OnTest GUI Preliminary Specification

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Introduction

This document is intended to provide a general overview of the Kubisys OnTest GUI. It isn't intended to be comprehensive or authoritative. Instead, hopefully, it will give you an overview of what OnTest is and what its GUI does.

The OnTest GUI is one module within the ONEnterprise application suite.

Important Concepts

Active Shadow Enterprises (ASEs)

Kubisys's Active Shadow Enterprise (ASE) technology allows users to create virtual versions (snapshots) of sets of their production enterprise servers. These virtual sets are called Active Shadow Enterprises or **ASEs**. Each ASE duplicates all functionality within its set's production servers. ASEs exist on a specialized server which we refer to as **the OnShadow appliance**.

Users can make changes to the configuration of these virtualized sets of servers and observe the resulting changes in performance. Once users have found optimal configurations for their servers by experimenting with an ASE, they will be given instructions on how to apply these to their actual production servers.

Current Production View

An ASE is created by making a virtual copy of a subset of the user's current production environment. The OnTest GUI allows the user to view their current production environment, select servers, then create an ASE based on these selections.

Primitives, Tasks & Workflows

Multiple ASEs can be created and experimented with simultaneously. Sequences of configuration **tasks**, called **workflows**, can be initiated and left to run, and results can be observed when a particular workflow has finished. The OnTest GUI allows users to initiate these workflows and to observe their consequences. For example, a user can start a workflow on one ASE, then another, etc, and return later to observe the outcomes.

Tasks are comprised of sequences of **primitives**. The OnTest GUI allows the user to either use pre-canned tasks or to create their own custom tasks by specifying which primitives they include.

An ASE can only have one actively running (or paused) workflow. Chained (sequential) workflows are technically possible, but we don't yet support them in this GUI.

Workflows can be run on multiple ASEs. Of course, target ASEs would have to include the correct server types, etc. as needed to run a given workflow.

Users can create workflows and save them. They can open workflows created by themselves and others and attempt to run them.

OnTest's Three Tiers
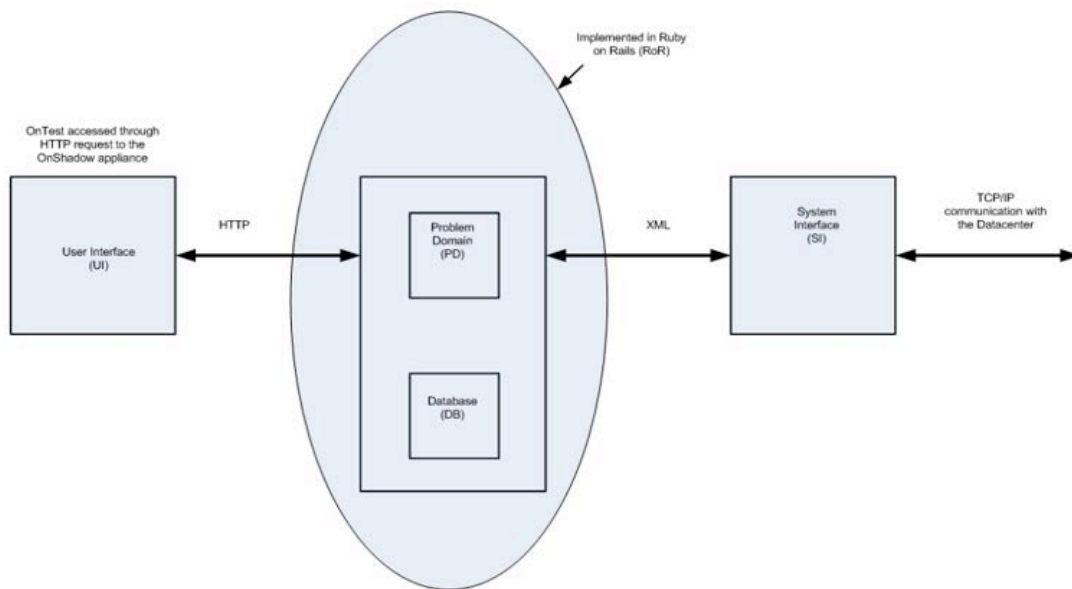
OnTest GUI Quick Tour

This section offers an overview of:
- The OnTest GUI's screen layout
- What each section of the screen does
- One typical user workflow

More detailed explanations and descriptions are in the sections that follow.

The Concept of the "Active Pane"

When a pane is used (interacted with by the user) it becomes the **Active Pane**.

In general, when a pane becomes the active pane the application reconfigures its layout so that the selected pane enlarges and other sections shrink.

Also, the Properties Pane will only display information relating to objects in the active pane.

Login Screen
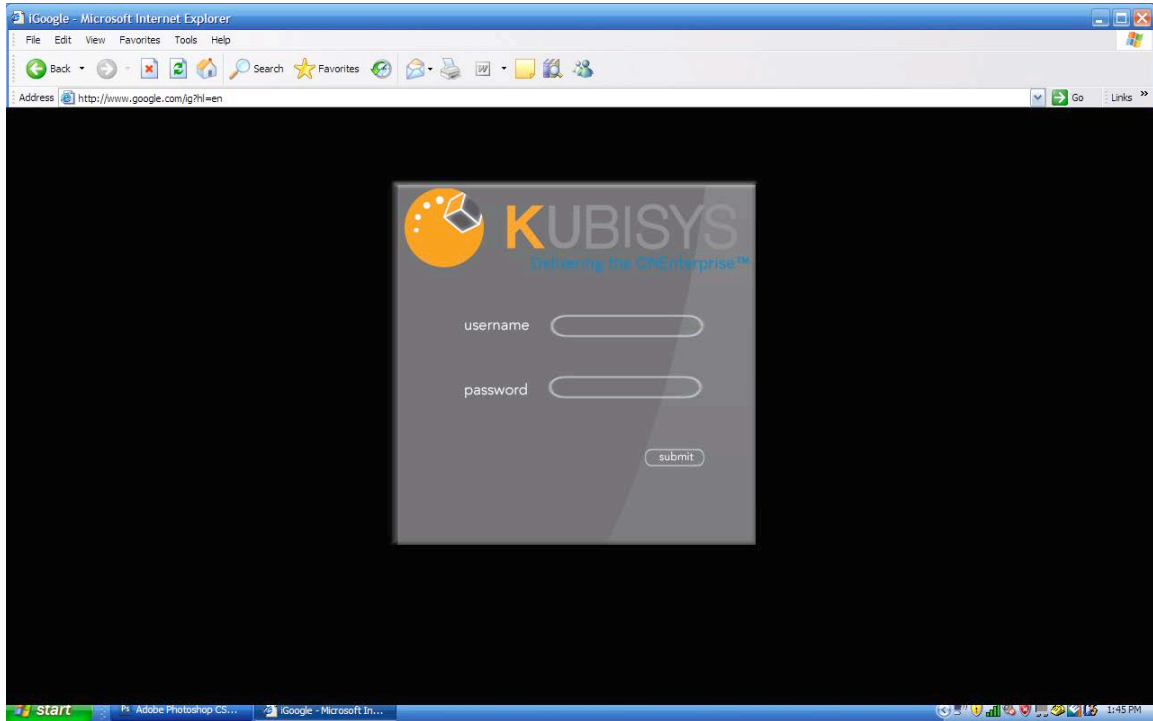
Launchpad
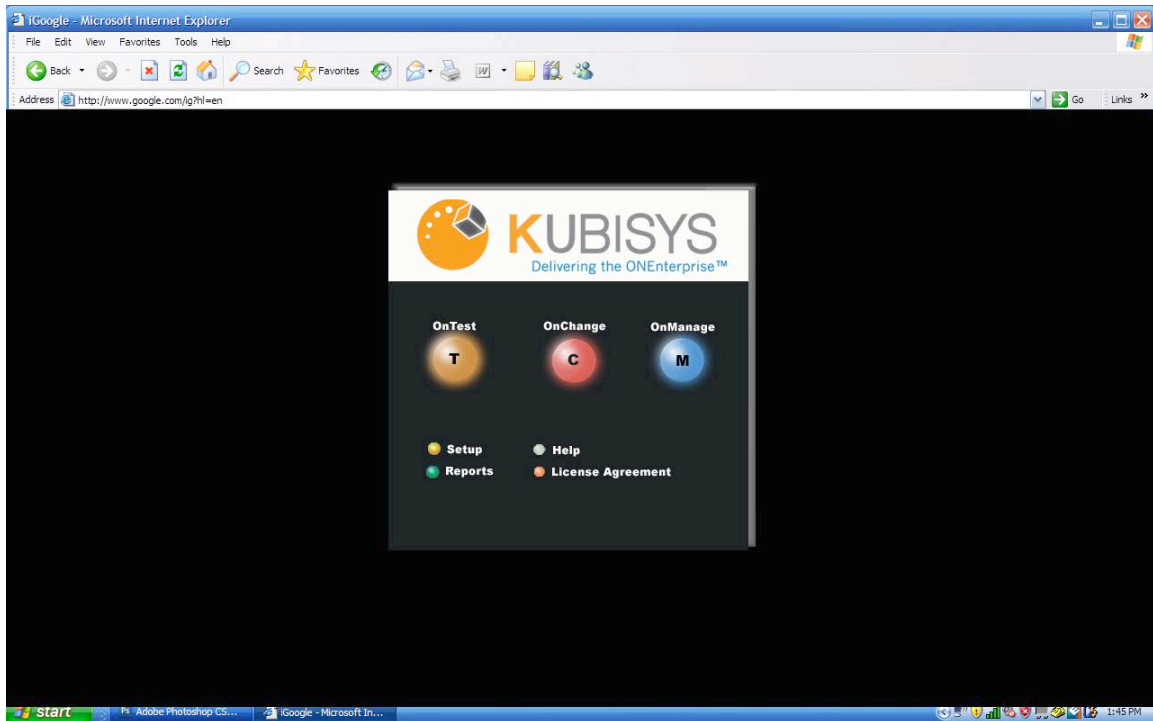
Initial OnTest GUI Screen
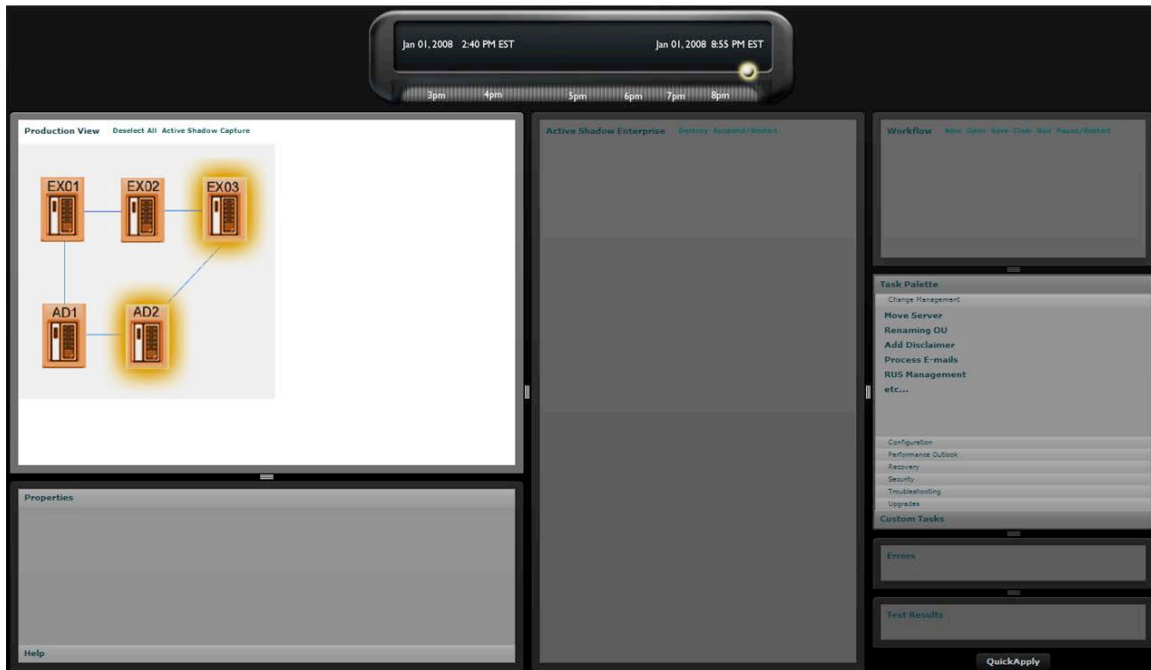
The first time a user enters the OnTest GUI the Production View is selected in the Navigation Pane and the production environment is displayed in the Production View pane.

Selecting Servers In Production View Pane
- User selects servers by clicking on them.
- Multiple servers can be selected.
- Selecting a server doesn't deselect other selected servers.
- Most recently selected server's properties are displayed in Properties pane.
- Deselect All button at top of pane deselects all servers.

Active Shadow Capture
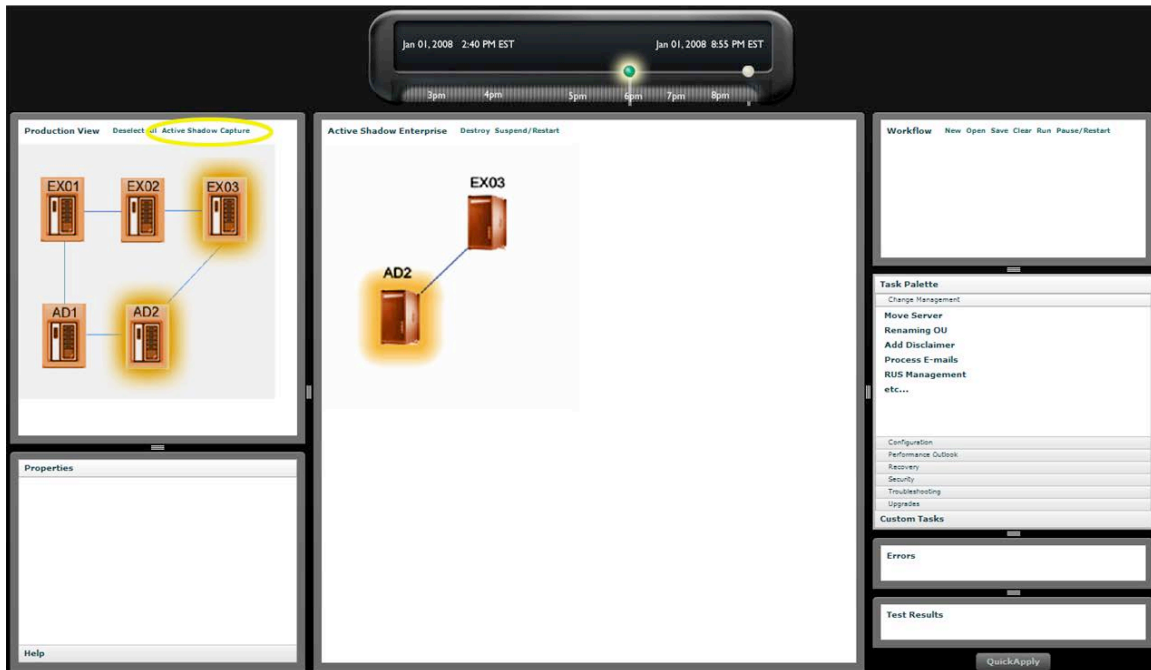
- User clicks Active Shadow Capture button to create a new ASE.
- GUI displays a dialogue that allows user to name the new ASE.
- ASE appears in Navigation Pane (as a ball button) and in Active Shadow Enterprise pane.
- ASE pane becomes active pane.
- Workflow Diagram and Task Palette are also enabled.

Selecting A Server In Active Shadow Enterprise Pane
- User selects one server (only) by clicking on it.
- Selecting another server deselects the currently selected server.
- The most recently selected server's properties are displayed in the Properties pane.

Starting To Build A Workflow
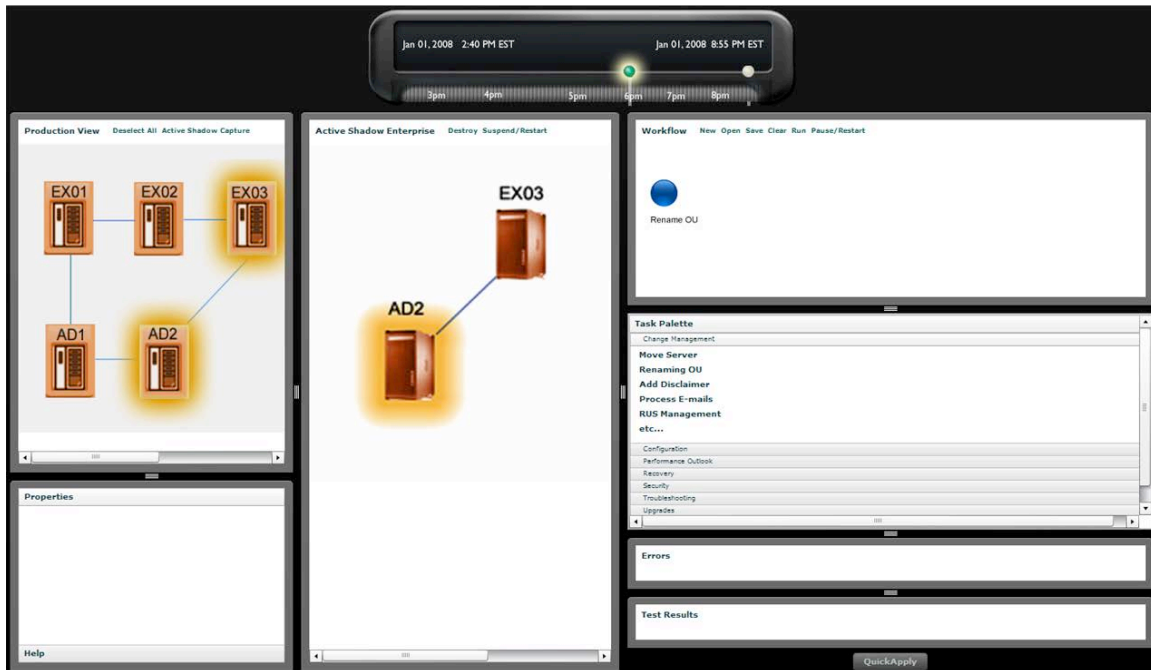
- User drags a task from the Task Palette onto Workflow Diagram.
- OnTest understands that user wishes this task to be applied to the server that is selected in the ASE pane.
- The task that has just been added is selected because it is the most recently added icon. In this case, it's the only added task, but as more icons are added, each will become the (only) selected icon when added.
- All icons placed in Workflow Diagram can also be selected/deselected by clicking.
- Multiple selected icons are allowed.
- Adding a new icon deselects all currently selected icons, as the new icon becomes the only selected icon.
- The most recently selected icon's properties are displayed in the Properties pane.

Adding A Split To The Workflow

- User drags Split/Merge icon from Workflow Diagram's Icon Palette onto diagram.
- OnTest understands that this split or merge will happen after the previously added task because that task's icon was the only selected icon, and adds an arrow to indicate this.
- OnTest understands that the newly placed Split/Merge icon represents a split rather than a merge because it is linked to a single preceding task.
- If multiple tasks had been selected when this icon was added, it would have represented a merge and OnTest would have added multiple arrows to indicate this.
- Because it is the most recently added icon, the Split/Merge icon is now the only selected icon.

Adding More Tasks To The Workflow

- User drags another task onto the diagram.

(Missing image here)

- User selects a different server in the Active Shadow Enterprise pane.
- User deselects most recently added task icon by clicking on it.
- User selects Split/Merge icon by clicking on it.
- User drags the same task as before onto the diagram.
- The two task items represent the same task running on two different servers simultaneously.
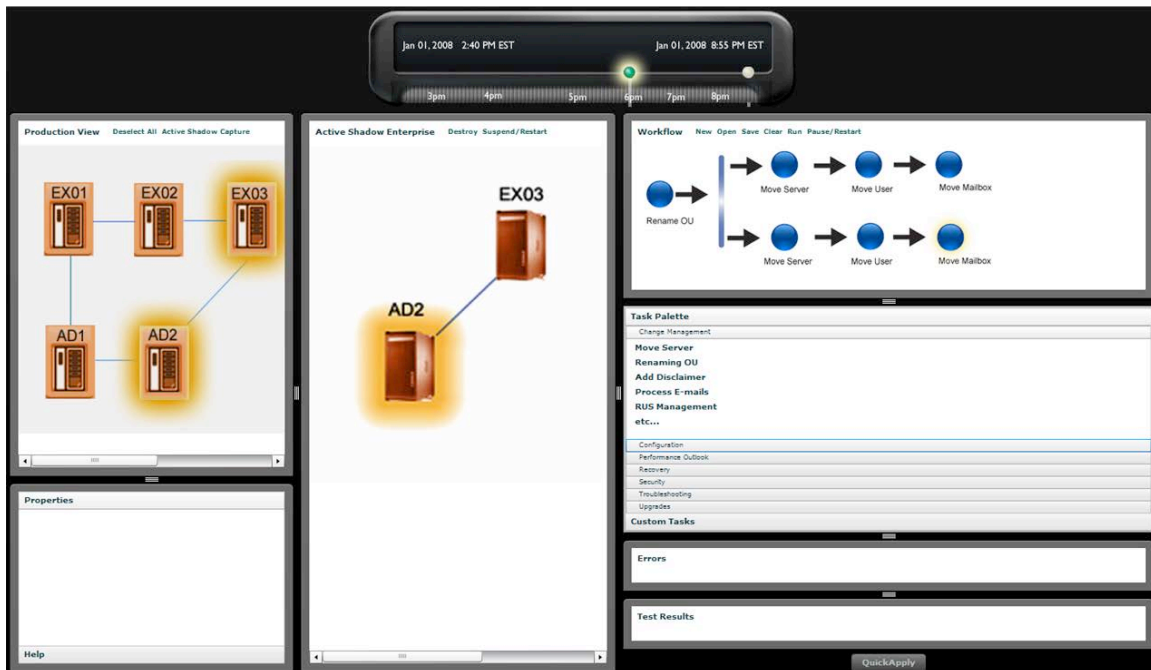
- User continues to add more task icons by repeating this sequence:
  - Select a server in the Active Shadow Enterprise Pane that task should be run on.
  - Select icon in Workflow Diagram that task should follow.
  - Drag task onto diagram.
- Note that the user has created two separate sequences, which will run simultaneously.

Finishing The Workflow
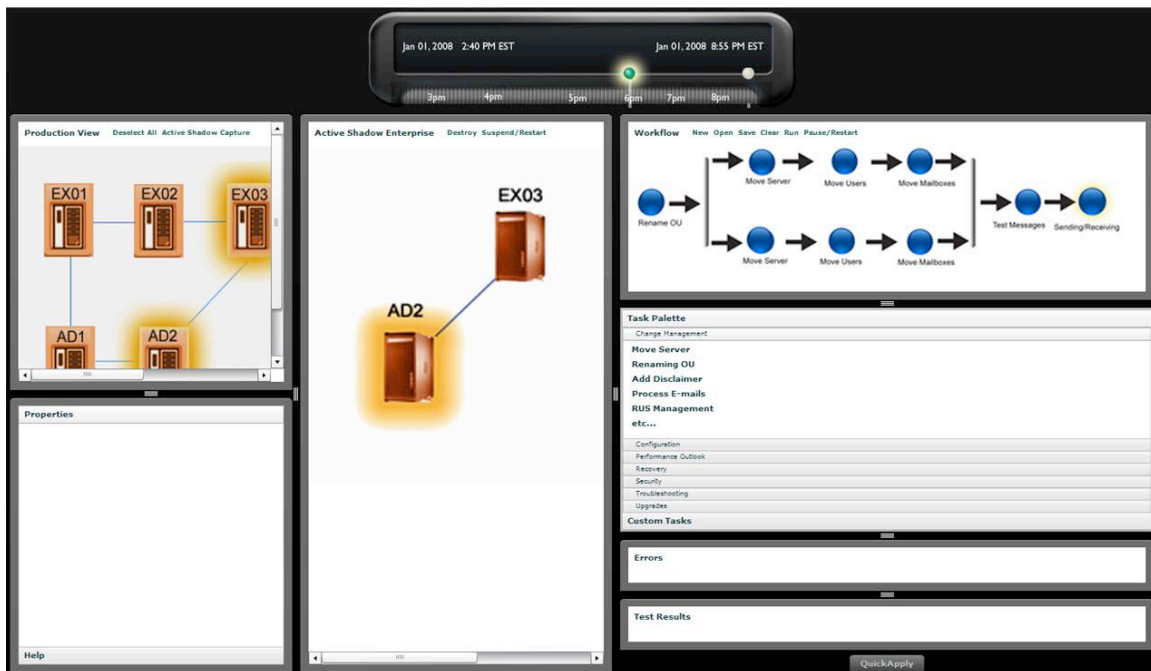
- User selects the end task for each of the two sequences.
- User drags a Split/Merge icon onto diagram.

- Split/Merge icon becomes the only selected icon.
- User drags another task onto the diagram, which becomes the only selected icon.
- User drags another task onto the diagram, which becomes the only selected icon.

Saving The Workflow
- User clicks Save button at top of Workflow Diagram.
- Save As dialog opens. Note that while this is similar to a standard dialogue for saving a file, and in fact has the effect of saving the workflow as a file, the file is saved by the middle tier. The user only specifies a name for the workflow and doesn't specify a location.

Running The Workflow
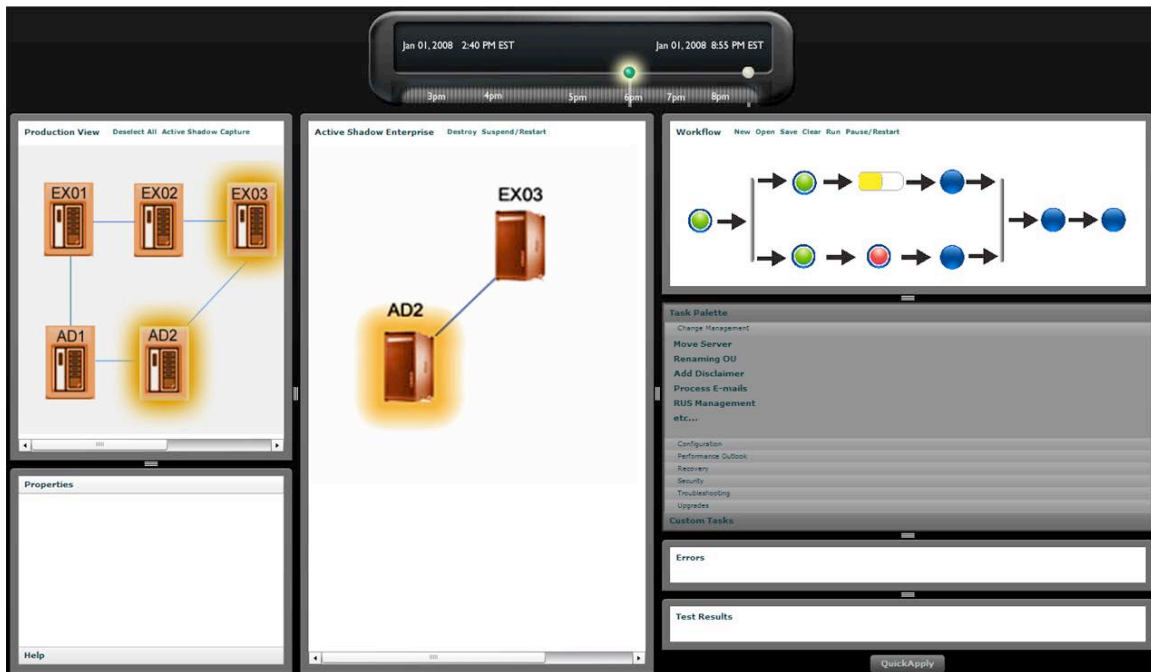
- User clicks Run button at top of Workflow Diagram.
- Workflow Diagram switches from Edit Mode to Run Mode.
- Task Palette is disabled.
- Workflow Diagram displays current state of running workflow.

Creating Another ASE & Running The Workflow On It

- User selects the Production View in the Navigation Pane, then repeats the steps above to create another ASE.
- User clicks the Open button at the top of the Workflow Diagram.
- GUI displays this **Workflow Chooser** dialogue:

Running Workflows	
Workflow Name	**Running On**
Workflow 1	ASE 1

Saved Workflows		
Workflow Name	**Compatible With ASE 2?**	**Currently Running?**
Workflow 1	Yes	Yes

- This is only intended to be a crude depiction that shows dialogue functionality. Final aesthetics will be quite different.
- User can select yellow rows by clicking on them.
- Note that at this point Workflow 1 is both saved and running on ASE 1.
- If user selects Workflow 1 under Running Workflows the Workflow Diagram switches to Run Mode and displays the current state of Workflow 1 running on ASE 1.
  - See diagram above under Running The Workflow.
- If the user selects Workflow 1 under Saved Workflows the Workflow Diagram switches to Edit Mode and displays Workflow 1.
  - User can click the Run button and run Workflow 1 on ASE 2 (the current selected ASE).
  - If user attempts to edit workflow an alert displays which explains that the workflow is currently running on one or more ASEs and that the user should save the workflow using a different name before editing it.

More On The Workflow Chooser
- Here's an example of how the Workflow Chooser might look after multiple ASEs and workflows have been created.

Running Workflows	
Workflow Name	**Running On**
Workflow 1	ASE 1
Workflow 1	ASE 3
Workflow 7	ASE 8
Workflow 13	ASE 1
Workflow 13	ASE 2
Workflow 13	ASE 6
Workflow 14	ASE 5
Workflow 17	ASE 1

Saved Workflows		
Workflow Name	**Compatible With ASE 2?**	**Currently Running?**
Workflow 1	Yes	Yes
Workflow 2	No	No
Workflow 3	No	No
Workflow 4	No	No
Workflow 5	Yes	No
Etc…		

Note the following:
- Two of our workflows are currently running on more than one ASE.
- The Saved Workflows section shows us whether workflows are compatible with ASE 3. It is doing this because ASE 3 is the currently selected ASE.
- The user may choose to open a compatible workflow and run it on ASE 3.
- The user may choose to open a non-running workflow and edit it.
- The user may choose to open a running workflow, save it under a different name, and edit it.

Suspending

Abbreviations
- ASEView – The active shadow enterprise pane.
- LaunchPad – The module selection area. The login dialogue turns into this once a user logs in.
- NavPane – The navigation pane
- ProdView – The production view pane
- PropsPane – The properties pane

Login Dialogue

LaunchPad

User Actions And Their Consequences

When the user clicks a module button the LaunchPad disappears (animation?) and the splash screen is replaced by the module's screen.

If the user clicks the OnTest button, OnTest screen content will appear. If the current user has previously used OnTest the screen will return to the state it was in the last time s/he used OnTest.

NavPane

This pane displays ASEs and the current production environment on a timeline, as shown here:
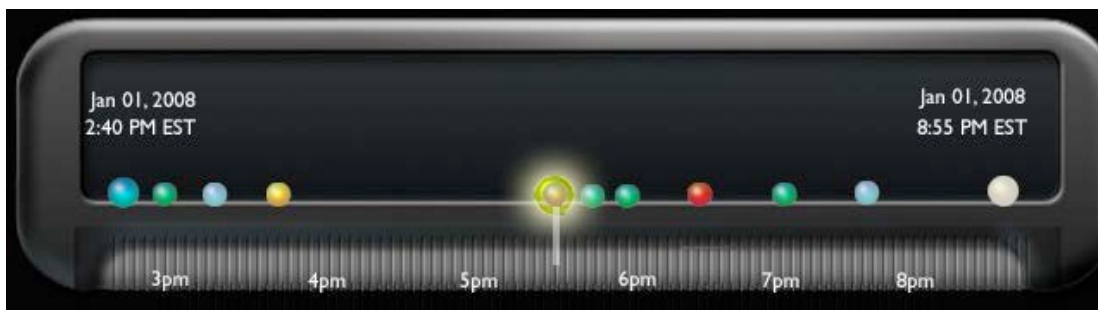
In this mockup the current production environment is represented by the white ball on the far right. The other balls represent ASEs that have been created over the previous six hours, with one ASE selected. ASEs are shown in different colors to represent their states, e.g. running, paused, etc.

While the above image shows a single timeline, the timeline should be thought of as two separate areas:
- The portion of the timeline showing the ASEs, which we'll refer to as the **ASE Timeline**. This starts at the left hand side and takes up most of the timeline.
- A short segment on the right end of the timeline, where the ball representing the current production environment is located. Because the current production environment always exists in the present, we refer to this as the current production environment in some cases, and **the present** in others.

In the image above, these are combined into one continuous timeline but this isn't always the case. For example the ASE timeline could show a time period starting two weeks in the past and ending one week in the past.

This text diagram attempts to show how such a scenario would be depicted. An image would be better here.

| |

```
|  3:30 AM EST, May 2, 2008                    5:50 PM EST, May 8, 2008               |

|  ------------------------0--------------------0--------000----------------------------- - - - - - ---0---   |

|                                                                                        |

|  May 2  |  May 3  |  May4  |  May5  |  May 6  |  May 7  |  May 8  |      | May 15  |
```
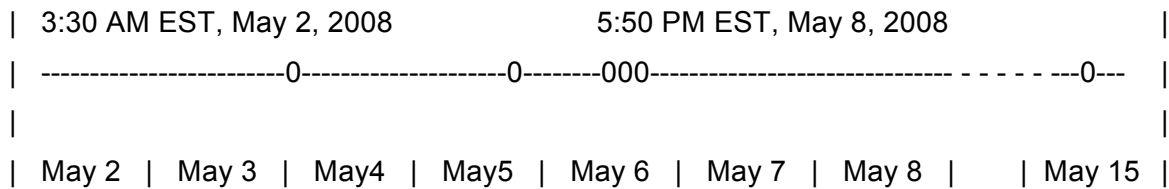
Note the dashed portion of the timeline between May 8 and May 15. This indicates that a period of time exists between the end of the ASE timeline and the present. We'll refer to this as the **non-displayed time indicator**. Obviously, this is a very crude representation and not intended to do more than give a general idea of how this indicator is used. I believe that Selvin suggested using a wavy line for this.

Also note that the right dateTime is not located all the way to the right, because that would suggest (in the above case) that the present is May 8th, which would be incorrect. The right hand dateTime will move to the left when the non-displayed time indicator appears, and back to the right when we return to an undivided timeline.

User Actions And Their Consequences

When a user selects the production view in the NavPane:
- The ASEView, Workflow Diagram, Help Pane, Errors Pane, and Results Pane (?) become blank.
- <mark>Does the PropsPane show info for the current production environment?</mark>

When a user selects an ASE in the Navigation Pane:
- The ASEView displays the ASE.
- The PropsPane displays the ASE's properties.
- The Workflow Diagram displays the active workflow for that ASE, or the workflow that has most recently run on that ASE, if any.
- The Errors Pane and Results Pane show errors and/or results for the same workflow, if any.
- The Help Pane becomes blank.

The user can use dragging motions to change the start dateTime and the end dateTime of the ASE timeline:
- Dragging motions that begin on the left hand side of the ASE timeline change the start dateTime:
- Dragging to the left moves the start dateTime further into the past
- Dragging to the right moves the start dateTime closer to the present
- Dragging motions that begin on the right hand side of the ASE timeline change the end dateTime:
- Dragging to the left moves the end dateTime further into the past
- Dragging to the right moves the end dateTime closer to the present

PropsPane

Please refer to the other sections of this document for details on how various actions in other panes can cause information to appear in this pane.

This pane only displays information relating to one selected object in the current active pane.

ProdView & ASEView – Common Functionality

User Actions And Their Consequences

ViewMode Buttons

ViewMode buttons are displayed at the top of the ProdView and ASEView:
- Exchange Servers
- Active Directory
- IP Tree (ProdView only)

These buttons have "radio button" functionality. Selecting a button will deselect the previously selected button.

When a user selects one of these buttons:
- Content displayed in the ProdView or ASEView changes to that ViewMode.

Selectable Servers

Servers displayed in these panes are selectable.
- When a server is single clicked:
- If not already selected it becomes selected:
- The server icon glows
- The server's properties are displayed in the PropsPane
- If server is selected when clicked, it becomes unselected:
- The server no longer glows
- Multiple servers can be selected
- Selecting one server does not deselect other servers
- The most recently clicked server's properties are displayed in the PropsPane

Opening Server Consoles

When a server is double clicked:
- The Console Window opens and displays a VNC console for the server. See the Console Window section for details.
- If the Active Consoles Pane isn't visible, it appears.
- The server's console is added to the Active Consoles Pane, if not already present, and is displayed as the current active console in that pane.

ProdView

The primary purposes of this pane are to:
- Give the user an overview of their production environment.
- Allow them to select servers within their production environment.
- Allow them to create ASEs that virtualize selected servers.

User Actions And Their Consequences

When the user clicks the Active Shadow Capture button:
- If no servers are selected, an alert will display explaining that no servers are selected, and/or that the user needs to select one or more servers before they can create an ASE.
- If one or more servers are selected:
- A new ASE will be created on the appliance.
- The ASEView Pane will display the new ASE.

- The new ASE will appear in the NavPane and its properties will appear in the PropsPane.
- The Workflow Diagram, Help Pane, Errors Pane, and Results Pane become blank.

ASEView

The primary purposes of this pane are to:
- Give the user an overview of the selected ASE.
- Allow the user to perform various functions relative to the selected ASE using buttons in the pane's header. Details below.

The ASEView displays the currently selected ASE in the currently selected ViewMode.

User Actions And Their Consequences
- Destroy button:
- Deletes ASE from appliance
- Removes ASE from NavPane
- Note that at this point no ASE is selected and no Server is selected, so the NavPane has nothing selected and the PropsPane is blank.
- If clicked when no ASE is selected, display alert.
- Pause button:
- Pauses active workflow, if any, but ASE continues running.
- If clicked when no ASE is selected, display alert.
- If clicked when there is no active workflow, display alert.
- If clicked when workflow is already paused, display alert.
- Suspend button:
- Suspends all ASE activity, including the ASE's active workflow, if any.
- If clicked when no ASE is selected, display alert.
- If clicked when ASE is already suspended, display alert.
- Restart button:
- Restarts a paused workflow
- If clicked when no ASE is selected, display alert.
- If clicked when workflow isn't paused, display alert.
- Resume button:
- Resumes a suspended ASE
- If clicked when no ASE is selected, display alert.
- If clicked when ASE isn't suspended, display alert.

Help Pane

The Help Pane displays help information when appropriate. Other sections of this document explain what kinds of user actions can result in help content being displayed.

Console Window

The Console Window displays an active VNC Console. It covers most of the application but not the Active Consoles pane.

User Actions And Their Consequences
- If the user clicks the Console Window's close button, it closes the console completely and the console no longer appears in the Active Consoles Pane.

- If the user clicks the Console Window's minimize button, it closes the Console Window but the console remains active and is visible in the Active Consoles pane.

Active Consoles Pane

This pane is visible whenever one or more consoles are active. Console icons are grouped by ASE and/or production view. If the Console Window is open, the console that is being displayed is emphasized by displaying as a wider console icon.

User Actions And Their Consequences

If the Console Window is open and the user clicks on a console icon other than the icon that represents the currently displayed console:
- The clicked console becomes the emphasized console in the Active Consoles pane.
- The Console Window displays the console represented by the clicked console icon.

If the Console Window isn't open and the user clicks on a console:
- The clicked console becomes the emphasized console in the Active Consoles pane.
- The Console Window opens and displays the console represented by the clicked console icon.

-
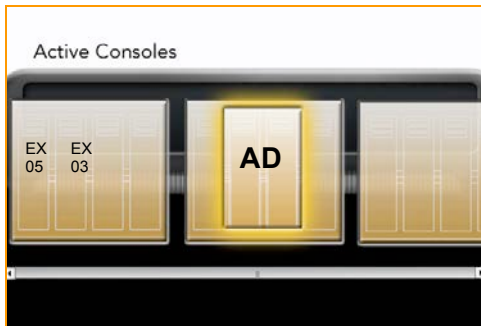
Workflow Diagram

The workflow diagram can function in two modes:
- Edit Workflow mode:
- Workflow is not running, and tasks can be added, removed, moved etc.
- The purpose of this mode is to allow users to:
- Create workflows
- Open saved workflows
- View workflows
- Edit existing workflows
- Save workflows
- Run specific workflows on specific ASEs.
- Run Workflow mode:
- Workflow is running, cannot be edited, and dynamically displays the states of the tasks in workflow.
- The purpose of this mode is to allow the user to see the current status of running workflows.

Edit Workflow Mode

Dragging Tasks

The user builds workflows by dragging tasks from the **Task Palette** (below the Workflow Diagram), and other types of icons from the **Icon Palette** (right side of Workflow Diagram), onto the Workflow Diagram.

Tasks are displayed in the Task Palette as small filled black circles with their names on their right. During dragging a task is represented by an icon with the same appearance that the task will have once dropped onto the Workflow Diagram, i.e. a larger filled black circle with its name displayed beneath it.

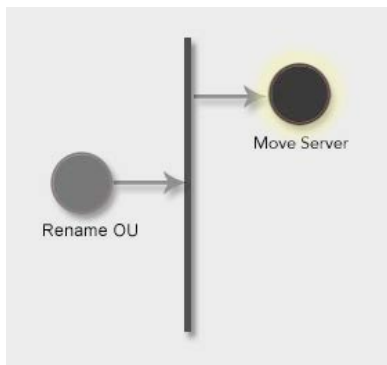Icons represented in the Icon Palette are also represented by larger icons when dragged.

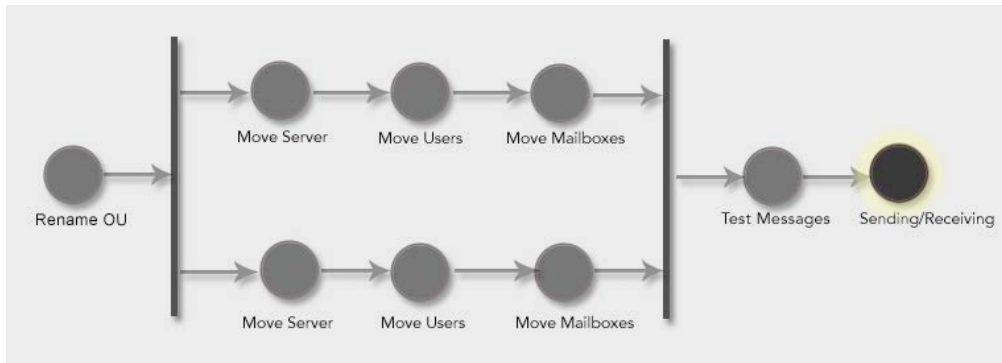**A Simple Example of a Workflow Build Process**

User adds a task icon:
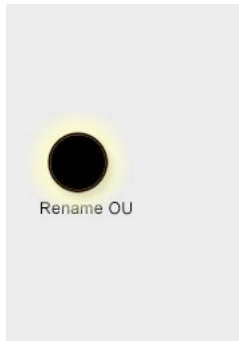
User adds transition icon plus task icon:

Finished workflow after adding other icons:

Selectable Task Icons

Icons placed in the Workflow Diagram are selectable. Only one icon can be selected at a time. When a new icon is added to the diagram, it becomes the selected icon. The user can also select icons by clicking on them.

Arrow Placement

When a new task is placed in the diagram an arrow will also be automatically added. The arrow will run from the previously selected icon to the newly placed (and newly selected) icon. Obviously, this doesn't apply when the very first icon is added.

Workflow Rules, "Logical", and "Illogical"

When the user uses the Workflow Diagram the goal is to create a workflow that is possible within the realities of the enterprise configuration process. These realities are reflected in a set of rules built into OnTest. We do not attempt to explain these rules in this document, nor will they be programmed into the OnTest GUI client. Instead, rule logic will reside in the middle tier. For the purposes of this document we simply need to understand that such rules exist, and that certain arrangements of tasks are not possible. We'll use the term "**logical**" to refer to arrangements that conform to these rules, and "**illogical**" to refer to arrangements that don't. In particular, we'll refer to logical and illogical placements of icons within the workflow.

Snap To Grid Functionality

When an icon is dropped, "snap to grid" functionality will cause the icon to be placed on the closest intersection of an invisible grid.

Pre-Drop Feedback

When icons are being dragged within the diagram, the icon and/or diagram background will at all times provide feedback on whether the icon can be dropped in its current position or not. We refer to this feedback as "**pre-drop feedback**" here. Pre-drop feedback will not take into consideration whether a particular placement is logical for a given icon. Instead, it offers this feedback:
* Pre-drop feedback will show the user where the icon will be located if dropped by displaying a faint + mark on top of the nearest intersection of the invisible grid, if dropping is possible.
* Is the dragged icon is positioned so that there isn't sufficient empty space for it at the closest grid intersection, no + mark will be displayed.

Post-Drop Feedback

Feedback on whether a given task-placement is logical or illogical will be provided after the task icon is dropped. If the icon placement is illogical feedback will be provided by a)

displaying the icon with a standard circle/slash symbol in it, b) not displaying an arrow with it, and c) displaying help text in the Help pane.

Example of an illogically placed icon:
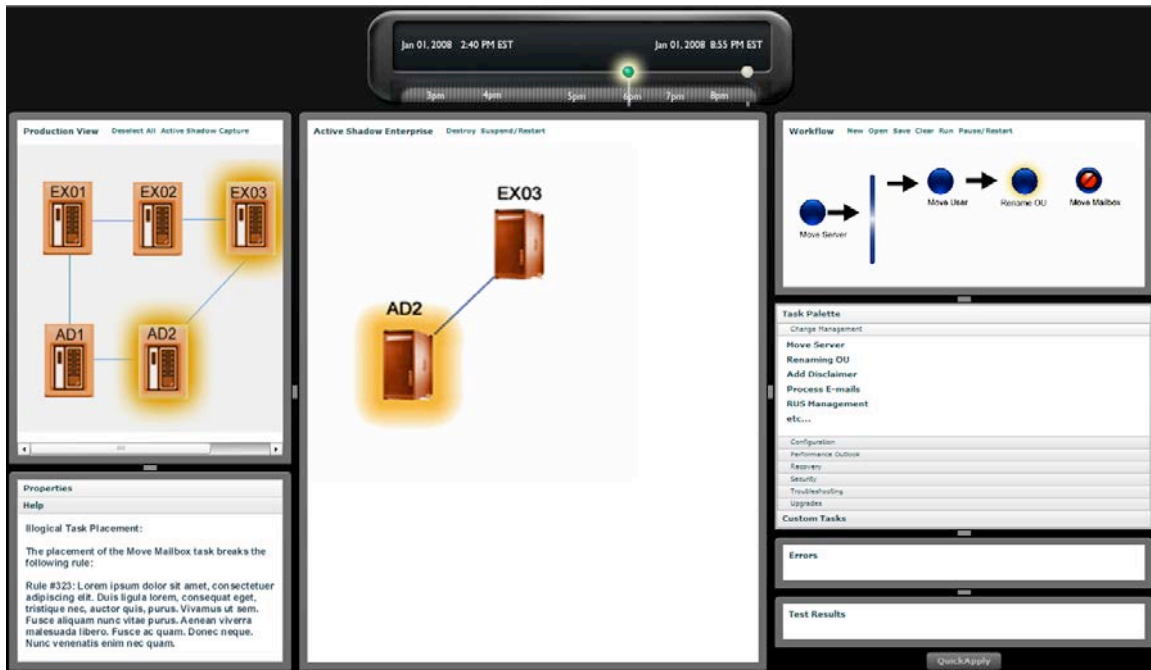
We provide this feedback after an icon is dropped, rather than before, because this approach gives the user more information, and more time to digest the information.

Run Workflow Mode

If a workflow is running on the selected ASE, it can be displayed in the Workflow Diagram in Run Workflow Mode. This is the default behavior when an ASE is selected, but the user can do the following at any point:
- Open a saved workflow in Edit Workflow Mode (Open button)
- Clear the screen and switch to Edit Workflow Mode (Clear button)
- Return to viewing the currently running workflow by clicking the selected ASE in the NavPane

Example of Run Workflow Mode:
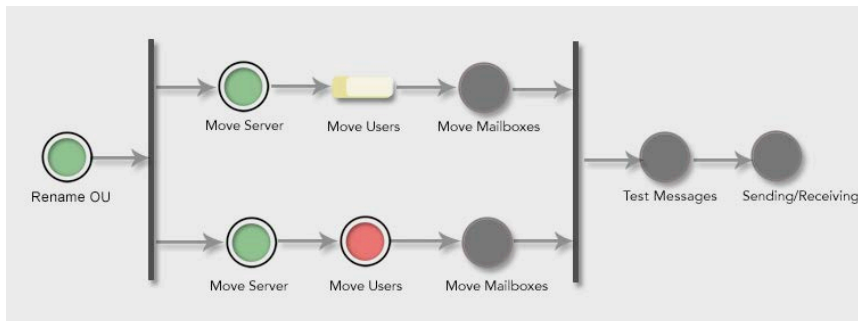
Note the following:
- Green indicates that a task has successfully completed.
- Red indicates that a task has encountered an error and stopped.

- The "Move Users" task shows how a running task is displayed. The task icon fills with yellow as the task progresses, like a progress bar.
- Note that there is no selected task in Run Workflow Mode. This is because this feature is only useful when editing a workflow.

Buttons

(Note: I anticipate some user confusion re how to stop or pause a running workflow. They will expect to be able to do that here, and won't think of doing it in the ASEView.)

Clear button is active in both modes. Other buttons are active in Edit Workflow Mode only.
- New
- If an edited workflow hasn't been saved, displays a "Save Workflow?" alert
- Clears Workflow Diagram
- Open
- If an edited workflow hasn't been saved, displays a "Save Workflow?" alert
- Allows user to select a saved workflow, then displays it.
- Save
- Saves currently displayed workflow
- Clear
- If an edited workflow hasn't been saved, displays a "Save Workflow?" alert
- Clears Workflow Diagram
- If diagram is in Run Workflow Mode it switches to Edit Workflow Mode
- Run
- If an edited workflow hasn't been saved, displays a "Save Workflow?" alert
- If user answers "Yes":
- Saves workflow
- Runs workflow on selected ASE
- If user answers "No":
- Does nothing
- If there is no unsaved content, runs workflow on selected ASE

Task Palette

The Task Palette allows the user to view pre-configured tasks, and to drag them onto the Workflow Diagram.

See the Edit Workflow Mode subsection of the Workflow Diagram section above for a description of dragging functionality.

See Appendix A for a list of task names and descriptions organized by category. Each task category is one pane in the Task Palette's accordion component.

Tasks are displayed in rows on the pane, one task per row. Each task is displayed as a filled black circle on the left, with its name to the right. Tasks have tool tip functionality that displays task descriptions.

Rules

This pane is disabled when the Workflow Diagram is in Run Workflow mode.

Custom Tasks

The Custom Tasks pane allows users to assemble primitives into tasks. We need a diagram here showing a Primitives Palette on the right, and text code such as this in the main body of the pane:

```
Begin Task
    {
        somePrimitiveName;
        anotherPrimitiveName;
        yetAnotherPrimitiveName;
        ...
    }
```

Obviously, we should use real primitive names here. <mark>Selvin should supply these so that they will be logical. Does logical/Illogical apply here?</mark>

Errors Pane

If the Workflow Diagram is displaying a running workflow, errors generated by that workflow are displayed here. <mark>(Is this correct? Or does this pane display all errors generated by all currently running workflows?)</mark>
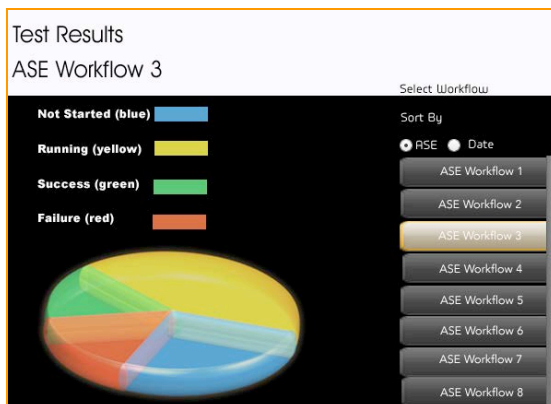
Results Pane

The Results Pane allows the user to select either:
- A specific instance of a workflow that is running on an ASE, or that has finished running, or
- "All Workflows"

Results are shown in a pie chart using the following categories as slices:
- Not Started (blue)
- Running (yellow)
- Success (green)
- Failure (red)

Appendix A – Tasks & Task Categories

Change Management

1. **Move Server** - Moving Exchange Server from one OU to another

2. **Renaming OU** – Rename organizational unit

3. **Add Disclaimer** - Adding disclaimer to outgoing SMTP e-mail messages

4. **Process E-mails** - Custom processing of incoming SMTP messages via creating OnArrival event sink

5. **RUS Management** - Creating RUS instances for remote domain

6. **Remove Server** - Removing Exchange 5.5 from Exchange Organization

7. **Remove Server** - Removing Exchange Server from Exchange Organization

8. **Test Messages** - Track message statistics, archive and remove messages in test environment via new SMTP Server

9. **Move Mailboxes** - Moving mailboxes may fill up Application Log

10. **Move Users** - Moving Users

11. **Mailbox Cleanup Agent**

12. **SMTP Management** - Flushing SMTP Mail queue

13. **RUP Management** - Define new naming convention via a recipient policy

14. **Create/Change/Add Users** - Csvde – creating contacts and user accounts

15. **AD Management** - CertAuthTool – writes to AD

16. **Archiving** - ArchiveSync – enables message archiving

17. **User Accounts** - Changing user account's Display Name

18. **User Accounts** - User delegation

19. **User Management** - Preventing users from sending/receiving

20. **Mail Flow** - Protecting from unsolicited e-mails

Upgrades

1. **Service Packs**

2. **Patches**

3. **Hotfixes**

4. **Security fixes**

5. **3rd party add-ons**

Troubleshooting
   1. **Database** - Exchange Standard Edition database will not mount if the limit reaches 16 GB

   2. **Database** - Database free space must be reclaimed via offline defragmentation

   3. **Database** - Database will not mount if there is an insufficient disk space

   4. **Monitor Mailboxes** - Monitoring Mailbox Activity

   5. **Database** - Transactions not committed completely before server crash

   6. **Restore** - Incorrect files replayed during restore

   7. **Hardware** - Defective disk controller

   8. **Database** - Transaction logs were manually removed before they were committed to the database

   9. **Database** - Database is corrupted

   10. **Database** - Database will not mount if defragmentation did not complete before copying temp .stm and .edb

   11. **Routing** - Remonitor – Routing engine cache cleaning tool

   12. **Routing** - NDRs

   13. **Connectivity** - RBLs

   14. **Connectivity** - Mail Relay

   15. **SMTP Connector** - Encrypting communication

   16. **SMTP Connector** - Tar pitting (delay)

   17. **SMTP Connector** - SMTP address space sharing

Security
   1. Service Account access

   2. Root certificates

Configuration
   1. **Mailbox** - Mailbox Management Store Event Sink

   2. **Public Folders** - Public Folders Management Store Event Sink

   3. **Smart Host**

   4. **Site consolidation**

   5. **LegacyDN** - Correcting LegacyDN issues

   6. **AD Objects** - Moving/migrating objects in AD

7. **Configure GC** - Forcing GC to have NSPI listen on different port when firewall requirements must be met

8. **Configure GC** - Create new MAPI GC reconnect logic to obtain new referral from Exchange if GC is down

9. **Configure MSDTC**

10. **OWA** - Load Balancing and HTTP encryption

11. **OWA** - "Safe HTML" filtering

12. **OWA** - Host header and authentication in cluster

13. **ExMerge**

14. **Recipient Policies**

15. **Migration**

16. **E-mail Forwarding**

17. **Modify user rights**

18. **RPC over HHTP**

19. **Mobile Access**

Recovery
1. **VSS** - Various VSS issues preventing backups from succeeding

2. **Database** - Database encounters errors during backups

3. **Database** - Database checksums do not match due to hardware or other problems

4. **VSS** - Maximum number of snapshot is exceeded

5. **Maintenance** - Exchange Server is in Maintenance mode

6. **Backups** - Another backup is still active

7. **Backups** - Specific database order preventing backups from succeeding

8. **Backups** - Transaction logs are manually moved or deleted

Performance
Outlook
1. **RPC issues**

2. **PSTs**

3. **Cached Mode**

4. **Resolving GAL vs. ANR issues**

5. **Message blocking**

6. **Sending/receiving**

7. **IMAP configuration**

8. **Mail Logging** - Enabling Mail logging for troubleshooting

9. **RPC over HTTP**

10. **Security** - Securely managing add-ins

11. **Configuration** - Pointing to GC

12. **PST Management** - Specifying PSTs and OSTs size limits

13. **Updates, patches, service packs**

Appendix B – Primitives

CreateASE { server1, server2, ... } =>
    {ASE_ID, { SVM_ID1, SVM_ID2, ...} {ENDPOINT1, ENDPOINT2, ...}

DestroyASE {ASE_ID}

SuspendASE {ASE_ID}

RestartASE {ASE_ID}

PauseASE {ASE_ID}

ResumeASE {ASE_ID}

Checkpoint_ASE {ASE_ID, name} => {Checkpoint_ID}

Goto_checkpoint {ASE_ID, Checkpoint_ID}

Delete_checkpoint {ASE_ID, Checkpoint_ID}

List_checkpoints {ASE_ID} => {Checkpoint_id1, Checkpoint_id2, ...}

Start_ASE { ASE_ID, Checkpoint_id OPTIONAL } // auto-determined dependency, serialization
etc.

Start_ASE_with_throttle { ASE_ID, Checkpoint_id, {cpu_throttle, network_throttle,
memory_throttle} }

Schedule_ASE { ASE_ID, time_filter OR TRIGGER}

Create_Workflow{ASE_ID, workflow_name} => Workflow_id

Clone_Workflow(ASE_ID, workflow_name, new_name) => Workflow_id

Add_Task_to_Workflow {Workflow_id, SVM_id, taskname, taskargs …}

Run_Workflow {Workflow_id} => {state[i], servers_touched, messages ...}

Abort_WorkFlow{Workflow_id)

Schedule_Workflow {Workflow_id, time_filter OR TRIGGER}

Write_VM_changes_back(ASE_ID, vm_id, checkpoint_id, abort_on_conflict OPTIONAL)

```
Tasks =>
    BOOT(vm_id),
    BOOT_PRODUCTION(vm_id)
    SLEEP(interval),
        SYNC,
        SHUT(vm_id),
        CRASH(vm_id),
    ADD(vm_id, package_uri),
        RUN(vm_id, script_uri) => {output,state, touched-server},
        READFILE(vm_id, filename),
        READEVENT(vm_id, type, severity, between),
    READ_APPLICATION_EVENT(vm_id, application_name, event_type) => {type, val}
    TRIGGER( vm_id, READFILE|READEVENT|READ_APPLICATION_EVENT, val)
    START_APP(vm_id, app_name),
    PING_APP(vm_id, app_name),
    TEST_APP_BASIC(app_name, test_name) => {output,state, server-touched},
    STOP_APP(vm_id, app_name),
    OPEN_CONSOLE_ASYNC(vm_id) => {console_id}
     OPEN_CONSOLE_SYNC(vm_id) => {console_id}
```

Example Workflow:

1. Add Patch

    ```
    BOOT(vmid=>17),
    BOOT(vmid=>18),
    RUN(vmid=>17, \\SUS\updates\update1.msi) => output,
    OPEN_CONSOLE_ASYNC(vmid=>17),
    PING_APP(vmid=>17, "sample")
    TEST_APP(vmid=>18, "test1")
    ```

2. Test failover

    ```
    START_ASE(ase_id=>2),
    CRASH(vmid=>10),
    SLEEP(interval=>2min),
    PING_APP(vmid=>17, "sample"),
    TEST_APP(vmid=>18, "test1")
    ```

3. Test configuration change

    ```
    START_ASE(ase_id=>2),
    STOP_APP("sampleapp")
    RUN(=>17, \\SUS\xx.reg) => output,
    START_APP("sampeapp")
    PING_APP(vmid=>17, "sample"),
    TEST_APP(vmid=>18, "test1")
    ```