Oracle® Enterprise Single Sign-on
Logon Manager

Best Practices: Template Configuration and Diagnostics for Windows Applications

Release 11.1.1.2.0

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ORACLE®

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Introduction

About This Guide

This guide describes the best practices and recommended procedures for creating and configuring Windows application templates. Topics covered include configuring logon and password change forms, as well as diagnosing and resolving most common Windows application response issues.

Prerequisites

Readers of this guide should be familiar with deploying and configuring the ESSO-LM Agent and using the ESSO-LM Administrative Console. Detailed information about each function described in this guide is available in the ESSO-LM Administrative Console help.

Terms and Abbreviations

The following table describes the terms and abbreviations used throughout this guide:

Term or Abbreviation	Description
ESSO-LM	Oracle Enterprise Single Sign-on Logon Manager
Agent	ESSO-LM client-side software
Console	ESSO-LM Administrative Console

Accessing ESSO-LM Documentation

We continually strive to keep ESSO-LM documentation accurate and up to date. For the latest version of this and other ESSO-LM documents, visit http://download.oracle.com/docs/cd/E15624_01/index.htm.

Contacting Oracle Support

To contact Oracle Support, visit the Oracle Support Web site at http://support.oracle.com.

Part 1: Understanding Form Detection and Response

This part explains the concepts necessary to understand how and why you should configure application templates to solve specific sign-on scenarios. It covers the following topics:

Overview of a Sign-On Event

ESSO-LM can be configured to detect and respond to a wide range of sign-on events, such as logon, password change, and variations of thereof; support is provided for a diverse range of forms, fields, controls, and event flows.

In order to recognize application windows, the Agent constantly monitors the currently logged in user's Windows message queue and responds as follows:

1. **Agent detects the window.** For each new window it detects, the Agent does the following:
   a. Searches through all of the available Windows application templates to find a match for the values of the identification criteria defined in the template. (These include the window title, window class, and executable name.)
   b. Selects the first template whose configuration matches the criteria presented by the window.
   c. Begins the response process.
2. **Agent responds to the form within the detected window.** The Agent follows the configuration stored in the template to determine how to interact with the fields and controls in the form. Typically, the Agent does the following:
   a. (Optional) Performs the actions, such as setting field focus, which might be required by the application to invoke or activate the logon or password change form.
   b. Retrieves the associated credentials from the user's store (if they exist) and populates the appropriate fields. (If the credentials don't exist, the Agent prompts the user to store them.)
   c. Performs the actions necessary to submit the credentials to the application for processing, such as pressing the **Logon** button.
   d. (Optional) Detects any follow-up forms or dialogs, such as new password confirmation, and performs the required action.

Understanding Window Detection

Whenever the Agent detects the instantiation of a new window (through the Windows message queue), the Agent examines the values of the following characteristics of the window and compares them to the values stored in each available *application template* in order to uniquely identify the window and the form it contains:

- Window title
- Window class
- Executable name (also referred to as a *module name* or an *AppPath key*)

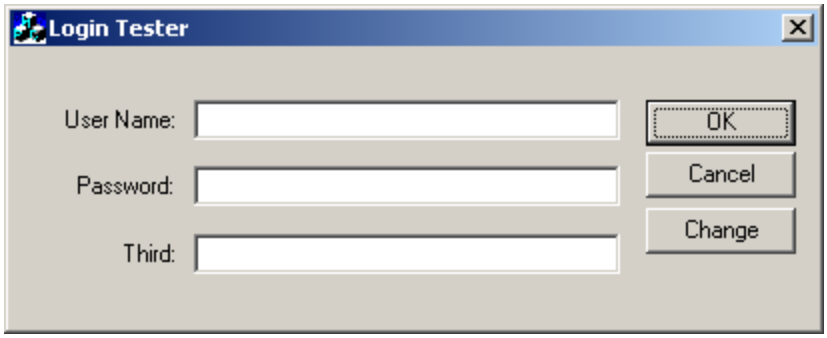
> **Note:** An *application template* is a set of configuration options that instruct the ESSO-LM Agent how to detect and respond to application windows and the forms they contain.

If a window other than the target window shares the values of these identifying criteria with the target window, the Agent may erroneously respond to such a window in addition to the target window. In such cases, you must use matching to more precisely constrain the allowable values of these criteria so that the resulting configuration uniquely identifies the target window and form to the Agent. For more information on matching, see Using Matching to Improve Detection Accuracy.

If a match is found, the Agent responds to the form as defined in the first matched template, i.e., logs the user on or initiates password change.

Understanding Form Response

Once the Agent recognizes an application window, it checks for the presence of fields and controls that comprise a "form," such as a logon form, or a password change form. A logon form, for example, typically contains at least a user name field, a password field, and a button that submits the credentials to the application. An example logon form is shown below.



Supported Form Types

As of the release date of this document, ESSO-LM supports the following types of forms in Windows applications:

- Logon
- Password change
- Password confirmation (a dialog requesting confirmation of the new password)
- Password change success (a dialog confirming successful password change)
- Password change failure (a dialog indicating the new password was rejected)

The same application window may contain different forms depending on the invoked function (i.e., logon or password change); thus, a single template can contain definitions for the multiple forms that the window can display. For most applications, you need to only define the forms to which you want ESSO-LM to respond.

> **Note:** Defining a form comprises providing unique identification criteria, specifying the action to take when the form is detected, and the specific way in which the action (e.g., injecting credentials) should be performed.

ESSO-LM can automatically populate the appropriate fields in a form with credentials retrieved from the user's credential store, as well as operate the form's controls to submit the credentials to the application for processing. Configuration options that instruct the Agent how to interact with the form's fields and controls are stored in the template.

Supported Form Response Methods

Depending on the design of the target application, ESSO-LM can use one of the following methods to interact with the fields and controls in the target form.

Control IDs

This is the default and preferred form interaction method for most Windows applications. This method uses the Windows API to identify and interact with the fields and controls within the form. In a Windows API-compliant application, each field and control exposes a unique Control ID to the operating system. The Agent detects these Control IDs and binds to them specific sign-on functions that signify the purpose of the object represented by the Control ID, such as the password field or the "submit" button.

> **Note:** If some or all of the Control IDs exposed by the application are non-unique or dynamic, the Agent can substitute ordinals – sequential ID numbers assigned to each item in the window from top to bottom, left to right – to uniquely identify the detected fields and controls.

If a field or control does not expose its Control ID, or if there are additional actions required to complete the sign-on event, such as selecting a check box or manually setting focus on a specific field, you may also have to use the "SendKeys" method, in tandem with Control IDs, to interact with the target form.

"SendKeys"

This method allows the Agent to interact with the target application by emulating user input, such as keystrokes and mouse clicks. Use this method if the Agent is unable to programmatically detect or interact with the target fields and controls. For example, if an application does not expose Control IDs for any of its fields and controls, you will need to send individual keystrokes to populate the fields, mouse clicks or **Tab** keystrokes to toggle between fields, and a final mouse click to engage the **Logon** button.

Control IDs with "SendKeys"

This method is a "best-of-both-worlds" combination of the two above methods and is the preferred way of solving sign-on scenarios that require actions that cannot be performed programmatically. Control IDs are used to interact with the form wherever possible, while keystrokes and mouse clicks are sent to accomplish tasks such as setting field focus, selecting a check box, and other actions that the Agent cannot perform programmatically within the target application.

For example, if fields must be populated in a specific order due to cascading validation (i.e., the password field becomes active only once the user name field has been populated), you would use Control IDs to inject credentials into the fields, but send a **Tab** keystroke via "SendKeys" between each field injection to advance field focus.

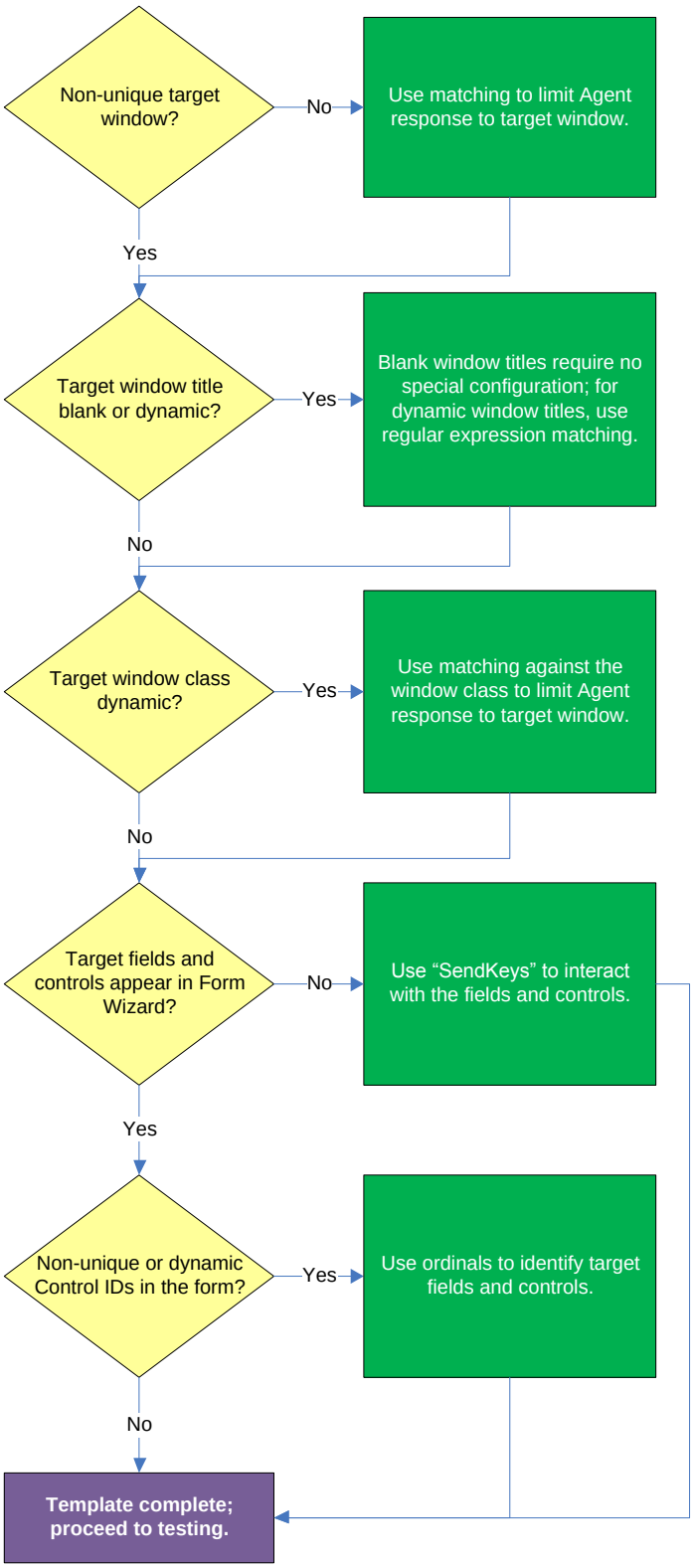
Part 2: Configuring and Testing Forms

This part describes the recommended best-practice procedures for configuring and testing Windows application forms. It covers the following topics:

Determining the Optimal Configuration for a Form

When configuring a form, use the information in this section to determine its optimal configuration based on the requirements and features of the target application.

Determining the Optimal Configuration for a Logon Form



Non-unique target window?

If the Agent cannot uniquely distinguish the target window from others, (i.e., another window whose window title, class, and/or module name are identical to those of the target window), the Agent might erroneously respond to such a window *in addition* to the target window. For more information on the causes of this issue and steps for resolving it, see Troubleshooting Form Detection.

Target window title blank or dynamic?

Blank window titles require no special configuration; dynamic text in the window title can be matched using either regular expressions or environment variables. For more information, see Using Matching to Improve Detection Accuracy.

Target window class dynamic?

If the window class of the target window is partially or fully dynamic, you must use matching to allow the Agent to uniquely identify the target window by its title. For more information, see Using Matching to Improve Detection Accuracy.

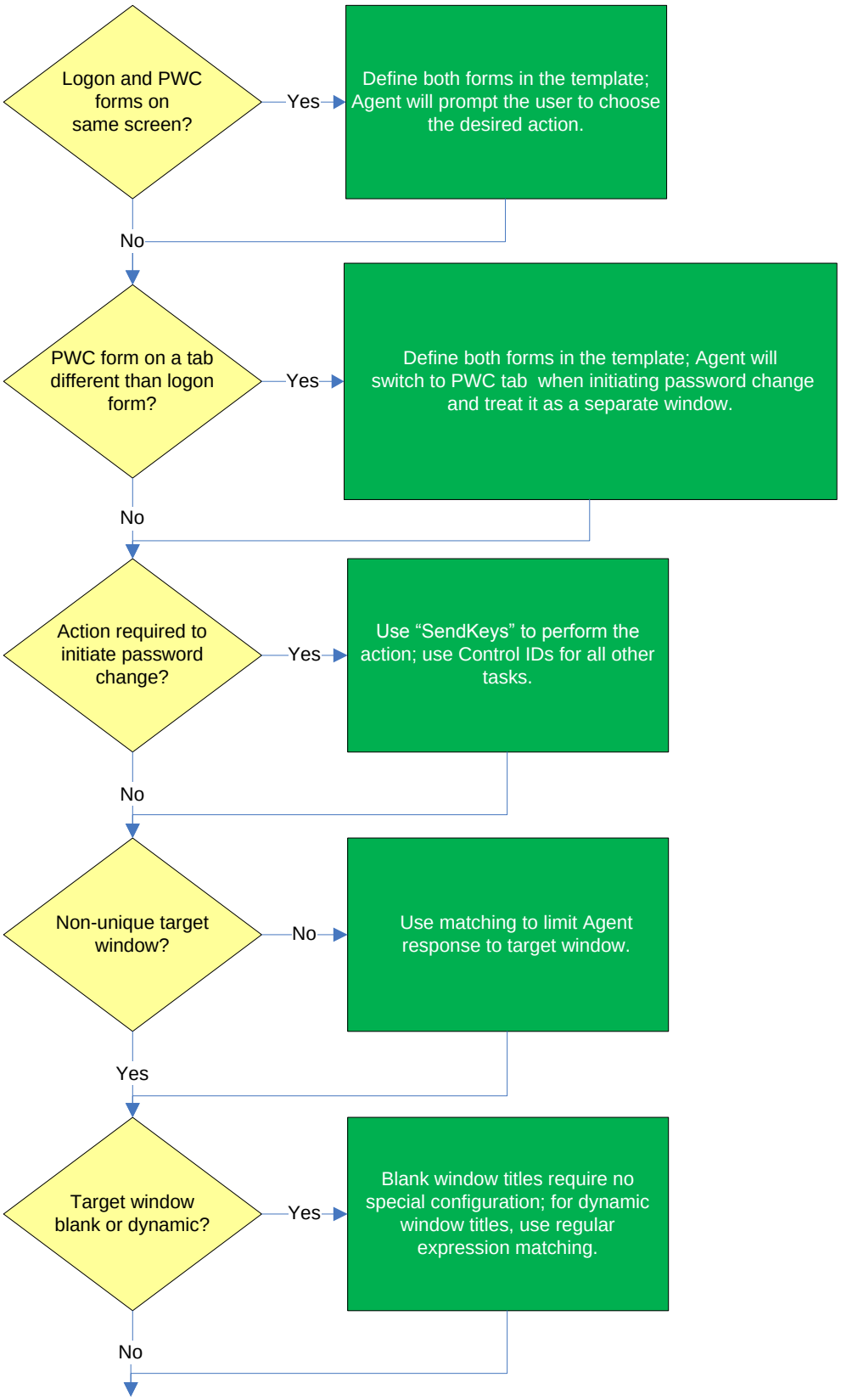
Target fields and controls appear in the Form Wizard?

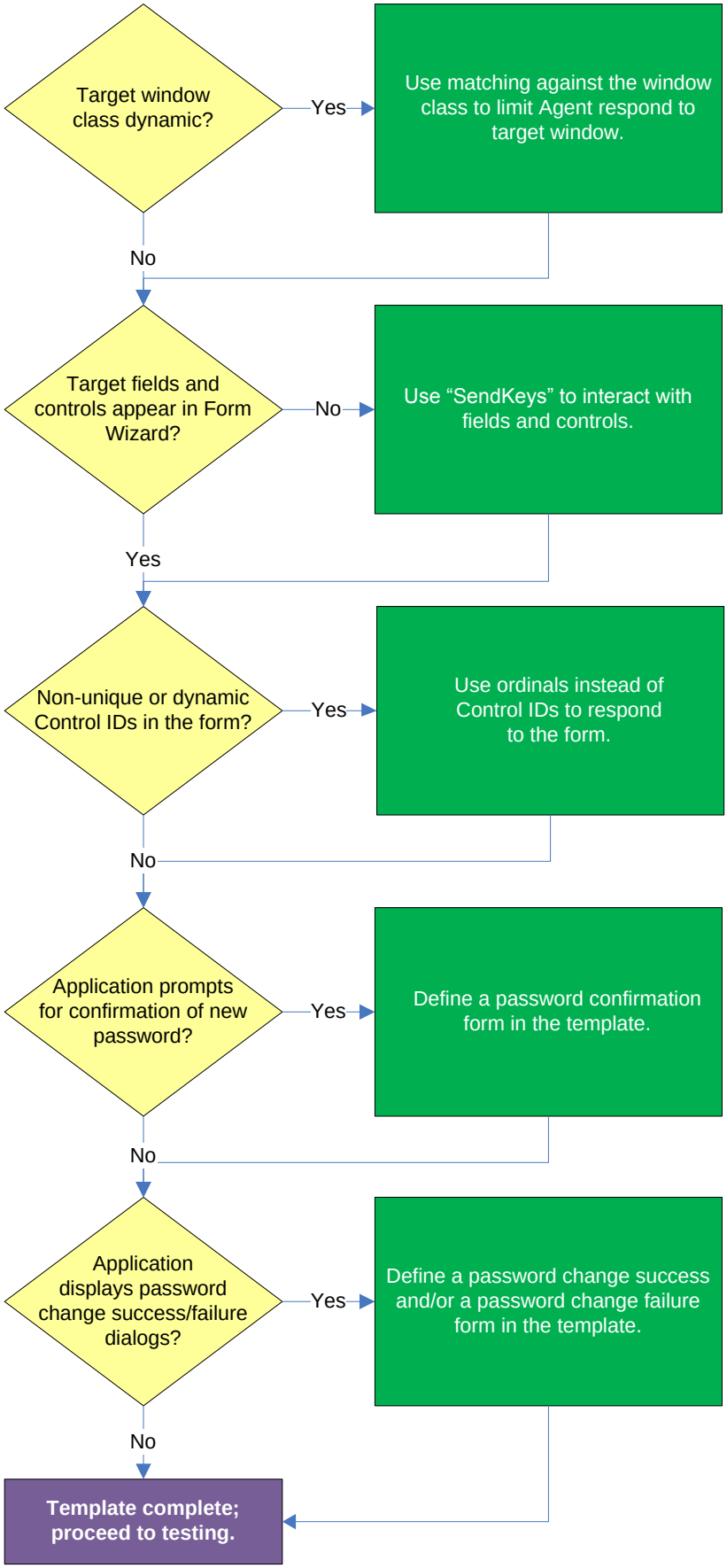
In most situations, the Form Wizard successfully detects and displays the credential fields and controls present in the target window. If no fields or controls are visible in the Form Wizard, or if the items listed do not correspond to any of the fields or controls in the target window, you may need to use "SendKeys" to interact with that field or control. For more information, see Supported Form Response Methods.

Non-unique or dynamic Control IDs in the form?

Once you have identified the credential fields and controls that you wish to enable for sign-on, check that their Control IDs are unique. If you discover duplicates, ESSO-LM's response to the application might be unreliable; in such cases, use "SendKeys" to interact with the fields and controls in question. For more information, see Supported Form Response Methods.

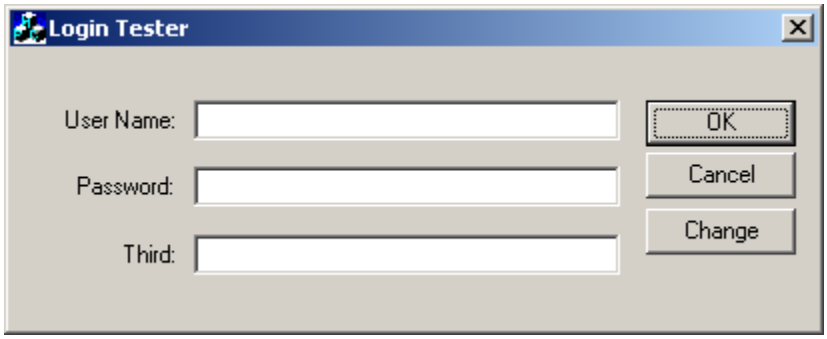
Determining the Optimal Configuration for a Password Change Form



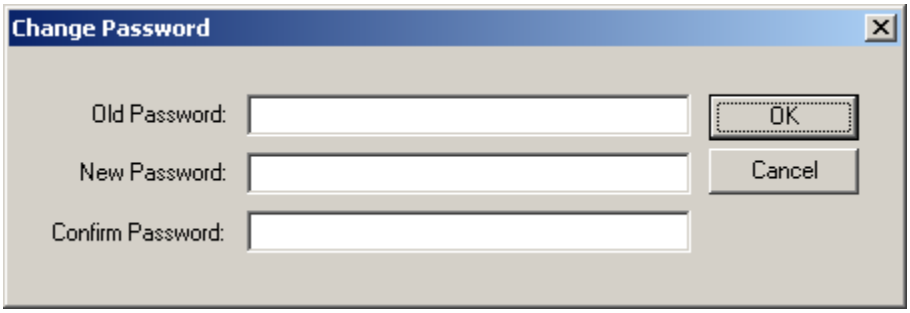

Target window class dynamic?
Yes
Use matching against the window class to limit Agent respond to target window.
No
Target fields and controls appear in Form Wizard?
No
Use “SendKeys” to interact with fields and controls.
Yes
Non-unique or dynamic Control IDs in the form?
Yes
Use ordinals instead of Control IDs to respond to the form.
No
Application prompts for confirmation of new password?
Yes
Define a password confirmation form in the template.
No
Application displays password change success/failure dialogs?
Yes
Define a password change success and/or a password change failure form in the template.
No
Template complete; proceed to testing.

Logon and password change forms on the same screen?

Some applications might present password change forms that also contain logon-related fields or controls, such as a user name field or a **Change Password** button. For example, the logon screen shown below contains a **Change** button.



This **Change** button, in turn, invokes the password change screen.



If the **Auto Submit** feature is enabled and the Agent responds to such application, the user is logged in automatically without being given the option to change the password.

In order to allow the user to select the desired course of action, define the logon and password change forms in the template. The Agent will prompt the user for the desired course of action (logon or password change) when it responds to an application with consolidated logon and password change forms.

> **Note:** You also have the option to configure a grace period for the "action chooser" feature, during which the Agent will automatically assume that logon is the preferred action and log the user on without prompting to choose the desired action. This option, named **Action Chooser Grace Period**, is available in the **Miscellaneous** tab in the application template.

Password change form on a tab different than logon form?

Define the logon and password change forms in the template. The Agent will automatically switch to the password change tab when password change is initiated, and treat the password change form tab as a separate window.

> **Note:** Only applications that implement tabs in full compliance with the WinAPI specification are supported.

Action required to initiate password change?

If the form requires an action to initiate password change, such as selecting a checkbox, and the Agent is unable to perform that action programmatically, you may need to use "SendKeys" to complete the action by sending keystrokes and/or mouse clicks to the application. For more information, see Supported Form Response Methods.

Non-unique target window?

If the Agent cannot uniquely distinguish the target window from other, similar windows, (i.e., when another window is instantiated whose window title, class, and module name are identical to those of the target window), the Agent might erroneously respond to such a window *in addition* to the target window. For more information on the causes of this issue and steps for resolving it, see Troubleshooting Form Detection.

Target window title blank or dynamic?

Blank window titles require no special configuration; dynamic text in the window title can be matched using either regular expressions or environment variables. For more information, see Using Matching to Improve Detection Accuracy.

Target window class dynamic?

If the window class of the target window is partially or fully dynamic, you must use matching to allow the Agent to uniquely identify the target window by its title. For more information, see Using Matching to Improve Detection Accuracy.

Target fields and controls appear in the Form Wizard?

In most situations, the Form Wizard successfully detects and displays the credential fields and controls present in the target window. If no fields or controls are visible in the Form Wizard, or if the items listed do not correspond to any of the fields or controls in the target window, you may need to use "SendKeys" to interact with that field or control. For more information, see Supported Form Response Methods.

Non-unique or dynamic Control IDs in the form?

Once you have identified the credential fields and controls that you wish to enable for sign-on, check that their Control IDs are unique. If you discover duplicates, ESSO-LM's response to the application might be unreliable; in such cases, use "SendKeys" to interact with the fields and controls in question. For more information, see Supported Form Response Methods.

Application requires confirmation of new password?

Some applications prompt the user to confirm the new password when performing a password change. If the target application displays such a dialog, configure the password change form, then configure a "Confirm Password" form that will respond to the confirmation dialog. For instructions, see Configuring a Form.

Application displays a password change success and/or failure dialogs?

Some application display a message indicating whether password change was a success or a failure. In such cases, define a password change success or a password change failure form in the application template. For instructions, see Configuring a Form.

Configuring a Form

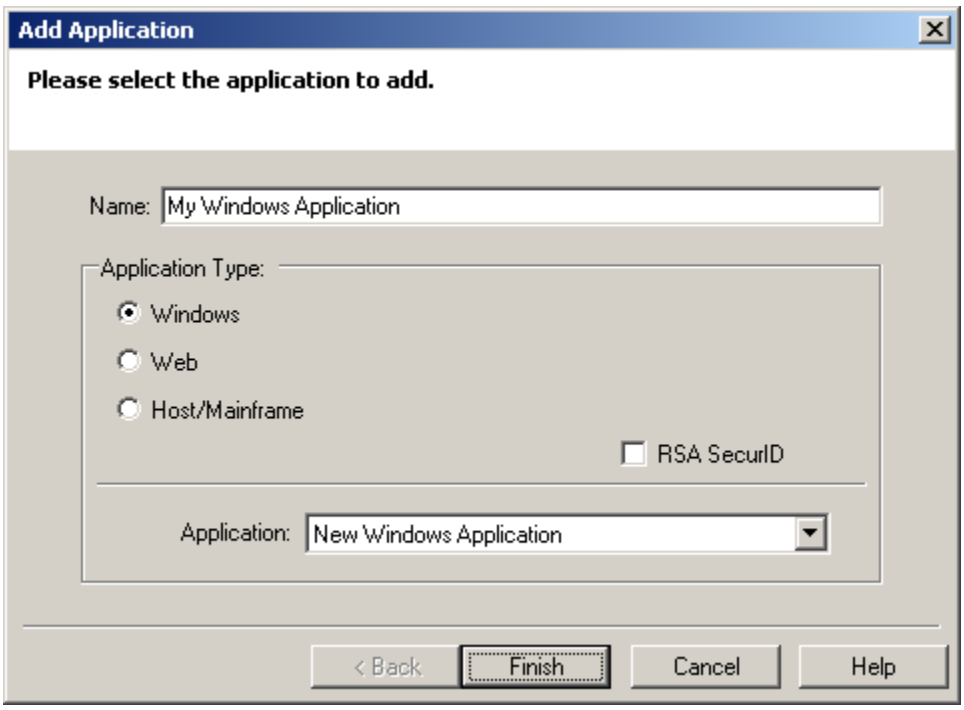
The procedures in this section use concepts and terminology explained earlier in this guide. When performing the procedures in this section, refer to Determining the Optimal Configuration for a Form to make configuration decisions that best suit the target application.

Basic Configuration

To complete a basic configuration of a form, do the following:

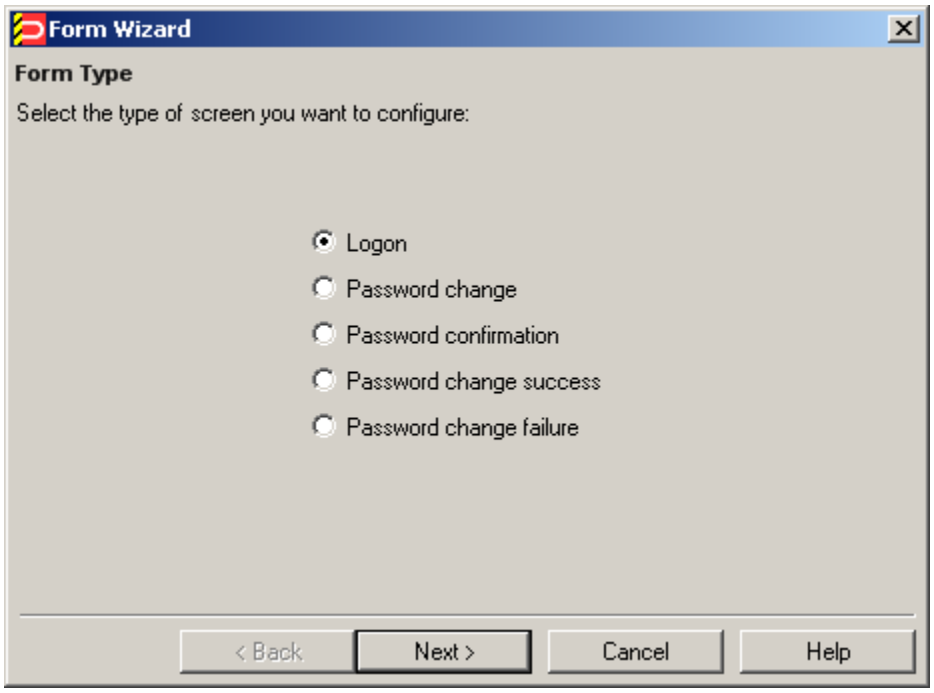
1. Open the ESSO-LM Administrative Console. By default, the shortcut is located at **Start → Programs → Oracle → ESSO-LM Console.**
2. In the left-hand tree, select the **Applications** node and do one of the following:
   - If you want to create a new template and define the logon form:
     i. Click **Add** in the right-hand pane.
     ii. In the **New Application** dialog, enter a descriptive name for the template and click **Finish**. The new template appears in the list of stored templates.

> **Caution:** If two or more application templates are named such that the name of one of the templates occurs in the beginning of the name of another template, the Agent will erroneously use the template with the shortest name to respond to all of the affected applications. To avoid this behavior, ensure that your template names do not begin with the same string of text.

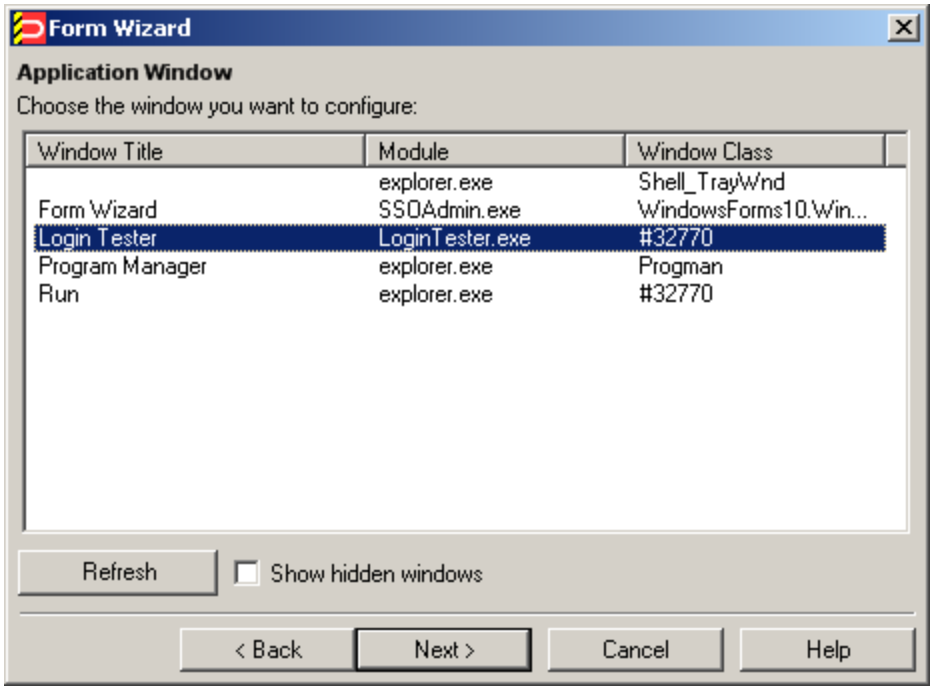


- If you want to add a logon form definition to an existing template, do the following:
    i. Expand the **Applications** node and select the desired template.
    The template appears in the right-hand pane.
    ii. Click **Add** at the bottom of the pane.

3. In the Form Wizard that appears, configure the fields and controls that you want the Agent to interact with when responding to the target form:
    a. In the "Form Type" screen, select the desired form type and click **Next**.



b. In the “Application Window” screen, select the window that contains the target form. A thick blue border appears around the chosen window to indicate your selection.



Note: If you see two or more windows that share the same value for any of the parameters, the Agent might erroneously respond to all of those windows, instead of only the target window. For more information on this issue, see Troubleshooting Window Detection.

c. In the “Credential Fields” screen, select and configure the target fields and controls from among the objects in the list as follows:

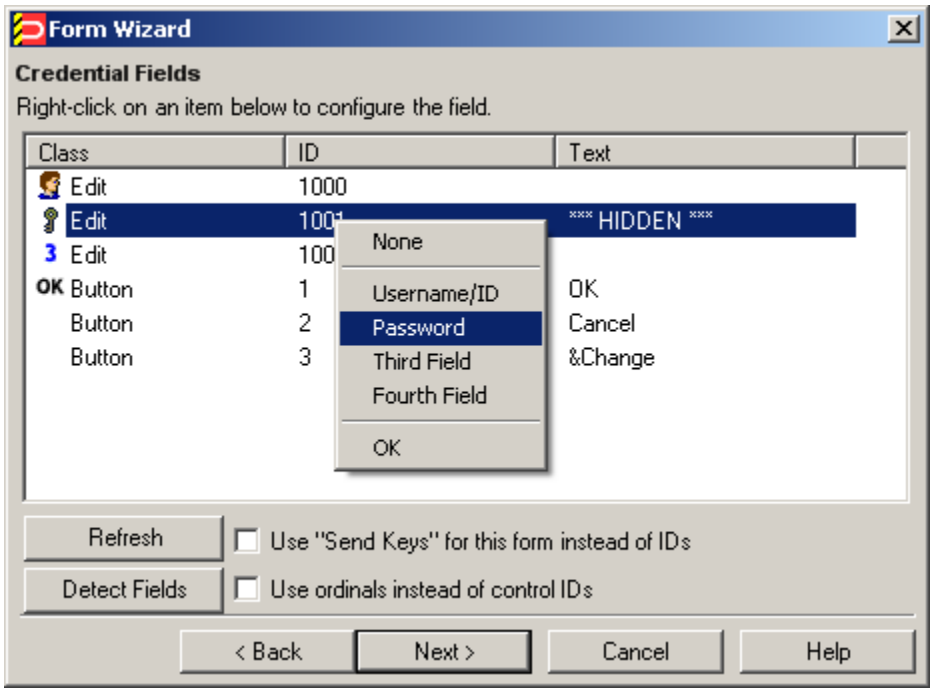
i. Right-click each desired field or control and select its function from the context menu.

Caution: While the **Detect Fields** feature is accurate the majority of the time, Oracle recommends always configuring fields and controls manually for guaranteed accuracy.

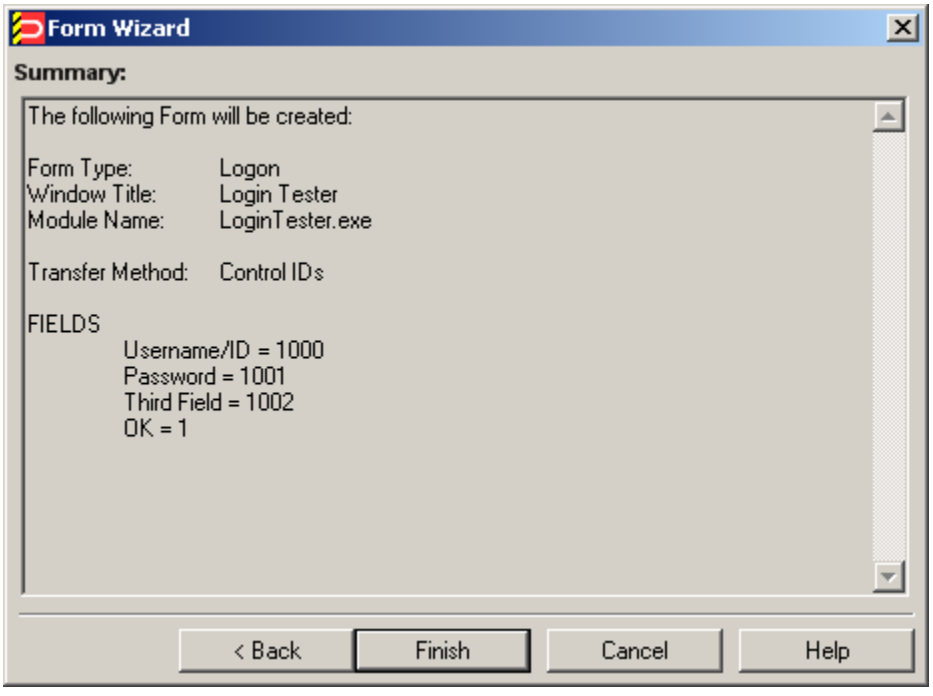
Note: If a “submit” button (usually labeled **OK**, **Logon**, etc.) is not visible in the list, ESSO-LM will still send a “submit” action to the application after injecting credentials.

ii. If the application requires that ESSO-LM interacts with its fields and controls using the “SendKeys” method, which emulates user input such as keystrokes and mouse clicks, select **Use “SendKeys” for this form instead of IDs**.
(To determine whether your application requires this option, see Understanding Form Response.)

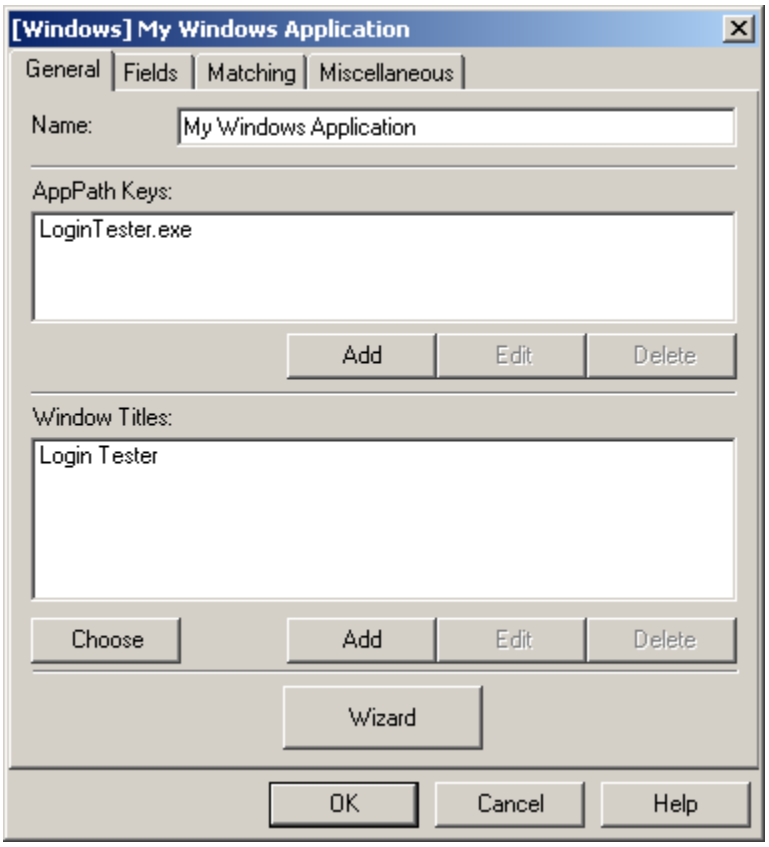
iii. If the application requires that ESSO-LM addresses its fields and controls via ordinals rather than Control IDs, select **Use ordinals instead of control IDs**. (To determine whether your application requires this option, see Understanding Form Response.)



d. In the "Summary" screen, review your configuration choices. If you want to change any of the options you selected, click **Back**, otherwise, click **Finish**.



e. In the template properties dialog that appears, click **OK** to complete the template configuration.



Note: If you want to configure additional options for the template and you are familiar with their locations and functionalities, you may do so now, if you desire. Configuration procedures for options present in this dialog are included later in this guide.

Using Matching to Improve Response Accuracy

Matching is a mechanism that allows ESSO-LM to uniquely distinguish a window and the form it contains from other windows and forms that may be encountered in a session. The term "matching" refers to the comparison of the values of certain parameters, such as window title or a field label, to the value stored in a template.

For example, an application might instantiate dialog boxes that serve different purposes, such as informative messages, wizards, and logon forms, but share the same window title and class; in such a case, you would configure matching against unique elements within the form to limit Agent response to that specific form.

ESSO-LM allows you to match against the values of the following criteria:

- Window title, including blank and partially or fully dynamic values
- Window class, including constriction to specific values
- Executable name (also referred to as a module name)
- A field, control, or a text string

Matching for a Blank or Dynamic Value

You can use regular expressions supported by the Microsoft .NET Framework to formulate the text pattern that the Agent should recognize as a match for a criterion. Wildcards, such as `?` (single character) and `*` (any combination of characters, excluding space), are the most commonly used regular expressions.

For example:

- `Je???e` will match both `Jeanne` and `Jessie`. It will not, however, match `Jeanine`, because neither the length of the string nor character order match.
- `Je*e` will match against all words that begin with `Je` and end with `e`; all three examples above are matches in this case.
- `Afx:400000:0:10011:0:*` will match against all window classes whose last six digits are variable. `Afx:400000:0:10011:0:130927` would be a match in this case.

If the target criterion, (for example, a window title) contains one or more system variables, such as the currently logged in user name, you can use the variable name as part of the matching text pattern. For example, the following pattern will result in a match against a window title that begins with `Password Expired –` and includes the currently logged on user's name in uppercase:

```
Password Expired - %UC%%DOMAINUSER%
```

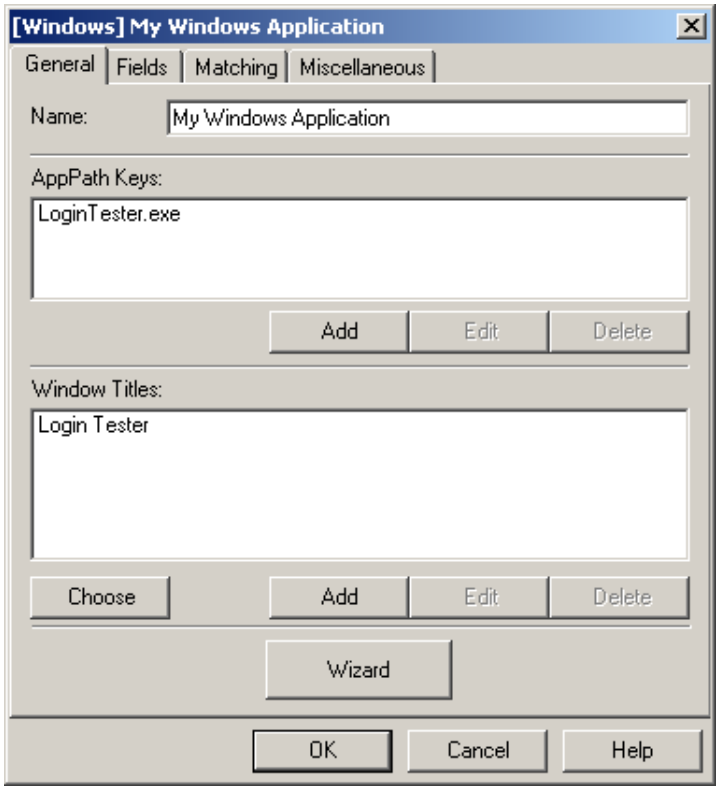
To match against:

- **A partially or fully dynamic value**, use regular expressions, environment variables, and static text, as appropriate, to create a text string that will cause a successful match against the target parameter value.
- **Against a blank value**, specify the null regular expression `^$` as the value.

> **Note:** Blank window titles are supported automatically; they do not require any special configuration.

Before completing the procedures in this section, do the following:

1. Launch the ESSO-LM Administrative Console.
2. In the tree in the left-hand pane, expand the **Applications** node and select the desired template.
3. In the right-hand pane, select the **General** tab.
4. Click **Edit** to bring up the template properties dialog.

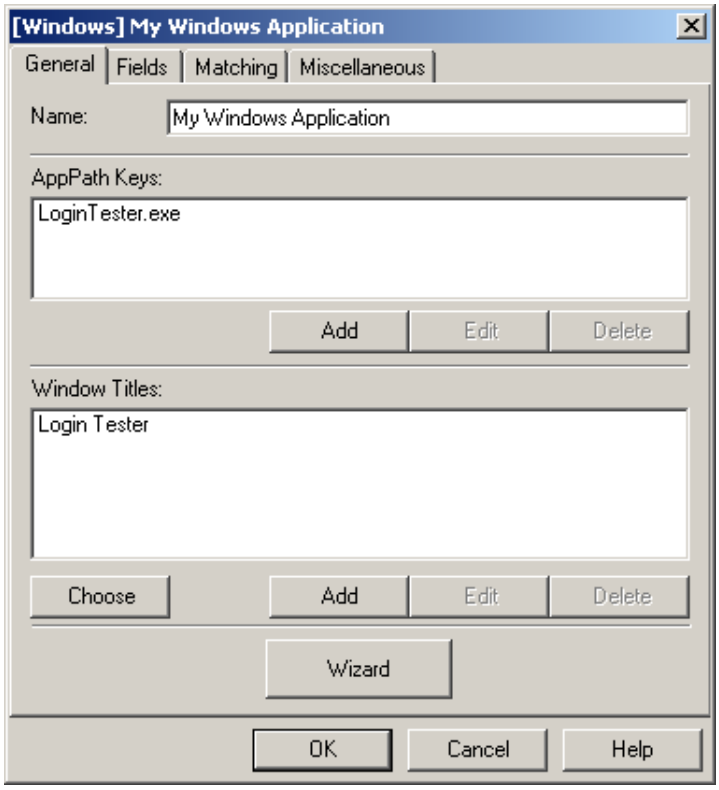


5. Continue to the desired procedure:
   - Matching Against a Window Title
   - Matching Against a Window Class
   - Matching Against an Executable Name
   - Matching Against a Field, Control, or Text String

Matching Against a Window Title

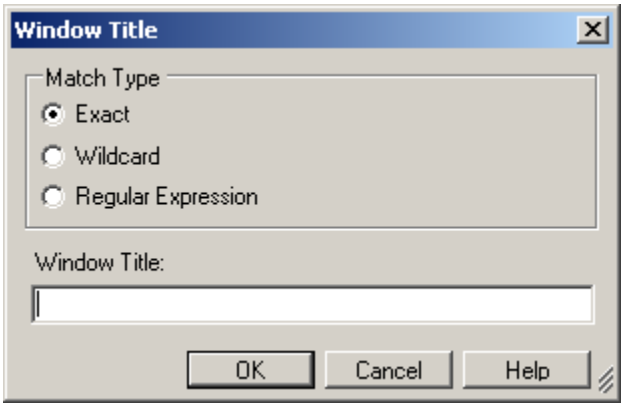
To match against one or more static or dynamic window titles, do the following:

1. In the template properties dialog, select the **General** tab.



2. In the "Window Titles" section, do one of the following:
   - To add a new matching rule, click **Add**.
   - To modify an existing matching rule, select the rule in the list and click **Edit**.

3. In the “Window Title” dialog, do the following:



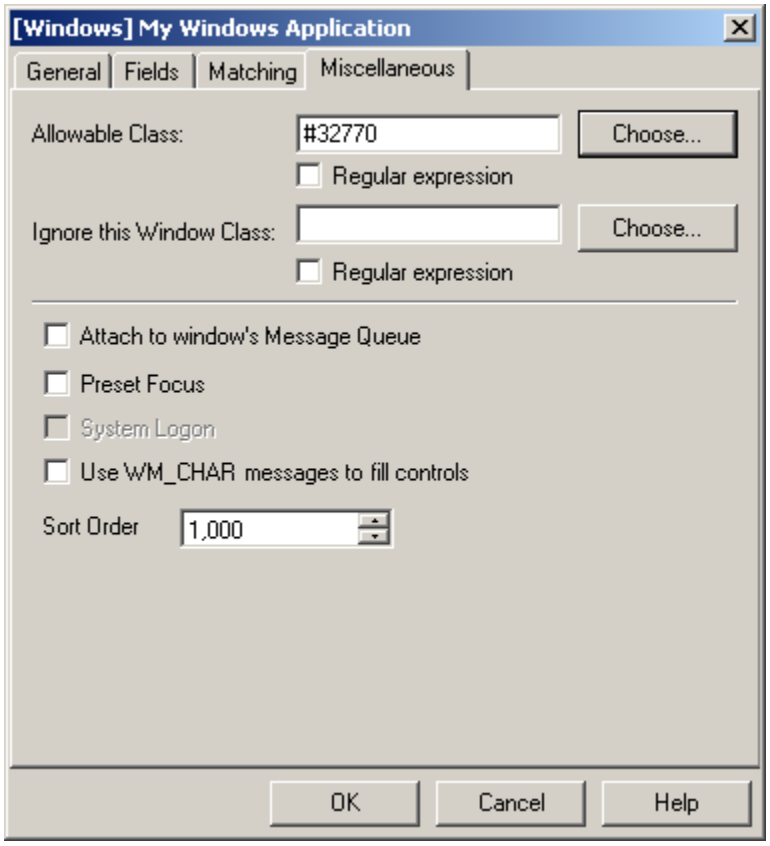
   a. Select the desired matching type:
      - **Exact** matches the string strictly as entered. Use with static window titles.
      - **Wildcard** allows matching using a combination of text and a wildcard. Use with blank or dynamic window titles.
      - **Regular expression** allows matching using a combination of text and regular expressions. Use with dynamic window titles.

      For more information, see Matching for a Blank or Dynamic Value.
   b. Enter the desired text string against which the Agent will perform the match.
   c. Click **OK** to add the new matching rule.
4. Click **OK** to close the properties dialog.

Matching Against a Window Class

To match against one or more static or dynamic window classes, do the following:

1. In the template properties dialog, select the **Miscellaneous** tab.



2. Specify the allowable window classes as follows:
    - If you don't know the exact value(s) of the class(es) you want to specify, do the following:
        i. Click **Choose**.
        ii. In the dialog that appears, select the target window.
        iii. Click **OK**. The class of the selected window populates the **Allowable Class** field.
    - If you know the exact value(s) of the class(es) you want the Agent to recognize, enter them as a comma-delimited list into the **Allowable Class** field. If you want to match against one or more dynamic window classes, select the **Regular Expression** check box and include the desired regular expressions in the list.

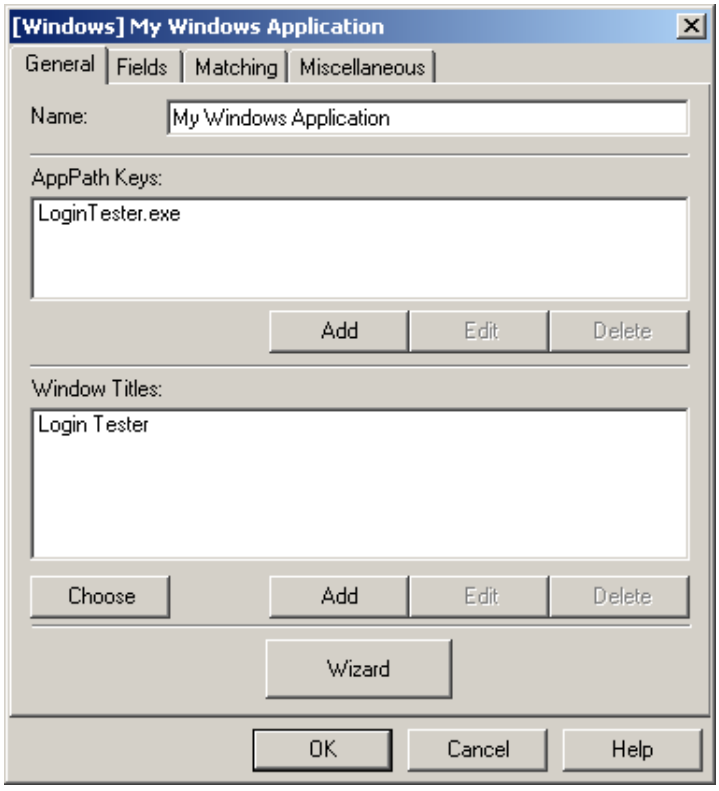
3. Specify the window classes you want the Agent to ignore (i.e., never respond to) as follows:
    - If you don't know the exact value(s) of the class(es) you want to specify, do the following:
        i. Click **Choose**.
        ii. In the dialog that appears, select the target window.
        iii. Click **OK**. The class of the selected window populates the **Ignore this Window Class** field.
    - If you know the exact value(s) of the class(es) you want the Agent to recognize, enter them as a comma-delimited list into the **Ignore this Window Class** field. If you want to match against one or more dynamic window classes, select the **Regular Expression** check box and include the desired regular expressions in the list.
4. Click **OK** to close the properties dialog.

Matching Against an Executable Name

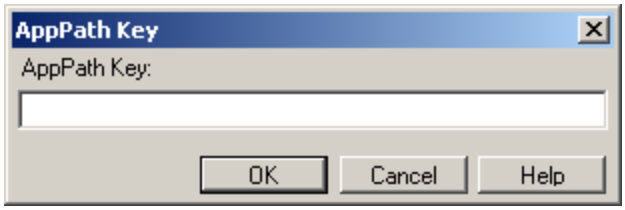
To match against a specific executable name, do the following:

> **Note:** Matching against executable names supports exact matching only. Wildcards or regular expressions are not supported.

1. In the template properties dialog, select the **General** tab.



2. In the “AppPath Keys” section, do one of the following:
    - To add a new matching rule, click **Add**.
    - To modify an existing matching rule, select the rule in the list and click **Edit**.
3. In the “AppPath Key” dialog, enter the desired value and click **OK**.



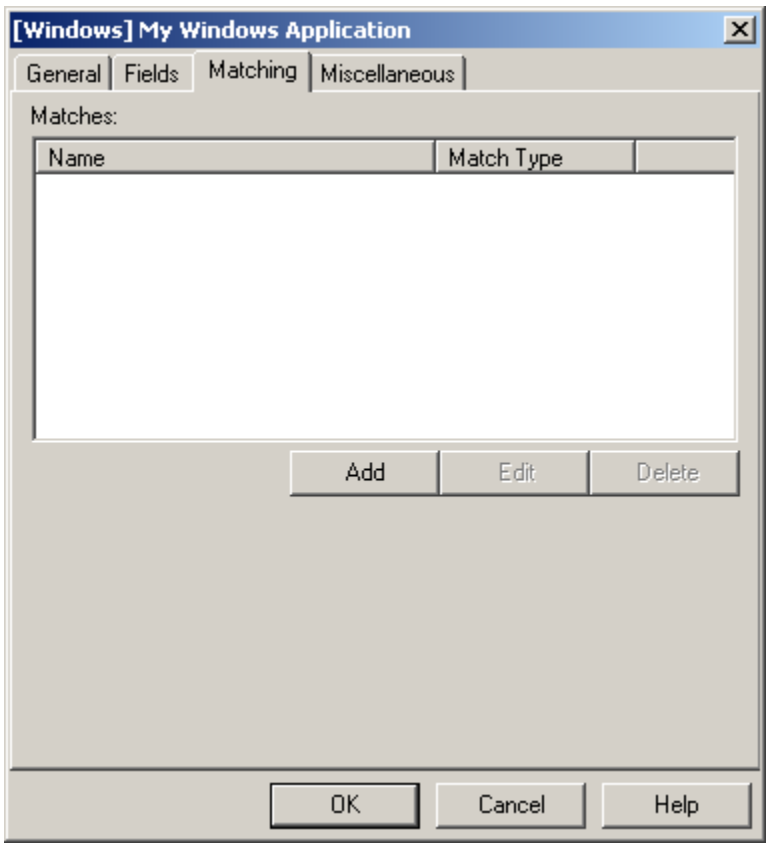
4. Click **OK** to close the template properties dialog.

Matching Against a Field, Control, or Text String

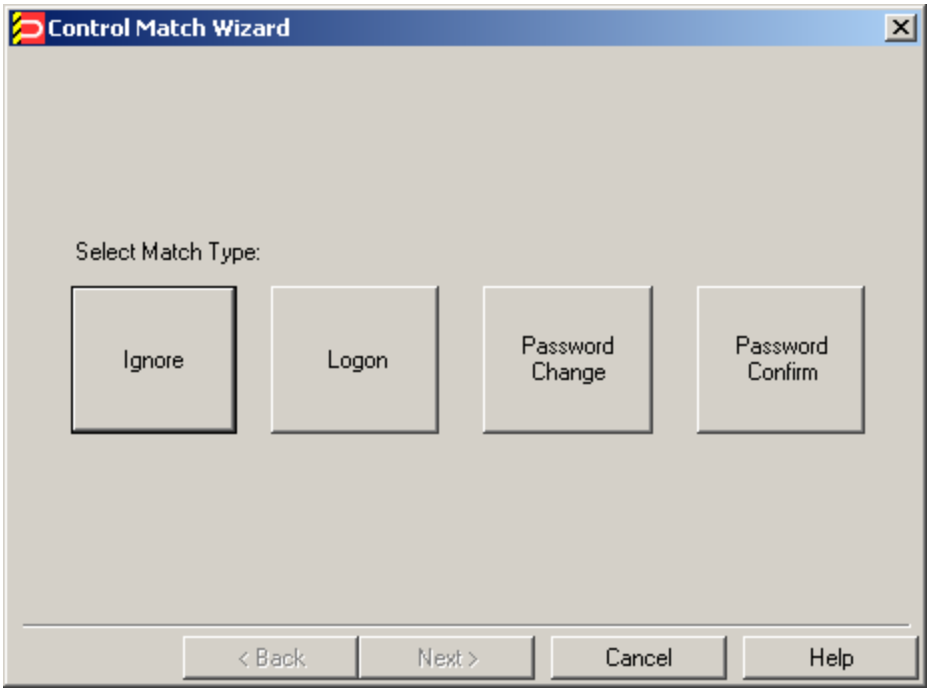
Use the **Matching** tab to map user credentials of the currently selected logon to other logon, password-change or password-confirmation forms (referred to here as target forms) within the same application. The Agent uses the match criteria you supply to distinguish among similar forms that use the same credential data. This lets the Agent apply a single set of user credentials appropriately to these multiple forms. You can use also use matching to identify forms that the Agent should ignore.

To match for a specific field or control, do the following:

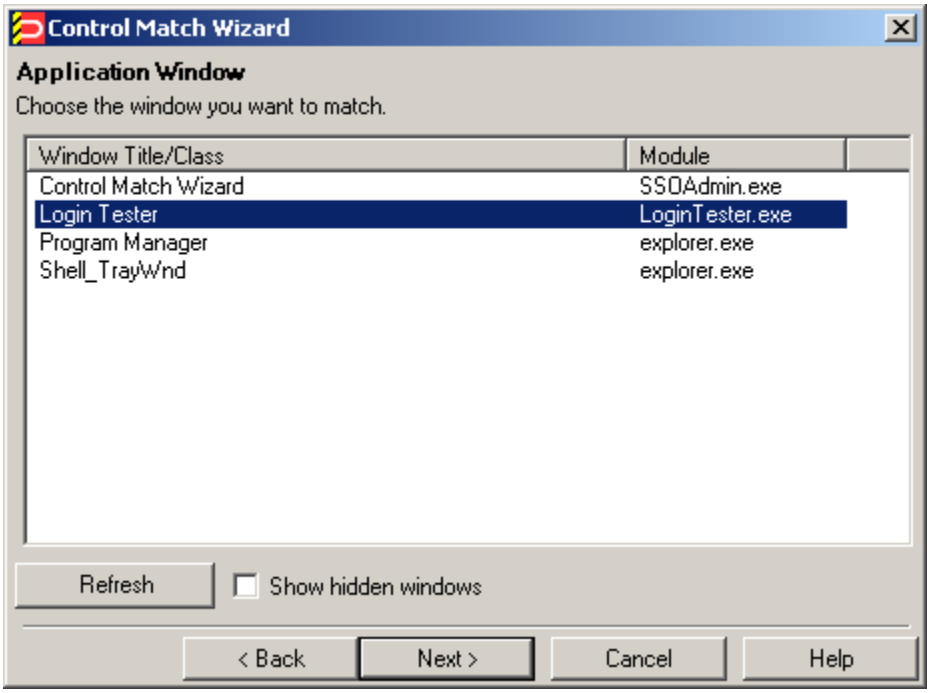
1. In the template properties dialog, select the **Matching** tab.



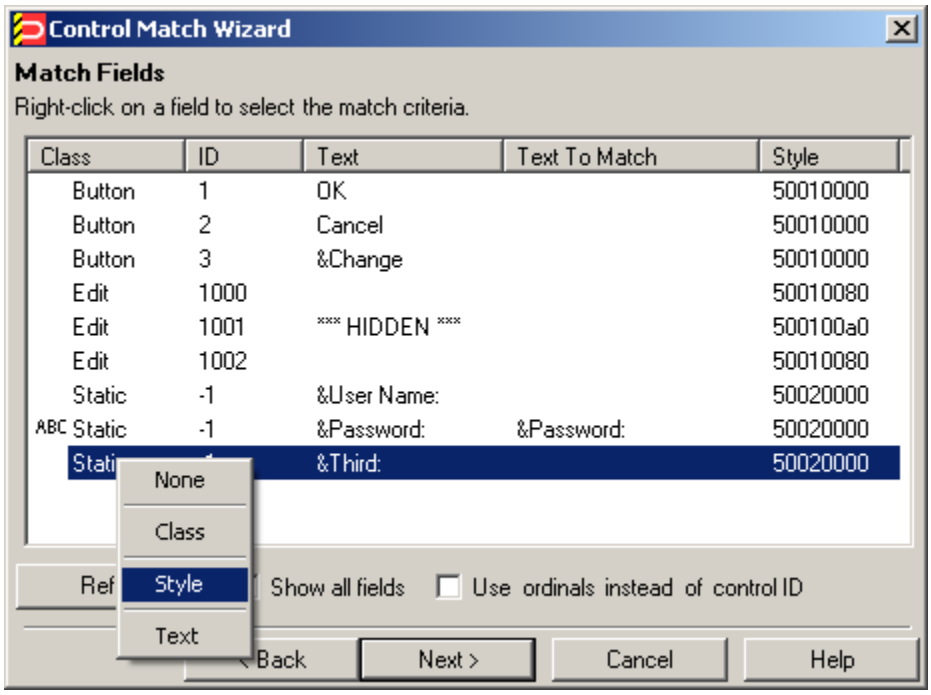
2. In the “Matches” section, do one of the following:
    - To add a new matching rule, click **Add**.
    - To modify an existing matching rule, select the rule in the list and click **Edit**.
3. In the Control Match Wizard that appears, select the desired matching type.



4. In the “Application Window” screen, select the target window.



5. In the “Match Fields” screen that appears, configure the desired match rules. For each field, control, or text string that you want to match against, do the following:
    a. In the list, select the desired item and right-click it.
    b. Select the desired match criterion from the context menu:
        - **Class:** instructs the Agent to match against the numeric class value of this item.
        - **Style:** instructs the Agent to match against the numeric style value of this item.
        - **Text:** instructs the Agent to match against the text presented by this item. When prompted, enter the desired match string into the dialog box that appears and click **OK**.
    c. Click **Next**.



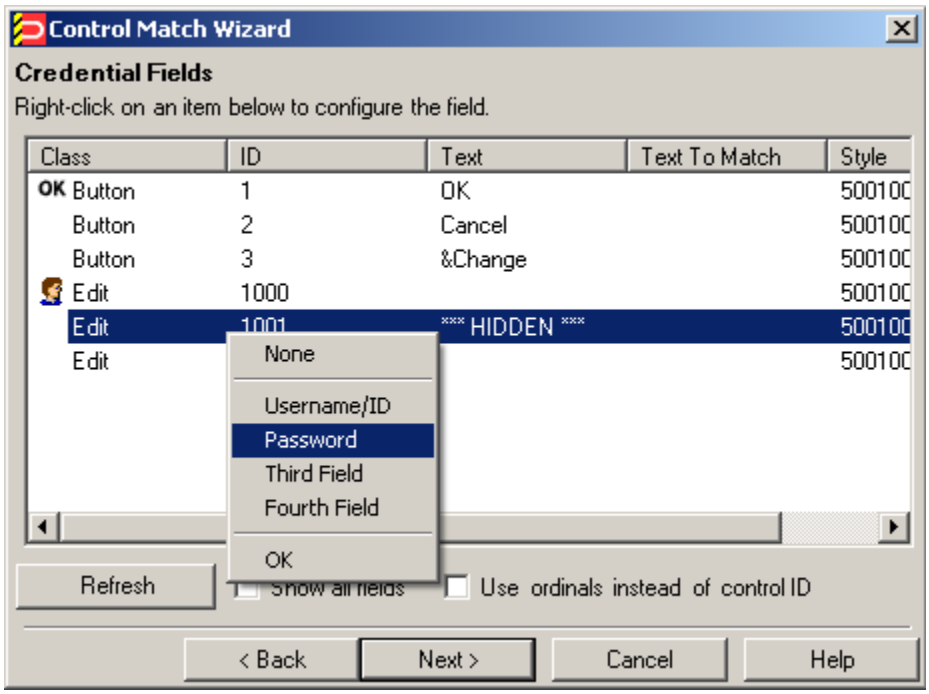
6. In the “Credential Fields” screen, select and configure the credential fields and controls that the Agent will use to complete the logon upon a successful match:
    a. Right-click each desired field or control and select its function from the context menu.

> **Note:** If a “submit” button (usually labeled **OK**, **Logon**, etc.) is not visible in the list, ESSO-LM will still send a “submit” action to the application after injecting credentials.

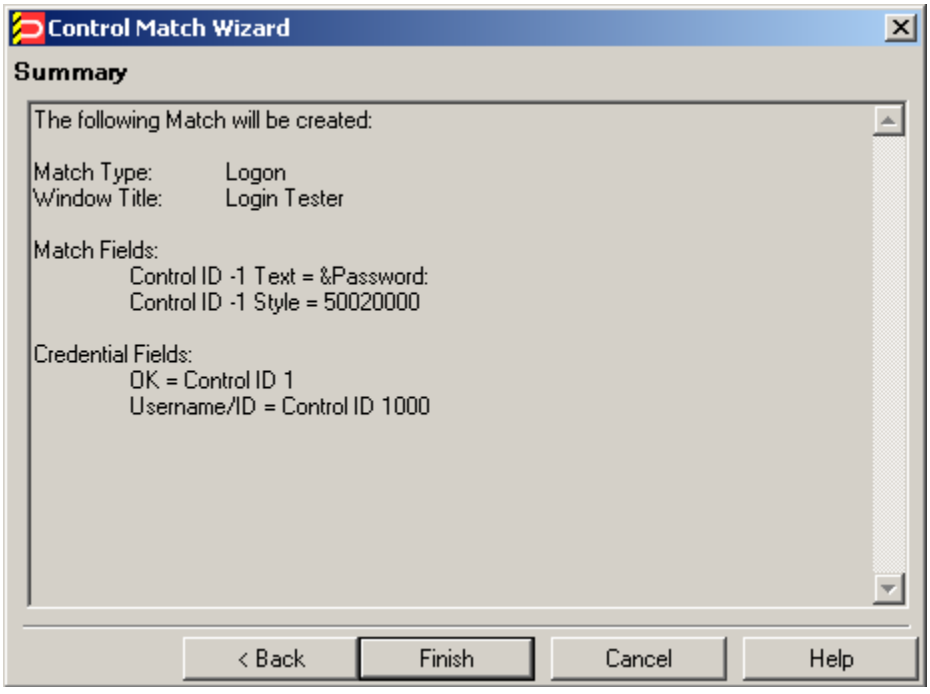
    b. If the application requires that ESSO-LM interacts with its fields and controls using the “SendKeys” method, which emulates user input such as keystrokes and mouse clicks, select **Use “SendKeys” for this form instead of IDs**. (To determine whether your application requires this option, see Understanding Form Response.)

c. If the application requires that ESSO-LM addresses its fields and controls via ordinals rather than Control IDs, select **Use ordinals instead of control IDs**. (To determine whether your application requires this option, see Understanding Form Response.)

d. Click **Next**.



7. In the "Summary" screen, review your configuration choices. If you want to change any of the options you selected, click **Back;** otherwise, click **Finish**.



Configuring an Application as a Service Logon

If an application is running in the system space (i.e., under the `SYSTEM` account) instead of the user space, or it has been launched to run under a user account other than the currently logged on user, you must configure it as a service logon. To configure the application as a service logon, do the following:

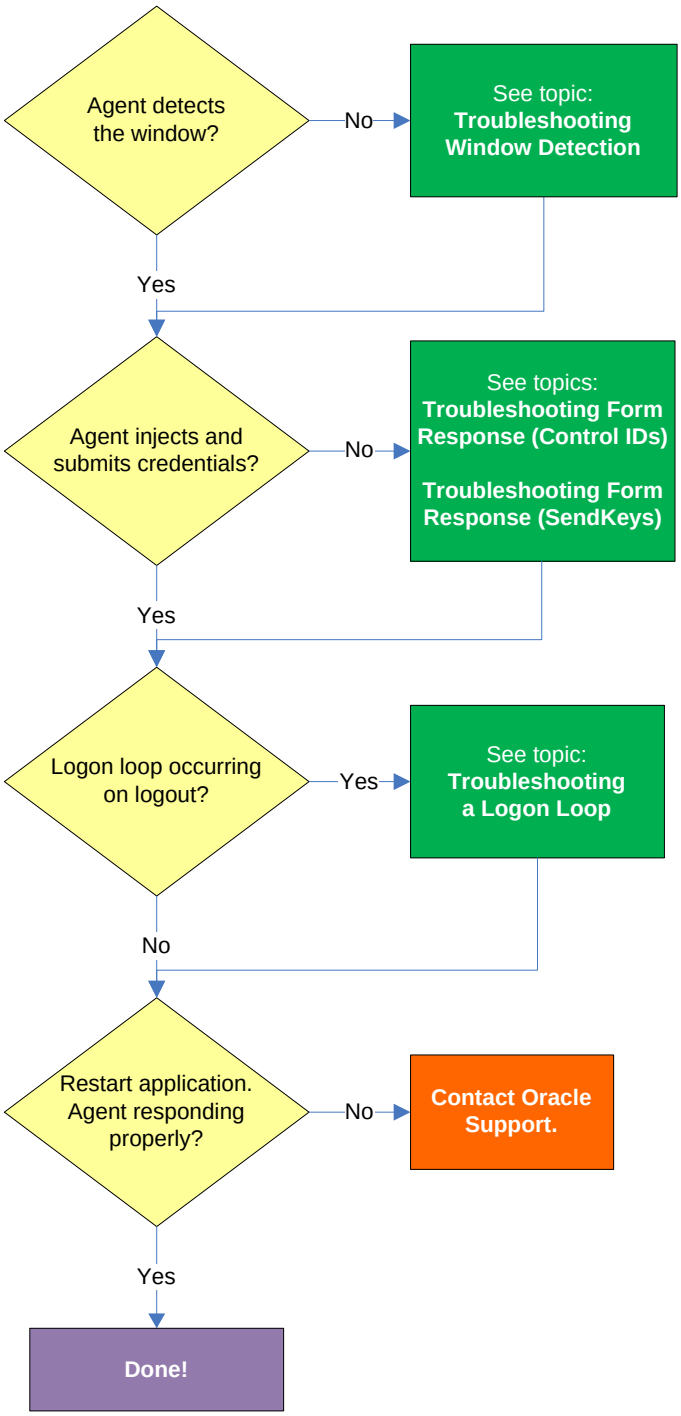
1. Open the desired template.
2. Select the **Miscellaneous** tab and check the **Service Logon** check box.
3. Obtain the application's window class:
    a. Select the **General** tab,
    b. In the list of form definitions, select the logon form and click **Edit**.
    c. In the form properties dialog, select the **Miscellaneous** tab and note down the value present in the **Allowable Class** field – this is the window class detected in the application by ESSO-LM.
4. Save your changes and push the updated template to the repository, if applicable.
5. Add the application's window class to the list of window classes the Agent will recognize as system services:
    a. Load your global Agent settings set.
    b. In the left-hand tree, navigate to **Global Agent Settings → End-User Experience → Windows Apps**.
    c. Select the check box next to the **Supported Window Classes for Services** option, if it is not already selected.
    d. In the field next to the above option, add the window class you noted down in step 3c to the list of existing classes, separated by a semicolon.
6. Save your changes and push the updated **Supported Window Classes for Services** setting to the repository as part of your administrative overrides.

Testing the Configuration of a Form

To test the configuration of a form, do the following:

1. Launch the Agent.
2. Launch the target application and invoke the desired form.
3. Use the appropriate flowchart to test the form configuration.

Testing the Configuration of a Logon Form



Agent detects window?

Once the Agent has been provided with the template, it will automatically respond to the target application, unless the automatic response feature has been explicitly disabled. If the Agent fails to respond to the application, see Troubleshooting Window Detection.

Agent injects credentials?

If credentials have been stored for the target application in the user's store, the Agent will inject them into the appropriate fields upon successful application detection. The Agent will also automatically submit the credentials unless the "Auto-Submit" feature has been explicitly disabled. If credential injection fails, see Troubleshooting Form Response When Using Control IDs and Troubleshooting Form Response When Using "SendKeys".

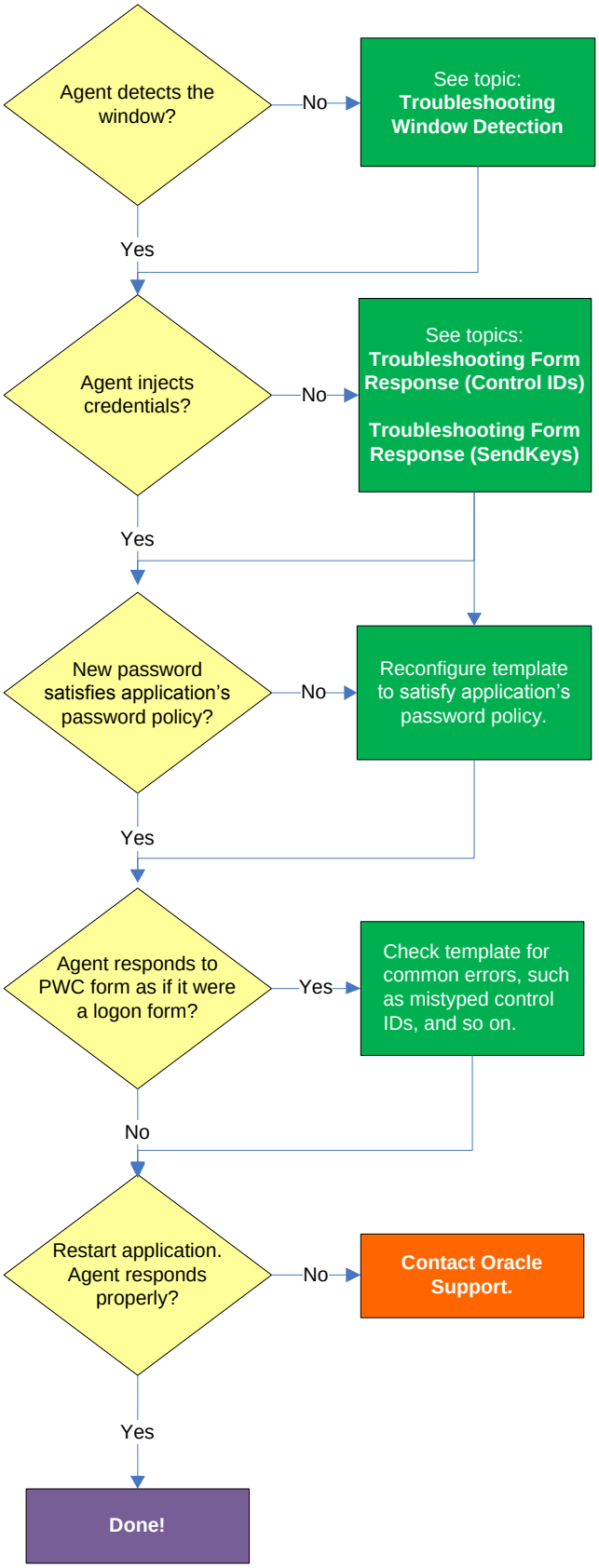
Logon loop occurring on logout?

Some applications display their logon screen upon logout, which causes the Agent to enter a logon loop and effectively prevents the user from logging out of the application unless the Agent is shut down. If this happens, see Troubleshooting a Logon Loop.

Agent responding properly after application is restarted?

If the target application is shut down and restarted, the Agent should respond to the application and log the user on. If logon does not occur, it is possible that the application is running in the system space instead of the user space and thus requires active polling instead of passive message queue monitoring by the Agent. If this is the case, you must follow the instructions in Configuring an Application as a Service Logon.

Testing the Configuration of a Password Change Form



Agent detects the window?

Once the Agent has been provided with the template, it will automatically respond to the target application, unless the automatic response feature has been explicitly disabled. If the Agent fails to respond to the application, see Troubleshooting Window Detection.

Agent injects and submits credentials?

When the Agent detects the password change, it injects credentials into the appropriate fields and submits them to the application, unless the Auto Submit feature has been explicitly disabled. If credential injection is erratic or does not occur at all, see Troubleshooting Form Response When Using Control IDs and Troubleshooting Form Response When Using "SendKeys".

New password satisfies application's password policy?

If the new password generated by ESSO-LM does not satisfy the application's own password policy, password change will be unsuccessful. If you determine this to be the case, compare the password generation policy currently deployed to the Agent with the password policy of the target application and correct any inconsistencies that may cause password change failure.

Agent responds to password change form as if it were a logon?

If the Agent responds to the password change form as if it were a logon form (i.e., Agent injects and submits the user's currently stored credentials), check for the following;

- Configuration mistakes in the template, such as incorrect form type, incorrect field and control definitions, and so on.
- Check whether the password change form has a dynamic window title or class, and configure the template accordingly.
- If you are using matching, check whether you are using the correct matching type and examine your matching strings for errors.

Publishing a Template to the Repository

Once you have successfully tested your application template, you can distribute it to end-user machines by publishing it to the selected target container within your repository, either in a directory-style hierarchy (default), or as a flat configuration file.

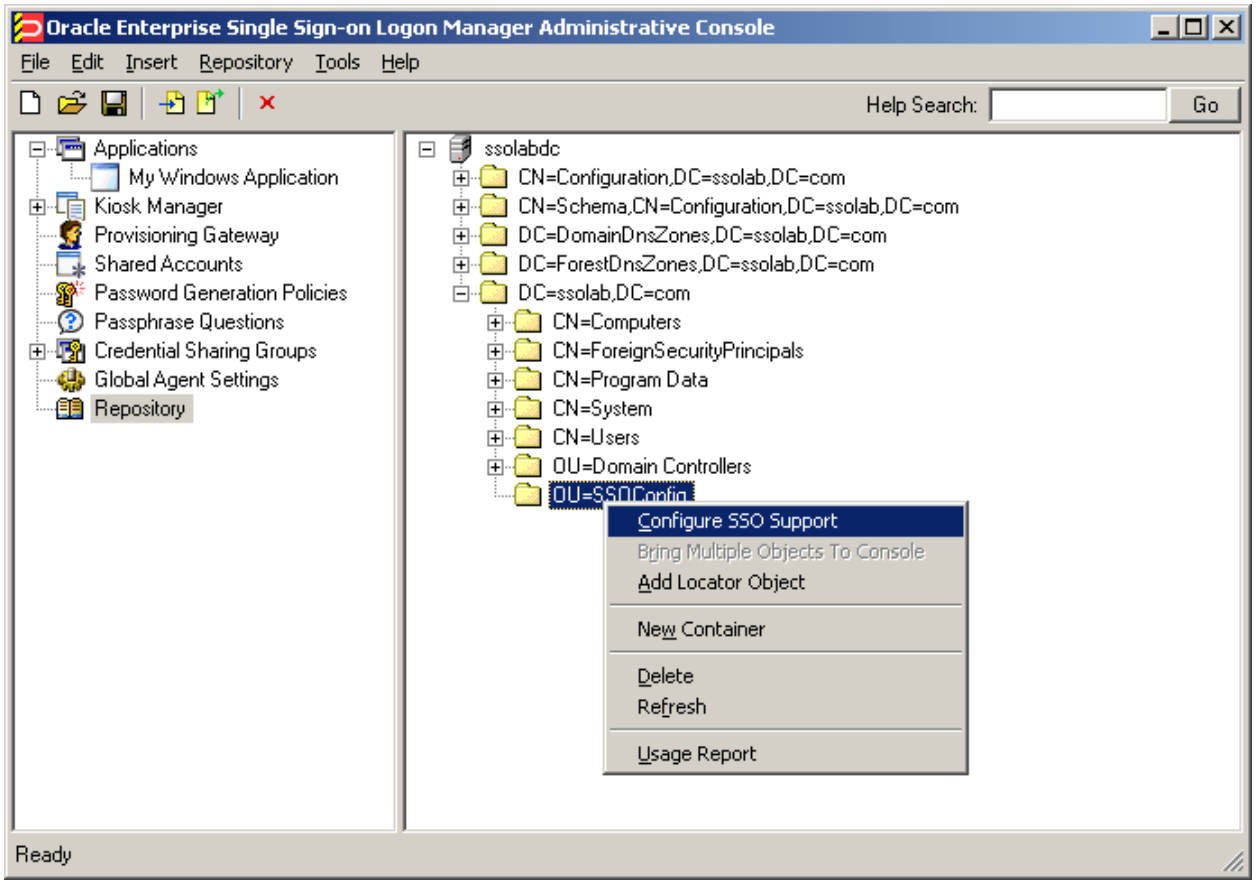
> **Note:** For more information on deploying ESSO-LM with a repository and best practices for structuring the repository tree, see the *ESSO-LM Best Practices* guide for your platform.

Publishing a Template with ESSO-LM Versions Prior to 11.1.1.2.0

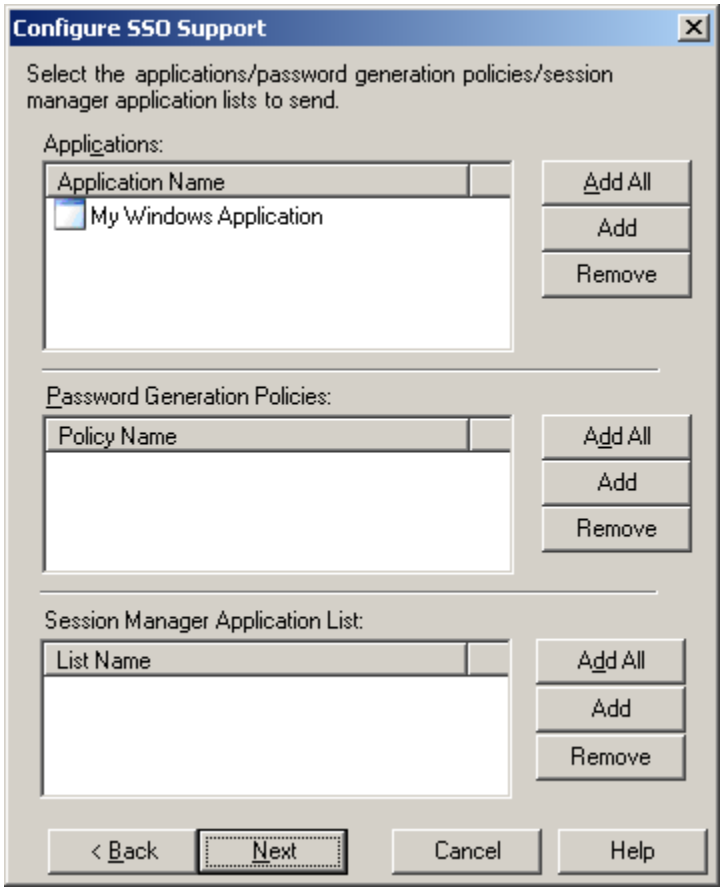
> **Note:** Before performing this procedure, make sure you are familiar with the structure and configuration of your repository.

To select and publish the desired templates and other configuration objects to the repository:

1. Launch the ESSO-LM Administrative Console.
2. In the left-hand pane, right-click the **Repository** node and select **Connect To…** from the context menu.
3. Fill in the required connection information and click **OK** to establish the connection.
   The directory tree appears in the right-hand pane.
4. In the tree, navigate to and select the desired target container.
5. Right-click the target container and select **Configure SSO Support** from the context menu.



6. In the "Configure SSO Support" dialog that appears, click **Administrative Console**.
7. In the screen that appears, select **Advanced mode** and click **Next**.
8. In the screen that appears, specify the objects you want to publish to the selected container.



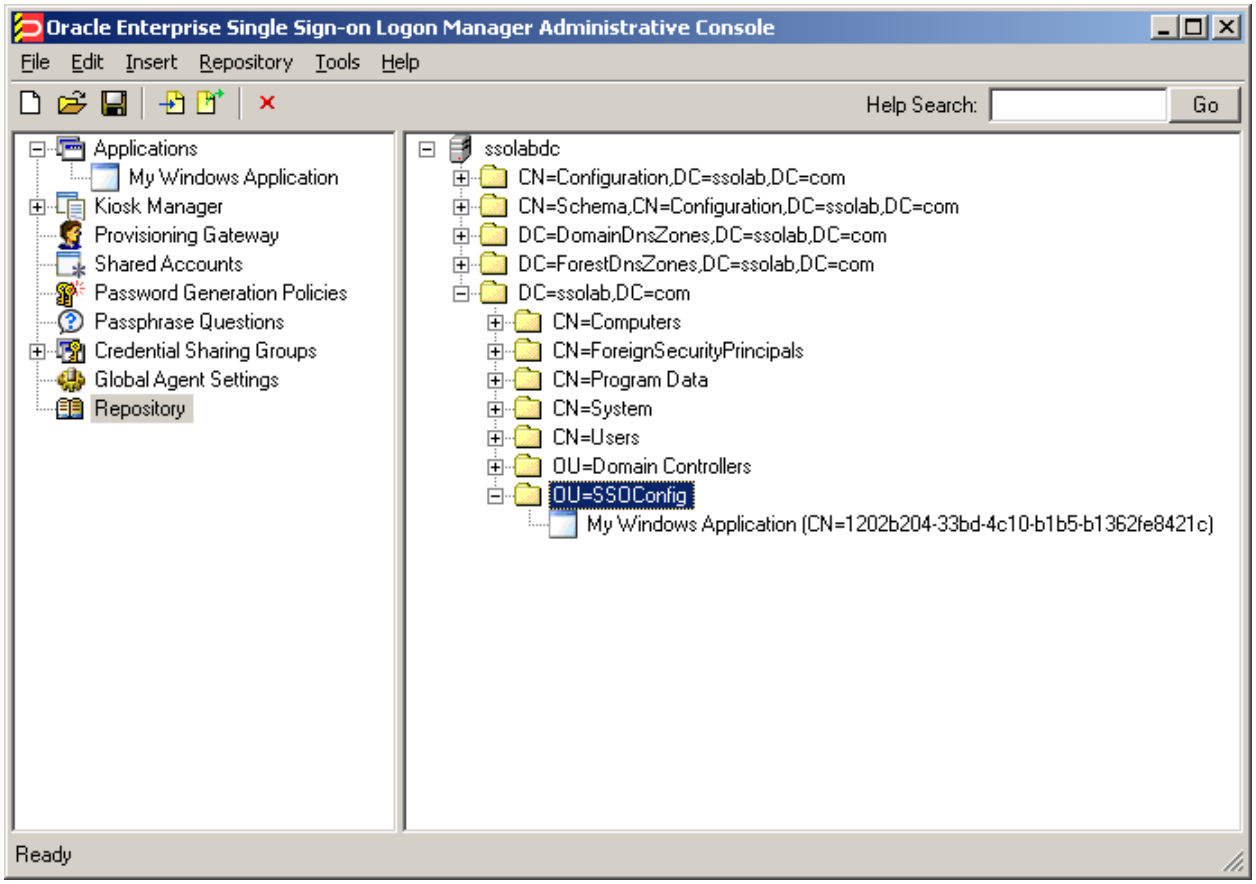
- To add select objects in a given category, do the following:
  i. Click **Add**.
  ii. In the dialog that appears, select the desired objects.

  > **Tip:** Use **Ctrl-click** to select multiple specific objects, or **Shift-click** to select the first and last objects in a desired range.

  iii. Click **OK**.
- To add all objects in a category that currently exist in the Console, click **Add All** in that category's section of the dialog.
- To remove an object from a list of objects to be published, click **Remove** in that category's section of the dialog.

When you have made your selections, click **Next**.

9. In the summary screen, review your choices. If you want to make changes, click **Back**; otherwise, click **Finish** to publish the selected objects to the chosen target container. The published objects appear under the target container in the right-hand pane of the Console.

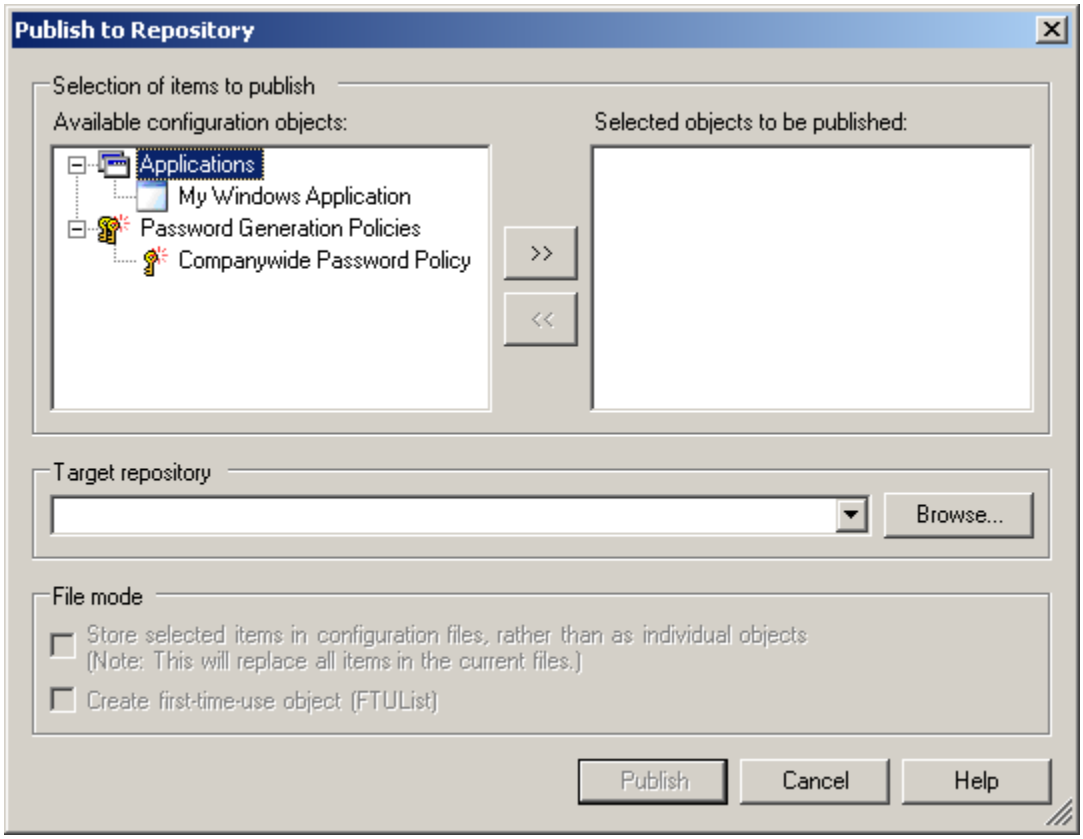


Publishing a Template with ESSO-LM Version 11.1.1.2.0 and Above

Note: Before performing this procedure, make sure you are familiar with the structure and configuration of your repository.

To select and publish the desired templates and other configuration objects to the repository:

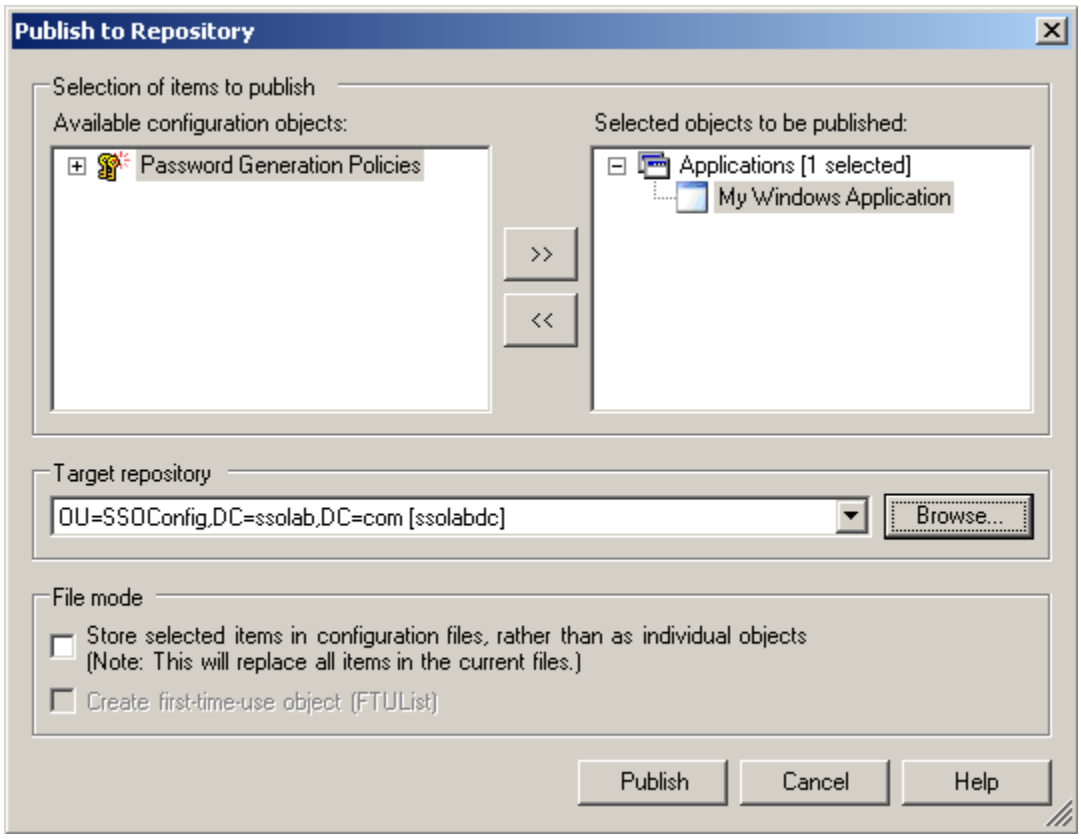
1. Launch the ESSO-LM Administrative Console.
2. Right-click the **Applications** node and select **Publish…** from the context menu.
   The "Publish to Repository" dialog appears.



3. In the **Available configuration objects** list, navigate to and select the desired objects.

Note: Only categories for which objects have been configured will appear in this list. For example, if no password generation policies exist, the corresponding category will not appear in this list.

4. Click **>>** to move the selected objects to the **Selected objects to be published** list.
   (To remove an object from this list and not publish it, select the object and click **<<**.)



5. Select the target container to which you want to publish the selected objects by doing one of the following:

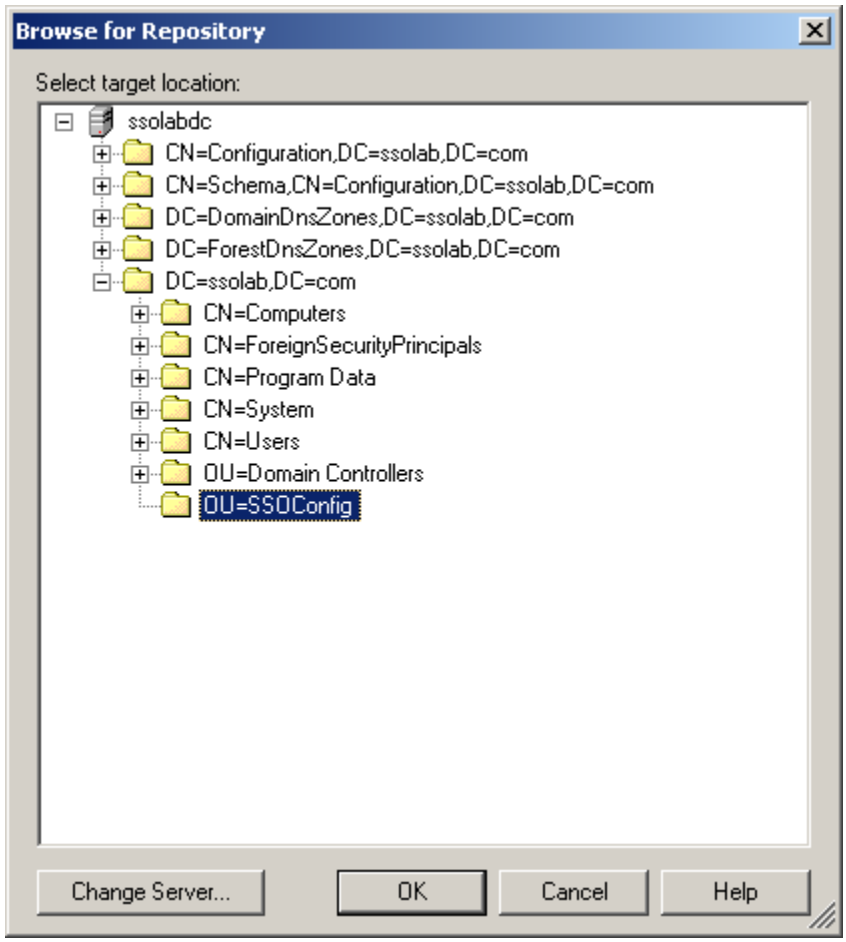
   - If you have previously published to the desired container, select it from the **Target Repository** drop-down list.

   - If you have not previously published to the desired container, or if the target container path does not appear in the **Target Repository** drop-down list, you must use the Browse feature to find and select the target container:

     i. Click **Browse** to browse the directory tree.

     Note: If you are not already connected to the directory, the Console will prompt you to provide the required connection information.

ii. In the “Browse for Repository” dialog that appears, navigate to and select the target container.



Note: If you want to create a new container, right-click the desired parent container, select **New Container** from the context menu, enter the desired name for the new container, and click **OK** to complete the process.

6. (Optional) If your environment calls for storing configuration objects in flat-format, select the check box **Store selected items in configuration files, rather than as individual objects.**

Note: Selecting this option will overwrite all items stored in existing configuration files, if present in the target container.

7. (Optional) If you want to create the first-time use object (`FTUList`), select the corresponding check box.

Note: This option only becomes active if you choose to store your configuration objects in flat format in step 6.

8. Click **Publish**. The Console publishes the selected objects to the target repository.

> **Caution:** Do not attempt to dismiss the dialog or close the Console until the publishing process completes. The dialog will disappear automatically when the objects have been published.

For more information on the publishing process, see the ESSO-LM Administrative Console help.

Part 3: Troubleshooting Detection and Response Issues

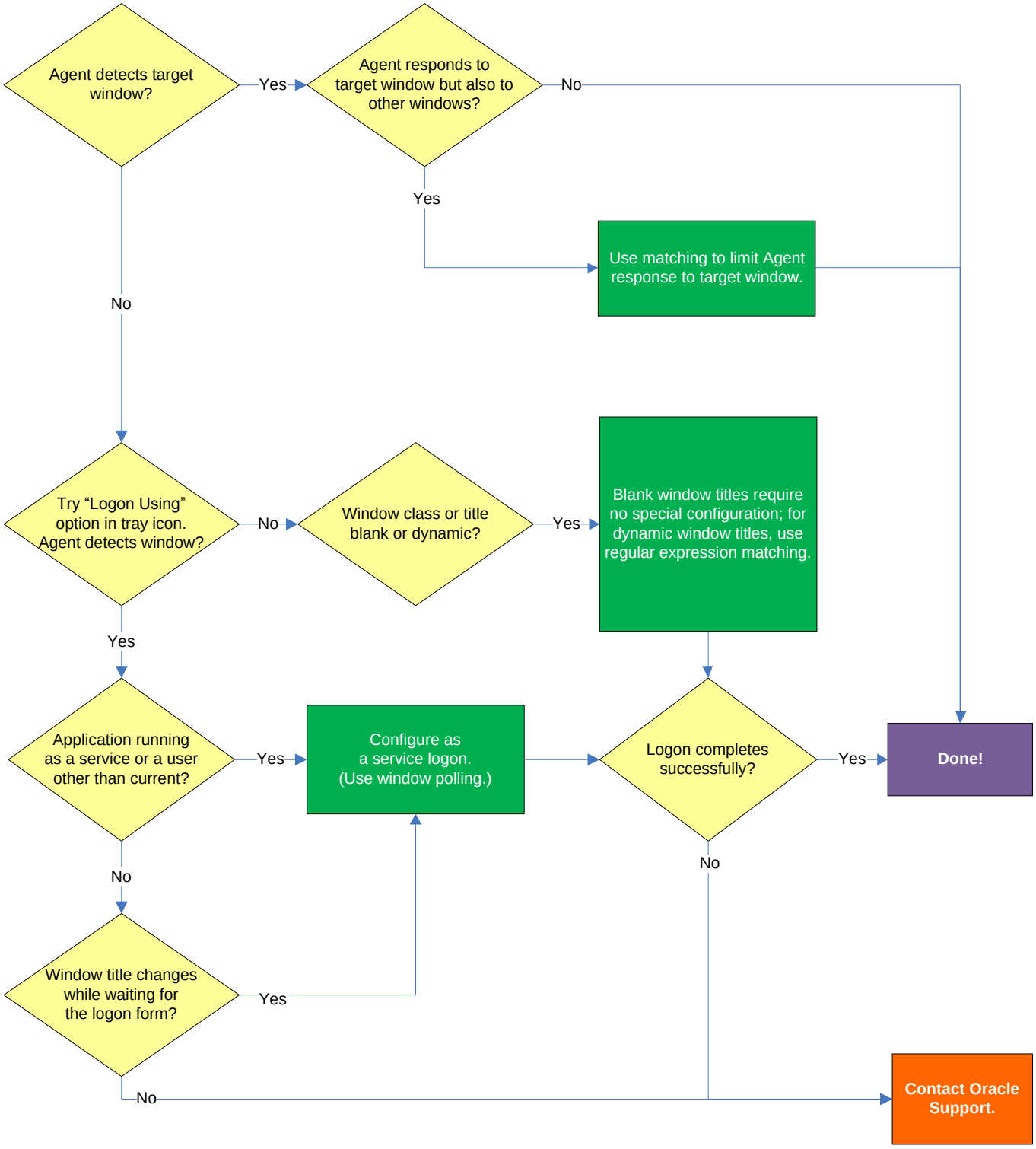
This part describes diagnosis and resolution steps for the most common issues that may cause the Agent to erratically detect and/or respond to application forms. It covers the following topics:

- Troubleshooting Window Detection
- Troubleshooting Form Response When Using Control IDs
- Troubleshooting Form Response When Using "SendKeys"
- Troubleshooting Matching
- Troubleshooting a Logon Loop
- Troubleshooting Java Application Issues

Tip: If the steps in this section do not resolve your issue, you can troubleshoot further by tracing and logging the activity of ESSO-LM and submitting the logged information to Oracle Support for analysis. For this purpose, Oracle provides the Trace Controller utility, from Oracle Support. For information on how to use the utility, see the *How-To* guide *Using the Trace Controller Utility*.

Troubleshooting Window Detection

Use the steps below to diagnose erratic window detection.



Agent detects the window?

If the Agent does not detect the window, first ensure that the **Auto-Recognize** feature is enabled. If the feature is enabled, proceed to the next step.

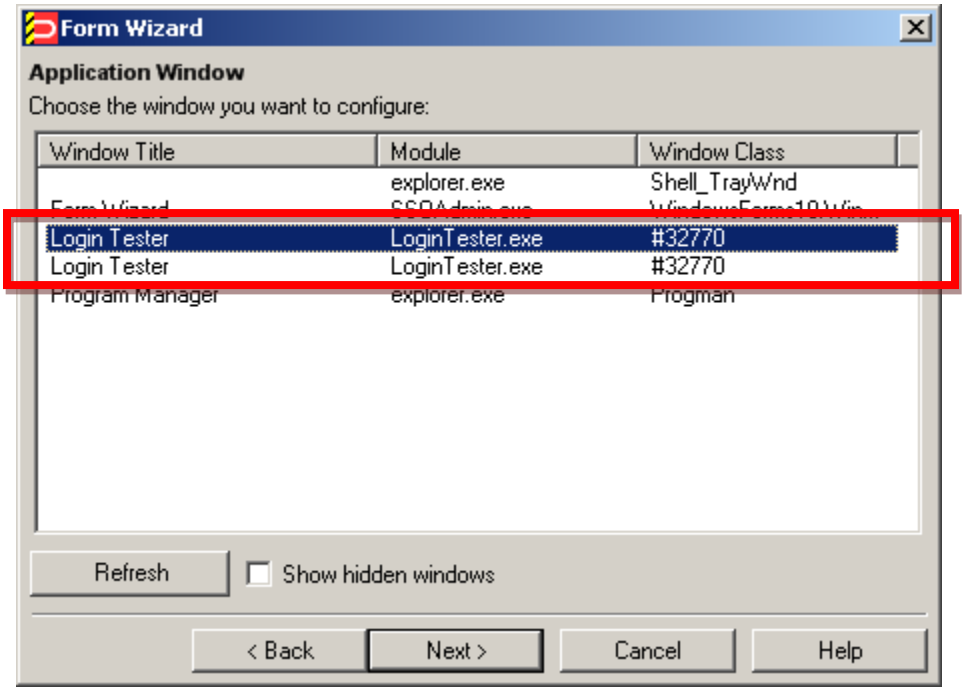
Agent responds to target window but also to other windows?

Since the Agent will respond to all windows that possess the characteristics defined in the template, a default form configuration (created by simply completing the Form Wizard) may result in undesired response to windows that should be otherwise ignored. It is critical to configure the template to be as specific as possible so that the Agent can uniquely identify the target window.

> **Note:** This situation is sometimes referred to as a "duplicate event model" because the Agent is facing multiple sign-on events which it cannot uniquely distinguish from one another.

To decide whether more granular response control is necessary, examine the list in the Form Wizard window for duplicate window titles, module names, and window classes when creating a template. In the following example, two instances of the "Login Tester" application share their module (parent process) names and window class values, and will thus appear as the same application to the Agent.

In such cases, you must use matching to place more specific constraints on the values of the criteria that uniquely identify the window and form to the Agent.



Agent detects window when using the "Logon Using ESSO-LM" tray icon option?

Manually invoke window detection by using the **Logon Using ESSO-LM** option from the Agent's system tray icon, then do one of the following:

- If the Agent detects the window, you may have to configure the application as a service logon; continue to the next step.
- If the Agent does not detect the target window even when you manually invoke detection by using the **Logon Using ESSO-LM** option from the Agent's tray icon, review the template for common configuration errors, such as a mistyped window title or class; also, determine whether the window title and/or class are dynamic, and reconfigure the template as appropriate.

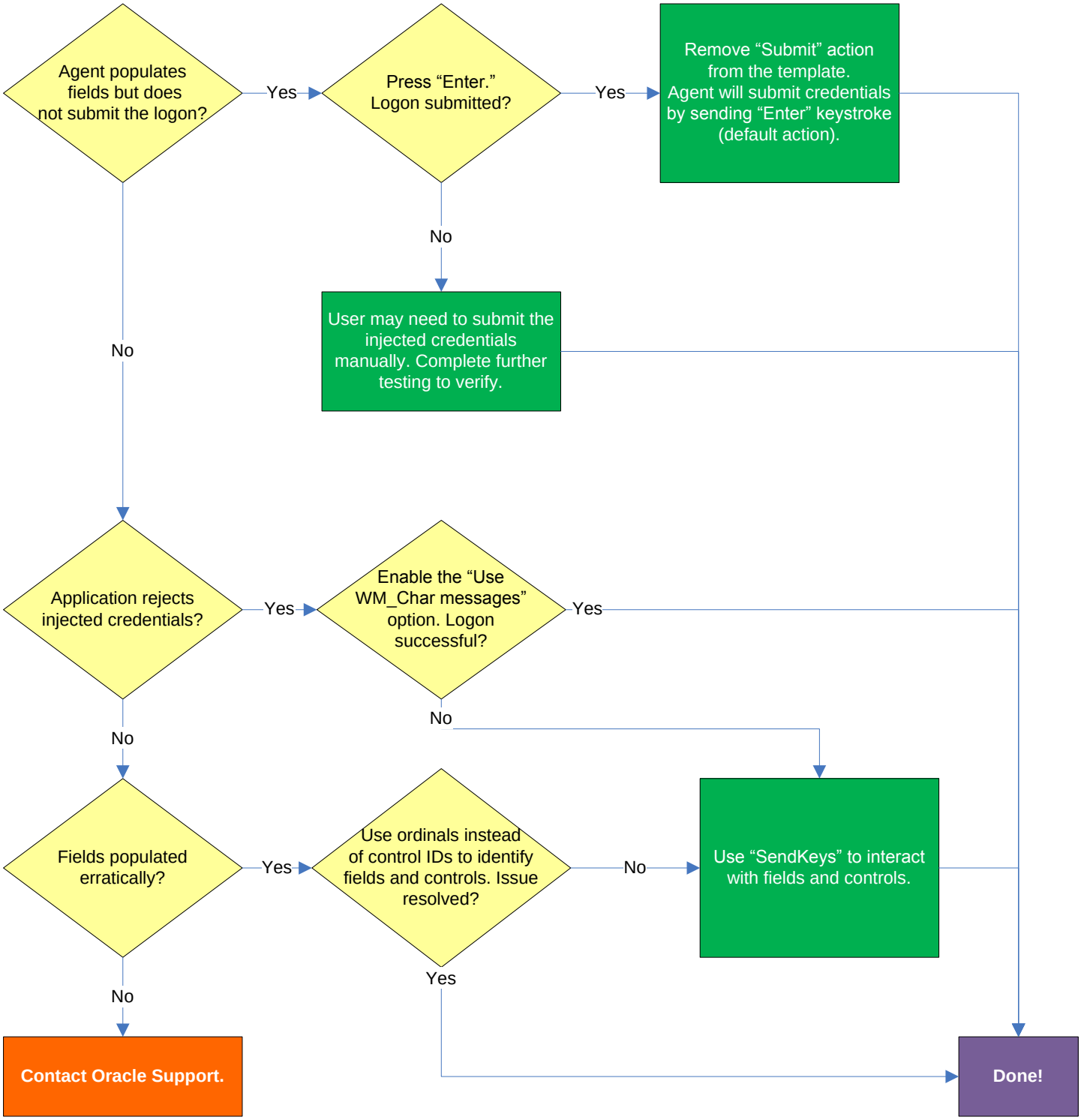
Application running as a service or a user other than the current?

If the application is running in the system space (under the `SYSTEM` account), rather than in the user space (under the currently logged in user's account), or the application has been launched under a user account different from the currently logged in user, you must configure it as a service logon. This allows the Agent to actively poll the application instead of passively responding to events in the currently logged on user's Windows message queue. For instructions, see Configuring an Application as a Service Logon.

Window title changes after detection?

If the title of the target window changes after the Agent has detected the window but before it begins responding to the window (for example, if the window title changes when the logon form is invoked), you must configure the application as a service logon. This allows the Agent to actively poll the application instead of passively responding to events in the currently logged on user's Windows message queue. For instructions, see Configuring an Application as a Service Logon.

Troubleshooting Form Response When Using Control IDs



Agent populates fields but does not submit the logon?

If the credentials are inserted by not automatically submitted, first check that the **Auto-Submit** option is enabled for the application. If **Auto Submit** is enabled but the Agent still does not submit them to the application, press **Enter** after the Agent has populated the fields and see whether the credentials are submitted. If the credentials are submitted, remove the **Submit** action from the template – this will allow the Agent to use its default submit action, the **Enter** keystroke.

Application rejects injected credentials?

If the application rejects the submitted credentials, enable WM_CHAR-style messaging in the application template – this causes the Agent to use an alternate API to interact with the fields and controls in the window. To do so, select the **General** tab in the template, select the target form, click **Edit**, and select the **Use WM_CHAR messages to fill controls** check box in the **Miscellaneous** tab of the form dialog.

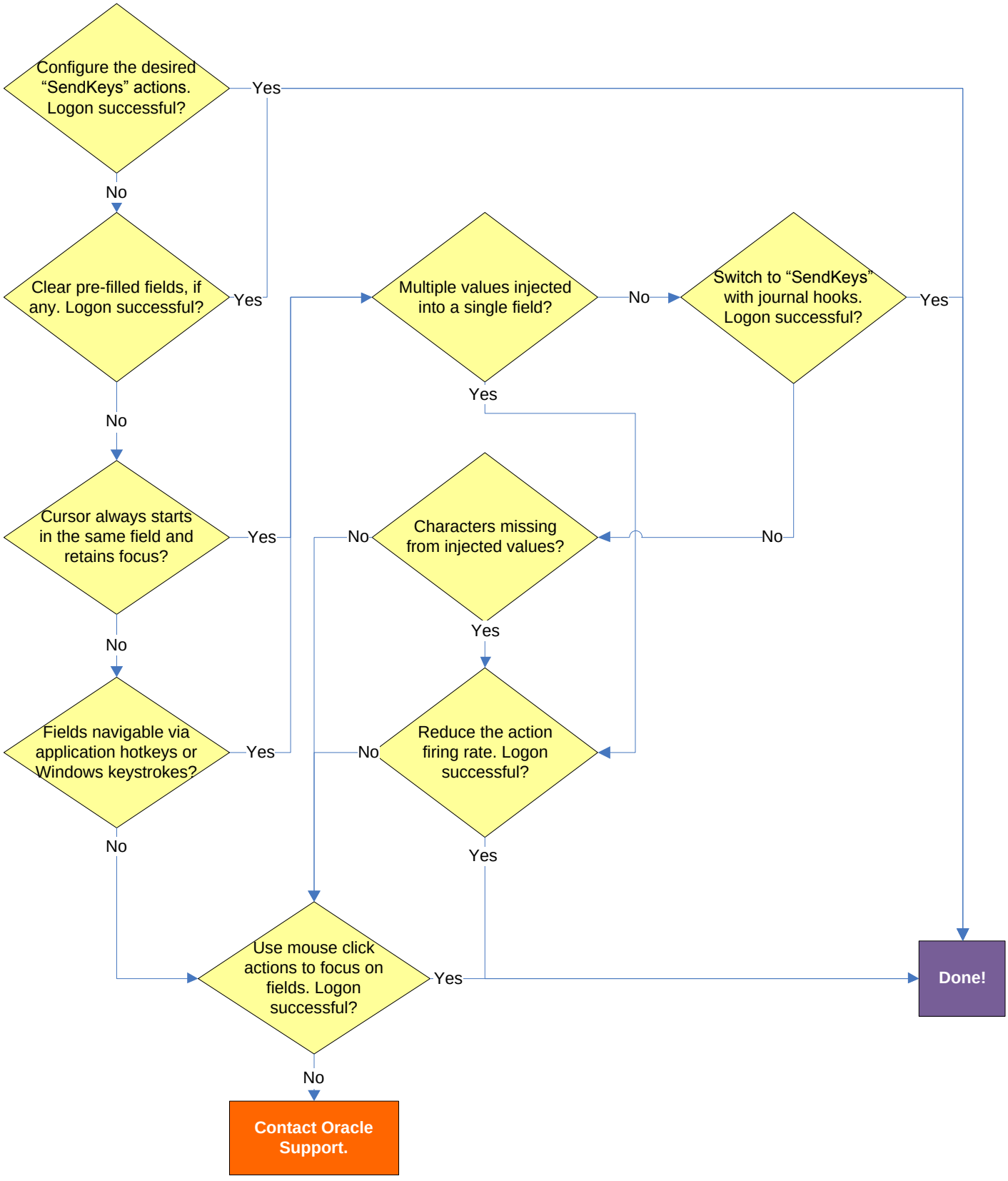
Fields populated erratically?

If the Agent populates the fields erratically, i.e., inserts wrong, truncated, garbled, or blank values, one or more of the target Control IDs might be dynamic. In such case, use ordinals instead of Control IDs to uniquely identify fields and controls within the form. Ordinals are sequential ID numbers assigned by the Agent to each object in the window, from top to bottom, left to right, which allow the Agent to uniquely identify the detected fields and controls separately from Control IDs.

To switch a form from using Control IDs to using ordinals, select the form in the **General** tab in the template, click **Edit**, and click **Wizard** in the form properties dialog. Then, follow the steps in Basic Configuration to re-create the form definition but select the **Use ordinals instead of control IDs** check box when you arrive at the "Credential Fields" screen. The new configuration choices you make in the wizard will overwrite the existing form definition.

If the issue persists even when using ordinals, consider using the "SendKeys" method of interacting with the application. For more information, see Supported Form Response Methods.

Troubleshooting Form Response When Using "SendKeys"

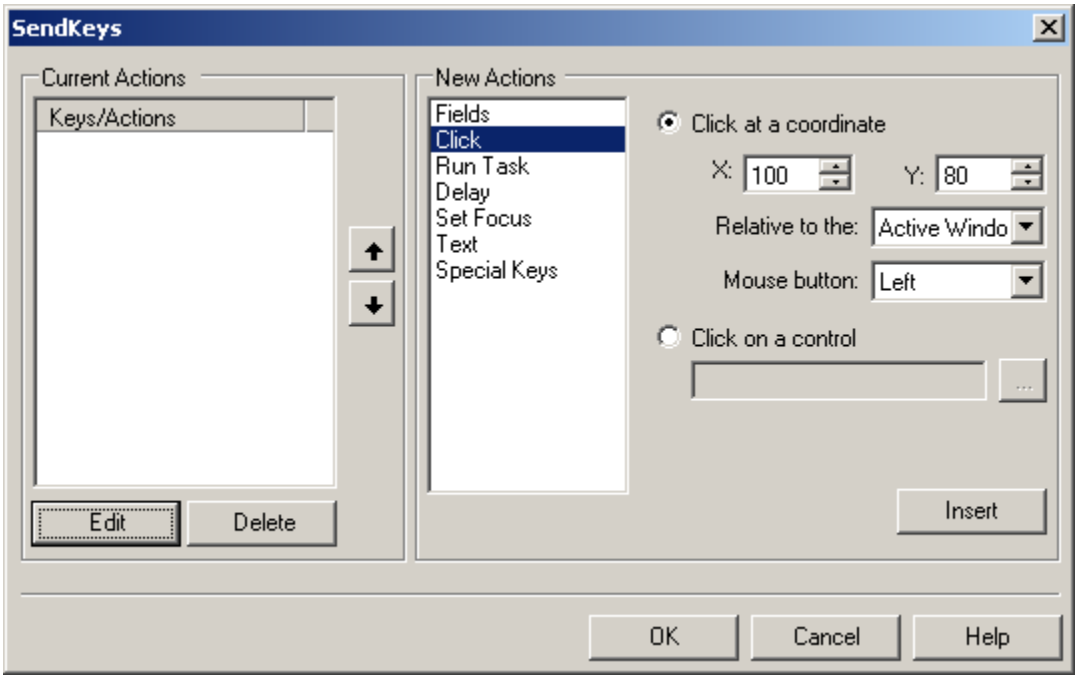


Pre-filled fields cause erroneous logon?

Some applications might pre-fill the logon fields when the logon form is displayed – for example, the user name field might be pre-filled with the name of the last successfully logged on user. You may have to send one or more **Backspace** or **Delete** key strokes to clear such a pre-filled field before injecting credentials into it.

Cursor always starts in the same field and retains focus?

If the cursor does not always start in the same field and the field loses focus before the Agent populates it, see if the application permits you to navigate to the field through a specific hotkey combination (such as **Alt**+**U**) or by using standard Windows keys, such as **Tab**, arrows, and so on. If you cannot use keystrokes to navigate to the field, use a mouse click action whose coordinates point to within the target field to allow the Agent to "click" within the field, as shown in the example below.



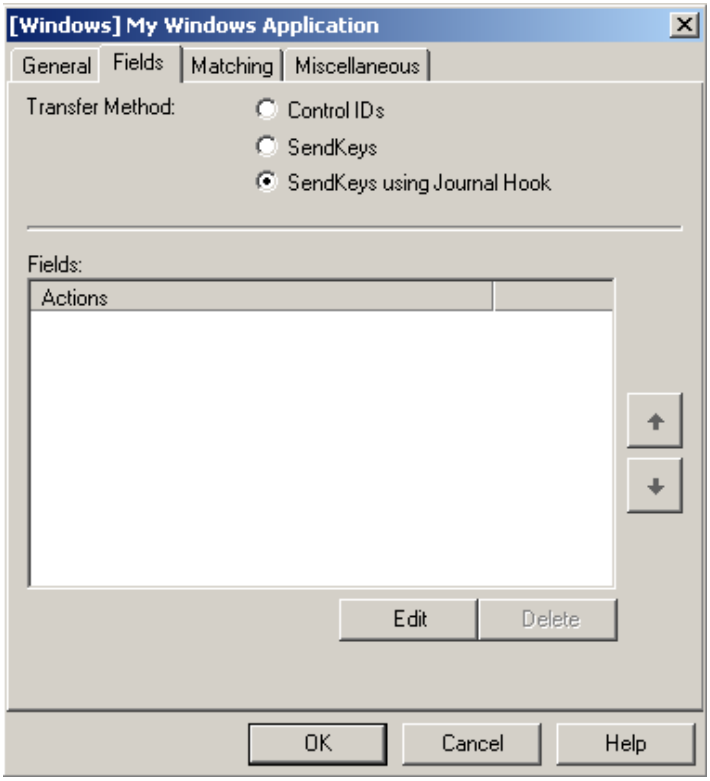
Multiple values injected into a single field?

If the Agent is inserting multiple values (e.g., both the user name and the password) into a single field, it might be firing the "SendKeys" actions too quickly for the application to respond properly. In such cases, experiment with slowing down the action firing rate until credential injection is reliable. To do so, either insert a "Delay" action in between other actions, or set the **SendKeys event interval** global Agent setting under **End-User Experience → Response** to either **Use for slow system** or **Use for very slow system**.

Switching to "SendKeys" with journal hooks restores reliable injection?

If the Agent continues injecting multiple values into a single field after you have tried the suggestions in the previous step, switch the form interaction method to "SendKeys" with journal hooks. To do so, select the **General** tab in the application template, select the desired form, click **Edit**, select the **Fields** tab, and set the **Transfer Method** option to **SendKeys using Journal Hook**.

> **Note:** The "SendKeys" with journal hooks option causes the Agent to use an alternate API to send keystrokes and mouse clicks to the application; it is typically the most effective in Citrix environments.



Characters missing from injected values?

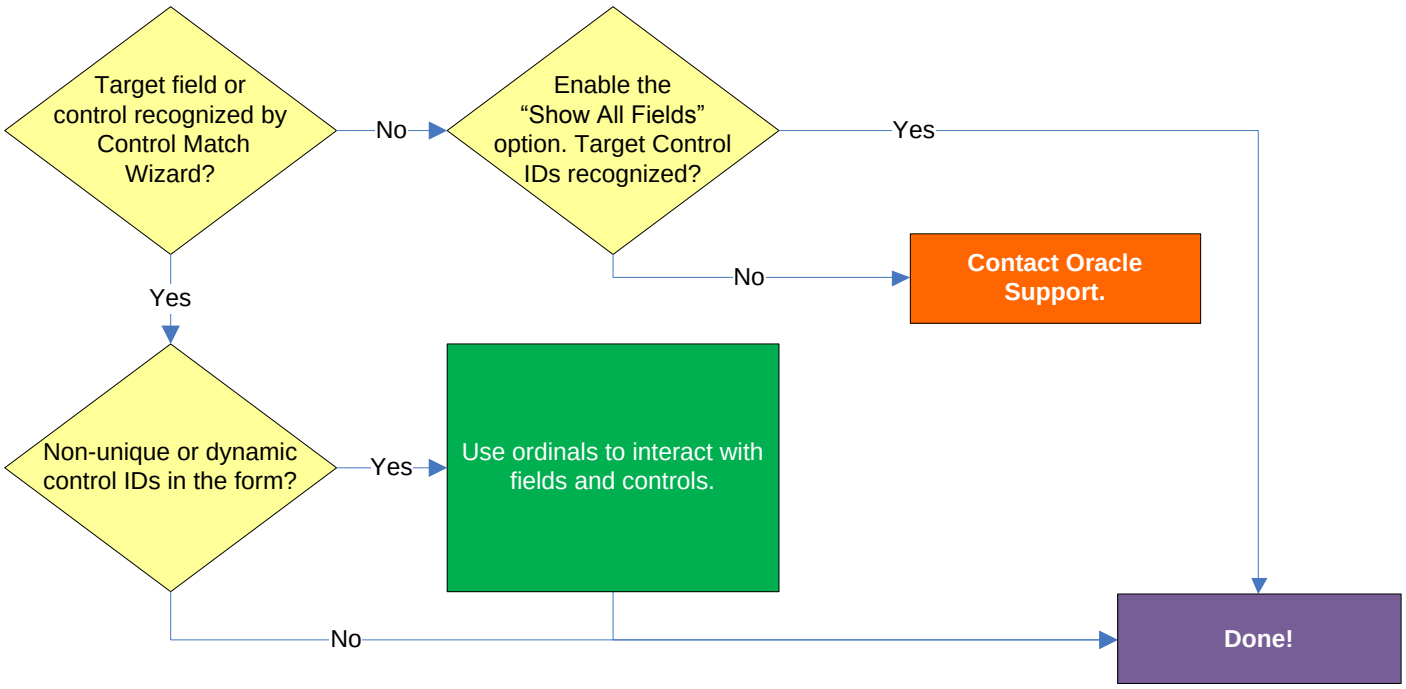
If you find that individual characters are omitted from the injected field values, the Agent might be firing the "SendKeys" actions too quickly for the application to accept them properly. In such cases, experiment with slowing down the action firing rate until credential injection is reliable. To do so, either insert a "Delay" action in between other actions or set the **SendKeys event interval** global Agent setting under **End-User Experience → Response** to either **Use for slow system** or **Use for very slow system**.

Using mouse click actions to focus on fields results in successful logon?

If logon is still unsuccessful, consider using mouse click actions to focus on all fields and controls within the form. Be aware that because each mouse click action requires exact coordinates of the field or control you want to click, those coordinates must remain static in order for the mouse click to succeed. Thus, mouse click actions might not be reliable for windows whose contents shift when the window is resized or displayed in different resolutions.

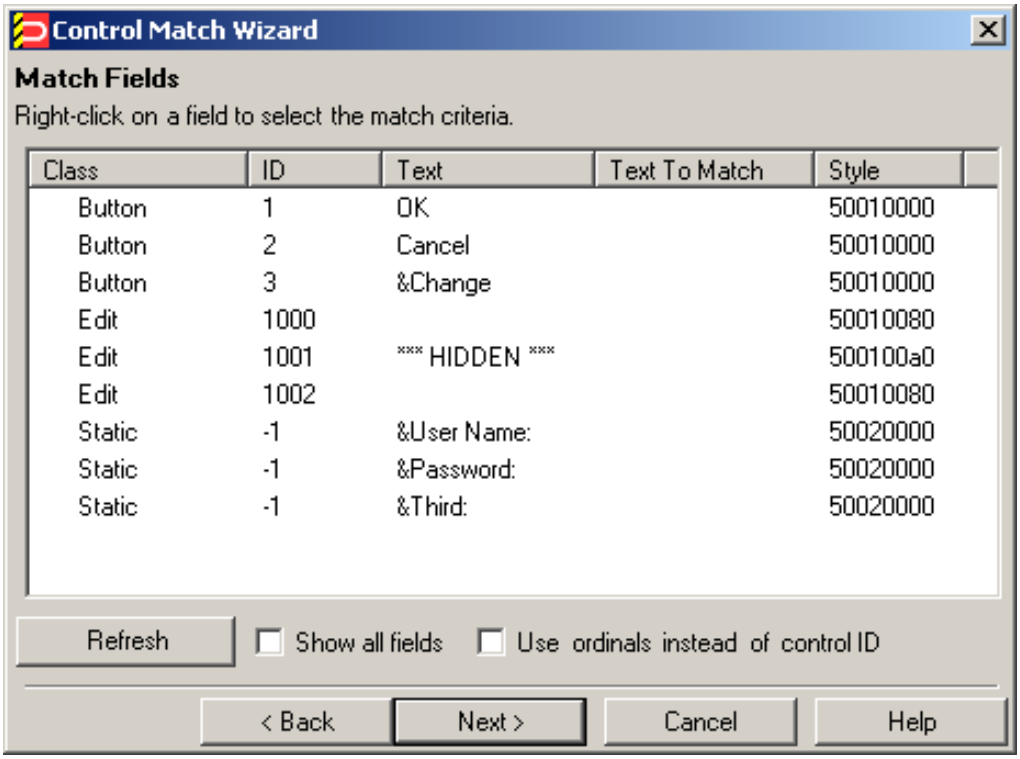
If none of the above steps resolve your issue, contact Oracle Support for assistance.

Troubleshooting Matching



Target field or control recognized by Control Match Wizard?

If the field or control targeted for matching do not appear in the Control Match Wizard, even after enabling the **Show all fields** option, matching might not be possible. In such cases, please contact Oracle Support for assistance.



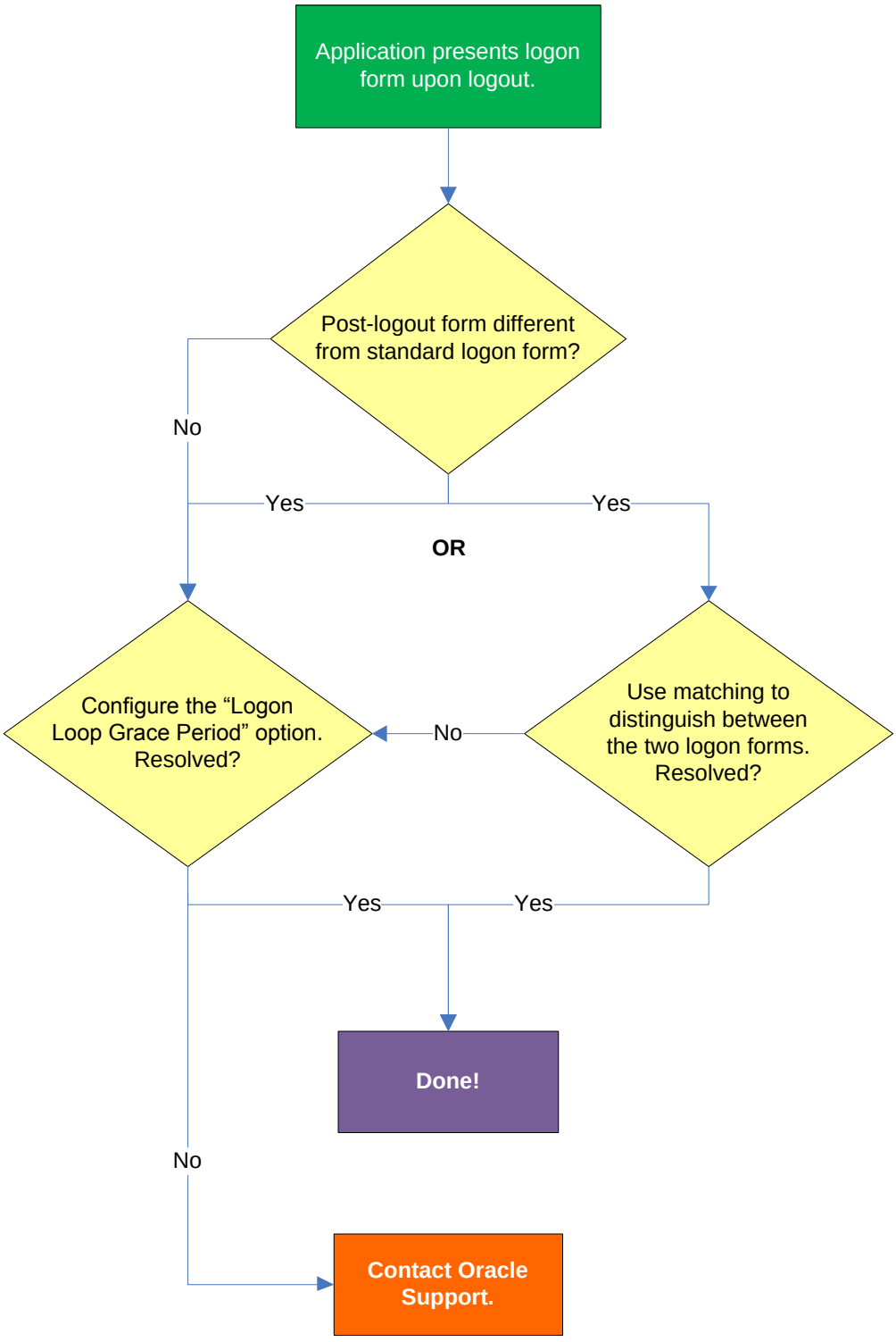
Non-unique or dynamic Control IDs in the form?

If one or more of the target Control IDs are non-unique or dynamic, use ordinals instead of Control IDs to uniquely identify fields and controls within the form. Ordinals are sequential ID numbers assigned by the Agent to each object in the window, from top to bottom, left to right, which allow the Agent to uniquely identify the detected fields and controls separately from Control IDs.

To switch a form from using Control IDs to using ordinals, select the form in the **General** tab in the template, click **Edit**, and click **Wizard** in the form properties dialog. Then, follow the steps in Basic Configuration to re-create the form definition but select the **Use ordinals instead of control IDs** check box when you arrive at the "Credential Fields" screen. The new configuration choices you make in the wizard will overwrite the existing form definition.

Troubleshooting a Logon Loop

Some applications display their logon form upon logout, which causes ESSO-LM to recognize the logon form and automatically log you back on to the application. This creates an endless “logon loop” preventing you from logging out of the application. To prevent this loop from occurring, the administrator may choose to enable the logon grace period feature which forbids ESSO-LM from logging on to an application within set time period since the last logon.



Post-logout form different from standard logon form?

Oracle recommends that you consider the "Logon Loop Grace Period" as well as matching if the logon form presented upon logout is sufficiently different from the application's standard logon form. (For more information on matching, see, Using Matching to Improve Response Accuracy.) If the forms cannot be uniquely distinguished, use the "Logon Loop Grace Period" feature described below.

Configuring the "Logon Loop Grace Period" option resolves logon loop?

If the post-logout form cannot be uniquely distinguished from the standard logon form, configure a grace period that will prevent the Agent from automatically logging on to the same application if the specified grace period has not fully elapsed.

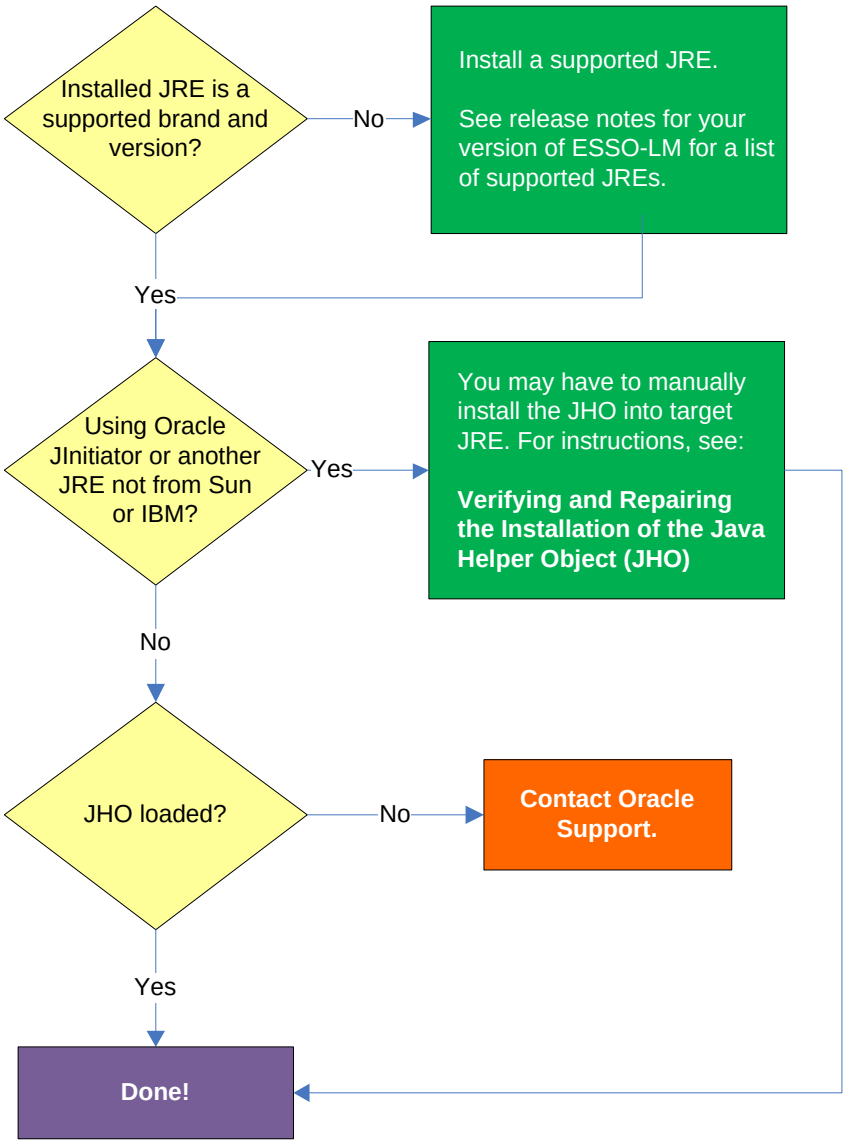
To configure the logon loop grace period timer, do the following:

1. In the ESSO-LM Administrative Console, open the desired template and select the **Miscellaneous** tab.
2. In the **Logon Loop Grace Period** field, select the desired mode of operation from the drop-down list:
    - **Prompt** – if the Agent detects the application's logon form while the grace period is in effect, the Agent will prompt the user whether to complete the logon or ignore the application.
    - **Silent** – if the Agent detects the application's logon form while the grace period is in effect, the Agent will ignore the application and not log the user on.
    - **None** – deactivates the grace period timer. Agent will respond to the application every time it detects the application's logon form.
3. Do one of the following, depending on what you want the Agent to do while the grace period is in effect:
    - If you want the Agent to log the user on each time the launch of the application's executable is detected, select the **Reset for each process** check box.
    - If you would like the Agent to ignore the application until the grace period has expired, leave the **Reset for each process** check box blank.
4. Save your changes and commit them to your repository, if applicable.

If this does not resolve the logon loop for the application, contact Oracle Support for assistance.

Troubleshooting Java Application Issues

Use the steps below to diagnose and resolve issues specific to Java applications.



Installed JRE is a supported brand and version?

Refer to the release notes for your version of ESSO-LM for a list of supported JREs. If the installed JRE is not supported, you must either upgrade ESSO-LM to a release that supports your current JRE, or replace the current JRE with a version supported by your release of ESSO-LM.

Using Oracle JInitiator or another JRE not made by Sun or IBM?

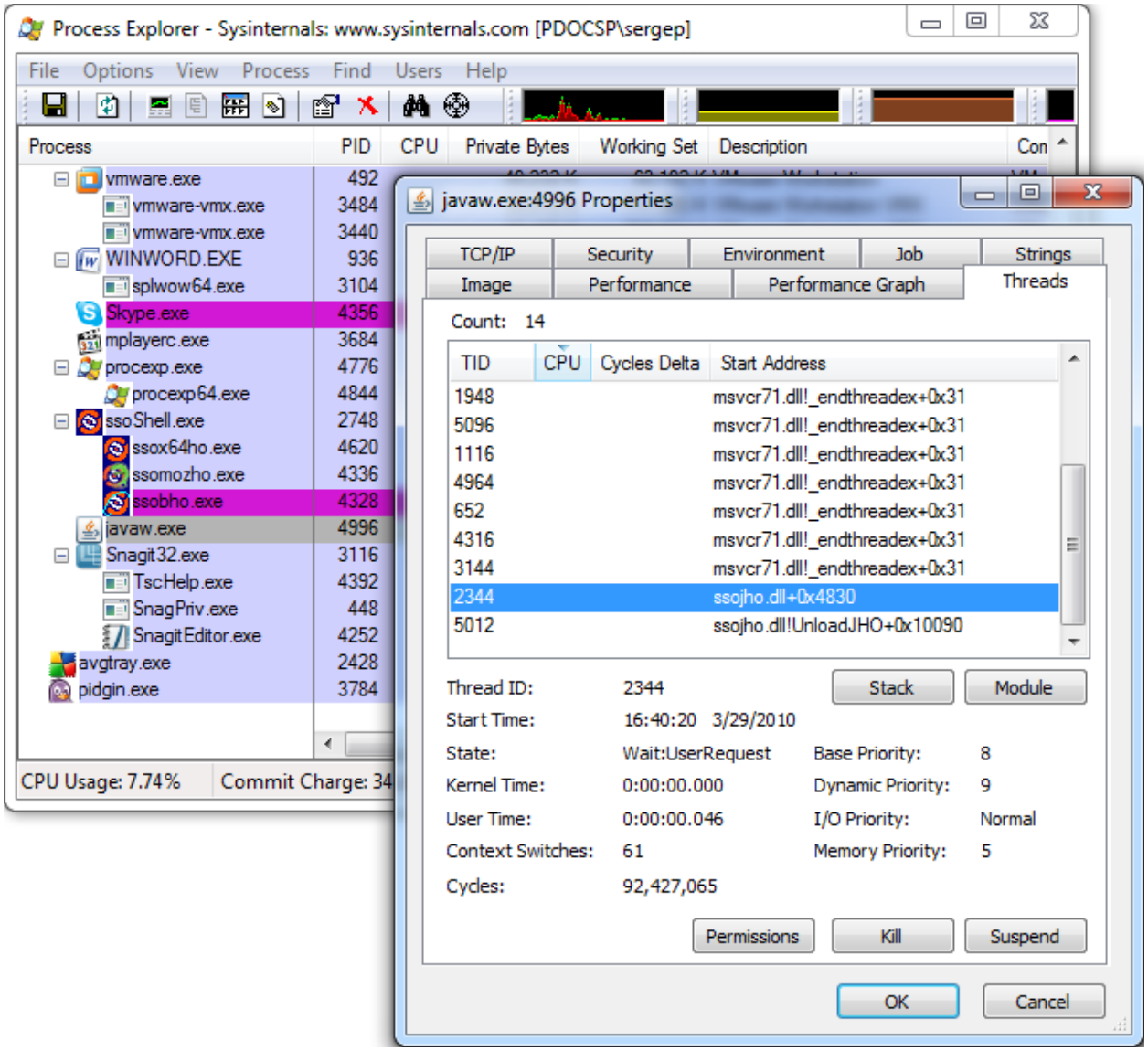
If you are using Oracle JInitiator or another JRE not made by Sun Microsystems or IBM, you might need to manually install the JHO into the JRE. For more information, see Verifying and Repairing the Installation of the Java Helper Object (JHO).

Note: While no issues have been reported when deploying ESSO-LM with non-Sun or non-IBM JREs other than Oracle JInitiator, Oracle does not support nor warrant the proper functioning of ESSO-LM with such JREs.

JHO loaded?

In certain situations, a configuration issue might prevent the JHO from loading when the Java application is launched, even though it has been installed properly. To verify that the JHO is installed and running, use a process viewer tool, such as Microsoft Spy++ (included with Microsoft Visual Studio) or SysInternals Process Explorer (http://technet.microsoft.com/en-us/sysinternals/bb896653.aspx) to verify that the JVM executable has spawned the `ssojho.dll` child thread.

The example below shows the properties box of the Sun JVM executable `javaw.exe` in Process Explorer showing the `ssojho.dll` child thread running:



If you have completed all of the previous troubleshooting steps and the JHO is not loading for the target JRE, contact Oracle Support for assistance.

Verifying and Repairing the Installation of the Java Helper Object (JHO)

Note: The instructions below only apply to the Oracle JInitiator and other JREs made by companies other than Sun Microsystems or IBM. When using Sun and IBM JREs, the ESSO-LM installer performs the required installation automatically.

ESSO-LM recognizes Java applications through the Java Helper Object (JHO). If the JHO is not installed correctly, ESSO-LM will not recognize Java applications. Use the steps below to verify that the JHO has been installed correctly and correct a damaged installation if necessary.

Since multiple Java Runtime Environments (JREs) can coexist on the same machine, the ESSO-LM installer installs the JHO into the JRE currently set as default (the current `JavaHome`).

The default JRE directory is specified by the following registry setting:

```
HKEY_LOCAL_MACHINE\SOFTWARE\JavaSoft\Java Runtime
   Environment\<JRE_version>\JavaHome
```

The JRE version is specified in the following registry setting:

```
HKEY_LOCAL_MACHINE\Software\JavaSoft\Java Runtime Environment
```

If the user starts a Java application from the default JRE that the JHO has been installed in, ESSO-LM will recognize that Java application. However, if the application is started from a JRE other than the default one, ESSO-LM will not recognize the application. Keep in mind that each JRE installs the JVM executables `java.exe` and `javaw.exe`. Copies of these executables are also installed into the `<%SYSTEMROOT%>\SYSTEM32` directory. ESSO-LM will only recognize Java applications if the JVM is launched from the JRE directory.

Verifying the JHO Installation in a JRE

To check whether the JHO has been installed into a JRE, do the following:

1. Navigate to the lib folder inside the JRE's directory. For example:

   ```
   C:\Program Files\Java\jre1.6.0_01\lib
   ```

2. Open the file `accessibility.properties` in a text editor and check whether the following property is present:

   ```
   assistive_technologies=<other_helpers>,com.passlogix.vgo.ho.jho
   ```

   If the property is present and the JHO string shown above is part of its value, the JHO has been installed into this JRE. If the property or file do not exist, stop here; the JHO has not been installed into this JRE.

3. Check whether the following files are present in the JRE:
    - `<JRE_dir>\bin\ssojho.dll`
    - `<JRE_dir>\lib\ext\jho.jar`
    - `<JRE_dir>\lib\ext\jaccess.jar`

If any of the files are missing, the JHO is not installed correctly.

Repairing a Damaged JHO Installation

To manually install the JHO into a JRE other than the default one, do the following:

1. Make sure the JHO has been correctly installed into the default JRE as described above.
   If the JHO is not installed, run the ESSO-LM installer, select the **Modify** option, and select the Java feature under **Extensions → Helper Objects**, then follow the installer prompts to complete the installation.
2. Add the JHO string to the `assistive_technologies` property in the following file:

   `<JRE_dir>\lib\accessibility.properties`

   Note: If the property and/or file does not exist, create them.

3. Copy the JHO files listed in step 3 in the previous section from the default JRE to their respective locations within the target JRE.

Restricting the Java Helper Object (JHO) to Specific Java Runtime Environments (JREs)

ESSO-LM provides registry settings that allow you to create inclusion and exclusion rules that ESSO-LM will use to decide whether to load the JHO for the target application. You can specify, via regular expressions, the Java Virtual Machine (JVM) executables, JAR files, and command-line parameters that you want the JHO to consider.

When configuring these settings, keep the following in mind:

- If the value for a given setting is omitted, the specified default is used; if a value is set, all non-matching values are ignored.
- The JHO processes the inclusion rules first, followed by the exclusion rules.
- The N suffix is a unique numerical identifier that bundles settings belonging to a specific application. The JHO will process the bundles sequentially in ascending order. The N suffix is a positive integer starting at 1.
- You can determine the application's host JVM executable and launch command using the Trace Logging utility. The beginning of the Java trace log will indicate the host JVM and the launch command for the application.

The settings are located at the following path in the Windows Registry:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Passlogix\Extensions\AccessManager\JHO
```

The settings are divided into the following categories:

- JHO Inclusion Rules
- JHO Exclusion Rules
- Allowed Java Runtime Environment (JRE) Versions

JHO Inclusion Rules

Use these settings to specify the host JVM executables, application JAR files, and command-line parameters that will cause the JHO to load for the target application. The values are case-insensitive regular expressions.

Setting	Description
`JhoIncludeHostNameN`	Specifies the application's host JVM executable(s). For example, if you want the JHO to load when the application is hosted by a JVM executable named `java.exe` or `javaw.exe`, set the value as follows: `JhoIncludeHostName1=.*javaw?\.exe` No-value default: All executables are accepted (i.e., JHO will load for any executable).
`JhoIncludeHostCommandLineN`	Specifies the command used to launch the application. The command string usually includes the full path and name of the JVM executable, the JAR file, as well as any required command-line parameters. For example, if you want the JHO to only load when the application's JAR file is named `Login.jar` (while the rest of the command is allowed to vary), set the value as follows: `JhoIncludeHostCommandLine1=.*Login\.jar.*` No-value default: All command strings accepted (i.e., JHO will load for any command).

JHO Exclusion Rules

Use these settings to specify the host JVM executables, application JAR files, and command-line parameters that will cause the JHO to ignore the target application. The values are case-insensitive regular expressions.

Setting	Description
`JhoExcludeHostNameN`	Specifies the application's host JVM executable(s). For example, if you want the JHO to ignore the application when the host JVM executable is named "java.exe" or "javaw.exe", set the value as follows: `JhoExcludeHostName1=.*javaw?\.exe` No-value default: Blank (i.e., nothing will cause the JHO to ignore the application)
`JhoExcludeHostCommandLineN`	Specifies the command used to launch the application. The command string usually includes the the full path and name of the JVM executable, the JAR file, and any required command-line parameters. For example, if you want the JHO to ignore the application when its JAR file is named "Login.jar" (but the rest of the command is non-consequential), set the value as follows: `JhoExcludeHostCommandLine1=.*Login\.jar.*` No-value default: Blank. (i.e., nothing will cause the JHO to ignore the application)

Allowed Java Runtime Environment (JRE) Versions

These settings allow you to specify the desired JRE/JDK versions for which the JHO will load; all versions falling outside of the specified range will be ignored and the JHO will not load.

The values for both settings must follow the format `x.y.z`, where:

- `x` is the major revision
- `y` is the minor revision
- `z` is denotes the release type (feature, maintenance, or update) and build ID of the installed JRE (for example, `1.6.0_07`)

Setting	Description
`JhoMinimumJavaVersion`	Specifies the lowest allowed JRE/JDK version. Default value: `1.2` (the earliest JRE version supported by the JHO)
`JhoMaximumJavaVersion`	Specifies the highest allowed JRE/JDK version. Default value: Blank (i.e., no upper JRE version limit is imposed)

Customizing the Event Response Behavior of the Java Helper Object (JHO)

In order to troubleshoot and optimize ESSO-LM performance when responding to Java applications, you can modify the settings that govern the Java Helper Object's response to specific events when a Java application has been detected.

The settings are located within the following key in the Windows registry:

`HKEY_LOCAL_MACHINE\SOFTWARE\Passlogix\Extensions\AccessManager`

Event Response Configuration Settings

Setting	Description
`JhoHierarchyEventProcessing`	Determines which Java hierarchy events are recognized. Set the flag as follows: `HIERARCHY_EVENT_CHANGED = 0x1` The above value instructs the JHO to recognize all hierarchy events.
`JhoEventWaitTimeout`	Determines the event processing timeout for JHO controls (in milliseconds). The default value of 0 instructs the JHO to wait indefinitely.
`JhoWindowEventProcessing`	Determines which Java window events are recognized. This flag is a combination of the following values: • `WINDOW_EVENT_OPENED = 0x1` • `WINDOW_EVENT_CLOSED = 0x2` • `WINDOW_EVENT_ACTIVATED = 0x4` • `WINDOW_EVENT_DEACTIVATED = 0x8` • `WINDOW_EVENT_CLOSING = 0x10` • `WINDOW_EVENT_ICONIFIED = 0x20` • `WINDOW_EVENT_DEICONIFIED = 0x40` By default, all window events are recognized.

Setting	Description
JhoComponentEventProcessing	Determines which Java component events are recognized. This flag is a combination of the following values: • COMPONENT_EVENT_SHOWN = 0x1 • COMPONENT_EVENT_HIDDEN = 0x2 • COMPONENT_EVENT_ADDED = 0x4 • COMPONENT_EVENT_REMOVED = 0x8 By default, all component events are recognized.
JhoInjectType	Determines the injection type used by the JHO to submit data to the controls. This flag takes one of the following values: • INJECT_TYPE_DEFAULT = 0 • INJECT_TYPE_METHOD = 1 • INJECT_TYPE_ACCESSIBLE = 2 • INJECT_TYPE_NONACCESSIBLE = 3 • INJECT_TYPE_ROBOT = 4 By default this flag is set to INJECT_TYPE_DEFAULT, in which case the JHO attempts injection using each of following methods, in the order shown, until injection is successful: • INJECT_TYPE_METHOD (if an appropriate set method had been found for the control) • INJECT_TYPE_ACCESSIBLE (if the control supports accessibility) • INJECT_TYPE_NONACCESSIBLE • INJECT_TYPE_ROBOT **Note:** For combo and list boxes, the JHO always uses INJECT_TYPE_METHOD.

Recommended JHO Event Response Configuration Defaults

We recommend the following default settings on new installations of ESSO-LM:

- JhoWindowEventProcessing=0x3
- JhoComponentEventProcessing=0xB
- JhoHierarchyEventProcessing=0x0

These values instruct the JHO to recognize the following events:

- WINDOW_EVENT_OPENED (0x1)
- WINDOW_EVENT_CLOSED (0x2)
- COMPONENT_EVENT_SHOWN (0x1)
- COMPONENT_EVENT_HIDDEN (0x2)
- COMPONENT_EVENT_REMOVED (0x8)