

SpaceWire standard revision

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ESTEC
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 - Technical presentations on issues to be possibly included in the next revision of the standard
3. Conclusion
 - a. Achievements
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1. SpW users (mainly the Working Group) have detected a number of ambiguities in the ECSS-E-ST-50-12C Standard.
 - a. unclear concepts (e.g. SpW nodes, usage of Time-codes)
 - b. non-systematic writing rules (clauses and comments are sometimes mixed)
2. SpW users (mainly the Working Group) have proposed a number of new features to be introduced in SpaceWire.
 - a. configuration port 0 in nodes
 - b. signalling codes to carry interrupts across the network
 - c. half-duplex and/or simplex links
3. Trade-off: **improvement vs interoperability**

1.b Interoperability – a MUST (1/4)



1. For system designers (ESA and prime)
2. For vendors
3. For ESA (Industrial Policy and Procurement Policy)

To what level?

Backward compatibility (only)

1. All devices complying to the updated standard shall accept and process ECSS-E-ST-50-12C packets (all layers are compatible) but are only allowed to send SpW-update packets to/through ECSS-E-ST-50-12C compliant devices.
 - a. Full interoperability at electrical level, at least up to a certain data rate (alternative of having auto-selectable signal layer is not an option)
 - b. No change at character level (no room for new characters except through the use of "Time-code" control flag)
 - c. Only additions at packet/network level, i.e. introduction of new protocols with proper PID (ECSS-E-ST-50-51C)
2. Makes technical design of the new features *rather* easy
3. Limits interoperability
 - a. The introduction of one single ECSS-E-ST-50-12C compliant device into an SpaceWire-update enabled subnetwork may forbid the usage of SpW new features in this subnetwork.
 - b. E.g. one single ECSS-E-ST-50-12C-only compliant device will probably not prevent network discovery (and therefore PnP) but may lead to system instability if the network discovery messages trigger unexpected messages from this node.

Full compatibility (backward and forward)

1. All devices complying to the updated standard
 - a. shall accept and process ECSS-E-ST-50-12C packets (all layers are compatible)
 - b. **and** are also allowed to send SpW-update packets to/through ECSS-E-ST-50-12C compliant devices without triggering unexpected behaviour.
2. Makes technical design of the new features rather complex
3. Preserves interoperability
 - a. The introduction of one single ECSS-E-ST-50-12C-only compliant device into an SpaceWire-update enabled subnetwork does not forbid the usage of SpW new features in this subnetwork.
 - b. E.g. one single ECSS-E-ST-50-12C compliant device does not prevent network discovery and therefore PnP and does lead to unexpected traffic.

1.b Interoperability (4/4) – examples in ground applications



1. Some commercial applications provide full compatibility
 - a. Plugging a USB 1.1 device onto a USB 2.0 host will allow the device to operate fully through USB 1.1 services; plugging a USB 2.0 device onto a USB 1.1 host will allow the device to operate its main features fully through USB 1.1 services
 - b. Connecting a 10Base-T Ethernet device to a 100Base-T device will simply result in 10Mbps Ethernet communication.
2. Most commercial applications provide only backward compatibility
 - a. You can run any legacy “X-os” software on any later version of the “X-os” operating system but not the opposite.
3. “Backward compatibility +”?
 - a. A ping to a none ping-enabled IP device will not return any pong (thus preventing device detection) but will not disturb any of the two devices.

1.C ESA funded support activities



1. ESA funded activities aimed at supporting SpW standardisation
2. Mix of design (**protocol specification**) studies and **breadboarding for validation**
3. ECSS-E-ST-50-12C update/revision
 - a. Closed ITT “SpaceWire Evolutions”, 150k€, December 2010
 - Expected kick-off in May
 - Preliminary results for the next SpW WG meeting (Sept.)
4. SpW-PnP
 - a. Closed ITT “Network Discovery Protocols”, 200k€, December 2010
 - Expected kick-off in May
 - Preliminary results for the next SpW WG meeting (Sept.)
5. SpaceWire 2
 - a. No activity in ESA R&D plans (GSP, TRP, GSTP, etc)
 - b. Inputs and technical suggestions are welcome (D. Jameux)

2. SpaceWire standard revision – Overview



1. Part I:

- a. Presentation by D. Jameux et al. and endorsement by the SpW Working Group of the Change Request dispositions proposed to ECSS. These dispositions are based on the outcome of the discussions during SpW WG mtg#15 Session 3.

2. Part II:

- a. Presentation by D. Jameux et al. of the Change Requests (submitted to ECSS) for which no disposition was agreed upon during SpW WG mtg#15 Session 3; elaboration and endorsement by the SpW Working Group of dispositions to be proposed to ECSS
- b. Technical presentations on issues to be possibly included in the next revision of the standard

2.a SpW standard revision Part I – Presentation/Voting process (1/4)



It is your last chance
to defend your
position !!

1. For each technical category or sub-category:
 - a. Verbatim of the Change Requests
 - Reference Number, impacted section(s) and page(s)
 - Proposed Change, Justification, Disposition (“firm” or “proposed”)
 - b. “Show of hands” vote on the (proposed) disposition
 - c. Recording of the vote
 - d. In the case of proposed disposition, the Working Group may devise some updated wording before submission to vote.

Your vote will make
the disposition
proposed for ECSS
standardisation !!

Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

2.a SpW standard revision Part I – Presentation/Voting process (2/4)



Endorsement of disposition by the SpW Working group		
In favour: 25	Against: 0	Abstaining: 5

1. Topic
1.1 Sub-topic

CR# 1	Whole document	All pages
6. Changes	7. Justification	8. Disposition
Do not change a word!	The document is perfect as it is.	<i>Proposed change approved.</i>

2.a SpW standard revision Part I – Presentation/Voting process (3/4)



Endorsement of disposition by the SpW Working group		
In favour: 25	Against: 0	Abstaining: 5

1. Topic
1.1 Sub-topic

CR#	2	Whole document	All pages
6. Changes	7. Justification	8. Disposition	
Re-write the whole document from scratch	To adapt the spec to the datasheet of my device	<p><i>PROPOSED DISPOSITION</i> <i>Please go for it if you are ready to produce the first draft and get the whole Working Group agree on your version ;-)</i></p>	

This is a work of fiction. Any similarity to persons living or dead (unless explicitly noted) is merely coincidental.

2.a SpW standard revision Part I – Presentation/Voting process (4/4)



1. It is going to be a lengthy process:
 - a. 52 formal Change Requests
 - b. Consensus-based show-of-hands for each
 - Not a formal vote
 - To express commitment
 - and identify non-consensual issues
 - c. But there are many duplicates (-> shorter than it seems)
2. **ECSS rely on endorsement of Change Requests by the SpW Working Group before starting the formal standardisation process.**



ECSS Change Request / Document Improvement Proposal

1. Originator's name: David Jameux

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: ESA/ESTEC

3. Date: 7 March 2011

e-mail: david.jameux@esa.int

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Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

NOTE: In the column “7. Justification” of the tables below, the references in brackets [...] refer to the Change Request numbers in “Annex 1: Change Requests collected from the SpaceWire Community”

1. General

1.1 Structure of the document (2)

CR#	1	Whole document	All pages
6. Changes	7. Justification		8. Disposition
<p>Re-write the standard according to the current ECSS drafting rules.</p> <p>Revisit the whole document so that each clause contains only a single requirement and that each requirement expresses a single need. Remove hanging clauses.</p> <p>Clearly separate informative and normative material</p> <p>Remove a number of ambiguities raised by the SpW users (mainly the Working Group).</p>	<p>As reported in [0] and [1]:</p> <p>A number of ambiguities identified by the SpW Working Group may lead to different implementations and limit the interoperability of unit/device vendors.</p>		<p><i>Proposed change approved.</i></p>

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

1. General

1.1 Structure of the document

CR#	2		Whole document	All pages
6. Changes	7. Justification		8. Disposition	
Introduce new backward compatible features raised by the SpW users (mainly the Working Group).	As reported in [86], [48], [51], [52], [53], [54], [55], [46], [47], 49], [61], and [62]: These additional features are considered necessary for the deployment of SpaceWire networks by the SpaceWire community.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>The principle of introducing new backwards compatible features is approved. The disposition of the proposed individual new features is handled in the respective Change Requests</i></p>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

1. General

1.2 Careful revision of some definitions (2)

CR#	3	Whole document	All pages
6. Changes	7. Justification	8. Disposition	
<p>Clarify definition and behaviour of “nodes” and review all node-related requirements. The term node should be only used as abstract end point (terminal) of the network and not for a physical unit.</p> <p>Introduce a different term (e.g. device) for electronic modules or units in the network which can contain one or more SpaceWire interfaces.</p> <p>Introduce a single configuration ports for devices and the permission to contain a routing capability. Remove a number of ambiguities raised by the SpW users (mainly the Working Group).</p>	<p>As reported in [3], [4], [94], [95], [98] and [100]:</p> <p>Some requirements in ECSS-E-ST-50-12C refer to the term “node” as some electronic module or unit comprising one or several SpW interfaces while other requirements refer to the term “node” as the SpW interface itself as a terminal of the network. This has been creating a lot of confusion, specifically when trying to define other protocols operating on top of SpaceWire.</p> <p>Amongst the related confusion is the Time-code usage in particular and time distribution in general, which is severely impacted by the definition of a “node”.</p> <p>Another source of confusion is whether a packet with unexpected destination address shall be discarded, since RMAP does not follow this rule.</p> <p>Moreover, the design of SpaceWire higher level protocols such as Plug-And-Play require a clear definition of items to be discovered in a SpW network, and the assignment of a configuration port to each of these items.</p> <p>At last, some discussion in the SpW WG is ongoing whether aligning the definition of nodes to the one of routers (with e.g. the possibility for nodes to switch characters/packets) would clarify this definition and help supporting PnP.</p>	<p>Clarify the terms “port”, “link”, “interface”, “router”, “node”, “end-point”, etc. w.r.t. SpaceWire as part of the revision of the standard.</p>	

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

1. General

1.2 Careful revision of some definitions

CR#	4	Whole document	All pages
6. Changes	7. Justification		8. Disposition
Carefully improve the protocol description and consistency formalism (clear layering) and precise the use of some terms (e.g. switching instead of routing) and clearly describing for each protocol “level” the description of syntax, synchronisation, semantics; and include a description of the Service Access Points.	As reported in [2], [11], and [99]: SpW does not involve routing (OSI layer 3) but only switching (OSI layer 2). In literature the term Wormhole switching is widely used as a synonymous of wormhole routing. However, the development of SpaceWire higher level protocols in general and the SOIS stack in particular involves routing. The use of this term at SpW level therefore may create confusion. Moreover, the ECSS-E-ST-50-12C Standard mixes for each protocol “level” the description of syntax, synchronisation, semantics; and it does not describe the Service Access Points. The advantage is that it facilitates the first reading/understanding of the major features of SpaceWire but it also increases the risk of ambiguities when it comes to detailed understanding and implementation		Keep the overall layering as it is but remove any kind of (minor) mixing/overlap between layers in the current standard and clearly define Service Access Points.

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

1. General

1.3 Streamlining references to other standards (1)

CR#	5	Sections 2 & 3.2	Pages 14 & 15
6. Changes	7. Justification	8. Disposition	
Streamline references to other standards	As reported in [5], [6], and [22]: Some of the normative references must be removed or updated. The related terms and definitions must then be updated.	Remove references to ECL, PECL and 1355-1995, especially in the normative parts of the standard. Keep the description of the DS encoding as part of the SpaceWire standard, unless it is shown that a better description can be found elsewhere. Note: The issue of the connector and the soldering and crimping standards is still open. This issue might disappear if the new standard does not specify manufacturing processes anymore (see section 2. Physical layer requirements).	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

2. Physical layer requirements (1)

CR#	6	Sections 5 & 6	Pages 31 to 51
6. Changes	7. Justification	8. Disposition	
Update the way the Physical channel is specified (cable assembly or backplanes).	<p>As reported in [39], [40], [13], [33], [12], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], and [32]:</p> <p>The specification of the SpW cable assembly (cable and connector) in terms of mechanical and physical properties is far too detailed in ECSS-E-ST-50-12C. In the past there have been a number of cases where the specified cable construction did not meet the mission needs (e.g. cable too heavy or too stiff or too high loss, etc). There is a general consensus in the SpW community that only the electrical, physical parameters of the cable assembly (e.g. Differential Impedance, Signal Skew, Return Loss, Insertion Loss, Near-end Crosstalk, Far-end Crosstalk, etc.) should be specified. The exact physical parameters and their values still need to be defined. Similarly, the SpW community would like to keep the existing connector (submicro-D) for SpW but generally recognise that several connectors have to be allowed, in order to avoid too many mismatches with mission needs. At least one other connector was identified.</p> <p>Moreover, the shielding scheme must be redesigned to allow intermediate connectors and improve EMC. Some new scheme has been proposed and will soon be validated through breadboarding.</p> <p>At last, SpaceWire links are often used within a unit or electronic box. The current SpaceWire standard contains some requirements on PCB and backplane tracking but no requirements on backplane connectors or backplane construction.</p>	Specify only the type and pin allocation of the connector; and electrical properties of the cable assembly. Consider one or two additional complementary connector types for inclusion in the standard.	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution (29)

CR#	7	Sections 7 & 8	Pages 31 to 51
6. Changes	7. Justification	8. Disposition	
Clarify time distribution	<p>As reported in [44], [45], [59], [69], [72], [73], [74], [75], [76], [77], [78], [79], [84], and [85]:</p> <p>Some clarification is required regarding the specification of the time distribution. The time distribution and the time interface are defined in 8.12 and 7.7. Some of the requirements are ambiguous and not well structured. This is in particular the case when it comes to the handling of error cases.</p> <p>There is for example a lot of debate within the SpW community whether only one or multiple nodes can issue Time-codes and whether they are then considered time masters.</p>	<p>PROPOSED DISPOSITION</p> <p><i>Clarify the time-code distribution. The requirements concerning the time distribution should be at only one place in the document.</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR# 2		Section 7.7d	Page 56
6. Changes	7. Justification	8. Disposition	
Remove and clarify in 8.12.2	Specified in 8.12.2 since only one node or router is allowed to be time-master. It is not appropriate to have time distribution specifications in this section as it should only specify the signal interface. 8.12.2 specifies that “only a single link interface shall manage the distribution of time”. This should be worded as it does not make sense if a router is used as the time master.	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. Time-code distribution should be described only in one place. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR# 18		Section 7.7d	Page 56
6. Changes	7. Justification	8. Disposition	
Remove and clarify in 8.12.2	Specified in 8.12.2 since only one node or router is allowed to be time-master. It is not appropriate to have time distribution specifications in this section as it should only specify the signal interface. 8.12.2 specifies that “only a single link interface shall manage the distribution of time”. This should be worded as it does not make sense if a router is used as the time master.	PROPOSED DISPOSITION <i>Proposed change approved. Time-code distribution should be described only in one place. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Pinsard

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: CEA

3. Date: 19/02/2010

CR#	CR-E-ST-50-12C_03	Section 7.7	Page 54
6. Changes		7. Justification	8. Disposition
<p>i. high time-synchronisation resolution option: On the transmitter part:</p> <ul style="list-style-type: none"> When a high resolution synchronisation is needed a jitter-correction Time-Code could be sent just after the usual Time-Code that carries the six-bit time. This jitter-correction Time-Code is built as follow: <ul style="list-style-type: none"> the two control flags are set to One in order to avoid any confusion with any other use of the Time-Code The Four lowest bits are equal to the number M of bits sent between the Tick-In signal assertion and the output on Dout of the first data-control flag bit of the Time-Code (ESC data-control flag bit) The two left bits are reserved for future use and shall both be set to zero. <p>On the receiver part:</p> <ul style="list-style-type: none"> A synchronisation signal shall be asserted after a number (64 minus M) of receiver bits from the arrival of the first data-control flag bit of the Time-Code (ESC data-control flag bit). 		<p>To improve the time synchronisation the following requirement could be added to the SpaceWire standard in section 7.7 time interface</p> <p>The implementation of this requirement is low resource consuming and will allow SpaceWire to be use were high accuracy synchronisation is needed (better than 10µs)</p>	<p><i>Proposed change discarded for SpaceWire Revision D but kept as input to SpaceWire 2</i></p>

Dispositions:

Accept and implement the change as proposed

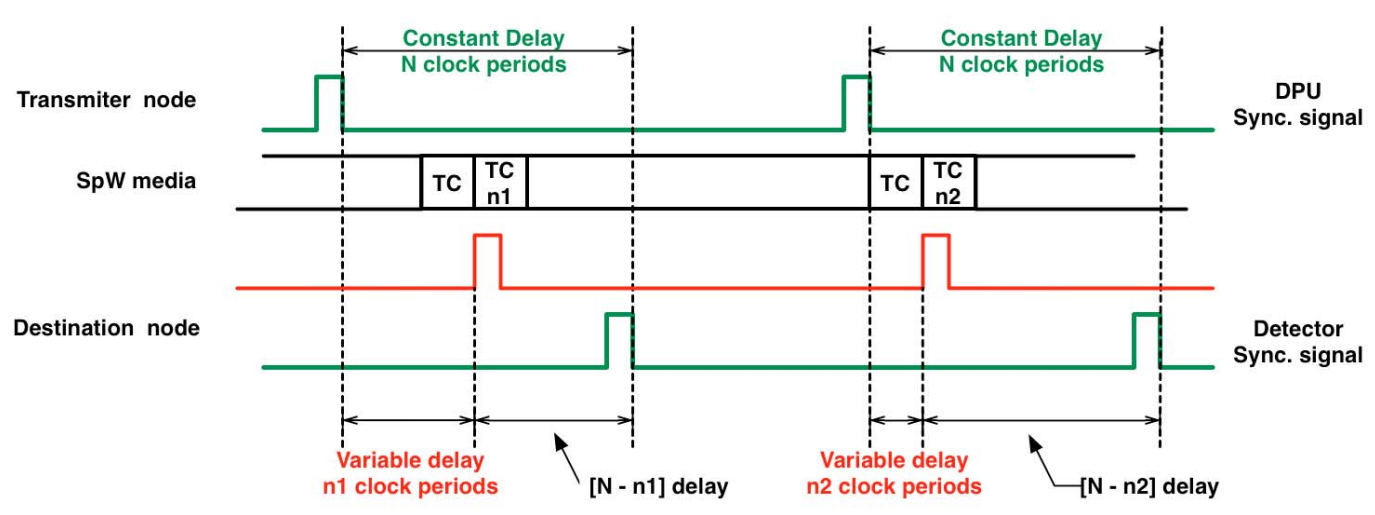
Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)

SpaceWire synchronization issue

- Synchronization performance of SPACEWIRE standard :
 - The difference between the longest and shortest time depends on the character being sent. It is in the order of 10 transmission clocks and for 200 Mbps it is in the range of 50 ns. The problem is compounded for each link interface the Time Code passes. (Gaisler presentation on the 15th SpaceWire Working Group Meeting)
- How to improve this figure ?
- Principle is to send along with the TIME-CODE its transmission delay to the receiver
 - This transmission delay is sent by the mean of a second TIME-CODE control code
 - The destination node takes into account this delay to create a synchronization signal with a fixed delay w.r.t. initial time-code request



- **This proposal solve the Jitter problems for current Spacewire version.**
- **It's low resource consuming solution and it's been already fully tested!**

SpaceWire synchronization issue

l r f u



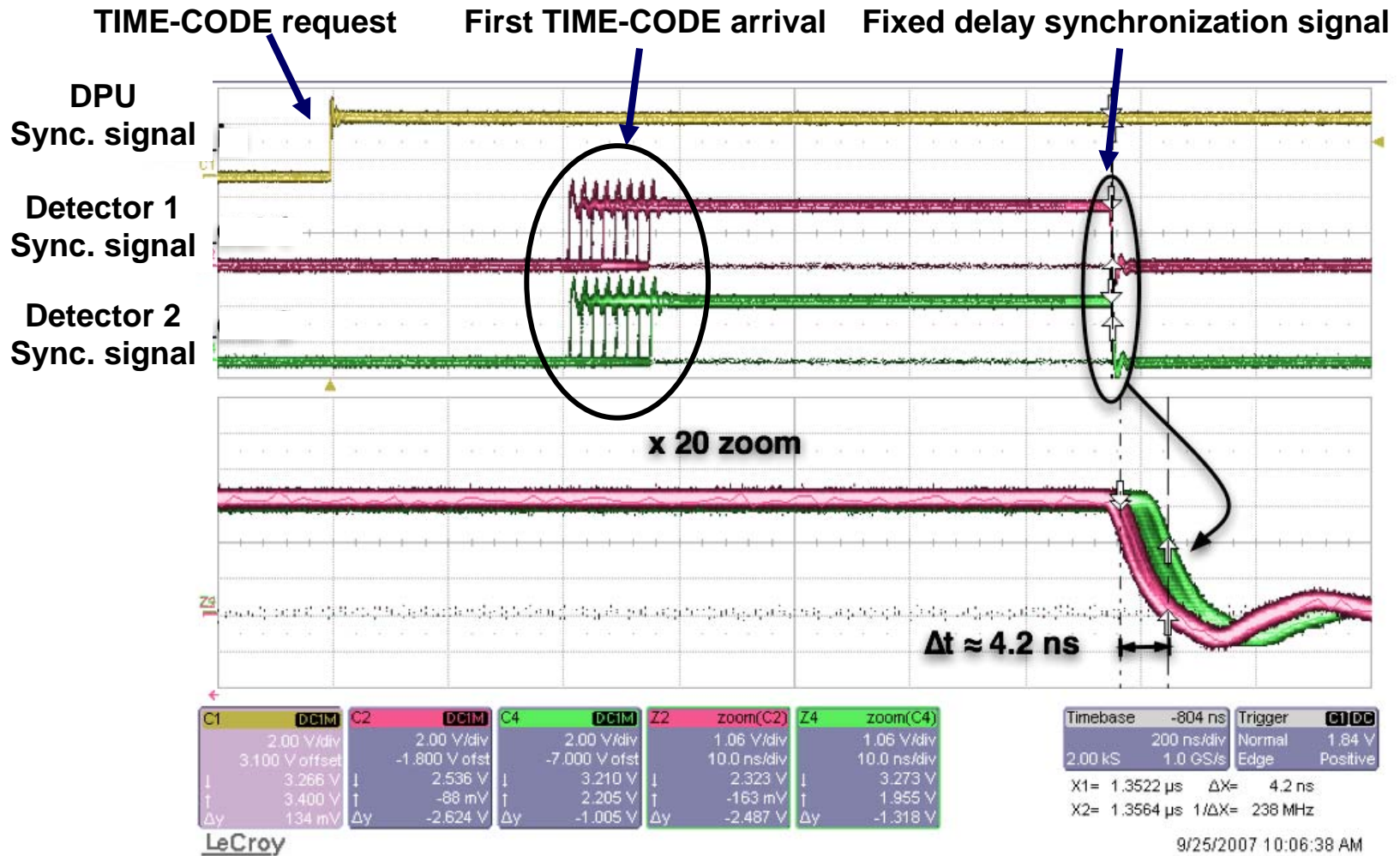
saclay

- In the current proposal:
 - This jitter-correction Time-Code is built as follow:
 - the two control flags are set to One in order to avoid any confusion with any other use of the Time-Code
 - The Four lowest bits are equal to the number M of bits sent between the Tick-In signal assertion and the output on Dout of the first data-control flag bit of the Time-Code (ESC data-control flag bit)
 - The two left bits are reserved for future use and shall both be set to zero.
 - The Two Control flag could also stay at 00 as this jitter-correction Time-Code can be identify because is right after the main TimeCode (with no other characters between this two time code)
 - The synchronization accuracy is independent of signalling frequency .

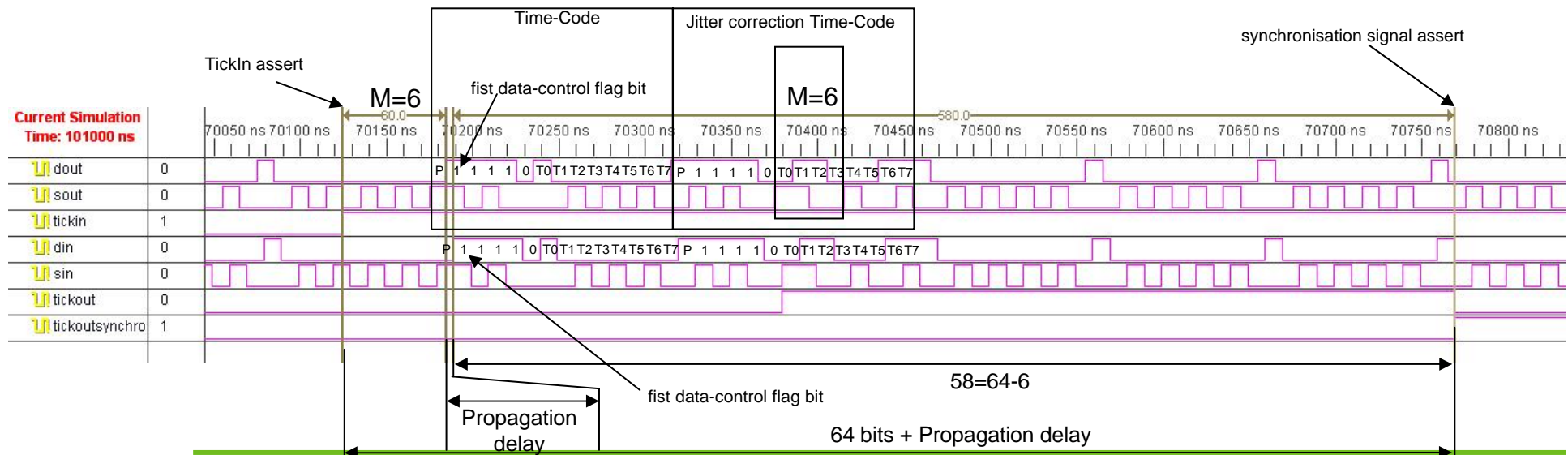
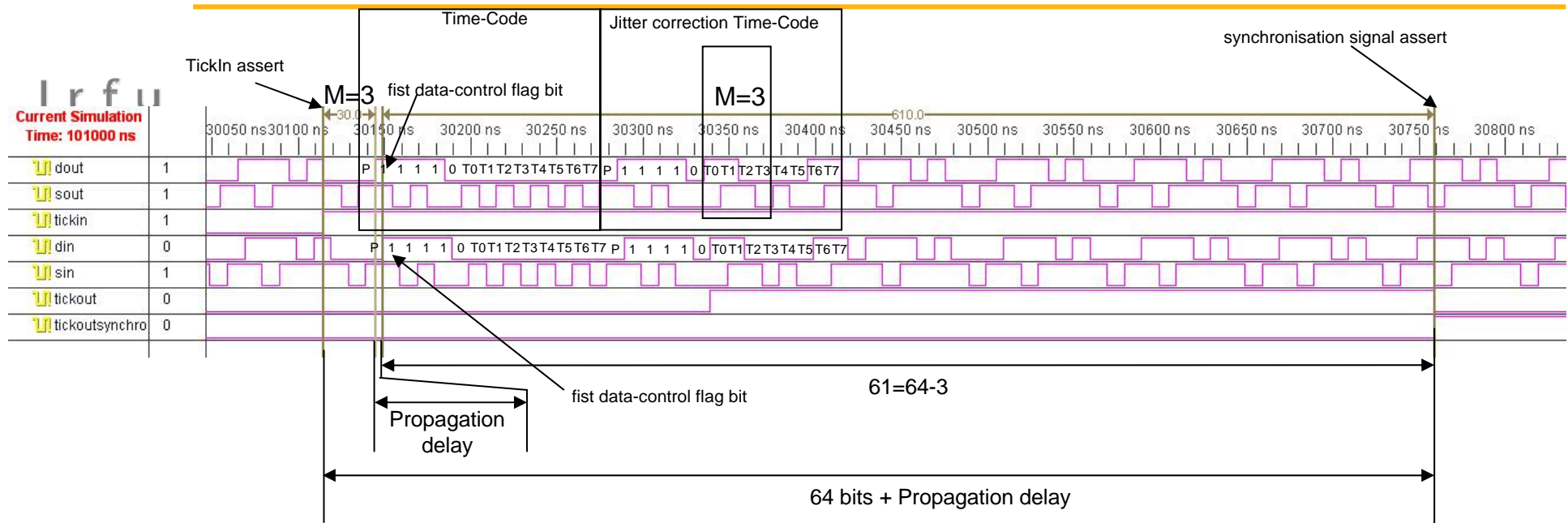
synchronization issue



- Experimental result



Examples



-
- Two new functions are added to the current SPACEWIRE codec:
 - One for the time transmission (TIME_TX)
 - Get TIME-CODE transmission delay
 - Send successively 2 TIME-CODES
 - One for the time reception (TIME_RX)
 - Computes compensation delay
 - Generates sync signal after compensation delay
 - Implementation is low resource consuming:
 - In an ACTEL RTSX-SU72 FPGA:
 - Combinational cells: 62 of 4024 (1.5%)
 - Sequential cells: 42 of 2012 (2%)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date:

CR#	1	Section 8.12.2b	Page 84
6. Changes	7. Justification		8. Disposition
<p>Replace with the following: At any moment in time there shall be only a single node or router, the time-master, managing the distribution of time. NOTE The node or router can use different link interfaces to transmit the time-codes. This allows for redundancy if a link is broken. NOTE It is allowed to switch the time mastery between different nodes or routers.</p>	<p>It is neither suitable nor feasible to restrict the time-code source to be a single link-interface. As there shall be only one time-counter in a node or router they shall be considered the source of the time-codes not a specific link interface. Redundancy is a desired feature in a SpaceWire network and thus it should be allowed for different link interfaces on different nodes or routers to handle the distribution of time as long as they are designed on system level not to do it at the same time.</p>		<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date:

CR#	2		Section 8.12.2c	Page 84
6. Changes	7. Justification		8. Disposition	
Remove	How a time-code is transmitted is clear from clause 7. This section should only specify how time is distributed that is how the time-counter is changed and how the value is propagated on a network.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]				

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date:

CR#	3		Section 8.12.2d	Page 84
6. Changes	7. Justification		8. Disposition	
<p>Replace with the following: To distribute time the time-master shall do the following:</p> <ol style="list-style-type: none"> The time-counter is incremented by one. The control flags are set to zero. A time-code is constructed from the new time-counter value and the control flags. The resulting time-code is transmitted on all link interfaces in the time-master. 	<p>Original description was not clear about where a time counter was located but indicated that one should be located in each link interface. This seems not to be what was actually intended from the beginning since other descriptive parts (8.4.2) of the standard indicate that when tick in is asserted then the time-code presented on a time-code input should be transmitted. This also seems to be in line with existing codec implementations such as the UoD codec. In my view the most reasonable thing to do is to entirely skip the talk of TICK_IN and similar signals in this section and only talk about what the clause title says that is: time distribution. It is specified how the time-counter is updated and to where the new time-count shall be sent. It should not specify how the time-code is transmitted. Clause 7 specifies a signal interface for time-codes. If one is present then a time-code should be transmitted as indicated there. Other implementations perhaps have the time distributor integrated in the link interface and does not need an external interface. Thus it is unnecessary to refer to specific signals here.</p>		<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]				

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date:

CR#	4		Section 8.12.2e	Page 84
6. Changes	7. Justification		8. Disposition	
Remove	Specified in 8.3 p, q, r, s.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]				

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#		19		Section 8.12.2e	Page 84
6. Changes		7. Justification		8. Disposition	
Remove		Specified in 8.3 p, q, r, s.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]					

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR#	1	Section 8.12.2f	Page 84
6. Changes	7. Justification	8. Disposition	
Remove	This clause is actually not as clear as it seems. It specifies that a time-master entity shall not try to transmit a time-code unless it has first checked that the link interface in question is in the run-state. Nowhere is a requirement written that says that a transmitter shall only transmit time-codes in the run-state. Clauses 8.3p,q, r and s have some requirements. 8.4.2 on page 60 also have some relevant text but it is descriptive. 8.5.2.7a states what is actually needed as a requirement but only as a NOTE which is thus descriptive. The part in the NOTE should be made an explicit requirement and this clause (8.12.2f) should be removed.	PROPOSED DISPOSITION <i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i>	
[final disposition]			

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#	20	Section 8.12.2f	Page 84
6. Changes	7. Justification	8. Disposition	
Remove	This clause is actually not as clear as it seems. It specifies that a time-master entity shall not try to transmit a time-code unless it has first checked that the link interface in question is in the run-state. Nowhere is a requirement written that says that a transmitter shall only transmit time-codes in the run-state. Clauses 8.3p,q, r and s have some requirements. 8.4.2 on page 60 also have some relevant text but it is descriptive. 8.5.2.7a states what is actually needed as a requirement but only as a NOTE which is thus descriptive. The part in the NOTE should be made an explicit requirement and this clause (8.12.2f) should be removed.	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR#	2	Section 8.12.2g	Page 84
6. Changes	7. Justification	8. Disposition	
<p>Replace with the following: When a Time-code is received on a node or router the following shall be done:</p> <p>4. Compare the time-count value of the time-code with the local time-counter.</p> <p>5. If the time-count value of the Time-code is one more modulo 64 than the current time-counter value the time-counter is updated and the updated value is transmitted on all link interfaces except the one it was received on.</p> <p>6. If the time-count value of the Time-code is equal to the current time-counter value nothing is done.</p> <p>7. If the time-count value of the Time-code is neither one more modulo 64 nor equal to the time-counter value the time-counter should be updated with the received value.</p>	<p>Previously the information in this replacement clause was spread out into several other clauses. I specify why these clauses should be removed and replaced with this one in the removal change requests for those clauses. It should also be specified explicitly that the calculations are done modulo 64. It is also specified that the node or router should send the time-code to all the ports except the one it was received on. The node or router at the originating port should already be updated but this is not a necessary requirement since even if the time-code is transmitted on the originating port it will not be propagated. This requirement could therefore perhaps be removed to ease implementation. The downside is that an unnecessary time-code is transmitted.</p>	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#	21	Section 8.12.2g	Page 84
6. Changes	7. Justification		8. Disposition
<p>Replace with the following: When a Time-code is received on a node or router the following shall be done:</p> <p>4. Compare the time-count value of the time-code with the local time-counter.</p> <p>5. If the time-count value of the Time-code is one more modulo 64 than the current time-counter value the time-counter is updated and the updated value is transmitted on all link interfaces except the one it was received on.</p> <p>6. If the time-count value of the Time-code is equal to the current time-counter value nothing is done.</p> <p>7. If the time-count value of the Time-code is neither one more modulo 64 nor equal to the time-counter value the time-counter should be updated with the received value.</p>	<p>Previously the information in this replacement clause was spread out into several other clauses. I specify why these clauses should be removed and replaced with this one in the removal change requests for those clauses. It should also be specified explicitly that the calculations are done modulo 64. It is also specified that the node or router should send the time-code to all the ports except the one it was received on. The node or router at the originating port should already be updated but this is not a necessary requirement since even if the time-code is transmitted on the originating port it will not be propagated. This requirement could therefore perhaps be removed to ease implementation. The downside is that an unnecessary time-code is transmitted.</p>		<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR#	3		Section 8.12.2h	Page 84
6. Changes	7. Justification		8. Disposition	
Remove	It is sufficient to state that it shall be checked that the time-count is one more than the time-counter value which is done in other clauses. This clause does not add any information.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]				

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#		22		Section 8.12.2h		Page 84	
6. Changes		7. Justification		8. Disposition			
Remove		It is sufficient to state that it shall be checked that the time-count is one more than the time-counter value which is done in other clauses. This clause does not add any information.		<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>			
[final disposition]							

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR#	4	Section 8.12.2i	Page 84
6. Changes	7. Justification	8. Disposition	
Introduce information to 8.12.2 g as specified in other change request.	As it is now it is not verifiable on its own since it specifies a situation when the procedure in the current 8.12.2 g does not apply.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#	23	Section 8.12.2i	Page 84
6. Changes	7. Justification	8. Disposition	
Introduce information to 8.12.2 g as specified in other change request.	As it is now it is not verifiable on its own since it specifies a situation when the procedure in the current 8.12.2 g does not apply.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR# 1		Section 8.12.2j	Page 84
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g. The relevant information from this clause is included in the new clause 8.12.2 g.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR# 24		Section 8.12.2j	Page 84
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g. The relevant information from this clause is included in the new clause 8.12.2 g.	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR# 2		Section 8.12.2k	Page 84
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g.	<i>PROPOSED DISPOSITION</i> <i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR# 25		Section 8.12.2k	Page 84
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR# 3		Section 8.12.2l	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR# 26		Section 8.12.2l	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	This clause is not individually verifiable since it violates the procedure specified in the current 8.12.2 g.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-02

CR# 4		Section 8.12.2m	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2 g.	It is not feasible to reset the time-counter when each individual link enters error-reset. Then the whole time distribution will be disturbed just because one link had a disturbance. It should instead only be specified that the time-counter shall be zero after reset/startup. The control flags do not need to be specified here since only the count is relevant to the time-distribution.	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#CR-E-ST-50-12C_01/SEQH-DG-T-10103-1 (time counter value after reset)</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-03

CR# 1		Section 8.12.2n	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2g.	This clause specifies the circumstances under which a time-code or the time-counter is considered invalid. The next clause (o) specifies what shall be done if the time-code is considered invalid but it is left to the implementer to determine which of the two cases apply.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR# 27		Section 8.12.2n	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2g.	This clause specifies the circumstances under which a time-code or the time-counter is considered invalid. The next clause (o) specifies what shall be done if the time-code is considered invalid but it is left to the implementer to determine which of the two cases apply.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-03

CR#	2	Section 8.12.2o	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2g.	This clause is not individually verifiable. It violates the procedure specified in the current 8.12.2 g. The actual behaviour has not been changed in the proposed 8.12.2 g but it could be argued that one change should be made. The current specification results in that after a time-code is lost it would take the number of additional time-code transmissions equal to the number of hops in the network until the complete network is synchronized again. This is probably not desirable. It is not good to leave this issue open for implementations to handle individually as it is currently.	PROPOSED DISPOSITION <i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i>	
[final disposition]			

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

CR#	28	Section 8.12.2o	Page 85
6. Changes	7. Justification	8. Disposition	
Remove. Information contained in new 8.12.2g.	This clause is not individually verifiable. It violates the procedure specified in the current 8.12.2 g. The actual behaviour has not been changed in the proposed 8.12.2 g but it could be argued that one change should be made. The current specification results in that after a time-code is lost it would take the number of additional time-code transmissions equal to the number of hops in the network until the complete network is synchronized again. This is probably not desirable. It is not good to leave this issue open for implementations to handle individually as it is currently.	PROPOSED DISPOSITION <i>Proposed change approved. The change will be implemented as part of the disposition to CR#7 (Clarify time-code distribution).</i>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

3. Time-code distribution

1. Originator's name: Hiroki Hihara

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: NEC TOSHIBA Space Systems, Ltd. / SpaceWire User's Group, Japan.

3. Date: 2010-02-20

CR#	CR-E-ST-50-12C_01/SEQH-DG-T-10103-1	Section 8.12.2m	Page 85
6. Changes	7. Justification	8. Disposition	
<p>After reset or disconnect-reconnect (state machine in ErrorReset state) the time-counters <u>in time master nodes and end nodes, excluding routers</u>, shall be set to zero and any control-flag outputs shall be set to zero. (under-lined words are to be added for changes)</p>	<p>Time-Counter Since SpaceWire routers are connected to multiple nodes, its internal time-counter does not have to be initialized after reset or disconnect-reconnect occurs in one port.</p> <ul style="list-style-type: none"> - The statement "After reset or disconnect-reconnect (state machine in ErrorReset state) the time-counter shall be set to zero and any control-flag outputs shall be set to zero." would not be suitable for router use. - Since a router accommodates several SpaceWire links, the internal counter, which is described as "the router's time-counter" in term k and l, should not be reset. In other words, one reset operation on a link should not have influence on other links. 	<p>The revised text shall express that the intention is not to reset time counters if a single SpW interface is reset but only if a whole device (node or router) is reset.</p>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

ECSS Change Request / Document Improvement Proposal

4. Introduction of new backward compatible features

4.1 Introduction of interrupt/signalling codes (1)

CR#	8	Sections 7 & 8	Pages 52 to 86
6. Changes	7. Justification	8. Disposition	
Introduce Interrupt distribution codes or more general low-latency signalling codes	<p>As reported in [86], [48], [51], [52], [53], [54], [55], [46], [47], and [49]:</p> <p>A possible use of one reserved state of the two “control bits” of the SpW standard to allow low-latency distribution of interrupts across SpW networks was presented to the SpW Working group several times. The technical solution was discussed thoroughly and improved.</p> <p>Some optimisation of this technique allowing low-latency distribution of any kind of signalling code, included but not limited to interrupts and time codes, was recently presented to the SpW Working group.</p> <p>Once validated by ESA through breadboarding, the feature will be ready for introduction into the new release of the standard.</p>	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Include the Distributed Interrupts or more general low latency signalling codes as a new feature in the revised standard. For this, one or more of the three reserved states of the two control bits shall be used.</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

4. Introduction of new backward compatible features

4.2 Introduction of simplex and/or half-duplex mode(s) (1)

CR#	29		Section 8	Page 57
6. Changes	7. Justification		8. Disposition	
Introduce simplex and/or half-duplex mode(s).	As reported in [61] and [62]: For many high speed payload data applications only a simplex connection from the instrument to the memory is required. In these cases the back channel provided by SpaceWire is often seen as unnecessary complexity and cable mass. It has been proposed to modify the SpaceWire codec and the state machine to support simplex operation. Also the possibility of a half-duplex SpaceWire implementation has been suggested.		PROPOSED DISPOSITION <i>Not to introduce simplex and half-duplex in the update of the SpaceWire standard unless more detailed explanations on the technical solution and on the impact on the current SpaceWire standard are provided very soon.</i>	
[final disposition]				

Dispositions:

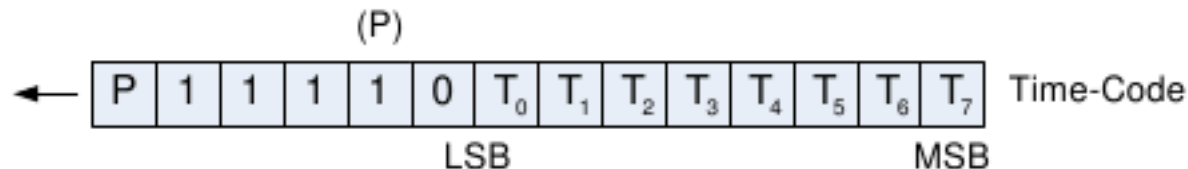
- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

Issue 1: Time-codes/Interrupt codes/Signalling codes

- Several proposals have been made to use the three control codes which are not yet specified.
- It has also been noted that they are not backwards compatible but that the impact is negligible in practice since implementations are done in a way supporting these new codes.
- The latter is NOT the case, which we will show in this presentation.
- Worth to note is that we think that Interrupt is a useful feature for SpaceWire that would be good to have in the standard but the potential problems of introducing it should not be underestimated.

Current Time-code specification

- Section 7.3 c defines the Time-Code control code as an ESC character followed by a data character.
- 7.3 d specifies that T0-T5 contain time information and T6-T7 contain control flags. Nothing is said about specific values thus all ESC+DATA characters are Time-Codes regardless of the value of T6-T7.



Current Time-code specification(2)

- The next specification relevant to Time-Codes is found in section 7.7. Clauses f-h specify that the control flags are reserved for future use and should be set to zero. But note that this section specifies the TIME INTERFACE not Time-Codes.
- Finally section 8.12 defines Time distribution. This section does not say anything about the value of the control flags. It does however somewhat mix definitions with section 7.7 since it specifies some things about the time interface signals.

Current Time-code specification(3)



- Clauses g-l and n-o specify how received Time-Codes should be handled. While some parts here are unclear as previously noted the only thing said about control flags is that they should be copied to the control flag outputs if the Time-count is +1.
- Thus there is nothing in the standard indicating that value 00 is the only valid Time-Code control flags.

Existing implementations

- Aeroflex Gaisler products are implemented so that the time-count qualifies the control flags. This means control flags are not checked.
- The same applies to the SpW-RTC and the COLE developed by RUAG (Saab Ericsson Space).
- Judging from the SpaceWire-AMBA (from ESA microelectronics website) documentation sections 5.4.3 and 3.3.6 it seems as it takes the whole Time-Code (bits 7 to 0) into account when checking the increment. There are 51 users of this IP according to the ESA website e.g. SCOC3, MDPA?
- Section 7.3.2 of the SpaceWire-b Codec also indicates that it always asserts Tickout when a time-code is received. Section 12.2.5 of the SpW standard requires a codec to implement section 8 which includes time-distribution requiring it to check the time-count increment.
- This does indicate that it is not safe to introduce new codes.

Implementation problems with new signaling codes

- Time-Codes have only one master and in practice the periodicity of the ticks are much lower than the clock cycle of the interface.
- This changes if general signaling codes are introduced. Interrupt codes for example could arrive from several different locations simultaneously.
- This requires buffering in a router
- There is now flow control as for data characters so the amount of buffering needed to guarantee delivery cannot be determined theoretically.
- In practice it might be possible to determine an amount of buffering for a specific case.

Summary of Issue 1 Time-Codes

- Ambiguities in the standard (as noted before)
- It does have significant impact to add new control codes with respect to existing implementations although the opposite has been suggested before.
- Interrupt codes is a useful feature but the problems with its introduction into the standard should be carefully analyzed.
- Having a set of different signaling codes using the existing control flags can be difficult to implement in a robust manner especially in routers.



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.1 Virtual channels (1)

CR#	9	Whole document	All pages
6. Changes	7. Justification	8. Disposition	
Remove all text related to virtual channels	As reported in [87], [88], and [97]: In several sections, ECSS-E-ST-50-12C hints at the possibility to implement “virtual channels” with Logical Addresses. This has created a lot of confusion amongst users and is not intrinsically part of SpaceWire but left to users (at application level).	<i>Proposed change approved.</i>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.2 Update state machine (2)

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-03-03

CR#	3		Section 8.5.2.7 a	Page 67
6. Changes	7. Justification	8. Disposition		
<p>Make the NOTE a requirement instead.</p> <p>8.5.2.7c The receiver is enabled.</p> <p>8.5.2.7d The transmitter is enabled to send Time-codes, FCTs, N-Chars and NULLs.</p>	<p>It is not specified in a requirement anywhere in the standard that the transmitter should be enabled to transmit all four character in the run-state. This is only written in descriptive text (and in the state diagram figure which is only referenced from descriptive text).</p>	<p>PROPOSED DISPOSITION</p> <p><i>Proposed change approved. The change will be implemented as part of the disposition to CR#10 (Change state diagram).</i></p>		
[final disposition]				

Dispositions:

Accept and implement the change as proposed

Refer the proposed change to the TA for disposition

Refine the proposed change for implementation (incl. justification)

Reject the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.2 Update state machine

1. Originator's name: Hiroki Hihara, Address: 10, Nisshin-cho 1-chome, Fuchu, Tokyo 183-8551, Japan 2. ECSS Document number: ECSS-E-ST-50-12C

Organization: NEC TOSHIBA Space Systems, Ltd. / SpaceWire User's Group, Japan.

3. Date: 2010-02-20

CR#	CR-E-ST-50-12C_02 / SEQH-DG-T-10103-2	Section 8.3e	Page 58
6. Changes	7. Justification	8. Disposition	
<p>Proposed addition is as follows on 8.3 e.;</p> <p>3. Credit count in the transmitter and the receiver might be checked, or the flow control could be re-established within upper protocol layers.</p>	<p>Due to some reasons, FCT transmission sometimes vanishes (“dead lock” in other words). One major cause of FCT disappearance is considered as the discrepancies of credit counters between an initiator and a target.</p> <ul style="list-style-type: none"> - Transmission error is considered in current specification, whereas some specific case, in that the credit counter in sending end becomes less than the one in receiving end due to some reason, has to be considered. - Strictly speaking, a credit counter in a receiving end, which corresponds to 8.3.c is not specified explicitly. 	<p><i>Proposed change discarded</i></p> <p>Document the issue and possible workarounds into the SpaceWire Handbook.</p>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.3 Router timeout (1)

CR#	12	Section 10	Pages 89 to 106
6. Changes	7. Justification	8. Disposition	
Add timeout to router specification (TBC)	<p>As reported in [90], and [91]: If a router stops receiving data due to an internal failure the packet is stuck and can block some paths in the network. It is difficult to detect and recover this situation from outside the routers. An effective method to recover from this failure condition is to introduce a timeout inside the routing switches which removes the stuck packet from the link after a certain period of time without movement.</p> <p>This feature is important to avoid failure propagation through the network and to allow local failure recovery without the need to power cycle the network.</p> <p>The details on how this optional timeout should be specified still have to be defined.</p>	<p>Introduce a requirement into the SpaceWire standard for a selectable timeout in each router. The possible values for these programmable time outs still have to be discussed and agreed. One of these possible values is infinity (i.e. it must be possible to disable the timeout). Routers do not have to implement all possible values for the timeout.</p>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.4 Specification of host interface (2)

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR#	2	Section 7.6	Page 55
6. Changes	7. Justification	8. Disposition	
The clause should specify everything without an explicit data width or require that everyone uses 8-bits+control bit. EEP and EOP could be specified with saying that the control bit is 1 and the lsb data bit is 0 (EOP) or 1 (EEP).	It seems unnecessary to have a lot of requirements for a specific implementation. It is better to write the requirement in general terms. Otherwise it should be specified that everyone MUST use 8-bit width.	PROPOSED DISPOSITION <i>Specify the use of 8 bits+control bit as Service Access Point to the SoW link interface; and that EEP and EOP are defined by the control bit set to 1 and the lsb data bit is 0 (EOP) or 1 (EEP); and add a note that recalls that an adaptation layer can be connected to this SAP to provide a higher level host interface. The change will be implemented as part of the disposition to CR#13 (Specification of host interface)</i>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

5. Miscellaneous

5.4 Specification of host interface

CR#	13	Whole document	All pages
6. Changes	7. Justification	8. Disposition	
Update the host interface description so as to limit its specification to the minimum required. The host interface specification should only contain the type of signals but not the exact format.	As reported in [58], [70], and [71]: It has been agreed at SpW Working Group level that the host interface description overlaps somehow with implementation requirements.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>For each layer, specify the interface as close as possible to the function in the form of Service Access Points.</i></p> <p><i>Possibly add notes that recall that adaptation layers can be connected to these SAPs to provide higher level or more complex interfaces.</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections (9)

1. Originator's name: Francois Bonnet

2. ECSS Document number: ECSS-E-ST-50-12C (31 July 2010)

Organization: CNES

3. Date of CR: 3 March 2010

CR#	CR-E-ST-50-12C_04	Figure 4-1	Page 26
6. Changes	7. Justification	8. Disposition	
Correct figure [voltage values indicated in the upper picture of Figure 4-1 appear to be wrong]	Indeed, if the voltage across the input resistor of 100 Ohm is 350mV, then the voltage indicated on the right of the arrows are wrong. It is not +250mV +400mV typical but +125mV +200mV typical. There is a ratio 2 between both values.	Change +250mV +400mV respectively to +125mV +200mV in Figure 4-1.	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

6. Editorial corrections

CR#	14	Figure 4-1	Page 26
6. Changes	7. Justification		8. Disposition
<p>Correct figure [voltage values indicated in the upper picture of Figure 4-1 appear to be wrong]</p>	<p>Indeed, if the voltage across the input resistor of 100 Ohm is 350mV, then the voltage indicated on the right of the arrows are wrong.</p> <p>It is not +250mV +400mV typical but +125mV +200mV typical.</p> <p>There is a ratio 2 between both values.</p>		<p>Change +250mV +400mV respectively to +125mV +200mV in Figure 4-1.</p>

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR#	3	Section 7.2	Page 52
6. Changes	7. Justification	8. Disposition	
Add specification in text that parity is sent first, then control bit and lastly data starting from the LSB	Currently it is only indicated in the figure with an arrow in what order the characters are transmitted. Only the data bit transmission order is explicitly specified in the text.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Add an explicit requirement defining the characters regardless of the figures. Add also an explicit requirement defining the transmission order of the bits.</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

CR#	15	Section 7.2	Page 52
6. Changes	7. Justification	8. Disposition	
Add specification in text that parity is sent first, then control bit and lastly data starting from the LSB	Currently it is only indicated in the figure with an arrow in what order the characters are transmitted. Only the data bit transmission order is explicitly specified in the text.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Add an explicit requirement defining the characters regardless of the figures. Add also an explicit requirement defining the transmission order of the bits.</i></p>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR#	4		Section 7.3	Page 53
6. Changes	7. Justification	8. Disposition		
An explicit requirement should refer to the figures as the definition of the characters. Also the transmission order of the bits should be explicitly stated.	Currently the figure is only referenced from a NOTE which is not according to ECSS standardization rules.	<p><i>PROPOSED DISPOSITION</i></p> <p><i>Add an explicit requirement defining the characters regardless of the figures. Add also an explicit requirement defining the transmission order of the bits.</i></p>		
[final disposition]				

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

CR#	16	Figure 7-2	Page 53
6. Changes	7. Justification	8. Disposition	
An explicit requirement should refer to the figures as the definition of the characters. Also the transmission order of the bits should be explicitly stated.	Currently the figure is only referenced from a NOTE which is not according to ECSS standardization rules.	<i>PROPOSED DISPOSITION</i> <i>Add an explicit requirement defining the characters regardless of the figures. Add also an explicit requirement defining the transmission order of the bits.</i>	
[final disposition]			

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group

In favour: 0

Against: 0

Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

CR#	17	Section 7.4a	Page 54
6. Changes	7. Justification	8. Disposition	
Remove.	It is already specified for both data characters and control characters in clauses 7.2 and 7.3 where a parity bit should be included. This clause should only specify how it is used.	<i>Proposed change approved.</i>	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR#	1		Section 7.4a	Page 54
6. Changes	7. Justification		8. Disposition	
Remove.	It is already specified for both data characters and control characters in clauses 7.2 and 7.3 where a parity bit should be included. This clause should only specify how it is used.		<i>PROPOSED DISPOSITION</i> <i>(same CR as CR#17)</i> <i>Proposed change approved.</i>	
[final disposition]				

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



Endorsement of disposition by the SpW Working group		
In favour: 0	Against: 0	Abstaining: 0

ECSS Change Request / Document Improvement Proposal

6. Editorial corrections

1. Originator's name: Marko Isomäki

2. ECSS Document number: ECSS-E-ST-50-12C

Organization: Aeroflex Gaisler

3. Date: 2010-07-01

CR#	1	Section 10.2.3i	Page 97
6. Changes	7. Justification	8. Disposition	
Define larger or remove requirement completely	This is not a requirement as larger is not defined which breaks the ECSS standardization rules.	Remove clause 10.2.3i.	

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

2. SpaceWire standard revision – Overview



1. Part I:

- a. Presentation by D. Jameux et al. and endorsement by the SpW Working Group of the Change Request dispositions proposed to ECSS. These dispositions are based on the outcome of the discussions during SpW WG mtg#15 Session 3.

2. Part II:

- a. Presentation by D. Jameux et al. of the Change Requests (submitted to ECSS) for which no disposition was agreed upon during SpW WG mtg#15 Session 3; elaboration and endorsement by the SpW Working Group of dispositions to be proposed to ECSS
- b. Technical presentations on issues to be possibly included in the next revision of the standard

2.b SpW standard revision Part II – Presentation/Discussion process (1/2)



1. For each technical category or sub-category:
 - a. Verbatim of the Change Requests
 - Reference Number, impacted section(s) and page(s)
 - Proposed Change, Justification, Disposition (“firm” or “proposed”)
 - b. one or more presentations by the CR initiator or by any body willing to contribute to the discussion
 - c. Discussion
2. For open points, additional requests for change and suggestions of technical solutions:
 - a. presentation by the initiator
 - b. Discussion

2.b SpW standard revision Part II – Presentation/Discussion process (2/2)



3. Goals

- a. Short term: The SpW WG to agree today on as many issues as possible
 - These agreements will be translated to proposed dispositions for the next SpW WG meeting
- b. Medium term: Endorse some disposition for these Change Requests at the next SpaceWire Working Group meeting
- c. Long term: Have these dispositions taken into account in the revised SpaceWire standard

4. Dispositions:

- a. Consolidated agreement on a disposition
- b. Preliminary agreement on a disposition
- c. Point still open

This session is
meant to be highly
interactive !!



7. Open points (Change Requests for which no disposition was proposed yet)

7.1 Clarification on the state machine (1)

CR#		Section 10.5.2	Page 101
6. Changes	7. Justification	8. Disposition	
Request that the state in which the SpaceWire link interface should be in during the spilling of a packet be defined.	Assume a large packet is being spilled on a SpW port. What state should the link halt in? Section 10.5.2 states that if an error is detected by either the source or destination node that the packet will be “spilled” if the pack being spilled is quite large it could take some time to rid the link of the error packet. f. Then goes on to state “the link shall not restart after an error until some N-Chars are read...” it does not state the state the SpW link should be in while/after the packet is spilled. Should the link be in the ErrorWait state? Ready state and not send data until some N-Chars are received? (per section 8.5 figure 8-2)		

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

7. Open points (Change Requests for which no disposition was proposed yet)

7.2 Update the state machine (1)

CR#	10	Section 8.5	Page 63
6. Changes	7. Justification		8. Disposition
<p>Change state diagram.</p>	<p>As reported in [65], [66], and [67]: During the implementation of the SpaceWire codec some inconsistencies in the transitions described in the state diagram have been identified.</p> <p>a) The transition from Started to ErrorReset is impossible when gotNULL condition is set.</p> <p>b) The transition from Connecting to Run shall be applied only after sending FCT to channel.</p> <p>These inconsistencies will have to be corrected by making some slight modifications of the standard text and state diagrams.</p>		

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

7. Open points (Change Requests for which no disposition was proposed yet)

7.3 Clarification Time-codes and introduction of Interrupt/signalling codes (presentation)

[presentation by Marko Isomäki (Gaisler/Aeroflex) on clarification of Time-codes and introduction of Interrupt/signalling codes]

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

7. Open points (Change Requests for which no disposition was proposed yet)

7.4 Clarification of the “node” definition (presentation)

[presentation by Marko Isomäki (Gaisler/Aeroflex) of Comments on the possible redefinition of nodes and other terms]

Dispositions:

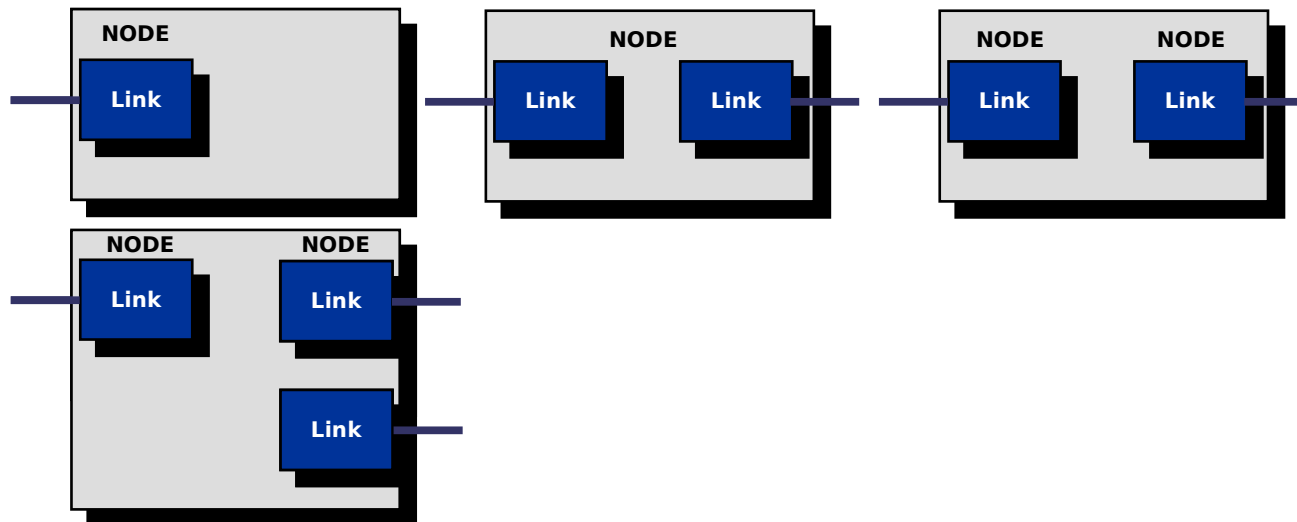
- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

Issue 2: Redefinition of Node

- The whole discussion should aim at a pragmatic rather than a philosophical approach. The biggest driving factor is PnP?
- The SpW standard specifies a set of requirements for routers: physical/logical addressing, wormhole routing, configuration port 0 etc.
- A set of ports/links fulfilling these requirements could be considered a router (including the configuration port which is not a node).
- All other ports/links belong to nodes. There should be no restrictions on if they should be located in one chip, board etc.
- It is more relevant to concentrate on SpW related requirements such as in how many places a time-counter should be located (e.g. one in every node) and whether they should have individually configurable addresses.
- A node should also be free to contain routing functionality (but if it is standard compliant it should be advertised as a router).

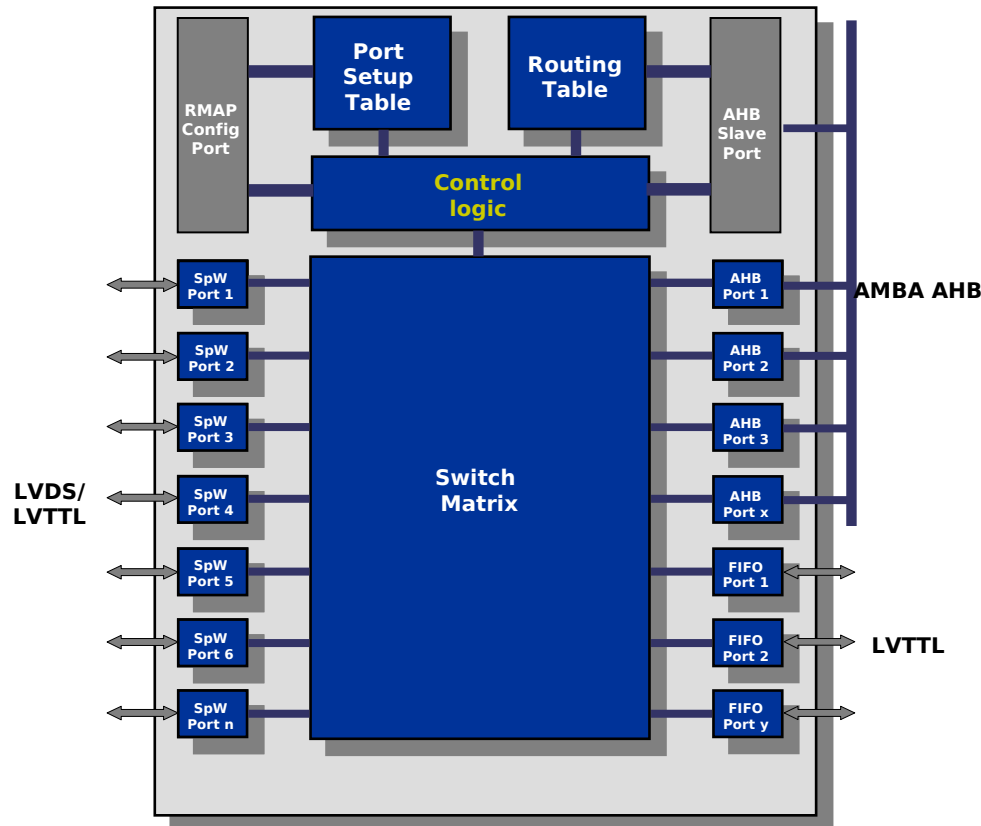
Redefinition of Node(2)

- One way to go could be that a node should have unique (range) of addresses but the time-counter could be optional.
- A host system with CPU could for example have multiple nodes (depending on what the definition is) and it this might require it to have several time-counters although unnecessary.
- SpaceWire does support address less point to point links but from the viewpoint of PnP this is not relevant.



Redefinition of Node(3)

- The type of a port should not matter in the case of a as long as all fulfill the data and time-code traffic requirements.
- The standard should not limit practically useful architectures.
- The Aeroflex Gaisler router for example has three port types, all capable of accepting and generating time-codes and data.



7. Open points (Change Requests for which no disposition was proposed yet)

7.5 New Change Request regarding broadcast/multicast (presentation)

[presentation by Marko Isomäki (Gaisler/Aeroflex) of Comments on Broadcast/multicast change request by professor Sheynin]

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

Issue 3: Broadcast/multicast

Change request regarding broadcast/multicast by professor Sheynin lacked a disposition.

It is a useful feature and the standard is overly restrictive at the moment. As long as there is not more than a unidirectional route between any pair of routers for a distribution address no infinite loops can occur.

The following in the standard should be removed as it is not broadcast or multicast, it is unicast. Suggestions for higher level protocols should be in a handbook.

“Broadcast and multicast can be implemented at a higher level by sending a packet to all (broadcast) or several (multicast) nodes on a network, one after the other. “

7. Open points (Change Requests for which no disposition was proposed yet)

7.6 Service Access points for SpaceWire (presentation)

[presentation by Valentin Olenev (SUAI) of a draft SAP specification for SpW standard revision]

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)



SpaceWire Service Access Points

Olenev Valentin

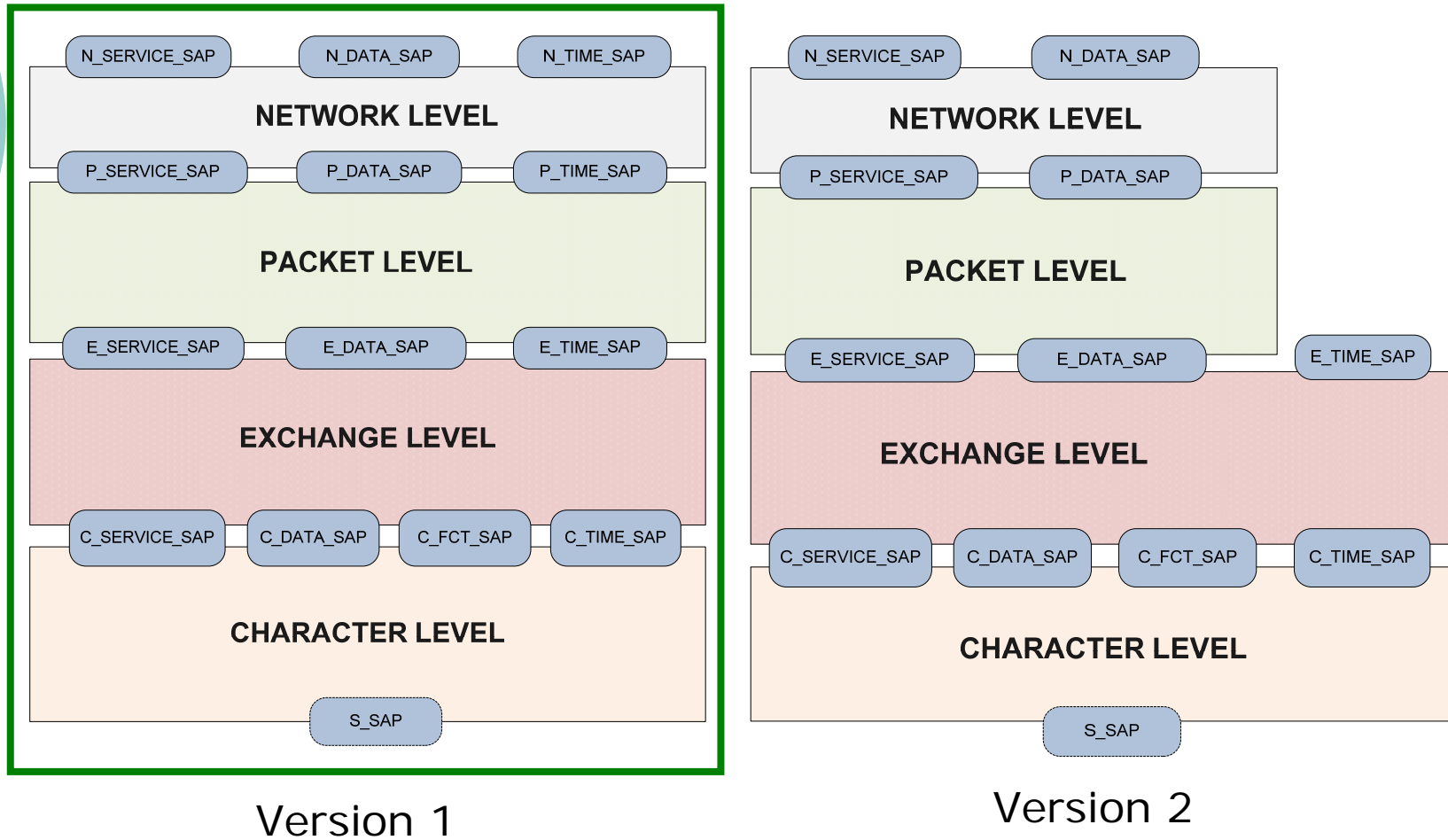
Saint-Petersburg University of Airspace Instrumentation



Service Access Points (SAP)

- Service Access Points (SAPs) - services are provided by lower levels and used by upper levels.
- Every SAP is named after the level whose services it uses (e.g. C_TIME_SAP).
- SAPs consist of a number of Primitives.
- Primitives are typed messages, with an optional parameter list, that are exchanged between levels.
- The following naming suffixes are used for the primitives:
 - Request primitive – **REQ** – requests the level to perform some action;
 - Indicate primitive – **IND** – indicates level that some action is performed in the lower levels of on the other end of link.

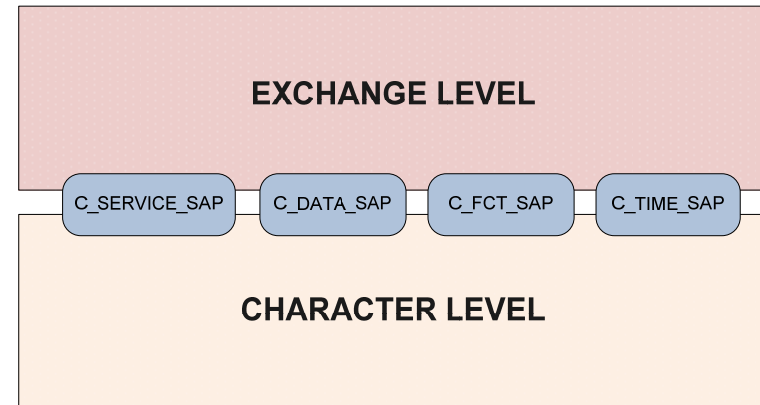
SpaceWire SAPs place in the stack



In the current document we use the Version 1.

C_SAPs

- The C_SAPs provide an interconnection between the Character level and the Exchange level by transmitting data from one level to another in both directions.



- There are four service access points:
 - **C_TIME_SAP** – SAP for transmission of Time-Codes;
 - **C_DATA_SAP** – SAP for transmission of data characters, end of packet markers and NULL codes;
 - **C_SERVICE_SAP** – SAP for transmission of control data and information about errors;
 - **C_FCT_SAP** – SAP for transmission of FCTs.



C_TIME_SAP

- C_TIME_SAP provides Time-Codes transmission between the Character level and the Exchange level.
- The primitives used in this SAP are:
 - C_TimeCode.Req (TimeCode)
 - C_TimeCode.Ind (TimeCode)

Name	Type	Value	Description
TimeCode	Byte	0..63	Defines the value of system time to be distributed across the network. Bits number 6 and 7 are control flags



C_TimeCode.req

The semantics of this primitive are:

C_TimeCode.req (TimeCode)

When Generated

- The Exchange level shall generate C_TimeCode.req primitive when it has a Time Code to transmit to the Character level.

Effect on receipt

- The transmitter of the Character level shall generate a Time-Code and send it on the link. Time-Code shall be formed from ESC followed by a single data character which holds six bit of system time value and two control flags.



C_TimeCode.ind

The semantics of this primitive are:
C_TimeCode.ind (TimeCode)

When Generated

- The Character level shall generate C_TimeCode.ind primitive when it has a Time Code to transmit to the Exchange level.

Effect on receipt

- If the state machine is in the *Run* state, then the time code shall be passed to the overlying level.



C_DATA_SAP

- C_DATA_SAP provides transmission of data characters, end of packet markers and NULL codes between the Character level and the Exchange level.
- The primitives used in this SAP are:
 - C_Data.req (Data)
 - C_Data.ind (Data)
 - C_EOP.req ()
 - C_EOP.ind ()
 - C_EEP.req ()
 - C_EEP.ind ()
 - C_NULL.req ()
 - C_NULL.ind ()

Name	Type	Value	Description
Data	Byte	0..255	Data byte



C_Data.req

- The semantics of this primitive are:
C_Data.req (Data)

When Generated

- The Exchange level shall generate C_Data.req primitive when it has a data character to transmit to the Character level.

Effect on receipt

- The Character level shall send a data character on the link if its credit count more than zero. After it the credit count shall be decremented by one.



C_Data.ind

- The semantics of this primitive are:
C_Data.ind (Data)

When Generated

- The Character level shall generate C_Data.ind primitive when it has data character received from the underlying level.

Effect on receipt

- If the state machine is in the *Run* state, then the data character shall be written to the receive buffer.



C_EOP.req

- The semantics of this primitive are:
C_EOP.req ()

When Generated

- The Exchange level shall generate the C_EOP.req primitive to indicate the end of packet.

Effect on receipt

- The Character level shall send the EOP on the link if its credit count more than zero. After it the credit count shall be decremented by one.



C_EOP.ind

- The semantics of this primitive are:
C_EOP.ind ()

When Generated

- The Character level shall generate the C_EOP.ind primitive to indicate the end of packet.

Effect on receipt

- If the state machine is in the *Run* state, then the EOP shall be written to the receive buffer.



C_EEP.req

- The semantics of this primitive are:
C_EEP.req ()

When Generated

- The Exchange level shall generate the C_EEP.req primitive to indicate the error end of packet.

Effect on receipt

- The Character level shall send the EEP on the link if its credit count more than zero. After it the credit count shall be decremented by one.



C_EEP.ind

- The semantics of this primitive are:
C_EEP.ind ()

When Generated

- The Character level shall generate the C_EEP.ind primitive to indicate the error end of packet.

Effect on receipt

- If the state machine is in the *Run* state, then the EEP shall be written to the receive buffer.



C_NULL.req

- The semantics of this primitive are:
C_NULL.req ()

When Generated

- The Exchange level shall generate the C_NULL.req primitive when it has a NULL code to transmit to the Character level.

Effect on receipt

- The Character level shall send the NULL on the link.



C_NULL.ind

- The semantics of this primitive are:
C_NULL.ind ()

When Generated

- The Character level shall generate the C_NULL.ind primitive when it has a NULL code to transmit to the Exchange level.

Effect on receipt

- If the state machine is in the *ErrorWait*, *Ready* or *Started* state, then the *gotNULL* condition shall be set.



C_SERVICE_SAP

- C_SERVICE_SAP provides transmission of control data between the Character level and Exchange level.
- The primitives used in this SAP are:
 - C_ParityError.ind ()
 - C_ESCError.ind ()
 - C_Disconnect.ind ()
 - C_ChangeStateRX.req (StateRX)
 - C_ChangeStateTX.req (StateTX)

Name	Type	Valid range	Value	Description
StateRX	Enumeration	Reset	0	RX does nothing
		Enabled	1	RX is enabled and is waiting for the first bit to arrive
StateTX	Enumeration	Reset	0	TX does nothing
		Started	1	TX sends NULLs on the link
		Connecting	2	TX sends FCTs or NULLs
		Run	3	TX sends NULLs, FCTs, Time-Codes and N-Chars



C_ChangeStateRX.req

- The semantics of this primitive are:
C_ChangeStateRX.req (StateRX)

When Generated

- This primitive is generated by the Exchange level in order to change state of the receiver.

Effect on Receipt

- The receiver shall move to the required state and start to operate accordingly to the state description.



C_ChangeStateTX.req

- The semantics of this primitive are:
C_ChangeStateTX.req (StateTX)

When Generated

- This primitive is generated by the Exchange level in order to change state of the transmitter.

Effect on Receipt

- The transmitter shall move to the required state and start to operate accordingly with the state description.



C_ParityError.ind

- The semantics of this primitive are:
C_ParityError.ind ()

When Generated

- This primitive is generated by the Character level when the parity error is detected.

Effect on receipt

- If a parity error occurs after the first NULL is received, then the link interface shall follow the error recovery procedure. If the parity error occurs in the *Run* state then the parity error shall be flagged up to the network level as a link error.



C_ESCError.ind

- The semantics of this primitive are:
C_ESCError.ind ()

When Generated

- This primitive is generated by the Character level when the escape error is detected.

Effect on receipt

- If an escape error occurs, then the link interface shall follow the error recovery procedure. If the escape error occurs in the *Run* state then the escape error shall be flagged up to the network level as a link error.



C_Disconnect.ind

- The semantics of this primitive are:
C_Disconnect.ind ()

When Generated

- This primitive is generated by the Character level when the link disconnection is detected.

Effect on receipt

- If a disconnection error occurs, then the link interface shall follow the error recovery procedure. If the disconnection error occurs in the *Run* state then the escape error shall be flagged up to the network level as a link error.



C_FCT_SAP

- C_FCT_SAP provides transmission of FCTs between the Character level and Exchange level.
- The primitives used in this SAP are:
 - C_FCT.req ()
 - C_FCT.ind ()



C_FCT.req

- The semantics of this primitive are:
C_FCT.req ()

When Generated

- The Exchange level shall generate C_FCT.req primitive when it is ready to receive eight more N-Chars.

Effect on receipt

- The Character level shall generate an FCT and send it on the link.



C_FCT.ind

- The semantics of this primitive are:
C_FCT.ind ()

When Generated

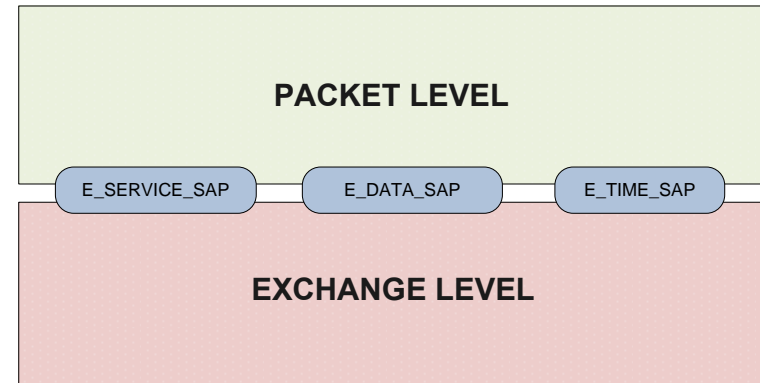
- The Character level shall generate the C_FCT.ind primitive when it has an FCT to transmit.

Effect on receipt

- If the state machine is in the *Connecting* state, then the *gotFCT* condition shall be set.

E_SAPs

- E_SAPs provide interconnection between the Exchange level and the Packet level by transmitting data from one level to another in both directions.



There are three service access points:

E_TIME_SAP – SAP for transmission of Time-Codes;

E_DATA_SAP – SAP for transmission of end of packet markers and NULL codes;

E_SERVICE_SAP – SAP for transmission of control data and information about errors;



E_TIME_SAP

- E_TIME_SAP provides Time-Codes transmission between the Exchange level and the Packet level in both directions simultaneously.
- The primitives used in this SAP are:
 - E_TimeCode.Req (TimeCode)
 - E_TimeCode.Ind (TimeCode)

Name	Type	Value	Description
TimeCode	Byte	0..63	Defines the value of system time to be distributed across the network. Bits number 6 and 7 are control flags



E_DATA_SAP

- E_DATA_SAP provides transmission of data characters and end of packet markers between the Exchange level and the Packet level.
- The primitives used in this SAP are:
 - C_Data.req (Data)
 - C_Data.ind (Data)
 - C_EOP.req ()
 - C_EOP.ind ()
 - C_EEP.ind ()

Name	Type	Value	Description
Data	Byte	0..255	Data byte



E_SERVICE_SAP

- E_SERVICE_SAP provides transmission of control data between the Exchange level and the Packet level.
- The primitives used in this SAP are:
 - E_Reset.req ()
 - E_LinkSetting.req (FlagCode, FlagValue)
 - E_LinkError.ind ()

Name	Type	Valid range	Value	Description
FlagCode	Enumeration	LinkDisabled	0	Corresponds to the [Link Disabled] condition
		LinkStart	1	Causes the transition from the <i>Ready</i> state to the <i>Started</i> state
		AutoStart	2	Request the link to start automatically on receipt of a NULL
FlagValue	Boolean		True	
			False	



E_Reset.req

- This primitive requests to reset the Exchange level.
- The semantics of this primitive are:
E_Reset.req ()

When Generated

- This primitive shall be generated by the Packet level in order to reset the Exchange level.

Effect on receipt

- The receive buffer and the transmit buffer shall be emptied, the state machine shall move to the *ErrorReset* state.



E_LinkSetting.req

- This primitive requests to change the link settings.
- The semantics of this primitive are:
- E_LinkSetting.req (FlagCode, FlagValue)

When Generated

- The Packet level shall generate E_Link_Setting.req primitive in order to change the state of a link interface flag.

Effect on receipt

- The flag indicated by *FlagCode* parameter shall be set in accordance with *FlagValue* parameter.



E_LinkError.ind

- This primitive reports a link error to the Packet level.
- The semantics of this primitive are:
E_LinkError.ind ()

When Generated

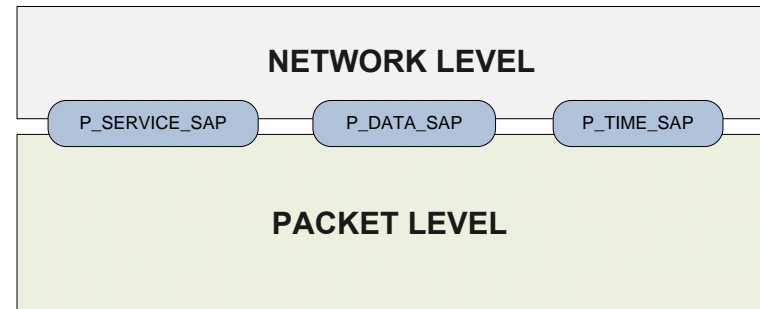
- The Exchange level shall generate E_LinkError.ind primitive whenever any of the following errors occur while a link interface is in the Run state: disconnect error, parity error, escape sequence error or credit error.

Effect on receipt

- The occurrence of the link error shall be reported to the overlying level.

P_SAPs

- P_SAPs provide an interconnection between the Packet level and the Network level and a transmission of different kinds of data from the one level to another in both directions simultaneously.



There are three service access points (SAP):

P_TIME_SAP – SAP for transmission of Time-Codes;

P_DATA_SAP – SAP for transmission of different kinds of data;

P_SERVICE_SAP – SAP for transmission of control data, including error indication.



P_TIME_SAP

- P_TIME_SAP provides Time-Codes transmission between the Packet level and the Network level in both directions simultaneously.
- The primitives used in this SAP are:
 - P_TimeCode.Req (TimeCode)
 - P_TimeCode.Ind (TimeCode)

Name	Type	Value	Description
TimeCode	Byte	0..63	Defines the value of system time to be distributed across the network. Bits number 6 and 7 are control flags



P_DATA_SAP

- P_DATA_SAP provides transmission of data characters and end of packet markers between the Packet level and the Network level.
- The primitives used in this SAP are:
 - P_Data.req (Data)
 - P_Data.ind (Data)
 - P_EOP.req ()
 - P_EOP.ind ()
 - P_EEP.ind ()

Name	Type	Value	Description
Data	Byte	0..255	Data byte

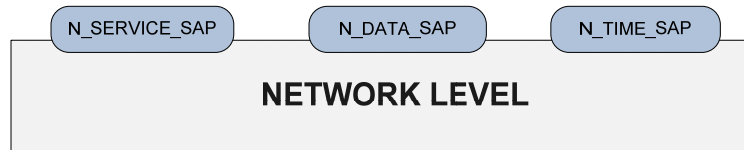


P_SERVICE_SAP

- P_SERVICE_SAP provides transmission of control data between the Packet level and the Network level.
- The primitives used in this SAP are:
 - P_Reset.req ()
 - P_LinkSetting.req (FlagCode, FlagValue)
 - P_LinkError.ind ()

Name	Type	Valid range	Value	Description
FlagCode	Enumeration	LinkDisabled	0	Corresponds to the [Link Disabled] condition
		LinkStart	1	Causes the transition from the <i>Ready</i> state to the <i>Started</i> state
		AutoStart	2	Request the link to start automatically on receipt of a NULL
FlagValue	Boolean		True	
			False	

N_SAPs



- N_SAPs provide an interconnection between the Network level and the overlying level (i.e. transport level) and a transmission of different kinds of data from the one level to another in both directions simultaneously.
- There are three service access points (SAP):
 - **N_TIME_SAP** – SAP for transmission of Time-Codes;
 - **N_DATA_SAP** – SAP for transmission of different kinds of data;
 - **N_SERVICE_SAP** – SAP for transmission of control data, including error indication.



N_TIME_SAP

- N_TIME_SAP provides Time-Codes transmission between the Network level and the overlying level in both directions simultaneously.
- The primitives used in this SAP are:
 - N_TimeCode.Req (TimeCode)
 - N_TimeCode.Ind (TimeCode)

Name	Type	Value	Description
TimeCode	Byte	0..63	Defines the value of system time to be distributed across the network. Bits number 6 and 7 are control flags



N_DATA_SAP

- N_DATA_SAP provides transmission of data characters and end of packet markers between the Network level and the overlaying level.
- The primitives used in this SAP are:
 - P_Data.req (Data)
 - P_Data.ind (Data)
 - P_EOP.req ()
 - P_EOP.ind ()
 - P_EEP.ind ()

Name	Type	Value	Description
Data	Byte	0..255	Data byte



N_SERVICE_SAP

- N_SERVICE_SAP provides transmission of control data between the Network level and the overlaying level.
- The primitives used in this SAP are:
 - P_Reset.req ()
 - P_LinkSetting.req (FlagCode, FlagValue)
 - P_LinkError.ind ()

Name	Type	Valid range	Value	Description
FlagCode	Enumeration	LinkDisabled	0	Corresponds to the [Link Disabled] condition
		LinkStart	1	Causes the transition from the <i>Ready</i> state to the <i>Started</i> state
		AutoStart	2	Request the link to start automatically on receipt of a NULL
FlagValue	Boolean		True	
			False	
DestinationAddress	Byte		0..255	Address byte



N_InvalidDestinationAddress.ind

- This primitive is used to report reception of a packet with invalid destination address.
- The semantics of this primitive are:
- N_InvalidDestinationAddress.ind(DestinationAddress)

When Generated

- This primitive shall be generated by the Network level when the received packet has an invalid destination address.

Effect on receipt

- Information about the invalid destination address can be processed in accordance with overlying level algorithm.



Thank You



7. Open points (Change Requests for which no disposition was proposed yet)

7.7 Standard Services Over SpaceWire (presentation)

[presentation by Takahiro Yamada (JAXA/ISAS) of a Proposal for Defining Standard Services Over SpaceWire]

Dispositions:

- Accept** and implement the change as proposed
- Refer** the proposed change to the TA for disposition
- Refine** the proposed change for implementation (incl. justification)
- Reject** the proposed change (incl. justification for rejection)

Proposal for Defining Standard Services Over SpaceWire

Takahiro Yamada (JAXA/ISAS)

March 2011

Sixteenth SpaceWire Working Group Meeting

ESTEC, Netherlands

Purpose of This Presentation

- ❖ This presentation proposes defining standard communications services over SpaceWire.
- ❖ Each standard communications service is provided by a combination of SpaceWire protocols for the applications on the hosts.
- ❖ For each service, a standard API should be specified.
- ❖ Definitions of standard communications services facilitate separation between applications and SpaceWire protocols and help the applications developers concentrate on the design of the applications.
- ❖ For defining services, the CCSDS Green Book on Spacecraft Onboard Interface Services can be used as the starting point.
- ❖ A document that shows the overall structure of SpaceWire services and protocols should be developed and published.

Examples of Standard Services

- ❖ Packet Services
 - Best Effort Packet Service
 - Assured Packet Service
 - Reserved Packet Service
 - Guaranteed Packet Service
- ❖ Memory Access Services
 - Best Effort Read/Write Service
 - Assured Read/Write Service
 - Reserved Read/Write Service
 - Guaranteed Read/Write Service

Protocols Providing Services

- ❖ SpaceWire-R
 - Provides reliable data transfer without loss, without duplication, and in-sequence
 - Optionally provides capability for managing redundant routes
- ❖ Remote Memory Access Protocol (RMAP)
 - Provides capabilities for reading data from and writing data into remote memories
- ❖ SpaceWire-D
 - Provides timely access to data links
- ❖ SpaceWire
 - Provides capabilities for sending and receiving data

Mapping Between Protocols and Services

	Packet Services				Memory Access Services			
	BE	A	R	G	BE	A	R	G
SpaceWire-R		X		X		X		X
RMAP					X	X	X	X
SpaceWire-D			X	X			X	X
SpaceWire	X	X	X	X	X	X	X	X

3.a Conclusions – Achievements today



1. Introduction
 - a. SpaceWire standard revision
 - b. Interoperability
 - c. ESA funded support activities
2. SpaceWire standard revision
 - a. Overview
 - b. SpW standard revision Part I
 - Presentation/Voting process
 - Presentation and endorsement of the Change Request dispositions proposed to ECSS
 - c. SpW standard revision Part II
 - Presentation/Discussion process
 - Presentation of the Change Requests (submitted to ECSS) with no disposition yet
 - Technical presentations on issues to be possibly included in the next revision of the standard
3. Conclusion
 - a. Achievements
 - b. Next steps

3.a Conclusions – Next steps (1/3)



1. For the next Working Group meeting:
 - a. For the Change requests which were still open today,
 - b. but for which some agreement was found,
 - endorsement by the SpW Working Group Change Request dispositions to be proposed to ECSS. These dispositions will be based on the outcome of the discussions during SpW WG mtg#16 Session 2.
 - c. For the Change requests which were still open today,
 - d. and for which no consolidated agreement was found,
 - presentation of the Change Requests (submitted to ECSS); elaboration and possible endorsement by the SpW Working Group of dispositions to be proposed to ECSS.

3.a Conclusions – Next steps (2/3)



2. For ECSS standardisation

- a. The ECSS New Work Item Proposal (NWIP) was approved in principle.
- b. The schedule still needs to be consolidated.
- c. Once the starting date of the ECSS Working Group will be set, a **deadline** will be set **on the submission of Change Requests to the SpaceWire Working Group**.

3.a Conclusions – Next steps (3/3)



3. For SpaceWire 2

- a. Present far-reaching evolutions or disruptive concepts for next generation SpaceWire
 - At SpW Working Group meeting #17 (Sept. 2011)
 - At the SpaceWire2011 international conference (deadline for abstract submission 4 April 2011)
- b. Contact D. Jameux for suggestions of R&D activities to be inserted in ESA R&D plans (GSP, TRP, GSTP, etc.)

Thank you

