Automation in Modern Network Operations and Management

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Abstract:

The rapid evolution of network infrastructure, driven by the demands of cloud-native applications, IoT, and 5G, necessitates a paradigm shift in network operations and management. NetDevOps, a fusion of DevOps principles with networking, emerges as a transformative approach to address these challenges.

This project explores the application of NetDevOps in modern network environments, emphasizing automation, agility, and scalability in network operations. By leveraging practices such as Infrastructure as Code (IaC), Continuous Integration/Continuous Deployment (CI/CD), and real-time telemetry, this project aims to demonstrate how network deployment and maintenance stages are redefined in the ISP and Cloud scale networks.

The project delves into key technologies like Ansible and Git for automation and configuration management, along with open-source tools (e.g. Prometheus and Grafana) for enhanced observability. Use cases such as automated network provisioning, compliance enforcement, and self-healing mechanisms are examined to demonstrate the operational efficiency and reliability achievable through NetDevOps.

This project aims to showcase the benefits of adopting NetDevOps in achieving robust, secure, and dynamic networks, while addressing challenges such as skill gaps, legacy system integration, and tooling complexity. Ultimately, it provides a comprehensive framework for modernizing network operations, aligning them with the demands of next-generation technologies and services.

This project aims to use Python for coding core application and Ansible playbooks for automating most of the network operations and maintenance related tasks. It is also aiming to develop this as a web application using Django and integrate other components (such Database, Git, Cloud networks, etc) using various APIs.

The integration of hybrid cloud environments and the potential of AI-driven network management shall be explored for further enhancement.

Keywords:

Core Concepts & Methodologies: NetDevOps, DevOps, Network Automation, Infrastructure as Code (IaC), Continuous Integration/Continuous Deployment (CI/CD), Real-time telemetry.