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Harnessing AI for Intelligent Network Management

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As modern networks become increasingly complex and dynamic, traditional manual approaches to network management are no longer sufficient. The rapid growth of devices, applications, and data traffic puts immense strain on network operations teams to ensure optimal performance, security, and reliability. Put simply, these teams are being overwhelmed in the increasing digital chaos of integrating multiple solutions together, when most CIOs would prefer to have their teams focus on projects that move their businesses forward.

This is where artificial intelligence (AI) comes into play. By leveraging AI techniques, IT teams can give themselves superpowers to rapidly evolve their network management practices, enabling automated, intelligent, and proactive management of their infrastructure.

For example, instead of being a tool for point problems and temporary solutions, network management solutions need to evolve into systems that don't just use AI for reporting but leverage this intelligence to continue to improve themselves over time. This also means solutions performing network management duties rather than simply suggesting solutions.

It's essential to distinguish between "AIOps," which is primarily limited to "Day 2" activities such as device offline issues, user connectivity issues, and configuration errors, from the real potential for AI and the network. We often talk about a "Shift Left" strategy with our customers, where they see a role for AI from Day 0 (design and implementation) to Day "N" activities, where AI is responsible for continuously optimizing the network for performance guarantees such as availability, capacity, and coverage.

The biggest benefit of leveraging AI is saving IT time wasted on ongoing management and time-consuming troubleshooting tasks. AI will serve as a copilot that will enable IT to solve problems more quickly and provide better performance while having to do less work. Most AI solutions

for network management today simply identify problems for IT to fix. We should be using it to proactively address issues without human intervention. No IT person looks forward to grunt work like addressing minor connectivity issues or other day-to-day drudgery of managing a network. AI can and should eliminate that wasted effort and allow teams to focus on activities that generate real value for their companies.

With these goals in mind, let's explore five key principles that underpin effective AI-powered network management solutions.

1. Closed Loop Automation

One of the fundamental principles of AI-powered network management is closed loop automation. In this approach, the AI system continuously monitors the network, gathering data on performance metrics, traffic patterns, and device behavior. It then analyzes this data in real-time, identifying potential issues or anomalies. Based on predefined policies and machine learning models, the system automatically takes corrective actions to mitigate problems and optimize network performance. This closed loop process operates autonomously, without the need for human intervention, enabling faster issue resolution and reducing the workload on network administrators.

A good example of closed loop automation is the ability to automatically detect anomalies in the network element resources (e.g., sudden spike in CPU utilization) or the connecting links (e.g., sudden spike in cabling errors), isolate the points of failure, reroute traffic, and restore the network to the original behavior when the condition is cleared. All of these happen in the background without the users or IT administrators knowing about it.

2. Continuous Optimization

Networks are dynamic environments with constantly evolving user behavior, application requirements, and device landscapes. AI-powered network management solutions embrace the principle of continuous optimization to adapt to these changes. By leveraging an integrated data model and a deterministic system design, AI algorithms can continuously analyze customer environment, network performance, and make intelligent decisions to optimize resource allocation, traffic routing, and quality of service. This proactive optimization ensures that the network remains agile and responsive to changing demands, delivering consistent performance and user experience. A good example of continuous optimization is the ability to continuously learn from users' RF environment to detect potential interferences, learn user behavior and their short term and long-term traffic patterns, and tune the wireless network parameters to deliver the optimal user experience.

3. Service Level Guarantees

In today's digital age, businesses rely heavily on their network infrastructure to support critical applications and services. AI-powered network management solutions must prioritize service level assurance to meet the stringent requirements of modern enterprises. By incorporating AI algorithms, these solutions can proactively monitor and predict potential service disruptions, enabling proactive maintenance and troubleshooting. AI can also help in capacity planning and

resource allocation, ensuring that the network has sufficient coverage, capacity, and availability to satisfy service level guarantees for both campus and branch connectivity.

A good example of guaranteeing the service is delivering the right signal strength for client devices. AI enabled network management can learn from the user's RF environment to detect any potential interferences, predict coverage gaps, and tune the wireless network parameters to close the coverage gaps, thus continuously delivering the coverage guarantees.

4. Deterministic Network Design

The most critical element in building a network to leverage AI is to take the time to install the right deterministic network architecture to ensure that the AI solution is getting access to high volumes of accurate, contextual data. Any AI system lives or dies based on the quality of the data at its disposal. Without the right data upon which to base its decisions, the concept of "garbage in, garbage out" applies, and that translates to poor performance at best, dangerous security breaches, and/or unhappy customers at worst. To achieve this, you need deep instrumentation with physical and virtual sensors measuring the state of the network elements, its performance, and popular applications. We should add that this doesn't mean we need device-level clients, but just the ability to understand the data flowing from those devices.

AI is also capable of assisting in designing the network itself, with some systems able to assist in installation of the network, such as determining the appropriate placement for wireless access points (APs) and even confirming that the network elements and connecting cables are properly installed. By using AI at the very genesis of the network, IT is able to guarantee the system design will perform as required.

5. Cloud Native Architectures

Complementing the deterministic network design, AI-powered network management solutions must embrace cloud native architectures. These modern-day architectures fully support today's software-centric systems and are a far cry from the 30-year-old network LAN architectures currently being championed by most incumbents. By adopting cloud software principles, AI-powered network management platforms can achieve scalability, flexibility, and agility.

Cloud native architectures enable the seamless deployment and orchestration of AI models and services across distributed network environments. They also facilitate the collection and processing of vast amounts of network data, providing the foundation for advanced analytics and machine learning. By leveraging the elasticity and resilience of cloud platforms, AI-powered network management solutions can adapt to the dynamic needs of modern networks.

Perhaps just as importantly, cloud native architectures facilitate the ability of IT to adopt a more service-centric model for network management, with many solutions that offer a "pay as you go" or "pay for what you use" model leveraging cloud native architectures as part of their solutions. IT organizations have made it clear that this approach to technology solutions is their preferred means of consuming applications and services. Why should the network be any different?

Conclusion

The advent of AI has opened up new possibilities for intelligent network management. By embracing the principles of closed loop automation, service level assurance, simplified management, deterministic network design, and cloud-native architectures, organizations can transform their network operations. AI-powered network management solutions enable proactive monitoring, automated troubleshooting, and intelligent optimization, reducing the burden on IT teams and ensuring optimal network performance and security. As networks continue to evolve and grow in complexity, the adoption of AI will become increasingly critical for businesses to stay competitive and deliver seamless digital experiences to their users.