SHAREPOINT APPLICATION LIFECYCLE MANAGEMENT

9/1/2016

SharePoint Application Lifecycle Management

A K2 for SharePoint 2013 application is made up of several core elements: SmartObjects (Data), Forms, Workflows and Reports, and the application could also include or require other artifacts. This whitepaper describes how to plan and manage the lifecycle of developing, deploying and maintaining K2 applications for SharePoint 2013.

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SharePoint Application Lifecycle Management

SCOPE OF THIS DOCUMENT

This document mainly covers applications that are created using the web-based design tools provided with K2 blackpearl for SharePoint 2013 and K2 Appit for SharePoint 2013. This document does not describe non-SharePoint applications created with other K2 design tools such as K2 Studio or K2 for Visual Studio.

BEFORE YOU BUILD K2 APPLICATIONS

1. **Upgrade to the latest version of K2**
   It is recommended to upgrade your K2 environment to the latest version of K2 blackpearl and K2 smartforms. This document assumes you have upgraded all your K2 environments to K2 blackpearl 4.7 or later and K2 smartforms 4.7 or later, including all prerequisites and supporting components for these products. If you are using an Appit environment, your environment will automatically be on the latest version of K2.
2. **Synchronize SharePoint environments**
   It is important to design and set up your SharePoint environment as much as possible before K2 is installed. When you are using multiple SharePoint environments (such as environments for Development, Testing and Production), the ability to maintain consistency between these environments is crucial to being able to deploy solutions from one environment to the next. All environments should be as much in alignment as possible, including the structure of the site collections and the structure of the lists and libraries that will comprise your K2 solutions.
   a. As you are developing your solutions, the lists and libraries as well as their structures will likely change. That is expected and the main purpose of this document is to describe how to manage these changes. It is important, however, that the site structure is synchronized across the environments.
   b. You can utilize site templates (.wsp files) and list templates (.stp files) in SharePoint to enable copying the structure to another environment. Site templates can be used once to copy the artifacts in the template to another environment and should not be used after K2 integration has occurred, while list templates can be used to copy items on an ongoing basis as you develop more and more solutions. Note however that updating a List template does not update existing Lists that were created using that List Template.
   c. If you are using list templates you MUST create the list template before you have integrated the list with K2. This applies only if you replace the default SharePoint forms with K2 forms. If you need to create the list template after you have created K2 forms, you must reset the list to SharePoint forms before creating the list template. This is because the New, Display and Edit form URLs are stored in the list template (*.stp) file. When creating new lists from the template the form URLs point to the old, source location, and you will see NULL errors upon deployment.

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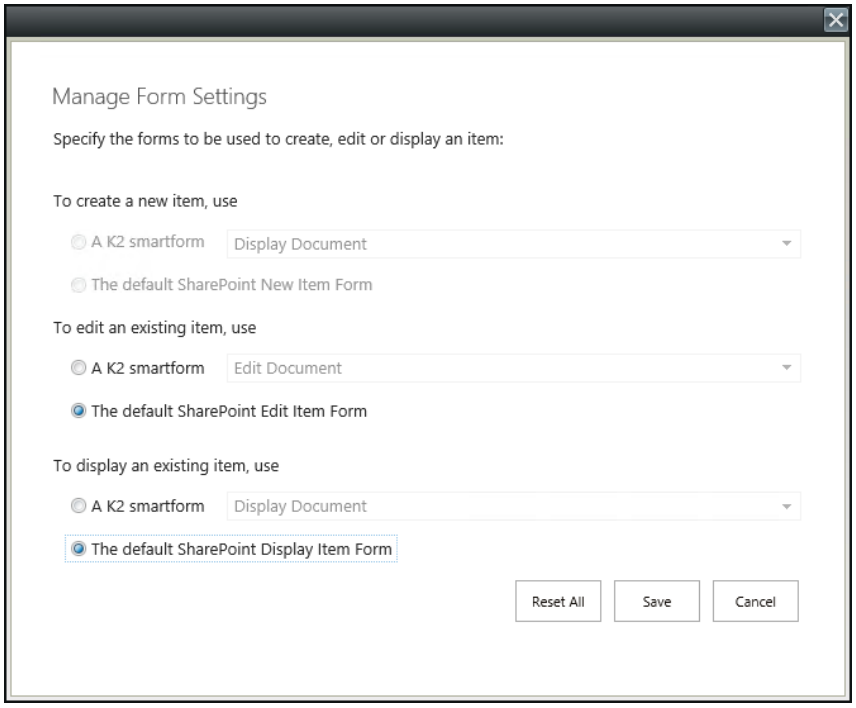

d. Keep in mind that your K2 service instance (the base-level artifact that enables communication between K2 and SharePoint) is bound to the site collection level. What this means is that each site collection will have its own service instance regardless of the number of subsites contained in each site collection.

BEFORE YOU DEPLOY K2 APPLICATIONS

1. Ensure that the relevant permissions are set correctly on any systems that the application will integrate with, such as SQL databases, web services and CRM environments.
2. Check-in all forms and views that will be included in the package
3. Ensure that the workflow has been deployed on the source environment, since the K2 Package and Deployment tool will download the deployed version of the workflow from the server and add it to the package

DEPLOYING K2 APPLICATIONS

1. Consider the impact of deploying updated Application elements on existing workflow instances and existing Items in the target environment. See the Scenarios section for more detail on the various considerations. If necessary, allow existing instances of workflows in the target environment to complete before deploying a K2 Application.
2. There are two different methods for packing and deploying solutions. It consists of a web-based user interface (UI) that is performed within the context of a SharePoint list or library and is limited to SharePoint 2013-based solutions. The second tool, called K2 Package and Deployment, is available for K2 on-premises installations only and is an MMC-based plug-in for deploying any K2 solution across environments. The scenarios treat these tools separately – first the web-based UI is used followed by the MMC-based UI.
3. Depending on the tool you're using, deploy the solution in your target environment. Where necessary, remap columns and lookups, reconfigure Services and References, and specify whether existing artifacts should be re-used or overwritten by the artifacts contained in the deployment package.

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Tip At the end of deployment the categories are fixed up for all artifacts in the solution. This happens during the post-deployment step. If you have created a list template from a list that has K2 forms instead of SharePoint forms, you may see many of the deployed artifacts turn from successful to error items all at once. This indicates that there was a re-categorization problem due to mismatched URLs.

AFTER YOU HAVE DEPLOYED K2 APPLICATIONS

1. Modify workflow permissions, if required. This is only necessary the first time a workflow is deployed to a new environment, since subsequent deployments will automatically use the existing workflow permissions in the target environment.
2. Populate roles with their environment members, if required.
3. Import data into the SmartBox Database, if required.
4. Modify permissions in the SharePoint environment, if required.
5. Import data into external systems, if required.
6. Configure alternate credentials for workflow server events, if required.

K2 PACKAGE AND DEPLOYMENT: INCLUDED AND EXCLUDED ARTIFACTS

The following table lists the K2 artifacts that are included or not included in deployment packages created with the Package and Deployment tool. You can assume that anything not explicitly listed as included in this table will not be included in the deployment package and may need to be migrated from the source environment to the target environment separately using the appropriate tools or interfaces for that component.

Note that the actual artifacts included in the package are based on selections used when the package is created and you may need to manually add or remove selected items form the package depending on the artifacts used in your application. K2 will attempt to do a *best guess* as to all the K2 artifacts required for your application but you should always double-check the artifacts identified by K2 for inclusion.

K2 Artifact	**Included in P&D package?**	**Notes**
Data (SmartObjects)	Yes	Even SmartObjects used by the workflow will be included.
Workflows	Yes	When workflows were created outside of the SharePoint Application designer environment (for example with K2 Designer or K2 Studio), you may need to select those workflows manually for inclusion in the package. If they are somehow referenced, P&D will discover the dependency and auto-include them.
Forms + Views	Yes	Only SmartForms Forms and Views are included in the package. Custom user interfaces created with another technology are not included.

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Custom SmartForms Controls	Yes	As of K2 4.6.9, custom controls are included in the package.
Reports	Yes	Only the generated reports for the Application are included by default. If you have created custom Forms and Views for reporting purposes, you may need to select those items manually. Any custom reports created with another technology (such as SSRS) will not be included in the K2 deployment package.
SmartBox SmartObject Data	Depends – see notes	The browser-based package and deploy tool exposed in K2 for SharePoint does not allow you to include SmartBox SmartObject Data. The MMC-Based Package and Deployment tool does allow you to include SmartBox data in the package, but SmartBox data is not included by default
Roles	Yes	Roles are deployed as empty. You need to add role members after deployment.
Service Objects	Yes	
Categories	Yes	
Service Instances	By Reference Only*	SharePoint Service Instances (along with SAP and Salesforce) are included by reference only. In other words, the package contains the GUID or System Name of the Service Instances required by the SmartObjects in the package. If a service instance is found on the target that matches by service instance Name or GUID, it is automatically selected and you cannot select a different Service Instance. If no matching Service Instance is found it will show up as a missing reference. Non-SharePoint Service Instances are included.
Service Types and Service Brokers	By Reference Only*	Service Types and the associated Brokers must already exist in the target environment
Environment Library Fields	By Reference Only*	Environment Fields other than Miscellaneous (Misc) need to exist on the Target. Miscellaneous fields are included in the package.

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Workflow Permissions	No	The deploying user account automatically gains Admin rights on the workflow. After a workflow is deployed, use the K2 Management site or K2 Workspace to set workflow permissions for the deployed workflow definition. This only needs to happen the first time a workflow is deployed since workflow permissions are version-agnostic.
Custom Service Brokers	No	Any customizations must be copied over and installed on the target K2 environment using the appropriate deployment mechanisms for those customizations.
Custom SmartForm Themes	No	
Custom Workflow Wizards	No	

* By Reference Only means the definition of the item is not included, only a reference to the item to ensure it exists on the target environment.

NOTABLE EXCLUDED ARTIFACTS

You should assume that if a solution artifact is not listed in the table above, it is not included in the K2 Package and Deployment package. Here are some notable and common solution artifacts that are not included in the K2 package that must be deployed manually:

- **Data**
  Any data entries such as lookup data in a SharePoint list or any data residing on an external system like a SQL database. Records in a K2 SmartBox database can be included when using the K2 Package and Deployment tool (MMC UI).
- **SharePoint Items and artifacts**
  SharePoint Sites, Libraries, Lists, Users, Groups, Permissions, Templates and Data. It is important to make sure that your source and target sites, lists and libraries match before attempting to deploy the K2 artifacts that require those artifacts. Whether you do this manually, through templates or through code does not matter, but if there are discrepancies between the two environments your chances of having a successful deployment are lowered.
- **Extensions**
  Extensions to the K2 platform includes such things as custom service brokers and custom security providers. Typically, these items need to be copied over to the target environment and registered in the appropriate manner for that component. SmartForms custom controls are packaged with K2 4.6.9 and later, however SmartForms themes are not.
- **Customizations**
  Any customizations to the K2 platform such as customized e-mail notification templates, SmartActions synonym definitions, and modified configuration files.
- **Workflow Reporting Data**
  Workflow history reporting data and any workflow instances (generally, workflow history and workflow instances are never migrated to the target environment)

DEPENDENT ITEMS PACKAGING

Packaging artifacts as *Referenced Items* allows greater control of the artifacts that are packaged. This allows you to reduce the size of the package by referencing artifacts that already exist on the target

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environment. You must have a full understanding of the relationships between the objects that you are packaging so that you do not reference an artifact that should be included. Referenced items are typically shared objects that span multiple solutions.

When lists, libraries, or other SmartObjects have lookup associations with other lists or libraries, those associated SmartObjects are included in the package by default (as included items), along with all lookup associated objects of those SmartObjects. To only package references of the lookup associated SmartObjects, select **Referenced Items** from the drop down. When a SmartObject is packaged as a referenced item, only the immediate lookup association is stored in the package, and references to any further lookup associated objects are not included in the package.

Objects that are packaged as referenced items must already exist on the target environment before the package can be successfully deployed.

VERSIONING OF K2 ELEMENTS AND ARTIFACTS

This section describes how K2 elements and artifacts are versioned.

K2 Artifact	Versioned	Notes
SmartObjects	No	For practical purposes, any interaction with a SmartObject will always use the last deployed version of that SmartObject. While SmartObject versions are internally stored in the K2 databases, this information is not exposed nor modifiable and therefore it is not possible to revert to or specify a specific version of a SmartObject.
SmartObject Service Instances	No	SmartObject service instances are not versioned. The available service objects will be based on the objects discovered the last time that the service instance was refreshed. Should the target system expose new items or functionality, you will need to refresh the service Instance to discover these new items.
SmartObject Service Types	No	Service types are generated when service instances are registered or refreshed.
SmartObject Service Brokers	No	Service brokers are not versioned at all
Workflows	Yes	By default the latest deployed version of a workflow becomes the version that any new instances of the workflow are started on. Any existing instances of the workflow will continue running on the version of the workflow that they were started against and will not be automatically upgraded to a newer version.

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		It is possible to use the K2 Management Site or K2 Workspace to select a different version of the workflow to be the default version, but this value is reset when the next version of the workflow is deployed again. K2 provides an API called Live Instance Management that you can use to write code to migrate active workflow instances from one version to another. Refer to the K2 blackpearl Developer Reference for more information. This API is not available in K2 Appit.
Workflow Permissions	No	Workflow permissions are version-agnostic and apply to all versions of a workflow
Workflow Server Step Alternate User Credentials	Depends: see notes	If you used K2 Workspace or K2 Management site to define alternate user credentials to use for a certain step in a workflow, those credentials are not automatically propagated to new versions of the workflow and you will need to re-define the credentials for those steps. If you defined alternate credentials for the step in the workflow design tool, those credentials are included in the workflow deployment and you do not have to re-define the credentials after exporting the workflow.
SmartForm Forms and Views	No (see notes)	For practical purposes, forms and views always use the latest deployed version of that form or view. In K2 blackpearl, it is possible to use database-level scripts to revert to a previous version of a form or view as described in http://help.k2.com/KB001311 but this procedure is not recommended for non-emergency situations.
Roles	No	Roles are not versioned at all
SmartForm Themes	No	Themes are not versioned at all
SmartForm Controls	No	Controls are not versioned at all

VERSIONING AND THE IMPACT ON ACTIVE INSTANCES OF A WORKFLOW

Since any active instances of a workflow are not automatically migrated to newer workflow definitions while SmartObjects and SmartForms always use the latest deployed version, there is a possibility that deploying updated SmartObjects and forms & views could impact any active instances of workflows that use these items and result in errors or unexpected behavior. Since it is unpredictable how SmartObjects and forms may be used in workflows, it is difficult to provide specific guidance but bear this potential impact in mind when updating SmartObjects and forms.

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Note Note that the API contains classes to migrate active instances, and there is a community-based solution that uses this API. Search for *instance migration* on the Market at community.k2.com. This is only available for on-prem K2 installations.

BEST PRACTICES

There are several best practices to keep in mind when developing, maintaining and deploying your solutions.

DEPENDENT ITEMS PACKAGING

Create a flow diagram of all the lookup associations in your K2 application.

When selecting to create a package using the Referenced Items option, you must have a full understanding of the lookup relationships between the lists, libraries, and associated SmartObjects. Packaging by reference includes only the reference to the first level of the lookup association, any further lookup associated artifacts are removed from the package.

For example, if you package a list (i.e. Area) that has a data look up association with another list (i.e. Region), that in turn has a look up association with a third list (i.e. Country), then selecting to use referenced items includes the Area list and a reference to the Region list. The definition of the Region artifact is not included (only a reference to the artifact is packaged), and the Country artifact is neither referenced nor included.

For more information, see scenarios 6 and 7 from the Package and Deployment examples at the end of this document.

REMOVING WORKFLOW INTEGRATION FROM A FORM

When you remove workflow integration from a form, there are rules left behind that the workflow put into the form and rule that you chose. These rules are not automatically deleted so some manual cleanup is required. The same holds true for the task forms.

Start Forms typically put their logic into a state named after the library, and the rule is called *On* [type of form, i.e. New, Edit or Display] [list or library name], *when Save Button is Clicked*.

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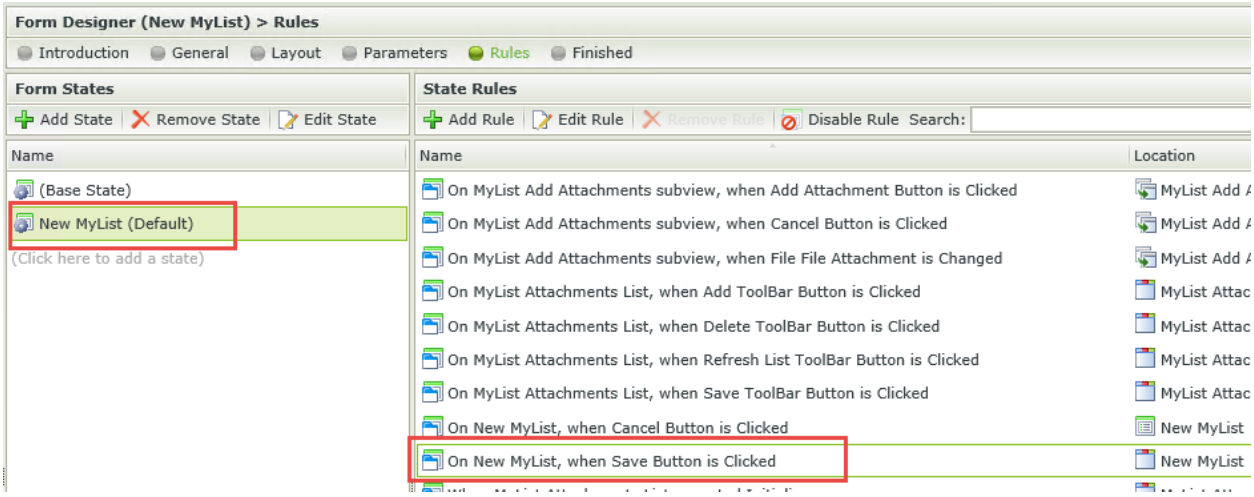
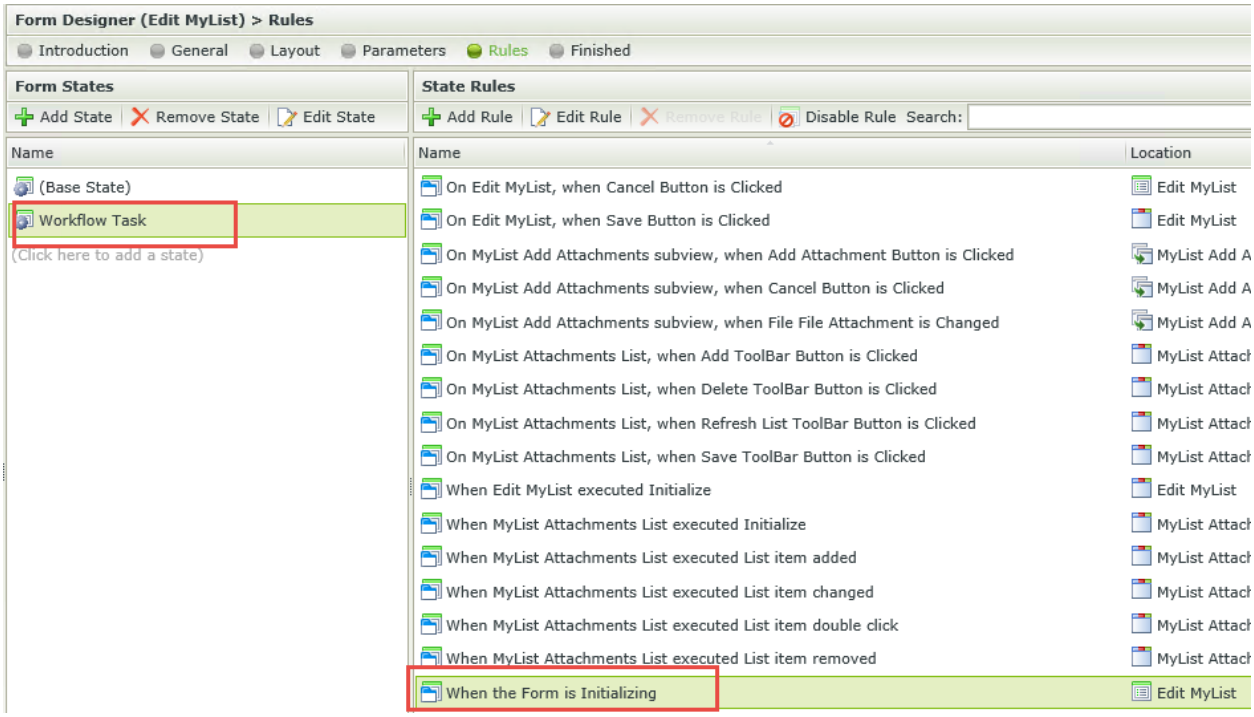


User Task Forms typically put their workflow rule logic into the Workflow Task state, and the rule is called *When the Form is Initializing*.



RENAMING A SMARTFORMS USER TASK STEP IN A WORKFLOW

When you rename a user task step in a workflow, your workflow rules must be updated too. For example, if you have a **Manager Approval** user task, and you rename that to simply **Approval**, you have renamed the activity. This requires that you update the rule to point to the renamed activity. However, the old rule with the original activity name does not get removed. You must do that manually.

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Notes

1. You must walk through the entire wizard when you rename a workflow step. You cannot simply rename the step on the canvas. This will not update the form.
2. Even though you are changing the workflow rules in the form when editing the workflow, the form updates do not occur until the deployment of the workflow.

Why do you need to do this? It's a best practice, first of all. But more than that, when you go to package your solution, K2 Package and Deployment may find a reference to something that doesn't exist and will either not be able to package the solution, or worse, not be able to deploy the solution.

DELETING A SMARTFORMS USER TASK STEP FROM A WORKFLOW

Similar to when changing a user task step name, when you delete a user task from a workflow you must edit the rule in the form that the workflow was integrated with. In this case you can also delete the Workflow Task state.

CHANGING THE FORM ASSOCIATED WITH A WORKFLOW START STEP OR USER TASK STEP

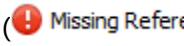
When you change the form associated with a start or a user task step, you must also go back and remove the rules that refer to the workflow in the original forms. Similar to the renaming or deleting the activity, old rules are left behind in forms that are no longer integrated with the workflow. In this case you should also delete any workflow-related states from the form as well (if applicable).

DIRECT AND INDIRECT MISSING REFERENCES

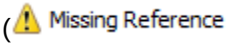
Note

This section applies mainly to the K2 Package and Deployment tool, but the concepts are similar for the web-based UI.

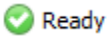
A reference is a pointer to an item that something in the package relies upon (is dependent on) but that is not included in the package, such as a service instance. There are two types of missing references: Direct and Indirect.

A *Direct* missing reference is a missing reference that the item has a direct dependency on, such as a service object having a missing reference to a service instance that cannot be found on the target environment. This appears as a red circle exclamation point in the Status of an item (

).

An *Indirect* missing reference is indicated by a yellow triangle missing reference (

), and occurs on items that have a dependency on an item that has a direct missing reference, for example a SmartObject where the Service Instance for that SmartObject does not exist. In this case the SmartObject will be reported as missing an Indirect Reference.

To resolve missing references, resolve all direct missing references first, and start at the service instance level first and work your way down from there. If you still have indirect missing references after all direct missing references have turned green (

), click the **Analyze** button in the toolbar.

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REMOVING A K2 SOLUTION AND THE K2 FOR SHAREPOINT APP

Sometimes it is necessary to completely remove one or all K2 solutions from an environment. There are several steps that you must complete to remove the solution entirely. At a high level these are:

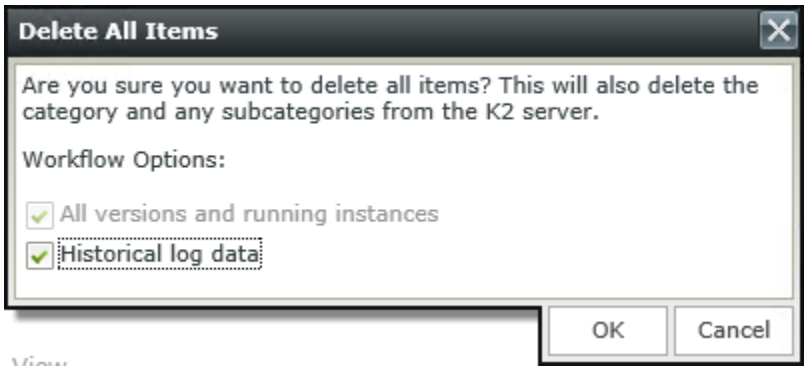
1. Ensure running workflow instances for all lists and libraries can be deleted.
2. Browse to each list or library that has K2 integration and use the **Delete All** button to remove all artifacts. This deletes everything except for the SmartObjects and the category.
3. Delete the SmartObjects and the category using K2 Designer or the SmartObject Services Tester tool.

DELETE ALL (INCLUDING WORKFLOW INSTANCES)

Determine if you have workflows currently running. Using the **Delete All** button on the artifact page automatically deletes the workflow and its instances, so as soon as you do that the workflow and any assigned tasks are deleted. Note, however, that they are not removed from the reporting database. You must manually clean those entries up if necessary for your reports.

Then browse to each list and library that has K2 integration and, from the artifacts page, click the **Delete All** button. This deletes everything from the K2 server.

Delete all deletes everything except for the category created for the solution. It also removes the database entries for the solution. If you click the K2 Application button again on the list or library, you see the Create K2 Application page.



Note

Before K2 blackpearl 4.6.9, Delete All did not remove the SmartObjects and the remote event receivers from the list or library. If you are needing to create a site template on a site that already has K2 solutions deployed, you must Uninstall the K2 for SharePoint app before creating the template because this is the only step that removes the remote event receivers. See http://help.k2.com/KB001619: K2 for SharePoint: Save Site as Template may not work as expected for more information.

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DELETING THE SMARTOBJECTS AND THE CATEGORY

For K2 blackpearl 4.6.8 and earlier, you must remove the SmartObjects after you delete from the artifact page. To remove the SmartObjects, browse to either the K2 Designer site or use the SmartObject Services Tester tool to delete the SmartObjects and optionally the category. Note that you will not be able to delete these items using the K2 Designer if there are other dependencies on the items or other items in the category. Also, if you have other items in the category and you delete the category using the SmartObject Services, the items that would have remained in the category are moved to the parent category, and items dependent on that item may not be able to locate it.

UNINSTALLING THE K2 APP

If you need to remove the K2 integration entirely from the site, you can use the Uninstall link on K2 for SharePoint Settings page. This removes the K2 integration from all lists and libraries, resets the remote event receivers, cleans up the K2 Settings list and removes the app itself. However, it doesn't delete any artifacts, it simply removes the settings. If you do this you will have to manually clean up the artifacts using the K2 Designer, which is not recommended. The best practice is to manually remove all artifacts using Delete All, then delete the SmartObjects and optionally the categories, and then uninstall the K2 for SharePoint App.

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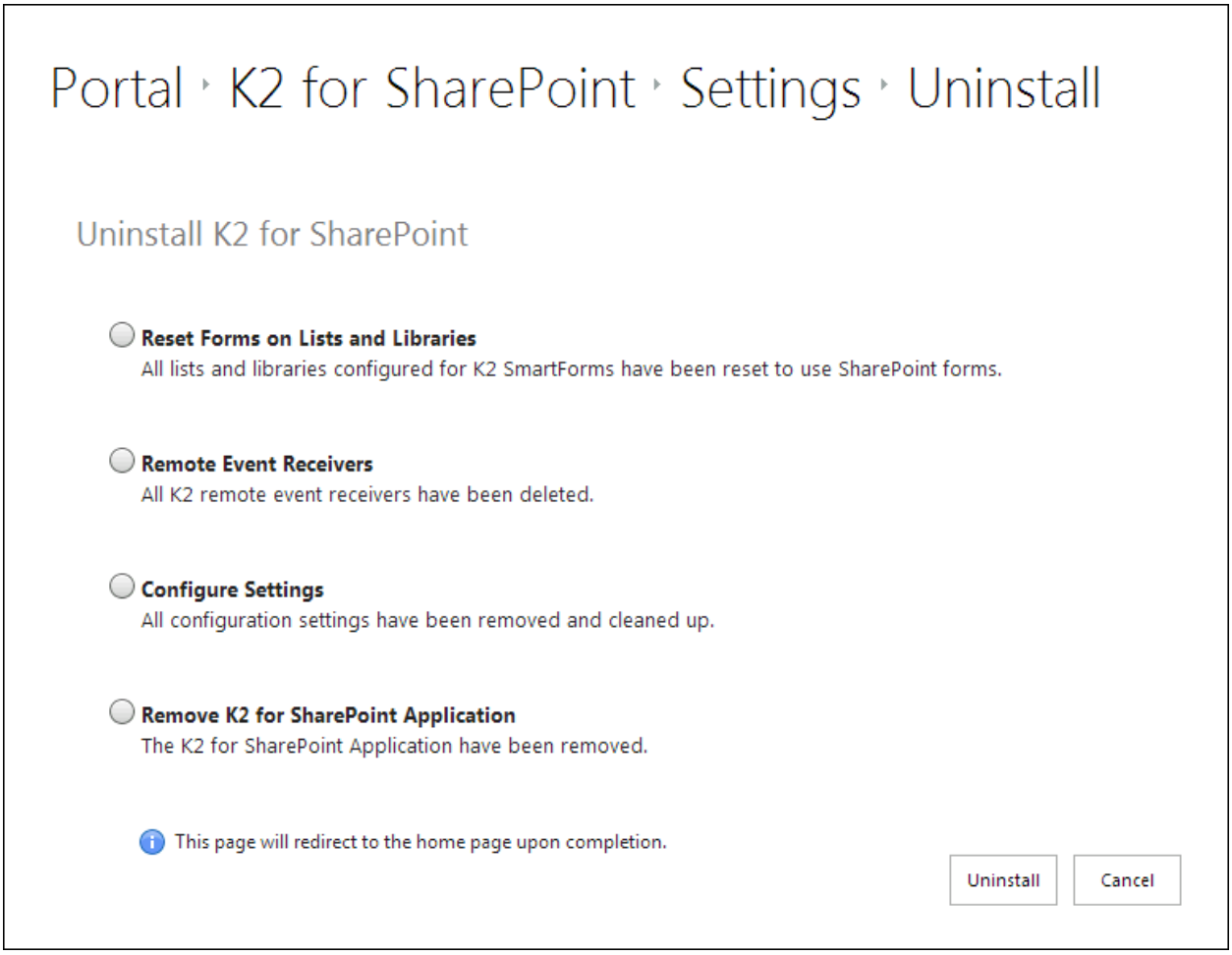

FREQUENTLY-ASKED QUESTIONS

1. **Can I make a change in my form or a SmartObject that only applies to new workflow instances?**
   No, this is not possible since existing workflows will always use the latest deployed version of a form or SmartObject
2. **If I change the target form in the workflow (for example switching the Form associated with a Start step or a User Task step to a different Form), will the integration with the previous Form automatically be removed?**
   No. The auto-generated integration between the workflow and the form through states and rules goes from the workflow to the form. When you switch the form out for another form, the workflow will inject the workflow integration into the new form but will not remove the existing integration with the old form. If you want to remove the workflow integration form the old form, you should edit the form and remove the applicable states and rules from the old form.
3. **The Package and Deployment tool reports a missing reference to a workflow that is not in the package, why?**
   There could be a SmartForm in the package which still has integration to a workflow. Alternatively, you may have deselected a workflow in the selection screen which actually is used by a form in the package.

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4. **A workflow is showing in my .kspx package but it does not appear on my artifacts page, why?**
   The workflow is only seen by the person who owns it. K2 Package and Deployment is run by the K2 service which can see everything.
5. **Uninstall doesn't remove my SmartObjects -- why not?**
   Prior to K2 4.6.9, SmartObjects were not deleted because they may have been referenced by another artifact unrelated to the current solution. This is no longer the case with K2 4.6.9 and later.
6. **Sometimes after I change which SmartForm I'm using in SharePoint, the old one is still displayed. Why is that?**
   This is a SharePoint issue that is solved by clearing the browser cache
7. **Why does my P&D package think it still has a reference to an old workflow?**

   K2 Package and Deployment queries the database to find references, and if there is an old rule in a form or view that references the old workflow, K2 Package and Deployment will find that reference and include the old workflow in the package. If you do not want this workflow in the package you should remove the rule that refers to the workflow before packaging. For more information see Removing the old rule

SAMPLE LIFE CYCLE MANAGEMENT SCENARIOS WITH WEB-BASED PACKAGING AND DEPLOYMENT

This section describes some sample scenarios that demonstrate common requirements during the solution life cycle for K2 for SharePoint applications. For the scenarios, assume that there are two environments (*Development* and *Production*) and that each environment has a separate K2 server and SharePoint site collection.

This document assumes you are already familiar with creating K2 applications. For a step-by-step guide for creating a solution similar to the application used for these scenarios, please refer to the available tutorials for your version of K2. (Appit tutorials, K2 for SharePoint tutorials)

APPLICATION FOR THE SCENARIOS

The example solution is an Incidents Management application. The application consist of a main SharePoint list called **Incidents**, which has a few columns including a lookup column to a list called **Departments**. Both of these lists were created in the *Development* environment (development.denallix.com) and, before the K2 application was created, saved as list templates. The Departments list template was created with list data included, but the Incidents template was not. The list templates were then used to create exact replicas of the Lists in the *Production* environment (production.denallix.com) with the exact same names.

After the lists were created in both SharePoint environments, the K2 for SharePoint App was deployed to BOTH of the SharePoint environments (Development and Production).

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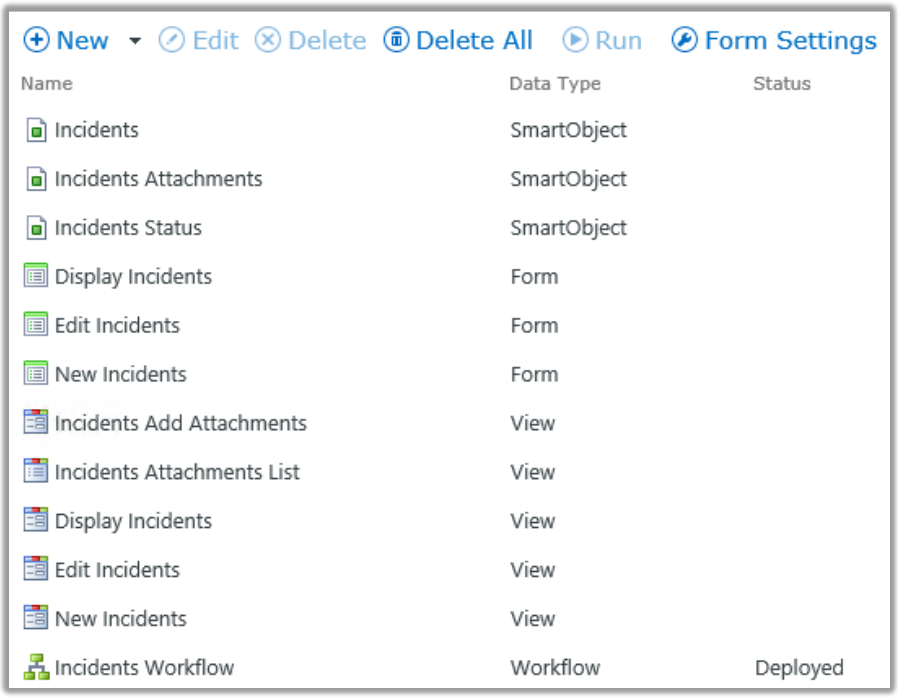
In the Development SharePoint site, a K2 Application with data, forms and a workflow was created for the Incidents list. The image below shows the application elements created for the application.



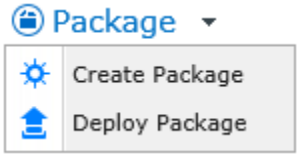
The workflow in this solution is started manually from the K2 workflows page. (If you are starting a workflow based on an event in the library and you are using a site template, see the K2 KB article http://help.k2.com/KB001619 for additional considerations)

Now that the first version of the application is created, you package and deploy the application artifacts to the Production environment.

SCENARIO 1: PACKAGING AND DEPLOYING A LIST-BASED APPLICATION WITH DATA, FORMS, WORKFLOW AND REPORTS

If you have not done so already, add the K2 for SharePoint app to the target site in the Production SharePoint environment.

To start the migration process, choose **Create Package** from the **Package** menu on the artifacts page.



For information about using the K2 Package and Deployment tool, see Using the P&D Tool. This MMC-based tool is required if you are using a previous version of K2. Note, however, that every effort should be made to use the SharePoint version of the tool to package and deploy SharePoint 2013 solutions.

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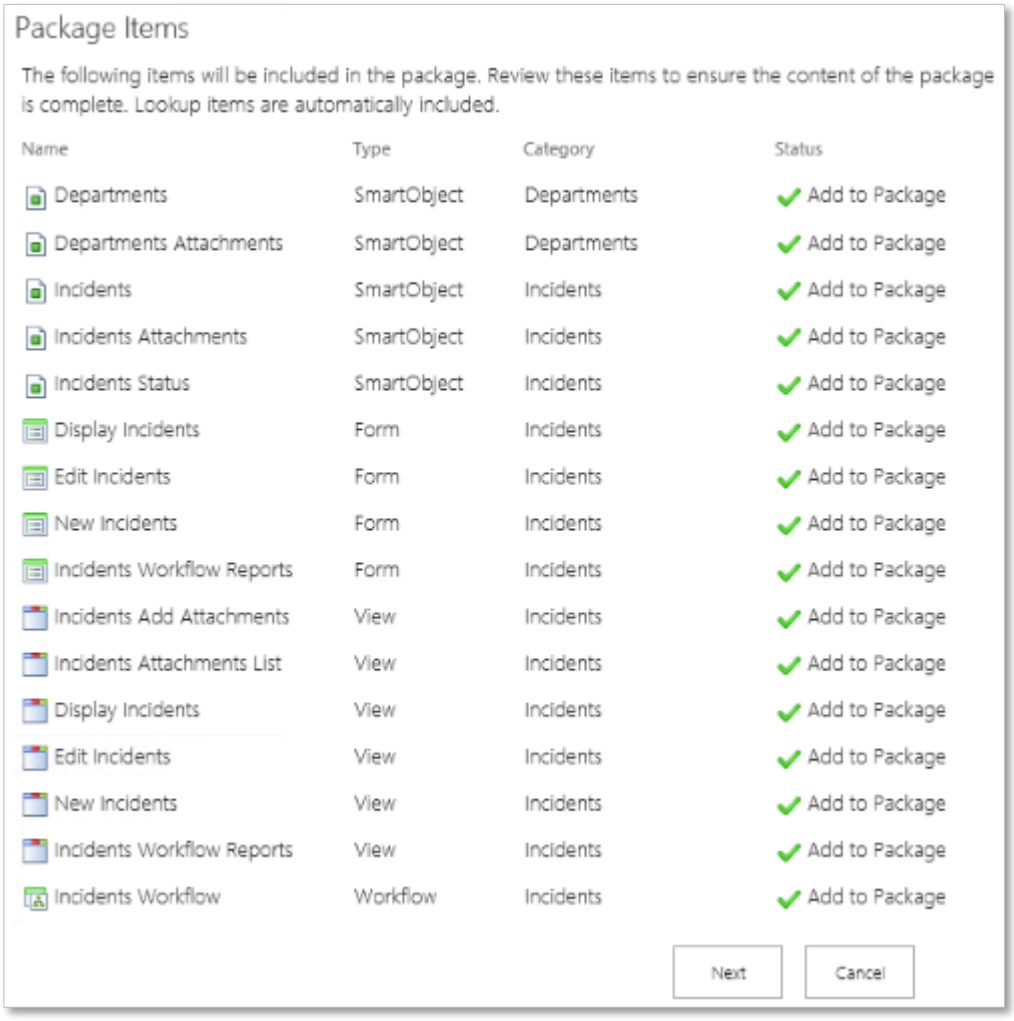

Click **Next** after verifying that the package includes the correct items. Note that Departments SmartObjects are automatically includes as the application is dependent on them.

On the next page you see two sections – **Additional Items** and **Package Fields/Variables**. For a typical SharePoint-only application you do not need to add anything to these sections. If you, for example, had a SQL SmartObject that you used to show data on the SharePoint form, it would appear in the Additional Items section. If you needed to create a variable for an artifact in the application you would add it in the Package Fields/Variables section.

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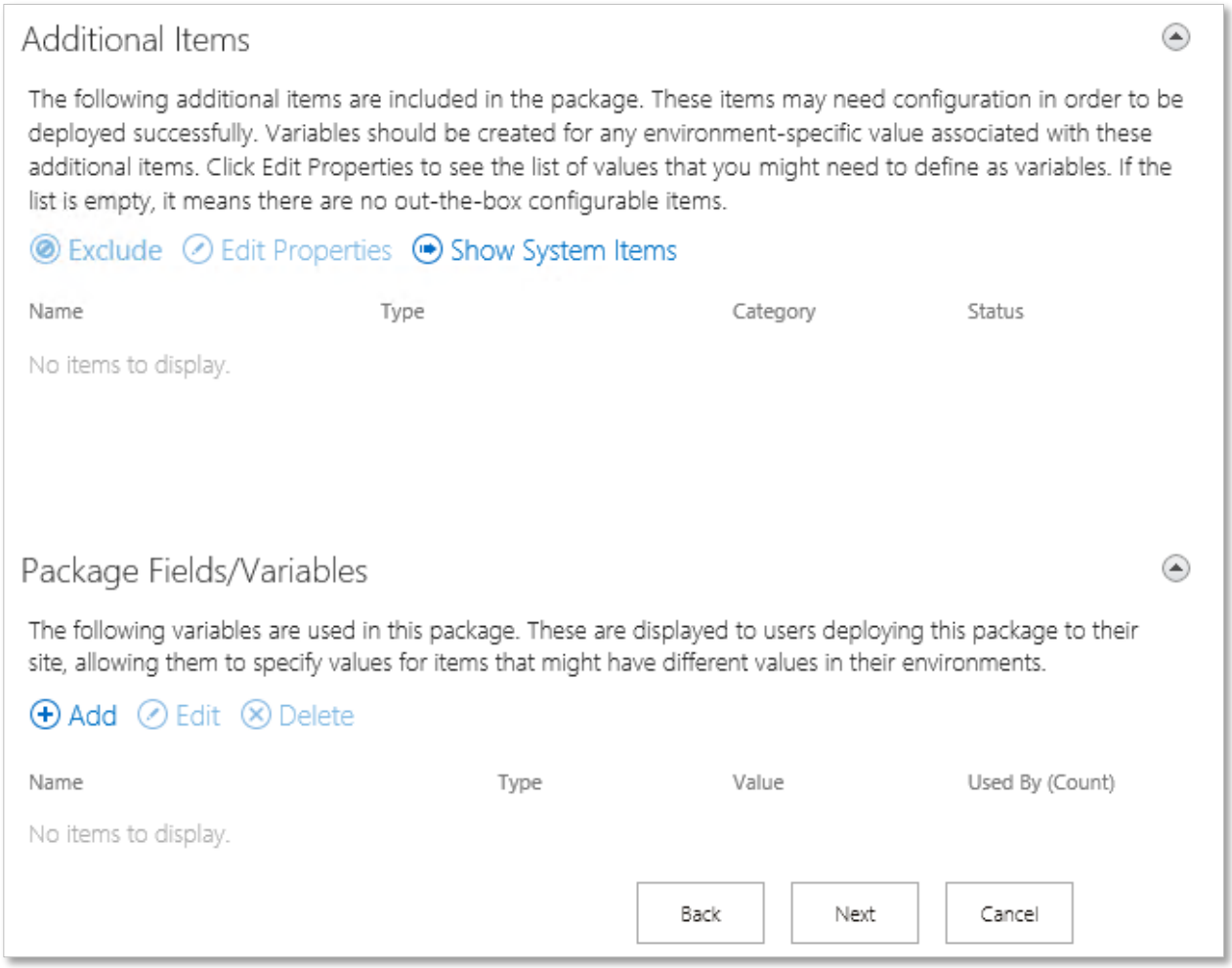
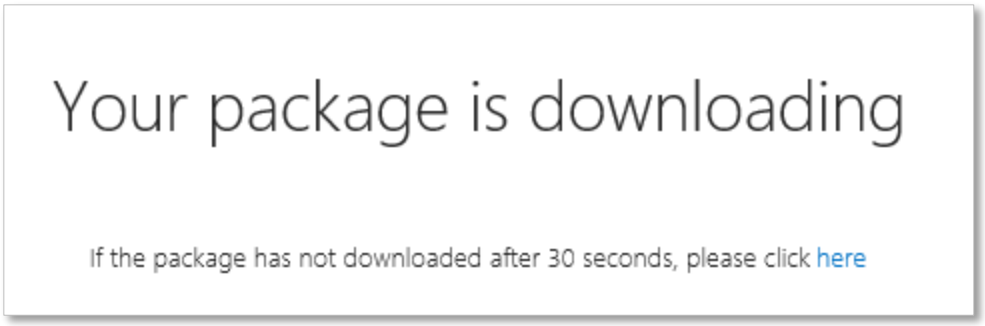


Click **Next** and the package is generated and downloaded. Save this package to a location where you can deploy it in your Production environment.



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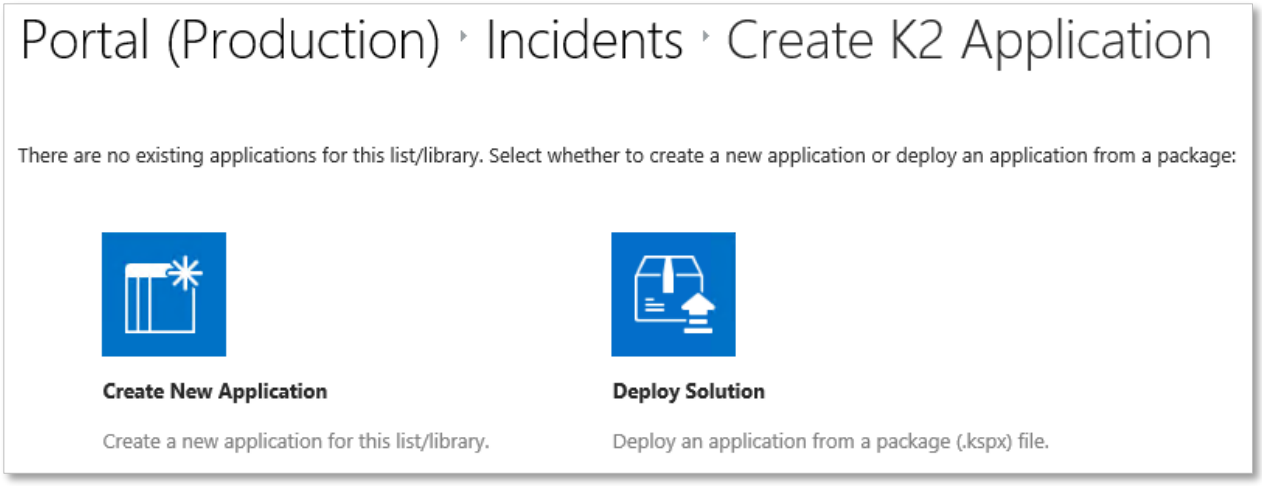
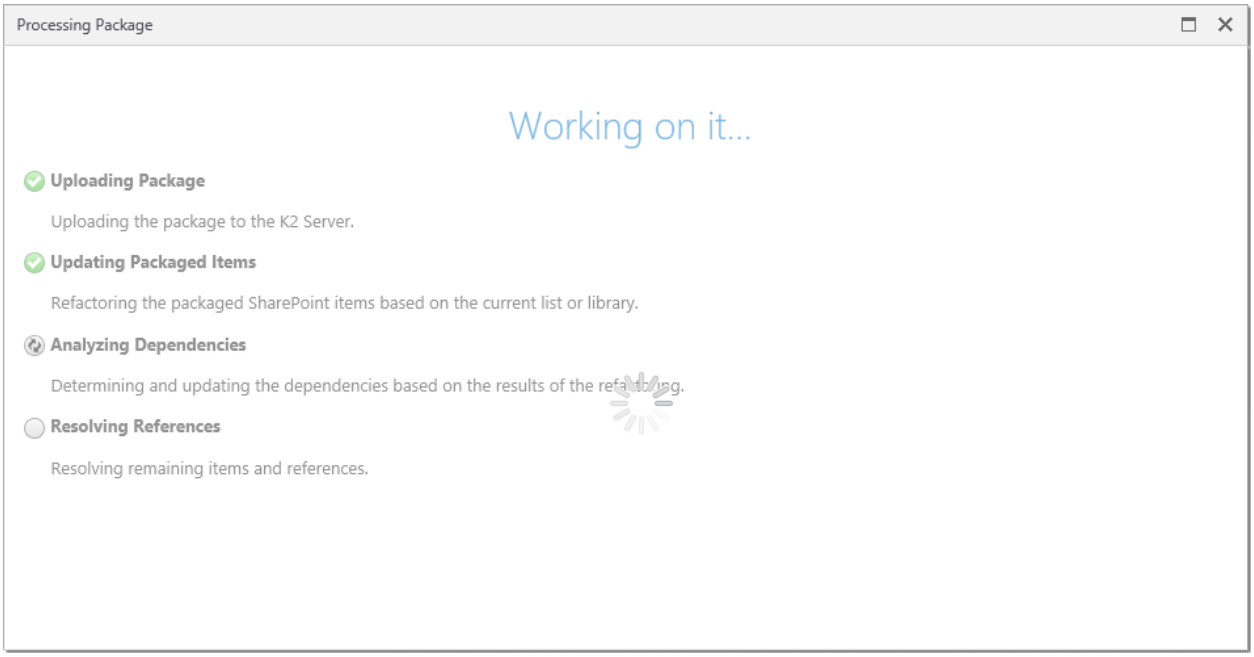
On the production server browse to your Incidents list and ensure that your Department lookup column is retrieving information from the Departments lookup list. When creating lists from templates you must delete and recreate lookup columns. If you have many columns to fix you can use a PowerShell function to do so – see http://get-spscripts.com/2011/01/fixing-blank-lookup-columns-in.html for more information.

Click on the **Application** button on the toolbar of the Incidents list and you will see the following options for creating a new application or deploying a solution. Click **Deploy Solution**.



Select the package you created on the Development environment and click **Open**. The package is opened and processed, showing you the progress as follows:



Once the package is fully processed you are redirected to the **Deploy Package** page. This page compares the columns in the list and either finds matches in the target list or allows you to choose how

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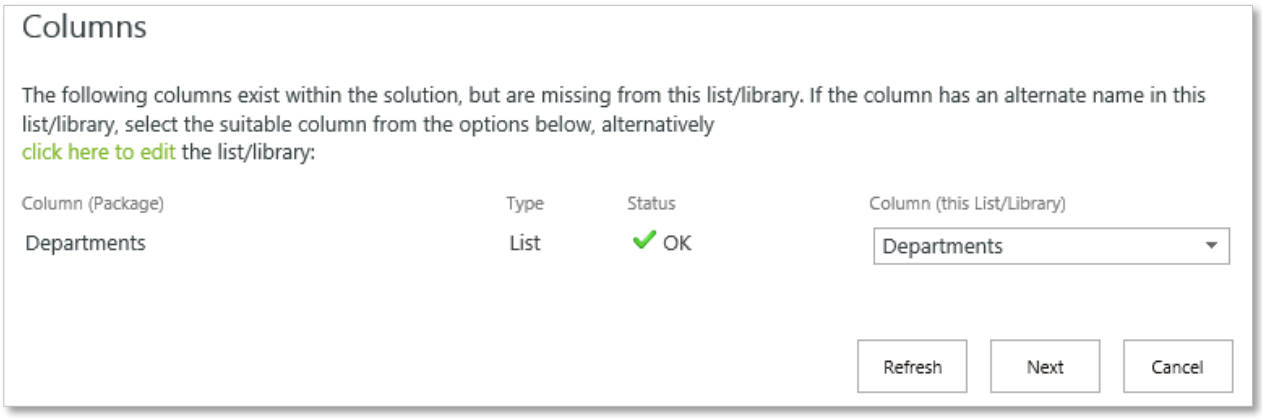
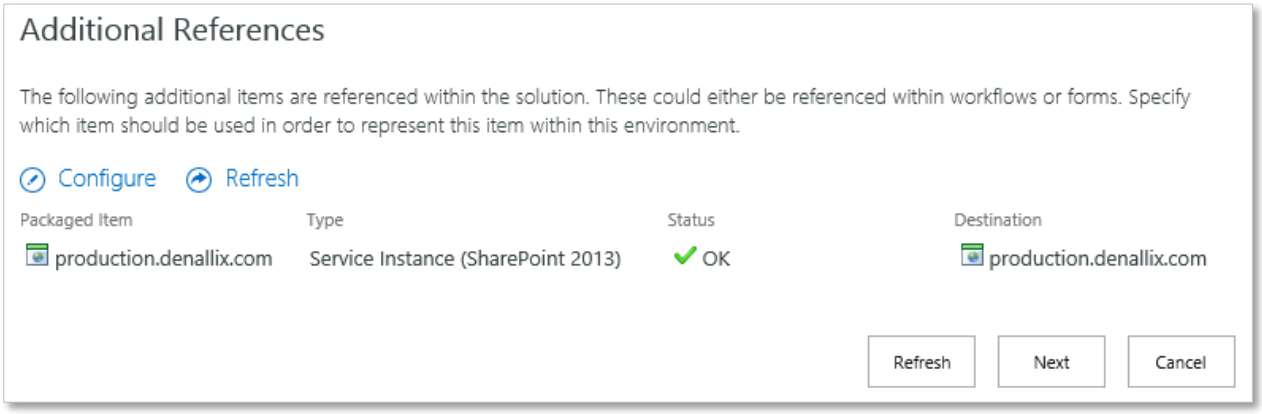
to map the columns. If you do not have any unmatched columns you may not see this page. If the column is a lookup type, the mapping is displayed even if it is matched, allowing you to always choose a different lookup list. In this case the lookup column with a lookup configure for the departments list was found and matched.



Clicking **Next** allows you to see any additional references that may be included in the package, and how they were mapped. Since the full context of the site is known by the deploy solution logic, the service instance from the package is automatically mapped to the service instance on the target server that corresponds to the target site, in this case production.denallix.com. If you had other service instances that could not be automatically mapped you could configure them here.



Clicking **Next** again displays the **Variables** page. This example package does not have any variables do this page is blank.

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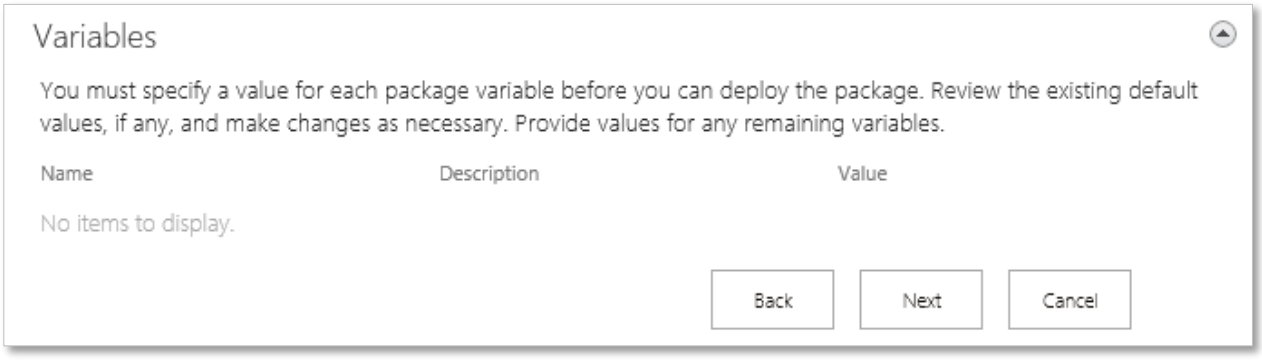
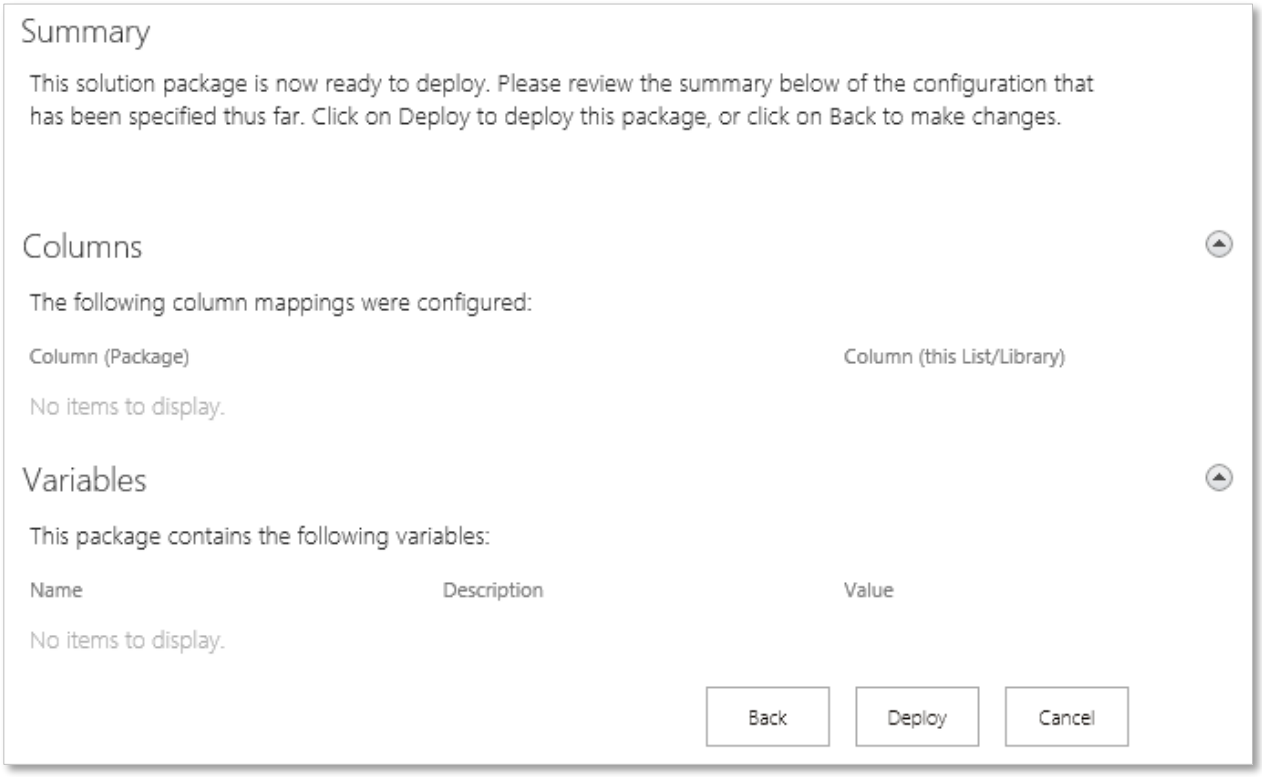


Finally a **Summary** page is presented that displays any additional configuration you've made and allows you to deploy the solution.



Click **Deploy** to deploy the solution.

If required, use the K2 Workspace or the K2 Management Site to set the workflow permissions for the deployed workflow, along with any specific settings such as data values that may be required by the application.

Now you can test the solution by browsing to the main list and clicking the **New** button to create a new item.

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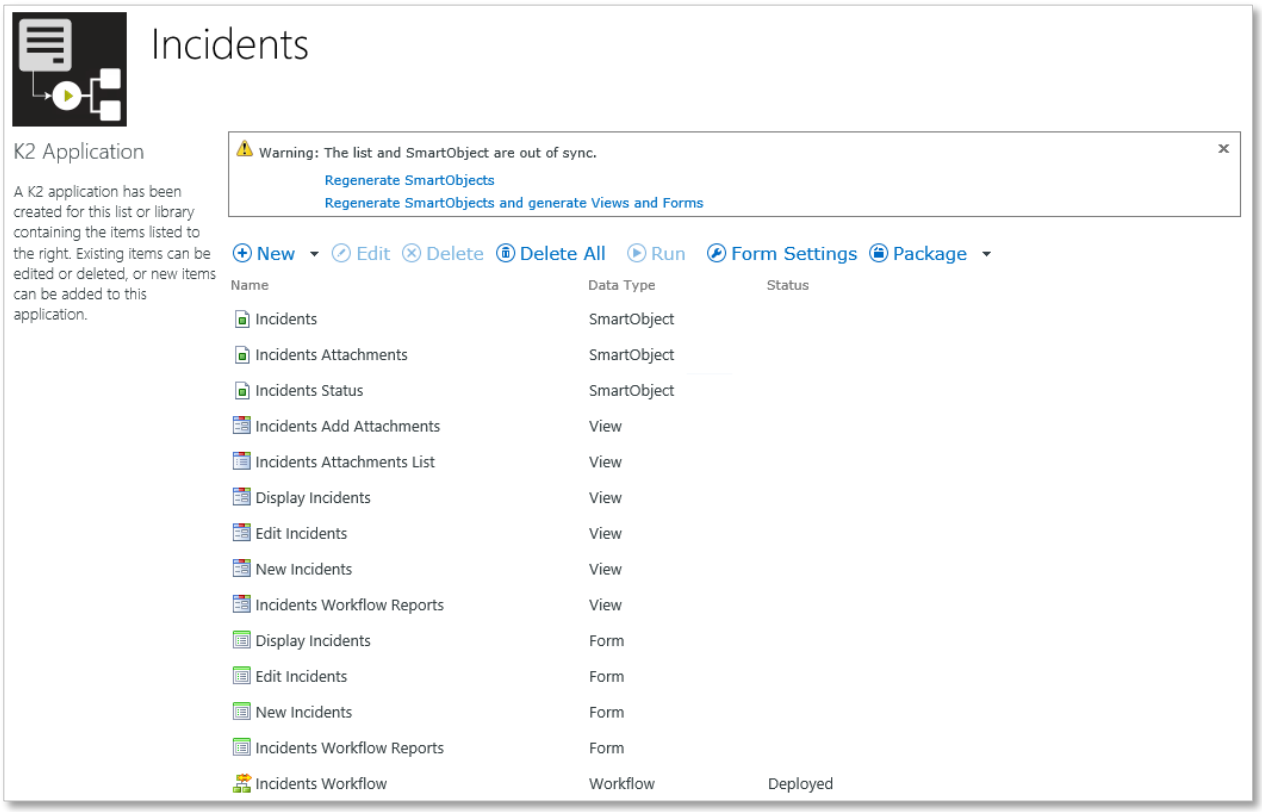
Scenario 2: Adding a column (field) to an application

You may want to make changes to your application after it has been deployed. For this scenario, we have added a text column called **Site of Incident** to the list in the Development site. This column contains information about where the incident took place.

SYNCHRONIZING CHANGES BETWEEN THE LIST AND THE APPLICATION ELEMENTS

Once the column is added, the SmartObjects, forms and views in the application must be updated to include this column. To do so, browse to the K2 Application elements page and notice the message that indicates that the K2 artifacts are out of sync:



Caution

If you had customized the forms or views after they were generated, do not click the **Regenerate SmartObjects and regenerate Views and Forms** option, because this erases your customizations. If you did customize the generated forms and views, you should only click the **Regenerate SmartObjects** option and then manually modify the forms and views for the application

Caution

If you deleted a column, you should not automatically regenerate your items as this would affect running instances of the workflow. See scenario 3 for more information.

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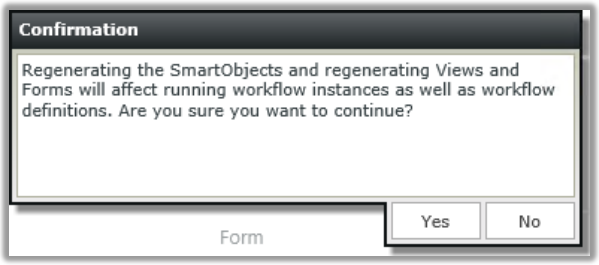
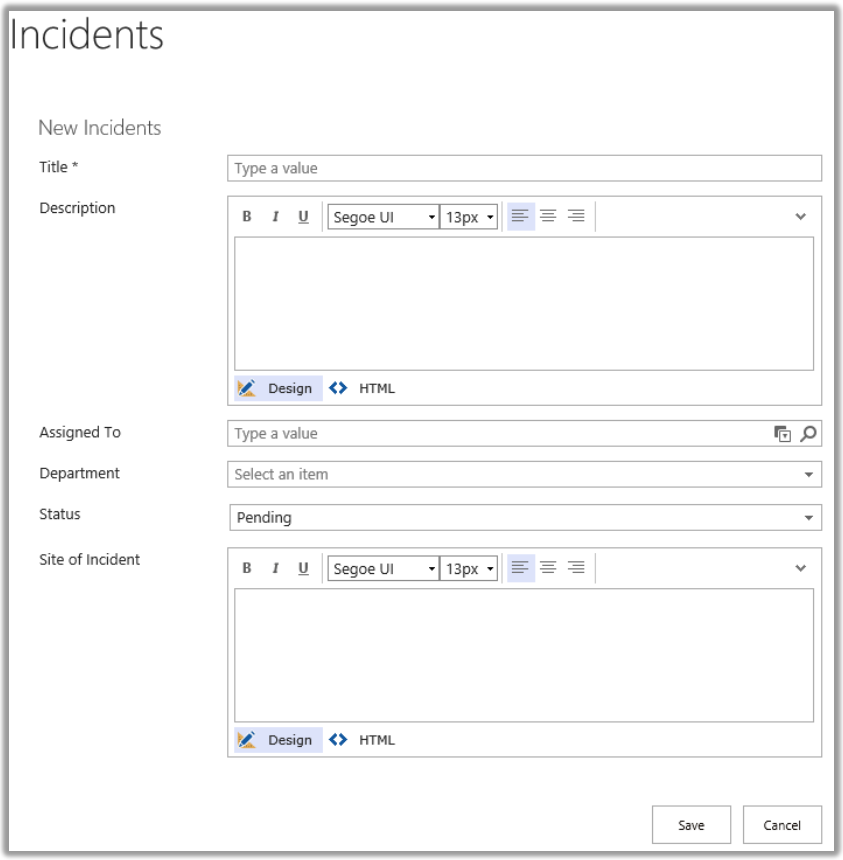
To bring everything in sync with the list changes, click the **Regenerate SmartObjects and regenerate Views and Forms** link. Say **Yes** to the confirmation dialog and K2 will regenerate the application elements.



After this has completed, click **New** to verify that the new field (Site of Incident) is on the form:



Note

The new column may impact running workflow instances of the application. The new column now appears on all forms, even for those list items created before Site of Incident was part of the solution. Therefore it is recommended that any time you add columns to your solution you make them optional, otherwise the form will not pass validation the next time it is opened in the solution until the field is filled in.

Create a new package for the application which contains the updated application elements. Once the new package is created, copy the package to the target (Production) environment.

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Manually add the new column to the Incidents List in the target SharePoint Site. (You cannot use the list templates again because those cannot be used to update existing list definitions).

Once you've added the column in the target (Production) SharePoint environment, deploy the updated package to the target environment just like you did in Scenario 1. There is no need to update the SmartObjects, views and forms on the production site because they are contained in the new package.

When the solution is deployed, test the solution out for new and existing items. In scenarios where you are adding columns, especially columns that are not required, there should be little impact when deploying new versions of the application elements. Be aware that the updated forms with the additional column are shown for all new and existing workflow tasks that use the forms.

SCENARIO 3: DELETING A COLUMN (FIELD) THAT WAS USED IN AN APPLICATION

If you need to remove an existing column from an application, you should consider the impact of the removal on existing instances of the application, especially if the column is a required column for the solution.

DATA LOSS AND IMPACT ON EXISTING LIST ITEMS

Removing a column from a list or library will result in data loss for any existing Items that store data in that column. If the data loss is acceptable, you can continue on with your deployment but take into consideration the impact on existing workflow instances as described below. If you must retain the data for auditing or some other future reference, you should copy the items to a retaining list for that purpose, but the item should remain an active instance and will inherit the updated design when the solution is deployed

IMPACT ON EXISTING WORKFLOW INSTANCES OF THE APPLICATION

If a workflow instance references a SmartObject which has changed (especially if a field was removed from the SmartObject), the workflow may go into error state since the workflow may be attempting to interact with a property that no longer exists on the latest version of the SmartObject. (Remember that while workflow instances are versioned, neither SmartObjects nor SmartForms are versioned). In this case, the recommended approach is to allow any existing instances of the workflow to complete and then, once they are complete, deploy new versions of all the application elements at the same time so that new instances of the workflow will be compatible with the latest version of the Forms and SmartObjects in the application. You can use workflow permissions to revoke all permissions from the workflow apart from your own rights, so that users cannot start new instances of the workflow while old instances are being completed.

For the application in this scenario, the **Assigned To** column will be deleted, perhaps due to a change in the way incidents are handled. The data loss in this case represents who was responsible for the incident before the incident workflow changed.

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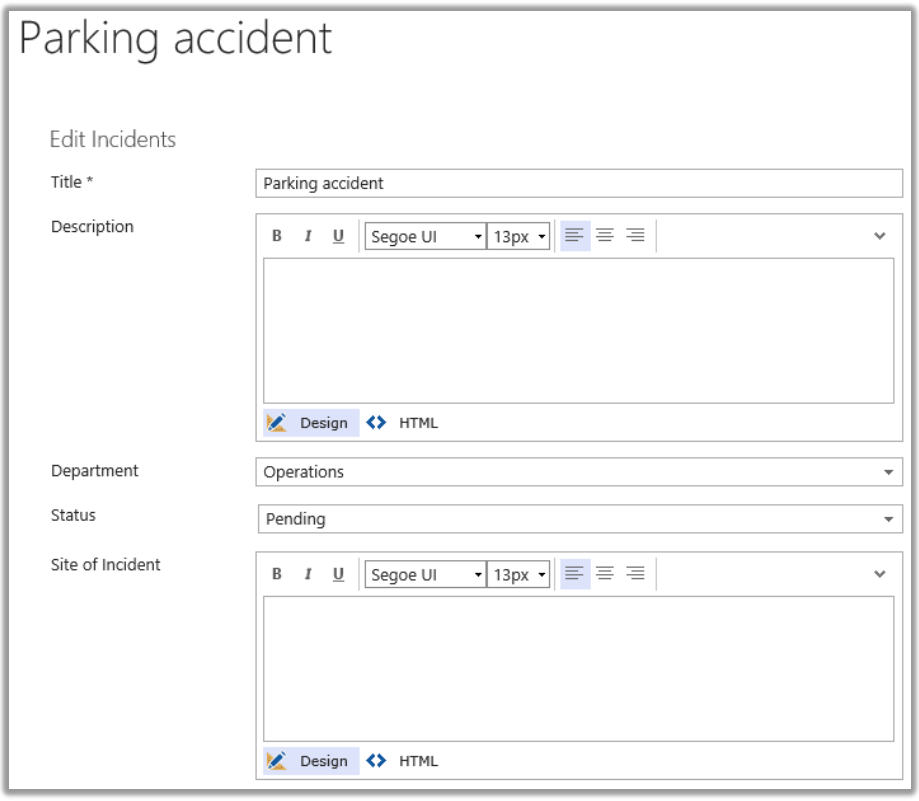
Note If the value from the column being deleted was used as a decision-point value in the workflow, you would have to modify the workflow so that it no longer relied on this value from the SharePoint list context. In this case the existing workflow definition on the target environment would probably be invalid, and existing (running) instances of the workflow would need to complete before the upgrade could occur.

Once you delete the column you must synchronize the K2 artifacts with the list because they are not automatically synced. Once this has completed, the form will no longer contain the **Assigned To** control as shown here:



Create a new package for the solution as you did in Scenario 1.

Assuming that the data loss is acceptable, update the list in the target SharePoint environment by deleting the column from the list. Remember to consider the impact of this change on existing instances of any workflows in the application and allow those instances to complete before deleting the column from SharePoint.

Once you've deleted the column, deploy the new package to the target environment.

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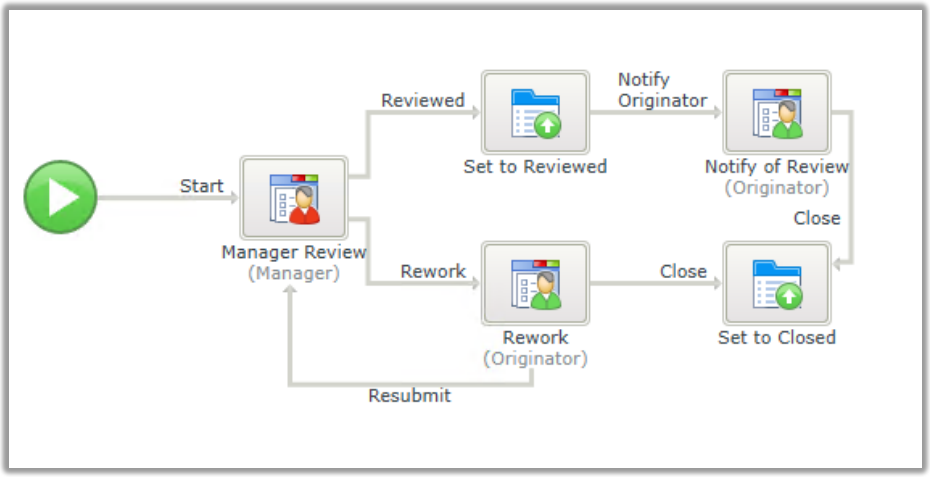
SCENARIO 4: CHANGING A USER TASK FORM TO A DIFFERENT FORM

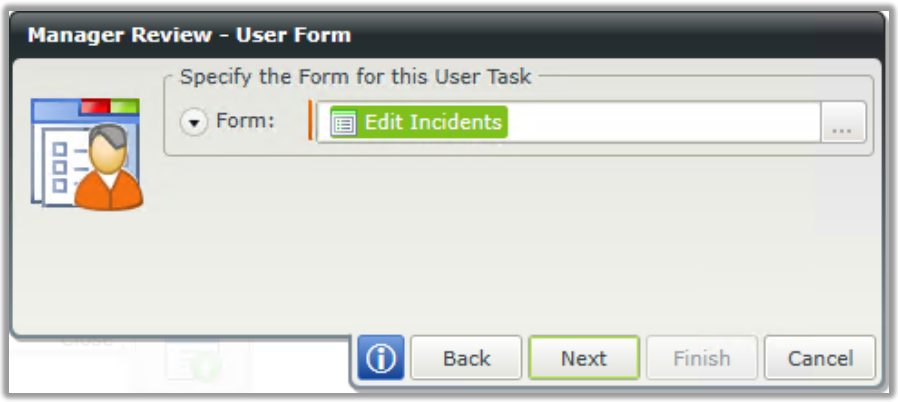
If you need to modify the user task form to a different Form in the solution, you must be aware of some downstream effects in SmartForms of integrating with a different form.

For reference, the workflow in our sample incidents application looks like the following:



When you first integrated the workflow with a particular form for the **Manager Review** step, it generated an additional rule in the SmartForm to load the worklist control and context into the form to enable the user assigned the task to action it.

Suppose that you initially used the **Edit Incidents** form, but you wanted to change this to use the **Display Incidents** form for the review step.



When initially integrating with the Edit incidents form, the workflow inserted rules into the form initialization that loaded the appropriate context of the workflow step to open the workflow step.

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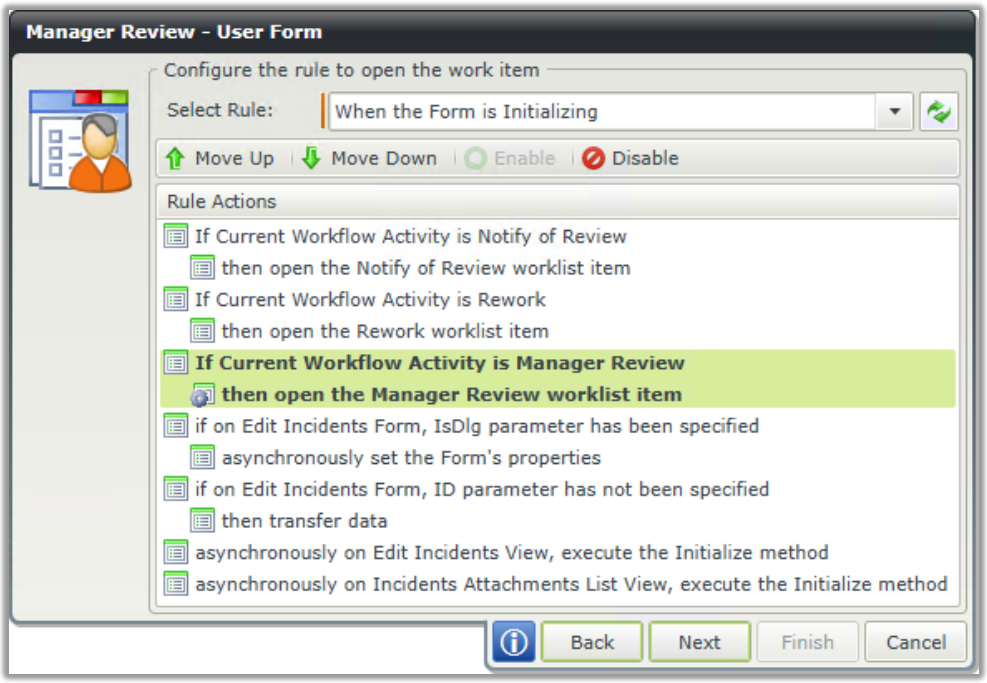
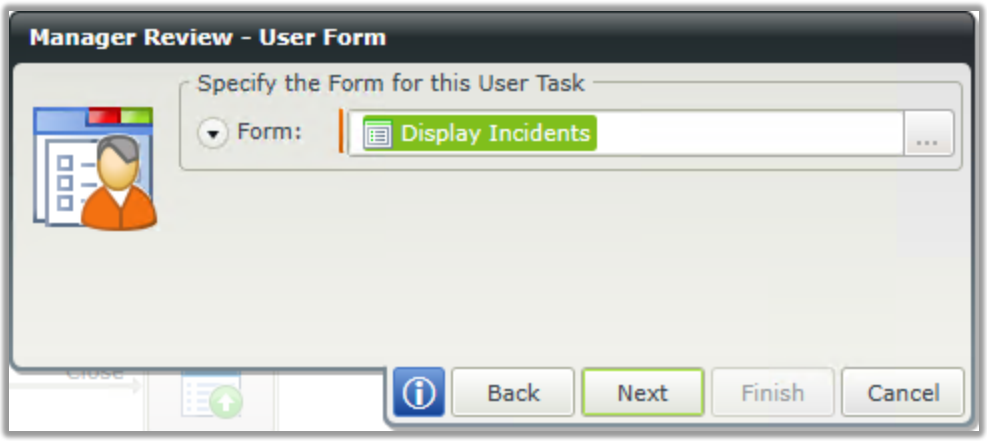


If you change the form, when you deploy the new version of the workflow the workflow integration rules are added to the new form. Here you can see that new rules were added to the Display Incidents form. The rule from the original form (Edit Incidents) is never removed: you must manually remove the piece that corresponds to the user step in the Edit Incidents form by directly editing that form.



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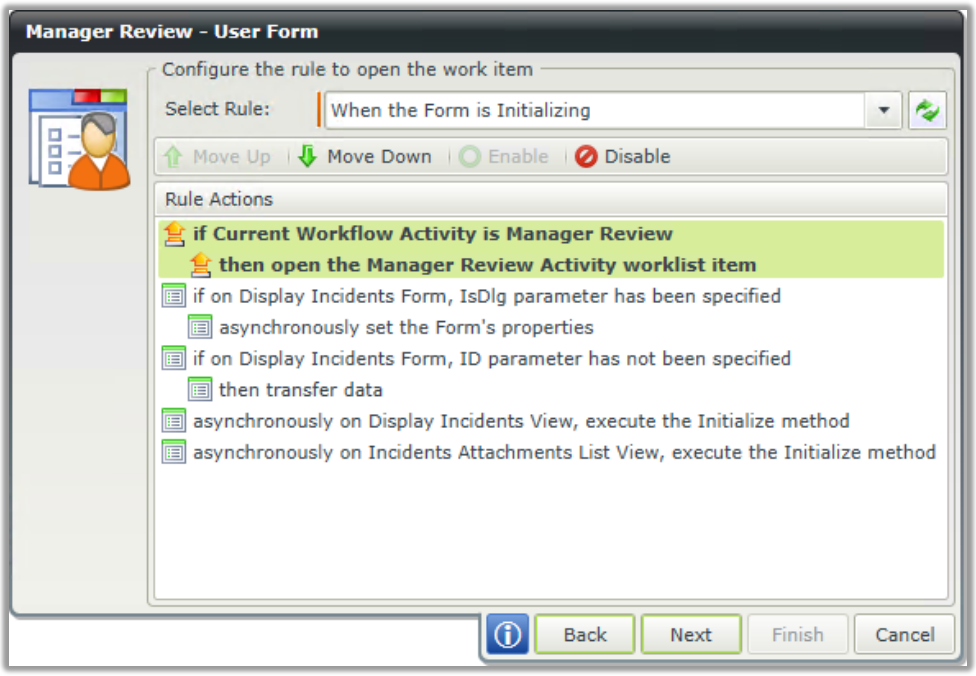

Deploy the workflow so that it is now using the Display Incidents form instead of the Edit Instances form. Any new instances of the workflow use the Display Incidents form instead of the Edit Incident form. Existing instances of the workflow still reference the previous Edit Instance form, however.

REMOVING THE OLD RULE

Before packaging and deploying the updated application, you must remove the workflow task rules from the *When the Form is Initializing* rule on the Edit Incidents form as it may cause a missing reference check when deploying the solution to the target environment.

Caution

Keep in mind the impact this change will have on existing instances of the workflow: since forms are not versioned while workflow instances are, existing workflows may fail before the forms associated with the user task no longer contains the workflow integration rules. Therefore, it is recommended to allow existing instances of the workflow to complete before you deploy the updated version of the application to the production environment

To remove the workflow integration rule actions from the original form, open the old form (in this case Edit Incidents) in K2 by choosing the Edit Incidents form on the application elements page and clicking the **Edit** button in toolbar.

Once you are done editing the form click the **Rules** breadcrumb item. Then select the **Workflow Task** state and find the *When the Form is Initializing* rule. Select it and click **Edit Rule**.

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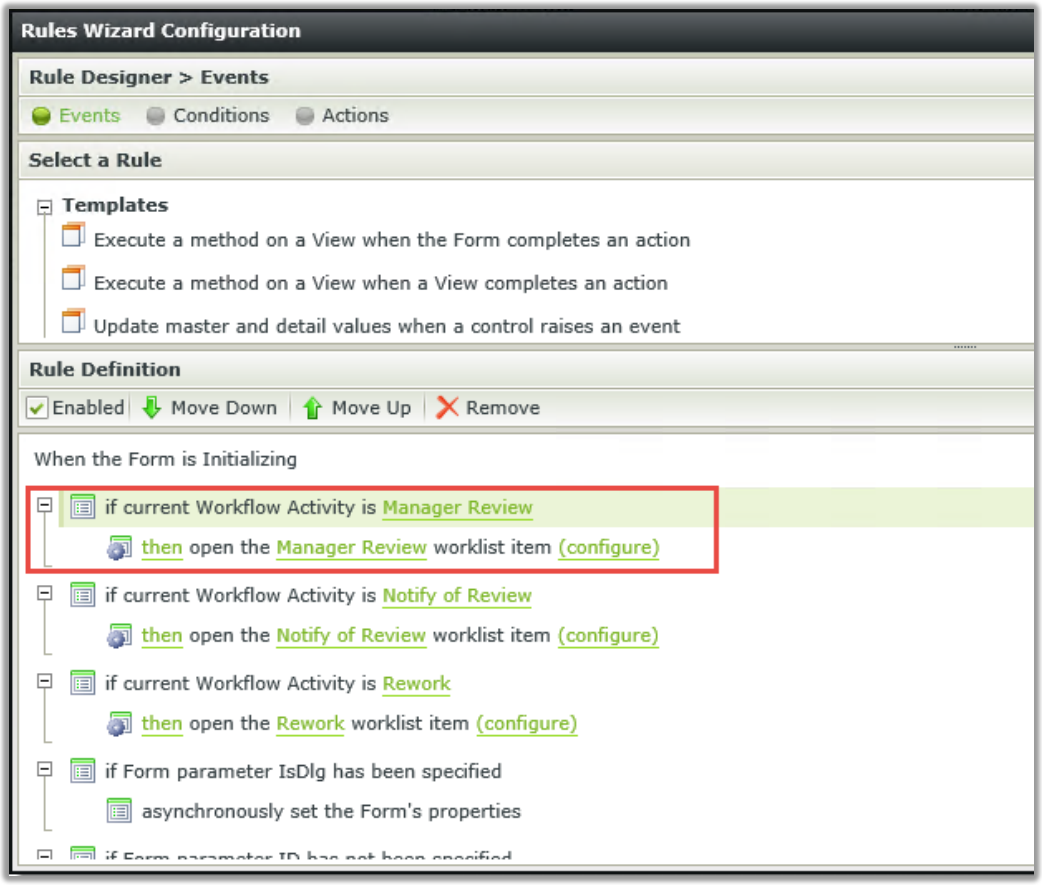
For each of the user tasks that are present in the workflow (in this case there are three), you'll see corresponding if/then conditions and actions. For the step that you've currently changed you must remove the condition and action. For example in the following illustration the items in the red box must be removed which will remove that rule from the Edit Instance form.



Notes

- The form rules are only modified when the workflow is deployed.
- The form rules are only added to, never removed. You must manually remove all remnants that each deployment of the workflow added to the rules that you have subsequently changed.
- If you do not see the rules that correspond to the user task that you've changed the form for, click on the **Workflow Task** state first.
- If you still don't see it, go back to your workflow user task and verify the rule that was modified with the workflow step additions. If you change the rule you will also need to go back and remove that previous rule action and condition corresponding to the user task, from the Form.
    - You should always use the *When the Form is Initializing* rule instead of any other rule present on the form for displaying user tasks.
- If you want to completely remove any workflow task integration from a form, you can simply delete the Workflow Task state from the form.

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IMPACT ON RUNNING INSTANCES OF THE APPLICATION

Due to the form and form rules being changed, existing (running) instances of the workflow may need to be expired or otherwise completed before the upgrade of the solution can occur. The upgrade should be tested in a non-production environment to verify whether changing the form would affect existing instances.

SCENARIO 5: ADDING OR DELETING A FIELD ON A FORM THAT WAS CUSTOMIZED AFTER BEING GENERATED

In this scenario you are modifying a Form after it has been generated. This is sometimes necessary such as when changing the order of the fields on the form, adding instructional text to the form or including data from non-SharePoint SmartObjects.

> **Caution** The most important thing to remember when making manual customizations to the form is that you can no longer regenerate the forms or you will lose your customizations. Regeneration of the forms using the artifacts page will reset the form to the definition of the list.

To add, edit or remove properties from a view, select the view that corresponds to the form you wish to modify, and click the **Edit** button at the top of the artifacts page. Once in the K2 Designer, add or remove the columns as necessary. Once you are finished editing the view click **Finish** and you are taken back to the artifacts page. If you need to make changes to the form, edit it the same way you edited the view.

Once you are done with all edits, make sure to check the views and forms in before creating the new package. Now you can package the solution again as you originally did, and deploy to the target environment and resolve any missing references.

IMPACT ON RUNNING INSTANCES OF THE APPLICATION

If you have added columns to the form, you will not affect running instances, but be aware that existing instances will probably not contain data for that column until it has been updated. Removing columns from a form may impact existing instances of the workflow if the workflow relies on that value, so consider this effect and if necessary, allow existing instances of the workflow to complete before deploying the updated version of the application.

SCENARIOS USING THE K2 PACKAGE AND DEPLOYMENT TOOL

If you find it necessary to use the MMC-based K2 Package and Deployment tool, the process to deploy a SharePoint-based application is more involved. Use this section for reference on how to deploy a SharePoint-based solution for the various scenarios.

> **Note** K2 Appit customers do not have access to deploy solutions using the MMC-based Package and Deployment tool.

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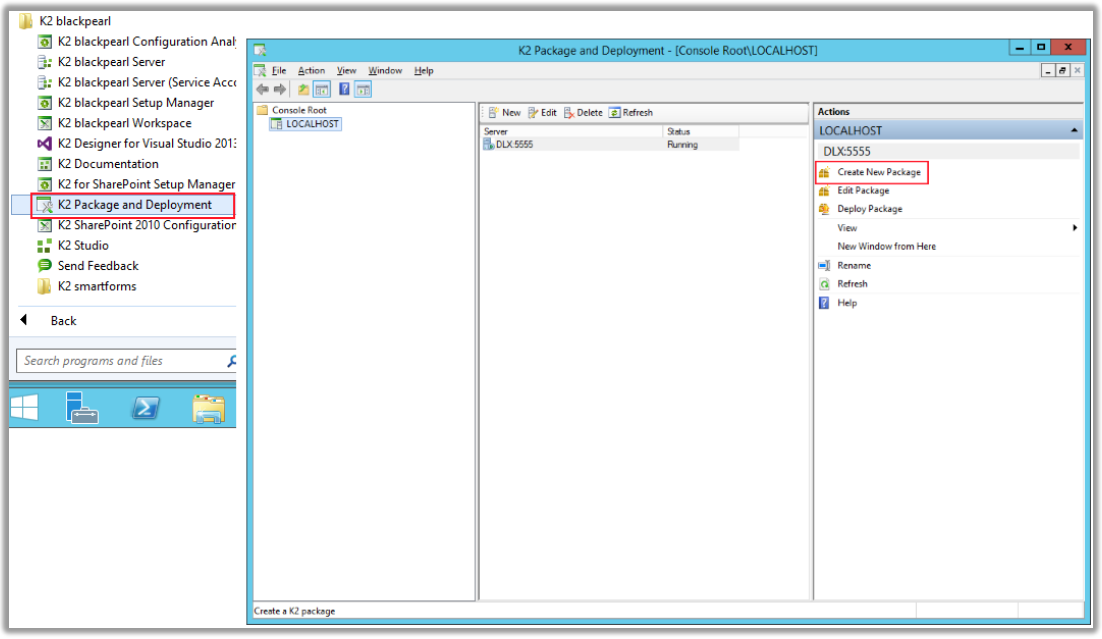
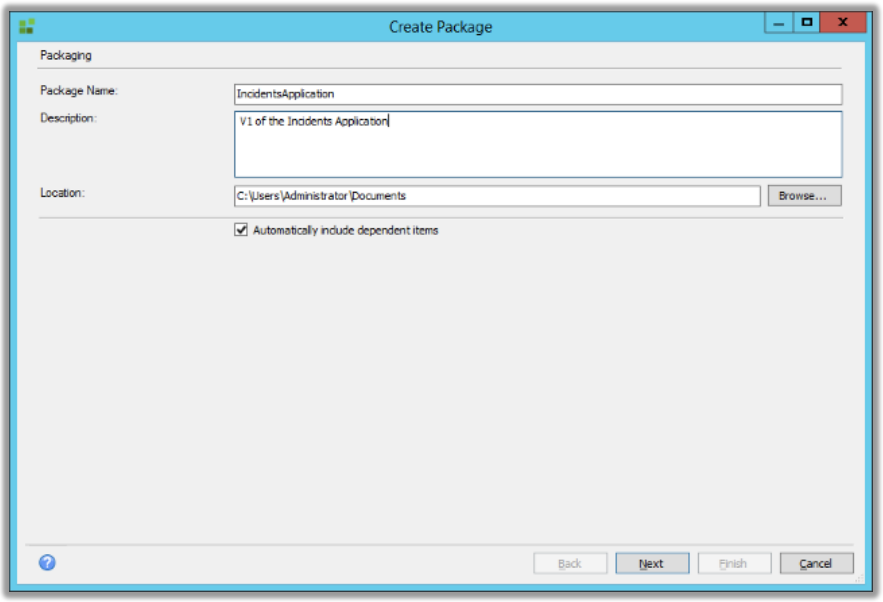
SCENARIO 1 (P&D): PACKAGING AND DEPLOYING A LIST-BASED APPLICATION WITH DATA, FORMS, WORKFLOW AND REPORTS

Develop your solution in your Development environment as you normally would. When you are ready to package your application, launch the K2 Package and Deployment tool from the Start menu. Then click **Create New Package**.



Provide a Name, Description and Location for the package file, and select the option to **Automatically include dependent items.** This option will look at the items selected for packaging and automatically add any dependent items to the package, such as other SmartObjects that are required in the application.



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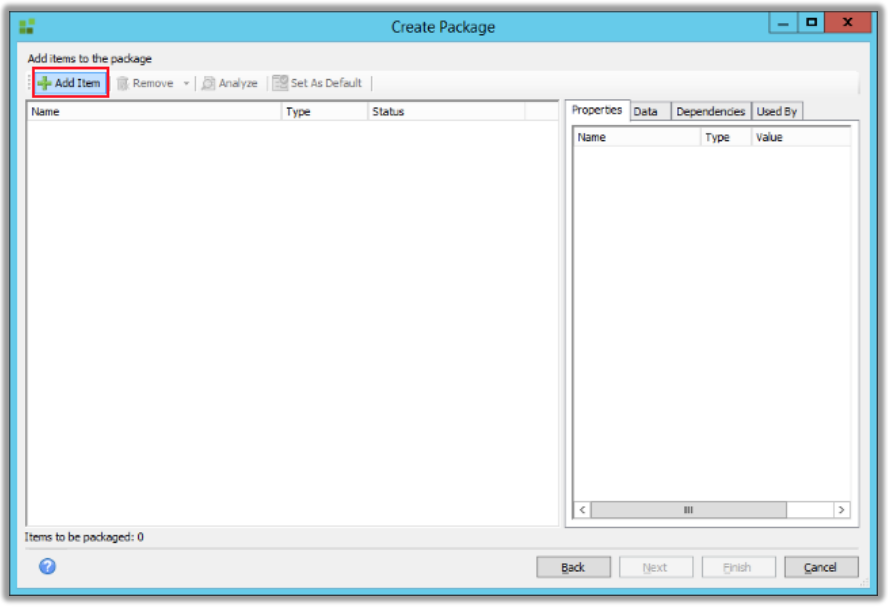
Click on the **Add Item** button to start adding items to the package.



In the Add Items page, select the category (the list name) for the Incidents list, since this is where all the application elements for this application reside.

Tip

Selecting the category ensures that all of the artifacts associated with the K2 application are included in the package. You should unselect any items that do not form part of the application. There may be remnants of previous solutions or items that you manually created via the K2 Designer which can be seen in the deployment tool but that do not show on the K2 application elements page in SharePoint. Do a comparison of the two to make sure what's selected in the tool is what's shown on the artifact page. For example, in the following image, the **Test** form has been unchecked after clicking the **Incidents** category, because it is not part of the solution.

Note

Although the Departments category is unchecked, this will be automatically included as part of the application package as long as the **Automatically include dependent items** remains checked on the first page of the Create Package wizard. This is because K2 detected that the Departments list is being used as a lookup in the application and therefore should be included in the package.

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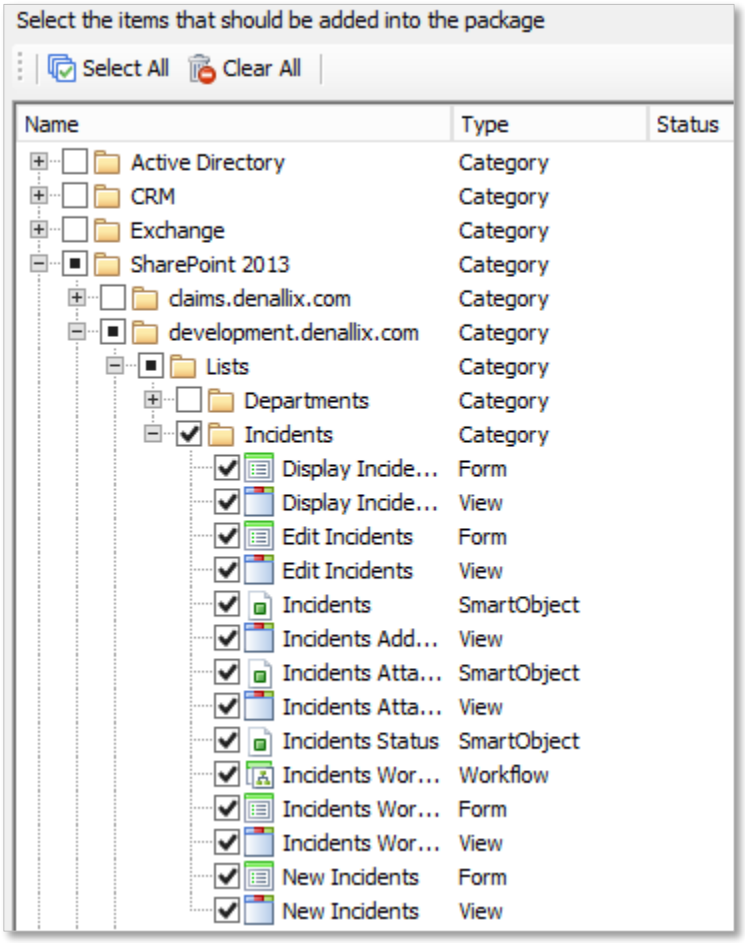

Click **OK** to start creating the package. You should see a spinner that indicates K2 is busy creating the package. This may take several seconds or even minutes to complete as K2 is determining the items that need to be included in the package. Once K2 has determined the items to include in the package, click the **Finish** button to finish creating the package.

Notice that K2 will attempt to discover, include and show dependent items that were included in the package. Review the selected items to ensure that all the required items were included in the package.

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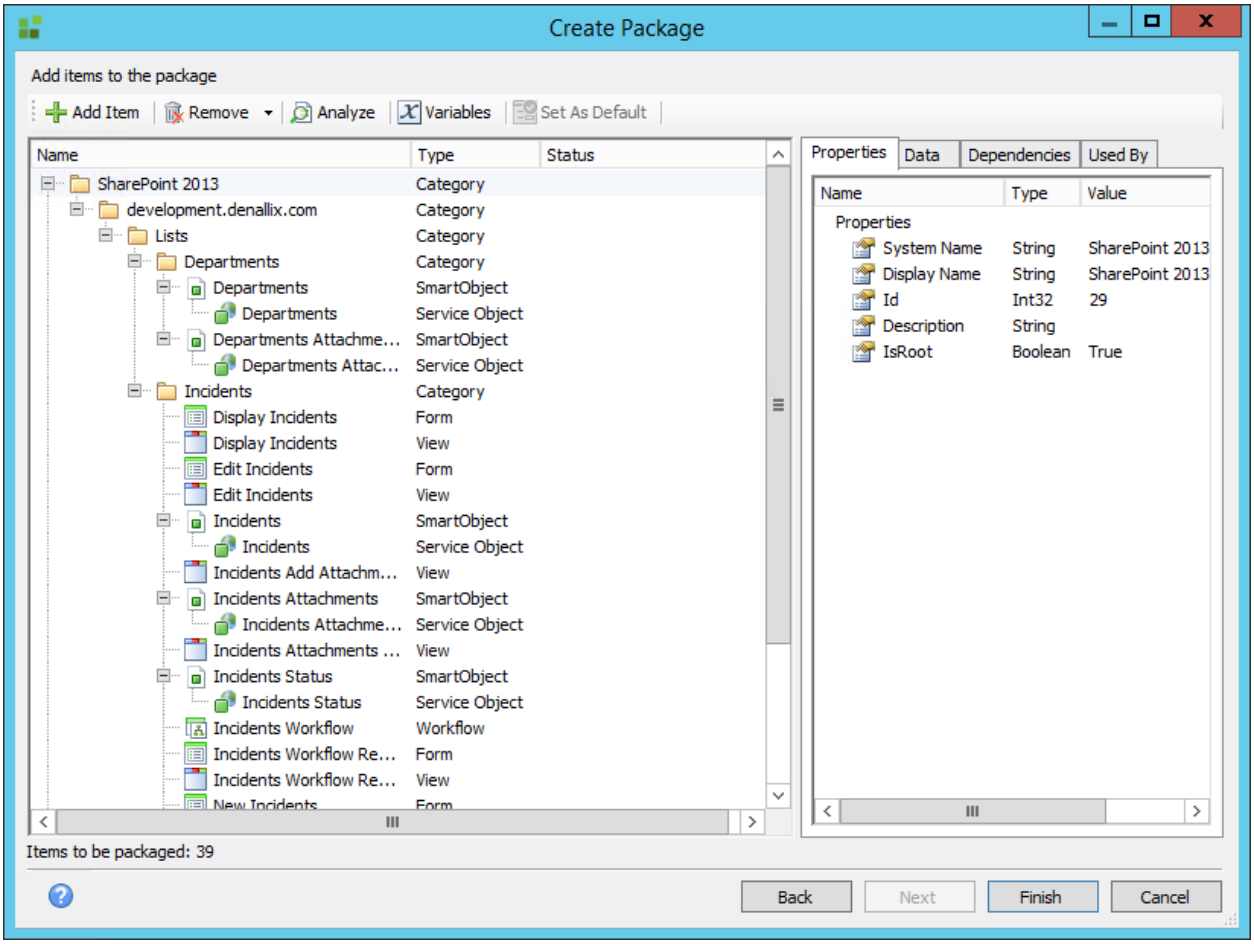

Once the package is created, copy the package file (.kspx) to the K2 server for the target environment, in this case the Production K2 server. Launch K2 Package and Deployment on the target server and select

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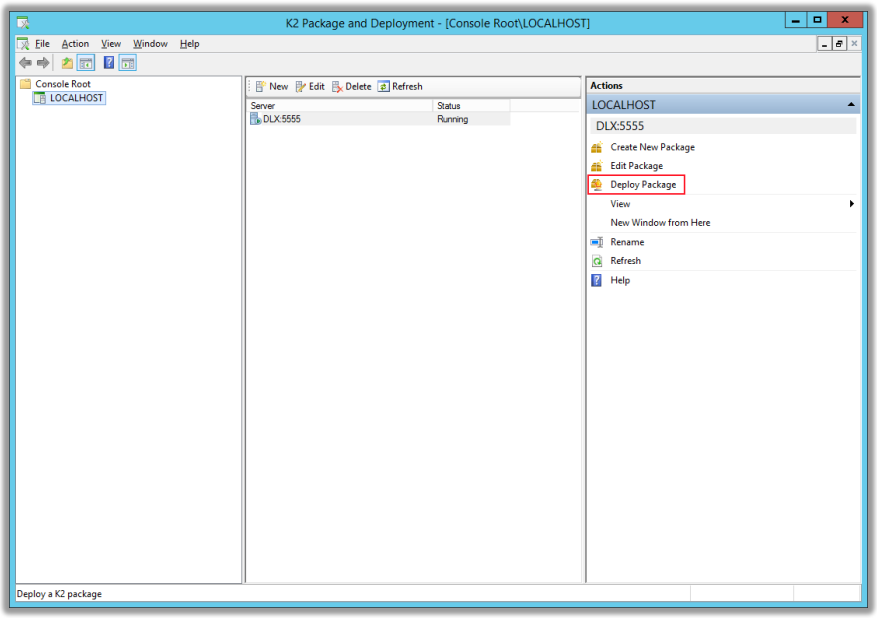
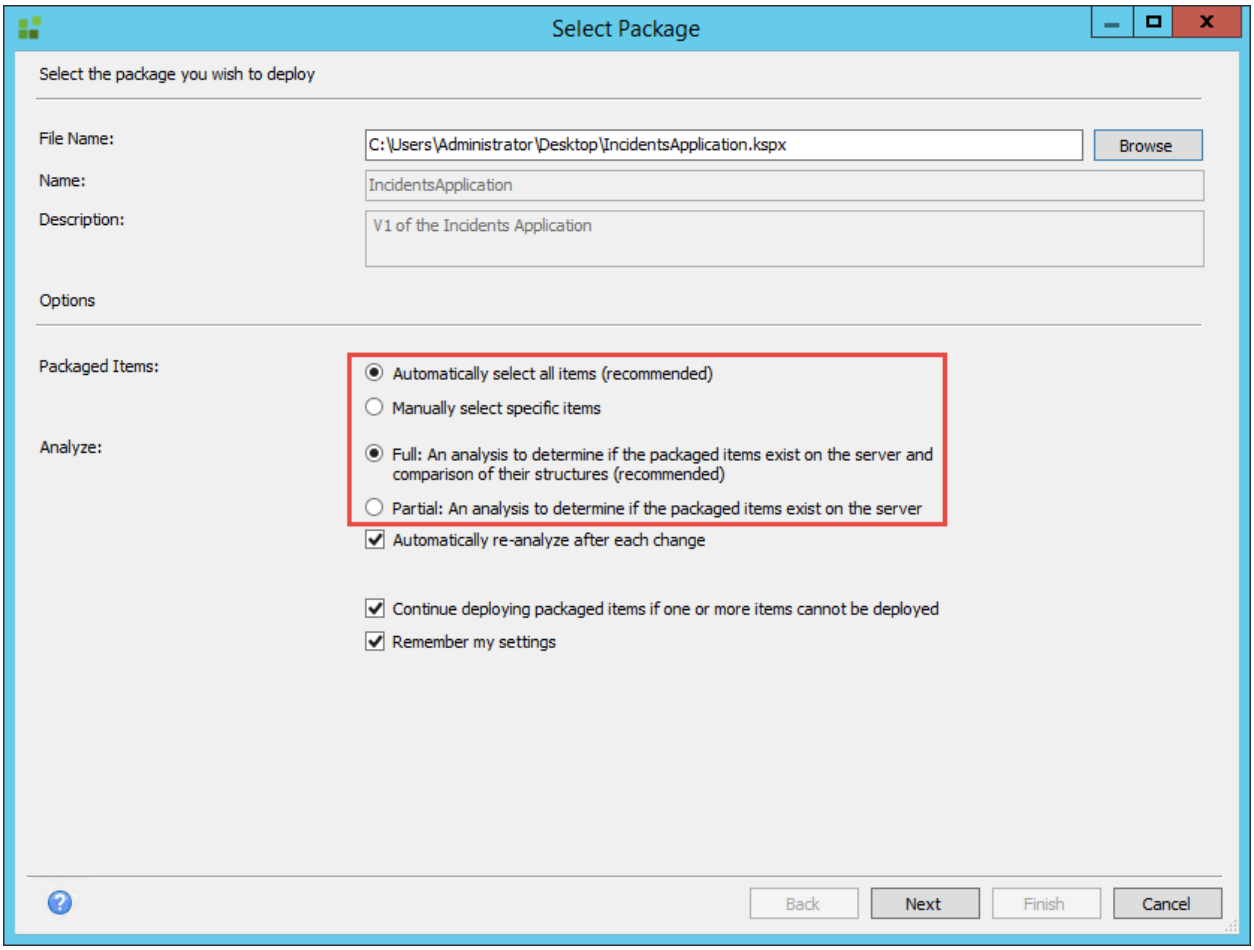
the **Deploy Package** option.



Open the .kspx file that you copied over and use these recommended settings shown below for the **Packaged Items** options.



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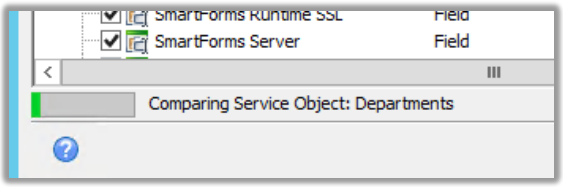
Automatically select all items	P&D will deploy all the items in the deployment package
Full analysis	P&D will analyze the target server to determine if any of the items in the package already exist on the target server. If duplicate items are found, you will be prompted on the next screen whether you wish to use the existing items or overwrite the items on the server with the items in the package.

Click **Next**. The analysis part of the package deployment will begin. In the lower left portion of the P&D tool, you should see a progress bar indicating the progress of the deployment analysis.



During this process, the schema of each item in the package is compared against what is currently deployed to the server. Since this is the first deployment, P&D should not find anything that matches on the target environment and therefore will default the Action column to create new items on the target server.

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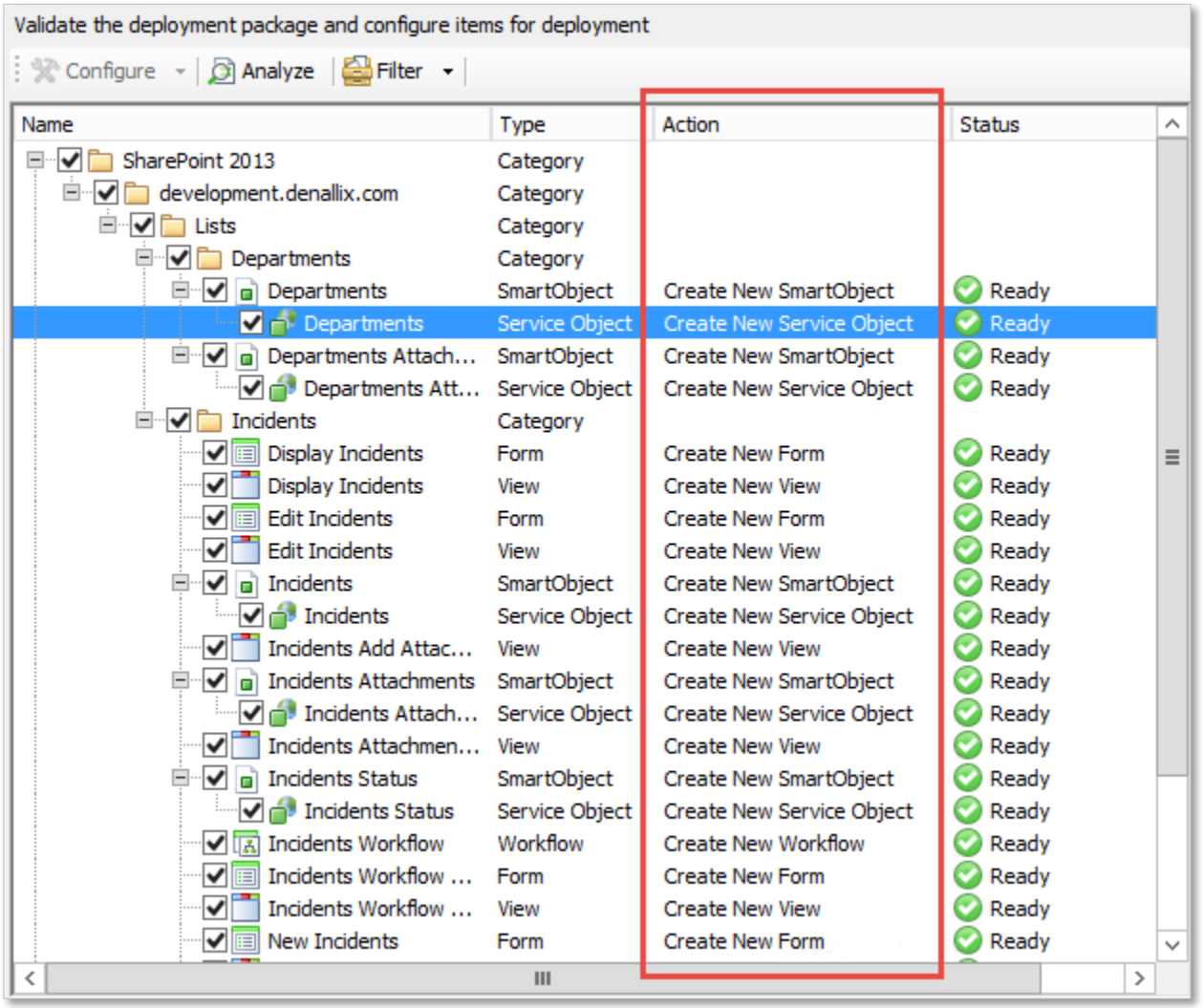

Note During the deployment process you may need to resolve missing service instance references, because K2 uses the name of a service instance to determine if an existing item exists already. If the site URL and list name exactly match between your source and target environments (for example deploying from https://development.denallix.com to https://development.denallix.com for a list called Incidents), the name of the service instance associated with the SmartObjects should also match between the environments and you should not need to resolve any missing service instance references, because Package and Deployment is able to find the service instance in the target environment

NO MISSING REFERENCES

In the image below you are deploying between environments where the Site URL and List Name for the Application match exactly, and therefore all the items are ready to be deployed because P&D was able to determine the service instances and lists that the SmartObjects should be associated with.

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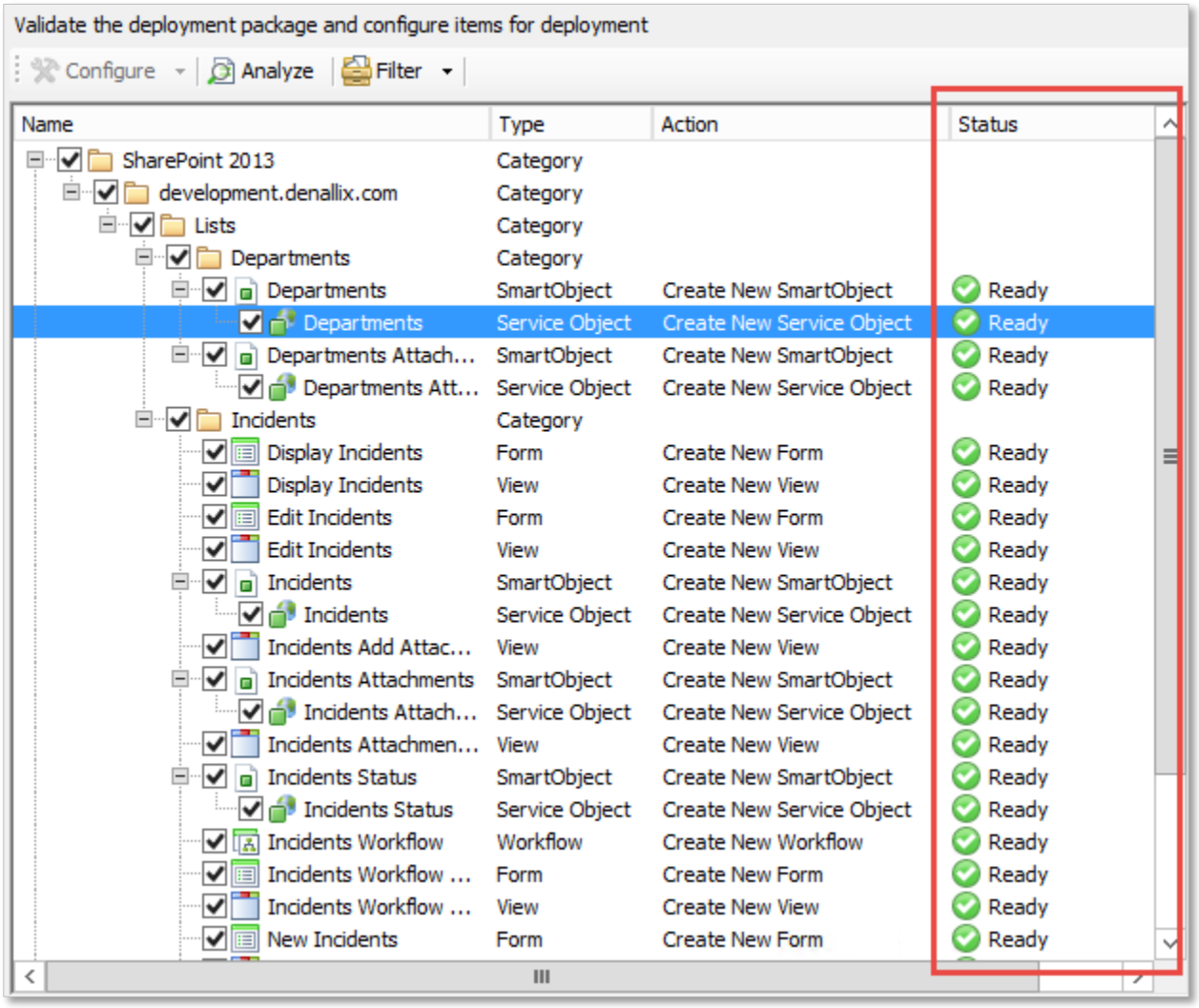

Click **Next** to deploy the items. If necessary, click **Retry** to re-deploy any items that may have failed to deploy.

RESOLVING MISSING REFERENCES

If you were deploying the package to a target Site with a different URL or site name (for example deploying from http://development.denallix.com to https://production.denallix.com for a list called Incidents), you must resolve the missing service instance references because P&D does not know which site the SharePoint list for the application resides in, and by implication which service instance it should bind the SmartObjects to. In this case, you will need to resolve the missing service instance references. (For more information about missing references see Direct and Indirect Missing References.)

To resolve missing references, start with direct missing references (items marked with Missing Reference) for the service objects in the deployment package. To do so, select one of the service objects in the application and then, in the **Properties** pane on the right, locate the **Service Instance** property as shown below.

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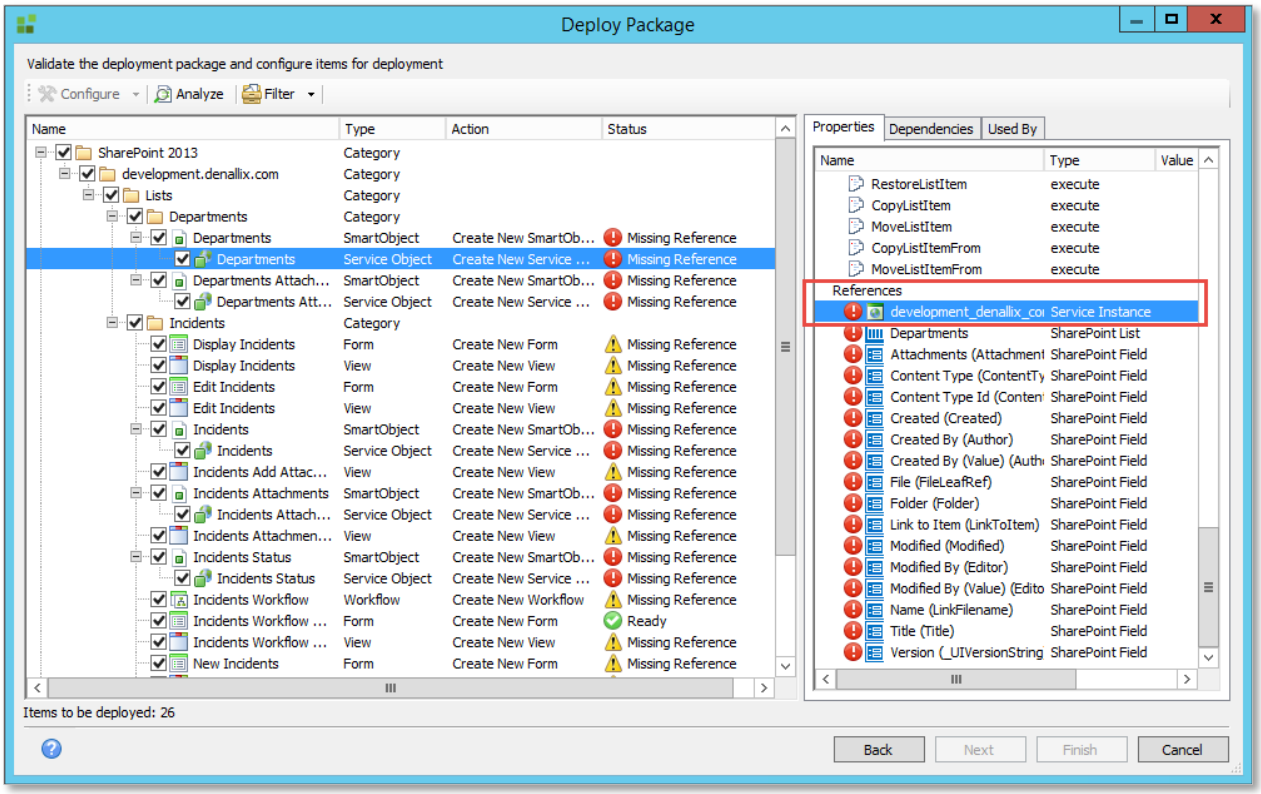

Note If you do not see a Service Instance in the properties of a service object that reports a missing reference, you have either resolved a different service instance already, or P&D found a matching service instance in the target environment. The latter case can happen if the source SharePoint environment is also registered in the target K2 environment, such as when you are using a virtual environment like the K2-provided Denallix VM. This should not typically happen in a standard enterprise environment.

Double-click the Service Instance property and then click the ellipses at the top left of the **Configure** page.

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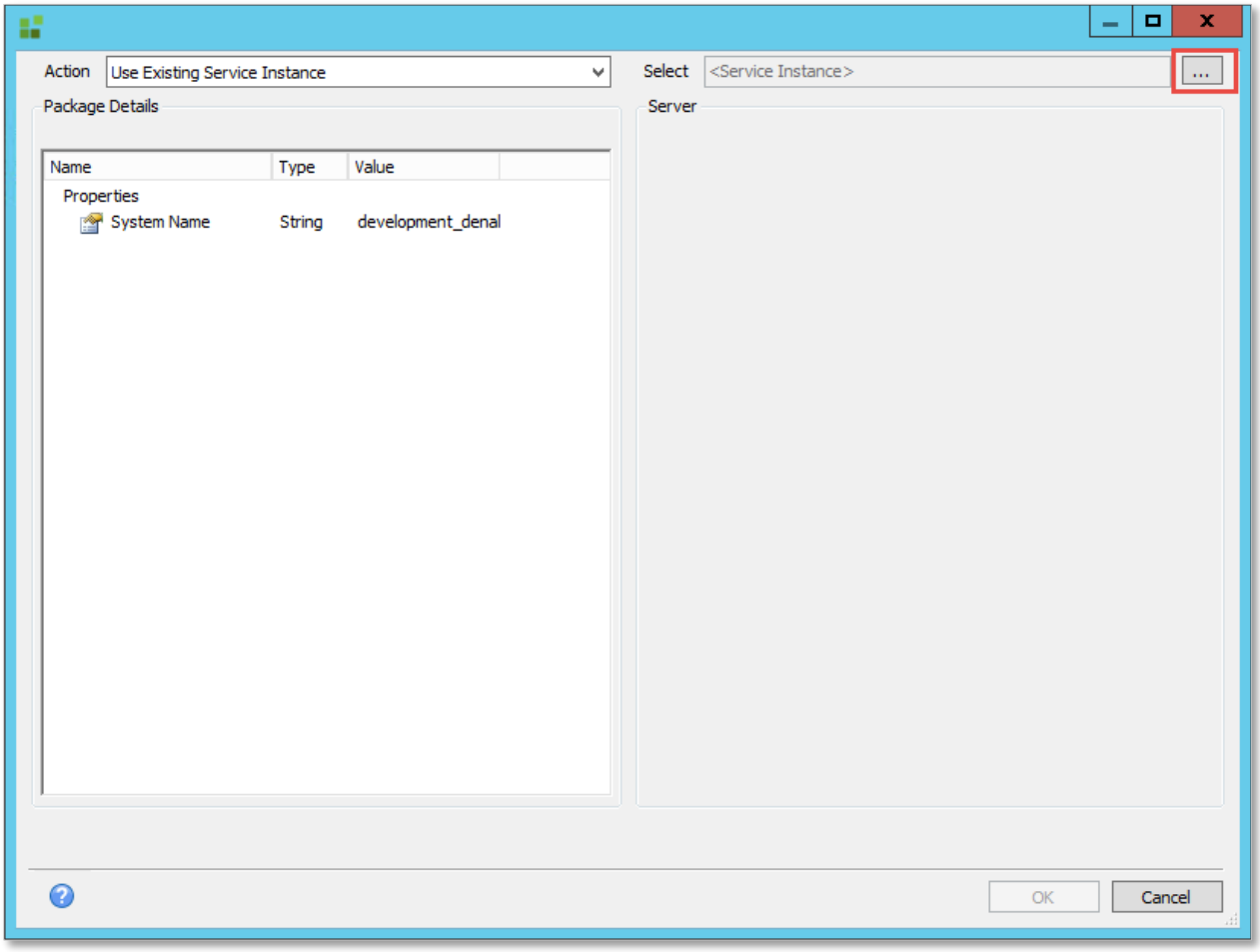
SharePoint Application Lifecycle Management



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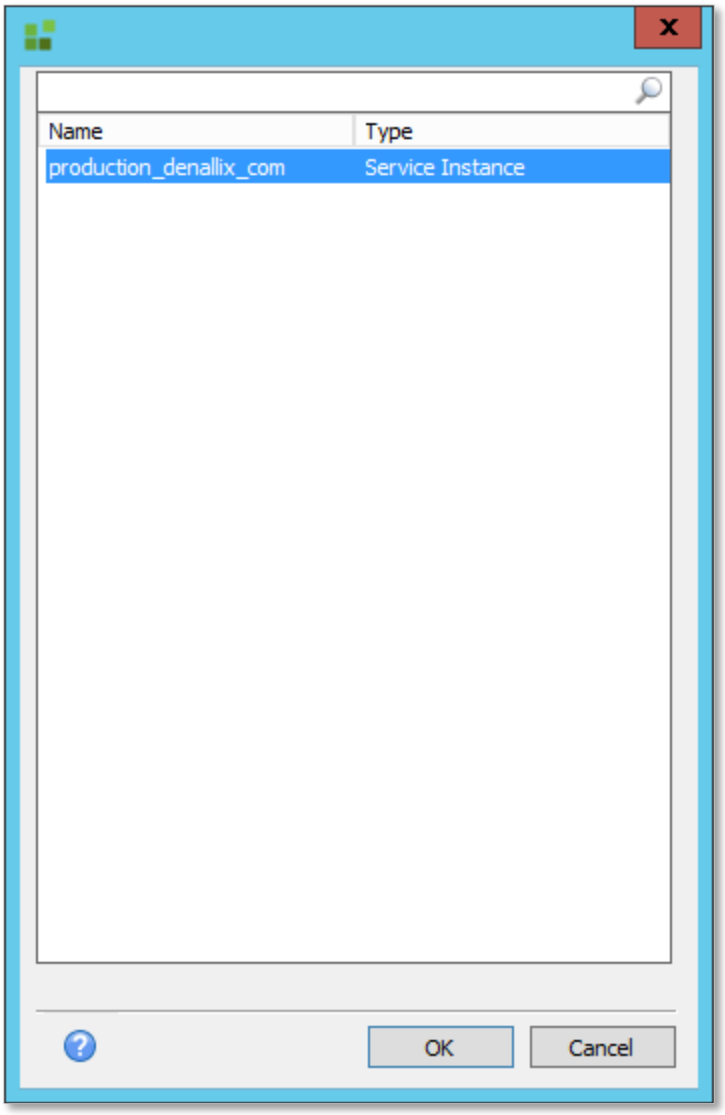
This displays a list of registered service instances on the target environment. Select the correct service instance for the target environment and click **OK,** and then **OK** again.



Note If you do not see any service instances, you have not added the K2 for SharePoint app to the target SharePoint site yet.

Once you select a service instance, all of the matching service objects in the package will be remapped to that service instance. If you have service objects from a different, secondary service instance, you must remap those to an existing service instance as well.

You will still see that there are missing references reported. After remapping the service instance, you must remap the service objects to their corresponding lists and libraries on the target environment. Select one of the service objects that is reporting a direct missing reference, and in the **Properties** pane

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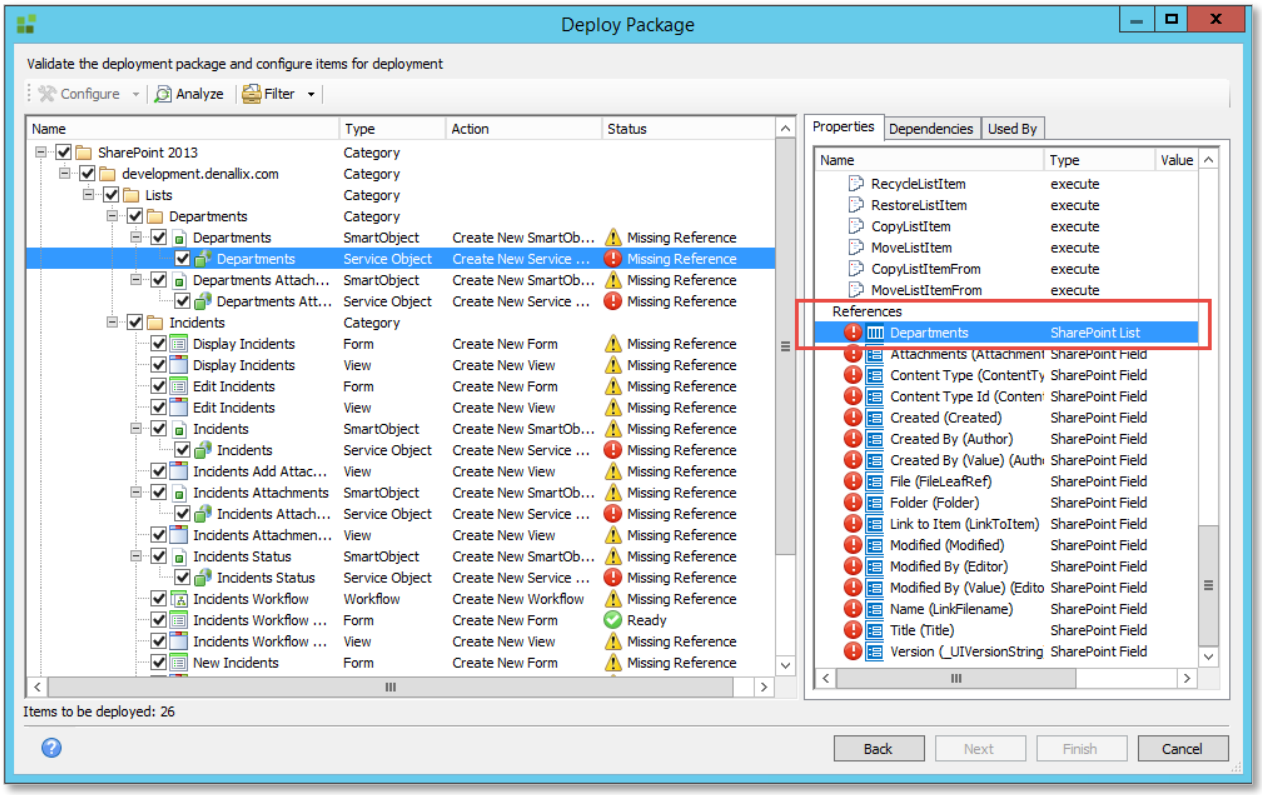
double-click the SharePoint List property as shown below:



The **Configure SharePoint List** browser appears. In this window, select the list that should be associated with the service object; in this page select the Departments list because you selected the

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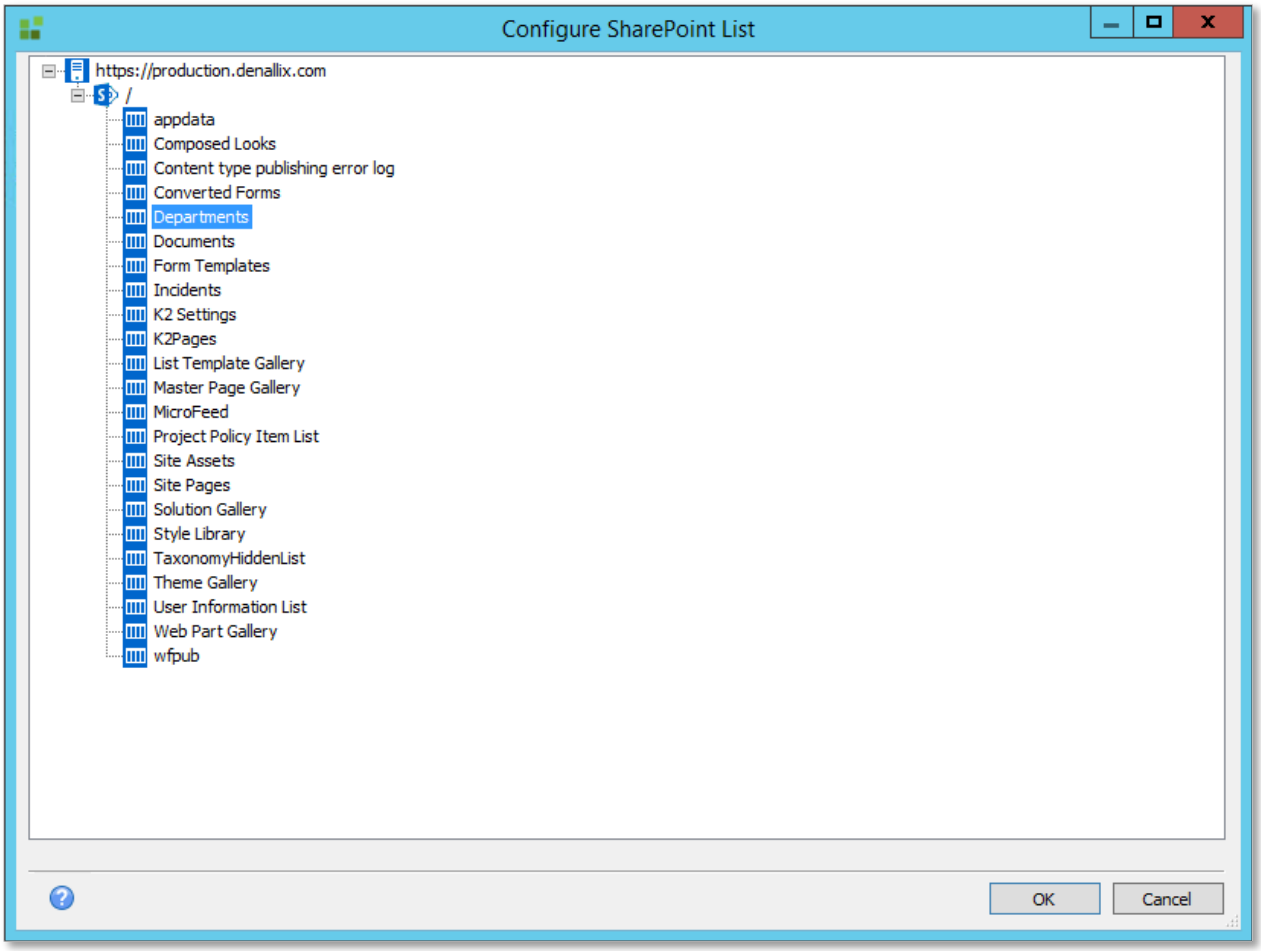
Departments service object



After selecting the list corresponding to the service object and clicking **OK**, P&D attempts to resolve the references (this may take a few seconds). Behind the scenes, P&D is retrieving the schema of the specified list on the target SharePoint site and comparing it with the schema of the service object in the package. As long as the lists and libraries are in alignment between the SharePoint environments, the status of both the service object and the SmartObject turn green and all the items in the package change

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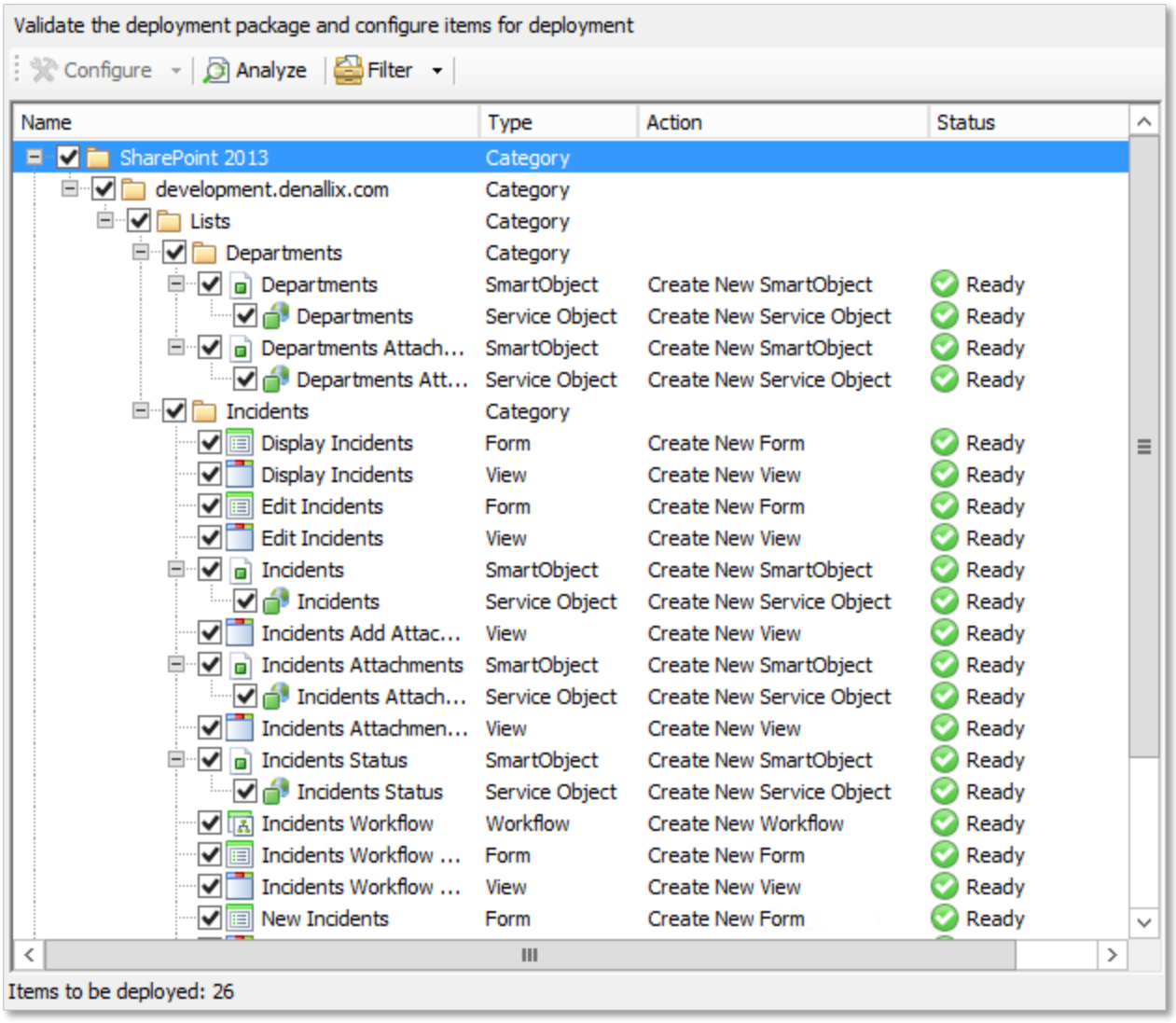
to **Ready** as shown below:



Tip

When a list or library is not in alignment you'll see something in the references that lists the fields that are not resolved. To resolve this issue, you must go to the list or library in the target SharePoint site and create the missing fields. Once you have done this, restart P&D and begin the deployment process again. If you still see errors after you've made sure that all of the columns are the same and have the same settings, click the **Analyze** button to attempt to resolve issues and investigate the errors reported. If you still do not have a status of Ready, there is likely a metadata problem with the list or library. These types of issues can be settings on the list or library such as content types, versioning, or attachments. It is imperative that the lists and libraries match exactly, or K2 P&D will not allow you to proceed.

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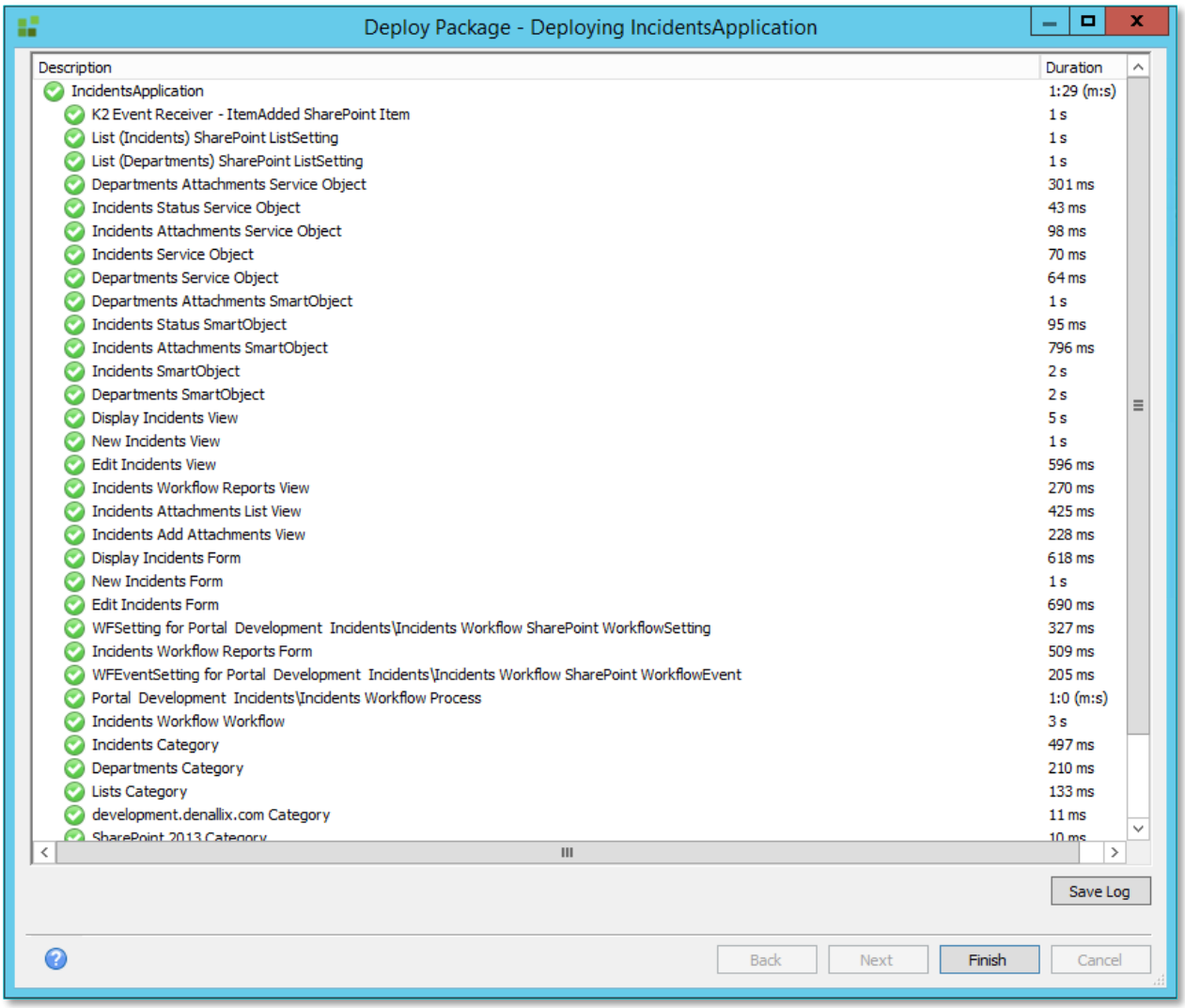
Note

- If the list on the target site is already appified (K2 integration has been completed for the list), you should delete the K2 artifacts from the list using the application elements page, and then delete the list itself. Once that is cleaned up, create the list again, either from a template or manually.
- When resolving missing references and getting the package ready to deploy, you will notice that the main category still has the name from the development environment. This is OK and will be fixed up in the post-deployment tasks.

After you have successfully resolved all missing references and retargeted all service objects to their appropriate list or library, you can click **Next** to deploy the K2 application. If the package does not successfully deploy, retry the items that did not deploy.



Once all the items are deployed, click **Finish** to complete the wizard and then close the tool.

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If required, use the K2 Workspace or the K2 Management Site in SharePoint to set the workflow permissions for the deployed workflow, along with any specific settings such as data values that may be required by the application.

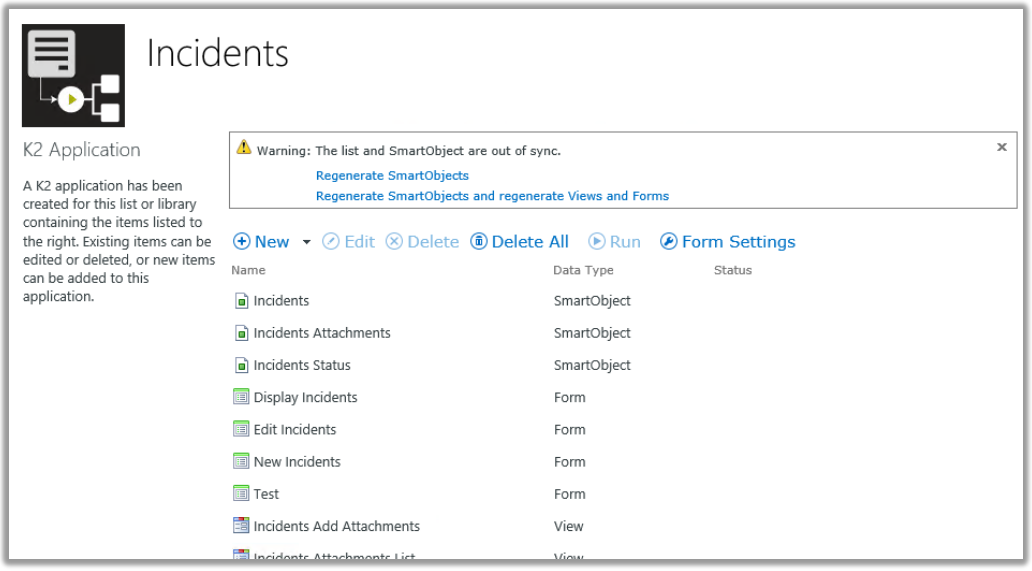
Now you can test the solution by browsing to the main list and clicking the **New** button to create a new item.

Scenario 2 (P&D): Adding a column (field) to an application

You may want to make changes to your application after it has been deployed. For this scenario, we have added a text column called **Site of Incident** to the list in the Development site. This column will contain information about where the incident took place.

SYNCHRONIZING CHANGES BETWEEN THE LIST AND THE APPLICATION ELEMENTS

Once the column is added, the SmartObjects, forms and views in the application must be updated to include this column. To do so, browse to the K2 Application page and notice the message that indicates that the K2 artifacts are out of sync:



Caution

If you had customized the forms or views after they were generated, do not click the **Regenerate SmartObjects and regenerate Views and Forms** option, because this will erase your customizations. If you did customize the generated forms, you should only click the **Regenerate SmartObjects** option and then manually modify the forms and views for the application

Caution

If you deleted a column, you should not automatically regenerate your items as this would affect running instances of the workflow. See scenario 3 for more information.

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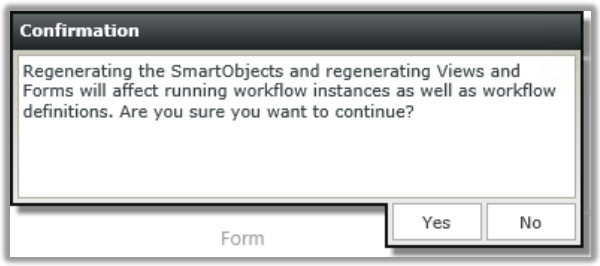
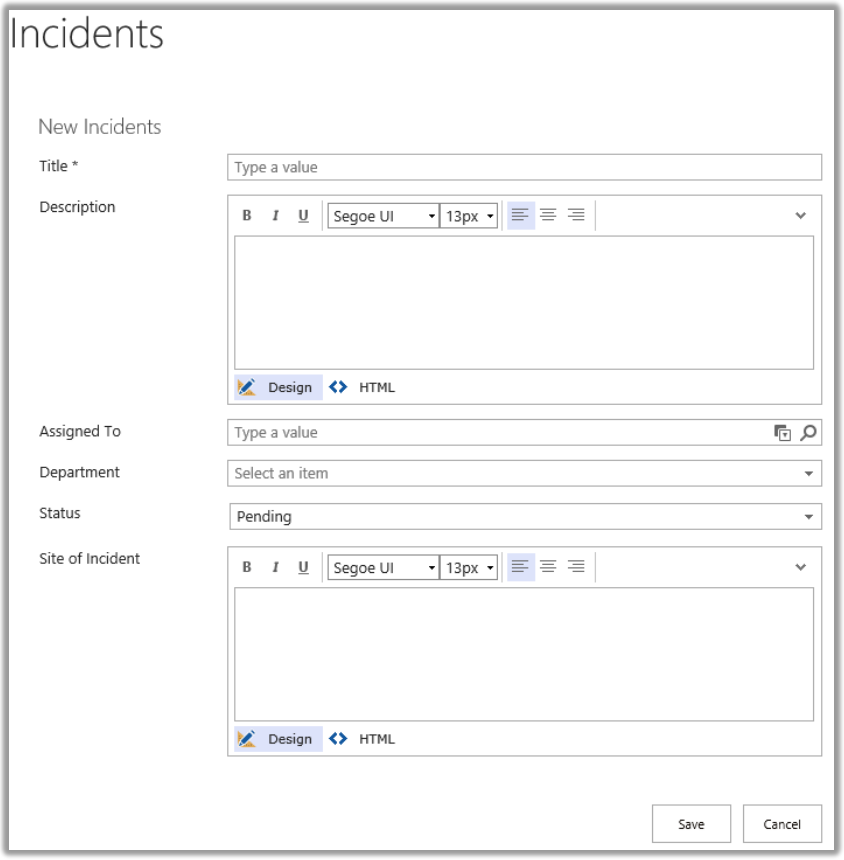
To bring everything in sync with the list changes, click the **Regenerate SmartObjects and regenerate Views and Forms** link. Say **Yes** to the confirmation dialog and K2 regenerates the application elements.



After this has completed, click **New** to verify that the new field (Site of Incident) is on the form:



Note

The new column may impact running workflow instances of the application. The new column now appears on all forms, even for those list items created before **Site of Incident** was part of the solution. Therefore it is recommended that any time you add columns to your solution you make them optional, otherwise the form will not validate the next time it is opened in the solution until the field is filled in.

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Use the P&D tool to generate a new package for the application to package the updated application elements.

> **Tip** You could use the **Edit Package** link to remove and re-add the package items from the initial package, but it is safer to re-package the solution using the same method as described in Scenario 1. It is also a good idea to keep the original package and all refreshed packages in a source control system.

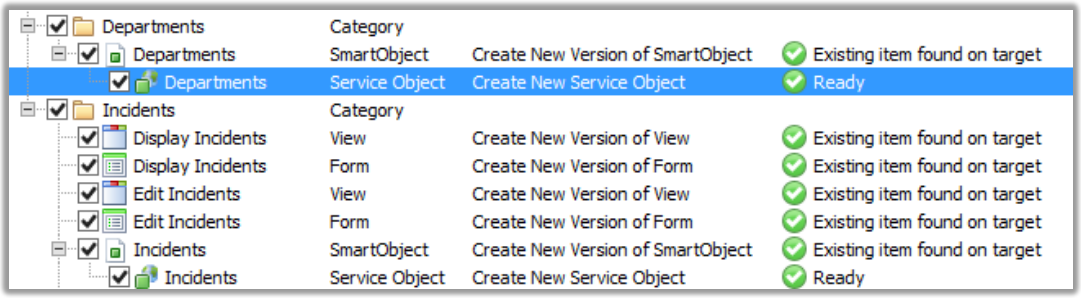
Once the new package is created, copy the package to the K2 server for the target environment.

Manually add the new column to the Incidents lsit in the target SharePoint site. (You cannot use list templates again because they cannot be used to update existing list definitions).

Once you've added the column in the target (Production) SharePoint environment, deploy the updated package to the target environment just like you did in Scenario 1. Depending on your environment setup, you may need to resolve missing references again as you did before, since retargeting information from the previous deployment is not saved in the package or on the server.

In some cases you will create new versions of items that already exist and other times you'll create new items. For more information see Versioning of K2 elements and artifacts.

For example with the solution used in the scenarios, you will see some differences in the default actions for items, compared to the original deployment. Notice that P&D has identified that existing items were found on the target environment, and by default will create new versions of the existing items. If you wish, you may select an alternative action (such as **Keep existing version**) but this is usually not required unless you have a specific reason for not updating the targeted item.



Once you have deployed the solution again, test the solution out for new and existing items. In scenarios where you are adding columns, especially columns that are not required, there should be little impact when deploying new versions of the Application elements.

SCENARIO 3 (P&D): DELETING A COLUMN

For the full discussion of this scenario, see the prior section Scenario 3: Deleting a column (field) that was used in an application

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Once you've deleted the column, deploy the new package to the target environment. You must resolve references as you did before, since resolved reference information is not saved in the package or on the server.

SCENARIO 4 (P&D): CHANGING A USER TASK FORM TO A DIFFERENT FORM

For the full discussion of this scenario, see the prior section Scenario 4: Changing a User Task Form to a different Form

Once you've changed the form, deploy the new package to the target environment. You must resolve references as you did before, since resolved reference information is not saved in the package or on the server.

SCENARIO 5 (P&D): ADDING OR DELETING A FIELD ON A FORM THAT WAS CUSTOMIZED AFTER BEING GENERATED

For the full discussion of this scenario, see the prior section Scenario 5: Adding or deleting a field on a Form that was customized after being generated

Once you've added or deleted a column, deploy the new package to the target environment. You must resolve references as you did before, since resolved reference information is not saved in the package or on the server.

SCENARIO 6 (P&D): SIMPLE SCENARIO USING REFERENCED ITEM ARTIFACTS

Including artifacts using the referenced items option adds some considerations when using K2 Package and Deployment. This scenario outlines a simple decision path of what is included, and what is not included when using the **Referenced Items** option when you create the package.

The example application uses three lists - the Customer Sales list which has a lookup to the Region list, which in turn has a lookup to the Country list, as shown below:

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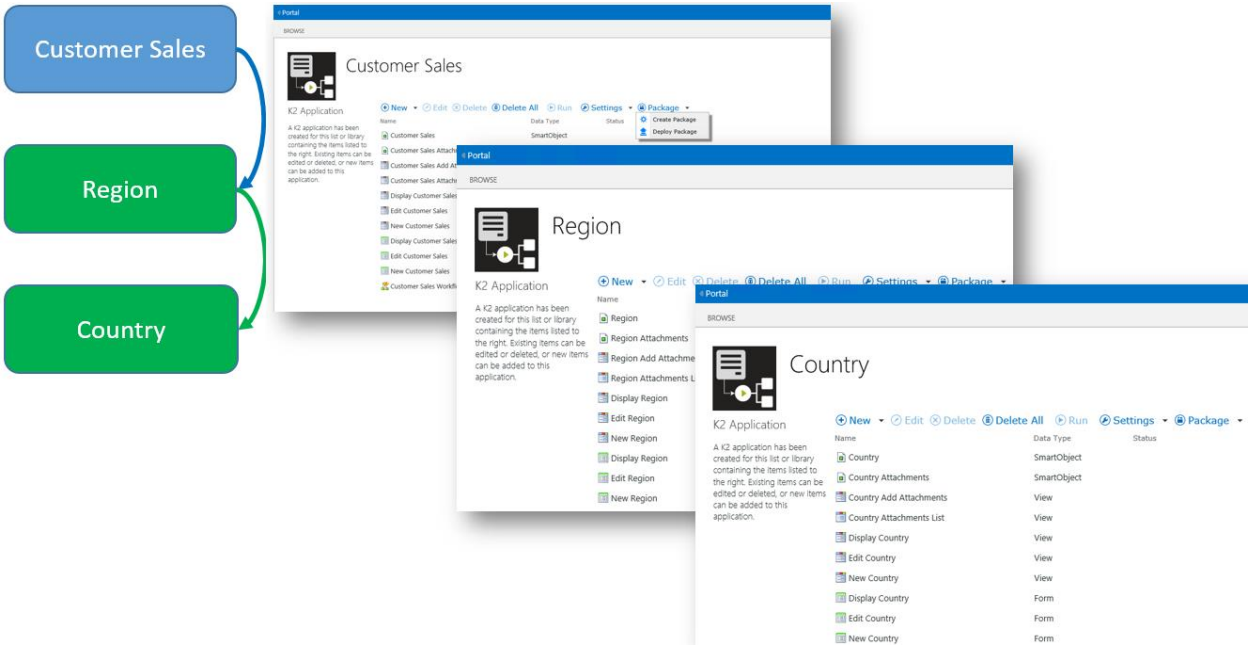
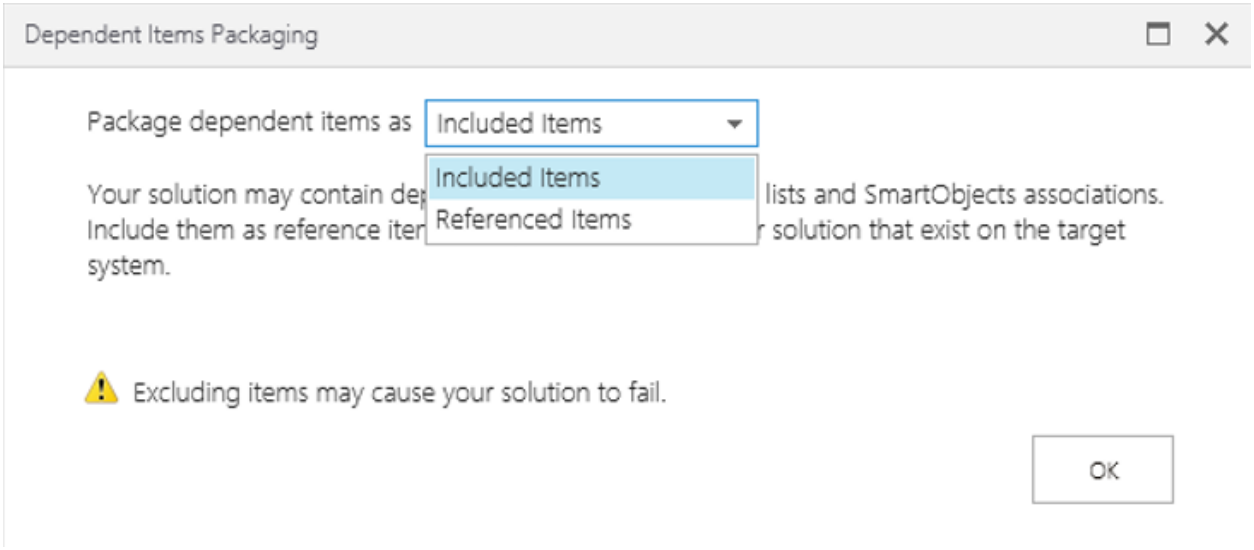
SharePoint Application Lifecycle Management



When packaging the Customer Sales list (shown in blue) using the **Package dependent items as Included Items** option, all three lists and their associated content is included in the package.



The inclusion of all the items in the package is shown below:

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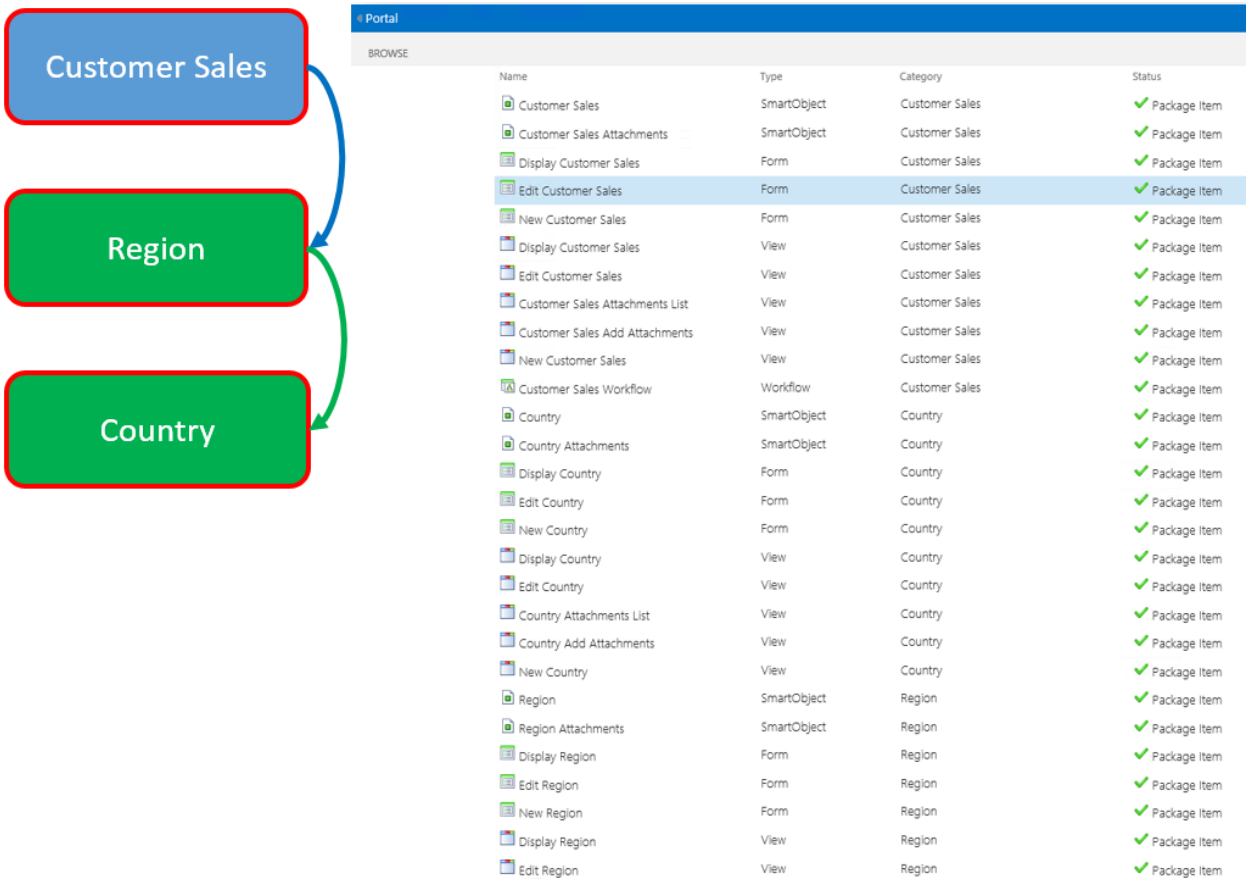
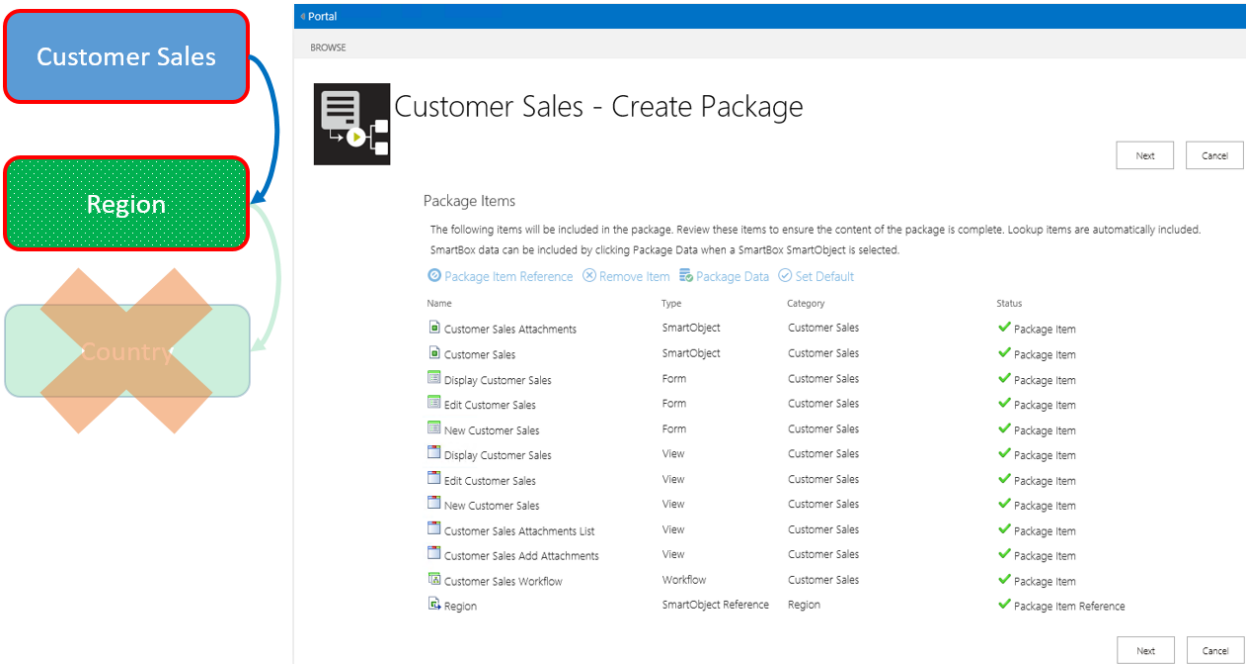


If, however, the **Referenced Items** option is selected, then only a reference to the first lookup list is added to the package, and any subsequent lookup relationships are ignored.



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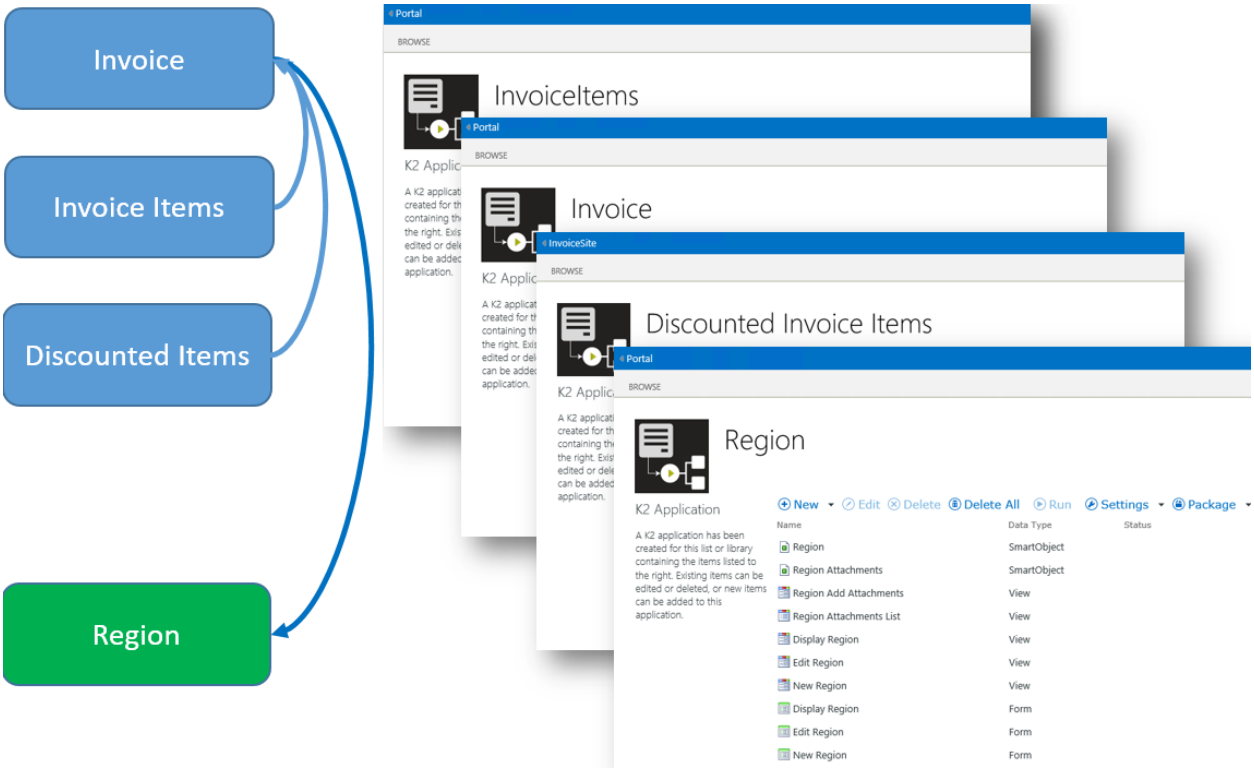
Packaging using Referenced Items assumes that the referenced artifact already exists on the target environment, including all additional lookup items, such as in this case Country.

SCENARIO 7 (P&D): COMPLEX SCENARIO USING REFERENCED ITEM ARTIFACTS

As shown in Scenario 6, including artifacts using the **Referenced Items** option for packaged items adds considerations when using Package and Deployment. This scenario traces a more complex decision path of what is included, and what is not included, when using this option.

The example application uses four lists -- Discounted Items, Invoice Items, Invoice, and a Region list from a shared app, where there are lookups from Discounted Items to Invoice, Invoice Items to Invoice, and Invoice to Region, as shown below:



When packaging the Invoice Items list using the default **Package dependent items as Included Items** option, only the three lookup-related lists and their associated content will be saved to the package.

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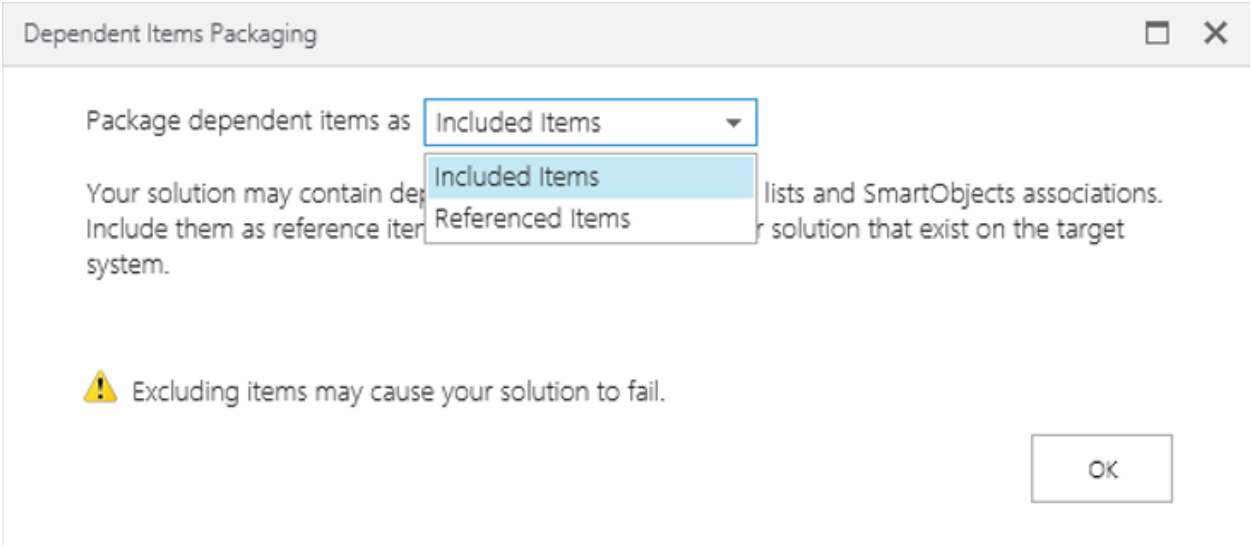
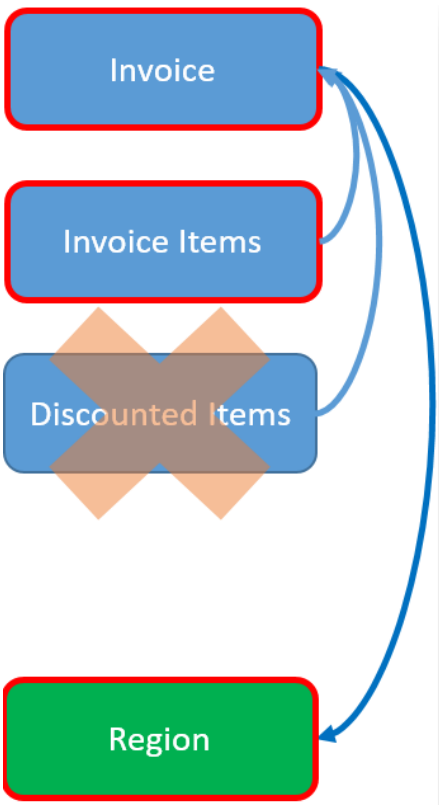
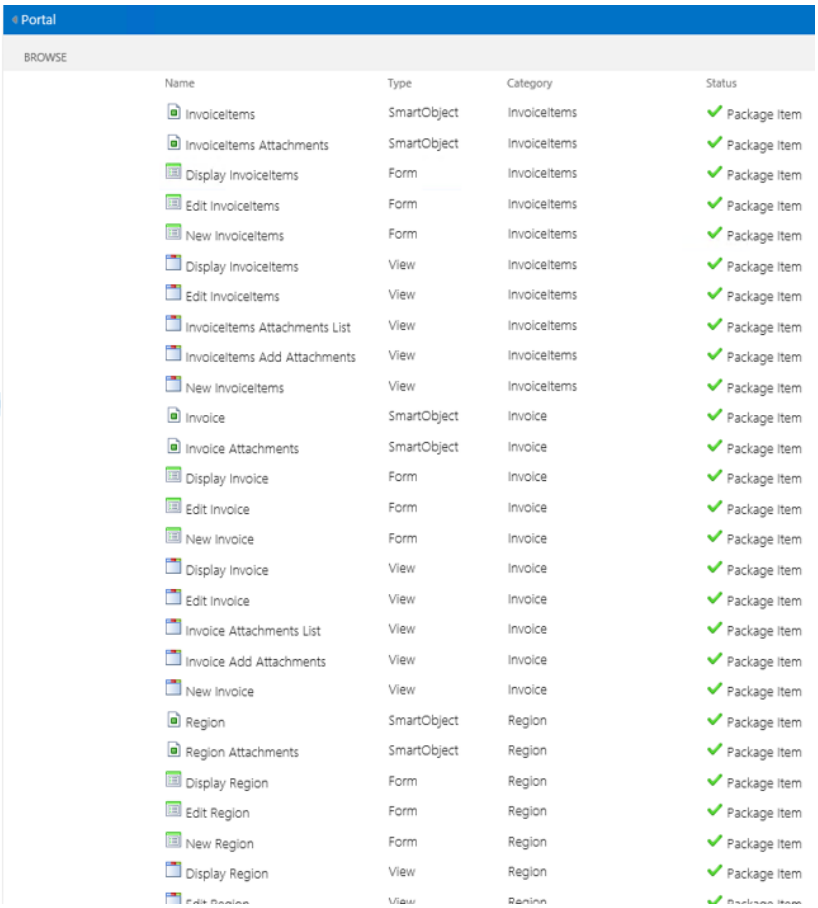


The inclusion of the artifacts of the three items in the package is shown below:





The Discounted Items list is not packaged as there is no lookup relation from Invoice Items to Discounted Items.

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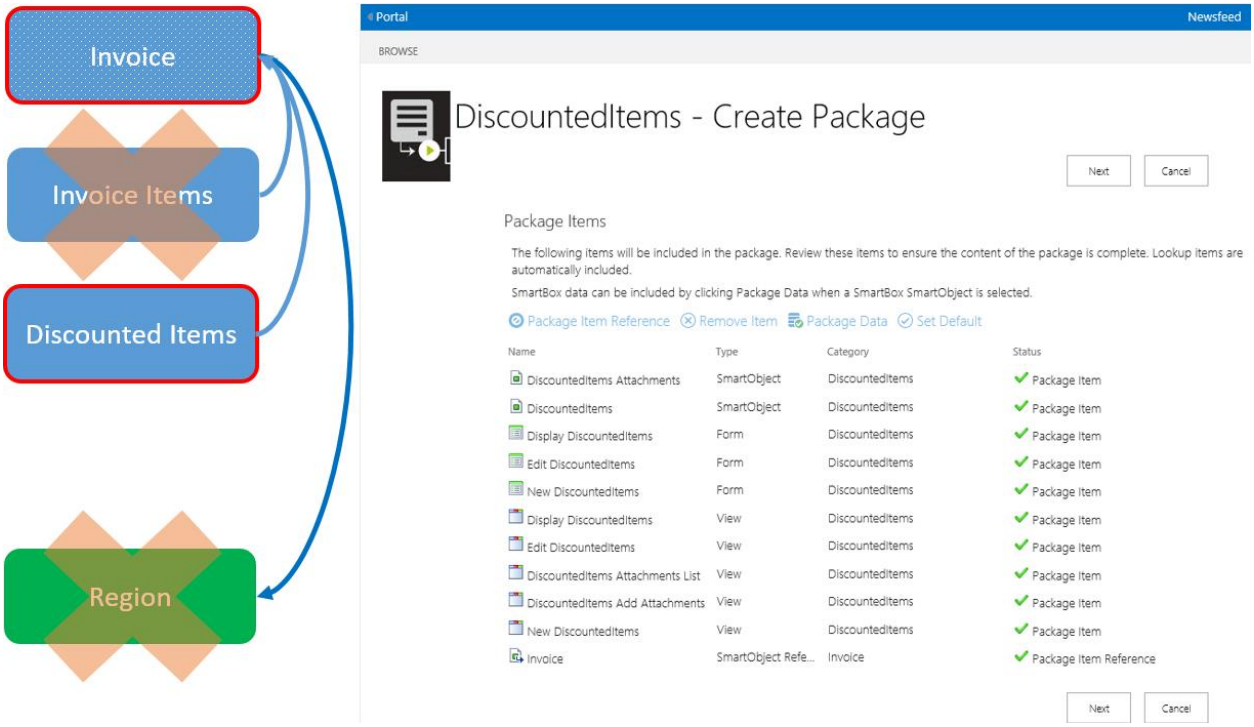
Finally, if you package Discounted Items, and use the **Referenced Items** option, your package would contain the Discounted Items artifacts, a reference to the Invoice artifact, and nothing else.



In a scenario like this, you could use two packages to move the whole application from your testing environment to your production environment.

Packaging this way by using the Referenced Items option is also useful when you have already deployed the application in another environment and you have updated something in one of the lists. In this case you can package the single artifact that has been updated, and package everything else by reference because it already exists on the target environment.

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