APPLICATION NOTE

Satellite Division

Asymmetric Satellite Backhaul Delivery

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With the explosive worldwide growth of the internet, satellites are increasingly being used to provide service to the more remote regions of the world. The very high costs of satellite bandwidth call for very efficient network implementations. For example, a typical internet connection requires far more downstream traffic than upstream, typically a ratio of four to one. This can be explained simply by looking at simple web browsing, the user issues a URL address, and the ISP returns a whole page, or pages of information. Since users find download delays frustrating, it is vital to provide the maximum downstream bandwidth. This means that for an efficient implementation, an asymmetric network is required.

How can the APX provide a solution? And what benefits will APX give over traditional router based architectures?

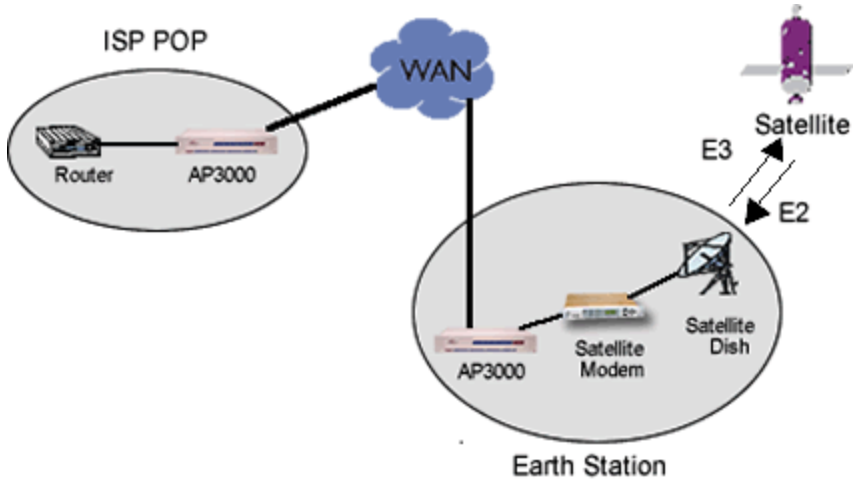

Figure 1. Asymmetric E3/E2 Backhaul

In this application, there are several points to consider. Firstly the ISP Point of Presence is not sited near to the Satellite Earth Station. Secondly the bandwidth requirements have been identified as 34M in the downstream direction, (towards the user) and 8M in the upstream direction, ie a 4:1 ratio.

How can APX provide a solution?

At the ISP POP, there will be a core IP router which in order for it to support an asymmetric connection will be fitted with a HSSI interface. This interface may utilise Frame Relay, PPP or even simple HDLC however it is transporting IP traffic. APX has as part of its wide range of Universal Interface Modules a Flexible Bandwidth HSSI Circuit Emulation Module which will transparently transport the entire HSSI payload utilising a ATM connection. The next problem to solve is the WAN connection between the ISP POP and the Satellite Earth Station. There are several options, simply use ATM at DS-3 or even STM-1 to transport the 34/8 HSSI circuit, however unless this is part of a future growth plan, this is inefficient. The most efficient, in terms of bandwidth and cost solution is to use an E3 Leased Line between the POP and Earth Station. This presents a little problem, however, how do I transport an E3 circuit emulation across an E3 link? (note that ATM AAL.1 adds around 12% overhead requiring at least a DS-3 to transport an E3 CE service). APX provides a simple solution to this, and that is the E3 CBR Interface Module for the downstream link, and the E3 UNI Module for the upstream connection. In this case, ATM will be used to transport the E2 circuit using AAL.1, however, in the downstream direction, ATM will only be used internally to the APX allowing a conversion from E3 HSSI to E3 G.703. Figure 2, shows the installation required at the ISP POP.

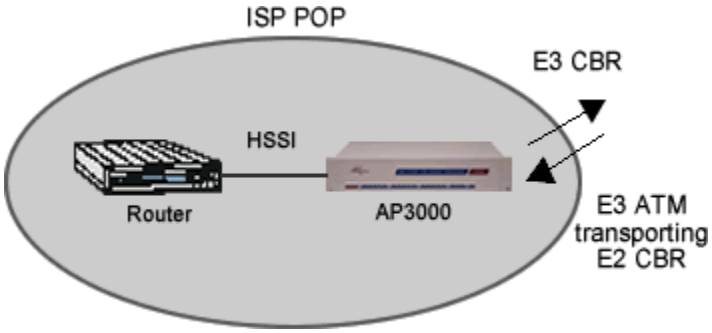

Figure 2. POP Configuration

The solution now requires the connection at the Satellite Earth Station to be designed. Since we have an E3 WAN connection carrying ATM traffic upstream and CBR traffic in the downstream direction the APX must be fitted with the E3 CBR Module, (Downstream) and E3 UNI module (Upstream). The next issue to resolve is the interface to the Satellite Modulators and Demodulators, and almost certainly the Redundancy switch. If the APX can be sited close to the Modems, then a HSSI interface may be used and since HSSI is inherently asymmetric that is the complete configuration and a simple AP3000 based solution may be used. However, where the APX and modems are not co-located then Co-Ax cables may be needed and an E2 CBR Module and an E3 CBR module, ie four interface modules requireing an AP4000.

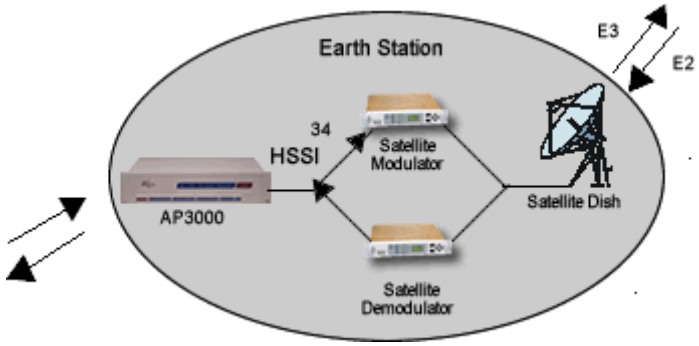

Figure 3. Earth Station configuration with HSSI Satellite Modems

What about the redundancy switching, well the APX provides an external alarm relay which will enable faults on the links to be easily signalled to the redundancy switch. However there is a slight problem, since most of the interfaces are only used in one direction there will be many unwanted alarms present which will mask the real alarm conditions!! APX solves this problem through its incredible flexibility and support for asymmetric solutions through Alarm Masking. For all those ports that are not used, the APX can be configured to mask those alarms, for example Loss of Signal since there is no network connection.

What are the benefits of an APX based solution over a traditional Router based service?

There is a simple cost benefit, due to the inherent low latency and transparency of the APX solution high end routers must be used, which when equipped with G.703 ports cost many times that of the APX solution.

Complexity, since the APX solution is not router based, a whole IP sub network layer has been removed, and since the APX is not providing a routing function the latency is minimised.