

Operations Aspects of Reliability: Measurements and Network Management

- Applying Legacy Principles to New & Emerging Technology

AT&T Global Technology Operations Center —
Emergency Management, Preparedness, & Response

IEEE Emerging Technology Reliability Roundtable

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Outline

Applying legacy principles to new and emerging technology

- Legacy TDM networks and network management principles
 - Focus of discussion on performance management
- Comparing legacy network and emerging technologies
 - What comparisons can be drawn?
- Network management measurements and interfaces
 - Like capabilities and leveraging on a new path
- Responsibility and measuring for end-to-end performance?
 - Whose problem is it?
- Toward the future



Applying legacy principles to new and emerging technology

Legacy TDM networks and network management principles

Bellcore standards for network management data collection have existed for decades.

The Network Management discipline, as it is engrained in AT&T's network management community, has been used across worldwide TDM switching networks for decades. The principles have preserved networks through countless events. The core of AT&T's network management principles are:

- Insure the maximum utilization of equipment and facilities at all times to complete as many messages as possible
- Keep all trunks filled with messages
- Utilize all available trunks
- Give priority to single-link connections when all available trunks are exhausted.
- Inhibit switching congestion

Network management, simply put, is an effort to preserve and restore call completions and maintain the health of the network elements over and above the self-healing capabilities of the networks.



Applying legacy principles to new and emerging technology

Legacy TDM networks and network management principles

Bellcore standards for network management data collection (TR-746 & GR-477 are examples) provide a standard set of element, traffic, or network specific data parameters that contain report statistics and alerting capabilities to identify performance and anomalies. Some capabilities within the standards are:

- 30 discrete data
- 5 minute register data
- Automatic and manual control capabilities

Examples measurements/capabilities used in the PSTN:

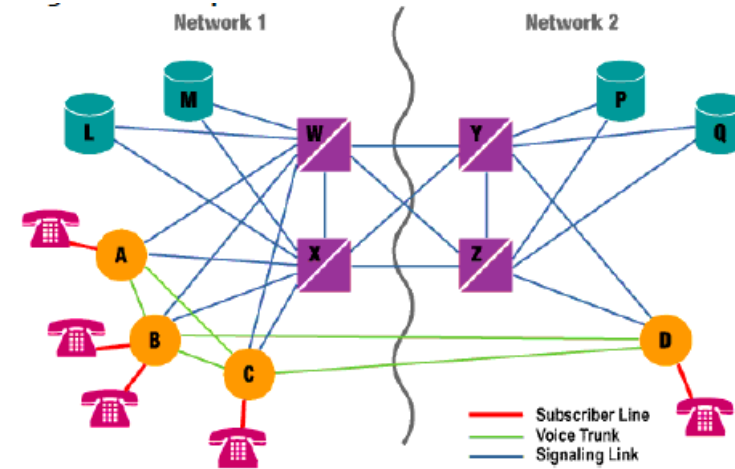
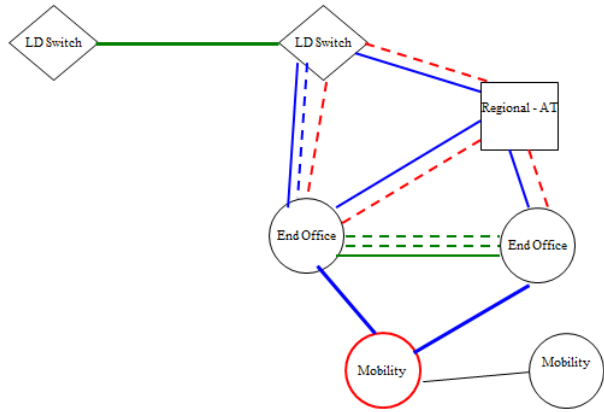
-Peg – Number of call attempts originating over a path
-OfI – Number of call attempts that needed an alternate path
-Pocc – Percent Occupancy of the path
-MC1 & MC2 – Machine Congestion alert & severity
-Oseiz – Outgoing seizures on a path
-Tcb_final – Calls blocked due to lack of Network Resources
-Ncp_cnt – Number of attempts to query Network Control Point for authentication/routing info
-IMA – Ineffective Machine attempts
Final Handling patterning

Expansive & Protective Traffic Controls:

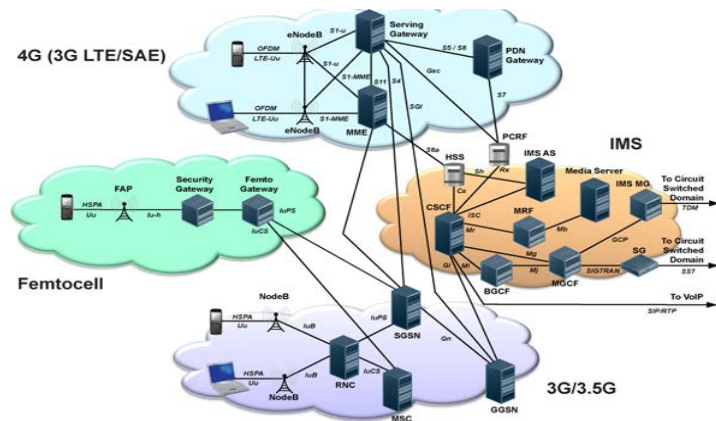
-Cancel To
-Cancel From
-Reroute
-Skip
-Code Gap
-Dynamic Overload control



Comparing legacy network and emerging technologies



Overall end-to-end performance of the network and every element in the communication path is what drives network management. As we view network architecture diagrams for legacy TDM, LTE, and cloud, we can see similarities to the network design and interaction from the A-Z end.



Comparing legacy network and emerging technologies

Legacy PSTN

- A user picks up telephone handset and receives dial tone from the central office
- User dials number to be called
- Initial address message is received by signaling network and validation of routing, permissions, and network path availability begins
- Trunks within the network are reserved for call
- Party at other end or line answers, and conversation is exchanged

Evolved communications model

- A user initiates a “session” (session could be a voice call, SMS/MMS, data transaction, etc.) from a device
- Connection to the network over a “path,” this path is connected to hardware
- User permissions are validated
- Look up completed to verify proper routing to the destination
- Ensures appropriate resources are available
- Gathers user packets
- Transmits/receives information back from/to the user



Applying legacy principles to new and emerging technology

Responsibility and measuring for end-to-end performance

- How do we measure the completion rate of user traffic crossing multiple networks and service providers when individual components are fine?
- If all resources in one geographic area of the network are exhausted but significant capacity exists elsewhere, how do we quickly share the load without overloading the network or components?
- What is the defined set of network parameters and method to collect them that will provide a complete end-to-end view, regardless of the network component provider?

A clearly defined and well coordinated command and control process is critical to managing outage restoration. How could outage be identified quickly to execute the command and control process?



Applying legacy principles to new and emerging technology

Toward the future

- What are the challenges in establishing standards and metrics in a virtual world?
- What are the key aspects of end-to-end performance that identify customer experience and network performance?
- Network management capabilities and principles should be used when evaluating and creating controls and measurements in evolving networks.
- Create scenarios to compare new services/network components to current management measurements, control, and theories.
- Creation of network management controls could remove “brute force” changes in network element.
- Enable the use of a single “tool” for control implementation and end-to-end visibility.



Thank You

