

# NASA Activities

## SpaceWire Working Group Meeting

ESTEC, Noordwijk, NL
February 20-21, 2008

Presented by
**Glenn Rakow – NASA/GSFC**
**Glenn.P.Rakow@nasa.gov**



# SpaceFibre Outline Specification Review

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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



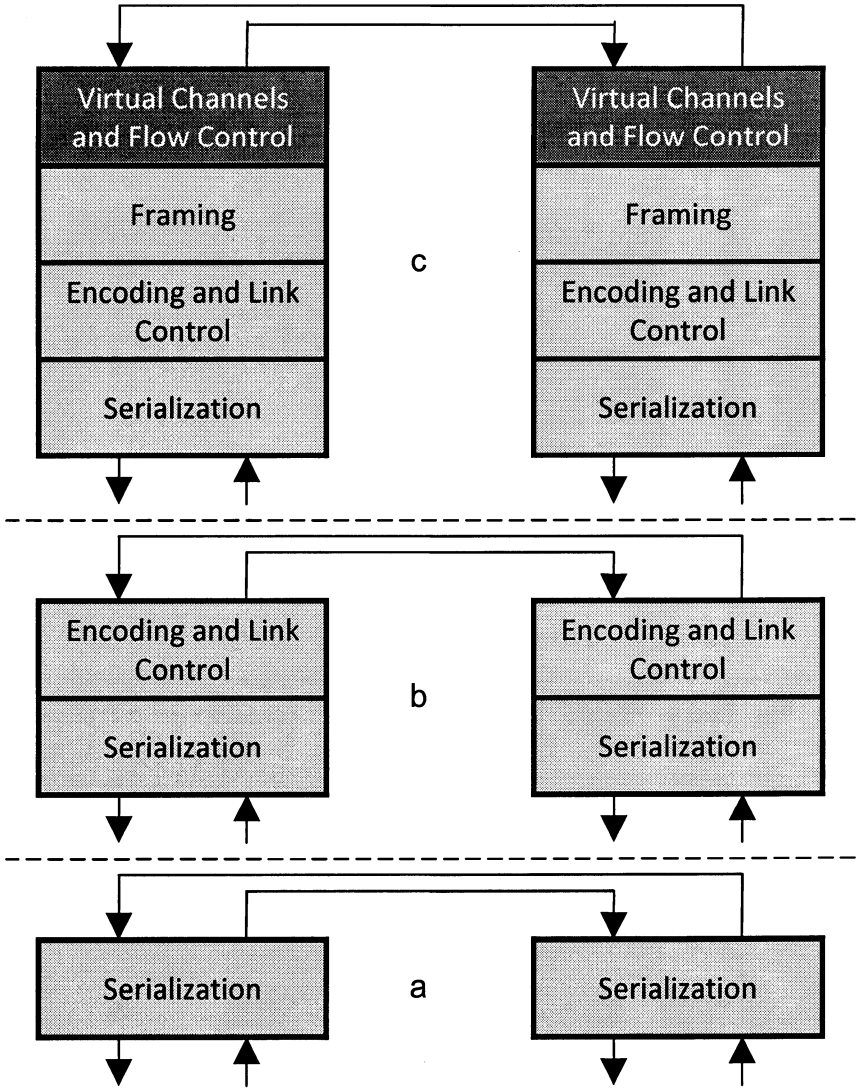

# General Findings

- 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



# 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




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