Notes

By Fred Santilo

Revision History

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Introduction

This application note is to be used in conjunction with Application Note 258 SwitchStar Cell-Bus Operation with 2.5Gbps ATM Switch Example.

There are several ways to implement a Sub Tending scheme, with priority levels, using the IDT Switching Memory and Peripheral devices. Two of the methods are described in this application note, and are noted as Option 1 and Option 2. Each Option includes a setup and configuration example, along with priority levels for each Quality of Service (QoS).

Option 1 Setup & Configuration Using the 77V012 for Header Translation

Two, or more, Access Switches are connected as shown in Figure 1. UBR priority levels are also shown (UBR = 1 or UBR = 0) at their respective Sub Ports.

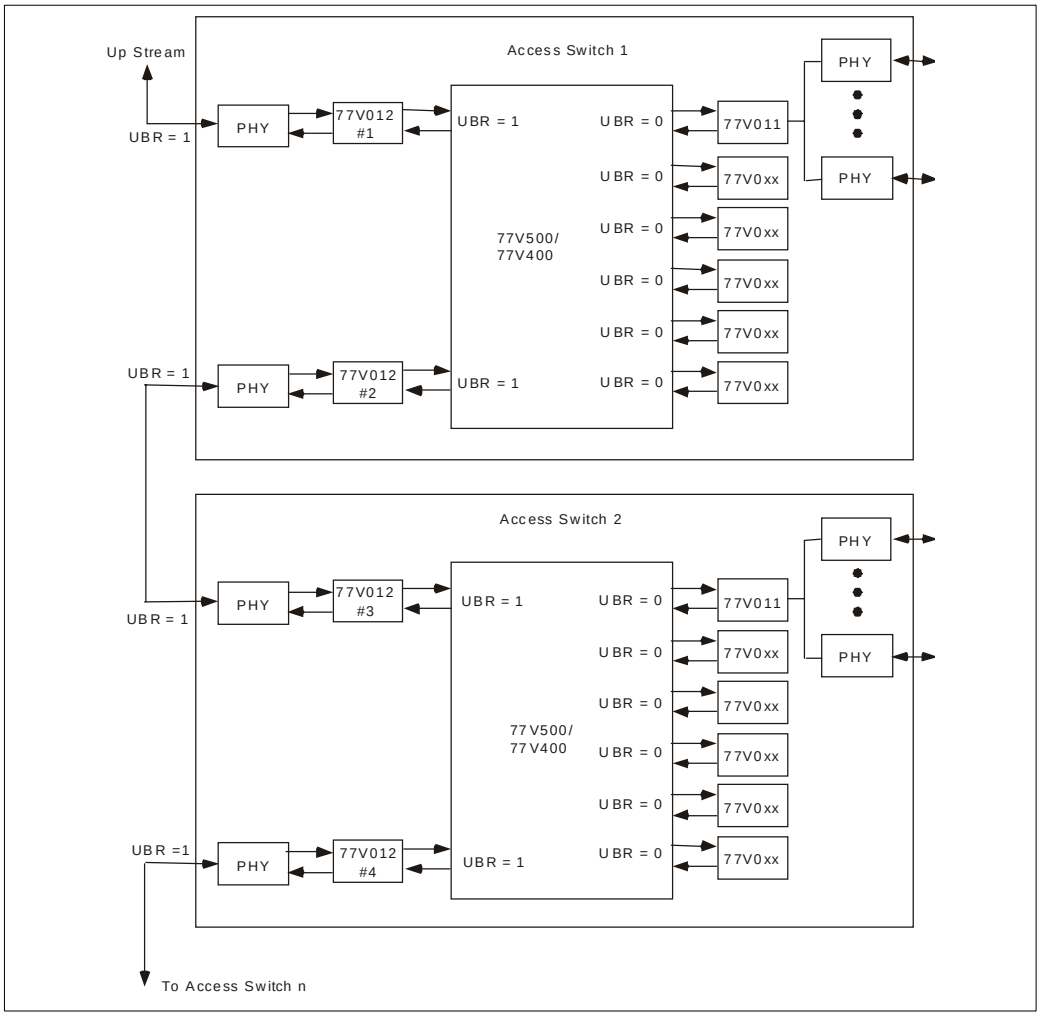

Figure 1

Notes

Access Switch1 has one 155Mbps port as an Up Link to the network, six 155Mbps ports for Sub Porting (each of these ports can be connected to either a 77V011 or a 77V012), and the remaining 155Mbps port is connected to Access Switch2 through 77V012 #2.

77V012 #1 is used for header translation, has VPI Tunneling enabled (register 0x8001 bit-0), and adds a four byte TAG to the beginning of the cell. All cells entering the 77V012 #1 receive UTOPIA interface are translated and have their new header value placed in the 4-byte TAG area. Access Switch1 is configured for 56-byte cells, VCI switching, and has the Start Byte set to 4 and the Stop Byte set to 3. Therefore, cells will be switched on the 4-byte TAG.

Each Access Switch in the daisy chain is configured in this manner.

Cell Routing Using Header Translation

Header translation is either performed on the full header value, or using VPI tunneling.

Cells with a VPI destine for Access Switch1 are translated on their full header value. They are routed to an Access Switch1 Sub Port, where the 77V011, or 77V012, removes the 4-byte TAG before transferring the cells to the PHY device.

Cells not destine for Access Switch1 have the VPI Tunneling bit set to a one in the Tunneling Node of the Search Tree. The New Header value for each of these cells will be based on the VPI value the cell carried when it was received by 77V012 #1. Therefore only one VPI/VCI value is required for all cells not destine for Access Switch1. When the cells destine for another Access Switch exit 77V012 #2 the 4-byte TAG is removed and the cell enters 77V012 #3 with its original cell header.

This process is repeated for each of the Access Switches in the daisy chain.

Cell Routing Using Header Translation Example

Assume that all cells with a VPI value of 0x01 to 0x05 are destine for Access Switch1, and all other VPI values are destine for another Access Switch further down the daisy chain. A cell enters 77V012 #1 with a VPI = 0x01 and a VCI of 0x0001. 77V012 #1 does a full header translation and attaches the New Header value in the Result Node to the 4-byte TAG it appended to the cell. The cell is switched accordingly and sent to the appropriate Sub Port in Access Switch1. The next cell to enter 77V012 #1 has a VPI = 0x06 and a VCI = 0x0001. 77V012 #1 performs a VPI Tunneling translation, as the VPI is not for Access Switch1, and attaches a New Header of VPI = 0x00 and a VCI =0x0fff. The cell is switched to the Sub Port where 77V012 #2 resides and the 4-byte TAG is removed prior to the cell entering 77V012 #3. The next cell to enter 77V012 #1 has a VPI = 0x0f and a VCI = 0x0001. 77V012 #1 performs a VPI Tunneling translation on the header and attaches a New Header value of VPI = 0x00 and VCI = 0x0fff. The cell is switched to the port where 77V012 #2 resides and the 4-byte TAG is removed prior to the cell entering 77V102 #3.

In this example Access Switch1 uses the VCI value of 0x0fff to route all cells not destine for one of its Sub Ports to the next Access Switch in the daisy chain. Therefore only one VCI value of Access Switch1 is consumed for all the cells destine for other Access Switches.

QoS Priority Levels Using Header Translation

Each switch can carry CBR, VBR, and UBR traffic. CBR and VBR connections each consume some predetermined amount of overall bandwidth that is allocated and always available. UBR connections consume some amount of bandwidth that is not allocated, nor guaranteed.

Cell priority levels are defined by the quality of service (QoS). The 77V500 offers four priority levels zero through three, with three being the highest priority and zero being the lowest priority.

CBR connections always get the highest priority level of three. This guarantees all cells carrying a lower priority level of either zero, one, or two will be dropped prior to a CBR cell being dropped, regardless of where the CBR cell is currently located in the daisy chain.

VBR connections for all the Access Switches in the daisy chain are assigned a priority level of two. This gives all VBR cells equal priority regardless of where the cell resides in the daisy chain, and guarantees UBR cells will be dropped prior to any VBR cells being dropped.

Notes

UBR connections are assigned either a zero or one priority level, which is dependent on where in the daisy chain the cell originated.

All UBR cells assigned to Sub Ports within an Access Switch have a priority level of zero, while all UBR cells assigned to an Up Link port have a priority level of one. This scheme provides fairness to the UBR cells within an Access Switch, and will not double penalize a UBR cell that has left one Access Switch to enter another Access Switch. Therefore, fairness is determined within an Access Switch, as once the UBR cell has left its originating Access Switch it will have a higher priority than the UBR cells of the Access Switch it is entering.

UBR priority levels are maintained using the 77V012 header translation method mentioned above, as UBR = 1 priority only needs to be assigned to a single connection in each of the Access Switches.

Option 2 Setup & Configuration without Using Header Translation

Multiple Access Switches are connected as shown in Figure 2. UBR priority levels are also shown (UBR = 1 or UBR = 0) at their respective Sub Ports.

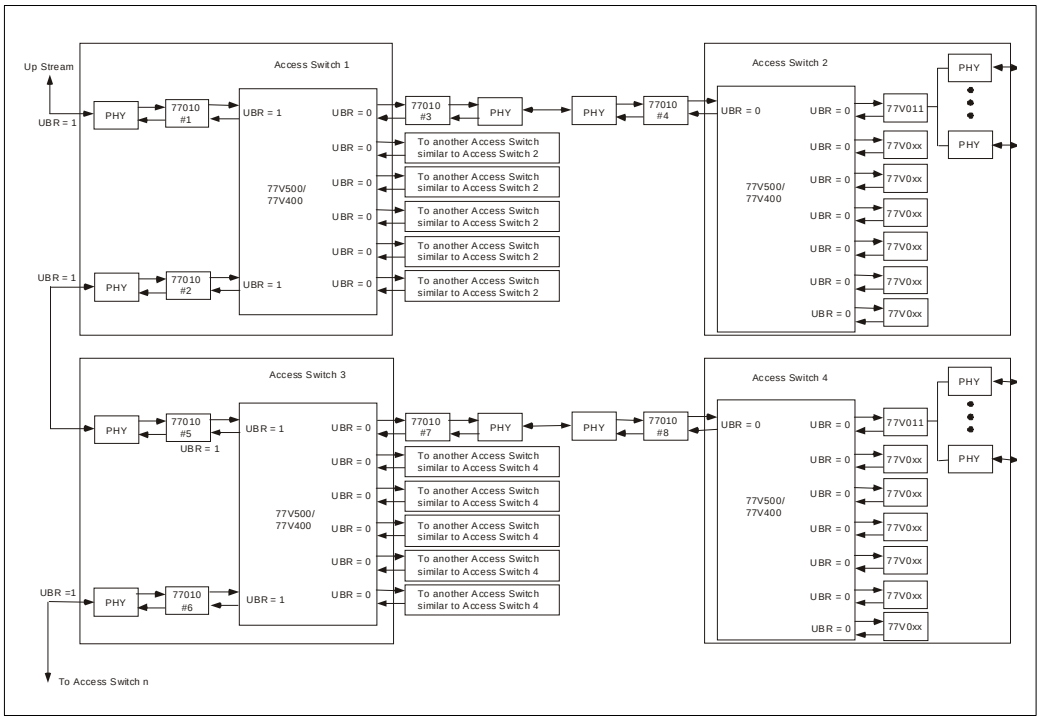

Figure 2

Access Switch1 has one 155Mbps port used as an Up Link to the network, six 155Mbps ports connected to six other Access Switches that are configured for Sub Porting (similar to Access Switch2), and the remaining 155Mbps port is connected to Access Switch3.

Access Switch1 is configured for 53-byte cells, which are switched on the VPI field. VPI cell switching is configured through the 77V500 with the LDCFG command.

Access Switch2 has one 155Mbps port connected to Access Switch1 and seven 155Mbps ports for Sub Porting. The Sub Porting ports can be connected to any of the DPI conversion devices for design flexibility. Access Switch2 is configured for 53-byte cells, which are switched on the VCI field. VCI cell switching is configured through the 77V500 with the LDCFG command.

Access Switch3 is configured similar to Access Switch1, and is required if the VPI header field needs further granularity, meaning the 255 possible VPI header values need to be routed to more than seven Sub Ports. Additional VPI granularity would require additional Access Switches similar to Access Switch3.

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Access Switch4 is configured similar to Access Switch2 and is required due to the addition of Access Switch3. Additional VCI Sub Porting Access Switches are required as Access Switches performing VPI switching are added to the system.

Cell Routing without Using Header Translation

Cells enter Access Switch1 via the Up Link port. Access Switch1 performs cell routing on the VPI field and either routes the incoming cell to an Access Switch similar to Access Switch2, or to another Access Switch similar to Access Switch3. Cells routed to an Access Switch2 switch are switched to their appropriate Sub Port based on the VCI header field.

In this design one Access Switch is used to switch on the VPI header value, similar to Access Switch1, and additional Sub Porting Access Switches are used to switch cells on the VCI header value, similar to Access Switch3.

This process is repeated for each of the Access Switches in the daisy chain.

Cell Routing without Using Header Translation Example

Assume that cells with a VPI value of 0x01 to 0x07 are destine for an Access Switch1 sub port, cells with a VPI value of 0x08 to 0x0e are destine for Access Switch3 sub port, and all other VPI values are destine for Access Switches further down the daisy chain.

A cell enters 77010#1 with a VPI = 0x01 and a VCI of 0x0001. Access Switch1 routes the cell to Access Switch2 based on the VPI value. Access Switch2 routes the cell to its appropriate Sub Port, with in Access Switch2, based on the VCI value.

Now a cell enters 77010#1 with a VPI = 0x0d and a VCI = 0x0010. Access Switch1 routes the cell to Access Switch3 via 77010#2. Access Switch3 receives the cell via 77010#5 and routes the cell to its appropriate Sub Port, within Access Switch3. The Access Switch connected to that Sub Port then routes the cell to its appropriate Sub Port based on the VCI header value.

QoS Priority Levels without Using Header Translation

Each switch can carry CBR, VBR, and UBR traffic. CBR and VBR connections each consume some predetermined amount of overall bandwidth that is allocated and always available. UBR connections consume some amount of bandwidth that is not allocated, nor guaranteed.

Cell priority levels are defined by the quality of service (QoS). The 77V500 offers four priority levels zero through three, with three being the highest priority and zero being the lowest priority.

CBR connections always get the highest priority level of three. This guarantees all cells carrying a lower priority level of either zero, one, or two will be dropped prior to a CBR cell being dropped, regardless of where the CBR cell is currently located in the daisy chain.

VBR connections for all the Access Switches are assigned a priority level of two. This gives all VBR cells equal priority regardless of where the cell resides in the daisy chain, and guarantees UBR cells will be dropped prior to any VBR cells being dropped.

UBR connections are assigned either a zero or one priority level, which is dependent on where the cell is in the daisy chain.

All UBR cells within a Sub Port Access Switch that switches on the VCI field have a priority level of zero. This would include all Access Switches similar to Access Switch2.

UBR cells within an Access Switch performing VPI switching have a priority level of either one or zero. A priority level of zero is assigned to UBR cells within the Access Switch. A priority level of one is assigned to UBR cells entering or exiting an up link, either from the network or from another Access Switch performing VPI switching.

Fairness is determined at the Sub Ports and UBR cells traveling to or from the up link ports are not double penalized.

Notes

UBR priority levels are maintained through the call setup for the connection, with the priority level of one being assigned either when the cell exits an Access Switch, similar to Access Switch3 or enters an Access Switch, similar to Access Switch3.

Summary

The SwitchStar switch fabric and peripheral devices allow design flexibility when multiple Access Switches are configured in a system with high bandwidth uplinks and low bandwidth sub-ports. Priority levels allow QoS parameters to be maintained throughout the system, even when cells are traveling from one Access Switch to another.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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