A PROCESS CONTROL NETWORK ANALYSIS FOR INDUSTRY

Plan and Design Networks (ITEC5100W:SYSC5407W)

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Introduction

Programmable Logic Controllers (PLC), and Programmable Automation Controllers (PAC) allowed operators to monitor and control mechanical devices or even personal performance remotely using point-to-point communication.

This project will focus on a TCP based Process Control Network at a large industrial processing facility.

Transmission Control Protocol (TCP) emerged with the introduction of Ethernet to industrial sites and has become widely popular throughout the industry as it continues the simple, robust application layer protocol.

Project Scope

The scope of this project consists of three parts:

- Developing Architecture solutions for an industrial network to improve reliability through redundancy and the addition of monitoring and configuration tools to reduce downtime associated with communication issues reported by delay accounting software.
- We are developing a theoretical framework for new switch configurations to allow for access to the device layer for a monitoring system for breakdown maintenance purposes.
- The Development of an Industrial network simulator that is capable of producing an industrial network model.

What is a network analysis?

A graphical presentation or an arrow diagram presented to the management in respect of a project which consists of all details regarding consumption of time and cost not only for each activity but also for the whole project so that management can manipulate the resources and cost can be controlled in a more effective manner.

Steps Involved In Process Of Network Analysis

- Identify the jobs, events or activities.
- Arrange the jobs in logical sequence.

Objectives of Network Analysis

Network Analysis is a successful technique frequently used to plan, monitor and control the projects involving thousands of activities.

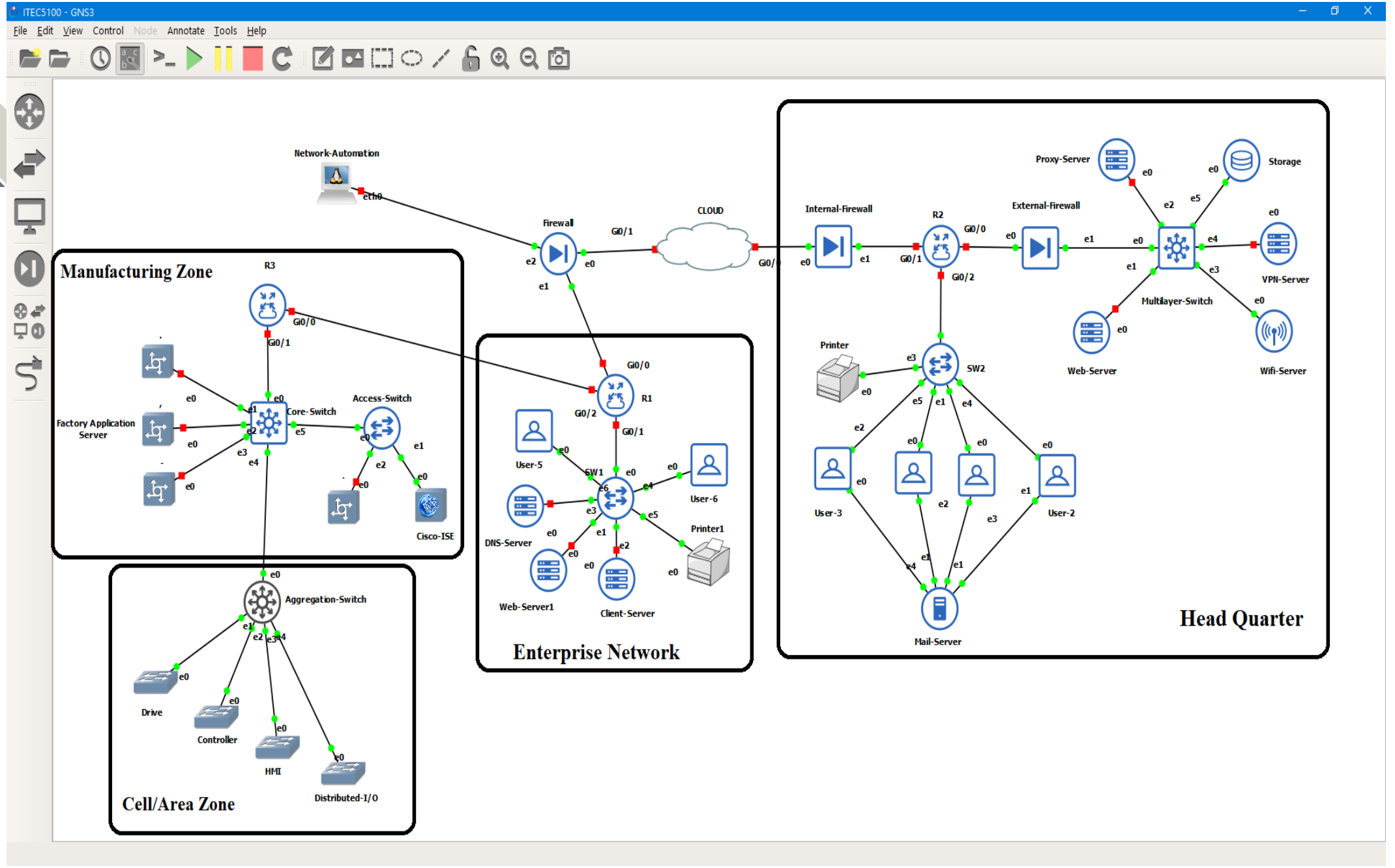
1. To minimize project cost.

2. To minimize the project time.

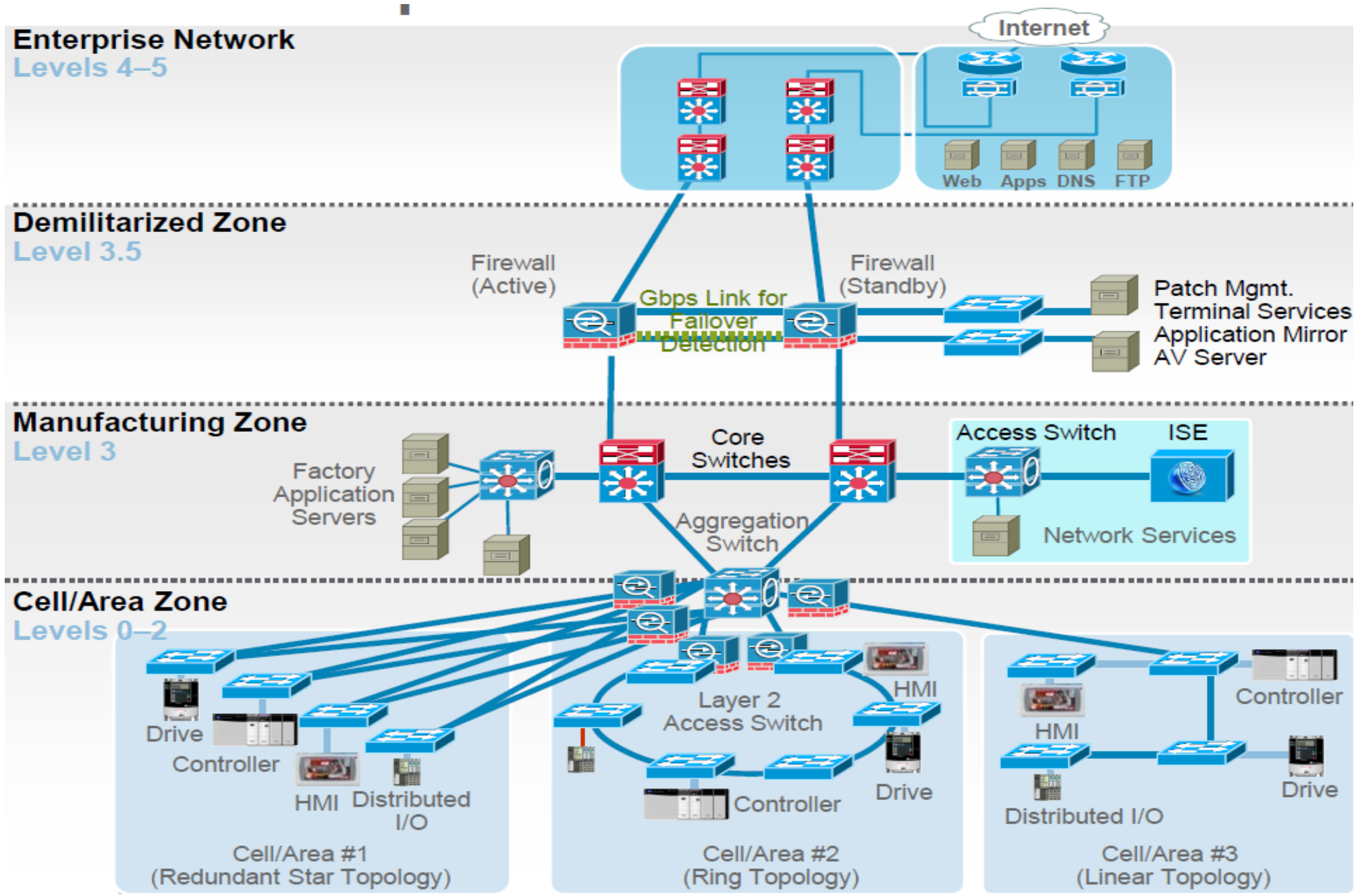
3. To ensure minimum conflicts and unnecessary delays.

4. To ensure optimum utilization of human and other resources.

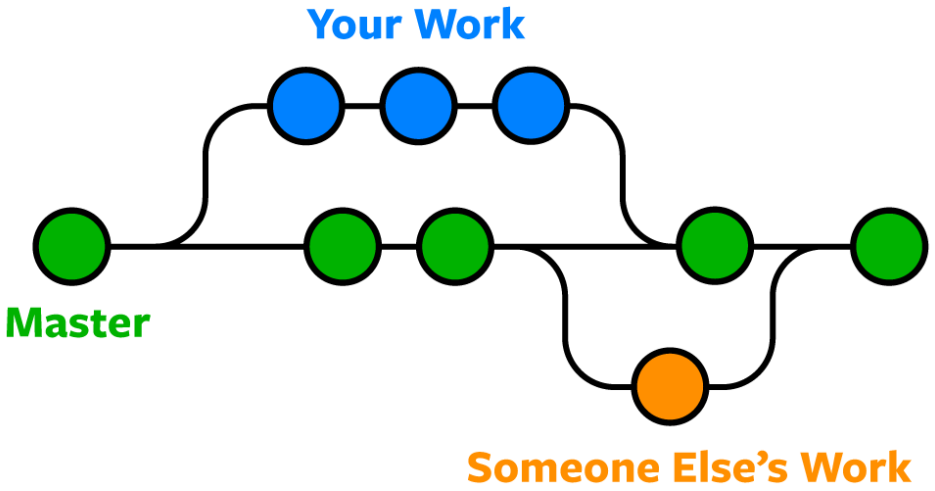
Network topology


ITEC5100 - GNS3
File Edit View Control Node Annotate Tools Help
Network-Automation
eth0
Firewall
Gi0/1
CLOUD
Internal-Firewall
R2
External-Firewall
Proxy-Server
Storage
VPN-Server
Multilayer-Switch
Web-Server
Wifi-Server
Printer
SW2
User-3
User-2
Mail-Server
Head Quarter
Manufacturing Zone
R3
Core-Switch
Access-Switch
Factory Application Server
Cisco-ISE
Aggregation-Switch
Drive
Controller
HMI
Distributed-I/O
Cell/Area Zone
R1
SW1
User-5
User-6
DNS-Server
Printer1
Web-Server1
Client-Server
Enterprise Network

Simplified structure of the Process Control Network (PCN).


Enterprise Network
Levels 4–5
Internet
Web
Apps
DNS
FTP
Demilitarized Zone
Level 3.5
Firewall
(Active)
Gbps Link for
Failover
Detection
Firewall
(Standby)
Patch Mgmt.
Terminal Services
Application Mirror
AV Server
Manufacturing Zone
Level 3
Factory
Application
Servers
Core
Switches
Aggregation
Switch
Access Switch
ISE
Network Services
Cell/Area Zone
Levels 0–2
Drive
Controller
HMI
Distributed
I/O
Cell/Area #1
(Redundant Star Topology)
Layer 2
Access Switch
HMI
Controller
Drive
Cell/Area #2
(Ring Topology)
Controller
HMI
Drive
Distributed I/O
Cell/Area #3
(Linear Topology)

Version Control System - Github



Why Git?

Git keep these revisions straight, storing the modifications in a central repository. This allows developers to easily collaborate, as they can download a new version of the software, make changes, and upload the newest revision. Every developer can see these new changes, download them, and contribute.

The link to our repo is given below:

https://github.com/lukemanhakkim/A-PROCESS-CONTROL-NETWORK-ANALYSIS-FOR-INDUSTRY-


In case of fire
1. git commit
2. git push
3. leave building

Analysis Graphs of Network Performance.

Network Performance Metrics

Network performance refers to the quality of service of the network from the customer's point of view. There are many different ways to measure the performance of a network because each network is different in nature and design.

The following measures are often considered important:

- Bandwidth
- Throughput
- Latency
- Jitter
- Error Rate

Network Monitoring Platforms (NMPs)

They are resource **monitoring** systems and monitor **network** service availability

The following measures are often considered important:

- SolarWinds Network Performance Monitor
- Atera
- Paessler PRTG Network Monitor
- Zabbix

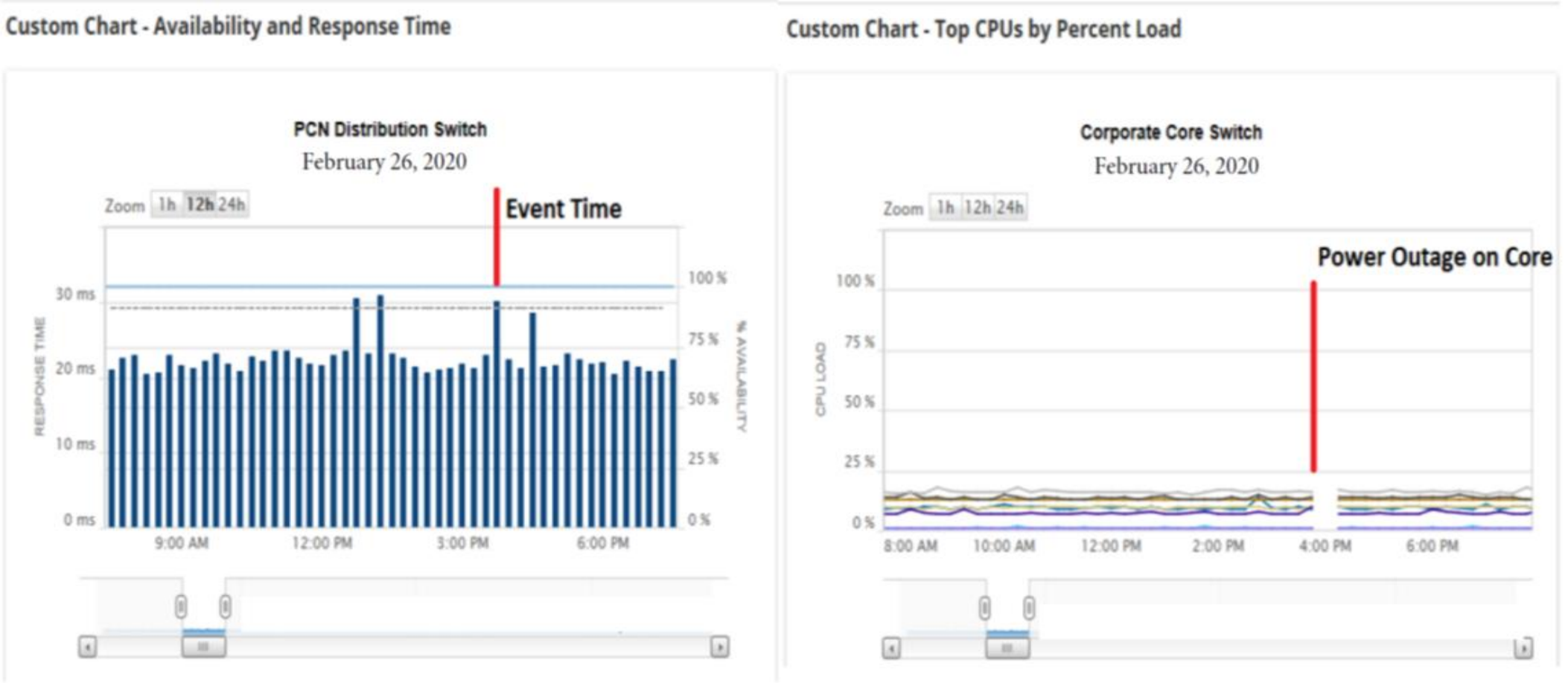


Figure. Analysis of Monitoring Data.

(Solarwinds Tool)

Future Scope

What's the answer to managing today's networks?

Automation

Humans and manual processes can no longer keep pace with network innovation, evolution, complexity, and change.

The Future would be "self-driving networks," "self-healing networks," "intent-based networking," which uses efficient algorithms (artificial intelligence (AI), machine learning (ML)), and provides support to support modern network operations.

Thank you.