DIGITAL MEDIA BRIDGE TRANSMISSION MODEL

Cilutions - Digital Media Bridge
877-515-4004

www.cilutions.com

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Introduction

Digital Media Bridge (DMB) is a file content and video distribution family of products useful for delivering files and video streams to a wide variety of IP-based multicast and unicast computers and set-top boxes in an automated, managed and controlled way.

DMB products support the mixing of streaming video and file transmissions over a shared network while seamlessly managing bandwidth in the subnet, guaranteeing performance of time critical applications and preventing network congestion. With DMB, a customer can be sure that their content will be delivered in the most relaible manner possible and that network performance will not suffer in the process.

DMB Products & Their Usage

The DMB Sender, used for multicast file distribution, performs the following tasks:
- Manages the outbound multicast groups and unicast destinations
- Initiates file transfers
- Initiates streaming video relay
- Controls and meters the transmission process

The DMB Receiver, when used in multicast mode, performs the following tasks:
- Joins multicast groups
- Listens on unicast ports
- Receives and processes files and streaming video sent by the DMB Sender
- Provides reception status to the DMB Sender when requested

DMB also supports distribution to "receive-only" sites with no back channel to the DMB Sender and offers a wealth of features for scheduling, monitoring, and reporting the status of delivered files and video streams.

Multi-Channel Operation

The DMB Sender supports multiple video and file channels each with its own set of transmission attributes (e.g., Time-of-Day Bandwidth Controls, Maximum Priority, FEC). This way the administrator on the DMB Sender can assign the performance characteristics of each channel and manage multiple classes of user content accordingly.

For example, high priority users can be assigned to a specific transmission channel permitting high priority traffic along with bandwidth, FEC and other settings appropriate for this class of user.

Sub-Channels

Each DMB Sender can be configured to support up to 20 sub-channels each capable of transmitting a single file. This is useful, as an example, for transmitting multiple files simultaneously to multiple sets of Receivers if the aggregate transmission rate of all the files is less than the total amount of bandwidth available at the Sender.

Retransmit Channels

The DMB Sender supports off loading any and all retransmission traffic from a primary channel (that is, a channel carrying the initial transmission of a package) onto a retransmission channel. In this way an administrator can offer a dedicated channel for primary delivery of files and guarantee the initial transmission schedule time of any and all deliveries on this channel.

Any retransmission, caused either by a poorly performing receiver or packet loss in the network, can be redirected to another channel for service.

Retransmit Priority Adjustment

The DMB Sender supports the automatic adjustment of the priority of a package to be either lower or higher than its registered priority. This lets an administrator create a channel of traffic where, for example, any retransmissions should take precedence over initial transmissions if it is determined that older content in the system has a higher priority than newly registered content; and vice versa.

Intelligent Retransmission

The DMB Sender and Receiver platforms coordinate any retransmission requests so only missing content is retransmitted to complete a file transfer. In addition, the Sender advertises any pending retransmission to the network so those receivers needing retransmission will refrain from making requests thereby suppressing unnecessary return traffic from Receivers back to the Sender.

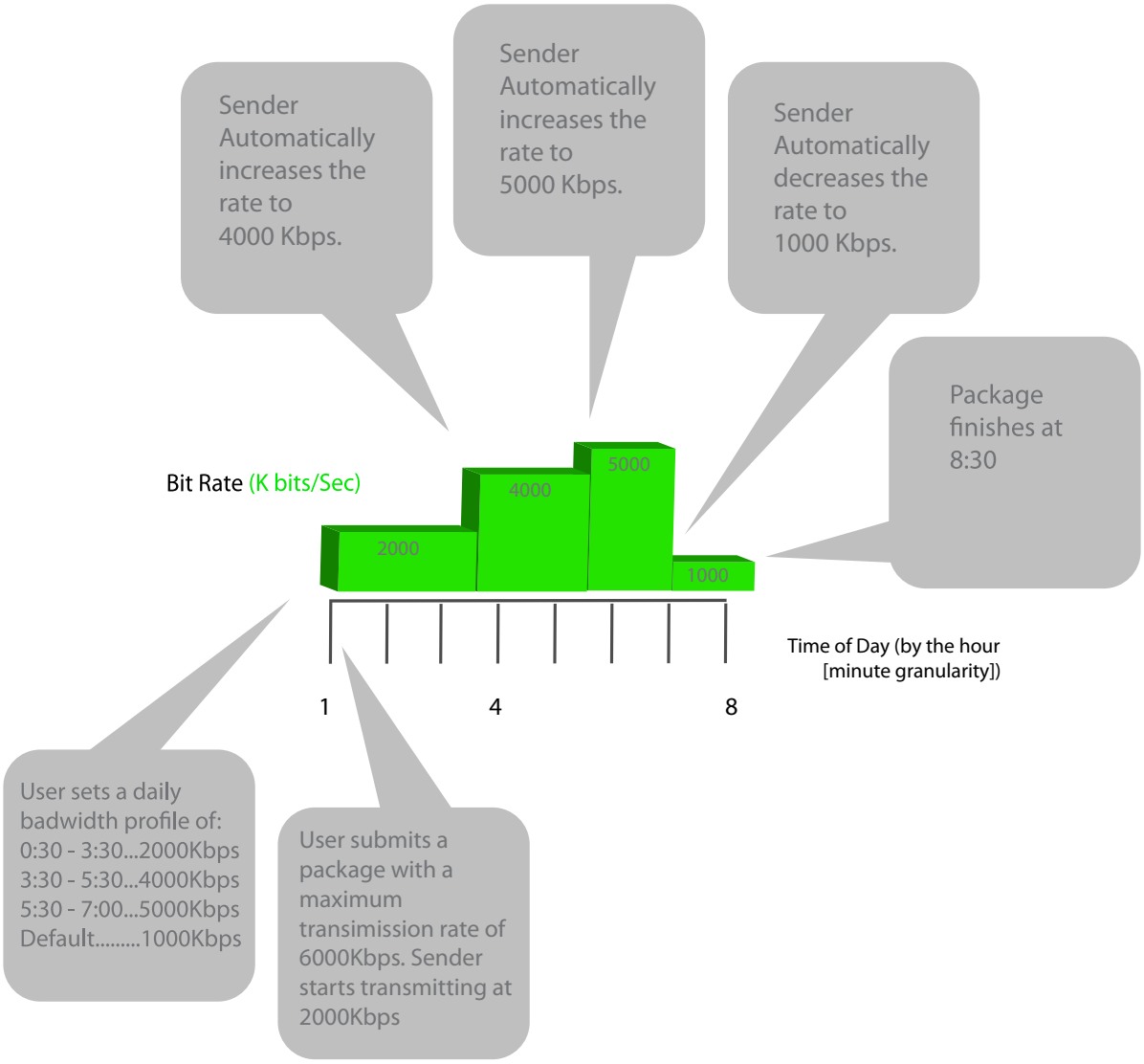
Receivers can also request that retransmission be routed over a separate IP path. In this way a user can send, for example, all primary traffic over a satellite link and retransmit traffic over the Internet.

Variable Transmission Rates & Time-of-Day Bandwidth Profiles

With time-of-day scheduling the administrator can configure the DMB Sender to dynamically modify the bandwidth available on each channel. That is, the bandwidth is no longer fixed. The transmission rate can change automatically while the file is in progress. In addition, the bandwidth schedule can be set either ahead of time, say, according to a regular weekly or monthly frequency or set on-demand in response to an unplanned bandwidth requirement (e.g., the immediate need to send a high priority package without impacting the current package transmissions). With this feature the Sender let's an administrator set a profile for each user (i.e., each login client on the Web Forms) to control how much bandwidth is available at any minute over the week, month or year.

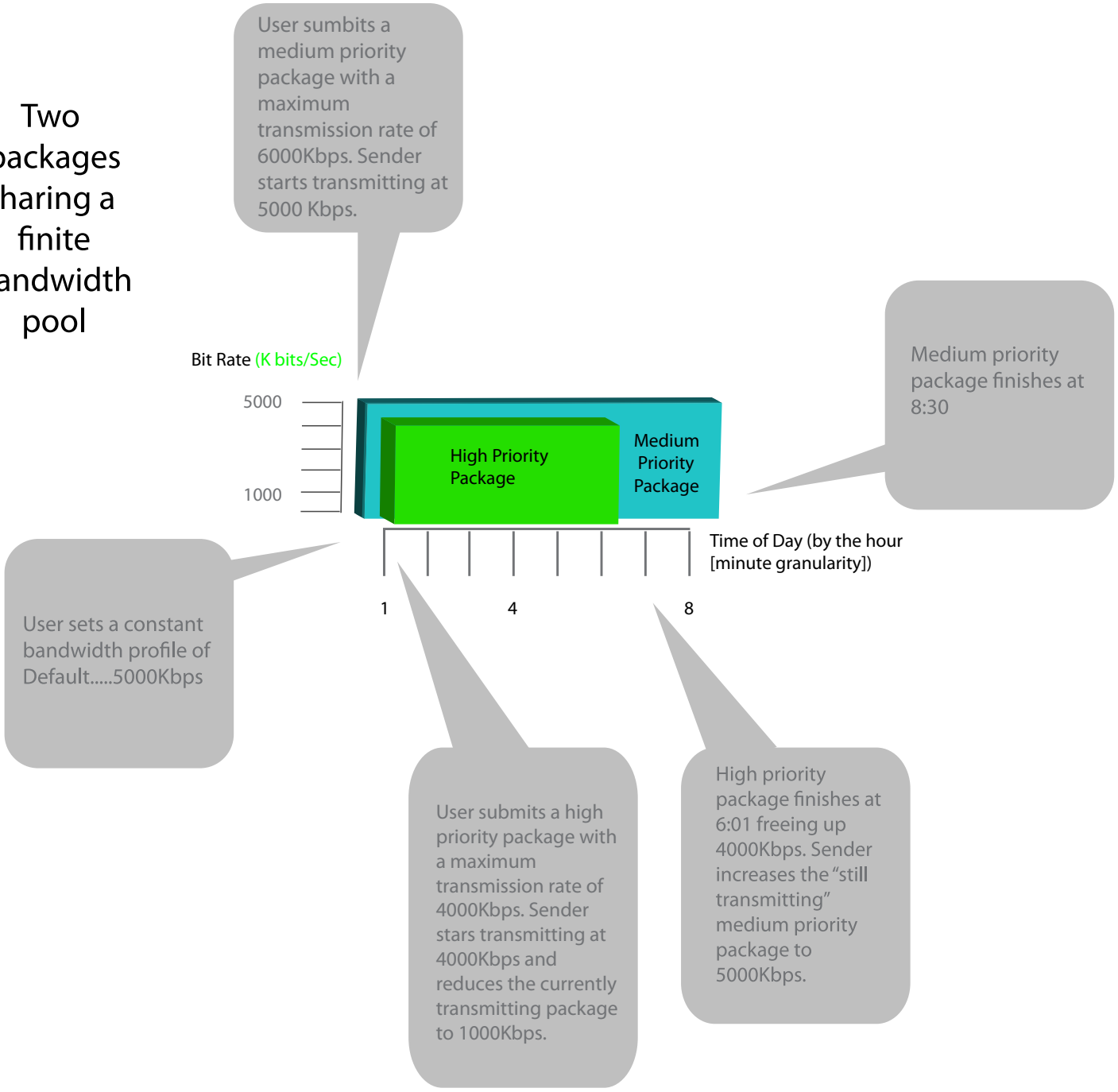
The following scenario depicts both the time-of-day scheduling capability of the DMB Sender and variable rate transmission control for a single package. The sequence of events are numbered from 1 through 6:

Single package transmitting across multiple time-of-day bandwitdth changes



The following scenario shows two packages sharing bandwidth. Note that the medium priority package is metered so it can continue transmitting (at a lower rate) and maintain full bandwidth utilization:

Two packages sharing a finite bandwidth pool



Setting the Time-of-Day Bandwidth Schedule

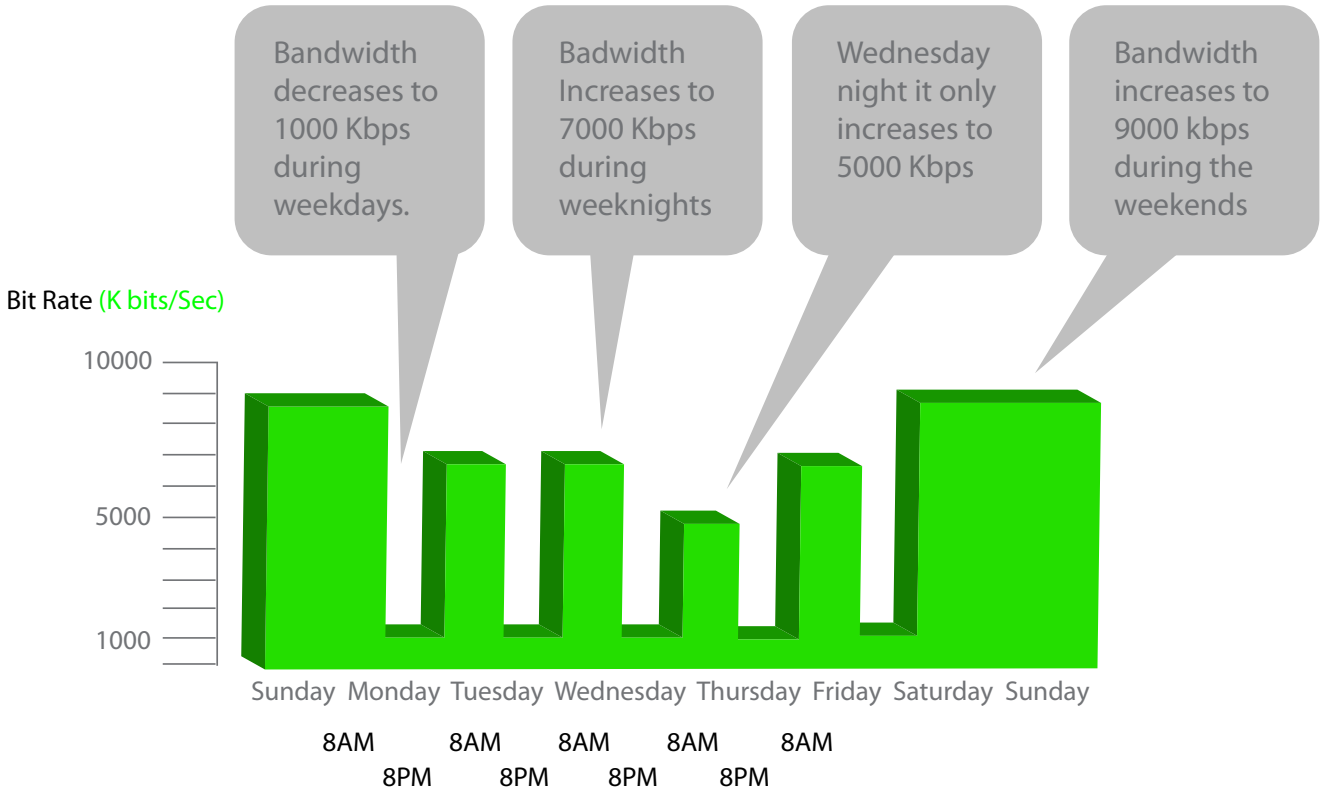
Following is an example set of time-of-day rules, configurable using the Sender Web Forms, and a graph of the weekly bandwidth profile these rules enforce.

An example weekly bandwidth schedule, configured as a set of bandwidth, and its corresponding rate profile

Time of Day Bandwidth Schedule - Microsoft Internet Explorer

Time of Day Bandwidth Schedule

	Start				Stop				
Precedence	Minute	Hour	Month Day	Week Day	Minute	Hour	Month Day	Week Day	Bit Rate (Kbps)
1	All	8:00 pm	All	Friday	All	8:00 am	All	Monday	9000
2	All	8:00 pm	All	Wednesday	All	8:00 am	All	Thursday	5000
3	All	8:00 pm	All	All	All	8:00 am	All	All	7000
4	All	7:00 am	All	All	All	7:00 pm	All	All	1000
5	All	All	All	All	All	All	All	All	4000



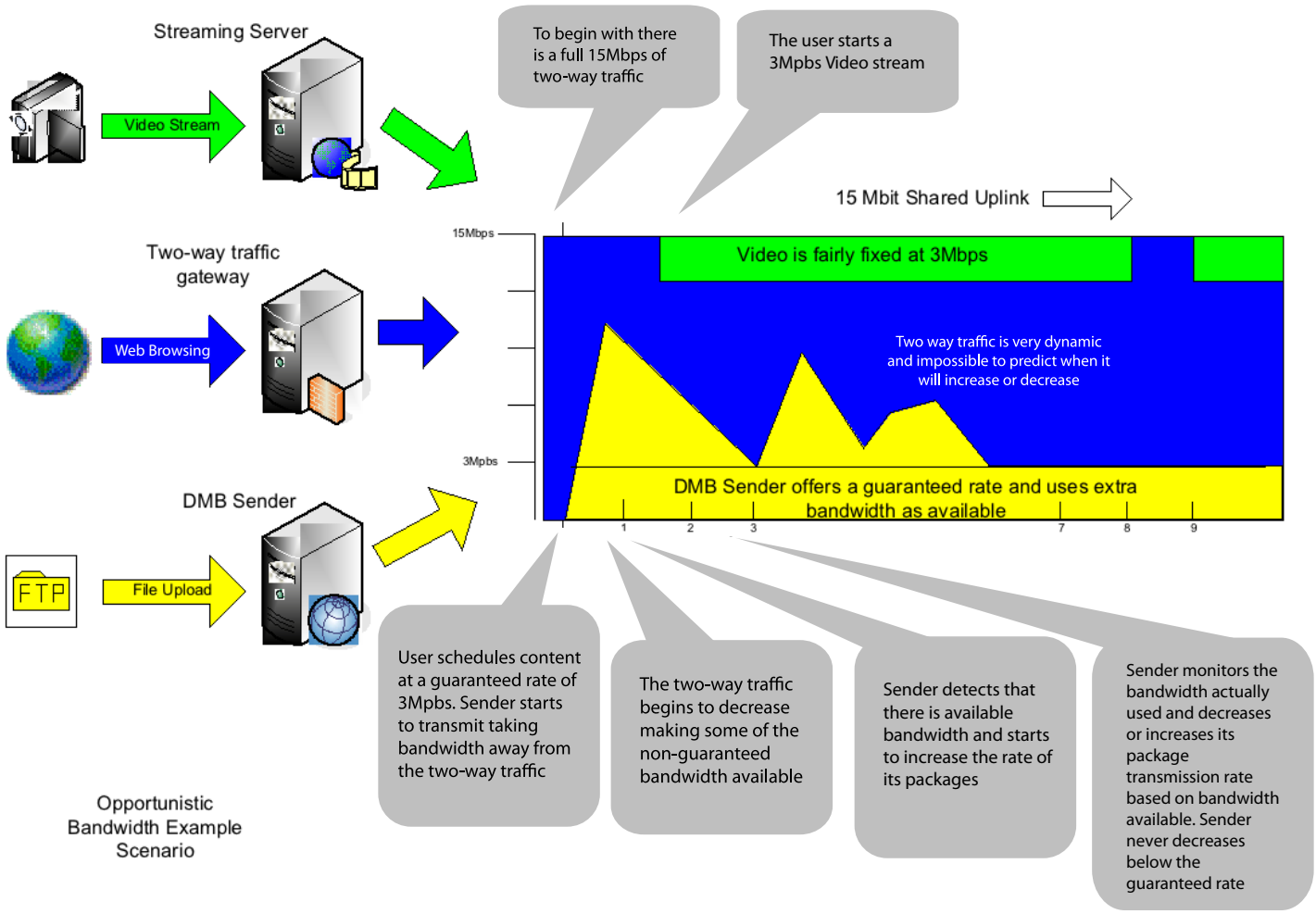
Opportunistic Bandwidth

The Sender administrator can configure external bandwidth monitoring. If enabled, the Sender will perform periodic SNMP polling of an external device (e.g., a switch) to determine the real-time rate of all traffic on a shared multicast/unicast uplink (e.g., a transponder).

If the aggregate real-time rate of all traffic is below the configured maximum rate of the uplink then the Sender ill take the bandwidth opportunity to increase its package transmissions thereby making use of the available bandwidth. The Sender will also automatically scale back package transmissions if the bandwidth becomes unavailable.

Note: a single Sender can each be guaranteed a minimum transmission.

A diagram depicting opportunistic bandwidth follows:



Opportunistic Bandwidth Example Scenario

Bandwidth Sharing Pools

A DMB Sender administrator can configure one or more bandwidth pools intended to be shared among multiple customers. This differs from Opportunistic Bandwidth in that there are no external dependencies for bandwidth pools. All configuration, sharing, and transmission metering take place within the Sender only. With bandwidth pools multiple customers (classes of content) on a single Sender can each be guaranteed a minimum transmission bandwidth. In addition, each customer will automatically scale up and allocate bandwidth that is unused by other customers in the same pool. The minimum guaranteed rate for each customer and the maximum aggregate rate for each pool are settable by time-of-day.

A diagram depicting two customers sharing a 10Mbps bandwidth pool follows: