Project Showcase

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Crystal Equation Managed Services: E2NIC

In 2023, Crystal Equation was approached by one of the Fortune 50 companies to build an End-to-End Network Insights Center (E2NIC). In a span of 3 months, Crystal Equation assembled a team of expert network engineers and AI specialists to deliver a customized service of proactive network monitoring. Once fully operational, the team transformed the network operations environment into a mature, scalable, and measurable construct which minimized Client's downtime. Potential issues were addressed before they caused downtime and forward-looking standards were implemented to maintain network serviceability and observability in the future.

Challenges the Client Initially Faced

- A portion of the Client's network infrastructure (core Data Center networks, WAN, and corporate network) was suffering from incidents impacting business operations. The issues spanned across approximately 9,000 network devices. Over a measured period of 18 months, at least one revenue-impacting incident per month was logged.
- Monitoring and visibility into device health metrics was impacted by incomplete log collection and lack of standardization across configuration and firmware of network devices.
- Multiple best practices in network operations were non-existent or not observed to a satisfactory degree, further impacting network stability and performance.
- Silo mentality of dispersed network operation teams led to frequent orphaned incidents, which were becoming major issues over time.

Approach to the Solution

Developing a central team	Crystal Equation suggested an approach where a central team consisting of seasoned Network Engineers and Architects would first analyze the network environment, then suggest improvements, and lead the process of implementing these improvements.
Collaborative planning	Through a collaborative planning process, Crystal Equation and the client decided to implement a custom, AI-driven early warning and issue detection system designed specifically for the network environment.
Implementation and ongoing support	After the initial phase of issue identification and overall operational processes improvement, the team continued the engagement as the End-to-End Network Insights Center, a separate organizational entity coordinating and supporting efforts of the existing network operations teams.

Solution

A collaborative framework was implemented to ensure ongoing network stability through proactive issue identification and resolution:

1. BASIC-9: standard for network device implementation and maintenance

The team defined the 9 basic tenets of a healthy networking environment, including centralized log and backup servers, out-of-band connectivity, OS version control, etc. The existing environment was analyzed along with the degree to which these tenets were implemented. Deficiencies were addressed and full visibility into the progress for the client's Senior Leadership was provided.

Examples of results achieved:

- Fixed device inventory, as more than 1200 devices were missing initially
- Resolved authentication vulnerabilities for over 1500 devices
- Increased % of devices covered by up/down monitoring from ~50% to over 90%
- Resolved central logging issues for 60% of devices
- Redefined the alerting system, reducing noise and allowing engineers to focus on actionable alerts only

During the implementation of BASIC-9, a compliance monitoring system was developed to maintain the high level of adherence to the standards set forth.

2. Implementation of CE Analytics Console (CEAC) and new alerting rules

The custom solution was designed to proactively identify issues with network devices before they resulted in downtime. CEAC leverages an AI-driven engine to analyze continuous streams of network device logs and generate actionable alerts for network operations teams. The solution's true strength lies in its ability to correlate log data with device inventory details (including device type, OS, and version), manufacturers' knowledge bases (known issues and remediation guidance), and historical device behavior.

Unlike traditional rule-based alerting systems, which often overlook subtle signals that may indicate emerging problems, CEAC surfaces meaningful insights that might otherwise go unnoticed. Throughout the engagement, several notable scenarios were identified and escalated to network operations teams, including:

- A network device that had been running without incident for several years but was operating on a severely outdated operating system, presenting both security and troubleshooting risks.

- Multiple devices nearing disk capacity limits, with configurations last saved months earlier. In the event of a power cycle, these devices would have restarted with outdated configurations and failed to resume proper operation. CEAC flagged this as a critical risk, prompting corrective action.
- A persistent stream of critical alerts caused by a known firmware defect that posed no actual risk. Due to alert fatigue, operations teams were disregarding these alerts along with potentially legitimate ones. CEAC reduced noise by automatically suppressing these false positives, restoring trust in the alerting system.
- Intermittent overheating of several backbone network devices occurring at regular intervals. When investigated during business hours, the devices appeared healthy, masking the underlying risk of future failure. CEAC identified the root cause as a known firmware issue causing fans to operate in the wrong direction.

In summary, the implementation of CEAC, combined with a modernized approach to alerting, enabled network operations teams to confidently rely on alerts for proactive intervention. Additionally, E2NIC led the development of standardized runbooks for each defined alert, streamlining troubleshooting and accelerating remediation efforts.

3. Engagement in network device OS upgrade project

Client teams had fallen behind schedule on the OS upgrade initiative, leaving a significant number of network devices running software versions that were no longer supported by vendors. This delay was driven by heavy operational demands, as day-to-day “keep the lights on” activities were consuming the full capacity of available staff.

As the network rationalization efforts led by E2NIC began to deliver measurable improvements, E2NIC personnel launched a comprehensive initiative to bring core network infrastructure back to supported OS versions. The team carefully planned, rehearsed, and executed critical upgrades, minimizing downtime while relieving the Client’s staff of the operational burden associated with these activities.

Summary

Over the course of one year of full E2NIC engagement, the key KPI measuring revenue-impacting core network incidents was reduced from approximately 12 per year to just 2. Notably, both incidents that occurred during the E2NIC tenure were the result of fiber cuts—events unrelated to the health or configuration of network devices.

To summarize, this solution didn't just solve the client's challenges. It rebuilt and redefined network resiliency.

The processes, policies, and procedures established by E2NIC remain in place within the Client's environment, enabling the Client to sustain a high level of network health and operational stability.

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