SpaceFibre Outline Specification Review

SpaceWire Working Group Meeting

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Outline

❑ Background

❑ SpaceFibre sub-working group

❑ General Findings

❑ Architectural Recommendations

❑ Virtual Channel Assumptions

❑ Virtual Channel Recommendations

❑ Programmatic Recommendations

Background

❑ ESA has contracted University of Dundee (UoD) to develop a prototype SpaceFibre Codec

❑ UoD has demonstrated the SpaceFibre Codec in hardware

❑ UoD in autumn 2007 released the SpaceFibre Outline Specification

❑ A SpaceFibre sub-working group has been established to evaluate the SpaceFibre Outline Specification

❑ NASA is currently developing a SpaceFibre sub-orbital flight demonstration to evaluate the SpaceFibre Outline Specification

SpaceFibre Sub-working Group

❑ Four meetings have occurred – in future attempt to have bi-weekly meetings

❑ Comments/questions/recommendations have been generated and provided to ESA/UoD

 ❑ Provided here to generate discussion and expand participation

General Findings

❑ UoD contracted to generate SpaceFibre Codec - not perform system level design for SpaceFibre network description

  ❑ System level behavior of SpaceFibre is missing from SpaceFibre Outline Specification (only specifies Codec behavior)

❑ Need to understand how SpaceWire maps to SpaceFibre (and vice versa)

❑ Need to clarify user interface to resolve inconsistencies *

  ❑ Location of Virtual Channel (VC) and Flow Control (FC) functions *

    ❑ Defined above Codec *

  ❑ Framing function necessary to support VC is in Codec *

    ❑ Appears to be driven by desire to implement scramble synchronization on a per frame basis *

  ❑ Ordered Set definitions associated with QoS *

  ❑ Tx and Rx Codec interfaces can not be tied directly together *

* From "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell

Architecture Recommendations *

- ❑ Define the User interface at the Network level interface (SpaceFibre packets) rather than the Framing interface (SpaceFibre frames)

- ❑ Define User ordered sets as any ordered sets passing unmodified through the stack below the User interface

- ❑ Make the interfaces to each functional level consistent so that a transmitter can be connected to the corresponding receiver transparently (see figures)
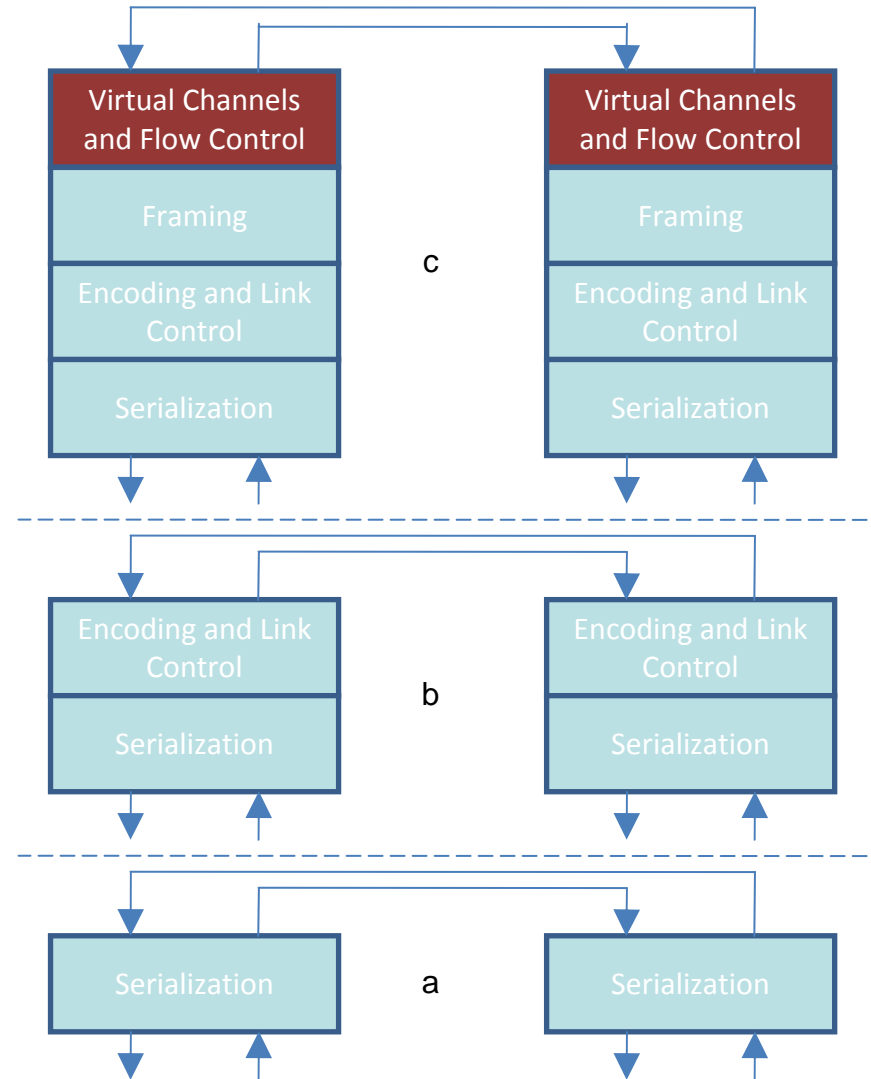
* Slide from "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell
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Virtual Channel Assumptions (1) *

❑ Assume SpaceFibre packets are similar to SpaceWire packets (interchangeable)

❑ Assume SpaceFibre virtual channels are similar to SpaceWire ports when routing SpaceFibre packets

    ❑ Each active SpaceFibre virtual channel is assigned an associated QoS

        ❑ The QoS of a SpaceFibre virtual channel can be reassigned if there are no SpaceFibre packets queued for the virtual channel

    ❑ SpaceFibre packets are routed to a destination virtual channel by destination and quality of service (the QoS of the packet is established by the QoS associated with the source virtual channel)

    ❑ Packets with the same QoS from different sources to the same destination must be transferred on a different virtual channel

* Slide from "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell

Virtual Channel Assumptions (2) *

❑ Assume the Virtual Channel function of the SpaceFibre protocol stack is responsible for segmentation and reassembly

   ❑ SpaceFibre packets are segmented into SpaceFibre frames for transmission through SpaceFibre virtual channels

❑ Assume SpaceFibre packets are routable and SpaceFibre frames are not

   ❑ SpaceFibre packets must be reassembled at each stage for routing

❑ Assume the Virtual Channel function of the SpaceFibre protocol stack is responsible for group adaptive routing of SpaceFibre frames through parallel SpaceFibre links

   ❑ Including any mechanism necessary to reassemble SpaceFibre frames transferred through multiple links to recreate the original SpaceFibre packet

* Slide from "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell

Virtual Channel Recommendations *

❑ Associate data frames with virtual channels rather than quality of service

  ❑ Change the QoS field of the SDF ordered set to a Channel Number field

  ❑ Allows the link endpoints to perform flow control

❑ Associate quality of service with virtual channels

  ❑ Define a quality of service ordered set to communicate the quality of service associated with a virtual channel across the link

  ❑ Allows dynamic allocation of a virtual channel to each SpaceFibre packet flow (source, destination, QoS)

* Slide from "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell

Programmatic Recommendations

❑ Define the high level (network) behavior of SpaceFibre network based upon a defined set of requirements

   ❑ Requirements need to be formalized

   ❑ Establish a forum (via teleconference) for larger participation on periodic basis (typically bi-weekly)

      ❑ Perhaps use existing SpaceFibre sub-working group meeting

         ❑ Please Contact Glenn.P.Rakow@nasa.gov to be placed on distribution

* From "Comments on SpaceFibre Outline Specification" – Cliff Kimmery, Honeywell

2/14/2008

SpaceWire (SpW) Working Group

End

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