



CAPACITY MANAGEMENT PLAN

This document describes the Capacity Management processes and activities for DIR or customer initiated and Verizon-initiated Capacity Requests in support of the CTSA.

IP Backbone

Verizon Businesses Internal Data Traffic Engineering organization is responsible for monitoring, capacity planning and traffic engineering the Private IP backbone. This organization will ensure that diversity, capacity, and network architecture requirements are met to guarantee the Private IP network will perform to the Verizon Business Private IP Service Level Agreement standards. Verizon Businesses Private IP Global Network architecture is built on scalable carrier class routing devices for growth.

Verizon Business has an internal Data Traffic Engineering organization that is responsible for monitoring, capacity planning and traffic engineering the Private IP backbone. This organization will ensure that diversity, capacity, and network architecture requirements are met to guarantee the Private IP network will perform to the Verizon Business Private IP Service Level Agreement standards. Increases in capacity can be driven by not only trended and projected peak utilization growth rates but also network diversity requirements. The Data Traffic Engineering organization utilizes network modeling tools such as WANDL, to ensure restorability based on single card failures, node failures and right-of-way or cable (fiber path) system failures.

Verizon Business designs the Private IP backbone to be able to reroute around trunk failures based on the number of trunks that exist out of any given location and the utilization associated with them. For example, when a trunk fails there must be enough capacity on the remaining link(s) to support all the bandwidth previously supported by the failed trunk. Example: Do not load a trunk more than 40% of its capacity if it is one of two trunks. (The two trunks could have load ratios of 60/40, 70/30, or share traffic in any ratio so that the aggregate of the total traffic does not exceed the node's ability to restore all traffic in the event of a single trunk failure.) The capacity is measured at peak demand.

Verizon Business monitors a host of thresholds including, but not limited to availability, CPU, trunk, and port utilization. A general rule is we try to keep everything below 50%. Daily monitoring is performed on the network to gain actual network traffic and forecast accordingly. For physical trunk utilization we watch them for a month and if the average is consistently above 50%, we will either re-direct traffic, or cap the router, or augment. Based on this information the Traffic Engineering group proactively deploys additional switches/ports/trunks to ensure that customer traffic send across the backbone are delivered within the guidelines set forth in the Service Level Agreement.

Transmission Systems

In general, overbuild capacity is added to the network based on trended rung rates. All backbone overbuilds are built as either a 1+1 or 4F Bi-Directional Line Switched Ring (BLSR) rings that are 50 millisecond restorable in the event of a fiber or electronics outage.

Terminal with low growth rates are built with OC-48 or OC-192 electronics depending upon the growth rate. In addition, terminal spurs are typically built with rings; however, some terminals are considered spurs because there is only one fiber path. Terminal spurs are built as linear systems that provide protection against an electronics failure but not a fiber cut.