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# Network Automation: Build vs. Buy

## Evaluating Three Popular Automation Methods

Today, business agility and operational agility are critical to success. Enterprise IT and service provider operations teams are turning to automation as a way to meet their agility goals. But before they can even start, they face a major decision: Do I build my automation from scratch, or do I buy an integrated automation solution?

When it comes to automation readiness, time-to-value and customization are very important to every organization. Turnkey and embedded automation solutions typically do not require extensive skills and deliver value quickly, but they limit long-term value due to restricted control and customization. On the other hand, Do-It-Yourself (DIY) solutions give developers total control, but they also require extensive skills and time commitments before any value can be derived.

This paper compares Extreme Workflow Composer™ Automation Suites, a customizable, pre-built automation solution, to integrated network automation and DIY automation methods. These solutions are intended to be used to automate network operations and, to some extent, data center operations. Through this paper, readers will gain a clear understanding of the different automation options, including their benefits and challenges, and ways to identify the best solution for their automation needs.

## Automation Methods Meet Demand

In today's world, organizations need to be agile to survive. Their success depends on both business agility and operational agility. As the rate of innovation accelerates, competition is becoming fiercer—and faster. Businesses must therefore find ways to respond more quickly and operate more efficiently. As a result, many organizations are turning to network automation to boost their agility.

But organizations are only as agile as their least agile component, and for most organizations that is the data center network. In fact, according to Gartner, organizations that automate at least 70 percent of network changes reduce outages and increase release velocity by 50 percent.<sup>1</sup> At the same time, a Gartner 2017 poll of CIOs revealed that a lack of appropriate skills and a lack of resources are the biggest barriers to resilient IT in this digital era.<sup>2</sup>

Clearly, there is a strong need and desire to implement automation. But which automation solution will best help network operations teams get up to speed and deliver business value quickly?

## Methods of Network Automation

Organizations can automate their network operations using three methods:

- Integrated/embedded automation: Automation “built into” and, sometimes, embedded into the device's operating system and/or firmware. This type of solution performs a narrow scope of automation based on the vendor's preferences. Any pre-built integrations, or openness for integration with third-party tools and applications, were developed based on the vendor's specific business goals and priorities.
- DIY automation: Automation developed completely from scratch using common programming languages, such as Java, Ansible, Python, or Puppet, and modern data models, such as YAML, to automate data center operations.
- Customizable, pre-built automation: Sometimes referred to as automation kits, packs, or suites. This form of automation typically consists of scripts, workflows, code snippets, and documentation developed and tested to accomplish a commonly encountered business or technical objective. Usually, this automation code focuses on a specific task, such as collecting configuration information from multiple devices or integrating with a monitoring application. And these code snippets are typically developed, maintained, and shared within a community using common tools, languages, interfaces, and models.

## Measurement Criteria

Five criteria have been selected to help compare the three network automation methods. These criteria represent common considerations when making a purchase decision that has strategic and tactical implications:

- Ease of implementation (getting started): The level of difficulty in deploying and configuring the method of automation.
- Time-to-value: The span of time between receipt of a solution and when the solution is delivering business or technical value.
- Scope of automation (network, lifecycle, cross-domain): Whether the automation method applies only to the network, provides lifecycle (provision, validation, troubleshooting, remediation) automation, and/or supports other domains (compute, applications, storage, cloud, and other technologies).
- Purchase and long-term costs: The acquisition and long-term costs for acquiring all that is needed to implement the method of automation.
- Scope of openness, community, and ecosystem: How “open” the method is for integration and customization, the size and activity of the community, and the scope of an ecosystem.

<sup>1</sup> Gartner, Inc. (Andrew Lerner and Sanjit Ganguli), Take These Six Steps to a Better Network (ID: G00307825), December 2, 2016.

<sup>2</sup> Gartner, Inc. (Tomas Nielsen, Chris Howard, Andy Rowsell-Jones, Jan-Martin Lowendahl), 2017 CIO Agenda: Global Perspectives on Seizing the Digital Ecosystem Opportunity (ID: G00318306), February 10, 2017.

# Comparing Network Automation Methods

	Integrated/ Embedded	Do-It-Yourself	Customizable, Pre-built
Ease of Implementation	4	1	4
Time-to-Value	4	1	4
Scope of Automation	Network = 3 Lifecycle = 2 Cross-domain = 2	Network = 2 Lifecycle = 2 Cross-domain = 3	Network = 4 Lifecycle = 4 Cross-domain = 4
Purchase and Long-Term Costs	Purchase = 1 Long-term = 1	Purchase = 4 Long-term = 4	Purchase = 4 Long-term = 4
Scope of Openness, Community, and Ecosystem	Openness = 2 Community = 3 Ecosystem = 3	Openness = 4 Community = 4 Ecosystem = 3	Openness = 4 Community = 3 Ecosystem = 2
Total Ranking	25	28	35

**Table 1:** Ranking automation methods on a scale of 1 to 4

(1= limited support/capability, 4 = broad support/capability) based on five key criteria.

Based on these five key criteria, each automation method has been ranked on a scale of 1 to 4, with 1 representing none or limited support/capability and 4 representing broad support/capability. Table 1 shows which method of automation best addresses the different criteria.

**Analysis -** The following provides a detailed analysis of how each network automation method fared in the rankings.

## Integrated/Embedded Automation

- **Ease of implementation:** This method provides the highest ease of implementation. All automation is designed and tested to address specific use cases on specific hardware platforms and third-party tools. Users are not required to have extensive skills beyond those they already have for deploying and managing networks. **Ranking: 4**
- **Time-to-value:** Time-to-value is very short because configuration complexity is drastically reduced, new skills are generally not needed, and everything is designed to work together “out of the box.” **Ranking: 4**
- **Scope of automation (network, lifecycle, cross-domain):** Extensive automation is provided for network provisioning, but only a little (or zero) automation is provided for validation, troubleshooting, or remediation. These solutions are built by the vendor based on the vendor’s vision of what automation is needed. Onsite customization and a small amount of cross-domain automation with approved vendors are both possible once engineers gain a sufficient understanding of the interfaces, which are typically proprietary. **Ranking: 3, 2, 2**
- **Purchase and long-term costs:** The acquisition costs for integrated systems can be quite high. Since so much of the automation is built into the operating system, users must purchase all the necessary hardware before the full benefits of automation can be realized. And because so much of the automation is enabled by the hardware, long-term costs are generally high as well, since new functionality and capabilities often require new hardware. **Ranking: 1, 1**

- **Scope of openness, community, and ecosystem:** Integrated systems, such as Arista CloudVision or Cisco ACI, vary in their breadth and depth of openness, community, and ecosystem. Most systems provide APIs for enabling elements of the solution to be accessed programmatically and/or integrated with other third-party tools. Quite often, these interfaces have a proprietary implementation associated with them, making integration cumbersome and challenging. **Ranking: 2, 3, 3**

#### **Do-It-Yourself (DIY) Automation**

- **Ease of implementation:** DIY automation is difficult to implement because engineers must start virtually from scratch. Users must first learn and become proficient with the programming language before building production-grade automation. The burden of development is eased somewhat through the availability of code snippets and modules from the automation platform's community. But these snippets typically only help users get started, and must be customized to meet each user's unique requirements. **Ranking: 1**
- **Time-to-value:** Like implementation, time-to-value for DIY automation is long. It takes time to learn and become proficient with the language, and work through infrastructure integration challenges before automation can be deployed in production and provide value. Hiring engineers with prior experience can eliminate the time needed to become proficient programmers, but even experienced engineers need time to learn an organization's unique network system and meet specific business and technical requirements. **Ranking: 1**
- **Scope of automation (network, lifecycle, cross-domain):** The potential for broad automation coverage with DIY is very high as long as the programming language and data models used are already widely adopted. Given the nature of DIY automation, anything and everything is possible if provided enough time, skills, and resources. The greatest challenge is therefore the cost, in terms of time and resources, to accomplish these objectives. **Ranking: 2, 2, 3**
- **Purchase and long-term costs:** The purchase and long-term costs for DIY are relatively low because most tools and languages are available for free in the open source community. For organizations seeking greater assurance and support, commercial-grade versions of many tools can be purchased for a small fee (when compared to the costs of integrated solutions). **Ranking: 4, 4**
- **Scope of openness, community, and ecosystem:** DIY tools have to be very open and customizable in order to deliver the automation benefits for an organization. And because most of these tools are available as open source projects, they tend to have vibrant and broad communities. And in the case of tools such as Puppet and Chef, there are also emerging ecosystems. **Ranking: 4, 4, 3**

## Customizable, Pre-built Automation

- **Ease of implementation:** Implementation for these automation solutions is very easy. Everything is built, tested, and designed to work out of the box with minimal skills. **Ranking: 4**
- **Time-to-value:** Similar to implementation, time-to-value is extremely short because everything is built, tested, and proven to work out of the box with specific network devices. For non-tested devices, time-to-value can still be much shorter than DIY automation because engineers only have to adapt the pre-built workflows and code to the unique capabilities and interfaces of the network devices. **Ranking: 4**
- **Scope of automation (network, lifecycle, cross-domain):** A customizable, pre-built solution delivers a very high scope of automation because it provides full network lifecycle automation and, in some cases, includes cross-domain automation support. This enables organizations to automate all aspects of network operations, automate operational tasks on other data center platforms and technologies, and then link it all together with an event-driven model to reduce cross-function delays, improving efficiency and agility. **Ranking: 4, 4, 4**
- **Purchase and long-term costs:** Purchase costs for pre-built automation are relatively low, especially when compared to integrated automation. And when the costs of time and programming experience are factored in, the costs of pre-built automation are much less than the costs of DIY solutions. Over time, the long-term costs of pre-built automation continue to grow, however, due to its completely open and customizable qualities. **Ranking: 4, 4**
- **Scope of openness, community, and ecosystem:** Customizable, pre-built automation combines the best of integrated and DIY automation. It uses popular programming languages, such as Python, and data models, such as YAML, and then develops, tests, and packages the code into automation that functions out of the box. For it to be customizable, pre-built automation must be completely open. This allows a community and ecosystem of innovators to grow, further amplifying the velocity and creativity of the automation, and benefiting organizations. **Ranking: 4, 3, 2**

## Conclusion

Based on this analysis, it is clear that deploying customizable, pre-built automation solutions best meets all five criteria. Users can deploy these solutions easily with a minimal skill set, realize short time-to-value, automate the entire network lifecycle and across all data center domains, and leverage an active community and ecosystem to improve agility and operational efficiency.

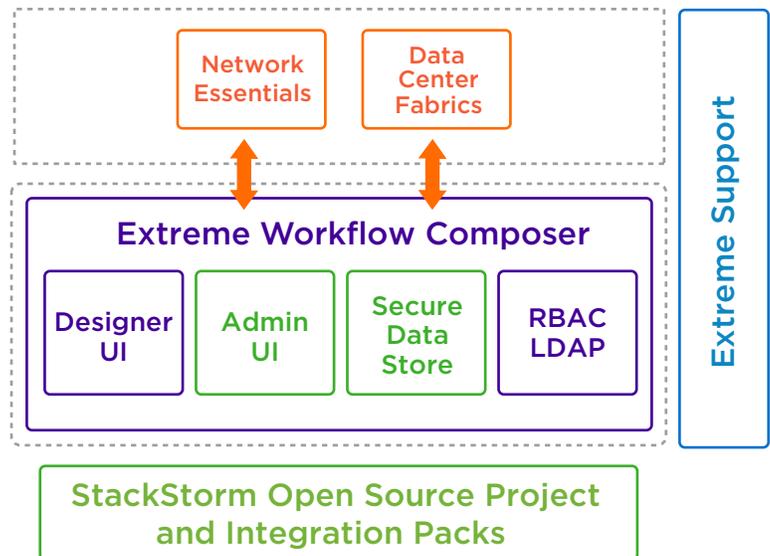
# Extreme Workflow Composer Automation Suites: Customizable, Pre-built Automation

Extreme Workflow Composer Automation Suites fall into the customizable, pre-built automation category. These automation suites allow organizations to achieve greater agility and efficiency with turnkey network lifecycle automation for common network provisioning and management use cases. They provide everything needed to address a use case: workflows, actions, sensors, UI components, documentation, and Extreme support (see Figure 1).

Because every organization and data center has its own unique culture—people, processes, policies—Extreme Workflow Composer Automation Suites are designed to be completely customizable. Unlike integrated automation solutions that force organizations to use only “supported” technologies and rigid processes provided by the vendor, the automation suites easily adapt to and integrate with virtually any existing (and trusted) technology, process, and policy.

To achieve end-to-end data center automation, Extreme Workflow Composer Automation Suites leverage the Extreme Workflow Composer automation platform, powered by StackStorm, and its nearly 2,000 pre-built cross-domain integration packs. This allows organizations to link network automation to existing and future cross-domain platforms and technologies using simply If This Then That (IFTTT) logic to rapidly achieve greater agility and efficiency.

## Extreme Workflow Composer Automation Suites



**Figure 1:** Extreme Workflow Composer Automation Suites running as an application on the Workflow Composer automation platform. Customers can run one or more automation suites and community packs as needed.

Network Essentials	Data Center Fabrics
<p>Provides automation building blocks for common networking tasks, such as:</p> <ul style="list-style-type: none"> <li>• Configure edge port VLAN, Layer 2 port channel, VLAN interface, VRRPe, and VRF</li> <li>• Set Layer 2 and 3, and System MTU</li> <li>• Validate edge port Layer 2 port channel state, VLAN interface, VRRPe, and OS version</li> <li>• Upgrade switch firmware</li> <li>• Place switch in maintenance mode</li> <li>• Create, add, or remove IPv4 ACLs</li> <li>• Configure Syslog, NTP, AAA, DNS, and SNMP v2c management services</li> </ul>	<p>Provides out-of-the-box provisioning and management automation of data center fabric networks with minimal training. Examples include:</p> <ul style="list-style-type: none"> <li>• Provision data center fabric underlay/overlay</li> <li>• Add servers, switches, or Layer 2 and 3 tenants to fabrics</li> <li>• Upgrade fabric (scheduled, organized execution)</li> <li>• Validate BGP settings and state, BGP neighbors, BGP-EVPN peering, and switch reachability</li> <li>• Troubleshoot and remediate issues with flow trace for end-to-end integrity or leaf-spine connectivity</li> <li>• Perform a “Support Save”</li> </ul>

Currently, Extreme Workflow Composer Automation Suites address the use cases shown in Table 2. Over time, each automation suite will be enhanced with greater capabilities and sophistication, and new automation suites will be introduced to address additional use cases.

### Employing an Agile Methodology

Increasingly, organizations are implementing an agile methodology of continuous improvement and continuous deployment. Therefore, they need a vendor that can provide automation updates at a rapid pace. Workflow Composer Automation Suites are updated and posted as a “technology preview” approximately every four weeks and released as generally available code on a quarterly basis. Subscribers receive:

- An annual subscription to tested, proven, turnkey workflows with quarterly updates
- An application that has been fully SQA tested and proven to work with supported devices

The choice of use cases for Extreme Workflow Composer Automation Suites is driven by customer feedback (via Request for Workflows) and by starting with the most frequent scenarios. Extreme manages these requests in the form of a backlog.

Since Extreme is continuously integrating and developing automation suites, customers can achieve predictable automation of network use cases, rather than having to invest in and build internal automation capabilities—a very expensive endeavor that offers no guarantee of success.

# Comparing Extreme Customizable, Pre-built Automation Suites to DIY and Integrated Automation

When it comes to automation readiness, time-to-value and customization are important to every organization. Turnkey and embedded automation solutions typically do not require extensive skills and deliver value quickly, but they also limit long-term value due to restricted control and customization. Do-It-Yourself (DIY) solutions give developers total control, but they require extensive skills and time commitments before any value can be reaped. How do these automation methods compare to Workflow Composer Automation Suites?

## DIY Automation vs. Workflow Composer Automation Suites

Many operations teams, especially those experienced using application provisioning tools such as Chef or Puppet, often consider developing their own automation. With nearly limitless customization possible, it makes sense to build automation that precisely meets the organization's requirements. But despite the low (sometimes even zero) cost to acquire the automation technology, development costs can be much higher, time-to-value much longer, and the results less than desirable.

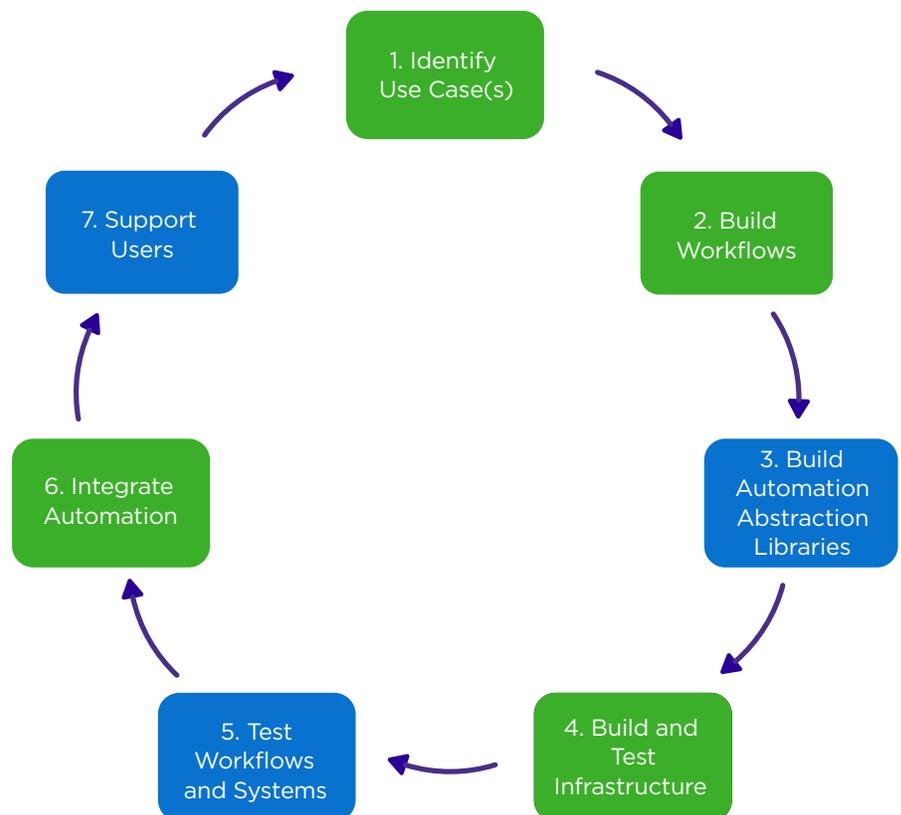


Figure 2: Lifecycle for building automation.

- **Skills:** DevOps/NetOps expertise is a rare skill set, requiring familiarity and experience with DevOps tools, network design and operations, and problem solving/programming. Additionally, the DIY team would need to have top-notch skills with Python, Yang, Netconf, and other widely used open source networking tool sets for integration purposes.
- If the team does not possess an expert understanding of the software architecture, the middleware libraries used for abstracting workflows, and the network operating systems, there is no guarantee that DIY automation will succeed.
- **Resources:** To build a network automation solution such as Extreme Workflow Composer Automation Suites to provision, validate, and troubleshoot data center deployments, a team of at least three to four full-time DevOps/NetOps engineers would be needed to identify, scope, build, integrate, test, and deploy automation workflows. After the solution was built and deployed, resources would then be needed to provide ongoing support to various stakeholders, such as operations and NOC teams, the users of the automation.
- **Cost:** In terms of investment, a conservative budget for DIY network automation is an annual operating expense of \$500,000 to \$1,000,000 to assemble and maintain DevOps/NetOps teams, release management and incident management tools, as well as network infrastructure and equipment for continuously building, integrating, and testing automation (see Figure 2).

Web-scale companies such as Google, Amazon, and Facebook took years and billions of dollars to develop their DIY automation solutions. Very few enterprise or service provider operations teams have the resources or time to successfully implement DIY automation.

Given these difficult challenges, many organizations are starting their automation journey with Extreme Workflow Composer Automation Suites. These customizable, pre-built automation suites deliver the best of both worlds—short time-to-value and customization. Their turnkey, out-of-the-box functionality is designed to work seamlessly with Extreme network infrastructure and can be deployed with only basic skills while still delivering near-immediate time-to-value. At the same time, the automation suites' components are completely open and extensible to allow organizations to customize as skills mature and requirements change.

ARISTA Price List as of 24 Apr 2017

Manufacturer Part Number	Description	Condition	Weight	Res/Com Price (USD)	Gov/Edu Price (USD)	In Stock
BND-7050SX-96-F	CLOUDVISION STARTER KIT 2X 7050SX-96-F 24X1M-NBD 24XCV-SWITCH	New	23.00	\$19,478.13	\$19,478.13	Email
SFP-10G-ZR	10GBASE-ZR SFP+ EXTENDED REACH TO 80KM	New	.20	\$9,770.11	\$9,770.11	Email
SS-CV-ENT-1M	CLOUDVISION SW SUB ENT LICs FOR 1MO UNLIMITED	New		\$977,495.11	\$977,495.11	Email
SS-CV-S500-1M	CLOUDVISION SW SUB LICs FOR 1MO FOR UP TO 150 SWITCHES	New		\$29,320.11	\$29,320.11	Email
SVC-7050QX-32S-1M-NB	1MO ACARE SW&NBD HW REPLACEMENT SAME DAY SHIP FOR 7050QX-32S	New		\$152.19	\$152.19	Email
SVC7050SX272Q1MNB	1MO NBD SAME DAY SHIP SW/HW REPLACEMENT A-CARE FOR 7050S	New		\$133.75	\$133.75	Email
SVC-7050SX-64-1M-4H	1MO A-CARE SW & 24X7 4HR HW REPLACEMENT FOR 7050SX-64	New		\$193.71	\$193.71	Email
SVC-7050SX-72-1M-NB	1MO A-CARE SW & NBD HW REPLACEMENT/SAME DAY SHIP 7050SX-72	New		\$184.48	\$184.48	Email
SVC-7050SX-72Q-1M-NB	1MO A-CARE SW & NBD HW REPL SAME DAY SHIP FOR 7050SX-72Q	New		\$133.75	\$133.75	Email

Figure 3: CloudVision pricing.

(<http://www.kernelsoftware.com/products/catalog/arista.html>)

### Integrated Automation vs. Extreme Workflow Composer Automation Suites

Several vendors offer integrated network automation solutions. These solutions provide turnkey automation for networking tasks and may include a list of vendors that have been pre-approved for cross-domain integration for vendor-defined use cases. The advantage to this approach is increased confidence that the solution will work out of the box. But compared to Extreme Workflow Composer Automation Suites, there are three main disadvantages:

- Limited cross-domain technology support: The integrated solution only works with pre-approved and pre-defined cross-domain technologies. If an organization does not use the specific technology, then it must replace its technology with one that is supported or forgo the capability.
- Limited use case support: Integrated solutions address very specific, vendor-defined use cases. While most organizations will find value in these use cases, many use cases considered far more critical to the operation will not be provided. With integrated solutions, organizations have few options for customizing the vendor-defined use cases. They must either wait until the vendor engineers support for the use case or forgo this capability. (Some vendors may offer design guides, but these documents contain hundreds of pages and require staff and time to implement.)
- Higher cost: Due to the integrated nature of a combined hardware and software solution, these solutions typically command a very high price. For example, Arista's list price for a CloudVision software subscription can range between \$30,000/month for 50 switches to nearly \$1,000,000/month for unlimited switches (see Figure 3).

No other vendor offers the equivalent of Extreme Workflow Composer Automation Suites—whether it is cross-domain technology support, use case support, or affordability.

# Extreme Workflow Composer Automation Suites Pricing

For organizations seeking predictive agility and the most compelling return on investment for automation, Extreme Workflow Composer Automation Suites deliver the best short- and long-term value.

The Network Essentials Automation Suite, available for free to any StackStorm or Workflow Composer automation platform user, provides the building blocks for network and cross-domain automation. If used with StackStorm, the entire solution is free. If used with Workflow Composer, which provides greater security and support options, the cost for the entire solution is less than \$75,000. Compared with Arista CloudVision, this solution delivers more automation, greater flexibility, and longer-term value at roughly one-tenth the cost.

For organizations deploying data center fabrics, the Data Center Fabrics Automation Suite works exclusively with the Extreme Workflow Composer automation platform to provide turnkey network lifecycle automation, and is priced based on the number of devices in the organization's network (Table 3).

Deployment Size	Number of Network Devices (min. to max.)	List Price (annual subscription)
Small	1 to 10 nodes	\$10,000
Medium	11 to 100 nodes; wide range incorporates network growth	\$50,000
Large	More than 100 nodes	\$80,000

**Table 3:** Pricing for the Data Center Fabrics Automation Suite based on the number of devices.

## The Right Automation Method for a Digital Transformation

For organizations seeking predictive agility, increased operational efficiency, and the most compelling return on investment for automation, Extreme Workflow Composer Automation Suites provide the best short- and long-term value of any automation method on the market today. While integrated automation solutions come with steep acquisition costs, limited cross-domain support, and questionable long-term value, and DIY solutions require upfront skills investment, leading to long and risky time-to-value, Extreme Workflow Composer Automation Suites provide the right solution to help today's IT operations teams embark on a digital transformation.

For more information about Extreme solutions, visit:

[www.extremenetworks.com](http://www.extremenetworks.com).

For more information on Extreme Workflow Composer and Extreme Automation Suites, visit : [www.ewc-docs.extremenetworks.com](http://www.ewc-docs.extremenetworks.com).



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