

SpaceWire Working Group meeting #19, October 2012

Organisation Team

Philippe Armbruster
ESTEC, Noordwijk
02/10/2011

SpaceWire in 2011-2012



2011

- February: ESA Bulletin : Well Connected – The SpW on-board data handling network
- March: SpaceWire Working Group meeting #16, March 2011
- October: ESA SpW Brochure published
- November: SpaceWire International Conference San Antonio
- November: SpW User Group seminar in Japan – Leaflet SpaceWire Activities in Japan
- December: SpaceWire Working Group meeting #17

2012

- April: SpaceWire Working Group meeting #18
- October 2-4/10 ESA-HQ Paris (F) TBC : SpaceWire Working Group meeting #19

SPACEWIRE TECHNOLOGY PROVIDERS

ESA's ESTEC technical centre in Noordwijk, the Netherlands, has developed several radiation-tolerant SpaceWire chips and related intellectual property (IP) cores to support the development of SpaceWire systems on Agency spacecraft. These are also available commercially: Almet (FR) supplies the chips and STMicroelectronics Ltd (SI) supplies the IP cores.

- ESA SpaceWire Interface IP Core provides a complete interface to SpaceWire that can be readily implemented in a field-programmable gate array (FPGA) or other chip technology. Already serving on several ESA missions.
- SpaceWire Remote Terminal Controller (RTC) core: there are two variants, based on SpaceWire's associated Remote Memory Access Protocol (see table page). One is the Terrestrial and one is the Target, the first used for remote commands and readwrite data and send results back to the Source.
- SpaceWire Remote Application Specific Integrated Circuit (ASIC): the ESA SpaceWire is a complete SpaceWire master in a single chip, with eight SpaceWire ports each capable of 200 Mbit/s bidirectional data transfer, two bidirectional FTDI (USB to UART) ports for connecting to other electronics and an external configuration port, available from Almet as the AT7932P device.
- SpaceWire Remote Terminal Controller (RTC) ASIC: an instrument controller or a bridge between SpaceWire and the popular CAN (Control Area Network) has standard originally developed for automobiles, available from Almet as the AT7932P device.

SPACEWIRE AROUND THE WORLD

SpaceWire-compliant devices and IP cores are available from numerous suppliers worldwide, demonstrating the standard's popularity. Below is a partial list of SpaceWire suppliers, together with their agency users and industrial partners.

- STMicroelectronics (SI) a spin-off from STMicroelectronics, the company produces an wide range of equipment for the development of SpaceWire systems, and the ASIC chip used in SpaceWire IP cores (see left), software and training.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.
- Almet (FR) makes an equipment designed to test SpaceWire systems in space. It also has a range of test equipment for SpaceWire systems.

DESIGNING THE FUTURE

The SpaceWire Working Group has been a major vehicle for the development and adoption of SpaceWire. This working group is open to engineers across the world dealing with data handling technology. Europe, Japan, Russia and the USA are currently represented.

To further ESA's mandate to promote cooperation in space research and technology, the SpaceWire Working Group is a truly international collaborative body, developing technology not just for European states but also for the benefit of the whole space community. International experts meet typically twice a year to discuss and review SpaceWire-related standards and trade experience in its application in space systems.

Suppliers (Blue circle)
Agencies (Red circle)
Partners (Green circle)

Callouts on the map include:

- USA: IBM Systems (SI) makes a multi-channel ASIC (SpaceWire to Ethernet) with FPGA, already used on the US Lunar Reconnaissance Orbiter and OSO. The company also produces a SpaceWire end station board for ground testing.
- ESA: Airbus (FR) produces a SpaceWire compliant SpaceWire SpaceWire interface and Processor Board.
- France: Almet (FR) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.
- USA: Space & Defense (SD) produces a SpaceWire compliant SpaceWire interface and Processor Board.

Images at the bottom show: G4, James Webb Space Telescope (JWST), Lunar Reconnaissance Orbiter (LRO), OSO, Deep Space 2, ESA's Mars Express, and Rosetta.

SpaceWire WG Web site



The screenshot shows a Firefox browser window with several tabs open. The active tab is 'SpaceWire - Work...'. The address bar shows 'spacewire.esa.int/WG/SpaceWire/'. The page content includes the ESA SpaceWire logo, a heading for the SpaceWire Working Group, a description of the group's purpose, an announcement for the 18th meeting in April 2012, a link to the preliminary agenda, registration information for a mailing list, and a list of previous meetings with links to their proceedings.

SpaceWire Working Group – ESA – JAXA – NASA – ROSCOSMOS

The SpaceWire Working Group is a forum aiming at promoting the usage of SpaceWire links, routers, nodes and networks. It has the additional mandate to steer new developments of devices, tools and protocols.

The Eighteenth SpaceWire Group Meeting will be held from the 23rd to the 25th of April 2012.

[SpW-WG-Mtg-18-Preliminary Agenda D](#)

Registration to the SpaceWire **WG Mailing List** can be done easily via:
<http://spacewire.esa.int/contact.php>
By registering to the mailing list, you will be informed on WG events.

Proceedings of previous Meetings and Workshops

Seventeenth SpaceWire Group Meeting, ESA/ESTEC, 13 -15th December 2011 [SpW-WG-Mtg 17-Proceedings](#)

Sixteenth SpaceWire Working Group meeting, ESA/ESTEC, 21st-23rd March 2011 [SpW-WG-Mtg16-Proceedings](#)

Fifteenth SpaceWire Working Group meeting, ESA/ESTEC, 18th to 20th of October 2010 [SpW-WG-Mtg15-Proceedings](#)

Fourteenth Space Wire Working Group meeting, ESA/ESTEC, 22nd to 24th of February 2010 [SpW-WG-Mtg14-Proceedings](#)

Thirteenth SpaceWire Working Group meeting, ESA/ESTEC, 14th and the 15th of September 2009 [SpW-WG-Mtg13-Proceedings](#)

- **The meeting will focus on SpaceFibre**
- In addition, the following topics will be addressed as well:
 - SpW Evolutions (Convener D. Jameux, ESA/ESTEC), including ECSS-ST-50-12C Rev.1, and SpW 2
 - SpW Network Management (Conveners G. Rakow, NASA/GSFC, P. Mendham, Bright Ascension)
 - SpW Test, Verification and “Certification” (Convener Y. Sheynin, UoStPg)
 - SpW Components (Convener J. Ilstad, ESA/ESTEC)
 - SpW International SpaceWire Conferences (Convener M. Suess, ESA/ESTEC)

SpaceWire Evolutions



Backwards compatible with existing SpW devices (or introduced as an option)

- Links (SpW Codec)
- Routers
- Controllers
- Remote Controllers

Support for additional protocols like SpW-CC&HTDT:

- SpW-RT
- RMAP based (Jaxa)
- SpW-D
- Time Synchronisation
- SpW-VC (4Links)
- SpW-PnP

SpaceFibre

- Encoding (HSSL)
- VC

SpaceWire (1)

SpW-D

Standard Revision

**ECSS-E-ST-50-12C
Rev 1**

e.g. :

- Cable specification
- Removal of ambiguities
- Connectors
- Distributed interrupts
- Features leading to compatibility issues

SpaceWire 2 /SpaceFibre

New Generation of devices (e.g. on DSM)

- Links (Codec)
- **Routers**
- Controllers
- Remote Controllers

2012 Objectives



- SpW ECSS-E-ST-50-12C Rev 1 finalized : *in progress*
- SpW-RTC Supported as a standard product in a good cooperation spirit between ATMEL – UoD - Gaisler Aeroflex and RUAG: *almost completed – industrialisation resumed by 28/12/2012*
- SpW-D and related time synchronization protocols ready for standardization, *in standby ?*
- SpW PnP demonstrated : ?
- SpW Backplanes defined and Demonstrated by MARC and other similar activities – MARC 2 approved : *MARC suffered from anomalies in the SpW RMAP IP Core implementation in an FPGA. This has been resolved and MARC will be completed by the end of 2012*
- SpaceFibre technically finalized: ? , *the main focus of this WG meeting*
- SpW Handbook draft available : ?
- SpW International Conference organized for 2013 : *Very good progress, will be a great event for the SpaceWire community*

Day 1: Tuesday 2nd October (all day) – Room BA0137

10:30 **Welcome and Introduction** (Philippe Armbruster, ESA/ESTEC)

10:45 **Session 1: SpaceFibre** (Convener M. Suess, ESA/ESTEC and S. Parkes, UoD)

This session will be dedicated to various aspects of the development of the SpaceFibre protocol.

- Revised SpaceFibre specification, Steve Parkes, UoDundee, 60 min
- SpaceFibre IP core beta-test opportunity, Steve Parkes, UoDundee, 30 min

Support documents:

[Updated SpaceFibre Standard](#)

[Draft ESCC standard for SpaceFibre flight connectors and cable assemblies](#)

12:15 Lunch break

Agenda (2/4)



Day 1: Tuesday 2nd October (all day) – Room BA0137

14:00 **Session 2: PR presentations** (Convener B. Sinka, ESA/ESTEC)

This session will be dedicated to PR presentations on the role of the two ESA establishments in Paris.

- PR presentation on ESA HQ (corporate matters)
- PR presentation on ESA Launchers

15:00 **Session 1: SpaceFibre – resumed** (Convener M. Suess, ESA/ESTEC and S. Parkes, UoD)

- SpaceFibre implementation and demonstration, Steve Parkes, UoDundee, 60 min
- Status report regarding SpaceFibre implementation activities, NEC, 15 min
- Status report regarding SpaceFibre implementation activities, Mitsubishi Electric, 15 min

16:30 Coffee break

17:00 **Session 3: SpW Evolutions – part I: SpW2** (Convener D. Jameux, ESA/ESTEC)

This session will be dedicated to medium term disruptive evolutions of the SpaceWire technology in preparation for the development of the SpaceWire 2 standard.

- Status on the FP7/SPWRT activity, Steve Parkes, UoDundee, 30 min

17:30 **Brainstorming session: Lessons learned from 19 Working Group meetings – improvements and way forward** (Moderator P. Armbruster, ESA/ESTEC)

18:30 End of Day 1

19:30 *Diner in Paris (Le Bistro de Breteuil, 3 Place de Breteuil, 75007 Paris, Île-de-France, France)*

Day 2: Wednesday 3rd October (all day) – Room BA0137

09:00 Session 3: SpW Evolutions – part II: ECSS-ST-E-50-12C Rev.1 (Convener D. Jameux, ESA/ESTEC)

This session will be dedicated to the revision of the current SpaceWire standard in preparation for the work of the ECSS Working Group.

- Status of the ECSS-ST-50-12C Rev.1 standardisation process, D.Jameux, ESA/ESTEC, 15 min
- Status of the “SpaceWire Evolutions” TRP activity, Antonis Tavoularis, Teletel, 30 min
- SpW Deployment and Handbook, B. Cook, 4Links, 15 min

10:00 Session 4: SpW Simulation, Test, and Verification (Convener Y. Sheynin, UoStPg)

This session will be dedicated to the test, verification and simulation tools and requirements.

- SpaceWire EGSE: Real-time instrument simulation in a day, Steve Parkes, Star Dundee, 30 min
- Presentation of and discussion around prototype of SpaceWire Decoder on LeCroy Oscilloscope, Roland Gamper, Lahniss, 30 min

11:00 *Coffee break*

11:30 Session 4: SpW Simulation, Test, and Verification – resumed (Convener Y. Sheynin, UoStPg)

- Versatile test system for varying hardware configurations, Dirk Thurnes, ESA/ESTEC, 15 min
- Status of MOST (SpW traffic simulator), Brice Dellandrea, TAS, 30 min
- Status of the “PVS-II” TRP activity, Antonis Tavoularis, Teletel, 30 min

12:45 Lunch break

Agenda (4/4)



Day 2: Wednesday 3rd October (all day) – Room BA0137

14:00 Session 5: SpaceWire Network Management and Protocol Stacks (Conveners G. Rakow, NASA/GSFC, P. Mendham, Bright Ascension)

- SpaceWire protocol stack, 15 min
- Status of the “Network Discovery Protocols” TRP activity, Stuart Fowell, SciSys, 30 min

14:45 Session 6: SpW component developments (Convener Jørgen Iltad, Dirk Thurnes ESA/ESTEC)

- Extended Common Mode LVDS Solutions, Volodymyr Burkhay, TELEFUNKEN Semiconductors, 30 min
- SpaceWire Link Isolation – Update on Product Development, Gil Baterina, Silanna, 20 min
- Isolation and common mode tests on prototype SpW galvanic isolators, Alan Senior, SEA, 20 min

16:00 Coffee break

16:30 Session 7: SpaceWire Events and Conferences (Conveners B. Sinka and M. Suess, ESA/ESTEC)

- Next SpW conference, Martin Suess, ESA/ESTEC, 15 min

16:45 Meeting close-out (Martin Suess, ESA/ESTEC)

- Next SpW WG meeting

17:00 End of SpW WG meeting #19

19 SpW WG Meetings:



Brainstorming session:

- **Lessons learned**
- **Improvements**
- **Way forward**

SpW WG Meetings: - Notion of "Topics" ? - Role of "Convenors" ?



- SpW **Networks for C&C** (SpW-D) (ESA Convener TBD, ESA/ESTEC & S. Parkes, UoD)
- SpW **Evolutions** (Convener D. Jameux, ESA/ESTEC), including ECSS-ST-50-12C Rev.1 and SpW 2
- SpW **Backplanes** (Convenors A. Senior, SEA & M. Nomachi, UoOsaka)
- SpW **System and Mission Requirements** (Convener D. Jameux, W. Gasti ESA/ESTEC)
- SpW **Simulation, Test and Verification** (Convener Y. Sheynin, UoStPetersburg)
- SpW **Network Management** (Convenors G. Rakow, NASA/GSFC, P. Mendham, Bright Ascension)
- SpW **Deployment and Handbook** (Convener B. Cook, 4Links)
- SpW **International SpaceWire Conferences, Events and Working Group meetings** (Convener M. Suess, B. Sinka ESA/ESTEC)

SpW WG meetings:



- Periodicity: 2 per year ? (Spring, Fall, less , more ?)
- Duration : 2 or 3 days ?
- Location : Estec baseline, very exceptionally somewhere else (one in Japan/Tokyo, one US/Washington, one in Paris !)

- Plenary session – going through:
 - All topics ?
 - Selected ones ?

- Concurrent sub-sessions followed by plenary session ?

- Conference, periodicity ? – 18 months
- Seminars/Courses (one in Russia, one in US (MAPLD), one in St Petersburg)
- Japanese SpW Working Group (meeting in 2011), others ?

As from this meeting the chairmanship of the Spacewire Working Group is taken over by Martin Suess

With kindest regards to all of you, Philippe Armbruster

