Mustang ME 200 System on Chip (SoC)

- **IEEE 802.1d Bridge**
- **EPON MAC and Encryption Engine**
- **PON (passive optical network) SerDes and CDR (clock and data recovery)**
- **Two GMII (Gigabit media independent interface) UNIs (user network interface)**
- **MIPS 4Kc® CPU core**

the edge in broadband™

The Mustang™ 200 SoC addresses the complex set of needs expressed by service providers deploying customer premises equipment (CPE) in Ethernet Passive Optical Networks. In association with either Centillium's OLT partner chip, Colt™ or interoperable solutions from other vendors, Mustang supports all the protocol requirements and relevant standards to ensure error free, bandwith efficient data transmissions over EPON networks.

High Level Hardware and Software Integration

The Mustang 200 ASSP is a fully integrated, cost effective, mixed-signal protocol processing solution for an EPON (Ethernet passive optical network) termination at the customer premises. The Mustang 200 integrates the following components into a complete single-chip solution for EPON ONU applications:

- IEEE 802.1d bridge
- PON (passive optical network) SerDes and CDR (clock and data recovery)
- Two GMII (Gigabit media independent interface) UNIs (user network interface)
- 192-Kbytes program SRAM (static RAM)
- 320-Kbytes packet SRAM
- MIPS 4Kc® CPU core

The Mustang 200 is shipped with a full featured software package which may be used without modification to integrate and build a complete ONU. This approach relieves a systems vendor from major software development, saving development cost and shortening time to market. A broad set of APIs (also provided with the chip) may also be utilized if the systems vendor wishes to individualize the ONU and build in incremental value. Modifications and updates to this code may be realized via the built in remote software download capability.

Standards and Quality of Service

The Mustang 200 fully implements the point-to-multi-point protocol specified in IEEE 802.3ah. Its bridge is compliant with IEEE 802.1d, and its VLAN processing with IEEE 802.1q. The Mustang 200 supports seven separate modes of removal, addition, and overwriting of VLAN and stacked VLAN (VMAN) tags.

The Mustang 200 supports up to eight priority queues upstream and downstream for each logical link. Frames can be prioritized by their VLAN tag or by the TOS or COS field in their IP header. The Mustang 200 maintains a filter table for up to 256 multicast groups, thus supporting a very broad range of service offerings including multiple broadcast and video-on-demand channels, high quality audio channels and premium interactive data offerings.

The Mustang 200 supports DBA (dynamic bandwidth allocation) using proprietary extensions to standard OAM message formats. Centillium™ provides a highly efficient, proprietary DBA algorithm with the Mustang 200, which can also be programmed to operate with a user-provided DBA algorithm.

Encryption, Authentication and OAM

Traffic is encrypted and decrypted at the full 1.25 Gbps wire speed using one of two AES-128 encryption approaches. The TLS (transit layer security) key exchange handshake protocol is fully supported. Encryption key exchange occurs with no loss of frame.

The Mustang 200 supports standard registration as well as two proprietary registration schemes.

The Mustang 200 also supports multiple authentication schemes including:

- IEEE 802.1X
- MAC address
- User ID- and password-based authentication

The Mustang 200 supports remote entry of user IDs and passwords easing on-site turn up of CPE by craft personnel.

An EEPROM interface is provided to store the parameters needed during registration and authentication.

The Mustang 200 operates in passive mode for OAM (operations, administration, and maintenance) in full compliance with IEEE 802.3ah clause 57. The Mustang 200 has mechanisms to send standard alarms to the OLT including fault indication and dying gasp. Remote configuration and monitoring of the ONU from the OLT is also fully supported.

The Mustang 200 also supports user-defined extensions to standard OAM.

CENTILLIUM COMMUNICATIONS

Mustang ME 200 System on Chip (SoC)

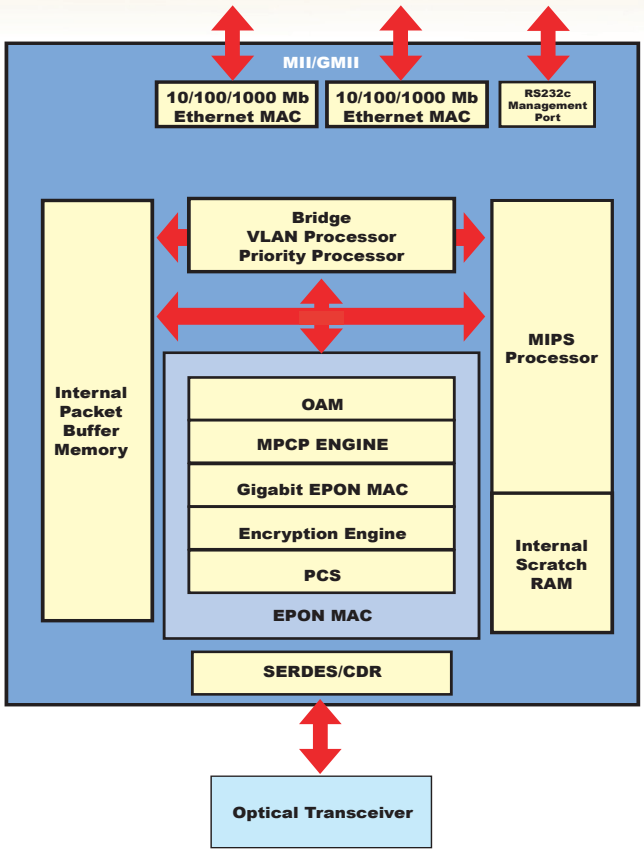
Features
- Single-chip, mixed-signal solution for ONU
- Components integrated:
  - —EPON protocol processor
  - —CDR and SerDes on PON interface
  - —320 Kbytes packet SDRAM
  - —192 Kbytes program SRAM
  - —MIPS CPU core with 16 Kbytes D-cache and 8 Kbytes I-cache
- Full compliance with the IEEE 802.3ah specification
- Supports loop timing

UNI ports
- Two 10/100/1000 Base-T GMII/MII interfaces
- Full-duplex and auto-negotiation modes

Bridge
- IEEE 802.1d compliant bridge connecting PON Interface to the UNI ports
- Fully configurable IEEE 802.1q VLAN and VMAN support including tag addition, removal, forwarding, overwriting, and learning
- Support of up to eight upstream and eight downstream priority queues for each logical link based on VLAN and VMAN tag or IP TOS or COS
- Support for 64 MAC addresses (static and dynamic) at the UNI with learning and filtering
- IPv4 and IPv6 support
- PPPoE (point-to-point protocol over Ethernet) support
- Configurable broadcast and multicast frame filtering, with filtering of up to 256 multicast groups
- Port-based flow control as specified in IEEE 802.3x including PAUSE messages with configurable buffer threshold; all separately enabled, disabled, and configured for each queue
- Programmable tailguard

Internal System Block Diagram

Illustrating the relationship between the significant internal blocks of the Mustang 200 and the major external interfaces:



EPON Protocol
- Full compliance to IEEE 802.3ah, including clauses 64 and 65
- Supports one LLID per ONU
- Supports SCB (single-copy broadcast)
- Complete processing and generation of EFM (Ethernet in the first mile) specific messages (MPCP messages)
- Standard as well as proprietary (explicit LLID and serial number based) registration and de-registration

Encryption and Decryption
- Configurable support for two distinct methods of upstream and downstream encryption and decryption based on AES-128 FIPS PUB 197
- Wire-speed (1.25 Gbps)
- Separate encryption key per logical link
- Encryption key handshake
- Key change on the fly with no loss of frame

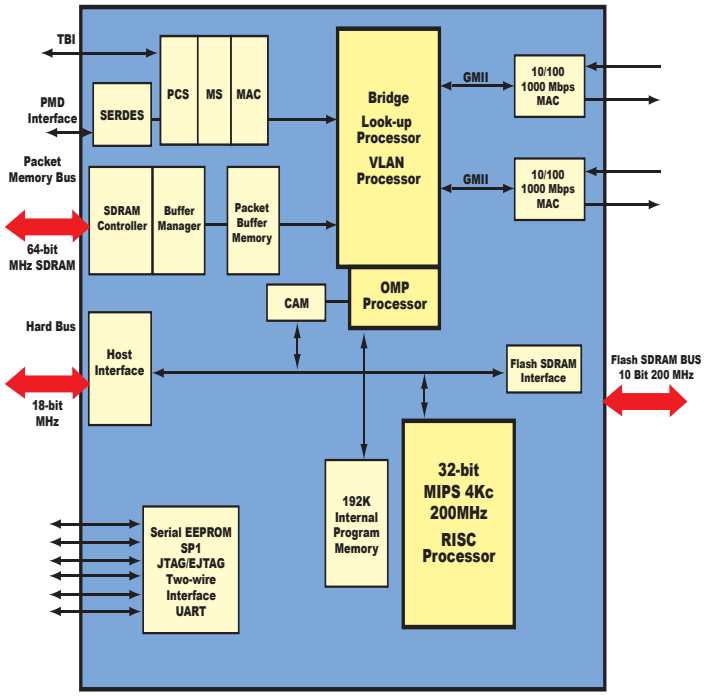
Authentication
- Supports multiple authentication schemes including
  - —IEEE 802.1X with remote input,
  - —MAC address
  - —Password-based authentication

PMD
- Integrated SerDes and CDR for PON interface
- Supports required interface to burst mode transmitter
- Multi-vendor PON transceiver interoperability

Management
- Full compliance to IEEE 802.3ah clause 57
  - —Supports IEEE 802.3 and 802.3ah annex 30A management elements and proprietary elements using organization-specific OAM messages
- GPIO (general-purpose input/output) and LED
- Two-wire and SPI (serial peripheral interface)
- JTAG

Functional Block Diagram

The functional block diagram illustrates the basic internal interconnects within the Mustang 200, and defines the interfaces available.



Part Ordering Information

Product	Function	Part Number	Package
Mustang	EPON ONU	CT-TPSMN1	456-BGA

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