Volta is a 10-port, 10Gb/s, multi-protocol mapper device that enables optimized transport of Gigabit Ethernet (GbE), DVB-ASI, and Storage Area Network (SAN) client data signals over SONET/SDH networks using Virtual Concatenation (VC). Its flexible architecture and built-in wide-range Clock and Data Recovery units support any protocol at any time on any client data port, allowing the implementation of mixed-protocol line cards. Combined with SONET/SDH VC, transparent GFP mapping allows transporting any client protocol over the WAN in right-sized tributaries while preserving the native 8B/10B coding information as required for point-to-point wire services. For GbE client ports, the device additionally supports a fractional frame-based mapping mode into SONET/SDH virtual containers of any size, using HDLC, X.86 (EoS), or GFP encapsulation.

Volta’s flexible, backplane interfaces support direct connection to two 4x2.488Gb/s backplanes as usually required in Multi-Service SONET/SDH switches. For Metro DWDM systems, Volta can alternatively be connected directly to optics or external FEC devices in either STS-192/STM-64 or 4xSTS-48/STM16 mode, offering a cost-effective, single-chip solution for data transport over SONET/SDH.

**Client Interfaces**

- Provides 10 client ports, provisionable on a per-port basis for Gigabit Ethernet (GbE), 1x or 2x Fibre Channel (FC), FICON, ESCON, or Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI) operation.
- Each serial interface includes an independent, built-in Clock and Data Recovery unit that operates between 200 Mbps and 2.125 Gbps to allow direct connection of optics modules to Volta.
- Includes a Physical Coding Sub-layer (PCS) and performs 8B/10B Performance Monitoring for all supported protocols.

**Transparent GFP mapping**

- Performs transparent GFP processing for all client protocols using 64B/65B encoding on a per-port basis.
- GFP-encapsulated data is mapped in right sized SONET/SDH using virtual, contiguous or arbitrary concatenation.
- Supports insertion/extraction of GFP Client Management frames from/to the microprocessor interface for management purposes.

**Frame-based GbE Operation**

- Supports both full-rate and fractional-rate frame-based GbE mapping into SONET/SDH tributaries.
- Each port integrates a full IEEE 802.3z Ethernet MAC and supports extensive RMON statistics.
- 48Kbytes ingress FIFOs on each port allowing loss-less flow-control between Volta and remote switches using IEEE 802.3x for distances up to 10km.
- Performs mapping of Ethernet frames in up to 10-payload tributaries using POS/HDLC (IETF RFC2615), ITU-T X.86 (Ethernet over SDH using LAP-S) or GFP framing. These tributaries can range in size from STS-48c/AU-4-16c down to STS-1/VC-3.
- Optionally supports PPP/BCP (Bridging Control Protocol) encapsulation.
- Supports four bit-maskable and four field-maskable ingress filters per GbE port.
- Supports Ethernet frame capture/insertion to and from the microprocessor interface.

**Figure 1: Block Diagram**
SONET/SDH and General Features

- Provides up to 10 SONET/SDH channels (one per client data port) individually provisionable for arbitrary, contiguous or virtual concatenation.
- Supports virtual-concatenation of STS-3c-Xv/VC-4-Xv as well as STS-1-Xv/VC-3-Xv tributaries, compliant with updated ANSI T1.105, ITU G.707, and G.783.
- Provides up to 15ms of inter-tributary de-skew for Virtual Concatenation groups using external DDR SDRAM or up to 90 Bytes using internal RAM.
- Supports Link Capacity Adjustment Scheme (LCAS) functionality of Virtual Concatenation per ITU-T G.7042.
- Supports the following contiguous and arbitrary concatenation modes: STS-48c/AU-4-16c, STS-24c/AU-4-8c, STS-12c/AU-4-4c, STS-9c/AU-4-3c, STS-6c/AU-4-2c, STS-3c/AU-4, or STS-1/AU-3.
- Supports transparent GFP mapping or frame-based Gigabit Ethernet mapping on a per-tributary basis.
- Provides two 4x2.488GHz TDM fabric to Framer Interfaces (TFI) using SONET STS-48 /SDH STM-16 framing for backplane connectivity to external redundant synchronous cross-connects.
- TFI interfaces can optionally operate in quarter rate mode for single OC-48/2.5G applications requiring 4x622MHz backplane with STS-12/STM-4 framing.
- Provides two SONET/SDH-compliant modes of operation for line-facing configurations: single STS-192/STM-64 or quad STS-48/STM-16.

- Terminates/generates SONET/SDH section, line, and, optionally, path overhead. SONET/SDH processing of TOH/POH bytes is compliant with Bellcore GR-253 and ANSI T1.105, and ITU G.707, G.751, G.783, G.804.
- Support 1:1 and 1+1 Linear Automatic Protection Switching in OC-192 line interface mode.
- 0.13µ CMOS, 1.2V/2.5V technology.

AMCC Companion Devices

- S19203 HUSDON - Digital Wrapper / FEC
- S19208 NIAGARA G.709 Digital Wrapper / FEC
- S19211 - OC-192 Transceiver with clock and data recovery unit for VSR applications - SFI-4 interface
- S2509 - Quad 2.488 Gbps SONET/SDH Serdes

Applications

Combined with other AMCC products, Volta can be used in multiple applications in edge, access, and metropolitan networks to map and transport Gigabit Ethernet and SAN protocols, such as Fibre Channel and ESCON over SONET/SDH networks.

The primary applications include:

- Multi-Service Provisioning Platforms and Metro Access platforms built around a SONET/SDH STS/VC cross-connect.
- Metro DWDM systems, where Volta can be used in transponder cards or tributary cards.

Figure 2: Volta in Multi-Service SONET/SDH platform or Add-Drop Multiplexer application