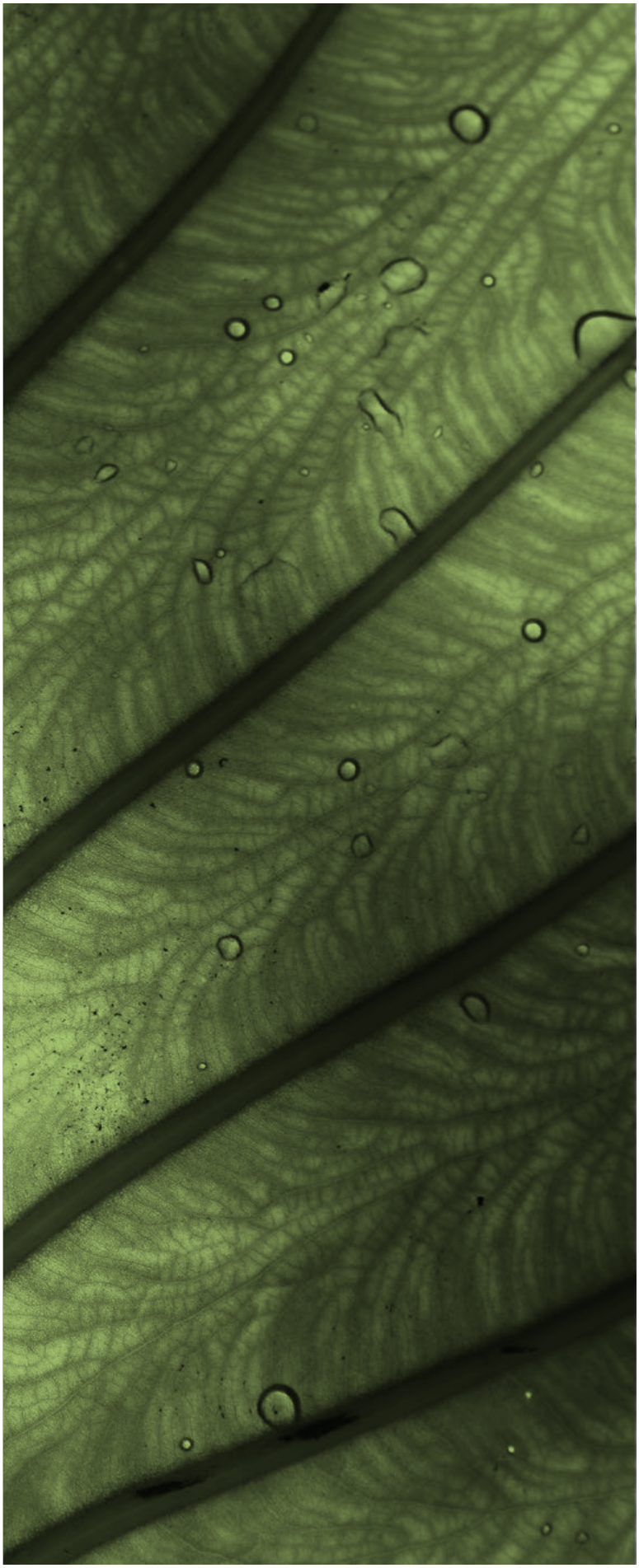
Next Step: Orchestration

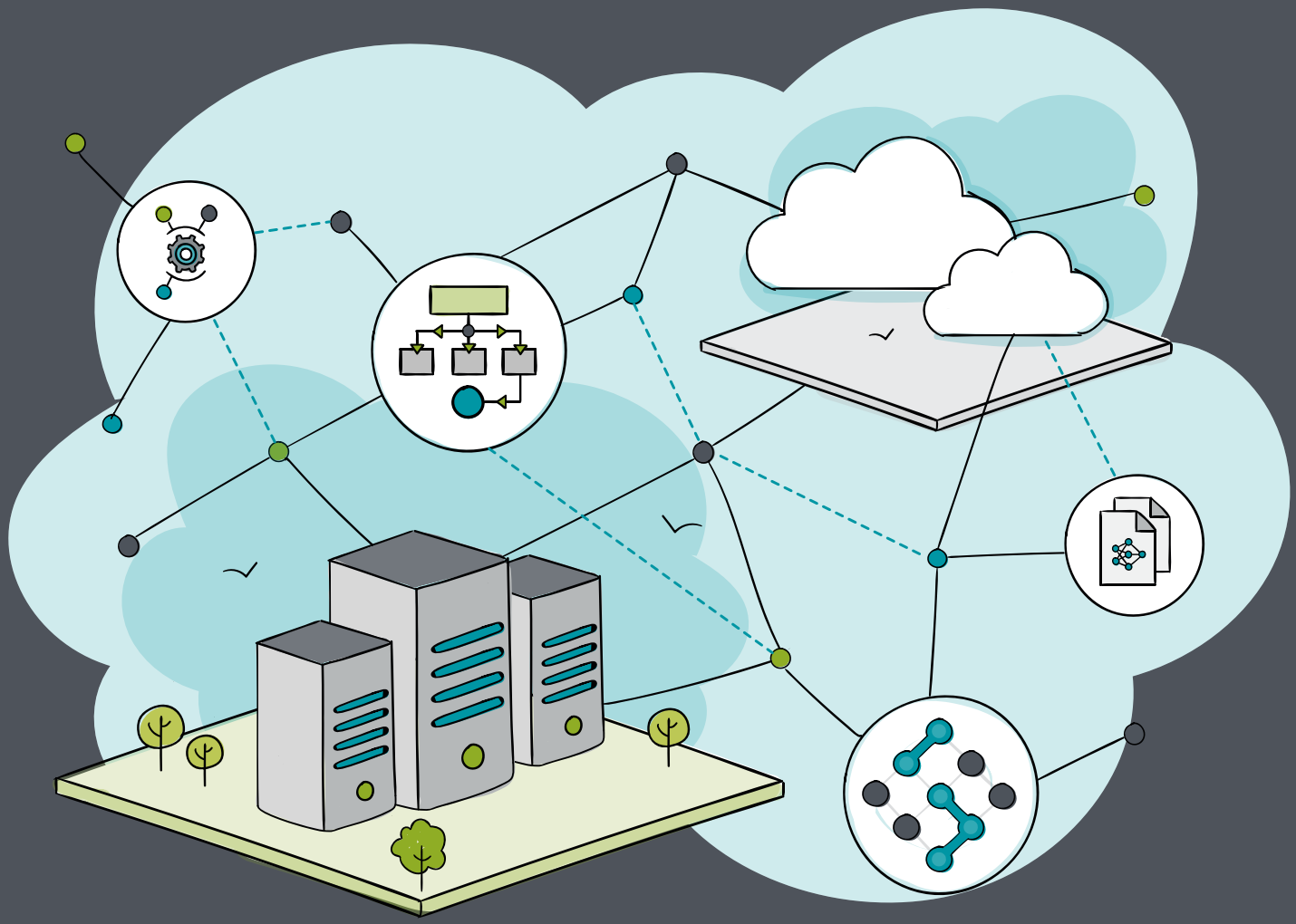
As described in prior eGuides, IP fabrics are becoming increasingly popular in the data center, allowing you to achieve massive scale and easily utilize overlay networks.

Benefits of IP fabrics include greater agility and secure multi-tenancy for your users and applications. With the rise of EVPN-VXLAN technology, network administrators can now transform their traditional data centers to more simplified, modernized operations.

The next step in this journey is to orchestrate these data center networks.







82% of data center network operations are still manual, with procedures that have stayed fairly consistent since the 1990s.

In order to support modern applications, especially those that span data centers and public cloud providers, connectivity and management of workloads and workflows across these environments is a must. This coordination of workflows, commonly referred to as orchestration, allows for greater scale and agility.

This enables operators to react more quickly to changes, and to make changes holistically rather than per element. Well defined workflows reduce errors that can be caused by manual intervention. If one needs to make the same changes to multiple elements within the data center so that they react identically to a particular application's networking and security requirements, this can be done more safely and efficiently in an automated fashion. Workflows can be pre-cleared by change review procedures to allow non-disruptive modifications to be made at any time, rather than only during change windows. Changes can also be tested automatically, end-to-end, to ensure that they do not impact operations or application functionality.

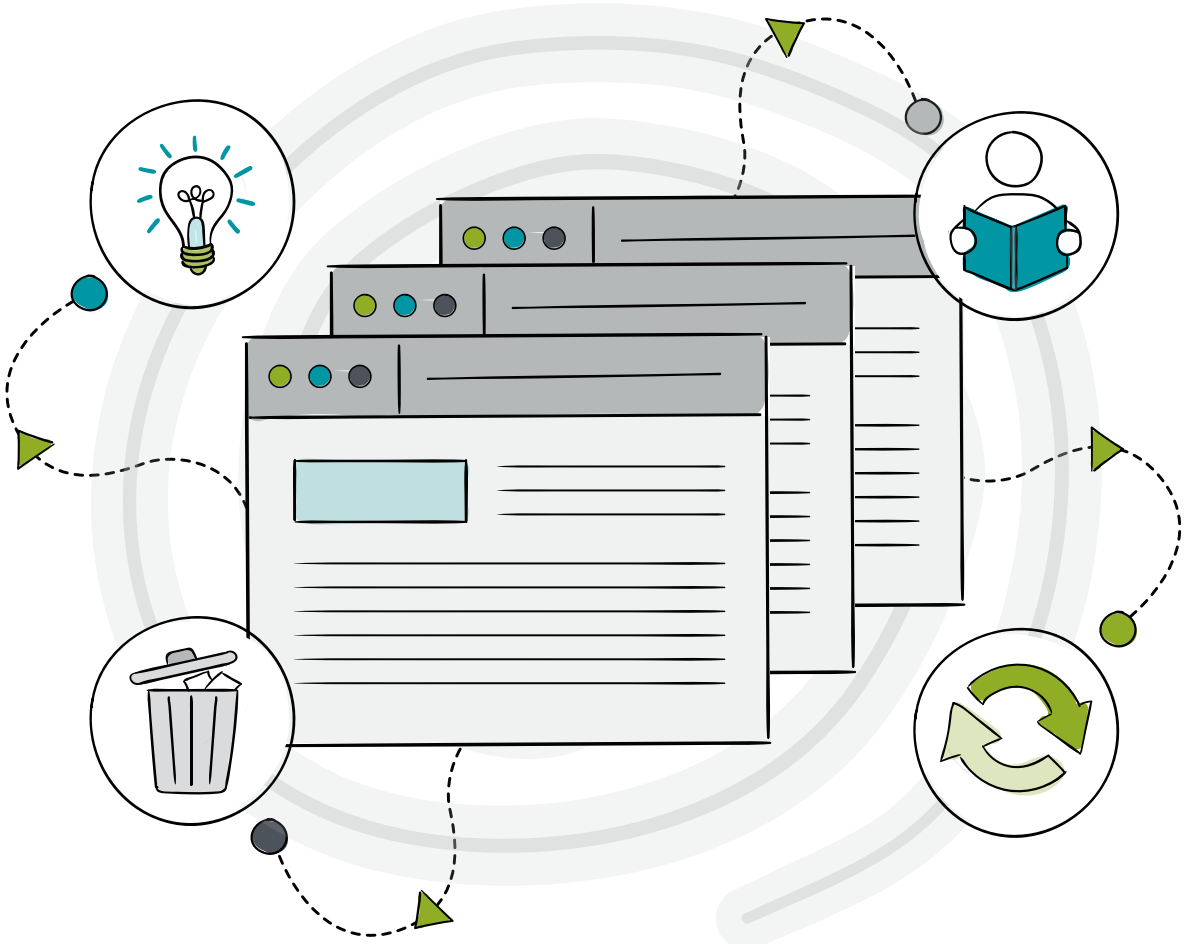
Say goodbye to 3 a.m. windows for routine changes which, considering that most enterprises have customers in multiple time zones, can never really satisfy everyone.

So what are the enablers of data center orchestration?

First and foremost, application programming interfaces (APIs) are critical to data orchestration. APIs are essentially a way to interact with software, generally remotely (via HTTP or another network protocol). Think of it as a predefined method for creating, reading, updating, or deleting (CRUD) something.

An essential part of this predefinition is that you don't necessarily have to know what is going on under the hood of the remote system in order to interact with it. You simply reference a prepublished definition for how to interact with the software, make your request, and get a response. In the case of data center orchestration, these APIs allow you to interact with the software that controls the networking hardware you'd like to manage. Oftentimes, CLIs or GUIs of a particular piece of hardware use an API as an intermediary, so when you're using the CLI, you're already working with APIs!

One important caveat is that, in order for the API to be useful, it must be public and well documented. It's relatively easy to find examples of such documentation.



Let's take a look at a quick API example

Imagine you're running some software called "cat" that has a published API. You'd like the cat software to do something. This can be done in the context of a script or piece of software, but it can also be initiated from the command prompt, using the utility cURL. (As its name implies, cURL is a command-line tool for getting or sending data, including files using URL syntax).

Let's see what that looks like:

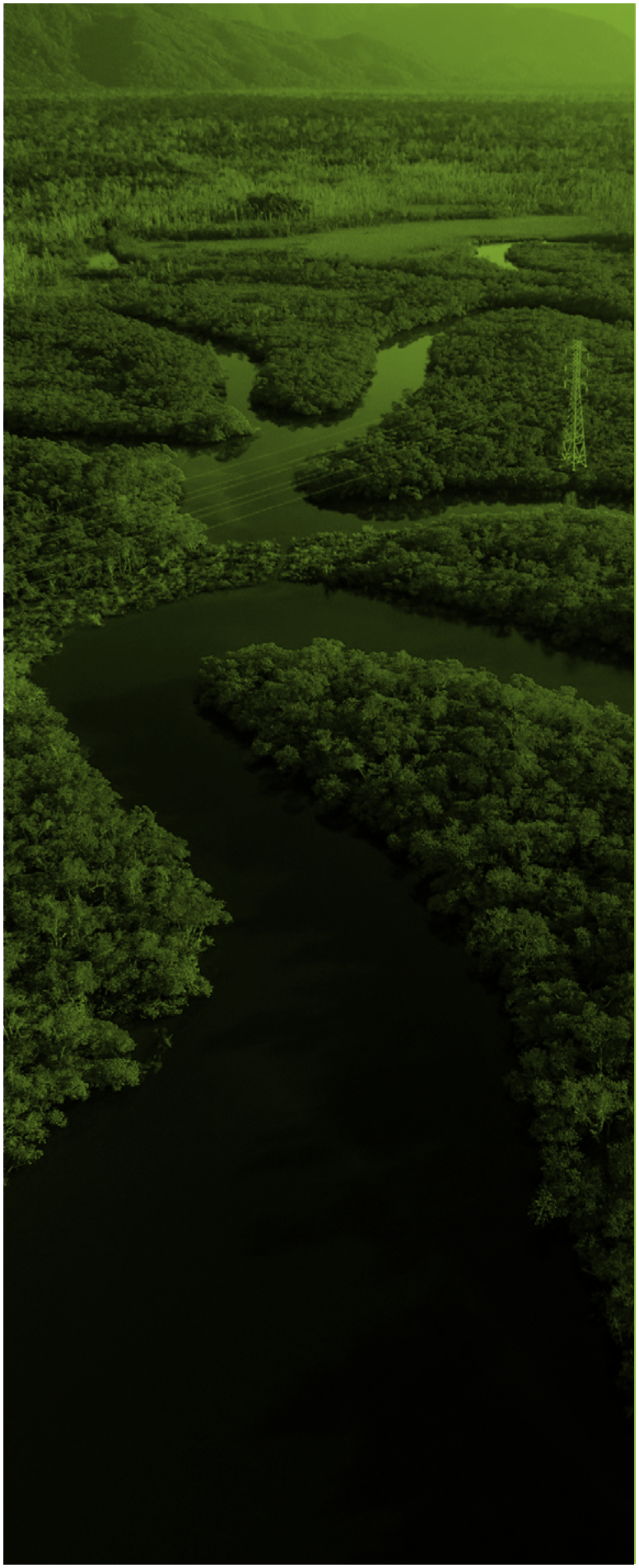
```
my-comp: curl -x POST http://api.cat.com/command/cmere
{
  "message": "no, yawn",
}
```

Seriously though, suppose you want to check the software version of your firewalls to ensure you are current. If you use the command:

```
curl http://my-firewall:3000/rpc/get-software-information -u "lab:lab" -H "Content-Type: application/xml" -H "Accept: application/xml" -d "<brief/>"
```

The device will return information about the software version.

This request can be incorporated into a script which checks the version information of all firewalls, incorporating the responses into an audit tool. Additionally, this script could kick off a workflow to schedule upgrades based on the version returned.



Technology Landscape

Various tools exist to allow you, as the user, to interact with these APIs (examples are shown in Figure 1). These include low-level tools such as Python, higher-level configuration tools such as Ansible, and, finally, full end-to-end data center orchestration tools that can group multiple workflows. Juniper published a **Five Steps to Automated Net-Ops** guide that can help align organizations along the path to full data center orchestration.

As mentioned previously, many organizations are at the early stages of this process, with most still conducting manual data center management. As they move along this path, they start recognizing frequently repeated workflows that can be automated. Mapping these out into repeatable, documented workflows is the key to success.

At this point, it becomes easier to turn these workflows into scripts that can automate basic network operations, such as making configuration changes (for instance, adding a VLAN to the network), retrieve information about the current state of the network, or perform troubleshooting steps.

At this point, it makes sense to store these scripts in a centralized repository so that they may be used by everyone concerned. This allows operations teams to more reliably make changes, and do so automatically. It would now make sense for network operations teams to start acting more like a software team. This doesn't mean turning this team into a team of developers, but simply allowing them to follow the same paradigms that the development team would. This includes following regimented procedures for moving changes between a development lab, to testing, and finally to production. A network operations team could then include a continuous integration pipeline which would perform automated testing before those changes get moved into production, providing even more reliability.

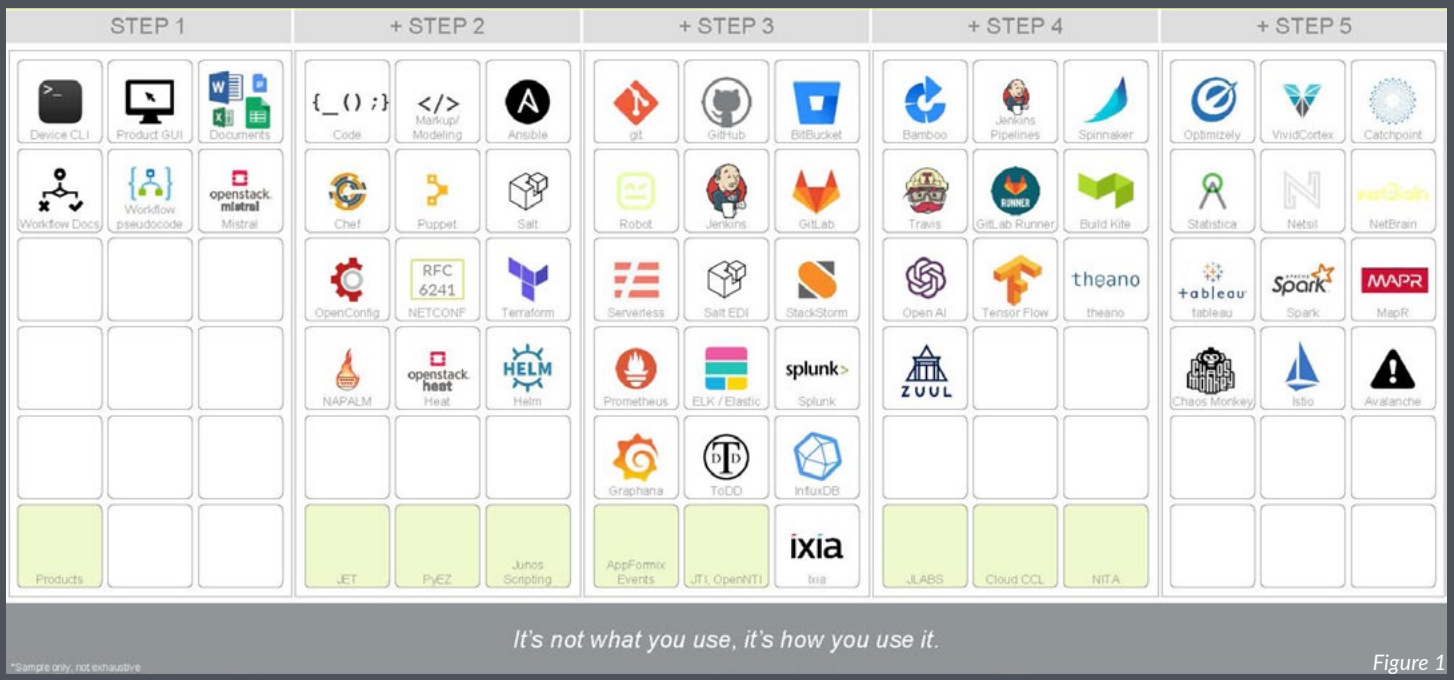


Figure 1

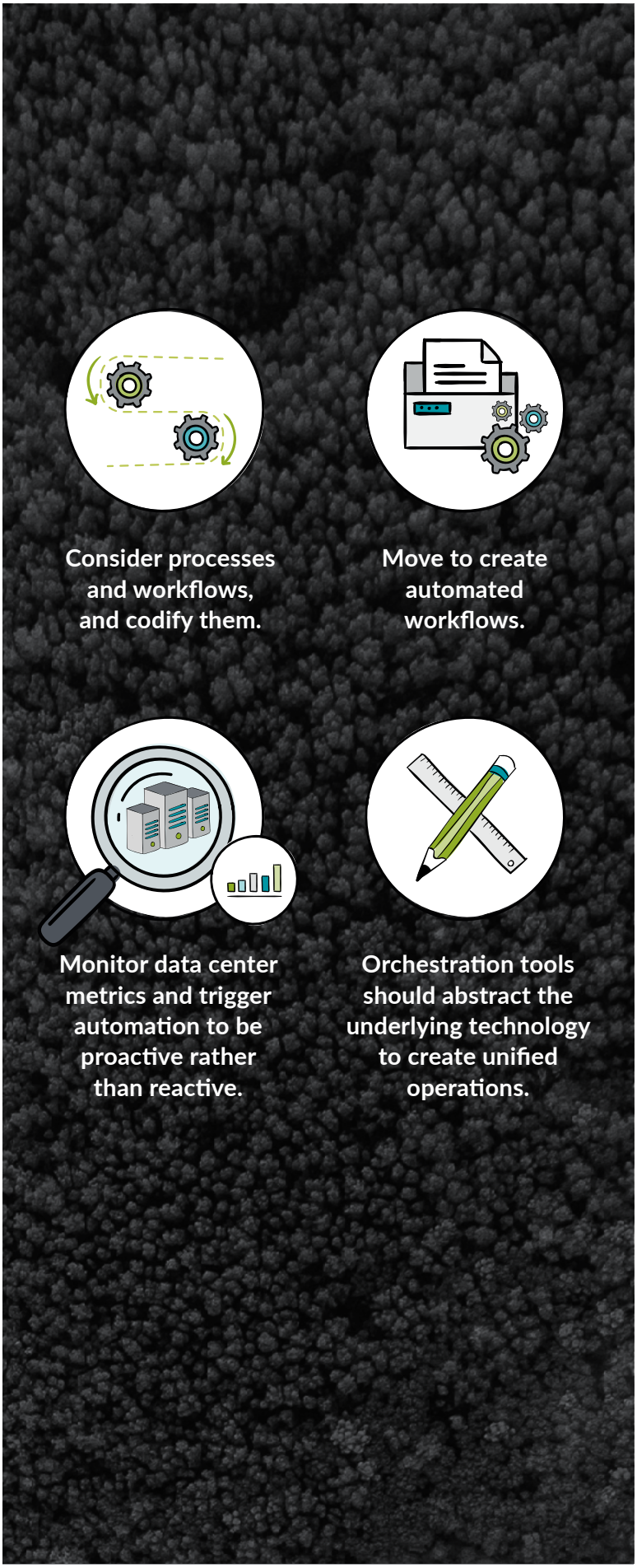
End-to-End Orchestration

Our end stage should be end-to-end orchestration of workflows, using all of the previously worked scenarios. The addition of a virtual machine, or Kubernetes pod, for a new application might require changes to network and security policies throughout the network. This requires a group of workflows that can be kicked off based on the demands of the application. Everything in the data center can be metered to provide data on proper functioning state, and automatically react to issues or changes.

For a simple example of orchestration vs. automation, let's look at a hypothetical cat food factory. Cat food is made from a combination of meat, usually some type of grains, and certain vitamins. There are individual workflows that can be automated - grinding meat, for example, since it is an easily defined task. The whole end-to-end process, grinding meat, adding grain and vitamins, and packaging requires orchestration, which includes grouping and initiating these individual workflows in the proper order.

A higher level orchestrator can help coordinate these workflows in the data center, providing full end-to-end workflow orchestration. Additionally, these orchestration tools should provide a way to orchestrate workflows no matter what the underlying technology is, abstracting that configuration for the user. It becomes especially important in a multicloud world to unify these operations. Adopting these methods can improve efficiency and reliability of data center operations, no matter where your workloads live.

Learn automation with NRE Labs, **right in your browser!**



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