The Clock Generation Board and Backplane V2.0

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1 Introduction

The backplane is a passive device which sits at the back of a crate and connects the Port Controllers or DAN devices to the switch fabric. It also distributes global signals. It consists of two electrically isolated 4 by 4 switches and two such backplanes can be used to make a 16 by 16 switch.

2 The New Backplane

The 2 clock signals, ϕ_1 and ϕ_2 were originally generated on the switch fabric board and sent across the backplane on global clock lines. This has two disadvantage. Firstly the devices at the far ends of the backplane receive their clocks later than the ones nearer the centre (since the fabric board is in the centre) and secondly the clock driver is loaded differently for different configurations. In order to overcome these problems (and to allow a 16 by 16 switch to be built) a new backplane (*Backplane V2.0*) was designed with individual clock lines coming from a new slot on the board. The *Clock Generation board* plugs into this slot and generates separately driven clocks to each device which can be delayed as necessary. The clock generation board also produces clocks for the two fabric slots which can either be sent across the backplane or distributed by coax lines. (see table 1).

The Clock Generation board also generates the 'frame start' and 'reset' signals (also previously generated on the fabric board) which are sent across global lines — one for each of the four 4 by 4 switches.

3 Backplane Configurations

Each backplane contains connections for two separate 4 by 4 switches which are interleaved. The eight slots are labelled, from left to right, zero up to seven, zero, two four and six being connected to the left fabric and one, three, five and seven being connected to the right fabric. The left and right fabric slots and the clock generation board slot are situated between slots three and four. For a 16 by 16 switch two backplanes are needed (labelled upper and lower here). The PCB for the backplane is designed to allow a device to be plugged into a slot in the upper backplane whilst a different device is plugged into the same slot in the lower backplane. This is done by having two identical sets of holes in the PCB for sockets to be soldered into, but offset by 0.8 inches (the width of a device). Which of the upper or lower backplanes has which socket populated varies from slot to slot. This allows space for podules to be placed between port controllers in adjacent slots when the backplane is being used for a 4 by 4 switch. (see figure 1 for the preferred arrangement)

		North is where the writing is	
Link	signal	WEST	EAST
LK1	Lower backplane ph1 for left fabric	over coax	across backplane
LK2	Upper backplane ph1 for left fabric	over coax	across backplane
LK3	Lower backplane ph1 for right fabric	over coax	across backplane
LK4	Upper backplane ph1 for right fabric	over coax	across backplane
Link	signal	ON	OFF
LK5	Lower backplane ph2 for left fabric	CONNECTED	DISCONNECTED
LK6	Upper backplane ph2 for left fabric	CONNECTED	DISCONNECTED
LK7	Lower backplane ph2 for right fabric	CONNECTED	DISCONNECTED
LK8	Upper backplane ph2 for right fabric	CONNECTED	DISCONNECTED
LK9	Lower backplane left reset	CONNECTED	DISCONNECTED
LK10	Upper backplane left reset	CONNECTED	DISCONNECTED
LK11	Lower backplane right reset	CONNECTED	DISCONNECTED
LK12	Upper backplane right reset	CONNECTED	DISCONNECTED

Table 1: Links on the Clock Generation Board

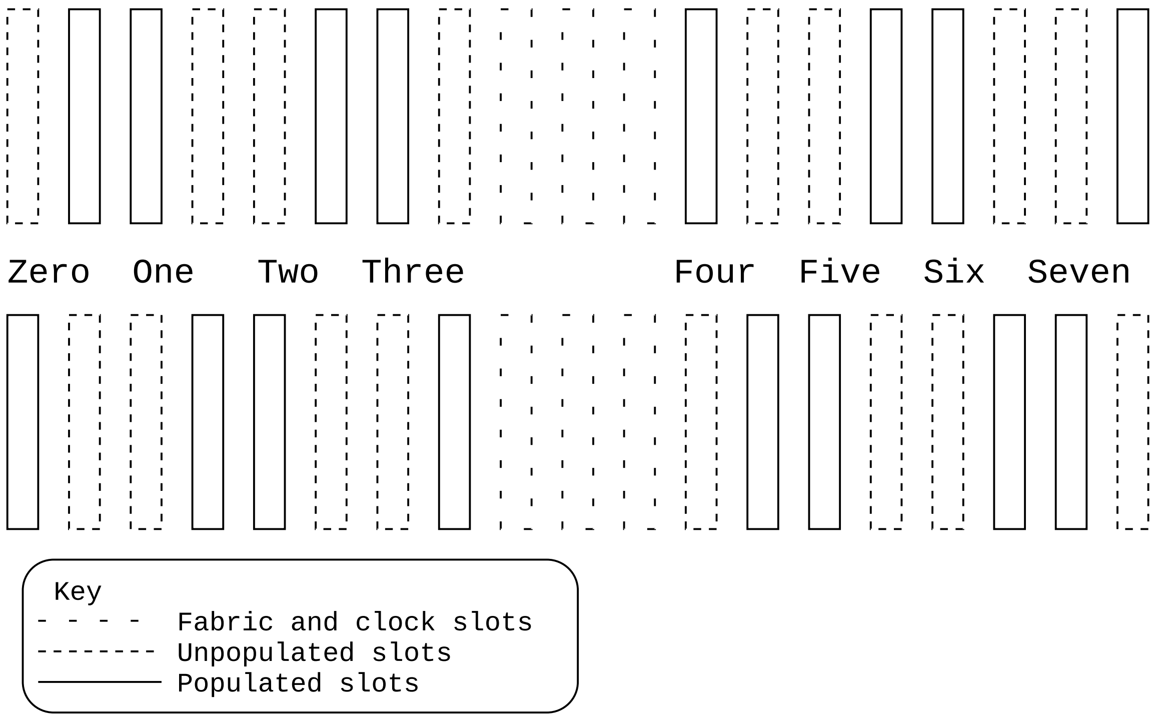

Figure 1: The preferred arrangement of connector positions

One backplane can only be used as two 4 by 4 switches. Two backplanes can be used as four 4 by 4 switches, two 8 by 8 switches or one 16 by 16 switch.

3.1 A 4 by 4 switch

A single 4 by 4 switch can be constructed by plugging a 4 by 4 switch fabric into the left fabric slot of a backplane and devices into the even numbered slots. A separate switch can be constructed using the right fabric slot and plugging devices into the odd numbered slots.

3.2 An 8 by 8 switch

A single 8 by 8 switch can be constructed by plugging a single 8 by 8 switch fabric board into the left fabric slot on the upper and lower backplanes and devices into the even numbered slots on both backplanes. A separate switch can be constructed using the right fabric slots and plugging devices into the odd numbered slots.

3.3 A 16 by 16 switch

A 16 by 16 switch can be constructed by plugging two 8 by 8 fabrics into the backplanes and connecting them together. Devices can then be plugged into any of the slots. When two 8 by 8 fabrics are connected, the BD signal becomes high on one of them (the one with J3 populated). This alters the value fabric routeing byte needed to route cells to the slots on that fabric board. The preferred arrangement is to have the fabric with BD high in the left hand slot [1].

4 Routeing through an 8 by 8 or 16 by 16 fabric

Figure 2 shows the mapping between the value of the fabric routeing byte and the slot to which a cell is routed. The vertical lines in this figure represent the slots as they appear on the backplane. i.e. A pair of sets of holes for two 96-way sockets, only one of which is populated. Where a pair of slots is shown vertically aligned, their order (horizontally) depends on how the slots on the backplane and populated. If the preferred arrangement of slot connectors is used (see figure 1), the horizontal arrangement of slots can be seem in document 43.

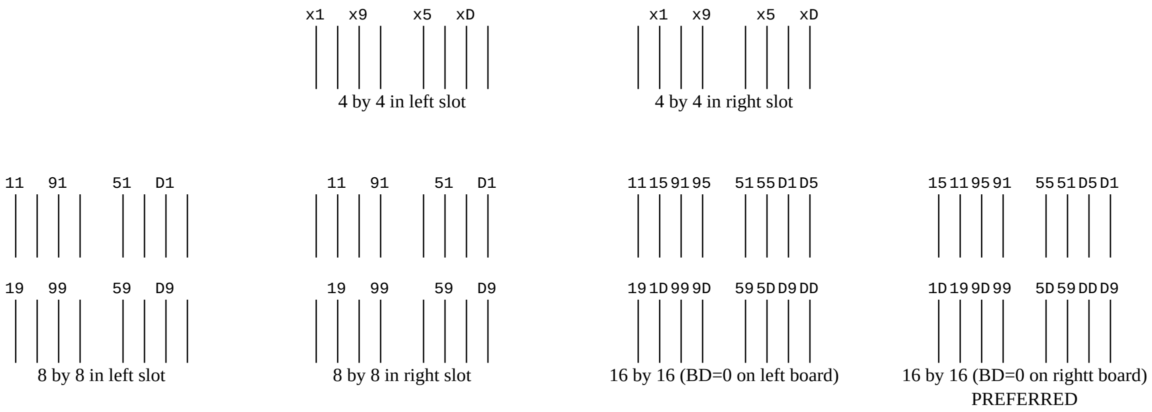

Figure 2: The Fabric Routeing Byte for each Slot

The slots are numbered by mapping the fabric routeing byte onto [0..15] as in figure 2

[1]The 8 by 8 fabric PCBs are numbers. The odd ones have BD high

FRB	11	91	51	d1	19	99	59	d9	15	95	55	d5	1d	9d	5d	dd
slot no.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Table 2: Fabric Route Byte (in hex) to Slot Number Mapping

5 The Clock Generation Board Connections

The clock generation board has space for four reset switches and/or reset server connections and four red LEDs on it's front panel. Each switch or reset server connection pulls a different reset line low When an 8 by 8 or 16 by 16 switch fabric is being used, two or more of these reset lines are connected together. In order to avoid two or more drivers clashing, some of links 9 to 12 should be removed (see table 1). Currently, the switches have 2 reset server connections: one (the lower one) to driver the left side of the upper and lower backplanes and the other to driver the right side.

6 Implementation

The backplane was designed in accordance with the mechanical specification for VME backplanes. The clock generation board is a double height extended eurocard. It contains an oscillator module, a 74AC74 to divide the speed of the oscillator by two, 10 74ACT04s to drive the frame and clock signals across the backplane and a 74LS14 to drive the reset lines. It has been found necessary to add series termination to the outputs of all the clock line drivers. 33Ω resistors seem sufficient.