Investigating the Fairisle Fabric

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1 Introduction

This document describes the algorithm used to investigate the switch fabric to which an entity is attached when it is switched on. By investigate it is meant that the entity determines what sort of fabric it is attached to and what port number it is plugged in to.

The switch fabric could consist of zero, one, or two stages and the algorithm must be designed such that it does not interfere with normal operations or with any other entity performing the same algorithm.

2 Considerations.

2.1 Fabric routeing.

Each stage of a fabric routes using a nibble the meaning of which is shown in table 1.

Bit	Name	Use
0	Active	Always set for a cell
1	Priority	Set for high priority cell
2-3	Route	Output requested for this cell

Table 1: Fabric Route byte

For a zero stage fabric there is no fabric routeing and the nibble should be entirely zero including the active bit.

For a single stage fabric the low nibble of the first octet is used as the entire route.

For a two stage fabric both nibbles contain a route. The nibble in bits 0-3 is considered more significant than the nibble in bits 4-7 for the point of numbering the possible outputs.

2.2 Port controller routeing.

All devices plugged into an output of the switch fabric route on the first byte received as described in table 2.

Some devices ignore cells with the loop-back bit set and some ignore cells with the loop-back bit clear as appropriate.

Bit	Name	Use
0	Active	Always set for a cell
1	Loop	set for loop-back or management, clear for transmission or data
2-7	Spare	Unused

Table 2: Port Controller Route byte

3 Algorithm.

The basic idea of the algorithm is to send a cell to all possible outputs and to see what subset of the possible 16 outputs the entity receives cells for. Each cell contains an indication of the output to which it was sent for this purpose.

Additionally, since the receipt of corrupt cells could cause considerable chaos, the cells contain an embedded test sequence designed to perform simple tests of the hardware (such as stuck bits) and a checksum field.

3.1 Data format

Since the first octet may be either a fabric route or a port controller route (in the case of a zero stage fabric) the values must be very carefully constructed. Likewise the port controller route octet may become the first octet of the VCI.

The header of the cell is such that the fabric route octet has the priority bit set. This means that should the fabric not be present it will become the port controller loop-back bit. The port controller route octet is set to all ones (0xff) since the VCI used for investigating the fabric is 0xff,0xff. The fas used for investigating the fabric should also be 0xff,0xff which again tolerates the slip.

The data portion of the cell begins with twenty three two octet fields. For each field the first octet contains the number of the output port which is the destination for that cell in the lower nibble and the value 0x1 in the upper nibble. The second octet in each field contains the field number (beginning at zero) XORed with zero in the case that the field number is odd and 0xfe in the case that the field number is even.

Following these twenty three fields there is a one octet checksum. The checksum is generated by XORing the first fourty six octets together and complementing the residue.

The last octet (which will be lost in the case of a zero stage fabric) contains all ones.

3.2 Reception

The number of cells received should not be counted but merely whether a cell has been received specifying it was sent to a particular output port. This allows multiple entities to simultaneously investigate the fabric.

If a cell is received whose format does not match the specified data format above the occurrence should be logged and the data fields printed since this may aid fault discovery. It should not be considered in the algorithm. Implementations are at liberty to refrain from logging cells with an old version of the data format. Such old versions are not described herein.

If cells are received for all sixteen outputs and they are all shifted (which is identified by the first data octet being all ones), then there is a zero stage fabric. If a single output port specification is received then there is a two stage fabric and the entity is plugged into the specified port. If cells are received denoting exactly four of the possible outputs and the four are consecutive and aligned on a multiple of four then there is a single stage fabric and the entity is plugged into the port number which is the value of the received port numbers specified divided by four.

In all other cases the entity *must not* attempt to use the fabric for network operations but should halt and optionally enter maintenance mode.