INCOSE MBSE Model Share Trade Study

# **Introduction**

MBSE working group team members collaborate and share models in the course of working group activities. This has been done by each group contacting the vendors directly installing local temporary licenses, and then identifying services needed to collaborate on the development of the models. This is a time consuming effort for every working group. Often times the results are time consuming and not very satisfying resulting in many team members not participating.

**Trade Study Goal**: Provide a collaborative modeling environment that facilitates initial setup of a modeling team, addition of new members, on-going collaboration among team members, and sharing results with the broader MBSE community.

The trade study identifies a set of environment requirements (criteria). Next, a set of evaluation tests are written to test each solution against the requirements. A set of potential solutions are then identified for each category of requirement. Each tool solution is researched. The promising solutions are installed and run against the evaluation tests to measure compliance with the requirements. The results of the evaluation are then carefully documented for review by the MBSE group.

# **Requirements**

R1.0 - Ability to manage licenses for MBSE tools.

R1.1 - Team Members can find and use licenses provided by tool vendors to install MBSE tools. (Team members are any INCOSE member. Team members are any person invited by an INCOSE member)

R1.2 - Team members have immediate access to install and use the MBSE tool.

R1.3 - Vendors can provide licenses for tools including version upgrades.

R1.4 - Vendors can monitor usage of licenses.

R1.5 - Vendors can not view or change the licenses of other tool vendors.

R2.0 - Ability to manage models.

R2.1 - Team Members can check-in and check-out models and related modeling artifacts (documentation, reports, ..). Check-out means that only one person can modify the model at a time.

R2.2 - Model versions are maintained with applicable metadata (e.g., version number, who changed, when changed, summary of change)

R2.3 - Team Members can categorize and then find models based upon the categorized information.

R3.0 - Ability to view and comment on the model in a web browser.

R4.0 - Ability to collaborate in real-time virtual meetings.

R3.1 - Team members can schedule meetings.

R3.2 - Team members have audio communications (e.g., voip or shared dial up number)

R3.3 - Team members can share a live view of the model. (Shared desktop)

# **Evaluation Tests**

## **Evaluation Test for Managing Licenses**

This evaluation test looks at how tools are managed and shared. The key usability question is how hard is it for a new member to install the tool and to get a valid license?

## **Evaluation Test for Managing Models, Viewing or Commenting on Models**

This evaluation test looks at the aspects of sharing and managing models across the MBSE teams. The key usability question is how hard is it for a new member to find a model, view the model, comment on the model, and modify the model?

**Case 1** (R2.1) - Create new model.

1. Create a simple test model, document, and html view.
2. Check-in or upload model, document, and html view.

**Case 2** (R2.1) - Modify and update the model. Check for edit conflict. Can 2 people edit the same file at the same time? How are conflicts prevented or resolved?

1. Person 1 - Check-out or download the model.
2. Person 1 - Modify the model.
3. Person 1 - Re-generate the document
4. Person 2 – Check-out or download the model. One acceptable solution is to block a person from checking out a locked file (model).
5. Person 2 – Modify the model. One acceptable solution is to block a person from editing or modifying the locked file after they have it local.
6. Person 1 - Check-in or upload the model and the document. Add a comment describing the change.
7. Person 2 – Check-out or download the model. This should work now.
8. Person 2 – Modify the model. This should work now.

**Case 3** (R2.2) (R3.0) - Collaborate - Comment on the model file in general. Comment on a specific version of a model.

1. View the stored model. View the comment on the current version of the model. Can the author change the comment? Can people that did not make the change modify the comment? Can I see who made the change? What other meta data can I use to describe the model? What can I view from a web browser? What browsers work (IE, Firefox, Chrome, Safari)
2. View old versions of the stored model. View the comment on the old version. Can the author change the comment? Can people that did not make the change modify the comment? Can I see who made the change? What other meta data can I use to describe the model? What can I view from a web browser? What browsers work (IE, Firefox, Chrome, Safari)

**Cast 4** - View and restore model versions.

1. View the stored model. Can I browse the content of the model from the web browser? If the modeling tool generates HTML? Can the solution store the HTML? Can I browse the HTML version of the model?
2. View and restore an old version of the model. View the version history. Can I see that the new version was restored? Can I see where the version was restored from?

**Case 5** (R2.3) - Find models - Able to describe (define, categorize and/or tag) and find models.

1. View the model. Are there any ways to define and categorize the model? Set some common attributes such as MBSE, Reuse, and Model or document.
2. Find the model. Using the attributes, search for and find the model. Can people that are on the MBSE team find the model? Can people that are not in INCOSE or on the MBSE team find the model? Can anyone on the internet find the model?

## **Evaluation Test for Collaborating in Real-Time**

This evaluation test looks at working on and reviewing a model in real-time as a team. The key usability question is how hard is it to for a meeting coordinator to setup an event to view and modify a model as a virtual team. Also, how hard is it for a meeting participant to participate in the event.

# **Tools Considered**

## **Solutions for managing Licenses (R1.0)**

## **Solutions for Managing Models (R2.0, R3.0)**

**Solution 1** INCOSE Alfresco (library.incose.org)

**Solution 2** - Use Google Site to store model documents. Roger Burkhart suggested looking at System Modeling and Simulation Working Group. The technology is SMSWG collaborative community. They use Google Sites.

**Solution 3** - Use Google code and Github to share models.

**Solution 4** - Files anywhere

**Solution 5** - Drop box [pack rat option for CM](David Lempia to check)

**Solution 6** - Google Drive

# **Results**

## **Results for Managing Licenses (R1.0)**

Executive summary

### **Web Faction**

## **Results for Managing Models (R2.0, R3.0)**

Executive summary

This study examined Alfresco, Google Site, Google Code/Github, Files Anywhere, Drop Box, and Google Drive. A deep dive was conducted on Alfresco and Drop Box. Alfresco was examined because it is the core technology used in the new INCOSE infrastructure. This infrastructure is available for free to INCOSE members. Drop box was examined because it is very simple to use.

Note: As of this time, Alfresco is limited to users that are part of the beta evaluation team.

Alfresco is a file based solution and meets the requirements laid out. It does a better job of preventing model conflicts than drop box. Therefore, Alfresco is the recommended solution.

Drop box is free with a limitation of 30 days of version history. The paid version has unlimited version history.

There are 3 categories of model exchange technologies to consider, Category 1 is a cloud technology with a thin client (HTML 5 browser), Category 2 is a cloud (database) solution that may or may not support services like OSLC and RAS, and Category 3 is a file based solution.

### **Alfresco**

Alfresco is a category 3 technology. Models are shared as a file in the alfresco content management system. No software must be installed on the users computer. Users must have access to the INCOSE.ORG and LIBRARY.INCOSE.ORG (NEW.INCOSE.ORG) web sites. A minimum set of companies may block access to this site. It is believed that this site is accessible to the largest number of INCOSE members.

#### Req 2.1 Check-in / check-out / modify

Yes – This solution meets this requirement. Use the “Edit Offline” to lock and “Upload New Version” to unlock. Modify is done on the local machine.

Note: There is an option in Alfresco to download the file and to re-upload the file. If a user chooses to download the file, an edit is made and saved to Alfresco after the download, and the file reupload, the edits made are not merged into the latest version. They will be in the stored version, but not in the latest uploaded version.

#### R2.2 Model Versions & Restore

Yes – Click on the revert in the history. The list of all old versions of the model are visible. Any old version can be downloaded and opened in the modeling tool.

#### R2.3 Find and Categorize

Yes – Tags and categories. The pages for models loaded into Alfresco can contain tags. A person can search for and find pages with combinations of tags.

1. **R3.0 View in Web Browser**

Maybe with work – If the html files are converted to a single mht file, they can be uploaded into Alfresco. It is possible to view the model. This technique depends upon users having a way to create a mht file (IE browser). This solution is difficult and time consuming.

A possible alternative is to store the result in a public folder of a dropbox. The dropbox folder can be shared with other team members. This solution is also complicated.

1. **Usability**

Of the category 3 content management systems, Alfresco is one of the easier ones to use. There is a web interface to view, upload, and download files.

The main usability issue is the possible confusion in editing inline or downloading a model file. It is possible to loose changes if a person does not understand how each one works.

### **Drop Box**

Drop box is a category 3 technology. Models are shared as a file in the drop box file sharing system. Special software must be loaded on the users computer. Some companies restrict access to Drop Box.

#### Req 2.1 Check-in / check-out / modify

Maybe – There is no direct check-in or check-out. Users work on files in the local folder for drop box. Changes are synchronized in the background to the repository. It takes time for the sync to find changes. Conflicts result in 2 copies of the same file in the folder. It is up to the user to merge conflicts or to tell other users when they are editing a file.

#### R2.2 Model Versions & Restore

Yes – Free versions are limited to 2 GB and 30 days of history.

#### R2.3 Find and Categorize

Maybe – If all sharable models are in the drop box, I can use my local computer search. No categories or tags.

1. **R3.0 View in Web Browser**

Yes – This solution is the best of all solutions I have looked at for Web Browser. The user HTML and in the local drob box folder. Drop Box will by synched to other computers after some time. Users just need to open the index.htm file. The server has a URL for the index.htm file that can be shared on WIKIs.

1. **Usability**

A folder on the user’s computer is kept synchronized with the cloud. This solution is very simple to use and to maintain.

1. **Cost**

Price is $15 per user per month. 30% discount for non-profits $2587 for 30 users for 1 year.

### **Google Code or GitHub**

Drop box is a category 3 technology. Models are configuration managed using a checkin checkout mechanism from either a web interface or a command line. Special software must be loaded on the users computer.

#### Req 2.1 Check-in / check-out / modify

Yes – Conflicts result in 2 files. It takes time for the sync to find changes. - \*\*

#### R2.2 Model Versions & Restore

Yes – Free versions are limited to 2 GB and 30 days of history.

#### R2.3 Find and Categorize

Maybe – If all sharable models are in the drop box, I can use my local computer search. No categories or tags.

1. **R3.0 View in Web Browser**

Yes – Able to generate HTML and view it in the local file.

1. **Usability**
2. **Cost**

Price is $15 per user per month

### **Google Drive**

Google Drive is a category 3 technology. Models are shared as a file in the google drive file sharing system.

#### Req 2.1 Check-in / check-out / modify

#### R2.2 Model Versions & Restore

#### R2.3 Find and Categorize

1. **R3.0 View in Web Browser**
2. **Usability**

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