

ISA SP100.11a  
Wireless Industrial Automation Networks

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Project	ISA SP100.11a Working Group for Wireless Industrial Automation Networks	
Title	<Sp100.11a Amsterdam Meeting Minutes 2006>	
Date	[21 December 2006]	
Submitted		
Source	[Pat Kinney] [<Kinney Consulting LLC>] [Chicago, IL]	Voice: [ ] Fax: [ ] E-mail: [ ]
Re:	[Amsterdam SP100.11a Meeting Minutes.]	
Abstract	[SP100.11a WG Amsterdam Meeting Minutes.]	
Purpose	[In compliance to ISA rules for standards and practices committees.]	
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**Tuesday, December 12, 2006**

**AM1**

WG meeting was called to order by P Kinney and D Sexton. A list of the attendees is included as Annex A.

Motion to *adopt agenda* was made by Tom Phinney and seconded by Geoff Mulligan. Upon no objection the motion carries.

The secretarial duties for this session are assigned by each two hour slot:

Tuesday

Opening - Geoff Mulligan

am2 – Michael Medley

pm1 - Tom Phinney

pm2 – Marty Zielinski

Wednesday

am1 – Dave Kaufman

am2 – Kevin Tower

pm1 – Rick Enns

pm2 - Art Howard

Thursday

am1 – Paul Sereiko

am2 – Mike Dow

pm1 – Rene Struik

Closing – Peter Single

**Recap of Chicago S-TG meeting**

Herman Storey - Connecting legacy systems paper

Chris Herzog - MAC PHY issues, interfacing to upper layers and not

- o Defining a PHY interface. Not a MAC defined interface. Defined logical interface only.

Jay Werb - Convergence. Read white papers and provide

- o Summaries. Declared victory in Chicago and created convergence task group.

Pat Kinney - systems task group. in Chicago defined levels and some terminology

Ludwig - TRD. Requirement document only defines requirements and not specification, but used to evaluate proposals. Merge .14 and .11.

Wayne presented the charter of SP100; SP100 is not just SP100.11a, rather there are 15 different working groups. Groups and work products are classified as either Prescriptive (shall), and Descriptive (goal of).

SP100 - develop analytical approach for end users to assess probability of success when applying to application, technology and standard. Wayne noted that SP100 has over 300 members.

Charlie Robinson informed the participants of the logistics for the wireless access and the ftp site: [ftp.isa.org](ftp://ftp.isa.org)

- username sp100
  - password:52Hau3
  - the previous dot14 info is under dot14 archive folder on ftp site

Overall schedule concept is that the baseline is complete in January and the principle of operations in March.

#### SP100.11a WG organization

##### SP100.11a:

- Convergence TG - to come to a baseline on the standard going forward and then will cease to exist
  - Participants: Jay Werb, Koji Demachi, Rick Enns, Tom Phinney, René Struik, Mikell Becker, Jose Gutierrez, Paul Sereiko, Israel Radomsky, Werner Thoren, Geoff Mulligan, Allart Karel Bastiaans
  - Job is to identify and work out compromises for proposals
- Systems TG (previously known as Architecture TG)
  - Significant discussion ensued concerning for areas that the System TG is responsible.
- Evaluation Criteria TG:
  - José Gutierrez, Tom Phinney, Ludwig Winkel

#### **Focus TGs:**

##### PHY/MAC TG:

- participants: Chris Herzog, Kevin Towers, Gerry Nadler, Michael Dow, Jay Werb, Åke Severinson, Rene Bischof, Mike Medley, Helmut Adamski, Tom Phinney, Wang Heng, Israel Radomsky, Toshi Hasegawa, Li Zheng, Paul Sereiko
- Scope?
- European participation is desired

##### Network/Transport TG:

- Participants: Geoff Mulligan, Jay Werb, Tom Phinney, Rick Enns, Chris Herzog, Marty Zielinski, Art Howard, Martin Turon

##### Editing TG:

- Participants: José Gutierrez, Ludwig Winkel, Tom Phinney, Geoff Mulligan
  - use the IEC style sheet, which is the same as the ISA style sheet, vocabulary

##### Security TG:

- Participants: René Struik, Wang Quan, Jeff Potter, Tom Phinney, Rene Bischof, Toshi Hasegawa, Art Howard, Jay Werb, Gerry Nadler, Rick Enns, Bruce Barnett, Zafer Sahinoglu

##### Network Mgmt TG:

- Participants: Chris Herzog, René Bischof, Ian McPherson, Rick Enns, Art Howarth, Michael Medley

Application TG:

- Participants: Wayne Manges, Marty Zielinski, Peter Fuhr

Gateway TG:

- Participants: Chris Herzog, Jay Werb, Geoff Mulligan, Paul Sereiko, Gerry Nadler, Wang Heng, Michael Medley

**AM2**

Review of Chicago discussion

Network hierarchy (levels)

Lots of discussion about the content, but no real actions defined

TRD

Discussions about nomenclature, but no specific actions defined

Architecture Overview

- Tom Phinney will recommend changes to the MAC and the data link layer
- Tom Phinney and Rick Enns will agree on a change/slice above the transport layer and propose this to the group; some feel that the current OSI model is just an abstraction and should not be sliced
- David Brandt will put a "brown vertical stripe" down the left side of the OSI model, going into each layer

**PM1**

**13:40** Pat Kinney called the meeting to order

David Brandt summarized his pre-lunch review of the basic OSI stack model within the converged TRD. He then presented summaries of the various OSI-layer topics within the TRD, indexed by OSI layer:

- Network functions, including the need within a system for:
  - System Network Management Process
  - System Security Management Process
- Field device functions (should this be "field device instrumentation functions" to differentiate from the networking functions in field devices)
- Routing functions (might be in a field device)
- Gateway functions
- Handheld functions

Topologies created by co-locating various functions in nodes:

- mesh topology (derived from Jose's diagrams presented during the SP100.11a Houston meeting)
- "star topology"(also derived from Jose's diagrams)
  - Tom Phinney commented that the "star topology" diagram described a "stars-at-the-edge" topology, but not a star topology (which necessarily has a single central hub and radial spokes)
- Handheld interactions

- Power sources
- Time synchronization

Transport Layer

Network Layer (including device mobility)

- Tom Phinney commented that the phrase "and UAP identifiers" in the description is a violation of layering and layer transparency requirements.

Data-link Layer

- MAC sublayer (includes a "shall" that none of the proposals meet, for use of a standards-based MAC based on economic arguments)

Physical Layer

- Interference sources
- Coexistence with other intentional radiators

Network Management

- Device Network Management Process
- System Network Management Process

Security Management

- Bottom-of-stack security (per MAC subnet)
- Top-of-stack security (per Transport endpoint association)
- Device Security Management Process
- System Security Management Process

The group applauded the TRD convergence team's work and David's presentation.

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Schedule for TRD and Convergence task groups (led by Pat Kinney)

The schedule for the January and February meetings was discussed, as was the need for additional work before the January meeting on the TRD. Pat Kinney put the dates 2007.01.08-11 (San Ramon) and 2007.02.12-15 (Phoenix) on the screen. The dates 2007.01.08 and 2007.02.15 are extension to prior agreed meeting dates.

For the 2007.01.08-11 SP100.11a WG meeting in San Ramon, CA, US:

- System TG starts draft of principles of operation
- Focus TGs work on their areas
- If there are areas of contention:
- WG hears presentations on alternative proposals for those areas of contention
- Convergence TG drives to consensus on areas of contention and enhances evaluation criteria

For the 2007.02.12-15 SP100 meeting in Phoenix, AZ, US:

- WG hears presentations on final proposals for any areas of contention

- Convergence TG presents report on contested issues along with potential resolutions using use cases, requirements and evaluation criteria

Wayne stated the gating criteria for a draft document to be published by SP100. The following is an ordered list of reasons not to publish:

- 1) Embarrassing
- 2) Known wrong content
- 3) Significant missing content

The system level drawings review and comment is due by 2007.01.03. Volunteers to review these drawings were:

Rene Struik, Wayne Manges, Tom Phinney, Helmut Adamski, Jay Werb, Sicco Dwars, José Gutierrez, Rick Enns, Dan Sexton.

Discussion and editing this document will occur on 8 January in San Ramon, CA, at the S-TG meeting; probably in a hotel conference room.

System level drawings (led by Dan Sexton, then by Pat Kinney)

Dan Sexton presented a revised version of Herman Storey's slides from the Chicago System architecture TG meeting. T Phinney queried whether "mobile workers" should be "nomadic workers". D Sexton changed the Level 1 and Level 0 entries to "nomadic workers"

Presented slides showed examples of corporate architecture, in-plant architecture, equipment monitoring architecture, control and alarming architecture, and remote systems architecture. Herman pointed out that a legend for the tunneling drawing nomenclature (fat tunnel layer overlaid by thin link for the layer that is tunneled). Sicco Dwars asked to see wired control in the field with wireless "home run" cabling back to the automation system.

Chris Herzog pointed out that the diagrams included physical connections overlaid with logical connections. A discussion of graphical nomenclature that could show separate logical and physical views was discussed. The remote systems example, which showed a control room, two VPN-firewalls interconnected by the Internet, and an instrumentation area with level 0 and level 3 communications, generated a lot of discussion about the placement of the gateway functions -- at the control room or at the instrumentation end of the Internet link.

Pat Kinney collected opinions on the purpose of these diagrams:

- illustrate options (0 votes)
- common language (7 votes)
- logical data flow/connection in terms of defined levels (3 votes)
- determine scope of first phase (7 votes)
- "Dummies guide to SP100.11a" (8 votes)
- visual work product (4 votes)

The winners were:

- common language (7 votes)
- determine scope of first phase (7 votes)
- "Dummies guide to SP100.11a" (8 votes)

The following people will work on these diagrams and integrate them into Herman's "Legacy" document: Herman Storey, Art Howarth, Israel Radomsky, Paul Sereiko, Dave Kaufman, Dan Sexton (owner).

**15:45** Pat Kinney called a recess

**PM2**

Draft Report of Convergence Task Group

Jay Werb presented the report of the Convergence Task Group. He emphasized that the Task Group has never met and that the report is his work alone. He divided the topics in the White Papers into three areas: Agreement, Variations, and Divergence. He reported on the features discussed in the White Papers that fell into each of these three categories.

Motion: *SP 100.11a adopt the "Reliability, Bounded Performance, and Coexistence Common Themes" as presented by Jay Werb and subsequently modified through discussion within SP 100.11a.* Moved by José Gutierrez; seconded by Tom Phinney. The motion passed unanimously.

Motion: *SP 100.11a adopt the "MAC Common Themes" as presented by Jay Werb and subsequently modified through discussion within SP 100.11a.* Moved by José Gutierrez; seconded by Tom Phinney. Vote required. The motion passed with 24 in favor, 0 opposed, and 2 abstained.

Motion: *SP 100.11a adopt the "Security Common Themes" as presented by Jay Werb and subsequently modified through discussion within SP 100.11a to be "Security Instructions".* Moved by José Gutierrez; seconded by Tom Phinney. The motion passed unanimously.

**Wednesday, December 13, 2006**

**AM1 - Kaufman**

Future Meetings

- Systems task group will meet one day early for both the January and February meetings. Meeting planners should allow for approximately 15-20 people.

IEEE 802.11 Wireless Proposal

Peter Single from G2 Microsystems presented his company's 802.11, low power radio product. His presentation will be put on the FTP server.

Key points from presentation:

- 802.11 market overall is growing (26% CAGR)
- Lots of "infrastructure" available for 802.11 (standards, products, tools, etc)
- Radio chip can last ~2 yrs on AA lithium battery
- Energy during "wait state" is 1 m joule
- With an 80 byte+ payload, 802.11 low power chip is better than Chipcon chips 802.15.4 (graphs shown)
- Provides a System on a Chip with memory, processor, power management, etc.

Instructions to Task Group Specification Editors from Dan and Pat (co-chairs)

Discussion on:

- Should we prefer that the PHY be based on a widely implemented standard?  
Provides multiple sources
- It must meet the SP100 customer goals and customer use cases
- Scalability is very important
- Customers have requested 20K in SP100 Goals
- Emmett Martin from (Pharmaceutical firm in the room) indicated 50K sensors with about 1 second updates for his plant in next 10 years.
- IEEE – Preference?
- SP100 will not have to maintain it
- Should a device be interoperable at the device layer?
- Required PHY for each band?
- Key questions should be given to User committee to help in selection of technologies. For instance, "What is the typical customer scalability needs in next 10 years? for what typical size plant? and at what update rates?"
- Lots of discussion.....

Conclusion: Want convergence task group to develop process for converging on key items like this.

## AM2

José Gutierrez moved *to amend the agenda to swap AM2 and PM 1*; this motion was seconded by Rene Struik. The vote results were 24/4/1 - motion carried

Continuing discussion on PHY selection....

Discussion on what the task groups need to their job and what they will do with it.

Chairs put three questions up to help this process

Questions were suggested by WG members and recorded by Chairs

José Gutierrez moved *to have TG to make a recommendation that the family of IEEE 802.15.4 radios be considered as the physical layer for S100.11a*

2nd by Peter Fuhr

José Gutierrez moved to amend the motion to: *Task group makes recommendation that the working group adopts the family of IEEE 802.15.4 radios as the PY layer for SP100.11a*

Rene Struik moved to amend the amendment to: *Task group makes recommendation that the working group adopts at least one of the family of IEEE 802.15.4 radios as a PHY layer for SP100.11a*

2nd Tom Phinney

Vote to amend the amendment: 24/1/5 - motion carried

Vote to amend to original motion: 26/1/4 - motion carried

Final motion now reads: *Task group makes recommendation that the working group adopts at least one of the family of IEEE 802.15.4 radios as a PHY layer for SP100.11a*

Vote to final motion: 27/2/3 - motion carried

Discussion moved onto trying to determine attributes that are necessary to help select the PHY layer.

Discussed ensued as to the method in what we would use to rank the attributes. It was agreed that we would use a low, med and high for ranking

The list of attributes will help us defend the decision

Proceeded to use a show of hands to determine the weighting (low, med, high) of each of the attributes

## PM1

5 Security TG members present at the start of the meeting

4 Management TG members present at the start of the meeting

### Security and network management

Tom Phinney presented Security by OSI Layer

The slides discuss potential uses of cryptography at Physical, MAC, Network, Transport and higher layers.

Comments

- PKI is good because no other device knows the key.
- Encrypting the channel hopping sequence is subject to export control. – Wayne M
- The cost of encryption is about the cost of authentication. Rene Struik
- Wayne does maintain have a use case for physical layer security.

This is under discussion in the Security TG. The presentation is not yet a voted work product of the group.

What questions does the Security TG need to answer to move forward?

- a. Should PKI be mandatory?
- b. If we do make PKI optional how do we maintain interoperability?
- c. What is the metric for security?
- d. Does the implementation of AES represent a burden to the vendor?
- e. Should the group consider a plug and play out of the box security?
- f. What are the alternatives to PKI?
- g. What are the threats we are trying to mitigate?
- h. How does the system operate with external legacy security systems like LDAP and RADIUS?
- i. Does every device have absolute clock?
- j. Will the SP100 eliminate the backdoor?
- k. Do we have a secure time distribution system?
- l. Do we have tamper resistant modules?
- m. Is it resistant to side channel attack?
- n. Are there significant differences in operational cost between the proposals?
- o. Ability to upgrade the system?
- p. What Information does the Security TG need to answer the questions?
- q. Cost of PKI implementation

What process will the Security TG use to gather the information and answer to questions?

Network Management Discussion:

The group should first work on a charter. No further work until the charter is done in PM2.

What questions does the Network Management TG need to answer to move forward?

What Information does the Network Management TG need to answer the questions?

What process will the Network Management TG use to gather the information and answer to questions?

System Road Map Task Group Discussion:

Reason for a System Road Map:

- o Document a phased approach
- o Future proofing

Discussion for uses of a System Road Map discussion

There is support for planning for either a 5 or 10 year plan.

Issues raised are future proofing and introducing new technologies, supporting products for 20+ years and backwards compatibilities

Straw poll for support for a phased release 15 yes and 0 no

There was discussion on how to do this  
A phased approach based on an end state.  
Need for mechanisms to support phased releases  
Support future proofing and backwards compatibility  
Sequential, parallel, and overlapping sc  
Presentations:  
Geoff Mulligan, Chairman of 6lowPAN IETF working group  
Discussion Topics:  
Brief questions and answers on 6lowPAN.

Convergence Task Group Workshop:

Reviewed Divergent views & items list submission by Jay Werb  
Questions around the goals / raison d'etre of the Convergence Task Group  
Drive recommendations & suggestions into other task groups  
Look for the points of convergence & recommend items to get group to convergence  
What is the process that the convergence group will use to make the recommendations?  
Convergence Task Group Process Discussion  
Finish the report (on similarities and differences)  
Recommends resolutions to divergent views to the workgroup  
Reviewed Motion from earlier in the day on recommendation 802.15.4  
Convergence Task Group Finish Report  
Slide 9: Reliability, Bounded Performance, and Coexistence Variations on the Themes  
Topology Variations were listed, modified, remodified, argued over, and vented on  
Jay committed to complete the remaining sections  
Consensus that page is descriptive  
Slide 10: Reliability, Bounded Performance, and Coexistence Divergent views  
This slide was earlier updated with the proper standards titles  
The convergence group needs to review the regulatory environment & regulations  
Consensus that page is descriptive  
Slide 11: MAC Variations on the Themes  
Asymmetric: Removed line on comment that consensus would be hard to achieve  
Consensus that page is descriptive  
Slide 12: MAC Divergent Views??  
Changed frequency agility to channel hopping  
Slot allocation changed to TDMA Slot Allocation  
Consensus that page is descriptive  
Moved to slide 17, statement that all slides were in consensus  
Group concluded that Step I is complete up to section 7 of the document

**18:01** Meeting recessed

Notes, Motions & Resolutions:

Tom Phinney has issues with the submission by Jay Werb. Jay approved / wished that changes be made to the official naming of the 802.15-4 standards.

Convergence Task Group concluded that Step I (Present Report) is complete up to section 7 of the document.

**Thursday Dec 14**

**AM1**

**Convergence Task Group (8-8:45)**

Dan started the meeting by showing a spreadsheet that Dave Kaufman developed to help assess the various attributes of the Physical layer from both a customer requirements and product attributes.

Art raised concerns about whether the process described would work unless we went through it for each application class or the two broad application classes (1-3) and (4, 5)

A lengthy discussion followed and general consensus was that it would be good to go through the exercise. There was mention of whether or not the exercise would result in a schedule shift.

The chair conducted a straw poll on whether to use the tool with the results of 9 for 7 against 3 abstain; accordingly the chair elected to use the tool.

**Use Work Group Report Out – Greg LaFramboise (8:45 - 9:40)**

Greg L presented User Group report out via PowerPoint. This PowerPoint is posted on the FTP under the WG8.

A spirited discussion followed regarding what the vendors mean by interoperability and the differences between interoperable and interchangeable.

Numerous clarifying questions were asked about several of the items in the presentation.

Dan Sexton gave Greg LaFramboise an action to rank the user requirements bullets H, M, L and also sort what is required for every SP100 device and what is optional for certain devices and/or environments.

**IEC Presentation – Valerie (Rockwell Automation) – France**

Valerie gave a presentation on IEC. This presentation is to be posted on the FTP site.

IEC has about 110-120 technical committees.

IEC is one of three standards organizations that are recognized by the world trade organization (WTO).

Valerie works in TC 65, which deals with Industrial process measurement and control.

After the presentation we discussed how SP100 could introduce itself into IEC.

Tom Phinney stated that the agreement within the IEC TC65 management was that IEC wireless standards work for industrial-process measurement and control would be placed as a new project under the existing IEC SC65C/MT9 field bus maintenance team. SP100 standards would go into IEC SC65C via this route.

Meeting recessed for break

**10:48** Dan called the meeting to order

Dan suggested that we not follow the agenda which called for starting the Application Gateway TG Workshop and instead continue the work on the evaluation spreadsheet.

Wayne made the motion to change the agenda, Chris H, seconded, to work on the Convergence Evaluation Spreadsheet instead of moving to the Application Gateway TG Workshop. No one objected and the Application Gateway TG Workshop was removed from the agenda.

Evaluation Spreadsheet

Dan took the User TGs list of requirements and created a Six Sigma spreadsheet with the User requirements as the "Y's" (or wants). The "X" column is labeled the Product Requirements. The idea was to rework the attribute list generated on Wednesday and use the new X-requirements list instead.

The group started this exercise with the list from Wednesday as a starting point. It was decided that this list would only be for the PHY layer (not MAC). The process was to take each product requirement one at a time and verify that there was at least one user requirement that dictated the product requirement. A vote of the group to park it or keep it decided whether it remained on the list. Dan recorded the votes on the same spreadsheet.

There was discussion on how complete the user requirements list was. The concern was that a product requirement would be deleted simply because the user requirement list was incomplete. The resolution was that the product requirement would be parked if it was voted that there was no relevant user requirement.

As questions came up during the conversations for the PHY/MAC TG, they were recorded in the PHY/MAC .ppt "Questions" slide as guidance to the PHY/MAC TG.

By the end of the AM2 time slot, the body had completed voting on the complete list of the previous existing attributes, now the "X" product requirements.

**12:37** AM2 session ended

### **Closing Meeting**

Thanks to Sicco for Hospitality

PHY/MAC Task Group Motion: (see motion, note it is at the task group level, and a further vote is needed at work group level)

Motion:

*The ISA SP100.11a MAC/PHY task group shall recommend adoption of the IEEE 802.15.4-2006 2.4 GHz DSSS radio as a physical layer that provides default interoperability for customers that do not specify a different radio. Contingent on the satisfactory resolution of co-existence issues, the standard will also support at least one other physical layer as a customer-selectable option, including at least one other 2.4 GHz option of equivalent raw bit rate.*

*Any such optional physical layer shall be approved and adopted based on user requirements, using the SP100.11a standards approval process. The standard shall not require simultaneous support of the default physical layer when an optional physical layer is selected by the customer.*

The vote results were 19 in favor, 4 opposed, 1 abstention; the motion carries.

Editing task group: would like 1 hour session with all task group people on drafting documents at San Ramon meeting.

San Ramon Meeting 9, 10, 11 February. The workgroup meeting on Thursday will be a half day. The location of System TG on the 8th is TBD since Chevron cannot host it.

The WG approved a meeting in April. The date will be the fourth week April with a venue of Austin (Freescale's campus).

And thanks for your efforts

Meeting was adjourned

**Annex A**

Attendance for ISA-SP100.11a, Amsterdam, Dec. 12-14, 2006

Helmut Adamski, Allart Karel Bastiaans, Jos Berkien, Joerg Bertholdt, René Bischof, David D. Brandt, Oliver Bredtmann, Kouji Demachi, Valerie Demassieux, Mike Dow, Sicco Dwars, Rick Enns, Frans Frielink, Peter Fuhr, Michael Gawronski, Brian Green, José Gutierrez, Toshi Hasegawa, Bob Heile, Chris Herzog, Art Howarth, Kees Kaijser, Dave Kaufman, Pat Kinney, Terry Krouth, Greg LaFramboise, John Lampe, Tomas Lennvall, Li Zheng, Rodney Livings, Jon Malins, Wayne Manges, Emmett Martin, Ian McPherson, Mike Medley, Berry Mulder, Geoff Mulligan, Gerry Nadler, Hieu Phan, Tom Phinney, Christos Polyzois, Israel Radomsky, Charley Robinson, Zafer Sahinoglu, Paul Sereiko, Dan Sexton, Peter Single, Herman Storey, René Struik, Herman Suselbeek, Werner Thoren, Kevin Towers, Martin Turon, Bram Van den Bosch, Niek Van Dierdonck, Hans van Dongen, Wang Heng, Wang Quan, Wei Li, Jay Werb, Ludwig Winkel, Tim Whittaker, Marty Zielinski