



CAPACITY MANAGEMENT PLAN

AT&T uses its capacity trending capabilities in conjunction with business forecasts. AT&T's Capacity Management organization is functionally organized around geography, with a team of dedicated individuals who manage capacity for the U.S. region, with a different team managing capacity for the MoW regions, using the same principles, tools, and metrics. Capacity managed consists of:

1. Backbone links (both inter-node and intra-node)
2. Customer ports on access routers architecture and connectivity
3. Per CoS capacity management
4. Overall network survivability

This team of technical professionals has their performance award tied to the performance of the network infrastructure and works to find the delicate balance between the conflicting demands of revenue growth, profitability, and managing capital expense for AT&T—to maintain a highly reliable, high-performing network while maintaining sufficient port capacity to be able to add customers wherever there is demand.

AT&T continuously monitors bandwidth utilization levels for individual customer circuits subscribing to AT&T Network services (i.e. AVPN Transport) terminating on network access nodes. Depending on AT&T services subscribed AT&T will notify customer proactively of utilization through a number of methods: AT&T Business Direct Web Portal, regularly scheduled AT&T – DIR Customer meetings (i.e. Weekly AT&T-DIR NSOC Operations meetings). An AT&T proprietary tool assists with collecting performance data and producing capacity management reports. Capacity management implies the long-term monitoring and trending of network measurements with the objective of detecting when and where we should deploy additional capacity. The objective of performance management is to verify that the network components are performing within AT&T's previously stated expectations. The tool analyzes, correlates, and trends network statistics and provides AT&T with performance management and capacity management reports. It compares trended measurements with engineering objectives and notifies AT&T Operations when specified thresholds are crossed, thus allowing AT&T to proactively manage capacity. Capacity management measurements are collected at five minute intervals.

In order to ensure high reliability, capacity management also runs a special AT&T Labs-developed tool daily that does a survivability analysis on the entire network's backbone links. This tool simulates potential facility failures and determines where traffic would be rerouted if a given link failed. This analysis enables the Capacity Management organization to ensure there is sufficient capacity to survive a facility cut anywhere. Thus capacity management is not performed in a simplistic manner but instead the entire network and its traffic flows and volumes are studied and engineered to give good performance even if a backbone link fails.

In addition to the tools referenced above, we use additional tools to monitor utilization of specific components of the network architecture. Our Capacity Management team uses the Capacity



Management Tool (CMT) to perform network capacity analysis and logical design. Our objective is to help make the most efficient selection and use of network facilities, while maintaining service objectives of delay and survivability. The major functions are

- Analyze the network
 - View the network topology
 - Query Switches, trunks, PVCs, routes, fiber spans
 - Display visual map
 - Generate reports on current network metrics
 - PVC distribution (delay, hop count)
 - Trunk utilization
 - Port utilization
 - Node-pair demands
 - Analyze failure survivability
 - Analyze single link failure
 - Analyze single switch failure
 - Analyze single card failure
 - Analyze cable segment and fiber span failure
 - Analyze routing feasibility. The CMT will simulate the PNNI routing of PVCs based on the network topology.
 - Input files from the network are generated several times each day.
 - Perform “what-if” analysis
- Perform network grooming
 - Manage PVC routes. Generate and implement improved routes. When defined paths are available, the CMT will analyze routes and implement route changes in the network via CWM.
 - Prepare and assist in network maintenance activities. This feature will allow reroute of PVCs to minimize the impact of trunk maintenance activities.
 - Analyze dynamic load
- Plan the ordering and deployment of facilities
 - Forecast customer demand

Optimize trunk design to meet capacity demands (determine the minimal number of trunks needed)