LEARNING MADE EASY

Intent-Based Networking

for dummies®

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Digital transformation is a key objective for most organizations today, and data center technologies have evolved to support this objective. Unfortunately, network operations lag far behind on the transformation curve, often inhibiting rather than promoting change. That's where intent-based data center networking software comes in. This paper helps you understand what intent-based networking (IBN) is, how it can benefit your business, and how to make the transition easily to IBN.

Jumping the Digital Transformation Hurdles

Why is digital transformation of network operations such a challenge? Your quest toward a smooth transformation may have been hindered by some very real hurdles:

- **Human error:** People are prone to errors, and they aren't typically good at mundane, repetitive tasks over a long period of time.
- **Inadequate automation:** Most automation tools only take input for specific tasks and output configurations specific to your current network. If your network changes, your scripts have to change, too. In addition, they often have no error checking or poor or no error handling.
- **Data fog:** Zeroing in on the right data at the right time is challenging because different data is important at different times.

- **Stale documentation:** Maintaining up-to-date documentation is a challenge, especially for networks that support modern digital services that change second to second.

Transforming Network Operations with IBN

IBN can help you overcome many of the hurdles that stand in your way of a successful transformation. It takes your network from piecemeal node-by-node management to an autonomic network — regardless of the specific vendor or operating system of your network devices. The system self-operates, self-adjusts, and self-corrects based on your expressed technical objectives, or *intent*.

IBN is about getting operational expenses (OPEX) under control and transforming the way you operate your network so you can realize the following benefits:

- **Managed complexity:** Break operational tasks down to their simplest elements and automate them based on expected outcomes.
- **Managed risk:** Eliminate human error in the flow from expressed intent to creation and deployment of specific configurations.
- **Managed data fog:** Get actionable insights into the massive collection of data your network throws at you, eliminating the OPEX of extracting only the data you need at a specific moment.
- **Increased reliability:** Network changes under IBN are faster and can often be performed in production.
- **Standardized network segments:** Use validated, best-practice blueprints to quickly stamp out reliable, industry-standard network segments.
- **Accelerated agility:** Adapt to changes and new applications without major structural changes. Agility is directly tied to OPEX savings.
- **Freeing your experts:** Spend less time fighting fires and more time working on strategic initiatives.
- **Surveying your options:** Put design first and deal with vendor specifics in the background.
- **Moving from days to minutes:** After moving to an IBN system (IBNS), your same project — from design to deployment and acceptance testing — takes minutes instead of days.

Looking at the Characteristics of IBN

With IBN, information not only flows down from the IBNS to the infrastructure based on your expressed intent, but also it flows up from the infrastructure to the IBNS. This two-way flow extends IBN through all phases of the network's life cycle — design, build, deploy, and validate.

The fundamental aspects of IBN

Many companies claim that their data center networking software is intent based, but a true IBNS must be capable of two things — intent fulfillment and intent assurance.

Intent fulfillment involves saying *what* you want and having the IBNS handle *how* to fulfill your requirements. Accuracy and consistency are essential in translating your intent to a working service, and that requires a well-thought-out architecture. While the terms and details may vary from one implementation to another, the IBNS architecture should support the following elements:

- **A reference design** of best practices that the IBN applies to your expressed intent
- **A database of abstractions,** such as details of the generic kinds of devices required to fulfill your intent
- **An inventory** of what's actually available to you that fulfills your abstraction, including an exhaustive list of vendors and models

REMEMBER

A *blueprint* pulls everything together from the reference design, the abstraction, the inventory, and the existing network state to push a valid, verified, and repeatable service to your network.

Intent assurance is vital so you know if a service diverges from intent. You can't just deploy a network service and throw it over the wall to operations because networks change for all sorts of reasons. The validators in the reference design are essential for providing assurance before, during, and after the service is deployed.

Idempotency

An idempotent operation is one that you can perform repeatedly to get the same results every time. An IBNS must have current insight into the network so that identical changes made any time in the

life cycle will have the same result. Without this assurance, the effect of a failed change could be enormous.

Single source of truth

Intent assurance and idempotent operations are impossible if you're working from many sources of truth. A single source of truth (SSoT) means that all network operations act on a single data set. The blueprint takes information from the infrastructure and from other entities within the IBNS. The IBNS consolidates that information into a single data set and views the network entirely from that perspective.

Simple pane of glass

The concept of a "*single* pane of glass" may be familiar as a benefit of having a single source of truth: You can see your entire network from a single, consistent perspective. However, what about when you want to see just one specific part of your network?

With a "*simple* pane of glass," you can say which part you want to see and see only that. This extends intent beyond fulfillment and assurance and allows you to express intent while you're viewing your network, which is particularly valuable when you're troubleshooting. Instead of sorting through a mountain of irrelevant data, you can quickly zero in on the relevant information needed to identify the root cause of an issue.

Creating a Practical IBN Architecture

The number one job of an IBN architecture is to break down high-level tasks into their constituent tasks, then recursively break those constituent tasks down to the very simplest sets of steps, information, and variables needed to instruct the relevant network. The blueprint is the starting point for constructing the IBN architecture itself; however, the blueprint isn't just for getting a service up and running. The IBNS continually uses the validation mechanisms defined in the blueprint to ensure constant compliance to intent.

At the heart of a conceptual IBN architecture is another blueprint that contains all the information needed for deploying and maintaining a system based on expressed intent. This information is provided by the abstractions, inventory, infrastructure, and reference design, as shown in Figure 1.

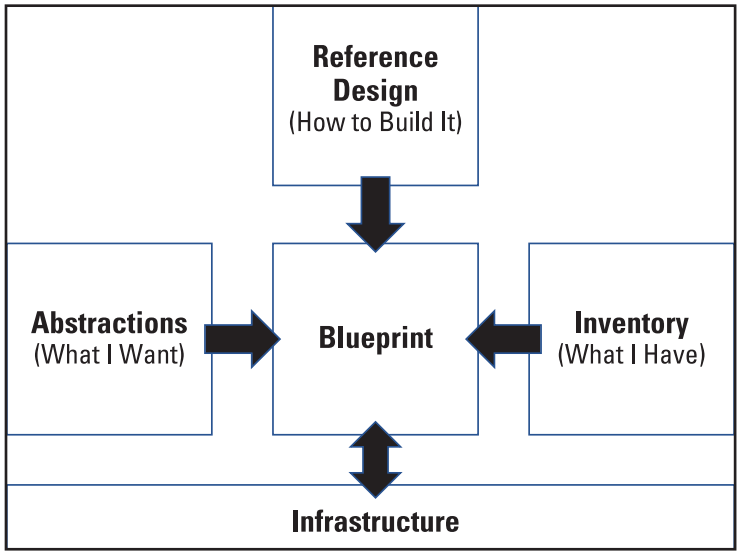


Figure 1: A conceptual IBN architecture.

With this raw information, the IBNS can assemble a working, best-practice, validated solution in the blueprint. The blueprint pushes configuration to the infrastructure, and the infrastructure informs the blueprint about state changes and anything else that can affect intent compliance.

TIP

An IBNS should have multiple means of communicating with infrastructure devices. Although it may be preferable to install an IBN software agent on your devices that your IBNS can talk to, not all devices can accommodate an agent installation, or the IBN agent software may not support all your devices.

Understanding the Importance of Analytics

Networks change — both intentionally and unintentionally. An IBNS should use intent-based analytics (IBA) to stay aware of network changes in real time, continually ensuring that your services remain in compliance with your intent. There are two types of changes:

- **Uncontrolled changes** are failures that occur unexpectedly.
- **Controlled changes** include configuration changes or addition, change, or removal of an element. These types of changes can also cause things to break.

IBA provides you with actionable insights that enable you to address network changes. It does this by sifting through the vast amounts of network data to detect conditions of interest and then classifying these conditions by their relationships to each other. The data points and their relationships are stored as a graph, as shown in Figure 2.

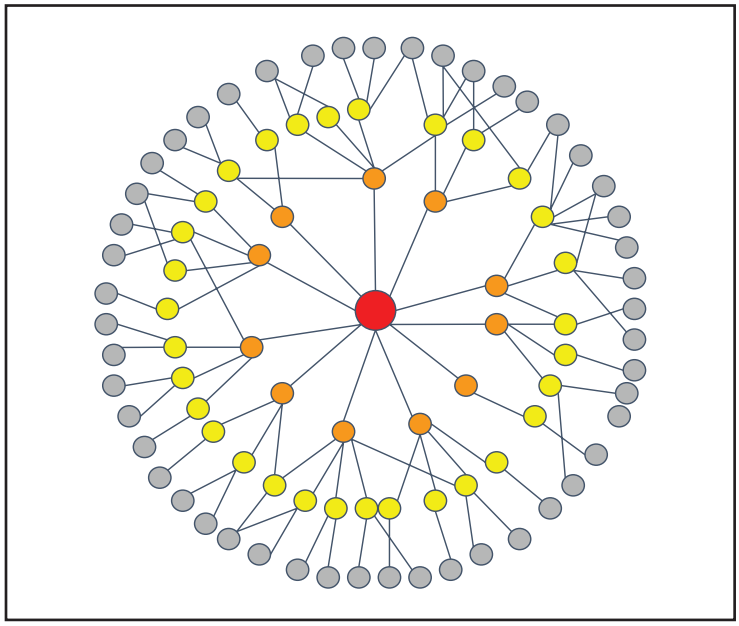


Figure 2: A graph data store leads you to the specific answers you need.

Analytic probes

Analytic probes ask essential questions and root out important data, stripping away what's irrelevant, so you can obtain specific information from your graphical data store. Ideally, your IBNS should provide you with a library of prebuilt probes that you can deploy, as well as enable you to define your own probes quickly and accurately.

Root cause identification

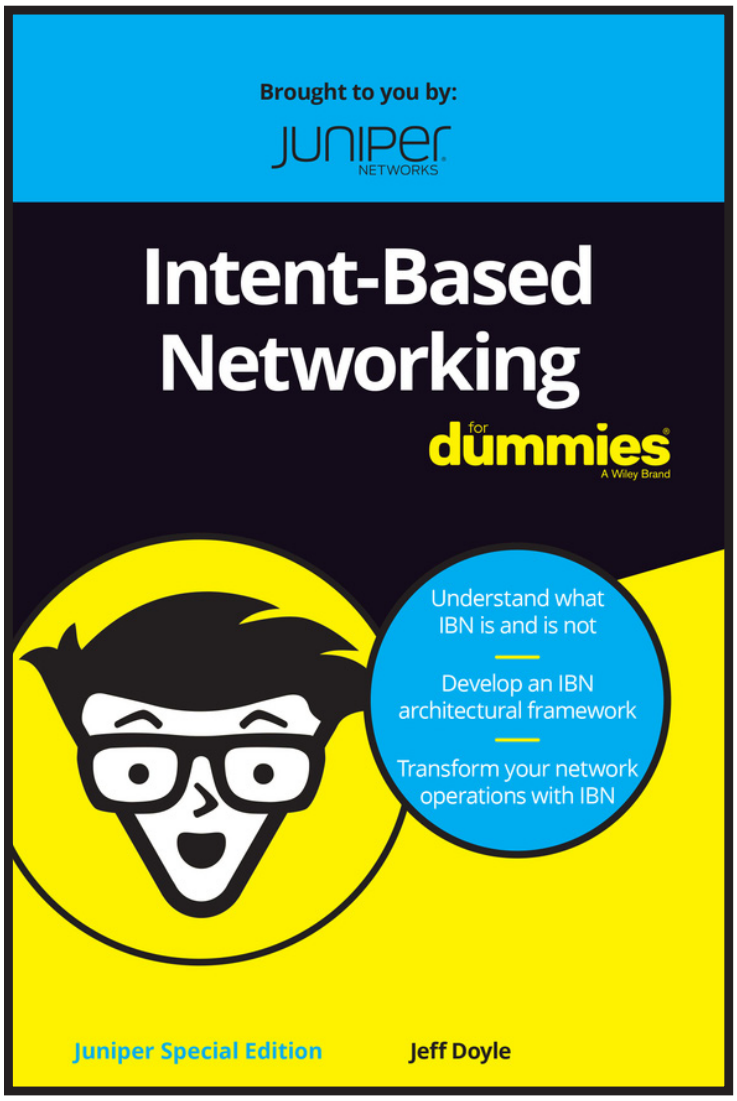
When something goes wrong, it can cause a flood of anomalies. Being able to sort through that flood and zero in on the root cause is crucial to quickly resolving the issue. This can be difficult to do when the root cause isn't observable, for example, if it occurs outside your administrative domain.

Root cause identification addresses this. While it is built on IBA — which is focused on identifying complex symptoms in your network — root cause identification focuses on the causes of those symptoms. It uses the reasoning defined in the reference design to differentiate between symptoms and anomalies and how they all relate to each other.

Multi-vendor rollback

Being able to roll back to a previously good state is crucial when a controlled change blows things up unexpectedly. Although many vendors implement configuration rollback capabilities, it's important that your IBNS allows you to roll back a multi-vendor network all at once instead of resorting to the capabilities and procedures of each vendor.

Take a deeper dive into the topics in this document by downloading the following asset from Juniper Networks:



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