Intent-based networking (IBN) has been labeled the “next big thing”. This is not the first or last big thing to come to networking. While building and operating networks based on business intent or objectives has a lot of promises, it is still a relatively new concept to much of the networking world. In order to facilitate understanding and increase awareness around IBN we drafted 10 top questions that we hear from customers and partners who are looking to this revolutionary technology to help them transform their networks and data centers from “fragile to agile” while overcoming complexity and enabling change.

1 What is the origin of IBN?

It is unclear whether a single “a-ha” moment resulted in the advent of IBN. It is a trend that has arisen in recent years out of the emphasis on automation and programmability in networking (along with SDN, verification, orchestration, etc.).

Academia has played a major role in advancing research in the area of network automation.

The researchers of complex systems at Veriflow (who trace their roots to the University of Illinois, Urbana Champaign and the University of California, Berkeley) made significant progress in the area of network verification – a critical component of IBN. Veriflow published the original research work at the SIGCOMM conference in 2011, and then demonstrated in 2012 that network data plane can be verified using mathematical models.

Gartner published the research note in early 2017 – coining the term “Intent-Based Networking Systems” and calling it “the next big thing in networking”. Veriflow and other start-ups continue to evangelize IBN to network operators and to the analyst community.

Veriflow is proud to be an early pioneer and enabler of IBN for multi-vendor networks. Veriflow technology complements many of the emerging IBN systems by providing continuous network verification capabilities. Visit our IBN Hub to learn more.
2 What is IBN?

IBN is a new way to build and operate networks based on business intent, in a continuous closed-loop.

The networking world has been very prescriptive, focusing on “how” to do things. However, context answers the question “why” a certain business outcome is desired. Intent defines “what” the business outcome is in a given context. Intent is declarative.

Take this everyday example. A person is hiking on a warm day and begins to feel tired and dehydrated (context). She wants the tiredness to go away (intent), and drinks water or a beverage and takes a rest (prescribed action).

Similarly, consider this networking example. A Director of Networks in an organization notices that the important software applications they rely on are loading unusually slowly. Investigation reveals that the network is congested due to significant online streaming activity (context). The desired business outcome is to stop live streaming traffic (intent). This intent is translated to a network configuration change: “Configure ACL to block port #X on all distribution layer devices.” (prescribed action).

3 What are the key operating principles of IBN?

IBN operates according to the following key principles:

- **Business Intent Is Paramount**
  IBN always keeps the business goal at its forefront. IBN ensures that business intent guides all phases of network design, deployment, and operation.

- **Network as a System**
  IBN requires the network to be designed and operated as an end-to-end system, rather than the as-needed, ad-hoc configuration of individual devices and interfaces.

- **Continuous Verification of Intent**
  Mathematical verification is an important element of IBN, and ensures during all phases – design, deployment and operation - that the intended behavior is actually realized.

- **Technology and Vendor Agnostic**
  IBN ensures that network operational intent is realized regardless of the underlying technologies or diverse equipment and command line syntax from various vendors. These networks may consist of multiple private and public clouds, software defined networks (SDN), along with legacy architectures.
4 How does IBN most differ from traditional networking approaches?

Today’s networks are managed with a very outdated method dating back to the beginning of the internet in the 1980s and 90s.

The traditional approach to managing networks is very prescriptive, device-by-device and bottom-up. This approach makes the network highly error prone, time consuming to manage, and resource intensive - considerably slows the evolution of the core business. This approach is untenable because today’s networks are critical to every business, while network complexity continues to grow.

Specifically, the traditional approach is:

**Device-by-device**
The network is treated as a loose collection of individual devices, not an end-to-end system. Network teams often specialize in network functions (routing, switching, security, application delivery, wireless, etc.). The network experts then configure and change one device at a time, often unsure of how an individual change may affect other devices, and by extension the entire network.

**Prescriptive**
Each networking device needs to be told exactly what it needs to do. The teams that manage the network need to be very prescriptive when making changes for each device (such as block port X, add route A.B.C.D, enable 802.1q for ports P,Q,R etc.) Any small mistake in a prescriptive command can cause the network to malfunction or even to experience an outage. The problem is compounded further because traditional network equipment makers offer their own user interfaces – which are mostly command line interfaces (CLIs). The team that manages the network must learn the CLI syntax for each vendor. The resulting complexity of CLI versions, network devices and technology changes is impossible for humans to keep track of. Most of the time is spent on “how” to make things work.

**Bottom-up**
This device-by-device view and the practice of making prescriptive changes to the network encourages silos. The teams that manage networks lose the big picture – “why” the network needs to behave in a certain way and “what” is the expected business outcome.

Currently, the translation of business intent into prescribed action is manual, arduous, and error-prone, with no algorithmic validation of this translation.
5 What are the key benefits of IBN?

At the highest business level IBN promises to improve network availability and agility, which are key concerns as organizations transition to digital business. IBN significantly saves time, reduces management complexity, improves automation, reduces workload on networking teams, increases robustness of the network, improves network security and helps maintain regulatory compliance. IBN helps the network go from fragile to agile.

IBN takes a top-down approach and starts by asking the question “what is the desired business outcome?”, and then continuously manages the network in a closed feedback loop. This approach ensures that the network supports the digital business, rather than standing in the way.

6 How does IBN work?

IBN uses elements of machine learning, data analytics, and the domain expertise of networking teams to ensure continuous operation.

As a closed-loop system, IBN starts with a desired business outcome and progresses through the following steps:

**STEP 1** Define/understand the intent - the desired business outcome

**STEP 2** Automatically convert intent into a series of prescriptive changes in the network (change ACLs, update application-specific protocols, etc.)

**STEP 3** Verify that the proposed network changes will work before actually deploying them in the live network

**STEP 4** Assuming success in step 3, deploy verified changes in the live network. Else go to step 2

**STEP 5** Periodically verify that the reality in the live network matches the intent defined in Step 1, in a closed-loop fashion

The same closed loop of steps is then applied to the next set of intents.
7 What are the primary challenges of IBN?

Although the concept of a “declarative paradigm” is found within the academic world, IBN is a newer approach. As the more advanced newcomer, IBN’s primary challenge is lack of awareness because it is a new concept.

Application Programming Interface (API) support is another challenge. Networking vendors that do not offer APIs to manage their platforms are at risk of losing out on this new trend because devices that lack API support will be left out of IBN.

8 How are SDN and IBN related?

SDN and IBN are complementary, yet orthogonal technologies. SDN and IBN can be deployed individually or together. SDN and IBN share the goal of helping to make the network more agile. Hence the Open Network Foundation (ONF) – the main institution that drives SDN - published the north bound interface specification for SDN to support IBN.

SDN focuses on how to control network infrastructure. IBN focuses on aligning the network infrastructure with business goals and on continuously maintaining that alignment.

9 What does IBN mean for the industry?

At Veriflow, we believe the networking layer of the IT infrastructure is finally starting to catch-up with the rest of the layers (namely servers, storage and application software) by moving towards automation.

IT organizations worldwide stridently complain that while they have more agility in deploying and managing servers, storage, and application software, the network is daily growing in complexity and is holding them back. IBN helps IT mitigate network complexity and realize the full intent of the network. Even IaaS cloud offerings are moving towards a declarative paradigm – where users tell the infrastructure what they want, instead of how to do it.

IBN signifies more automation, accuracy, measurability and agility.
10 What can you do to learn more about IBN?

To learn more about IBN and how it can benefit small, medium or large networks, please:

- Read Gartner paper titled [Innovation Insight: Intent-Based Networking Systems](https://www.gartner.com/it-law/newsletter/Gartner_Insight/201702_HALJZT-6PZQ), February 2017
- Review IBN vendor analysis in [Cool Vendors in Enterprise Networking 2017](https://www.gartner.com/technology/research/cool-vendors/enterprise-networking), April 2017
- Research IBN vendors’ websites for more information
- Follow Gartner’s recommendation to “pilot intent-based networking solutions”, and “budget for it using improved network agility, increased network uptime, and/or better alignment with business initiatives as the funding drivers”
- Visit our IBN Hub for more resources
- [Request a demo](https://www.veriflow.net/demo) and see first-hand IBN at work

When looking at intent, remember that the core movement behind IBN is about giving network operations the confidence they need to take control of their entire network while automating daily tasks and checks, that now align directly to business objectives and this is not a far-off future tech. There are approaches that allow you to step-into intent within any networking environment and without network disruption.

Intent-based systems promise to increase agility and availability of networks while reducing opex which is key as traditional business evolve with digital dependencies. It is no longer humanly possible for network operations to provide 100% availability with the level of complexity in today’s network.