IP DSLAM with Integrated ATM Aggregation and Interworking to Ethernet

featuring Total Access 5000
Introduction

The ADTRAN Total Access 5000 is a carrier class Multiservice Access Platform (MSAP) enabling service providers to evolve to an IP/Ethernet network model while preserving legacy investments. The Total Access 5000 is designed around a pure IP/Ethernet core that offers unparalleled bandwidth to each subscriber. The backplane architecture provides a fully redundant, dedicated dual star bus to each individual slot, supporting up to 80 Gbps of non-blocking redundant throughput. This bandwidth scalability, combined with the next generation architecture, ensures a long product lifecycle and long-term investment protection as bandwidth demands continue to increase.

By providing a simplified migration path to a next-generation IP/Ethernet core infrastructure, the Total Access 5000 has the ability to help maximize the lifecycle of carriers’ existing legacy ATM DSLAM base, reduce the cost associated with maintaining legacy ATM switches, and enable higher speed Broadband Services. In a traditional high speed internet infrastructure, DSL services are provided via ATM based DSLAMs. These DSLAMs are aggregated by ATM switches/routers which are expensive to maintain as many of them are in an End of Life state or nearing it. In addition, many ATM switches are reaching port exhaust so critical bandwidth upgrades can not be realized without major expense. All of these challenges, in addition to the large embedded base of ATM DSLAMs that terminate subscriber traffic in the existing network, make the business case for ATM to Ethernet migration via the Total Access 5000.

ATM Aggregation and Interworking to Ethernet

The Total Access 5000 allows the aggregation of existing ATM DSL traffic via integrated line modules that terminate incoming ATM PVCs and interwork the traffic to Ethernet. By using existing VPI/VCI assignments taken from working high speed internet database systems, ATM aggregation modules in the Total Access 5000 can be pre-provisioned with subscriber information (mapping incoming VCs to VLANs) prior to the physical interface actually being changed. Once this information is pre-provisioned on the ATM aggregation modules and the GE uplinks are operational, the physical links can be moved from the ATM switches to the Total Access 5000 ATM aggregation modules at the cross-connect panel. Subscriber traffic will come up using the pre-provisioned PVC to VLAN mapping, PPPoE or DHCP requests will be forwarded upstream, and the existing ATM based DSLAMs will be migrated into the new IP/Ethernet core (Figure 3).
As shown in figure 3, the ATM network goes away once the migration is in place which means that ATM switches can be decommissioned or at least consolidated. In some applications, the service providers relationship with 3rd party service providers requires that a subset of the ATM network stay in place to be able to provide ATM interconnect to the 3rd party BRAS. In this case, the Total Access 5000 can support both an ATM and Ethernet network connection and will allow each DSLAM subscriber to be individually assigned to either the IP/Ethernet network or the ATM network for a graceful migration from ATM to Ethernet for the entire network.

In addition to providing a graceful migration path from ATM to Ethernet, The Total Access 5000 will serve as a platform for Broadband Service growth. The Total Access 5000 offers ADSL2+ and VDSL2 for copper based Broadband Service growth and offers GPON and P2P Ethernet for fiber based Broadband Service growth. This is important to realize because when a legacy DSLAM is aggregated and interworked, it still may not support high-speed services that could be offered from next generation technology due to the limited capability of its line cards; however, once the Total Access 5000 is in place for interworking, new revenue generating high-speed Broadband Services can be offered directly from the same system. There are two VDSL2 Access Modules available. Both units are standard compliant and support multi-pair bonding and fallback to ADSL operating modes. For medium density applications, the Total Access 5000 can provide up to 320 VDSL2 ports with integrated splitters per 9 RU shelf. For ultra-high density applications, the Total Access 5000 can provide up to 864 VDSL2 or ADSL2+ subscriber access ports.

In a sample network application, ADTRAN has modeled a representative central office with 11 existing ATM uplinks from numerous ATM DSLAM shelves. This office has 7,656 installed DSL ports. The Total Access 5000 can aggregate and interwork to Ethernet all of this subscriber traffic on only three ATM aggregation cards, providing non-blocking throughput to each individual ATM trunk and ensuring that no additional oversubscription is introduced as a part of the ATM to Ethernet interworking. This is accomplished via the 4 port DS3 or 4 port OC3 Access Modules. These modules use a single slot in the Total Access 5000 chassis and can be inserted in any of the access module slots. An additional 18 access module slots remain available in the Total Access 5000 chassis which can be used to provide up to 864 VDSL2 or ADSL2+ subscriber access ports.

Figure 4: Sample Office Conversion

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The flexible architecture of the Total Access 5000 allows subscriber VCs from the incoming ATM trunks are mapped to an Ethernet VLAN, with a C-Tag used to identify the customer and an S-Tag used to identify the ATM trunk. This allows all traffic from the ATM line modules to be switched into the network using VLAN tags only, creating a scalable service model for ATM to Ethernet interworking.

The Total Access 5000 Switch Module supports 1 GE up to 4 x 10 GE Ethernet uplinks for connectivity to the network core and offers full redundancy. These GigE ports can be bonded together using Link Aggregation (802.3ad), providing up to 40 Gbps of uplink speed. Small form-factor pluggable (SFP or XFP for 10 GE) optics is used to ensure proper electrical or optical signal support.

In addition to being an industry leading Interworking, Aggregation, and IP DSLAM as discussed above, the Total Access 5000 also supports many other critical applications including broadband loop carrier with GR303, TR-008, and VoIP based POTS support, Pseudowire emulation of DS1 circuits over Ethernet, Optical and Electrical based Carrier Ethernet, GPON, P2P Ethernet (Active E) and P-OTS transport. Furthermore, the IP/Ethernet core provides flexibility and scalability to support the additional growth of new applications as they emerge.

Summary

The Total Access 5000’s Ethernet architecture allows the deployment of an advanced packet network infrastructure that is capable of delivering a host of services. This robust packet network architecture allows carriers to use the Total Access 5000 to economically address both legacy and next generation services while providing a seamless migration path towards converged network architecture. Its integrated packet capabilities and highly scalable architecture provide flexible aggregation and transport options across multiple network topologies. As service providers undertake the network evolution required to deliver these next generation services, ADTRAN’s Total Access 5000 is one component of an industry leading family of access and transport solutions that ubiquitously support multiple network topologies, reducing unwanted operational complexity and maximizing network efficiency. With the ADTRAN Advanced Operational Environment (AOE) providing a common management application that supports these technologies and topologies ubiquitously, ADTRAN’s Total Access 5000 is the right choice for next generation network requirements.