

Project: SpWire WG										List of Review Items Discrepancies			
Equipment:		Review: SpWire RT Protocol Def											
RID No.	RID Title/Topic	Document Title	Document Reference	Page/Section	Originator	Discrepancy incl. Recommendation				Classification	Contractor Answer	Personal Remarks	RID No.
1	Negative requirements	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	General	F.Torelli	Requirements stating what the protocol shall not do should be avoided. These "non-features" can be briefly presented in a general description introducing sections or as a note to actual requirements stating features in a positive form.				Minor			1
2	Packet maximum size	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	23/3.1	F.Torelli	Reference to Summary of Open Issues in SpWire-RT Requirements point A.4 and req. R1-2. Packet maximum size should be a mission configuration parameter. Efficiency and effectiveness of the communication across the network depends on the network topology and on the user nodes requirements which depend on the mission. Note: as it is done in the ECSS-50-13 standard, it is suggested to define the terms: - mission configuration parameter, when the parameter value applies to all the nodes of the network (it is defined at mission requirement level); - application configuration parameter, when the parameter value applies to one node of the network (different node of the same network can have different values).  Recommendation: to add requirement stating that maximum packet size shall be a mission configuration parameter.				Major			2
3	Address format	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	23, 33/3.1, 3.3	F.Torelli	Reference to Summary of Open Issues in SpWire-RT Requirements point A.5, R1.3 and R3-1, R3-2, R3-3. 16 bit address allows to address up to 64k nodes across the network. Having a fixed size address simplify the protocol management. However it seems redundant to have the low level spacewire addressing an upper level spacewire rt addressing scheme (considering in addition on top of these the SOIS addressing). Maybe it could be interesting to put constraints on the types of (low level) spacewire addressing schemes allowed within the spacewire rt network and to use these, instead of introducing a new one.  Recommendation: to consider to add a requirement defining the low level spacewire addressing scheme allowed in the spacewire rt network.				Minor			3
4	In sequence packets delivery	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	25/3.2.1	F.Torelli	Reference to Summary of Open Issues in SpWire-RT Requirements point A.1 and req. R2.1-3. It is suggested not to include requirements about in-sequence delivery. Best effort should imply simplicity in the protocol implementation and, more important, if the best effort is selected it's because network nodes and layout are designed in such a way that, it shouldn't be required to manage these errors at protocol level (e.g. single path for point to point communication, reliable communication between nodes).  Recommendation: to delete req. R2.1-3.				Minor			4

5	CRC error detection	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	25-26/3.2.1	F.Torelli	<p>Reference to Summary of Open Issues in SpWire-RT Requirements point A.3 and req. R2.1-4. It is suggested not to include CRC check. See RID 4.</p> <p>The requirement is stated in a unclear form. Low error probability is a propriety of the link/network, having a CRC check for the packet at protocol level, implies the capability of detecting the error, not to have it with a given probability.</p> <p>Recommendation: to move req. R2.1-4 to rationale note of req. R2.1-1 or R2.1-2.</p>	Minor			5
6	No duplicate packets delivery	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	26/3.2.1	F.Torelli	<p>Reference to Summary of Open Issues in SpWire-RT Requirements point A.2 and R2.1-6. It is suggested not to include requirements about no duplication packets delivery. See RID 4.</p> <p>Recommendation: to delete req. R2.1-6.</p>	Minor			6
7	CRC error detection	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	27-28/3.2.2	F.Torelli	<p>Reference to req. R2.2-6. The requirement is stated in a unclear form. Low error probability is a propriety of the link/network, having a CRC check for the packet at protocol level, implies the capability of detecting the error, not to have it with a given probability.</p> <p>The concept that CRC check has a very low probability not to detect an error is understood, but it rather theoretical, there's no need to bring it in the requirements.</p> <p>Recommendation: to reword the requirement stating that packet error shall be detected by means of CRC check. CRC algorithm should be specified.</p>	Minor		Algorithm provided in SpW-RT WP3-200.1 section 7.2.	7
8	Acknowledge	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	27-28/3.2.2	F.Torelli	<p>Reference to section 3.2.2. A requirement defining the acknowledge mechanism used to inform the sender of the outcome of the transmission should be foreseen.</p> <p>Recommendation: to add a requirement stating the need of the acknowledge sent from destination to source to communicate the outcome of the transmission.</p>	Minor		Covered by SpW-RT WP3-200.1 section 6.	8
9	Acknowledge timeout	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	27-28/3.2.2	F.Torelli	<p>Reference to section 3.2.2. A requirement defining the timeout within the acknowledge has to be received should be foreseen. If timeout expires, sender considers the transmission in error.</p> <p>Timeout value should be a mission configuration parameter.</p> <p>Recommendation: to add a requirement stating the need of the acknowledge timeout as a configuration parameter.</p>	Minor		Covered by SpW-RT WP3-200.1 section 6.	9
10	In sequence packets delivery	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	29/3.2.3	F.Torelli	<p>Reference to Summary of Open Issues in SpWire-RT Requirements point A.1 and req. R2.3-3. It is suggested not to include requirements about in-sequence delivery. If the reserved QoS is selected it's because network nodes and layout are designed in such a way that, it shouldn't be required to manage these errors at protocol level (e.g. single path for point to point communication, reliable communication between nodes).</p> <p>Recommendation: to delete req. R2.3-3.</p>	Minor			10

11	CRC error detection	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	29/3.2.3	F.Torelli	<p>Reference to Summary of Open Issues in SpWire-RT Requirements point A.3 and req. R2.3-4. It is suggested not to include CRC check. See RID 10.</p> <p>The requirement is stated in a unclear form. Low error probability is a propriety of the link/network, having a CRC check for the packet at protocol level, implies the capability of detecting the error, not to have it with a given probability.</p> <p>Recommendation: to move req. R2.3-4 to rationale note of req. R2.3-1 or R2.3-2.</p>	Minor			11
12	No duplicate packets delivery	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	29-30/3.2.3	F.Torelli	<p>Reference to Summary of Open Issues in SpWire-RT Requirements point A.2 and R2.3-6. It is suggested not to include requirements about no duplication packets delivery. See RID 10.</p> <p>Recommendation: to delete req. R2.3-6.</p>	Minor			12
13	CRC error detection	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	31/3.2.4	F.Torelli	<p>Reference to req. R2.4-6. The requirement is stated in a unclear form. Low error probability is a propriety of the link/network, having a CRC check for the packet at protocol level, implies the capability of detecting the error, not to have it with a given probability.</p> <p>The concept that CRC check has a very low probability not to detect an error is understood, but it rather theoretical, there's no need to bring it in the requirements.</p> <p>Recommendation: to reword the requirement stating that packet error shall be detected by means of CRC check. CRC algorithm should be specified. CRC algorithm should be the same as specified for assured service.</p>	Minor		Algorithm provided in SpW-RT WP3-200.1 section 7.2.	13
13	Acknowledge	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	30-32/3.2.4	F.Torelli	<p>Reference to section 3.2.4. A requirement defining the acknowledge mechanism used to inform the sender of the outcome of the transmission should be foreseen.</p> <p>Recommendation: to add a requirement stating the need of the acknowledge sent from destination to source to communicate the outcome of the transmission.</p>	Minor		Covered by SpW-RT WP3-200.1 section 6.	13
14	Acknowledge timeout	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	30-32/3.2.4	F.Torelli	<p>Reference to section 3.2.4. A requirement defining the timeout within the acknowledge has to be received should be foreseen. If timeout expires, sender considers the transmission in error.</p> <p>Timeout value should be a mission configuration parameter.</p> <p>Recommendation: to add a requirement stating the need of the acknowledge timeout as a configuration parameter.</p>	Minor		Covered by SpW-RT WP3-200.1 section 6.	14
15	Simultaneous retry and hot redundancy	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	34/3.4	F.Torelli	<p>Reference to re. R4-2. The requirement should address the management of hot redundant nodes on the network. It unlikely that hot redundant paths are foreseen in the network (add complexity at HW, protocol and application level), moreover this would be in contrast with the no duplication packet delivery requirements of the previous sections.</p> <p>Recommendation: to reword the requirement addressing hot redundancy of nodes.</p>	Minor			15

16	Retry number	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	34/3.4	F.Torelli	Reference to re. R4-3 and related rationale. A requirement should be added defining the number of retry as an application dependent parameter.  Recommendation: to add requirement defining the N or retries as protocol application dependent parameter.	Minor			16
17	Resend on alternative path	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	34/3.4	F.Torelli	Reference to re. R4-4. Automatic switch between network paths should be carefully evaluated. It is more reasonable that FDIR application process is in charge of commanding the reconfiguration to an alternate path according to the options available and error conditions detected. See also RID 15. Similar considerations applies to more specific requirements presented in sections 7.9 and 8.  Recommendation: to reword the requirement defining that the protocol support the possibility to send packets to alternate paths.	Major			17
18	Resend on multiple paths	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	34-35/3.4	F.Torelli	Reference to re. R4-5. See RID 15 and 16.  Recommendation: to delete req. R4-5.	Major			18
19	Failure report	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	35/3.4	F.Torelli	Reference to req. R4-6 and R4-7. Normally reconfiguration (network, paths, nodes) is performed by the Application according to the failure report provided by low layers (e.g. protocol) and on the recovery options available. It is unlikely that the protocol is allowed to perform autonomous reconfiguration of the network or of the nodes.  Recommendation: to reword the req. R4-6 stating that failure report is provided to the user when errors have been detected on all the retries foreseen for the active path. To delete req. R4-7.	Major			19
20	Timeliness	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	36/4	F.Torelli	Reference to Summary of Open Issues in SpWire-RT Requirements point A.6 and req. N-3. For some applications/mission 1 ms could be a too tight constrain, for some other a too loose constrain. The actual value should be a performance application configuration parameter. A note providing a performance figure with in a well specified scenario would help to define the parameter.  Recommendation: to reword the requirement defining the timeliness as an application dependent parameter.	Major			20
21	Time distribution and synchronization	SpaceNet - SpWire-RT Requirements is.1.0	SpW-RT WP3-100.1	General	F.Torelli	Reference to Summary of Open Issues in SpWire-RT Requirements B.2 section. Time distribution and synchronization is not foreseen in the spacewire rt protocol because it can be implemented using Time Codes and RMAP. Since RMAP doesn't support timeliness, it is not clear how this can be archived. It would be more reasonable to see requirements about time distribution and synchronization related to time code and assured QoS transfers.  Recommendation: to consider to add requirements about time distribution and synchronization or to better elaborate the solution based on RMAP.	Major			21

22	Example of data handling architecture	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	17/3.4.1.2	F.Torelli	<p>Reference to figure 3-1 and 3-2. Since the layout provided in the figure describes just one of possible architectures for a data handling system, it is suggested to refer to it as "example of possible spacewire based data-handling architecture" instead of "typical".</p> <p>Additional remarks:</p> <ol style="list-style-type: none"> <li>1. the blocks "prime" and "redundant" should be called "OBC prime/nominal" and "OBC redundant".</li> <li>2. "memory" block should be called "mass memory" to avoid confusion with respect to the processor memory.</li> <li>3. Telemetry and telecommand usually is part of the avionics core hw (e.g. OBC), it would be good to include it in the OBC block.</li> <li>4. Telemetry and telecommand modules are always cross-strapped with the two processor modules, this has to be presented in the figure.</li> </ol> <p>Recommendation: to update the figure and the related texts as proposed above.</p>	Minor			22
23	Telecommands through spacewire	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	18-19/3.4.1.2	F.Torelli	<p>Reference to last bullet. The statement should be clarified. It is unlikely that SpW is used to send TC from TC module to Processor Module. For criticality reasons dedicated MAP/PacketWire I/F are normally used (and shall be used). Processor Module is normally in charge to relay TC coming from TC module (ground) to other onboard units, eventually using spacewire network.</p> <p>The comment applies also to table 3-1 (link D, left to right/up).</p> <p>Recommendation: to reword the statement clarifying which equipment is in charge to relay TC to the onboard units.</p>	Minor			23
24	Requirements organization	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	42/4.1-4.2	F.Torelli	<p>The requirements provided in these sections are hw design requirements, instead of protocol requirements. See for example (but not only) req. 4.2f.</p> <p>Recommendation: to consider to re-organize the requirements in a more "neutral" form with respect to the implementation.</p>	Minor			24
25	Prime and alternate paths	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	42/4.1	F.Torelli	<p>Reference to req. 4.1c. To associate prime and alternative paths to the same channel buffers (source &amp; destination) seems not compatible with "Simultaneous Retry" requirement (see SpW-RT WP3-100.1, R4-2).</p> <p>Recommendation: to clarify this aspect.</p>	Minor			25
26	Requirement for user application	SpaceNet - Spwire-RT Initial Protocol Definition is.	SpW-RT WP3-200.1	42/4.1-4.2	F.Torelli	<p>Reference to req. 4.1f, 4.1g and 4.2e. The requirements are related to the user application instead of the protocol.</p> <p>Recommendation: to reword the requirement or to delete them.</p>	Minor			26
27	Fixed maximum size	SpaceNet - Spwire-RT Initial Protocol Definition is.	SpW-RT WP3-200.1	43/5	F.Torelli	<p>Reference to req. 5a. Maximum SDU size should be configurable, depending on the network (mission).</p> <p>Recommendation: to consider to make the maximum SDU size configurable.</p>	Major			27

28	SDU encapsulation	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	43/5	F.Torelli	<p>Reference to req. 5b. The requirement makes the SpW-RT a standalone protocol, most probably not compatible with RMAP and other currently used protocol. To be noted that ASICs and dedicated HW supporting existing protocol are available and used in space applications, these component wouldn't be compatible with SpW-RT requirements.</p> <p>Recommendation: it is suggested to consider SpW-RT as a set of requirements to apply to existing protocols in order to classify the QoS and the performances. New protocols can be introduced to cope with specific QoS requirements not covered by existing protocols (e.g. RMAP).</p>	Major			28
29	Requirement misplaced	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	43/5	F.Torelli	<p>Reference to req. 5c. The requirement looks to be related to control flow section.</p> <p>Recommendation: to delete the requirement or to move it to the control flow section.</p>	Minor			29
30	End to end flow control	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	44/6	F.Torelli	<p>Reference to section 6. End to end flow control complexity should be reduced and it should be specified to which QoS the requirements are applicable to. Flow control reduces the probability to lock a shared path because the destination node is not ready to receive a packet, this may prevent other communications using that physical path to comply with timeliness requirements. However, the system (nodes and network) should be designed to cope with the peak throughput conditions. Additionally, in case of reserved and guaranteed QoS, to comply with timeliness, the transmission can't be delayed, so the destination shall always be available at the required "time slot" by "design". This imply that end to end flow control is not necessary.</p> <p>On the other hand, best effort and assured QoS should be kept simple, because it should be assumed that reliability is provided by other elements of the system (e.g. bandwidth margins), so the usage of end to end flow control add unnecessary complexity and overheads.</p> <p>Recommendation: to consider to reduce the complexity of the end to end flow control mechanism (e.g. keep only acknowledge for assured and guaranteed QoS)</p>	Major			30
31	Acknowledge and QoS	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	47/7.3-7.4	F.Torelli	<p>Reference to section 7.3 and 7.4. The requirement related to the acknowledge should be applicable only for assured and guaranteed QoS.</p> <p>Recommendation: to add applicability of the requirement.</p>	Minor			31
32	Error conditions	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	48/7.6	F.Torelli	<p>Reference to section 7.6. Error conditions reported in detail in this sections should be in line with the ones anticipated in section 7.1.</p> <p>Recommendation: to updated section 7.1.</p>	Minor			32
33	Address translation	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	54/9	F.Torelli	<p>Reference to req. 9f. Address translation should be left to the upper layers user application (e.g. SOIS application layer).</p> <p>Recommendation: see comment and recommendation at RID 3.</p>	Minor			33

34	Redundancy management	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	54/9	F.Torelli	<p>Reference to req. 9g, 9h. Alternate paths selection should be managed by reconfiguring the router in order to change the path, but to keep the same spacewire logical address of the nodes.</p> <p>Recommendation: to consider this alternative solution, to consider to reduce the number of levels of address translation present in the SOIS stack.</p>	Minor			34
35	Retry and time-slots	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	63/12.4	F.Torelli	<p>Reference to req. 12.4f. The capability to automatic retry should be analyzed:</p> <ul style="list-style-type: none"> <li>- what is the probability (on the basis of projects experience) to have a successful transfer on retry in case of failing the first transfer?</li> <li>- if retry is enabled on guaranteed service, bandwidth has to be reserved for the worst case (all transfers require retries). This reduces a lot the actual bandwidth available and leaves in the nominal case with a lot of unused bandwidth which could be used otherwise in an effective way (on the other hand it requires to oversize the system).</li> </ul> <p>Recommendation: to consider avoid the usage of automatic retry. To analyse if in practice it's actually beneficial in the improvement of the reliability of the communication.</p>	Major			35
36	RMAP and SpW-RT	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	64/13	F.Torelli	<p>Reference to req. 13.c. As far as the SpW-RT is specified, it seems difficult to see RMAP and SpW-RT coexisting in the same network. See also RID 34.</p> <p>Recommendation: see recommendation at RID 28.</p>	Major			36
37	All links at the same data rate	SpaceNet - Spwire-RT Initial Protocol Definition is. 1.1	SpW-RT WP3-200.1	64/13	F.Torelli	<p>Reference to req. 13.d. The constrain to have all the links running at the same data rate imposes to oversize some parts of the network. What is the rationale behind this requirement?</p> <p>Recommendation: to clarify.</p>	Minor			37