Available online www.ejaet.com

European Journal of Advances in Engineering and Technology, 2019, 6(11):90-93

Research Article ISSN: 2394 - 658X

Optimizing Network Availability Through Out-of-Band Configuration Change (OOBC) Process- Network Management for Communication Service Providers

Mohit Bajpai

USA

ABSTRACT

Out-of-Band Configuration (OOBC) plays a crucial role in network management by offering a secure and resilient method for accessing and configuring network devices independently of the main network. This paper presents an in-depth analysis of OOBC, its architecture, benefits, and a real-world application in a large communication service provider utilizing IBM Tivoli ITNCM. The use of OOBC ensures continuous device accessibility, even during network failures, thereby enhancing operational efficiency and security. The paper concludes with an evaluation of OOBC's significance in modern network environments, focusing on the integration of IBM Tivoli for managing large-scale networks.

Keywords: Out-of-Band Configuration, OOBC, Network Management, Network Device Configuration, IBM Tivoli ITNCM, Resilience, Security, Remote Access, Communication Service Provider, Automation.

INTRODUCTION

Network components, such as routers, switches, and firewalls, play a pivotal role in contemporary information systems. As these networks grow in complexity, the need for efficient and secure configuration management becomes imperative [1]. Traditional in-band configuration methods, where modifications are made directly through the production network, can be vulnerable to various challenges, including service disruptions, security vulnerabilities, and operational complexities.

With the increasing complexity of modern network infrastructures, ensuring the availability and security of network operations is paramount. Communication Service Providers (CSPs) in particular, rely on robust network configurations to maintain connectivity across large geographical areas. Any network failure or misconfiguration can cause significant service outages, impacting millions of users. Traditional in-band management methods rely on network paths used for data traffic, which can become problematic in the event of network failures. Out-of-Band Configuration (OOBC) provides a secure, independent communication path for managing network devices, ensuring access during network outages or misconfigurations. This paper explores OOBC processes and their implementation, using IBM Tivoli ITNCM in a large CSP to illustrate a real-world scenario of OOBC deployment and management.

HIGH-LEVEL IMPLEMENTATION ARCHITECTURE

The OOBC process is typically implemented with a dedicated management network that is physically and logically separate from the primary network. The architecture is designed to ensure continuous accessibility to network devices, even in the event of failures in the primary network. Below are the key components of OOBC architecture:

1. **Dedicated Management Interface:** Devices like routers and switches feature separate management ports (e.g., console or serial ports) used exclusively for out-of-band management. These interfaces are isolated from the primary network interfaces that handle data traffic. Thus By separating the

configuration management channel from the primary data network, OOBC reduces the possibility of network issues during configuration changes, ensuring the availability of critical network services.

2. **Out-of-Band Network:** A dedicated, secure management network connects all the out-of-band interfaces across devices. This network is typically kept separate from the main operational network, either through physical separation or logically via VLANs.
3. **Management Tools:** IBM Tivoli ITNCM (IBM Tivoli Integrated Network Configuration Manager) is an advanced tool used for managing device configurations in large-scale networks. Tivoli ITNCM automates network configuration tasks, tracks configuration changes, and integrates with out-of-band networks to perform secure, remote configuration management
4. **Access Protocols and Terminal Servers:** Administrators access devices through secure protocols such as SSH, often via terminal servers, which provide centralized access to console ports on multiple devices over the OOBC network. The terminal servers aggregate console access, enabling remote management over a secure network.
5. **Disaster Recovery and Fail-Safe Mechanisms:** With OOBC process in place, network administrators can leverage ITNCM to revert changes to a previously stored version of the device configuration, restore device configurations to a point in time based on the backup schedule, or troubleshoot issues, even if the primary data network is compromised or unavailable.

USE CASE- A COMMUNICATION SERVICE PROVIDER

In this use case, a Communication Service Provider (CSP) manages a vast, geographically dispersed network of routers, switches, and firewalls. The CSP uses IBM Tivoli ITNCM to configure and automate the management of these network devices. The CSP's primary network spans multiple cities and provides critical telecommunications services to millions of customers. Any disruption in this network could lead to significant service outages and customer dissatisfaction.

To ensure continuous network management, the CSP implements OOBC using the following components:

- **IBM Tivoli ITNCM:** The CSP deploys IBM Tivoli ITNCM to manage device configurations across thousands of network devices. Tivoli ITNCM automates configuration tasks, tracks configuration changes, and integrates with the CSP's OOBC network by forwarding any configuration changes to syslog servers to be processed by OOBC job running on the server [5].
- **Out-of-Band Network:** The CSP maintains a dedicated OOBC network, separate from the operational data network, to ensure continuous access to devices for configuration management. This out-of-band network uses backup connections to provide reliable access even in the event of primary network outages.
- **Syslog Server:** The CSP uses Syslog servers to log configuration changes. The syslog servers runs OOBC process and allow IBM Tivoli ITNCM to communicate with devices over the out-of-band network for configuration updates, rollback, and troubleshooting.

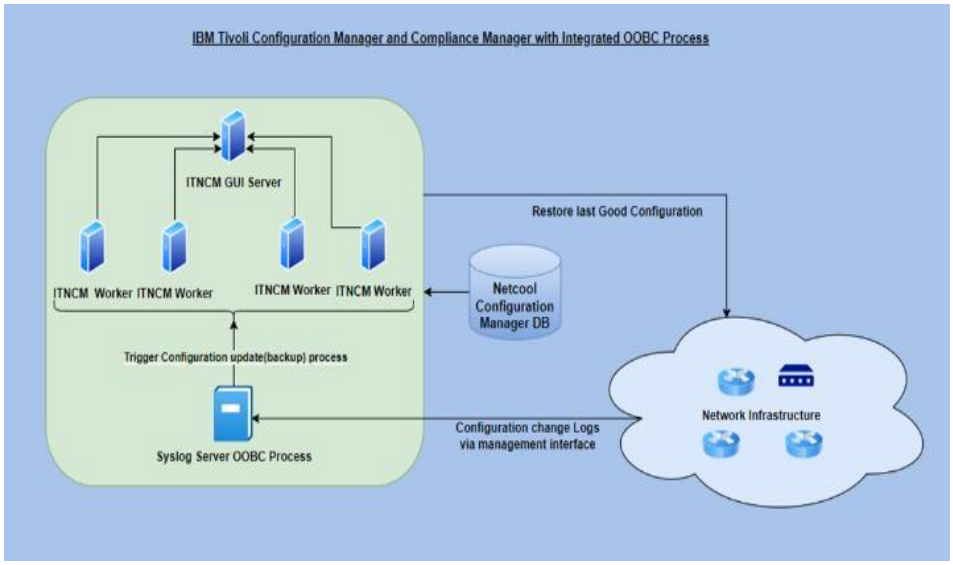

***Figure-1** below shows the high level ITNCM implementation with OOBC process*

Figure 1

During a network upgrade, an erroneous configuration change can cause routing issues in multiple core routers, making the primary network inaccessible. Using the IBM Tivoli ITNCM integrated with the OOBC process, The network administrators access the routers through the management interface. By leveraging ITNCM's automation capabilities, they would be able to quickly identify and roll back the bad configuration, restoring network operations within minutes. Without OOBC and Management Interface, this process would have required physical access to the affected routers, significantly increasing downtime.

This use case highlights the importance of OOBC in large-scale network operations, particularly for CSPs where downtime can lead to massive service disruptions.

BENEFITS OF OOBC WITH IBM TIVOLI ITNCM

OOBC provides several key advantages, particularly when combined with IBM Tivoli ITNCM for managing complex, large-scale network environments:

1. **Automation and Efficiency:** The automation of OOBC process seamlessly interact with the main module of ITNCM that allows for quick and efficient configuration rollbacks and updates. IBM Tivoli ITNCM automates network configuration management tasks, reducing errors during manual configurations.
2. **Resilience:** By configuring OOBC process along with management interface independently of the primary network ensure continuous access to devices during outages or misconfigurations. This allows the CSP to quickly recover from network disruptions.
3. **Scalability:** With the scalability offered by IBM Tivoli ITNCM, the CSP can manage thousands of devices across geographically dispersed locations. Tivoli's integration with OOBC ensures that devices can be configured and managed remotely, even in remote or difficult-to-reach areas.
4. **Improved Service Reliability and Availability:** By enabling quick rollback of faulty configurations and providing access to devices during outages, integration of OOBC process with Tivoli ITNCM significantly reduces downtime and minimize the risk of service disruptions, thereby improving the overall reliability and availability of its services [4].
5. **Enhanced Security:** The separation of management traffic from operational traffic ensures that critical configuration management is shielded from potential attacks on the primary network. Tivoli ITNCM's security features further enhance protection by automating access control and monitoring configuration changes.

The successful implementation of IBM's Tivoli ITNCM solution for the Out-of-Band Change process at the Communication Service Provider demonstrates the importance of effective change management in the telecommunication industry. By leveraging advanced IT service management tools, Communication Service Providers can enhance the reliability and availability of their services, improve operational efficiency, and maintain a competitive edge in the rapidly evolving market. [2] [3]

CONCLUSION

Out-of-Band Configuration (OOBC) is an essential strategy for ensuring continuous network management and reducing downtime, particularly in large-scale operations like those of Communication Service Providers. The integration of IBM Tivoli ITNCM with OOBC allows for automated, efficient, and secure management of network devices, providing resilience in the face of network failures. This paper demonstrates the importance of OOBC in minimizing downtime, enhancing security, and increasing the overall operational efficiency of networks. As network infrastructures continue to grow in complexity, the use of OOBC with advanced tools like IBM Tivoli ITNCM will become increasingly critical in ensuring high availability and efficient network management.

REFERENCES

[1]. Lee, S., Wong, T M., & Kim, H. (2008, January 1). To Automate or Not to Automate: On the Complexity of Network Configuration. https://doi.org/10.1109/icc.2008.1072.

[2]. Williams, M D., & Williams, J. (2007, January 2). A change management approach to evaluating ICT investment initiatives. Emerald Publishing Limited, 20(1), 32-50. https://doi.org/10.1108/17410390710717129

[3]. Pandian, K., & Chinnathurai. (2016, January 1). Sustaining quality of services through service reliability and availability. https://doi.org/10.1109/astr.2016.7762294

[4]. Olynyk, R. (1989, January 1). Managing change in a wide-area network. https://doi.org/10.1145/73760.73777
[5]. Tivoli Netcool Configuration Manager https://www.ibm.com/docs/en/netcoolconfigmanager/6.4.2.0