

# A Collaborative, Cloud Hosted Environment for Simulating CDISC SEND Submissions between CROs, Sponsors and Regulators

Heather Williamson, Shree Nath, Nicholette Ross, Raoul Kumar Kotian and Jackson Zalki

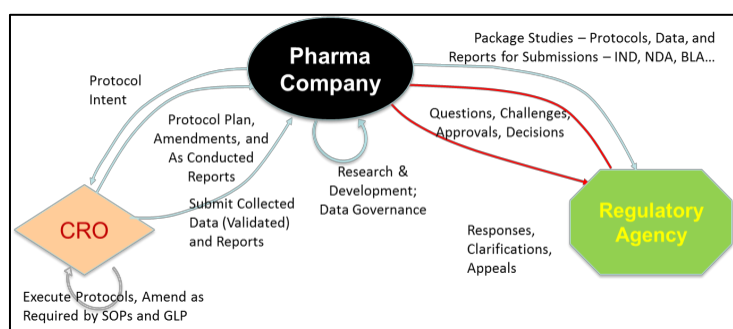
PointCross Life Sciences, Inc., #1291 E. Hillsdale Blvd., Ste. 304, Foster City, CA 94404, USA

Contact: [getSENDReady@pointcross.com](mailto:getSENDReady@pointcross.com)

## 1 – Background

At the 2012 FDA/PhUSE CSS meeting, Working Group 6 discussed **implementation needs for the exchange of nonclinical CDISC SEND (Standard for the Exchange of Nonclinical Data) in a multi-organizational setting comprising CROs, Sponsors, and Regulators**. These needs stem from an increased awareness that the assembly of submission-ready SEND datasets will require new kinds of workflows, data flows, business rule checks along with quality assurance checks and audit traceable controls in settings where different organizations conduct different parts of a study or assemble associated datasets for a SEND submission (see figure below). The Interorganizational SEND group has been discussing and developing common types of use case scenarios for such settings.

In parallel with this PhUSE-led effort by the industry, **PointCross has been running a community driven SEND Simulation Environment** which has been in operation since September 2012 to support the kinds of needs being identified both by the Interorganizational SEND team and by the broader industry. This presentation describes the SEND Simulation Environment, experiences gained over the past six months, lessons learned and future plans for the environment moving forward.



## 2 – The Environment

The SEND Simulation Environment comprises **separate CRO, Sponsor and Regulator instances**, each of which provide configurations for **data exchange, normalization, storage, workflow, SEND validation, visualization, and analytics** software built on the **PointCross DSIMS®** platform.

The following functionality was made available in the environment which is **securely hosted by PointCross in the Amazon Cloud**:

- A role that users can assume based on their typical real-world organizational role; multiple roles for the same user are supported.
- A dashboard or directory to view all studies and their data - incoming, outgoing, partials, in process, archived;
- Interfaces for sponsors or CROs to populate protocol related data;
- A **SEND Validator** incorporating OpenCDISC business rules that can be invoked on any selected SEND package with associated validation reports;
- The **ToxVision** viewer for study data with **advanced visualization, charting and export controls to SEND, Excel and XML**;
- **Search and analytics** within and across studies and species at the **individual subject and group summary** level;
- An advanced data services layer – the **Semantic Data Exchanger** – for configuring interfaces to data extracts from third party LIMS systems or other data files;
- Exchange of datasets between the CRO and the Sponsor; as well as between the Sponsor and the Regulator;
- A collaboration space (**VDR or Virtual Data Room**) where organizations can share files, capture all their emails, and discuss new needs and issues.

## 3 – Start-up Operations for the Simulation Environment

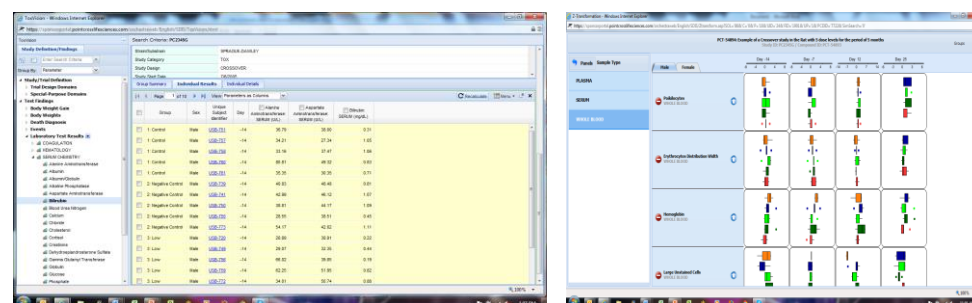
Virtual training sessions were offered to participants - representing **12 sponsors, 3 CROs and 4 consulting firms** - during the initial three months. An understanding was established with participating organizations that all datasets they uploaded into the environment were sanitized and could be used by other participants. To assist with data preparation, additional tools for proprietary data sanitization, a Microsoft Excel-based SEND submission template and legacy data conversion were provisioned into the environment. Troubleshooting sessions were setup on demand with individual organizations to address issues with their datasets and to re-configure workflows for dataset uploads where necessary. In total, **22 study datasets** were populated into the environment as seen below.

| Study No. | Study Title                                                                                      | Study Type     | Species | Strain         | Study Start Date  | Study End Date    | Stage        | Status |
|-----------|--------------------------------------------------------------------------------------------------|----------------|---------|----------------|-------------------|-------------------|--------------|--------|
| PC24562   | PC2-54884: Example of a Crossover study in the Rat with 5 dose levels for the period of 5 months | REPEAT DOSE T. | RAT     | SPRAGUE-DAWLEY | 01/05/2005 7:0 PM | 03/11/2009 7:0 PM | Data Import  | Active |
| PC2965    | PC2965: A 5-WEEK TOXICITY STUDY IN MONKEYS                                                       | REPEAT DOSE T. | MONKEY  | CYNOMOLGUS     | 06/24/2007 7:0 PM | 09/08/2007 7:0 PM | Study Review | Active |
| SEND123   | 28-Day Oral Toxicity Study of Test Compound in Rats                                              | REPEAT DOSE T. | Rat     | Sprague-Dawley |                   |                   | Data Import  | Active |
| SEND2     |                                                                                                  |                |         |                |                   |                   | Study Review | Active |
| SEND21    |                                                                                                  |                |         |                |                   |                   | Study Review | Active |
| SEND22    |                                                                                                  |                |         |                |                   |                   | Study Review | Active |
| SEND23    | PC2-54884: Example of a Crossover study in the Rat with 5 dose levels for the period of 5 months | REPEAT DOSE T. | Rat     | Sprague-Dawley | 01/05/2005 7:0 PM | 03/11/2009 7:0 PM | Data Import  | Active |
| SEND24    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND25    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND26    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND27    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND28    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND29    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND30    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND31    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND32    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND33    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND34    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND35    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND36    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND37    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND38    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND39    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |
| SEND40    | 1-Month RD Oral Tox Study with 1-Month Rec                                                       | Unknown        | Rat     | Sprague-Dawley | 01/13/2009 6:0 PM | 03/11/2009 7:0 PM | Study Review | Active |

## 4 – The Experience

Early interactions in the Simulation environment revealed that participants were either **very new to SEND or already had extensive experience with the model**. Initially, only a few organizations had experience and expertise to assemble complete or partial SEND datasets. This gap was addressed through working sessions designed to build a foundational understanding of SEND and data representation principles that eventually contributed to better use of the environment.

Participants were able to use the tools provided to either create datasets or use their existing data to test an initial set of scenarios ranging from **basic data packaging, to capturing and fixing errors, to adding missing data detection and handling**. Once participants were conversant with the tools and facilities in the simulated organizations, additional workflows and processes such as **partial uploads with dataset versioning** were provisioned into the environment. Participants could view their data for **review, visualization and analytics** purposes as depicted in the screenshots below.



## 5 – Conclusions

Participant feedback indicated that access to the SEND Simulation Environment where **real-world SEND scenarios** can be executed, and to **SEND experts from the community and PointCross**, was a powerful way help the industry to rapidly ramp up the SEND learning curve., and help contribute to the goals of the FDA/PhUSE collaboration across relevant players. This kind of environment can also be of use to other FDA/PhUSE initiatives in the future.

The availability of simple tools to represent and sanitize SEND datasets, and **access to example study data and open sharing of issues and needs** were found to be very useful to participating organizations.

Feedback from active participants suggests that the experience with the Simulation Environment has set the foundation for people to better understand what they do not know about SEND, and what it will take to generate datasets from across their systems and/or suppliers.

Access to review facilities similar to those that might be used by regulators was valuable in terms of understanding the **exploitation of data** during regulatory **reviews of a SEND enabled submission**.

These observations have, in turn, has led to identification of key topics of interest to the community which are summarized in the section on **“Future Directions”**.

## 6 – Future Directions

Several participants have indicated an interest in having PointCross continue to make the SEND Simulation Environment available for the **open development and exercising of use case scenarios** particularly those relating to multi-organizational settings and the assembly of a complete SEND package including a full repertoire of study data and the Define file.

As a result of the **success of the first phase of running the SEND Simulation Environment**, a second phase has been launched with a specific focus on topics identified and prioritized by participating organizations. We anticipate **provisioning additional tools, controls and workflows** into the environment resulting both from participant inputs and from related SEND implementation solutions being deployed by PointCross at **three major Pharmaceutical Sponsor companies**.

## 7 – Acknowledgements

We wish to acknowledge **all the participating organizations** and their staff for contributing their time, data and inputs to the SEND Simulation Environment. We also acknowledge the help provided by technical staff at PointCross involved with the setup and maintenance of the environment.