



## ***High Availability***

ST™200 Service Edge Router

*Technology Overview*

## Introduction

High availability is critical at the customer-facing edge of carrier networks. Unlike core routers which are designed with alternative paths should a router fail, the edge is a single point of customer-facing connectivity. Any failure at the service provider edge can result in significant service disruption.

Though IP networks have become increasingly reliable, they are still prone to outages. With business critical traffic traversing IP networks, any edge-facing router must be designed to minimize the effect of network outages through device stability, redundancy, distributed hardware design, software modularity and advanced recovering capabilities.

The ECI Telecom Data Networking Division's ST™200 was designed with the hardware and software reliability required in the world's largest service provider networks. Functionality is distributed to multiple line cards and Network Processor Blades (NPBs), eliminating a single point of failure. All common equipment is redundant and hot-swappable for hitless software upgrades and maximum uptime and reliability.

High availability begins with carrier-class hardware. The NEBS-compliant ST200 includes distributed, redundant components, a requirement at the customer-facing service provider edge.

**Redundant Route Control Processor:** the redundant Route Control Processors (RCPs) are the main controller for the ST200, housing the system management software and the full suite of routing protocols supported by the ST200. One RCP is designated as active, while the other is the standby RCP. In the event of an RCP failure, the secondary RCP immediately takes over, without requiring system reboot or reload of line cards.

**Distributed Line Cards and Network Processor Blades:** Functionality is distributed to multiple line cards and NPBs, eliminating a single point of failure.

**Redundant and Hot-Swappable Common Equipment:** All common equipment is redundant and hot swappable for hitless software upgrades and maximum uptime and reliability.

- Route Control Processor (RCP)
- Timing Control Module (TCM)
- System I/O (SIO)
- Optical Switching Fabric (OXF)
- Packet Switching Fabric (PXF)
- Cooling and Power Systems

## Graceful Restart

The ST200 supports the graceful restart protocol as defined by the IETF. Graceful restart alerts peering routers that the restarting router will continue to forward packets, despite going down temporarily. ST200 support of graceful restart of routing protocols (BGP, OSPF, IS-IS and LDP) enhances its ability to maintain uninterrupted packet forwarding when network stress forces a routing protocol restart. Routers without graceful restart will allow peers to detect if a session goes down and has to be restarted. The result is route re-computing and network-wide routing updates (also known as router flapping) which could result in packet loss.

## Stateful Failover

Stateful failover maintains Layer 2 sessions to minimize network disruption in the event of an RCP failure. ST200 Layer 2 protocols supported include: PPP, HDLC, Ethernet with 802.1q VLAN, Frame Relay, ATM (SAR at OC48c), X.86 Ethernet over Sonet, MPLS over Ethernet and PPP. Stateful failover is critical at the edge, where large numbers of individual sessions are affected in the event of an RCP failure.

## Fast Re-route

ST200 Fast Re-route technology enables diversion of traffic around points of failure along an MPLS path in tens of milliseconds. This is particularly critical due to the singularity of devices at the customer-facing edge and the increasing shift of business-critical traffic to MPLS-based networks.

## Non-stop Forwarding

In the event of a protocol crash or network instability affecting the control plane, ST200 non-stop forwarding continues to forward packets. ST200 forwarding is distributed across multiple NPBs that perform all packet processing, Layer 2/3 forwarding, IP filtering, accounting and link management for the system, while the Route Control Processor is dedicated exclusively to routing. As a result, the network remains available in the event of control plane issues.

## Software Scalability and Modularity

Designed in-house specifically to ensure the stability and scalability required for service provider edge networks, ECI's ShadeTree™ system software, which the ST200 operates, includes multiple, independent processes to maximize efficiency and scalability, protect against system corruption and eliminate a single point of failure. This is critical to ensure stable and reliable operation under extreme network conditions.

Fault isolation and memory protection occurs between each software process and the system kernel to protect the kernel (which links all system processes) and other processes from corruption in the event of a single process failure. This modular design ensures no one process can consume all CPU resources, while preventing a single process failure from initiating a chain of events that could dramatically impact system performance. Modular components include:

- Route Control Process (RCP): controls routing protocols and MPLS label allocation, maintains routing information, performs routing policy, manages processes on ST200 hardware and sends operational information to the CLI (Command Line Interface) and ShadeTree Management Suite element manager.
- Configuration Process: manages the configuration database and performs configuration operations. It responds to and propagates configuration change requests to the rest of the system.
- SNMP Process: controls and manages all SNMP requests for ST200 operation monitoring via SNMP read access.
- Command Line Interface (CLI): primary interface used to access, configure and monitor the ST200 via a console or remotely via telnet or secure shell. The CLI operates in operational and configuration mode.
- Process Manager: monitors and verifies the state of all system processes. It automatically restarts processes if issues are discovered, and also is responsible for initially starting system processes.

## Conclusion

High availability is a critical requirement in any service provider edge device. ST200 high availability includes a distributed design and redundant, hot-swappable components to minimize the impact of individual component failure, as well as modular, in-house developed software. To assure maximum service provider uptime, ECI Telecom's ST200 advanced high availability features include graceful restart, stateful failover, fast reroute and non-stop forwarding.

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