Complete APS Solution for Linear 1+1, 1:n and UPSR

Automatic Protection Switching (APS) is a feature for SONET equipment that is used to improve the availability and reliability of transport systems by switching to a standby facility when failures occur. The Mindspeed APS Controller complies with the GR-253-CORE standards identified for two varieties of linear switching (1+1 and 1:n) as well as a ring switching topology known as SONET GR1400 Unidirectional Path Switched Rings (UPSR). This single package offers a portable solution to make implementation of Linear 1+1, 1:n and (UPSR) architectures simple and quick. The APS Controller can also be distributed to support card level protection.

APS Controller

The APS Controller is operating system (OS)- and hardware independent software with well-defined interfaces that allow easy integration with system software. The APS Controller consists of an application interface for users’ applications and network management, a SONET driver interface for interacting with a SONET device, and a bridging_switching interface for switching over the standby line. The APS software works with Mindspeed’s TAP driver software to provide a complete PHY solution.

APS State Machine

At the heart of the APS Controller is a state machine that handles the signaling and the state transitions based on incoming APS messages. The APS message for Linear configurations consists of the combination of K1 and K2 bytes of the SONET overhead frame. The K1 and K2 are used to coordinate bridging and switching action with the far end.

For UPSR architectures, path layer indications are detected locally by the APS controller and used to switch to the ring that exhibits the best performance.

Network Management and Configuration

The APS Controller’s application interface lets users employ existing network management software with the Controller to provide protection switching messages and statistic retrieval. The APS is highly configurable through the application programming interface (API).
Portability
The Mindspeed APS software has been designed to be portable across operating systems and hardware platforms. An OS abstraction layer is incorporated to ease integration of the APS Controller to a target hardware and operating system. The APS software is a modular design using service layers. The APS software operates above the TAP device driver software, and utilizes the services of the TAP driver to control the PHY according to the APS requirements.

SONET Driver Interface
A general-purpose SONET driver interface (SDI) allows the APS Controller to communicate with the TAP device driver and the underlying PHY device. This interface can integrate seamlessly with the required Mindspeed TAP device driver to support the CX28250 ATM OC-3 PHY, CX29704 Quad STS-3/STM-1 ATM/POS PHY, and the M29730 Quad OC-48/Single OC-192 Packet Over SONET Framer.

Bridging and Switching Interface
The APS Controller has a bridging and switching interface to perform these operations. The underlying device can be either a SONET device or a bridging and switching device.

Application Interface
The APS Controller features a well-defined application programming interface (API). The API allows the APS Controller to be implemented as a module that can be accessed directly by other components. It allows easy integration with higher-level application software to shorten the development cycle.

Ordering Part Numbers
CX28299 APS Controller
CX28250 TAP Device Driver
CX29704 TAP Device Driver
M29730 TAP Device Driver

Figure 1 APS Design
**Figure 2 APS Structure**

**Figure 3 1+1 Architecture**

**Figure 4 1:n Architecture**
Basic UPSR Operation

Product Features

- APS Architectures Supported
  - Linear 1+1
  - Linear 1:n
  - UPSR
- Distributed Processing
- Telcordia GR–253–CORE
- G.783 Annex A Compliant
- Flexible system design
  - SONET driver interface
  - Bridging and switching interface
  - Application interface
- Network management and configuration
  - Manually initiated APS switch requests
  - Statistic retrieval
  - Configure APS Controller
- Integrate seamlessly with required TAP Device Drivers
  - CX28250TAP
  - CX29704TAP
  - CX29730TAP
- Portability
  - ANSI–C source code
  - Extensible to other embedded kernel
  - VxWorks sample port
  - QNX
  - Solaris

Figure 5 Basic UPSR Architecture