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NeSSI2002 - Update No. 4
End-of-Year (EOY) Summary

Dear NeSSI Enthusiasts,

As mentioned in our cover note, several months have rushed by since our last update on April 29,2002 and we are indeed way overdue in providing an update on the NeSSI activities since then.

Several activities involving NeSSI have occurred since April:

1. ISA Analysis Division (AD) meeting in Denver, May 20002
2. CPAC Spring Meeting, Seattle, May, 2002
3. Presentation to DoE's (US Department of Energy) Program Comm. by Ulrich Bonne in Las Vegas, June 2002
4. CPAC Summer Institute (July 17-19, 2002) “Micro-instrumentation for High Throughput Experimentation”
5. SP76 Specification approved as ANSI/ISA Standard
6. ISA2002 Meeting in Chicago, October 2002
7. CPAC Fall Meeting, Nov 2-5, Seattle
8. Proof of Concept Proposal by Honeywell
9. Gen II Specification prepared; undergoing legal review
10. Sneak Preview of NeSSI related papers at IFPAC2003

A short summary for each of these activities is presented below:

1. ISA Analysis Division (AD) meeting in Denver, April 14-18, 2002

Jim Tatera presented a tutorial on NeSSI at this AD meeting in Denver. The presentation a duplicate of the tutorial session that was presented at Pittcon2002 and which we have reported in detail in the previous update.

The session was attended by between 70 and 80 attendees and the NeSSI program goals received general support. About 20 people requested to be added to our distribution list.

2. CPAC Spring Meeting, Seattle, May, 2002

A status report on NeSSI (and ConnI) was presented at the CPAC Sponsor meeting held in Seattle on May 5 -10, 2002. Key points made were that the future NeSSI emphasis will shift to a Project Mode to allow us to access outside funding to develop, build and test some Generation II prototypes. Additional legwork and planning were done at the meeting to support Ulrich Bonne (Honeywell) in leading the effort to present a preliminary proposal to the DoE/OIT (Office of Industrial Technology) steering team meeting in Las Vegas, June 2002. Item 3 below has more detail about this effort to pursue external funding to assist with the engineering and commercialization of the NeSSI technology according to the Generation II specifications (see item 8).

3. Presentation to DoE by Ulrich Bonne in Las Vegas, June 2002

At IFPAC2002, Pittcon2002 and the spring CPAC meeting, a consortium of Users and Suppliers interested in participating in the proposed DoE/OIT sponsored NeSSI Gen II development program, was put together. On behalf of this group, Ulrich also lead the preparation of a White Paper defining this program goals, plans, participants, schedule etc. The White Paper served as the basis for the preliminary proposal outline presented to the DoE/OIT steering team in Las Vegas on June 12, 2002.

The White Paper can be accessed at the following URL (note that this pdf file is about 0.94 MBs):
http://mn65-www-cbt.htc.honeywell.com/bonne/WP-02-NeSSI-DoE-T.pdf

Ulrich's trip report is appended as Appendix 1. In summary, all lights are green even though some work needs to be done to get participation across a broader range industries. The DoE/OIT solicitation is expected to be published Jan.15, 2003, at which time Ulrich and his team will develop and submit the NeSSI II proposal. Given the legwork that has been done so far, we expect to have a very strong proposal in DoE/OIT's hands in a relatively short time.

Please review the White Paper and if your company might be interested in participating as a member of the end-user/supplier consortium, please let us know at your earliest convenience. We are of course very excited about this opportunity for NeSSI to become a focal point for pursuing some R&D funding on behalf of the general process analytics community. Any additional participation can only strengthen our hand and increase our chances for success.

4. CPAC Summer Institute (July 17-19, 2002) “Micro-instrumentation for High Throughput Experimentation”

The NeSSI concept to develop "smart" modular plug-and-play elements that can be readily combined into sampling/sensor systems for process monitoring applications was described. In addition, a variety of micro-analytical technologies under development at CPAC and elsewhere were presented. During open discussion periods, it was emphasized that many of these analyzer concepts could be implemented on the NeSSI platform. Initial thoughts were to integrate the resulting platform with process streams (for monitoring and control) and micro-reactors (for process optimization studies). It became apparent that this approach could also be extended to laboratory and development operations, providing further incentive to developing a general suite of miniaturized analytical tools. These would provide real-time analytical characterization and possibly method development.

5. SP76 Specification approved as ANSI/ISA Standard

Our thanks to Dan Podkulski who chaired the SP76 subcommittee that wrote the specification for the following summary of this important achievement:

"In July of 2002 the subject standard "ANSI/ISA-76.00.02-2002: Modular Component Interfaces for Surface-Mount Fluid Distribution Components - Part 1: Elastomeric Seals" received ISA and ANSI approval for the dimensions of a surface mount interface for sample system component design. The dimensioning of a standard interface between a sample system component and the flow substrate will allow flexibility in design and use far beyond what current sample systems can do today.

The standard can be accessed through ISA's website at www.isa.org, clicking on the standards tab, and searching for the standard number or any of the keywords in title. Downloadable versions are available for a nominal cost.

This was the result of more than two years effort by a subcommittee of industry users as well as major sample system component suppliers. The committee originally used a semiconductor industry design concept and then made it their own by making the design requirements relevant for chemical and petroleum process industries."

We would like to thank and congratulate Dan and his team for this accomplishment which is a real boost for the NeSSI effort now that a formal standard is available. **The SP76 committee members that we would like to recognize and thank for their effort and a job well done are:**

Dan Podkulski (Chairman) - ExxonMobil Chemical
Bac Vu - Dow
Don Nettles - Chevron Texaco
Richard Hughes - Autoflow
John Thomas - Parker
David Hasak - Swagelok
Charlie Robinson - ISA

Separately, Jim Tatera is working hard to get the SP76 standard also accepted as an IEC standard. Jim's hope is "that the relevant IEC subcommittee will first approve the SP76 document as an IEC PAS (Publicly Available Specification) at the first meeting after it gets the ISA copyright permission. A PAS is not an IEC Standard but is the closest thing to it. Sort of an endorsement that it is a valuable document worth the IEC distributing world wide. After that we will begin the longer IEC Standards procedure. This is the approach that was recommended at the Beijing IEC meeting last April. Now that we have an ANSI/ISA standard approved we can give it a try".

6. ISA2002 Meeting in Chicago, 22 October, 2002

Jim Tatera also led the NeSSI session at the ISA2002 Meeting in Chicago, titled: "New Sampling/Sensor Initiative (NeSSI) Update and Information Exchange"

The abstract for this session is a good summary of the goals of NeSSI and it is repeated here for the benefit of those of you that are relatively new to the initiative:

"NeSSI is an open technology initiative that is being coordinated through the Center for Process Analytical Chemistry at the University of Washington. It is a new, compact, smart, and modular approach to process sampling and a mounting platform for many analytical devices of the future. The physical modular mounting platform is based on the ISA SP76 Modular Sampling Footprint. Recent advances in process analytical technology have primarily focused on the analyzer itself. We are now focusing on a revolutionary smart sampling concept. Instead of walls full of valves, tubing, filters, etc.; we want a new Modular Sampling System platform with new small intelligent devices (analytical devices, sensors, actuators, valves, regulators, filters, etc.) to mount on it. We are talking about a revolutionary new approach to process analytical sampling. For as long as most practicing process analyzer professionals can remember, sampling systems have been blamed for most of our systems maintenance and performance problems. NeSSI aims at fixing this significant problem".

7. CPAC Fall Meeting, Nov 2-5, Seattle

At the CPAC Fall meeting, a status update for the NeSSI and ConnI initiatives was provided which covered most of the topics alluded to above.

In our NeSSI focus group though, a new marketing focus was identified for NeSSI. It is based on the expectation that the full capability and benefit of NeSSI will only be realized once it can also accommodate the new generation of micro-analytical sensors that are and will be emerging over the next couple of years. To initiate this change in focus to micro-analytics, it was proposed that CPAC sponsor a two day workshop on micro-analytics immediately preceding the next CPAC sponsor meeting in Seattle i.e., May 3-4, 2003. We are only in the very early stages of planning the workshop and preliminary thoughts about the goals/objectives for this workshop are that it will:

- provide a general overview of the current commercial and technical viability status of miniature analytical sensors including MEMS and Nano-based technologies
- identify the future trends and opportunities in micro-analytical sensors including technology and commercial barriers to overcome; this session is also expected to identify some sensor/actuator needs not currently addressed such as an inexpensive micro-coriolis flow meter
- explore the role that NeSSI can play as an on-line and off-line platform for micro-analytical devices and as a sampling bridge between the macro chemical manufacturing process and the micro analytics worlds
- explore how a clearing house mechanism can be established to allow the process analytics community to stay abreast of micro-analytics developments and facilitate the commercialization of these technologies for the process analytics community

We realize that we do not have any program/agenda details available at this time but hope that the broad outline of our goals will assist with generating interest to participate in the workshop.

If you are interested in attending and/or participating in this workshop, we will be delighted to hear from you. Even better, if you can let us know what specifically you might be looking for in such a workshop, please let Mel (mel@cpac.washington.edu), Rob (rndubois@dow.com) or Peter (peter.vanvuuren@exxonmobil.com) know by sending them an e-mail note with your suggestions. See also the e-mail cover note for more information about how you can assist us with feedback on this proposed workshop.

8. "Proof of Concept Apparatus" (NeSSI-II-POCA) Proposal by Honeywell

In topic 3, we have mentioned that an effort is underway to submit a proposal to the DoE for funding of some NeSSI II prototypes. We expect that if the DoE does fund these proposals, the earliest time-frame that work can begin will probably be in the 3Q03.

To maintain the current NeSSI momentum in the mean time, Honeywell has approached some companies that has an active interest in NeSSI to develop a proof of concept apparatus (POCA) which will demonstrate some of the next generation concepts that will further enhance the capability and benefits of NeSSI. In particular, the POCA assembly will demonstrate the use of an IS serial CAN-bus, the basic functionality of the Sensor/Actuator Manager (SAM), the availability and performance of inexpensive P,T,F sensors and a new generation combi-valve, both on-off and proportional to allow flow control.

These POCA units are expected to be ready for testing in the 1Q03 and preliminary results may be available for the proposed workshop meeting in May (see topic 7).

If your company might be interested in participating in this POCA evaluation, you can contact John Mosher at Honeywell directly (e-mail: john.mosher@honeywell.com or phone: (209) 339-4004).

9. Gen II Specification almost ready for publication

In our presentations this year, we have mentioned that Rob and Peter has prepared the draft version of the NeSSI Generation II specification. It is our intention to post it on the NeSSI website for your review and comments prior to updating and finalizing it. As this work was done under the auspices of Dow and ExxonMobil Chemical respectively, it requires a legal review by each company. The main stumbling block that prevents us from posting it, is related to how these companies and CPAC handles the copyright issue. We are confident that this will be resolved in the near future and will let you know as soon as it is ready for posting. We believe that the GenII specification will take us a long way towards realizing the full benefits for NeSSI and we will be eagerly looking for your input/comments and eventually your endorsement of the specification.

10. Sneak Preview of NeSSI related papers at IFPAC2003

IFPAC2003 is just around the corner, i.e. it will be held at the Westin Kierland Resort in Scotsdale, AZ on Jan 21-24, 2003. There will be a NeSSI session on Wednesday PM and it will cover not only the current status for NeSSI developments but also begin to highlight the use of NeSSI as a sampling platform for the new generation of micro-analytical devices. We hope to see many of you at the IFPAC2003 meeting.

The following papers are scheduled to be presented at the NeSSI Wednesday PM-II session:

NeSSI: The Good, the Bad and the Ugly - Early Implementations and Directions
Rob Dubois - Dow Chemical Canada Inc., Fort Saskatchewan, AB, Canada; John Cumbus, ExxonMobil Chemical

NeSSI Generation - A Solid Foundation
Douglas A. Nordstrom, David M. Simko, John J. Wawrowski, Swagelok Co., Solon, Ohio

Between SAM and the Substrate - A Smart Valve for NeSSI
Richard A. Ales, David M. Simko, Swagelok Co., Ohio

Networked Sampling System (NeSSI-Generation II) Development and Field Test
J.Mosher, R.Nickels and U.Bonne, Honeywell International - ACS

Microelectromechanical Systems for Process Analytics
Frank A. DeThomas, Company: ABB Analytical, Woodstock, MD

PHASED, a Faster, Smarter and More Affordable Gas Analysis Device - Update
U.Bonne, J.Detry, R.Higashi, K.Newstrom-Peitso, H.Pham, T.Rezacheck and S.Swanson
Honeywell Labs, Plymouth, MN

Low Water levels in various solvents: on-line monitoring by a miniature MIR spectr ometer
Joseph P Sung and Jim Tatum, Rohm & Haas, Houston, TX, Yael Barshad and Yoav Barshad, Applied Analytics, Inc., Chestnut Hill, MA

Computational Fluid Dynamic(CFD) Analysis of Gas and Liquid Flow Through a Modular Sample System
Tanios Y. Bougebrayel, John J. Wawrowski, Swagelok Co., Solon, Ohio

"Chip-based HPLC for On-Line Analytical Applications and NeSSI Generation III Sensors"
Scott E. Gilbert, Mario Schlund, Crystal Vision Microsystems S.A., The Science Park, Swiss Federal Institute of Technology, Lausanne, Switzerland, and Philippe Renaud, Microsystems Institute, Faculty of Engineering Sciences, Swiss Federal Institute of Technology, Lausanne, Switzerland

Mel is also presenting a paper in the opening plenary session that is going to be focused on the use of the NeSSI platform for micro-analytical instrumentation:
The Impact of Micro-Analytical Instrumentation on Process Sensor Applications
Mel Koch, CPAC, University of Washington, Seattle, WA

The detailed IFPAC2003 presentation programs can be viewed at:
http://www.ifpac.com/IFPAC03/IFPAC03DtlPrgm.html

In general, 2002 was a good year in terms of getting general acceptance of the NeSSI concept, seeing several NeSSI systems deployed in the field for evaluation and laying the groundwork for some DoE funding to build several Generation II prototypes. The year 2003 promises to be another banner year for NeSSI (IFPAC2003, POCA, DoE Proposal, ISA-AD Meeting in Calgary, Micro-analytics Workshop at CPAC in May, etc.). Let us know if you or your company would like to share some of your activities regarding NeSSI for the next newsletter or for sharing on our NeSSI website. For those of you who might be new to our NeSSI efforts, please visit the NeSSI website for an overview of all the activities to date:
http://www.cpac.washington.edu/NeSSI/NeSSI.htm

Looking forward to hearing from you and thanks again for your continuing interest and support for NeSSI. And finally, it is not too late to wish all of you a very good 2003.

Regards,
Jim, Rob, Peter and Mel

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Appendix 1

Date: 13 June 2002

Subject: TRIP REPORT: DoE-OIT Sensors and Controls Meeting, Las Vegas, NV, 10-12 June 2002

To: NeSSI Team From: U.Bonne, Honeywell Labs

Summary
The purpose of attending this meeting was to 1) better understand DoE-OIT procurement procedures, 2) present a White Paper on the subject of NeSSI Development and Demonstration (to which DoE's Gideon Varga had invited us to), and 3) possibly sign up additional participants in the NeSSI Consortium of Users and Suppliers. The meeting was attended by the 10 Members of the DoE Program Steering Committee, in addition to about 35-40 speakers + coworkers tied to ongoing and proposed future projects.

The above objectives were met as follows:

1. DoE's program managers are encouraged to seek and support Sensor and Control projects that cut across a number of users or preferably across diverse industries. In that sense our NeSSI project would well serve as a poster project. Wireless sensors are also heavily emphasized, in view of a Presidential Commission having determined that wireless sensors would bring about "an improvement in (industrial) efficiency of 10% and a reduction in emissions of 25%". Reporting is being revised to exclude proprietary information from Quarterly Technical Reports (with small financial statement included) and Annual Technical and Financial Reports. DoE is being reorganized according to Energy Efficiency and Renewable Energy (EERE) concepts.
2. Our 20-min NeSSI white paper presentation was well received. Within that period I made sure that there was time for questions and comments:
   - Q.: Are there applications of NeSSI envisioned outside of the chemical industry? A.: Yes.: We are aware of and welcome additional participants from the power, pulp and paper, food, beverage industries,.... we envision that NeSSI will eventually be able to sample either gas or liquid streams,
   - Q.: Might Sandia's "µChemLab" analyzers fit onto and be networked to the NeSSI "footprint"? A.: Sure, provided they can "plug and play", and "connect" with the TBD NESSI protocols;
   - Complimentary comments by PNNL's Barry Wilson and Elwin Rooy(?) (Elwin Rooy & Assoc.) about our comprehensive and inclusive (across industries) approach.
   - Comments by Bruce Johnson, DuPont, highlighting CPAC's contributions to NeSSI

   Without taking direct credit for this, I was told that our NeSSI proposal was on the Steering Committee's Agenda for June 13. I inquired what our chances might be, to land a "sole source" award, in view of the unique and diverse participation of the NeSSI Team of industrial processing Users.... The response was that this is unlikely, at the proposal stage, but that a DoE Request for Proposals is due to come out soon.

   Additional feedback we received via Bruce Johnson, DuPont & CPAC:
   1. "Cross Cutting": Gideon Varga expressed some disappointment that NESSI did not have people outside of the chemical, petrochemical and pharmaceutical industries involved in the development and on the NESSI steering team. To maximize our chances of landing a funded project, we should try to get additional participation from the food, mining and forest product industries. Barry Wilson of PNNL indicated that NESSI would be of use in his project that was aimed at the forest products industry. During the steering team meeting Jerry May (INEEL, the mining industry representative on the steering team) indicated that NESSI would have use in mining. He agreed to talk to someone from the NESSI group and help them make contacts with in the industry. The metals and glass people did not see direct applications.

   2. Enery Savings: Gideon Varga said that the sensors and controls program has the lowest energy savings claim in OIT. He also said that he was very suspicious of the wireless benefits claim mentioned above. Several steering team members talked about the need for programs to include a plan to both understand better the energy savings as the program goes on, and the need to audit some test cases. Bruce felt that the calculations done on the nominal ethylene plant operation looked pretty solid relative to many other savings claims he had seen.

3. Networking: There was a lot of discussion in the DoE steering team about whether we can (or how we might) avoid a repeat of the Field Bus situation. Can the Suppliers and Users arrive at a standard specification that all use, and will make all sensors, actuators, and analyzer systems plug and play?

3. PNNL's pulp and paper customer might be a candidate of joining the user's team of NeSSI. As mentioned above, Sandia's Alex Robinson (recent PhD from CPAC) inquired whether their µChemLab analyzer might be a candidate to plug into a NeSSI substrate, and John Coates (also serving on the DoE S&C Steering Committee) also asked about such a possibility for a sensor he is developing.

The National Labs (3-ORNL, 5-Sandia, 3-PNNL,) were well represented at the meeting. There may be increasing pressure to include wireless features to the NeSSI project, with both ORNL and PNNL competing for their "brand" of wireless. Wayne Manges delivered a lively presentation on wireless technology, their patented approaches (mix of frequency hopping and "direct sequencing" spread-spectrum approach. I asked him about the possibility of IS certification of any wireless, to which he responded that only Motorola claims to have such a feature at present. Battery power and their safety are two limiting factors at this point. (TI also may have IS-CAN bus technology).
Bruce Johnson further reminded me that there is a DOE wireless workshop in San Francisco in July. The contact for more information is Nancy Margolis at (410) 290-0370. He expects an announcement any day, and will forward it. DoE is looking for user industry representatives to attend. It looks like there are plenty of potential vendors and National Labs interested, but they want people representing the end users. It would be good if one of the NESSI User/Supplier Steering Team members could attend.

ACTION

- Barry Wilson, PNNL, will send info on pulp and paper application of NeSSI. Ulrich to inquire about their participation in the NeSSI field test
- J.Bruce Kelley, [jbkelle@sandia.gov] will send info and Agenda on the upcoming DoE IMF Meeting in July in Albuquerque. Done: see Appendix
- NeSSI Steering Team: Lets try to get additional members representing other industries such as food & beverage, mining and forestry products; and continue to work on the networking technology; and sharpen our energy savings projections from ethylene plants to across all applicable industries
- U.Bonne to contact John Coates about how his sensor technology may plug into NeSSI
- B.Johnson to let us know about the Wireless DoE Workshop