To synchronize data from Kentico to external applications, you need to decide:

- which **objects** and **pages** you want to synchronize
- which data type you want to use
- whether you want to use synchronous or asynchronous processing of integration tasks
- whether you want to handle **translations** of foreign key bindings

Use this information to implement the outgoing synchronization in your connector class:

1. Prepare subscriptions for the Kentico objects that you want to synchronize:
   - Use predefined subscription methods - allows you to easily subscribe to objects or pages
     OR
   - Build subscription objects - allows you to select exactly which objects are synchronized

   You can create your own subscription class if you need to define custom options for the subscription scope.

2. Implement the method that converts objects or pages to the objects used by the external application.

3. (Optional) Implement translation of foreign key bindings:
   - GetExternalObjectID method - if the synchronized objects or pages have bindings to objects inheriting from *BaseInfo*
   - GetExternalDocumentID method - if the synchronized objects or pages have bindings to pages (*TreeNode*)

Creating subscriptions

Subscriptions keep track of actions that occur in Kentico, such as creating, updating or deleting objects and pages. Use subscriptions to determine the scope of the changes that the connector synchronizes.

You need to implement subscriptions inside the **Init()** method of your connector class:

```
using CMS.SynchronizationEngine;
using CMS.Synchronization;
using CMS.DataEngine;

public class CMSIntegrationConnector : BaseIntegrationConnector
{
        public override void Init()
        {
                // Initializes the connector name
                ConnectorName = GetType().Name;

                // Register your subscriptions here
        }
}
```

Using predefined subscription methods

You can subscribe to pages or objects by calling the following methods:

- SubscribeToAllDocuments
- SubscribeToDocuments
- SubscribeToAllObjects
- SubscribeToObjects

See Reference - Integration bus data types for information about the method parameters.

Examples:

```
// Subscribes to all types of changes made to user objects
SubscribeToObjects(TaskProcessTypeEnum.AsyncSnapshot, UserInfo.OBJECT_TYPE);
```

```
// Subscribes to all types of changes made to all pages on all sites
SubscribeToAllDocuments(TaskProcessTypeEnum.AsyncSimpleSnapshot, TaskTypeEnum.All);
```

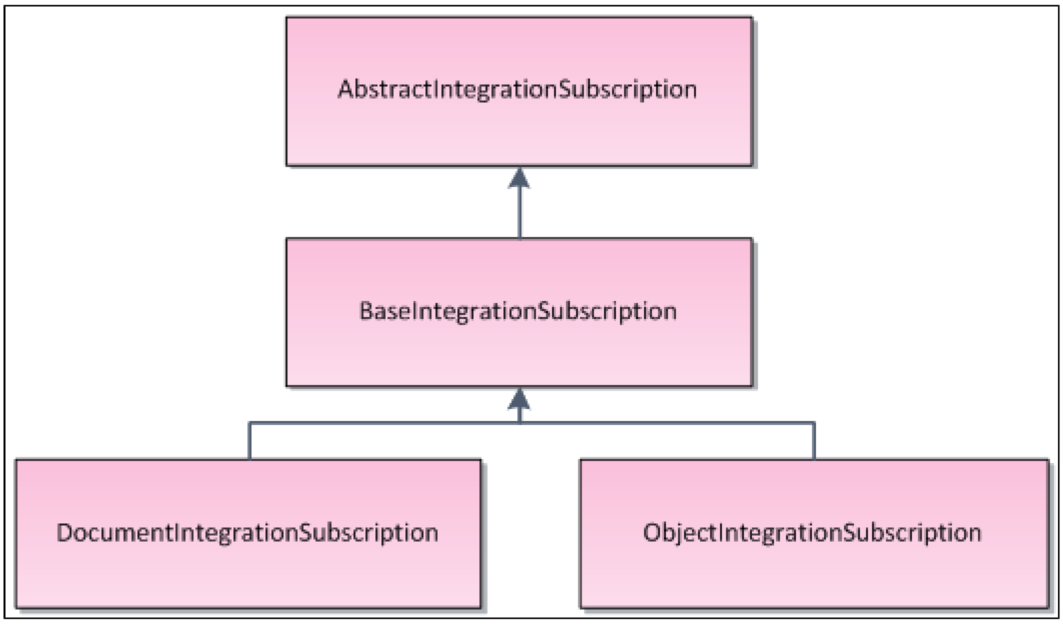
Building subscription objects

You can select exactly which objects are synchronized using subscription objects:

1. Create a new object of a subscription class.
2. Call the **SubscribeTo** method for the object.

Subscription classes inherit from *AbstractIntegrationSubscription*, and you can use the following predefined options:

- BaseIntegrationSubscription
- ObjectIntegrationSubscription
- DocumentIntegrationSubscription


AbstractIntegrationSubscription
BaseIntegrationSubscription
DocumentIntegrationSubscription
ObjectIntegrationSubscription

The subscription classes provide the following **filtering options**:

BaseIntegrationSubscription

- **ConnectorName** - string; assigns the subscription to a connector. Use the *ConnectorName* property to enter the name of the current connector.
- **TaskProcessType** - enumeration; specifies the synchronization mode and data type. See TaskProcessTypeEnum for details.
- **TaskType** - enumeration; determines the type of the synchronized action (create, update, delete, etc.). See TaskTypeEnum for details.
- **SiteName** - string; determines the code name of the site where the objects or pages belong. You can use *AbstractIntegrationSubscription.GLOBAL_OBJECTS* to subscribe only to global objects.

ObjectIntegrationSubscription

- **ObjectType** - string; determines the type of the synchronized object. You can either use the object type value directly (for example *cms.user*) or system constants (*UserInfo.OBJECT_TYPE*).

  Tip: To find object type values, open the **System** application in the Kentico administration interface and select the **Object types** tab.

- **ObjectCodeName** - string; determines the code name of one specific object, for example: *administrator*

DocumentIntegrationSubscription

- **DocumentNodeAliasPath** - string; determines the alias path of the synchronized pages, for example: */Products/%*
- **DocumentCultureCode** - string; determines the culture of the synchronized pages, for example: *en-US*
- **DocumentClassName** - string; determines the page type of the synchronized pages, for example: *CMS.MenuItem*

Wildcard character %

You can use the percent character (%) as a wildcard representing any number of characters in the string parameter values.

For example, if you specify the *DocumentCultureCode* as "en-%", the subscription covers all English cultures: *en-US*, *en-GB*, etc.

If you do not want to limit the synchronization scope through one of the properties, set the given value to ***null*** in the subscription object's constructor. For the *TaskType* enumeration, set the ***All*** value.

Examples:

```
// Subscription that synchronizes the creation of object types starting with 'poll.
poll' - polls and poll answers
ObjectIntegrationSubscription objSub = new ObjectIntegrationSubscription
(ConnectorName, TaskProcessTypeEnum.AsyncSnapshot, TaskTypeEnum.CreateObject,
"DancingGoat", "poll.poll%", null);
SubscribeTo(objSub);

// Subscription that synchronizes all changes made to pages on 'NewSite', located
under the /Home/ path in the content tree
DocumentIntegrationSubscription pageSub = new DocumentIntegrationSubscription
(ConnectorName, TaskProcessTypeEnum.AsyncSimpleSnapshot, TaskTypeEnum.All, "NewSite", "
/Home/%", null, null);
SubscribeTo(pageSub);
```

```
// Subscribes to all changes made to the SETTINGS of a specific custom table, where
'customtable.SampleTable' is the table's code name
ObjectIntegrationSubscription customTableSub = new ObjectIntegrationSubscription
(ConnectorName, TaskProcessTypeEnum.AsyncSimpleSnapshot, TaskTypeEnum.All, null, null,
"customtable.SampleTable");
SubscribeTo(customTableSub);

// Subscribes to all changes made to the DATA of the 'customtable.SampleTable' custom
table
ObjectIntegrationSubscription customTableDataSub = new ObjectIntegrationSubscription
(ConnectorName, TaskProcessTypeEnum.AsyncSimpleSnapshot, TaskTypeEnum.All, null,
CustomTableItemProvider.GetObjectType("customtable.SampleTable"), null);
SubscribeTo(customTableDataSub);
```

Creating custom subscription classes

If you need to extend the filtering options of a connector's subscriptions, you can create your own subscription class:

1. Create a new class inheriting from one of the existing subscription classes.
    - If you wish to create a completely custom subscription class, we recommend inheriting from **AbstractIntegrationSubscription**.
    - If you only wish to add custom filtering for objects or pages, inherit from **ObjectIntegrationSubscription** or **DocumentIntegrationSubscription**.
2. Define any properties and constructors that you need for the custom logic of your subscription class.
3. Override the **IsMatch()** method:

```
public override bool IsMatch(ICMSObject obj, TaskTypeEnum taskType, ref
TaskProcessTypeEnum taskProcessType)
{
        /* If you are inheriting from ObjectIntegrationSubscription or
DocumentIntegrationSubscription,
        * we recommend calling the IsMatch method of the parent class first:
        * bool result = base.IsMatch(obj, taskType, taskProcessType)
        * You can then use additional custom logic to modify the result. */

        /* Evaluate whether the subscription's properties match the properties of
the 'obj' parameter (TreeNode page or BaseInfo object)
        * and the value of 'taskType'.
        * Return a boolean value that indicates when objects match the
subscription requirements. */
}
```

You can then use the custom subscription class to build subscription objects.

Implementing outgoing synchronization

To synchronize the objects covered by your subscriptions to external applications, you need to override methods inside your connector class:

- **ProcessInternalTaskAsync** for asynchronous processing of integration tasks
- **ProcessInternalTaskSync** for synchronous processing

Asynchronous processing

The **ProcessInternalTaskAsync** method ensures asynchronous processing of **objects** (users, roles, forums, etc.) or **pages** (co ntent tree nodes):

Objects

```
public override IntegrationProcessResultEnum ProcessInternalTaskAsync
(GeneralizedInfo infoObj, TranslationHelper translations, TaskTypeEnum taskType,
TaskDataTypeEnum dataType, string siteName, out string errorMessage)
```

Pages

```
public override IntegrationProcessResultEnum ProcessInternalTaskAsync(TreeNode
node, TranslationHelper translations, TaskTypeEnum taskType, TaskDataTypeEnum
dataType, string siteName, out string errorMessage)
```

Synchronous processing

The **ProcessInternalTaskSync** method ensures synchronous processing of **objects** (users, roles, forums, etc.) or **pages** (cont ent tree nodes):

Objects

```
public override IntegrationProcessResultEnum ProcessInternalTaskSync
(GeneralizedInfo infoObj, TaskTypeEnum taskType, string siteName, out string
errorMessage)
```

Pages

```
public override IntegrationProcessResultEnum ProcessInternalTaskSync(TreeNode node,
TaskTypeEnum taskType, string siteName, out string errorMessage)
```

In all cases, the purpose of the method is to transform the *GeneralizedInfo* or *TreeNode* internal object into a corresponding object in the third party system, and perform the action specified by TaskTypeEnum. You also have to take the TaskDataTypeEnum into account. When you are done with the processing, set the error message and return an IntegrationProcessResultEnum value.

For example:

```
public override IntegrationProcessResultEnum ProcessInternalTaskAsync(TreeNode node,
TranslationHelper translations, TaskTypeEnum taskType, TaskDataTypeEnum dataType,
string siteName, out string errorMessage)
{
        // Convert the TreeNode to an external page object

        // Optional: Translate foreign key values

        // Send the data to the target application

        // Method result for successful processing
        errorMessage = null;
        return IntegrationProcessResultEnum.OK;
}
```

The synchronous and asynchronous versions of the methods work in the same way. The only difference is that you cannot use the *TranslateColumnsToExternal* method to translate foreign key values inside the *ProcessInternalTaskSync* method. If you wish to translate foreign keys with synchronous processing, you need to manually write the translation code.

Processing child object data

When using asynchronous processing for tasks with the **Snapshot** data type, the task data includes both the main object and any child objects. Within the **ProcessInternalTaskAsync** method, you can access collections of child objects via the **Children** property of the **GeneralizedInfo** parameter.

The following example demonstrates how to correctly get the main object and its child objects within the *ProcessInternalTaskAsy nc* method (the example processes Order objects and child items within the order).

```
using System.Linq;
using System.Collections.Generic;

using CMS.DataEngine;
using CMS.Ecommerce;
using CMS.Synchronization;
using CMS.SynchronizationEngine;

public override IntegrationProcessResultEnum ProcessInternalTaskAsync(GeneralizedInfo
infoObj, TranslationHelper translations,
        TaskTypeEnum taskType, TaskDataTypeEnum dataType, string siteName, out string
errorMessage)
{
        // Runs when processing Snapshot type tasks for order objects
        if (infoObj.TypeInfo.ObjectType == OrderInfo.OBJECT_TYPE && dataType ==
TaskDataTypeEnum.Snapshot)
        {
                // Gets the parent order object
                OrderInfo order = infoObj.MainObject as OrderInfo;

                // Gets a List of the order's OrderItemInfo child objects
                List<OrderItemInfo> orderItems = order.Children

.FirstOrDefault(child => child.ObjectType == OrderItemInfo.OBJECT_TYPE)?

.Cast<OrderItemInfo>()

.ToList();

        // Convert the data to external objects
                // ...
        }

        // Send the data to the target application

        // Method result for successful processing
        errorMessage = null;
        return IntegrationProcessResultEnum.OK;
}
```

Sending data to the target application

Once you have converted the object or page to an external equivalent, there are several ways to synchronize the data with the target system:

- Call the API of the external system (you need to add references to the required namespaces).
- Use *CMSConnectionScope* and *GeneralConnection* and perform a query against the external database.
- Push the data to an external endpoint in a format that the target system can process. For example, the endpoint can be represented by a web service in the external system.

You can use any other approach, but you always need to be able to determine whether the processing succeeded on the external side. Both the *ProcessInternalTaskAsync* and *ProcessInternalTaskSync* methods must return the result status.

Translating foreign keys to match external objects

The values of identifier columns may not always be the same for equivalent objects in Kentico and external systems. For subscriptions using the *SimpleSnapshot* or *Snapshot* data type and asynchronous processing, you can ensure consistency by translating the columns that store foreign key bindings to related objects.

To perform the translation, call **TranslateColumnsToExternal** inside your connector's ProcessInternalTaskAsync method. The TranslateColumnsToExternal method is inherited from *BaseIntegrationConnector* and accepts the following parameters:

Objects

```
TranslateColumnsToExternal(GeneralizedInfo infoObj, TranslationHelper translations,
bool processChildren)
```

Pages

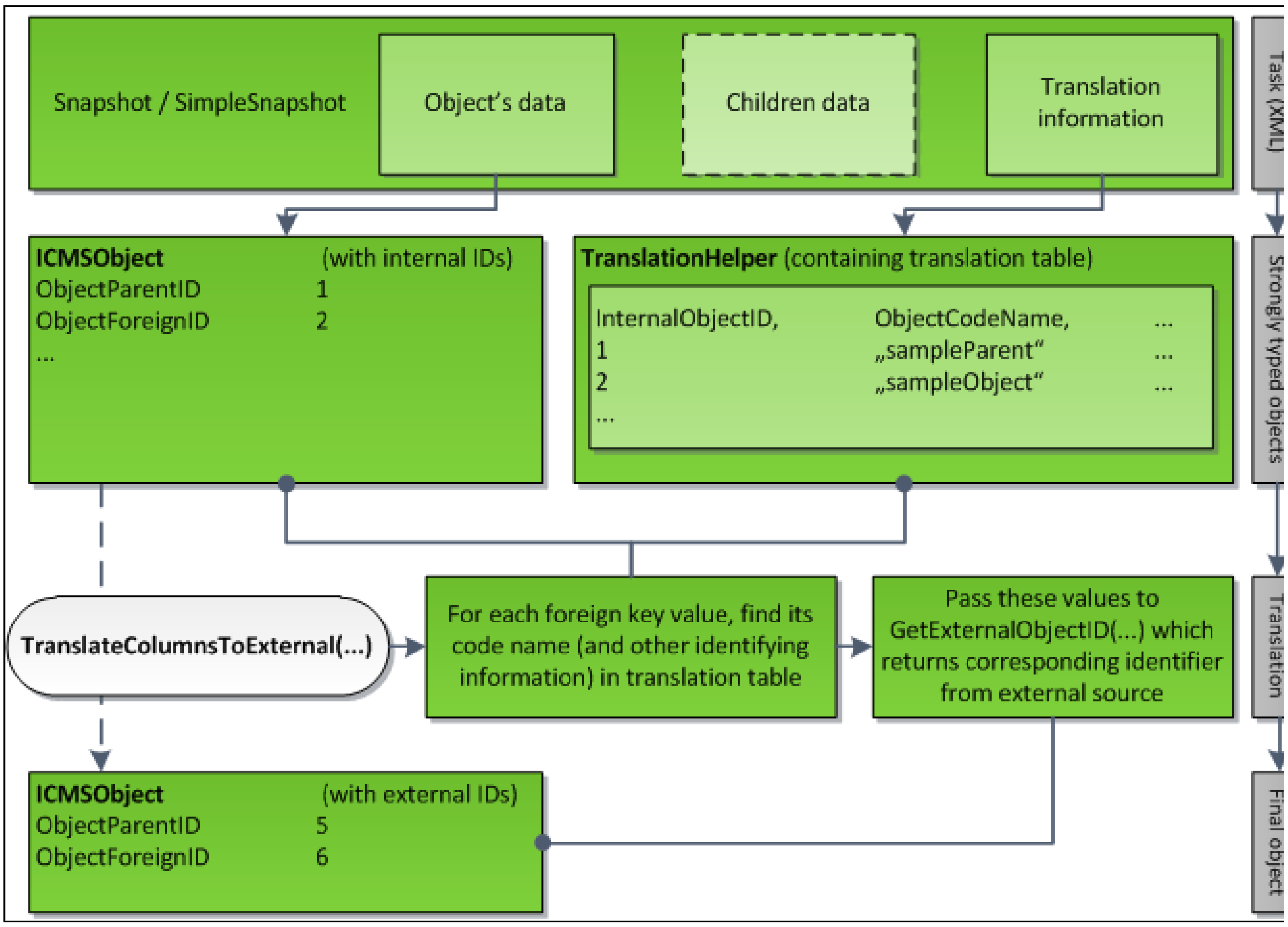
```
TranslateColumnsToExternal(TreeNode node, TranslationHelper translations, bool
processChildren)
```

The last parameter determines whether to translate foreign keys of child objects. For the *SimpleSnapshot* data type, always pass *false*. The processChildren parameter is useful when using the *Snapshot* data type, for example when you are processing an object that does not exist in the target system yet, and you do not have enough information to translate the foreign keys of child objects before you process the main object. We recommend using the following translation order:

1. Call *TranslateColumnsToExternal(infoObj, translations, **false**)*.
2. Process the main object (send the data to the target system).
3. Call *TranslateColumnsToExternal(infoObj, translations, **true**)*.
4. Iterate through the **Children** collection of *infoObj* and process each object.

To ensure correct translation functionality, you need to override one or both of the following methods inside your connector class:

- GetExternalObjectID - implement if the synchronized objects or pages have bindings to objects inheriting from *BaseInfo*
- GetExternalDocumentID - implement if the synchronized objects or pages have bindings to pages (*TreeNode*)


Snapshot / SimpleSnapshot
Object's data
Children data
Translation information
Task (XML)
ICMSObject (with internal IDs)
ObjectParentID 1
ObjectForeignID 2
...
TranslationHelper (containing translation table)
InternalObjectID, ObjectCodeName, ...
1 „sampleParent" ...
2 „sampleObject" ...
...
Strongly typed objects
TranslateColumnsToExternal(...)
For each foreign key value, find its code name (and other identifying information) in translation table
Pass these values to GetExternalObjectID(...) which returns corresponding identifier from external source
Translation
ICMSObject (with external IDs)
ObjectParentID 5
ObjectForeignID 6
Final object

GetExternalObjectID method

Override the GetExternalObjectID method inside your connector class if you call *TranslateColumnsToExternal* for objects or pages that have references to other objects inheriting from *BaseInfo*.

```
public override int GetExternalObjectID(string objectType, string codeName, string
siteName, string parentType, int parentId, int groupId)
```

Parameters:

- **objectType** - identifies the type of the synchronized internal object (class). For example, *cms.user* can match external objects such as "person" or "member".
- **codename** - the unique identifier of the synchronized object.

- **siteName** - the code name of the site where the object belongs (only for site-related objects).
- **parentType** - the type of the object's parent (if the object has a parent).
- **parentId** - the ID of the object's parent.
- **groupId** - the identifier of the object's group (if the object belongs to a group).

Use the parameters to find the corresponding object in the external system and **return the given object's identifier** (integer value).

GetExternalDocumentID method

Override the GetExternalDocumentID method inside your connector class if you call *TranslateColumnsToExternal* for objects or pages that have references to other pages (*TreeNode*).

```
public override int GetExternalDocumentID(Guid nodeGuid, string cultureCode, string
siteName, bool returnDocumentId)
```

Parameters:

To learn how Kentico stores pages in the database, refer to Page database structure.

- **nodeGuid** - the page's GUID identifier.
- **cultureCode** - the culture code of the page's language (for example *en-US*).
- **siteName** - the code name of the site where the page belongs.
- **returnDocumentId** - indicates which identifier you need to provide as the method's return value. If true, return the *DocumentID*, otherwise return the *NodeID*. The *NodeID* is an identifier of a tree node including all language versions, while *DocumentID* is unique for each language version.

	Identifier	Alternative identification
Shared page data	NodeID	nodeGuid & siteName
Culture version of a page	DocumentID	nodeGuide & siteName & cultureCode

Use the parameters to find the corresponding page in the external system and **return the given page's identifier** (integer value).

Translating foreign keys in synchronous mode

If you need to translate ID column values to match external objects, we recommend using asynchronous processing. In synchronous mode, the only way to translate columns is to write custom code inside the ProcessInternalTaskSync method.

The following sample code indicates how to translate the identifier of a page's parent:

```
using CMS.DocumentEngine;
using CMS.Membership;

public override IntegrationProcessResultEnum ProcessInternalTaskSync(TreeNode node,
TaskTypeEnum taskType, string siteName, out string errorMessage)
{
        ...

        // Gets the Kentico parent node of the synchronized page
        TreeProvider tree = new TreeProvider(MembershipContext.AuthenticatedUser);
        TreeNode parentNode = DocumentHelper.GetDocument(node.NodeParentID, tree);

        // Gets the properties of the parent node
        Guid parentGuid = parentNode.NodeGUID;
        string parentSiteName = parentNode.NodeSiteName;

        int newParentId = 0;

        // External code that finds the matching external page according to the
parentNode properties, and fills the newParentID

        // Assigns the new parent ID to the synchronized page
        node.NodeParentID = newParentId;

        ...

}
```