

Unified Fiber Access Application

Data Plane Software for the AX Family of Programmable Ethernet Switches

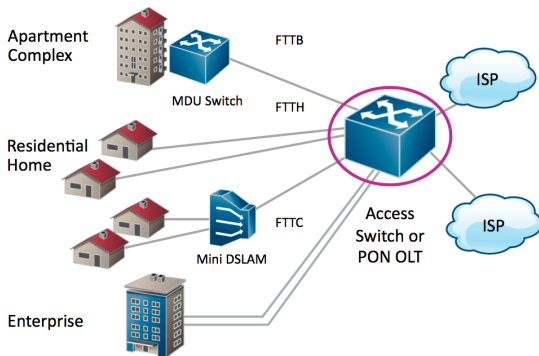
Overview

Xelerated's Unified Fiber Access Application (UFA) is a complete data plane software for forwarding and OAM functions of feature-rich Ethernet access systems. It is designed for the AX Programmable Ethernet Switches targeting point-to-point Ethernet access nodes, PON OLTs and access aggregation switches. The software enables unified fiber access data planes for pizza boxes and chassis-based systems using the same design for both business and residential services.

The UFA is designed to support a wide range of fiber deployment scenarios where the access system simultaneously serves:

- Directly attached residential users
- Directly attached enterprise users
- Residential users via MDU switch

Sophisticated classification features allow fine-grained flows of traffic to be classified to service instances with individual traffic conditioning, forwarding policies and QoS shaping. The software includes flexible demarcation services supporting single ISP or Open Access models of operation, where the Access Provider connects to multiple ISPs.

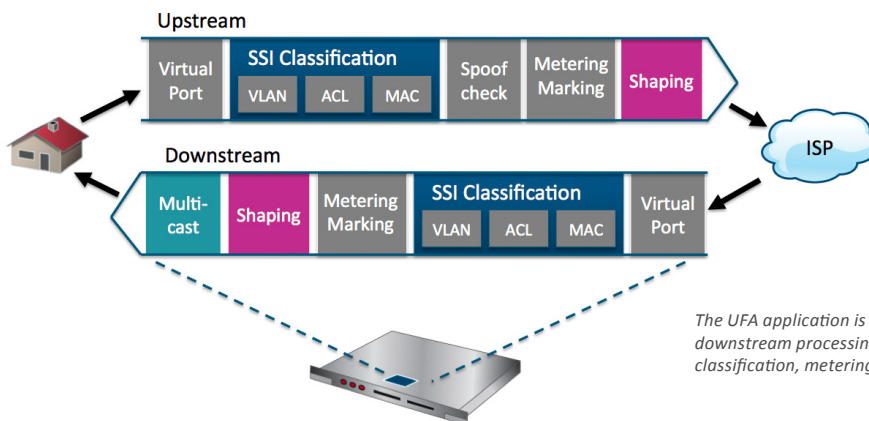


The UFA performs advanced user and service classification, traffic conditioning and QoS shaping required in Open Access models of operation.

The UFA is provided in source code to enable customization and implementation of proprietary functions. It leverages the inherent programmability of the AX family of Programmable Ethernet Switches, enabling extended product lifetime through adaptation to future standards. To ensure consistent table management and ease of control plane integration, the software provides a portable API in ANSI-C language. The UFA reference software may serve as a base reference software, reducing time-to-market and R&D cost. Xelerated Professional Services are available to further cut time-to-market and ensure smooth integration to control and management planes.

Flexible Concepts

Forwarding plane processing in the UFA has been separated into two parts; upstream for processing of user and control traffic towards the ISP, and downstream for traffic processing towards the residential or business customer.



The UFA application is divided into upstream and downstream processing with logical blocks, e.g. for classification, metering, marking and shaping.

The traffic is separated into Virtual Ports based on incoming port and VLAN in both upstream and downstream directions. A Virtual Port can be associated to a customer or an ISP connection.

Traffic to a Virtual Port is further classified to Subscriber Service Instances (SSIs) based on CVLAN and SVLAN tags, MAC source address, Layer 2 or IP Access Control Lists (ACLs). The classification flexibility allows user and service separation to support the widest range of market conditions and service provider preferences.

Each SSI supports individual policing, COS mapping and statistics counters. In addition, security features are enabled per SSI. IP and MAC address spoofing check ensures customer address integrity. Optionally, the Access Provider may translate MAC addresses to enable structured management of layer 2 addresses and to avoid address conflicts.

The UFA software supports service delivery with fine-granular QoS by leveraging the advanced Traffic Manager integrated into the AX Programmable Ethernet Switches. Hierarchical scheduling and shaping with priority propagation provide scheduling per service, per user and per group of users. This enables operators to offer, monitor and enforce service level agreements for TR.101/TR.156-based service delivery.

Ethernet and IP multicast are supported, enabling efficient support for IPTV services. The functionality allows both service-VLAN based spatial multicast and IP-based multicast with logical multicast on layer 3 per individual subscriber. The multicast functionality is used in combination with IGMP snooping, and can be limited to selected SSIs.

Supported Hardware

The UFA software is designed for pizza boxes or line cards of chassis-based systems. All parts are provided as source code including forwarding plane code for the AX Programmable Ethernet Switch and control APIs for the CPU. Build scripts are included for building the software for both the simulator environment of the Software Development Kit (SDK) and for the ASF4648XAS Gigabit Ethernet Fiber Access Switch from Accton (see separate Product Brief for more details).

The UFA takes advantage of the built-in memories of the AX Programmable Ethernet Switch and low-cost external DRAM for a comprehensive feature set with table sizes that can scale to large numbers if needed. Optional external QDR SRAM is used for scaling the number of meters used for policing and for statistics counters.

Unified Fiber Access Switch Functions

- 64-byte to 10240-byte jumbo frames
- 48x 1Gbit Ethernet User Ports (dual speed)
- 4x 10Gbit Network Ports (dual speed)
- Upstream processing of up to 60Mpps (shared up/downstream)
- Upstream full bandwidth guaranteed to Traffic Manager
- Downstream 20Gbps guaranteed from Network Ports
- Downstream wire speed processing guaranteed for 30Mpps
- Multicast to User Ports (L2 or L3) to full user BW
- Upstream and downstream traffic shaping with DRAM buffer
- Per user and service granularity for queues
- 5-level hierarchy with hierarchical WRED
- 4K Virtual Ports based on Physical Port, Ethernet type and VLAN tag
- Packet processing of three levels of VLAN tags; full push/pop/swap of S and C level tags
- Transparent third-level VLAN supported
- Access Control Lists (ACLs) for L2 or L3, selected per Virtual Port
- 16K Subscriber-Service-Instances (SSI) selected from any of
 - VLAN (Port, Eth-type, VLAN tag)
 - ACL (L2 or L3 flow)
 - MAC source + VSID
- Policing per SSI with dual-rate token bucket metering and statistics per color
- Color based re-mapping of P-bits and DSCP-bits
- MAC source address translation (64K address with ageing)
- Selectable forwarding per SSI
 - MAC address based forwarding
 - Policy based forwarding (fixed destination per SSI)
- 64K MAC address forwarding, dual VLAN tag
- IP and MAC spoofing check
- IGMP snooping
- L2 spatial multicast for multicast VLANs
- L3 logical multicast for IP multicast
- Link aggregation IEEE 802.3ad
- Packet snooping per Virtual Port, ACL or per SSI
- MPLS encapsulation to uplinks (UFA 1.1)



The ASF4648XAS Gigabit Ethernet Fiber Access Switch from Accton is one of the supported platforms for the UFA.

Features and Benefits

Comprehensive feature set for PON OLT and point-to-point Ethernet access systems	Reduces data plane software development time, which shortens time-to-market and provides robust implementation of all key access functions.
Provided as source code	Use as-is or easily adapted to system vendor specific requirements using the powerful development environment in the Xelerated Software Development Kit.
ANSI-C control plane APIs and data structures	Easy integration to custom control planes.
Advanced Traffic Management	Offers, monitors and enforces fine-granular QoS per user and service. Support for TR.101/TR.156 service delivery models.
Flexible user and service classification and forwarding	Supports multiple deployment scenarios, including Open Access model for both residential users and enterprise access.
Multicast on L2 and L3 with IGMP snooping	Support for IPTV services over both service VLANs and deployed with IP-multicast.



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