Sitecore® Experience Platform™ 7.5 or later

Developer's Guide to Item Buckets and Search

A developer's guide to working with item buckets, search, and indexing in Sitecore

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Chapter 1

Introduction

This document describes how to set up, configure, and tune search and indexing in Sitecore 7.5 0r later.

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- **Chapter 2 — Configuring Item Buckets**
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1.1 Introduction

Item Buckets is a system that lets you store millions of content items in one container. You can convert individual items in the content tree into item buckets that can contain any number of subitems. These subitems are not listed in the content tree and do not have a direct parent-child relationship with the item bucket item.

You can search in each item bucket to find the content items that you are interested in.

Item buckets allow content authors to:

- Hide content items in the content tree.
- Use the search functionality to retrieve content items from the item buckets.
- Use the search functionality to set the value of fields in content items.
- Alter the parent-child relationship of content items.

Important
Converting content items into item buckets removes the hierarchy of that content and can cause your code not to work as intended if the code depends on the hierarchical structure. For more information about coding and item buckets, see the chapter *Developing with Item Buckets*.

You don't have to use the item buckets functionality when you install Sitecore. The buckets system only starts to work when you create the first item bucket.

In an item bucket, you can create a hybrid structure that consists of content items that are hidden in the item bucket and content items that are structured in the normal way.

You can also define a sub-structure within an item bucket.

1.1.1 Backwards Compatibility

The old Sitecore search API — `Sitecore.Search` — has been retained for backwards compatibility.

We recommend that you use the new search API — `Sitecore.ContentSearch`.

1.2 Fundamental Concepts

This section explains some of the basic concepts used in item buckets.

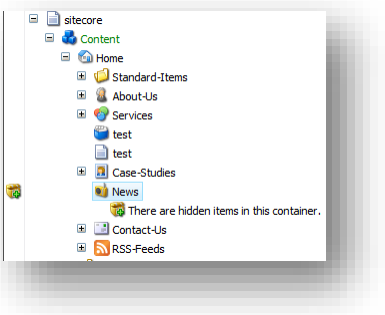
1.2.1 Item Bucket

An item bucket is a repository in the content tree that can store other content items. The difference between an item bucket and a regular container in the content tree is that an item bucket can store a theoretically unlimited amount of items without displaying them in the content tree.

The items in an item bucket are by default hidden in the content tree, which is why you no longer can use the content tree to navigate to and select the items. Instead you can search for and open the items in an item bucket from the Sitecore search engine available from every item in the Content Editor or from the ribbon in the Page Editor.

Furthermore, the parent to child relationship between the content items in an item bucket is completely removed and instead the items are automatically organized into folders. By default, the items are organized according to the date and time of when the item was created, but this can be configured to use different behavior, such as the item's globally unique identifier (GUID).

To provide the content author with a helpful overview of which containers are item buckets and which are normal containers, an item bucket icon can be enabled in the Quick Action Bar to the left of the content tree in the Content Editor. Additionally, if you expand an item bucket in the content tree you will also see a visible cue, that the container is an item bucket. If the items in an item bucket are hidden, a small notification tells you that there are hidden items in the container.



Using item bucket has many advantages, including:

- Automatically organizing all the content items in an item bucket in a logical format, so that the performance of the search engine increases.
- A single item bucket can contain millions of content items without slowing down the UI or congesting the content tree.
- You can have as many buckets as you want. This is useful if you want to split up your buckets into logical containers for example one for products and one for articles.

1.2.2 Why Use an Item Bucket?

An item bucket addresses the problem of managing large numbers of items within the content tree, retrieving them, and working with them in a speedy and efficient manner. To decide if you should turn an item into an item bucket, and in-turn, hide all its descendants, you must ask yourself if you care about the structure of the data that is stored in the item bucket.

For example, if you have items within the content tree that contain a large number of sub items such as products, media, or tags, it may be an advantage to turn these items into item buckets and thereby remove the need for hierarchically managing the content.

Important
Note that a connection between two or more items does not necessarily need to be hierarchically.

Then when you want to work with a particular item placed in an item bucket, you can search for it and open it. The advanced Sitecore search functionality allows you to search among all items in Sitecore using for example free text, search filters, or facets, that makes it easier for you to find exactly what you need.

Viewing Hidden Items

Even when the bucketable items are hidden in the item bucket you have the option to view the items anyway by selecting the **Bucket** check box in the **Content Editor**, on the **View** tab, in the **View** group.

However, we recommend that you clear the **Buckets** check box when working with item buckets. This will prevent the system from unnecessarily loading all the items in the content tree. Remember that you can use the search tab to find and work with the hidden content items.

Chapter 2

Configuring Item Buckets

This chapter describes how to convert a content item into an item bucket that can contain thousands of items.

This chapter contains the following sections:

- Creating an Item Bucket
- Making Content Items Bucketable
- Managing Item Buckets

2.1 Creating an Item Bucket

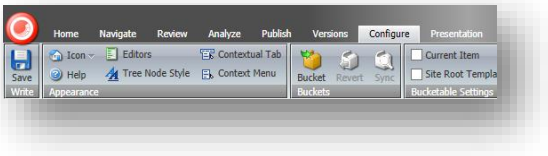
Content items that are stored in item buckets are just like any other content items — you can create, edit, and delete them.

When you convert a content item that already exists into an item bucket, the item bucket organizes and hides all its descendants if they are based on templates that are bucketable *or* if the item itself is set as bucketable. Depending on how many items it contains, it can take a considerable amount of time to organize the items after converting the item into an item bucket. A progress bar appears displaying a running tally of the items being processed. During the bucketing process it is possible to cancel the construction of the item bucket, in case you regret before the organizing of the items are complete.

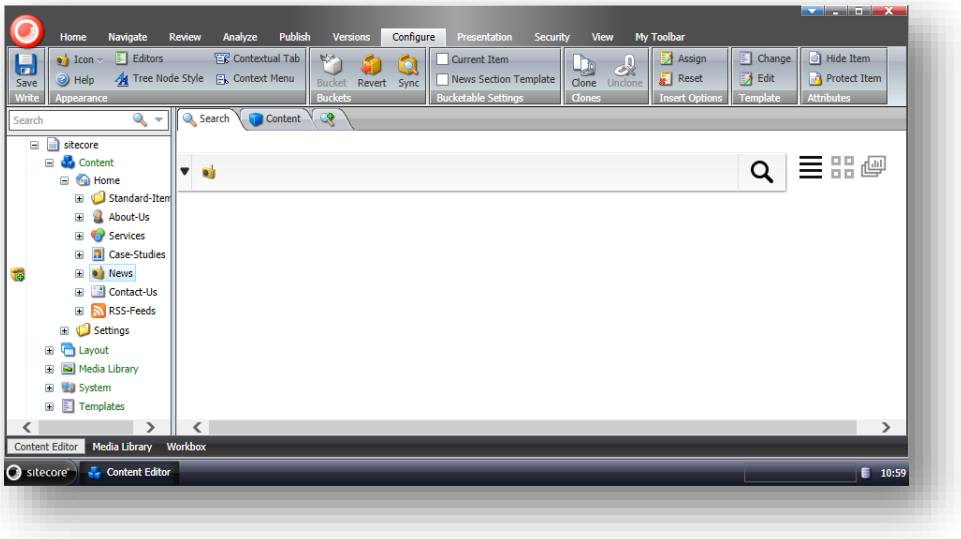
You can create an item bucket from a new content item or convert an existing item structure into an item bucket.

To create an item bucket:

1. In the **Content Editor**, in the content tree, create a content item, for example a folder, and give it a suitable name.
2. In the content tree, select the content item and then on the **Home** tab, click **Edit** to lock the item.
3. Click the **Configure** tab and then in the **Buckets** group, click **Bucket** to convert the new item into an item bucket.



When you convert a content item into an item bucket, a new **Search** tab appears in the right-hand pane.



You use this tab to search for content items in the item bucket.

2.1.1 Item bucket Icon in the Quick Actions Bar

In the Quick Action Bar you can enable an item buckets icon, to indicate which content items in the content tree are item buckets.

To display the item buckets icon, right-click the quick action bar left of the content tree**,** and select **Item Buckets**.

2.2 Making Content Items Bucketable

When you set up an item bucket, you must ensure that the content items that you want to store in the item bucket are bucketable.

To make a content item bucketable, you can:

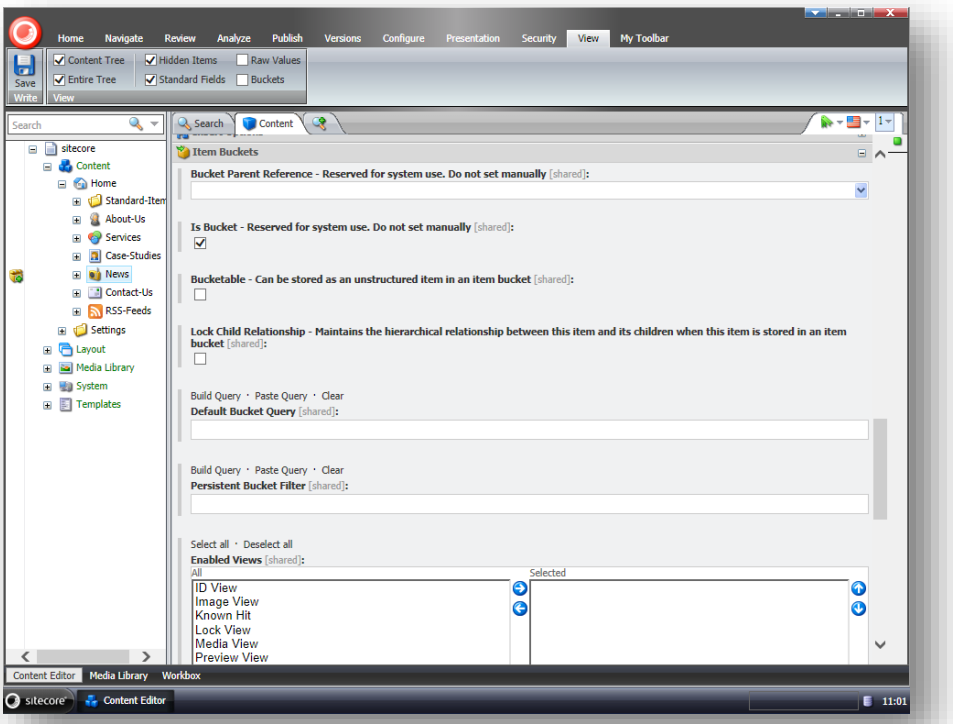
- Make the individual content item bucketable.
- Make the template standard values that it is based on bucketable.

Content items that are bucketable are hidden and searchable when they are stored in an item bucket.

If the content items are based on a template that is not bucketable, the system will not automatically structure and hide the content items for you. Instead, the content items are treated like normal items in the content tree.

To make a content item bucketable:

1. In the **Content Editor**, on the **View** tab, in the **View** group, select the **Standard Fields** check box.
2. Select the content item that you want to make bucketable.
3. In the right hand pane, click the **Content** tab and scroll down and expand the **Item Buckets** section.



4. Select the **Bucketable** check mark.
5. Save your changes.

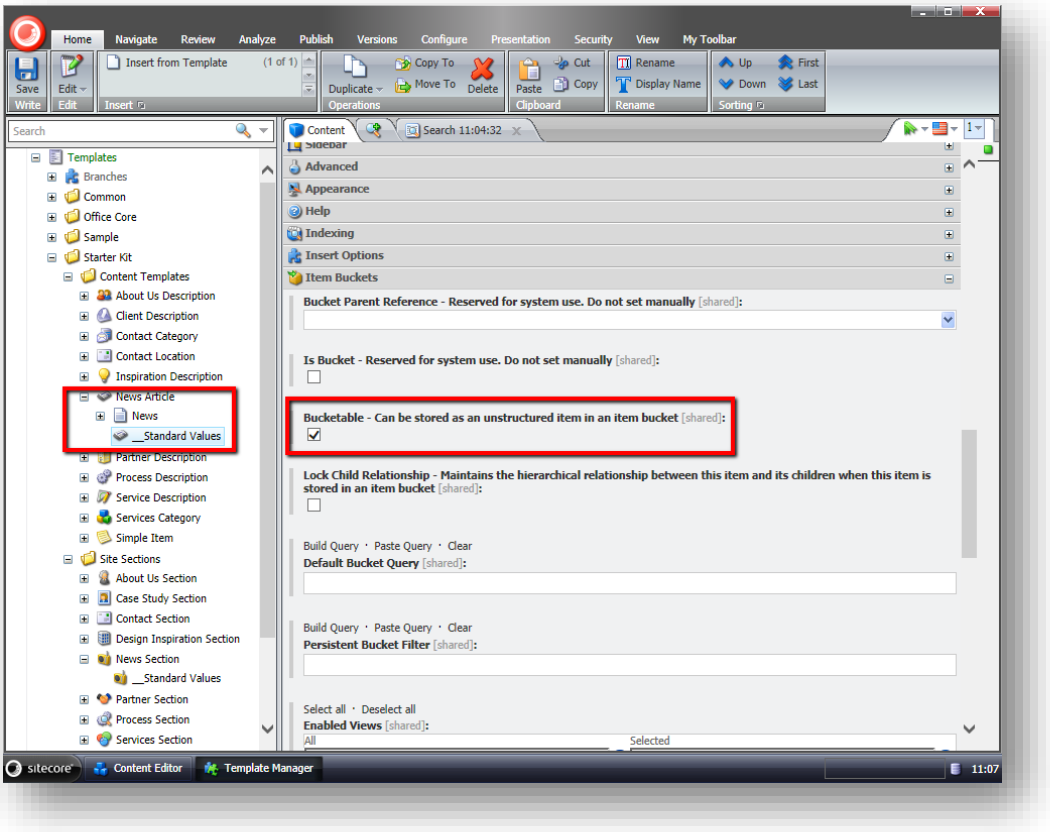
After you have made the content item bucketable, you must synchronize the item bucket and update its structure. For more information about synchronizing an item bucket, see the section *Synchronizing an Item Bucket*.

2.2.1 Making a Template Bucketable

If you have a large number of similar content items that you want to hide in an item bucket, it makes more sense to make the template that they are based on bucketable.

To make a template bucketable:

1. In the Content Editor, on the **View** tab, in the **View** group, select the **Standard Fields** check box.
2. Select one of the content items that you want to make bucketable.
3. In the right-hand pane, on the **Content** tab, expand the **Quick Info** section.
4. Click the template link and the template that this content item is based on opens in the **Template Manager**.
5. In the **Template Manager**, in the content tree, expand the template in question and select the **_Standard Values item**.
6. In the right hand pane, click the **Content** tab.
7. Scroll down and expand the **Item Buckets** section.



8. Select the check box for **Bucketable - Can be stored as an unstructured item in an item bucket**.
9. Save your changes.

   After you have made the template bucketable, you must synchronize every item bucket that contains content items that are based on this bucketable container. This updates their structure and hides the bucketable items.
10. In the **Content Editor**, select the item bucket folder that contains items based on this template.

11. On the **Configure** tab, in the **Buckets** group, click **Sync**.

If you create any content items based on this template in another folder that is not an item bucket, these items are treated like normal content items and are displayed in the content tree.

Changing a Bucketable Template to a Non-Bucketable Template

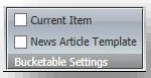
If you change the template of an item in an item bucket from bucketable to non-bucketable, synchronizing the item bucket will not make the item visible in the item bucket. To achieve this, you must revert the item bucket to a normal container and then convert it into an item bucket again.

2.2.2 Changing the Bucketable Settings

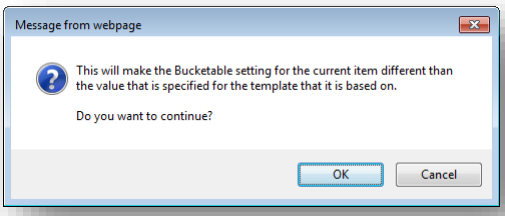
You can change the setting of the Bucketable field of an item and the template that the item is based on.

To change the Bucketable setting for the current item:

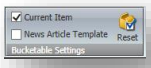
1. In the Content Editor, on the **Configure** tab, in the **Bucketable Settings** group, select the **Current Item** check box:



2. Sitecore shows a confirmation dialog if this makes the setting different from the Bucketable setting of template that the item is based on:



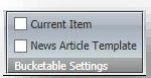
If an item has a different Bucketable setting than the template of the item, the **Bucketable Settings** group has a **Reset** button:



When you click this button, the Bucketable setting of the item is reset so that it is the same as the setting in the template of the item.

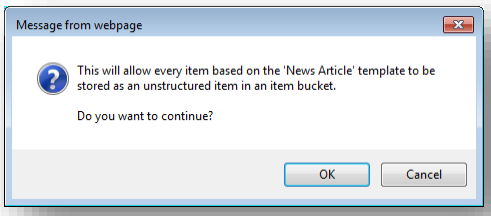
To change the Bucketable setting for the template of the current item:

1. In the Content Editor, on the **Configure** tab, in the **Bucketable Settings** group, select the **News Article Template** check box:



"News Article Template" is the actual name of the template, and it will probably be different for other items than the item in this example.

2. Sitecore shows a confirmation dialog before making changes:



When you select this setting for the template, the setting of the current item is also changed.

2.2.3 Synchronizing an Item Bucket

When you create an item bucket, you can store both bucketable unstructured content items and normal structured content items in it. If you decide to convert some of the normal content items into bucketable items or make the templates that they are based on bucketable, you should always synchronize the item bucket to make sure all the items are organized correctly.

You should synchronize an item bucket when you make items bucketable.

To synchronize an item bucket:

1. In the content tree, select the item bucket whose structure you want to update.
2. On the **Configure** tab, in the **Buckets** group, click **Sync**.

   The structure of the contents in the item bucket is now updated:

   - The bucketable items are organized and hidden.
   - All the content items that are based on bucketable templates are organized and hidden.
   - The normal content items remain visible.

You can use the Sitecore search engine to search for all the content items in the item bucket.

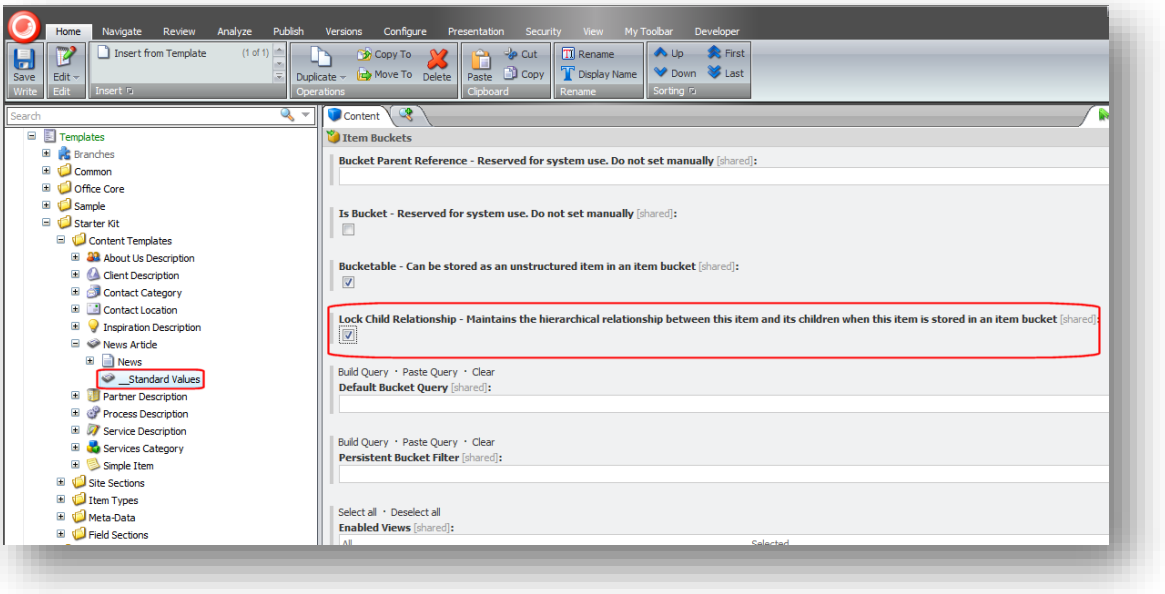
2.2.4 Locking Parent/Child Relationships

In some cases, you may want to lock the relationship between a parent item and its child items even though both are stored in an item bucket. You might need to ensure that the child items are always stored below the parent item, for example, you might want to lock the parent to child relationship between news articles and comments.

To lock the parent to child relationship:

1. In the **Template Manager**, navigate to the template for the parent item. In this case it would be the news article template.
2. Expand the template in the Content Tree, and select the *_Standard Values* item.

3. In the right-hand pane, scroll down to the **Item Buckets** section.



4. Select the **Lock Child Relationship** check box.

If you create a content item that is a child of a content item based on this template, it is not automatically structured in the item bucket. Instead it retains its relationship with the parent item. For example, comments will always be children of the news article that they refer to.

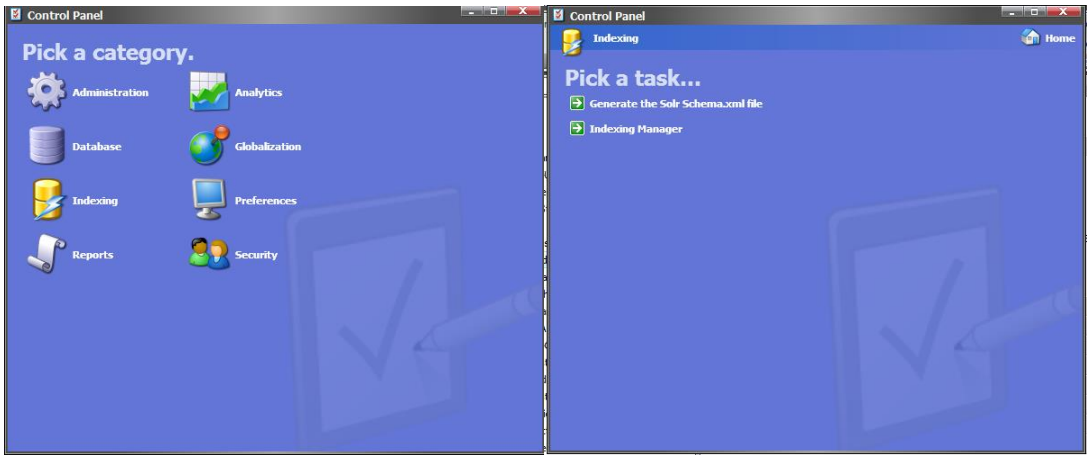
2.3 Managing Item Buckets

There are a number of settings and tools that you can use to configure the way item buckets works on your installation.

These can build the item buckets indexes, specify a number of search settings, set up default search queries, and create facets among other things.

2.3.1 Building the Search Indexes

You can build the search indexes from the Control Panel.



You use the Indexing section in the control panel to:

- Generate a Solr schema.xml file — if you are using SOLR as your provider.
- Rebuild search indexes — only supporting the indexes in Sitecore.ContentSearch.

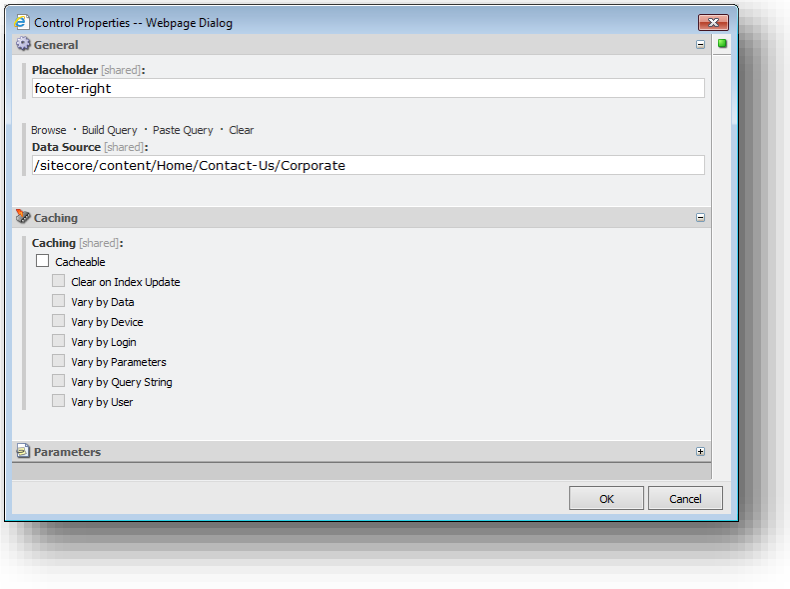
2.3.2 Clearing the HTML Cache

It is possible to have Sitecore clear the HTML cache for presentation components (such as renderings or sublayouts) each time the search index has been updated. This is useful for components that retrieve items or render information from a search index.

This is how to enable it:

1. Select an item in the Content Editor.
2. On the **Presentation** tab, click **Details**.

3. Select a control in the **Layout Details** dialog box and click it:



4. In the **Caching** section, select the **Clear on Index Update** option.

2.3.3 Item Bucket Settings

There are a number of settings that you use to configure how search works with item buckets. These settings are stored at `/sitecore/system/Settings/Buckets`.

You can use these settings to define various features including:

- Changing the keyboard shortcut for searching.
- Defining the facets that are available on your website.
- Specifying the way that an item opens when you click it in the search results.
- Specifying the way Sitecore resolves bucket folder paths.
- Specifying the number of items displayed on a search results page.

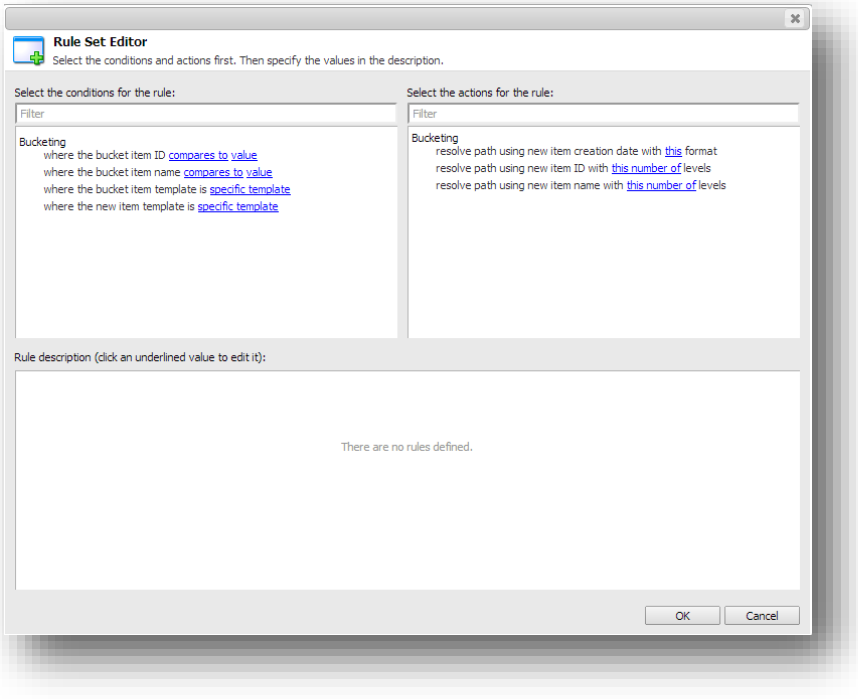
You can also specify which fields are used when you perform a tag search. To specify which fields are used for tag searches, in the *Item Buckets Settings* item, you must ensure that the **Tag Parent** field points to the item in the content tree that contains all your tags — the tag repository.

You can then create a field called *Tags* in any template and set the type to multi-list.

Bucket Folder Paths

The `BucketConfiguration.BucketFolderPath` setting defines the format Sitecore uses for creating folder trees for item buckets. The default setting creates a structure based on dates.

You can change this by creating rules in the *Item Buckets Settings* item. The field is called **Rules for Resolving the Bucket Folder Path**. Click **Edit Rule** to open the Rule Set Editor:



You select a condition (such as “where the bucket item template is…” and an action. The action is the specification of the bucket folder path. Only bucket items that match the condition will use the action. You can create any number of rules. Sitecore will use the format defined by *BucketFolderPath* for items that do not match any condition.

Chapter 3

Searching

Once you start using item buckets, you will soon have buckets that contain hundreds if not thousands of content items. This underlines the need for search functionality that can help content authors and developers find the individual content items that they need to edit and update.

To this end, Sitecore has implemented a new search interface.

This chapter describes how to search for content items.

This chapter contains the following sections:

- Configuring Search
- Using Facets to Refine your Search
- Using Search Filters
- Security and Item Buckets
- Using a Custom Class to Create a Query
- Using Item Buckets with the Data Source of a Control

3.1 Configuring Search

After you have created an item bucket and specified which content items can be stored in it, you can configure how search will work.

You can specify many aspects of how search works including which:

- Facets you can use to filter your search results.
- Fields are displayed in the search results.
- Image is displayed with each content item in the search results.
- Text is displayed with each content item in the search results.

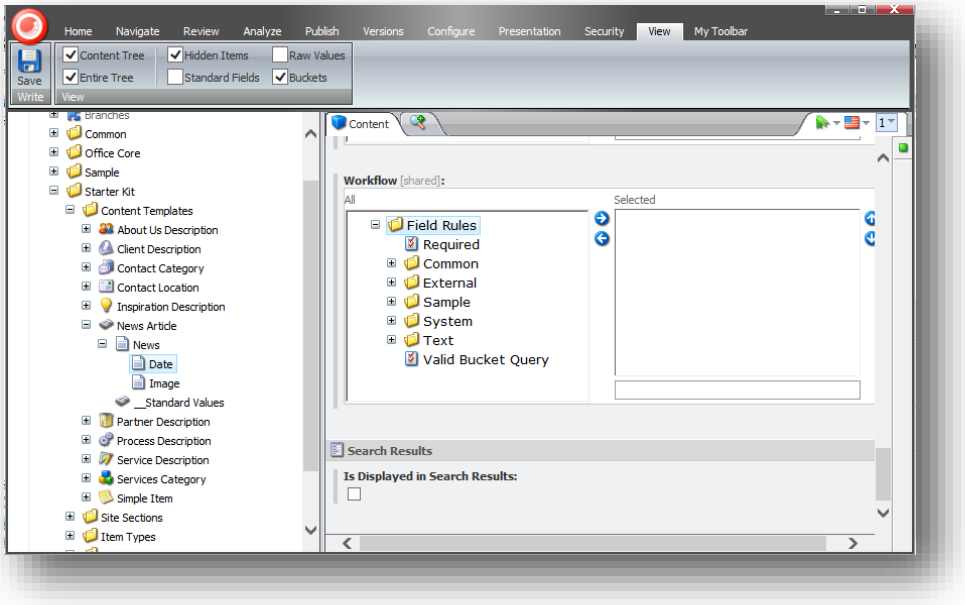
You can also specify a default query that is run every time you open a search pane.

3.1.1 Specifying which Fields are Displayed in the Search Results

You can specify which fields are displayed in the search results when you search an item bucket.

To specify that a field should be displayed in the search results:

1. Open the template in the **Template Manager**.
2. Click the **View** tab and then in the **View** group, select the **Standard Fields** check box.
3. In the content tree, expand the template and select the field that you want to be displayed in the search results.
4. On the **Content** tab, scroll down to the **Search Results** section.



5. In the **Search Results** section, select the **Is Displayed in Search Results** check box.

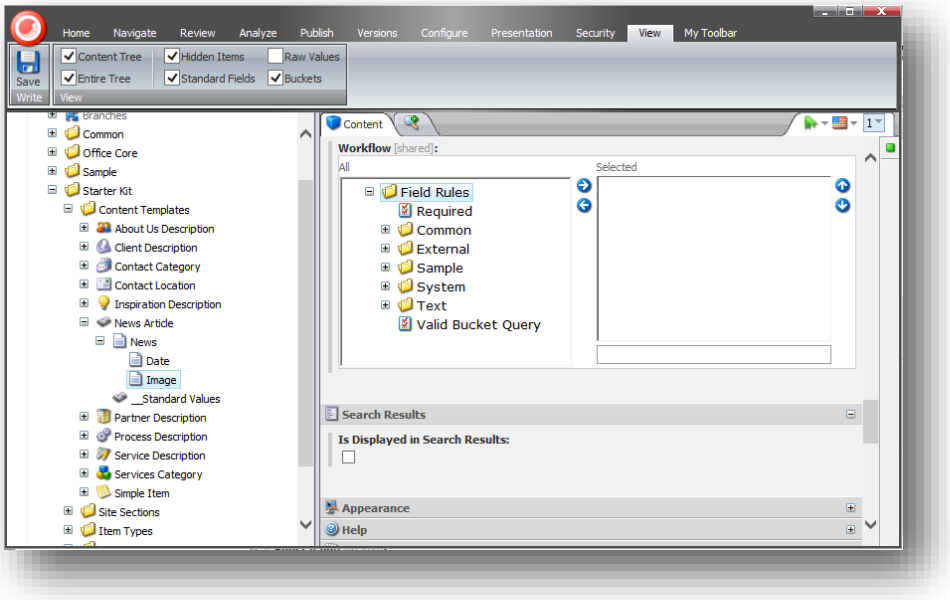
3.1.2 Specifying a Search Result Image and Search Result Text

When you search in an item bucket, Sitecore displays an image with each content item that is listed in the search results. The **Search** tab displays the template icon by default.

You can specify which of the image fields in the template should be shown in the search results.

To specify which image field should be displayed in the search result:

1. Open the template in the **Template Manager**.
2. Click the **View** tab and then in the **View** group, select the **Standard Fields** check box.
3. In the content tree, navigate to the template and expand it.
4. Select the image field that you want to appear in the search results.
5. On the **Content** tab, scroll down to the **Search Results** section.



6. In the **Item Buckets** section, select the **Is Displayed in Search Results** check box.

The image that is displayed in this field is shown in the search results.

You can also use this check box to specify which text field should be displayed in the search results.

These values are cached, so that this search does not have to be run again every time you run a search. It is therefore required that you clear the cache after you have made changes for this by resetting the cache in `/sitecore/admin/cache.aspx`.

3.1.3 Displaying Media Library Images in Search Results

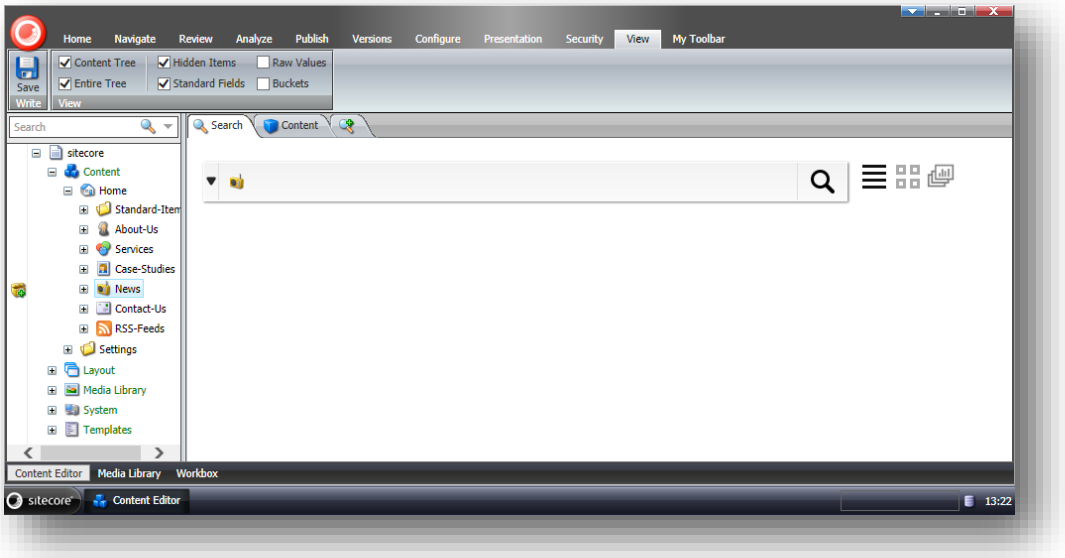
The entire content tree can work with item buckets, including the Media Library. If you need to search for media items and want the images to appear in the search results, you must make sure that the **Is Displayed in Search Results** check box is selected in:

- `/sitecore/templates/System/Media/Versioned/File/Media/Blob` - for Versioned media item
- `/sitecore/templates/System/Media/Unversioned/File/Media/Blob` - for Unversioned media item

After you make these changes, you must use `/sitecore/admin/cache.aspx` to clear the cache.

3.1.4 Viewing the Search Results

When you convert a content item into an item bucket, it automatically inherits the new search interface.



To search for an item in the item bucket, enter a search term that you think the item contains, then press ENTER and a list of search results is displayed. You can return all the content items by typing"*" and pressing ENTER.

You can use the buttons on the right to specify how you want the results displayed.

Different Ways to Display Search Results

Sitecore 7.5 comes with several different views that you can use to display search results.

The three default views are:

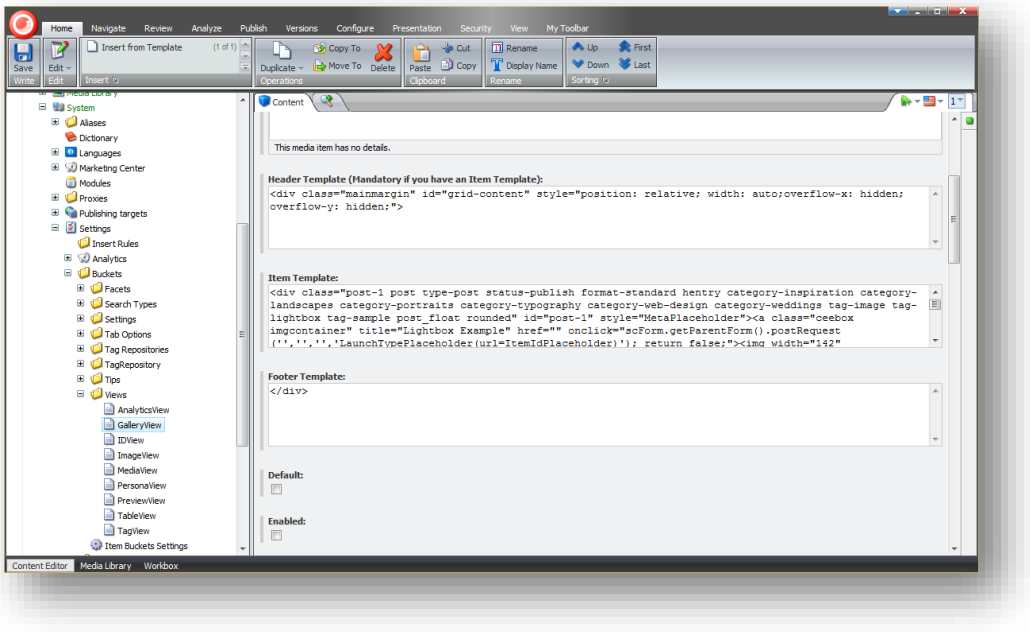
- List — The default view. Items are shown in a plain list.
- Grid — Item information is shown in rectangular cells laid out in rows containing several columns of cells.
- Image — Item images are shown in a grid. Obviously, if an item *is* an image, this image is shown. Other items are represented by their icons.

You can also use the following views, but you must enable them first:

- ID — The ID View is useful to developers and administrator. It can be used as a quick way of assigning multiple values to a list. When you click the ID view for a search, you get a list of item IDs (GUIDs) that you can copy and paste into a multilist field, for example.
- Lock — Similar to the Grid View, but also shows whether the items in the result set are locked or not.
- Media — Similar to image, but for media such as videos.
- Preview — Show a preview of each item in the result – that is: what this item looks like in context on the website.
- Table — Show the items in the result as a table.
- Tag — This view orders items in the result by tags.

To enable another view:

1. In the **Content Editor**, navigate to `/sitecore/system/settings/Buckets/Views` and select the view that you want to enable.



2. In the **View Details** section, select the **Enabled** check box.
3. If you want this to be the default view, select the **Default** check box.
   The default view must be enabled.
4. You can now select views for an item by selecting the item in the **Content Editor**, and then scroll down to **Item Buckets** section on the **Content** tab. Here you can select the views that should be abled for this item.

3.1.5 Exclude Current Item from Search

When you search within an item bucket, the item you search *from* — the item that is selected when the search starts — is included is the search results by default — when it matches the search.

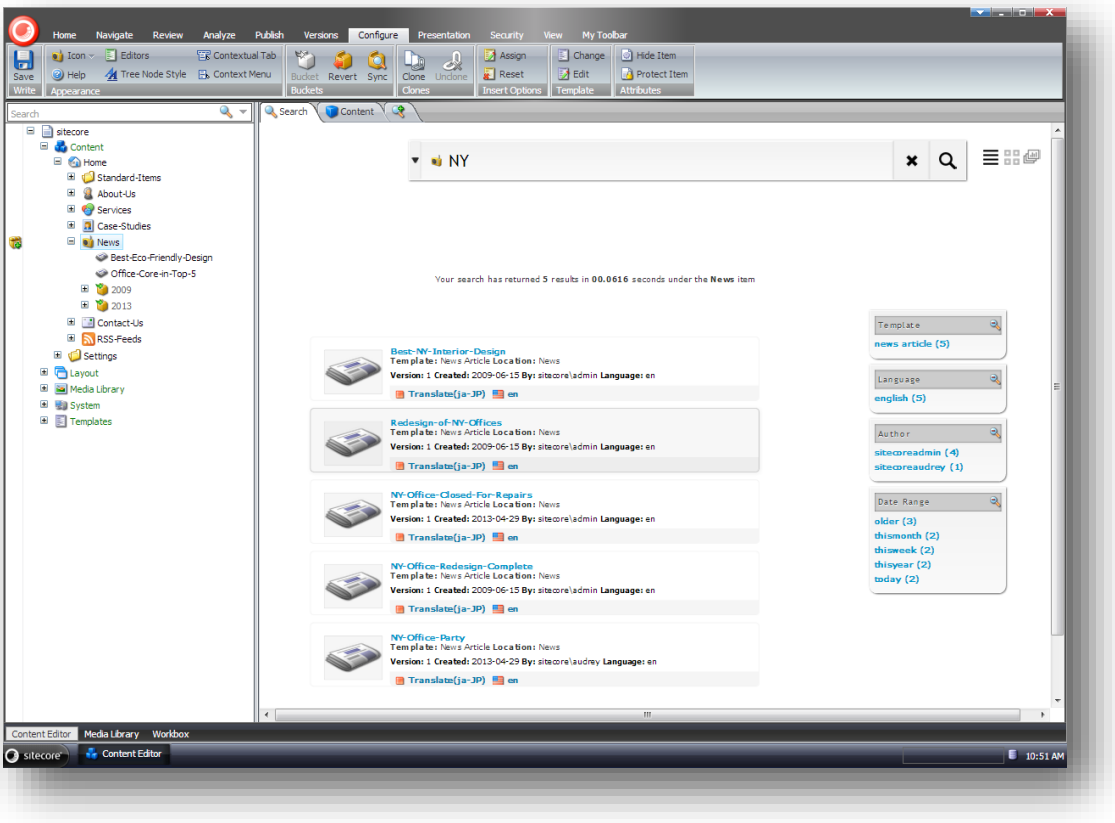
To exclude the current item from the search results, in `Sitecore.Buckets.config` file, set the `BucketConfiguration.ExcludeContextItemFromResult` setting to true.

3.2 Using Facets to Refine your Search

After you have run a search, you can use facets to filter the results into a smaller and more concise list.

A facet is a characteristic or a way in which a content item can be viewed or classified. For example, you can classify a content item in terms of the language that it is in, the date on which it was created, or the template that is based on.

When you run a search query, a facet search is also performed. The facets are listed on the right of the search pane. You can use these facets to filter the search results.



To filter your query, click one of the facet links. For example, in the previous image, the facets show that for the five results returned by this search, they were all based on the *news article* template, they are all in English, four were created by *sitecoreadmin* and one by *sitecoreaudrey*, and they were created at a number of different times.

Sitecore uses the following facets:

Facet	Description
Author	Groups the results according to the authors who created the items.
Author Template	Groups the results according to a combination of author and template.
Bucket	Groups the results according to the buckets that they are stored in.
Creation Date & Author	Groups the results according to the date items were created and who authored them.

Facet	Description
Date Range	Groups the results in three categories — created within a day, a week, or a month.
File Size	Groups the results according to the size of the file.
File Type	Groups the results according to file type.
Image Dimensions	Groups the results according to the dimensions of the images they contain.
In Workflow	Groups the results according to the workflow they are in.
Language	Groups the results according to language.
Language Template	Groups the results according to the languages the template are in.
Location	Searches all the bucket locations to see which buckets the results are stored in.
Owner	Groups the results according to their owner.
Tags	Groups the results according to their tags.
Template	Groups the results according to templates.
Template Author	Groups the results according to a combination of template and author.

3.2.1 Language Search

The search functionality supports many different languages including Chinese, Arabic, and non-UTF based characters.

3.2.2 Complex Searches

Sitecore supports complex searches such as wildcard, replacement, and exact text searches.

Examples that are supported:

- Tim*
- *Tim
- *Tim*
- T*m
- T?m
- ?im
- Ti?e
- Ti*e
- “Tim Tim”

To run one of these searches, enter the text in the search box.

If you want to search

Searching within a Range

Sitecore also supports range searches.

Examples that are supported:

- price:[400 TO 500] – use square brackets to include the endpoints in the range.
- price:{ 400 TO 500} – use curly brackets to exclude the endpoints from the range.
- price:[400 TO 500} – square and curly brackets can be mixed. In this example, 400 is included in the range, while 500 is excluded.
- title:[Algeria TO Bahrain]

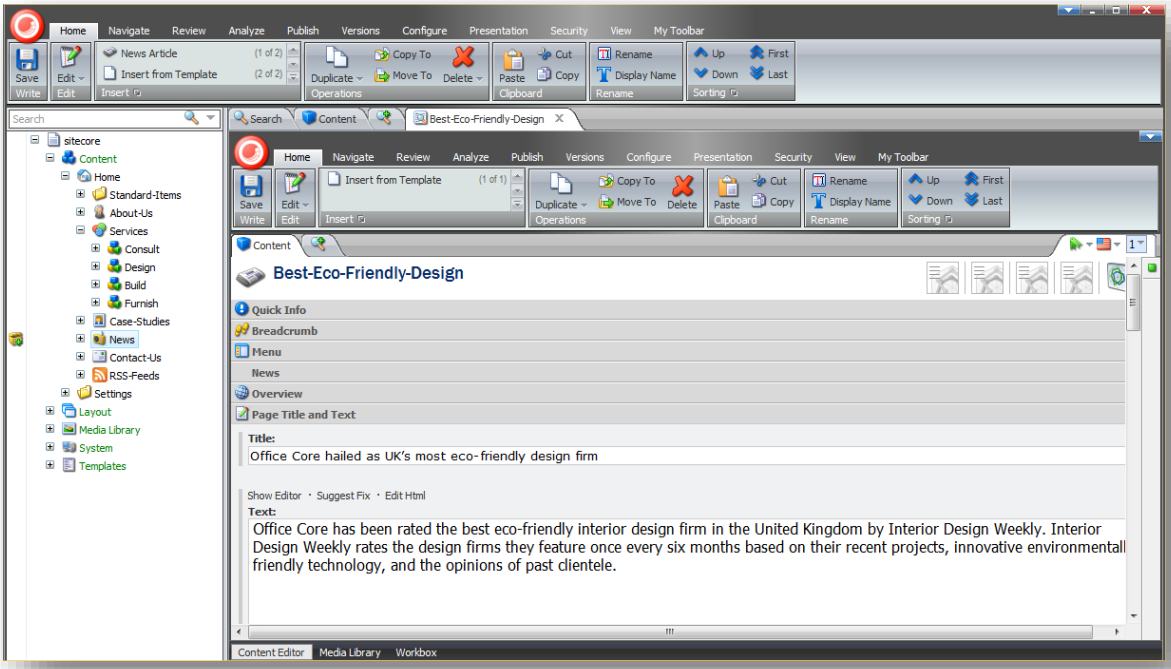
Combining, *and*, *or*, and *not*

Sitecore also supports complex text searches.

For any of the filters you use, you can click on the icon for that filter and it will toggle between that filter using MUST, MUST NOT or SHOULD logic.

3.2.3 Opening Items in the Search Results

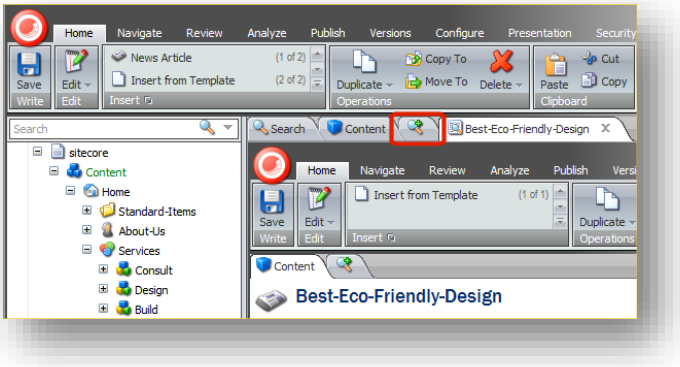
To open an item that appears in the search results, click the image, the title, or any of the links in the results and the item opens in a new tab in the Content Editor.



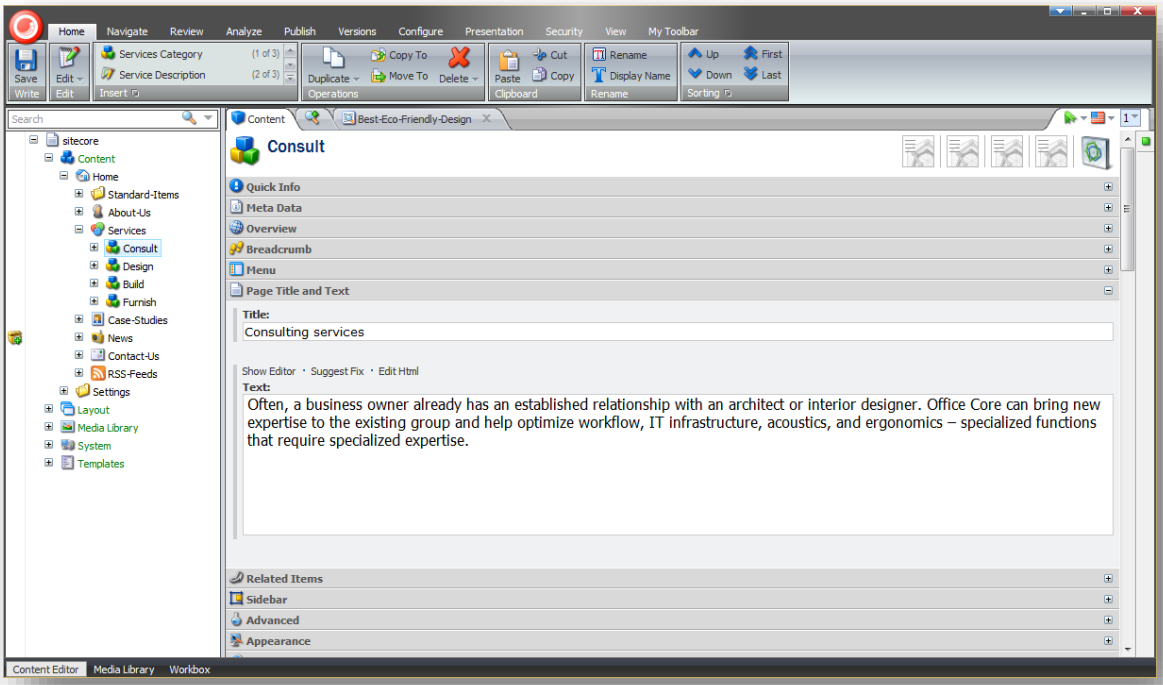
You can edit this item in the new tab. You can open as many extra tabs as you need.

This allows you to open multiple content items at the same time. These content items can come from multiple searches. You can also have multiple search tabs open at the same time. Be aware that search tabs and content tabs are reloaded when you select a different item in the content tree.

To open another search tab, in the editing pane, click the  tab.

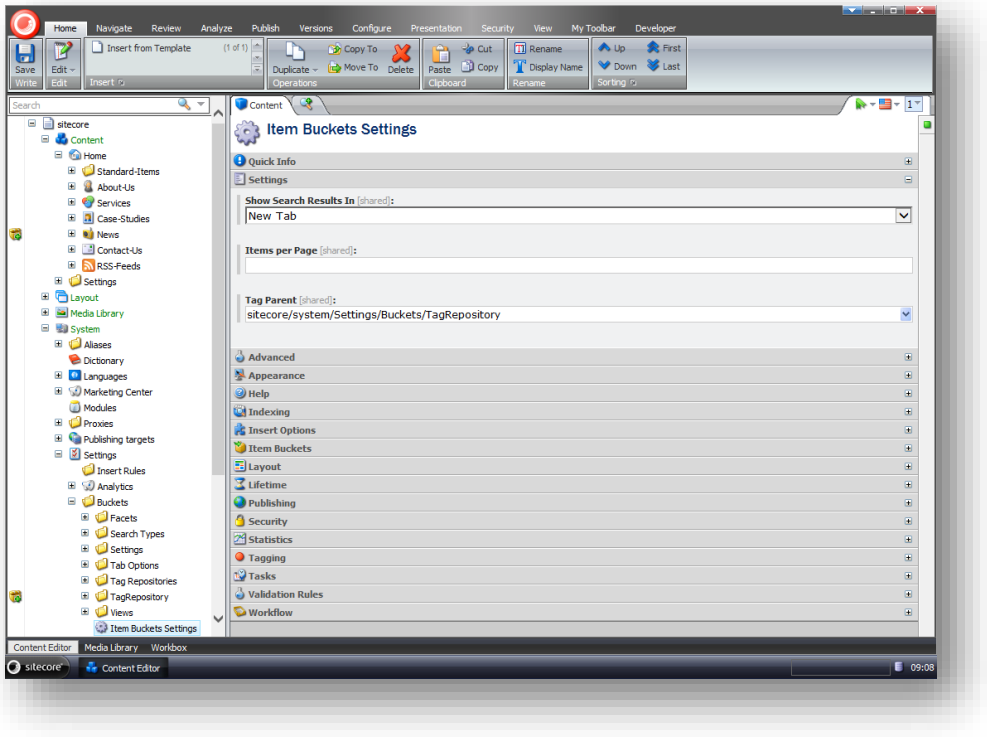


If you select another item in the content tree and open it, all the open tabs persist — but the search results are lost.



When you click a content item in the search results, it opens in a new tab in the Content Editor by default. You can configure the way that search results open in the *Item Bucket Settings* item —

`/sitecore/System/Settings/Buckets/Item Buckets Settings`



The **Show Search Results In** field contains the following options:

Option	Description
New Content Editor	The content item opens in a new instance of the Content Editor.
New Tab	The content item opens in a new tab.
New Tab Not Selected	The content item opens in a new tab. However this tab is not the current tab.

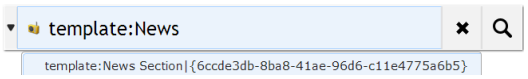
3.3 Using Search Filters

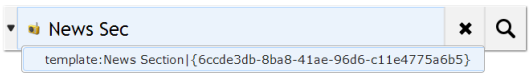
You can insert filters into a search string to narrow down the results.

To use a search filter, enter the reserved filter keyword and Sitecore either auto-suggests a filter or prompts you to enter a date or a text.

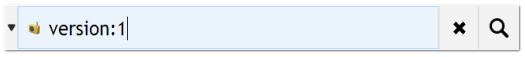
The following filters are supported:

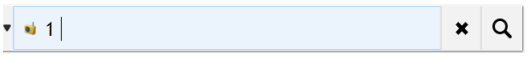
Template Filter



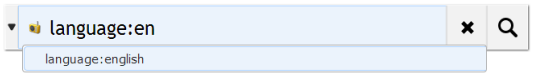


Version Filter

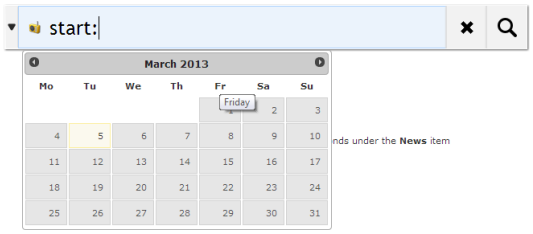




Language Filter



Start and End Date Filter

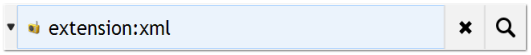


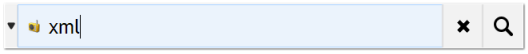
When you work with the calendar, you can use the following keyboard shortcuts:

Keyboard Shortcut	Description
PAGE UP & PAGE DOWN	Previous month, next month
CTRL+PAGE UP/DOWN	Previous year, next year
CTRL+HOME	Current month or open when closed
CTRL+LEFT/RIGHT	Previous day, next day
CTRL+UP/DOWN	Previous week, next week
ENTER	Accept the selected date
CTRL+END	Close and remove the date
ESC	Close the calendar without making a selection

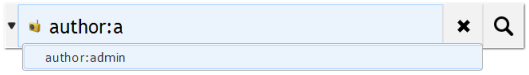
Note
Depending on browser, browser version, and operating system, these shortcuts may not always be available.

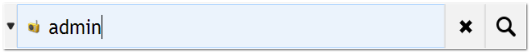
File Type Filter





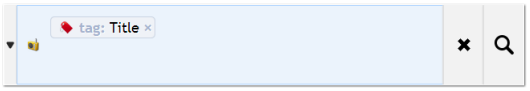
Author Filter

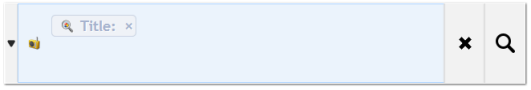




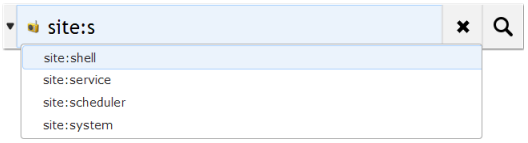
You must enter at least 2 characters before the system makes any suggestions.

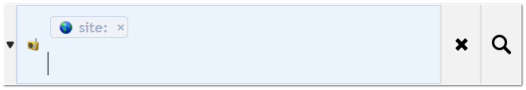
Tag Filter



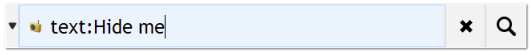


Site Filter

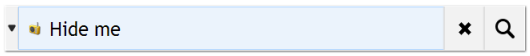


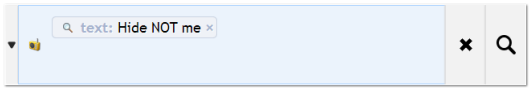


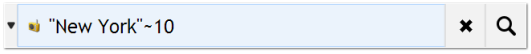
Advanced Text

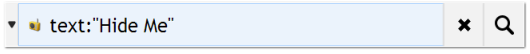


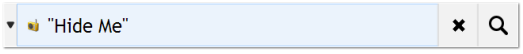
When the *text:* prefix is used, the words (if more than one) are split into individual search terms. When *text:* is not used and there is more than one word, they are turned into *one* search term — as if they were inside a pair of quotation marks.

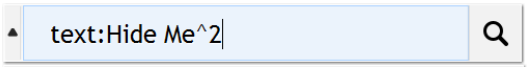


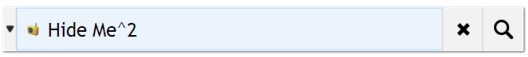


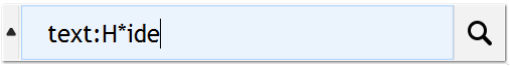


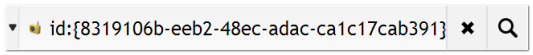


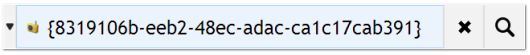


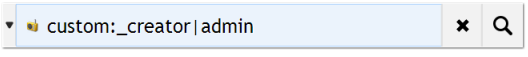


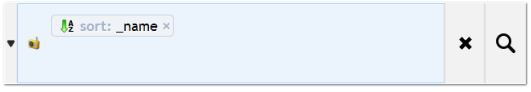






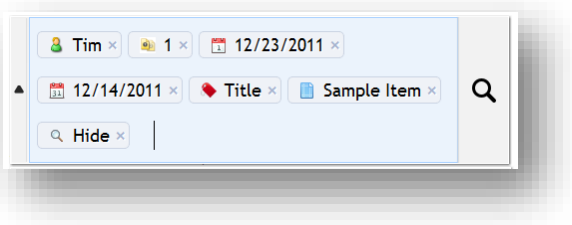






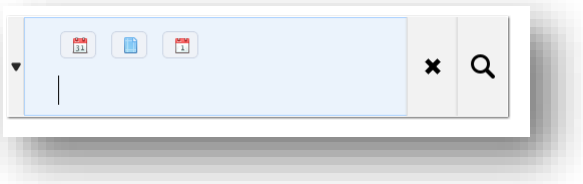
Combining Filters

You can combine various filters by entering them consecutively — they are ORed:



3.3.1 Auto-Organizing

If you enter too many terms in the drop-down box, the search filters are shrunk automatically.



3.3.2 Paging Results

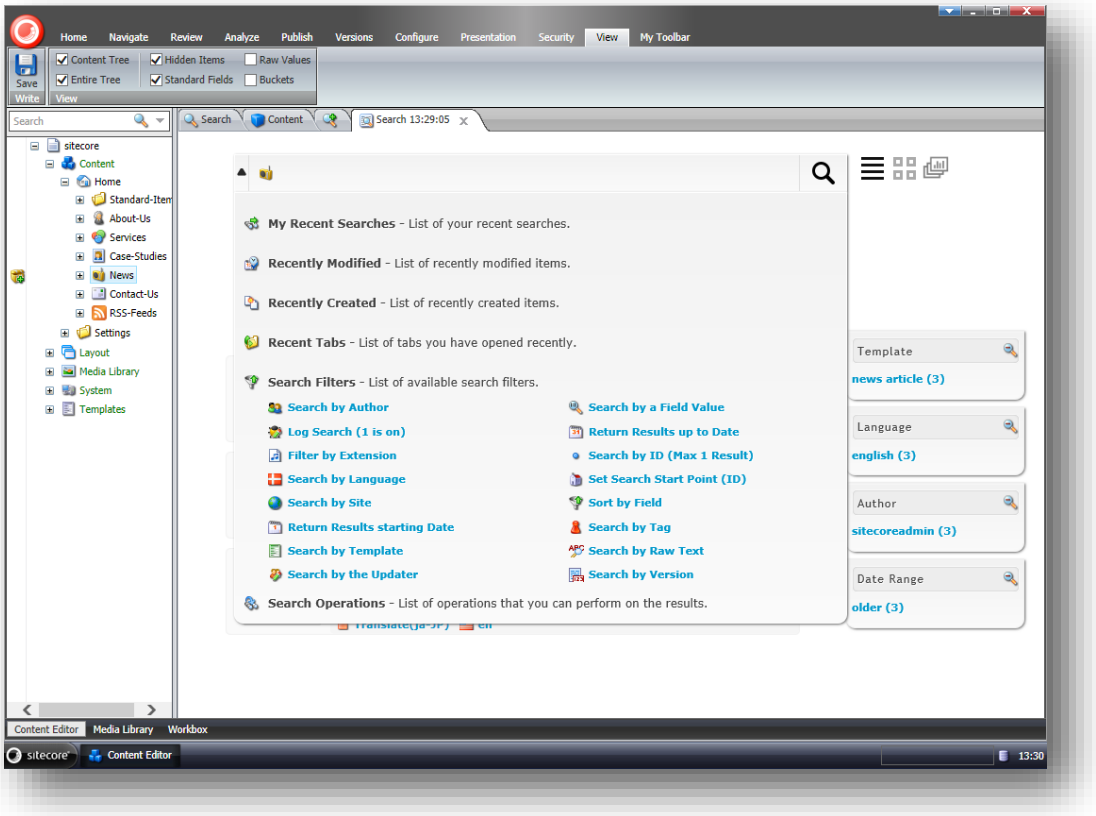
The search results are displayed in lists of 20 items per page by default, and the number of pages is displayed at the bottom of the tab.

To specify the number of items shown per page, in the `Sitecore.Buckets.config` file, change the value of the `BucketConfiguration.DefaultNumberOfResultsPerPage` setting.

If more than 10 pages are listed, you can move on to the next 10.

3.3.3 Predefined Search Options

When you click the drop-down arrow on the left hand side of the search field, a list of categories appears. You can expand each category to see a more detailed list of search options.



You can add more search options to this list. The search options are stored at:

`/sitecore/system/Settings/Buckets/Settings/Search Box Dropdown`.

The search categories are:

Category	Description
My Recent Searches	A list of your recent searches.
Recently Modified	A list of the items that have been modified recently.
Recently Created	A list of the items that have been created recently.
Recent Tabs	A list of the tabs that you have opened recently.
Search Filters	A list of filters that you can use in your searches. These filters are stored in `/sitecore/system/Settings/Buckets/Search Types/`. It is recommended that you store custom search filters in a subfolder called `User Defined`.
Search Operations	A list of operations that you can perform on the search results. This is a powerful feature that lets you run any operation on the search results. You can add more operations to this list.

The available search operations are:

Operation	Description
Add Tag	Add a single tag to many items at once.
Search and Replace	Replace all results text, link etc. values.
Clone Results to	Clone all items that were found (a dialog will open)
Delete Results	Delete all items that were found (you will *not* be asked to confirm, so be careful)
Publish Items	Publish the items that were found
Apply Campaigns Goals Event to All Items	(Only if DMS installed)
Apply Presentation to All Items	Apply Presentation to many items
Copy to Datasource Query	Copy this search that gave this result in a way so that it can be used as a datasource query
Apply Security Rule	Apply a security setting to many items.
Copy Results To	Copy all items found (a dialog will open)
Move Results To	Move all items found (a dialog will open)
Serialize Items	This will save the search results in a file in a subfolder called `serialization` under the Data folder in the root of the web site.
Apply Profile Score to All Items	Add a profile score to many items

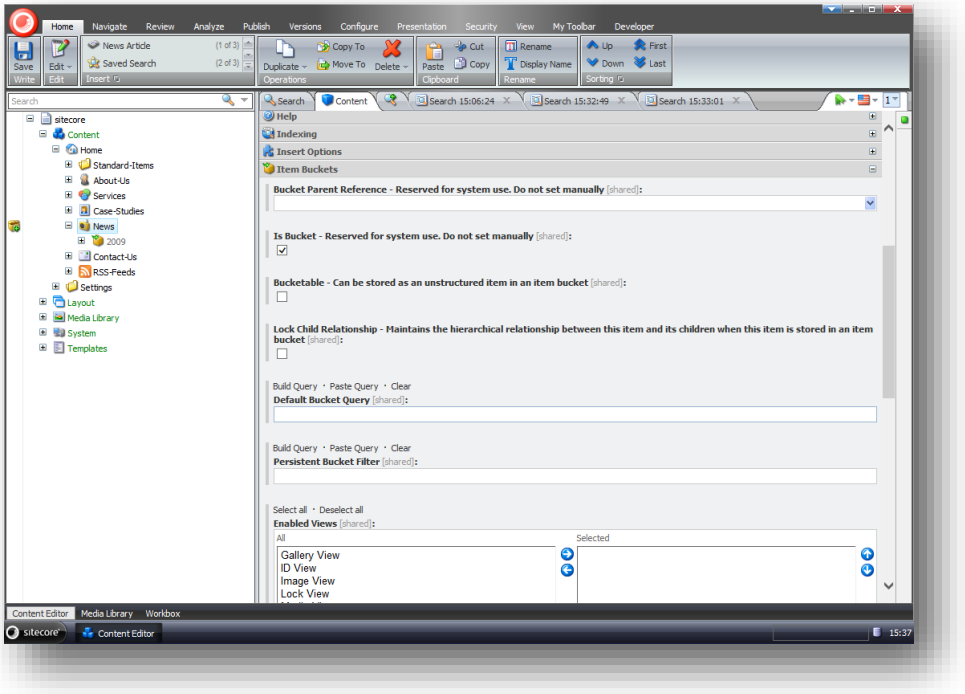
3.3.4 Default Search Query

On every item bucket, you can specify a default query that runs when you open the **Search** tab and displays a list of items that match that query.

To define a default search query:

1. In the content tree, locate the item bucket that you want to define a default query for:
2. On the **Content** tab, expand the **Item Buckets** section.

3. In the **Default Bucket Query** field, enter a query, for example *text:new.*



This query finds all the content items in this item bucket that contain the word *new* and displays them on the **Search** tab every time you open it.

On the **Search** tab, you can remove this default query if you want to perform a different search. The default query reappears the next time you open the **Search** tab for this item bucket.

3.3.5 Persistent Search Query

You can also add a query to the search field that you cannot remove and is always a part of your search. This query *cannot* be deleted in the **Search** tab.

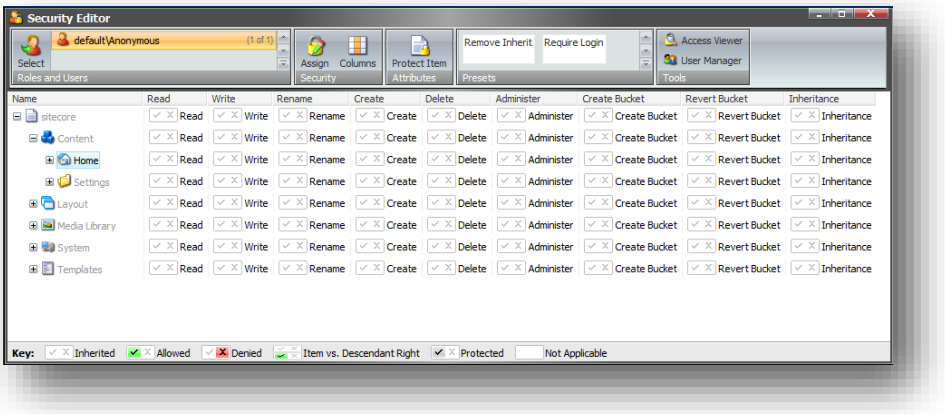
3.4 Security and Item Buckets

If you need to restrict the ability of a user or role to convert a content item into an item bucket or to convert an item bucket back into a normal item, you can use the Security Editor to change their access rights.

The Sitecore security system contains two access rights to support item buckets:

- Create Bucket
- Revert Bucket

If these security settings are not immediately available in the **Security Editor**, in the **Security** group, click **Columns** and then in the **Columns** dialog box, select *Create Bucket* and *Revert Bucket*.



Tip
We recommend that you use the Sitecore security system to prevent particular users from performing certain operations. For example, you do not want someone to accidentally delete a lot of items.

Locking

You must lock a content item before you can convert it into an item bucket or turn an item bucket into an ordinary content item.

To minimize the possibility of accidentally creating an item bucket or making a template bucketable, all users but administrators *must* place a lock on the item before they can place it in a bucket.

3.4.1 Identification and Authentication Modifications

Item buckets drastically improves the way that identification and authentication — IA — is managed on a website. Items that are stored in a bucket no longer maintain a child to parent relationship and the item bucket is simply a pool of items.

Item buckets support all the normal IA operations including:

- Copy To
- Copy From
- Move To
- Move From
- Clone To
- Clone From

- Delete

If you copy or move a content item that is based on a bucketable template into an item bucket, the item is placed in the bucket and automatically organized in the bucket structure.

If you copy or move a content item that is not based on a bucketable template into an item bucket, it is placed in the bucket and is treated like a normal content item.

You can also:

- Drag a copy into an item bucket.
- Drag a copy out of an item bucket.
- Drag an item to move it into an item bucket.
- Drag an item to move it out of an item bucket.

If you delete an item bucket, a message appears informing you that when you delete an item bucket you also delete the content items that are stored in it. You can restore these content items from the recycle bin by restoring the item bucket. If you want to see the content items that are in the item bucket, revert the bucket.

Note
After you restore an item bucket from the Recycle Bin, you must rebuild the search index.

Keyboard Shortcuts

Here is a list of the keyboard shortcuts that you can use with item buckets. Note, however, that there are many possible combinations of browsers, browser versions, and operating systems, and all shortcuts may not always work.

Shortcut	Description
CTRL + SHIFT + B	Converts a content item into an item bucket. You must lock the item first.
CTRL + SHIFT + D	Converts an item bucket into a content item. You must lock the item first.
CTRL + X	Clears the text box.
CTRL + SHIFT + S	Opens a new search tab on the selected content item. This shortcut does not convert the item into an item bucket.
CTRL + SHIFT + A	Selects the closest item bucket ancestor of the current item and adds a search tab to it.
Space Bar	Scrolls down the results when the search box is not selected.
CTRL + Space Bar	Displays the dropdown options when the search box is selected.
ESC	This hides the drop-down list if it is shown.
CTRL + B	Shifts the focus to the text box if it is outside the textbox.
SHIFT + Number	Runs the search in a particular view. 1 will run the first, 2, the second, and so on.
1-9	The numeric characters move focus to the corresponding page of the search results.

3.5 Using a Custom Class to Create a Query

To quickly query a field, you can use a compiled class that returns an `Item[]` as the source of your fields. Start your query with the word *code* and then enter the `.class, assembly` namespace as the source field.

You do this by implementing the `IDataSource` interface.

```
code:Sitecore.Namespace.Class, Assembly
```

3.6 Using Item Buckets with the Data Source of a Control

If all the items in a bucket are hidden and cannot be selected, you can choose the data source for a control by specifying a search query. This section describes the syntax for setting the data source to run a query in an item bucket.

Types of queries:

- Template
- Version
- Language
- Creation Start and End Date
- File Type
- Author
- Tag (Facet)
- Site
- Advanced Text
- ID
- Custom

You must place the queries in a semicolon separated list. For example, to search for all the Nicam products, you could specify:

```
+text:Nicam;template:<Product Template ID>;
```

This is passed to your control as a string and you can then use `UIFilters helper class` to create a list of items. Please refer to the Sample Datasource Sublayout in the Layouts folder to see how to use this.

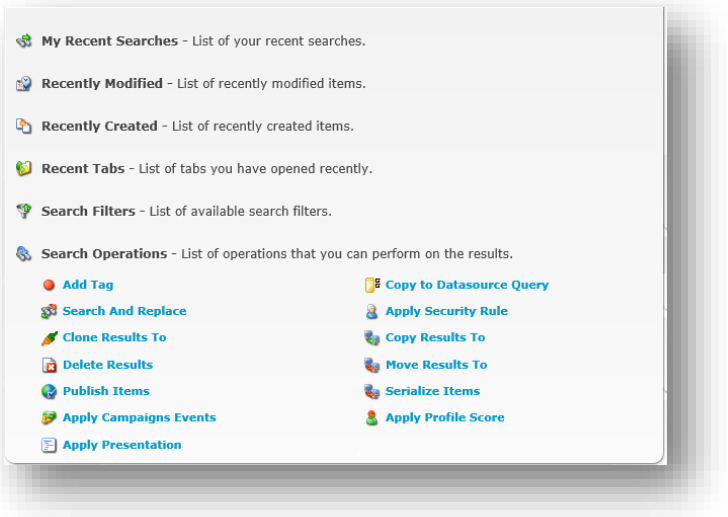
Tips

Sitecore runs the query in the context of its location. For example, if you run a query on a control, Sitecore starts the query from the context item and works through all its descendants. If you need to perform a global search or search in another part of the content tree, you can pass the location parameter to the query for the data source.

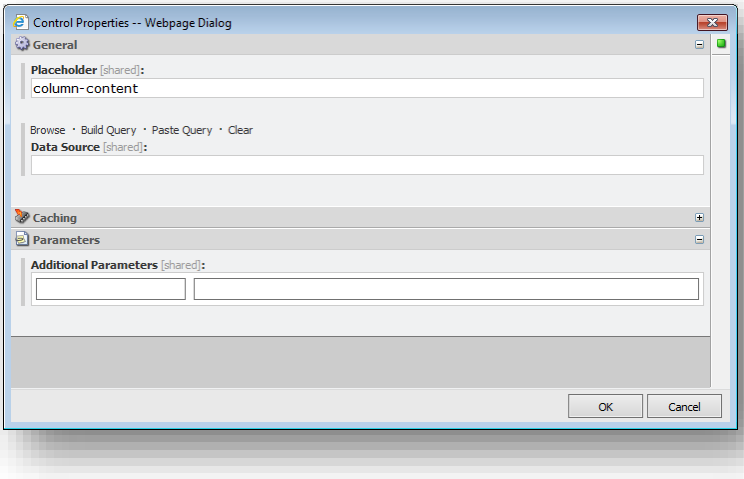
For example, the following query looks for all the items that are tagged *Nicam* and that exist under the `/sitecore/content/home` node — the ID of the home item is shown:

```
tag:{TagId};location:{110D559F-DEA5-42EA-9C1C-8A5DF7E70EF9};
```

To paste queries, search for content in the normal way. Once you have a filter, click the drop down menu and in the **Search Operations** section, click **Copy to Datasource Query**.



When you configure your presentation data source, you can paste the query into a **Data Source** field.



Chapter 4

Sitecore DMS and Item Buckets

As you work with Sitecore, you may need to link to an item that is stored in an item bucket. For example, you may need to insert a link to a bucketable item or use a bucketable item as a variation when you are creating an MV test. To help you locate items in these situations, Sitecore provides search functionality in the appropriate dialog boxes in the Page Editor and in the Content Editor.

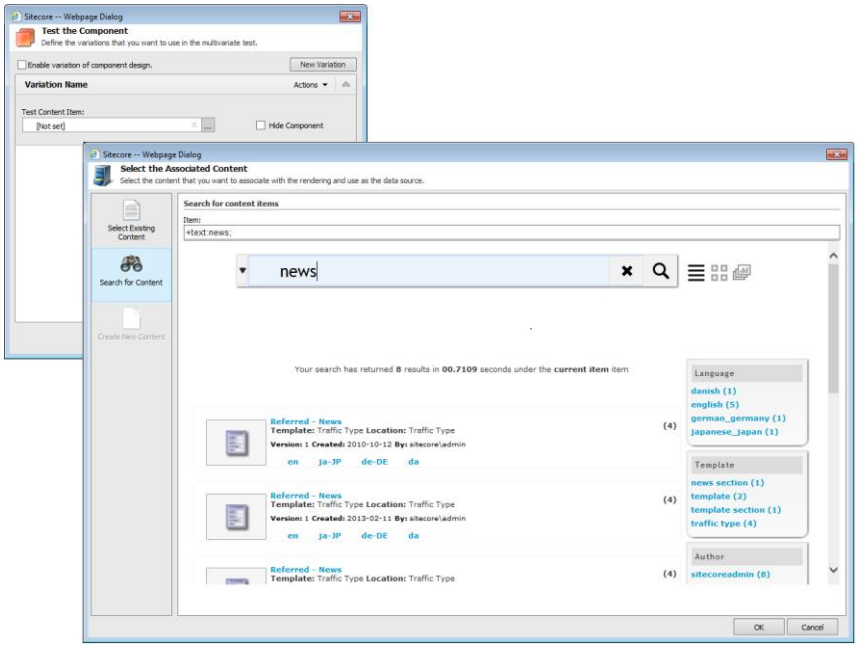
This chapter contains the following sections:

- Personalization and MV Tests
- Inserting and Managing Links
- Tagging Associations across Many Items

4.1 Personalization and MV Tests

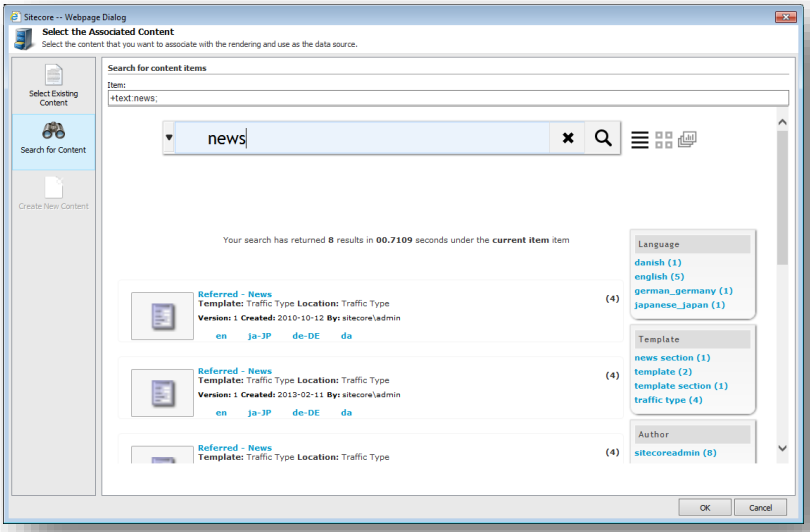
When you set up a personalization rule or create an MV test, you must specify the data source for each variant in the test.

For example, when you create an MV test, you must select the content items that should be used as variants in the test. Selecting a normal content item is straightforward — you browse the content tree and select the item in question. However, this is not so simple when you want to use a content item that is stored and hidden in an item bucket. A search tab has therefore been added to the **Select the Associated Content** dialog box to help you find the items that you need.



4.1.1 Setting the Data Source

When you specify the data source for a control, you can also use the new search functionality to either set an individual item or a list of items as the data source.



4.2 Inserting and Managing Links

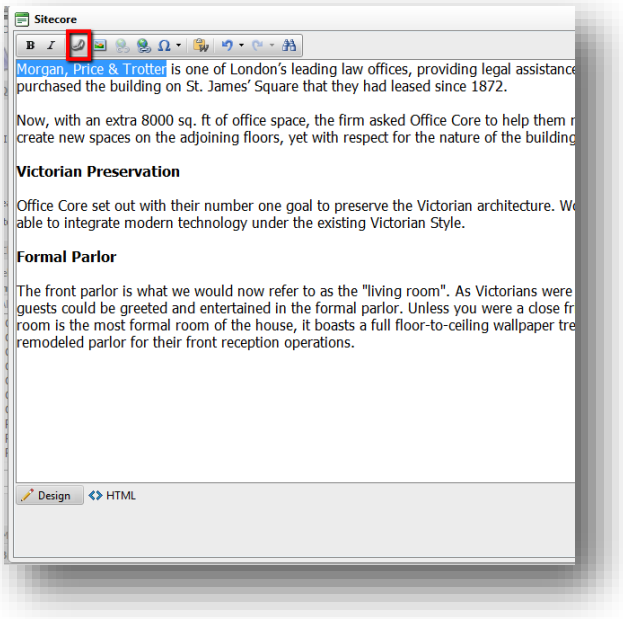
This section describes how to insert and manage links to items that are stored in item buckets.

4.2.1 Inserting a Link in the Rich Text Editor

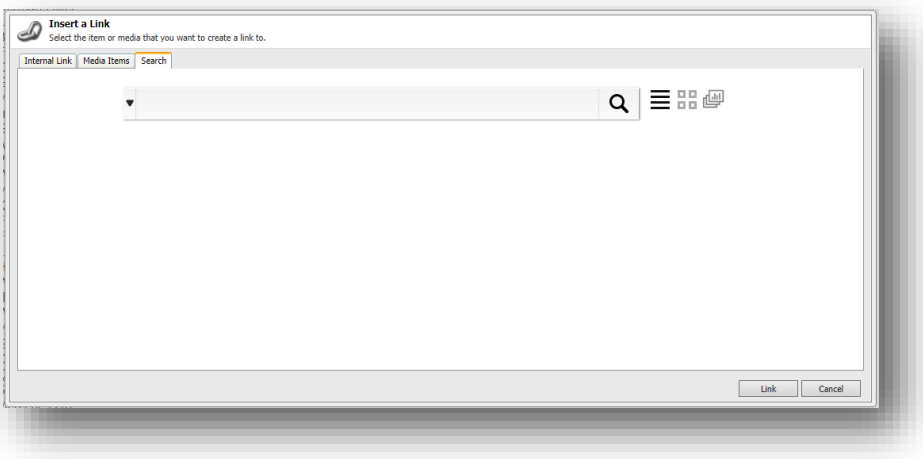
When you edit content items in the Page Editor or in the Content Editor, you often use the Rich Text Editor.

To insert a link into a rich text field:

1. In the **Content Editor**, open the content item that you want to edit.
2. Scroll down to the rich text field that you want to edit and click **Show Editor**.
3. In the **Rich Text Editor**, select the text that you want to use as a link.

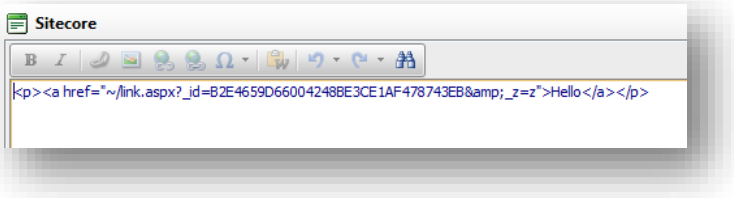


4. Click **the Insert Sitecore Link** button and an **Insert a Link** dialog box appears. This dialog box contains a **Search** tab.



5. Enter the search terms that you want to use.

6. In the search results, click the item that you want to link to and the link to this item is inserted into the text.

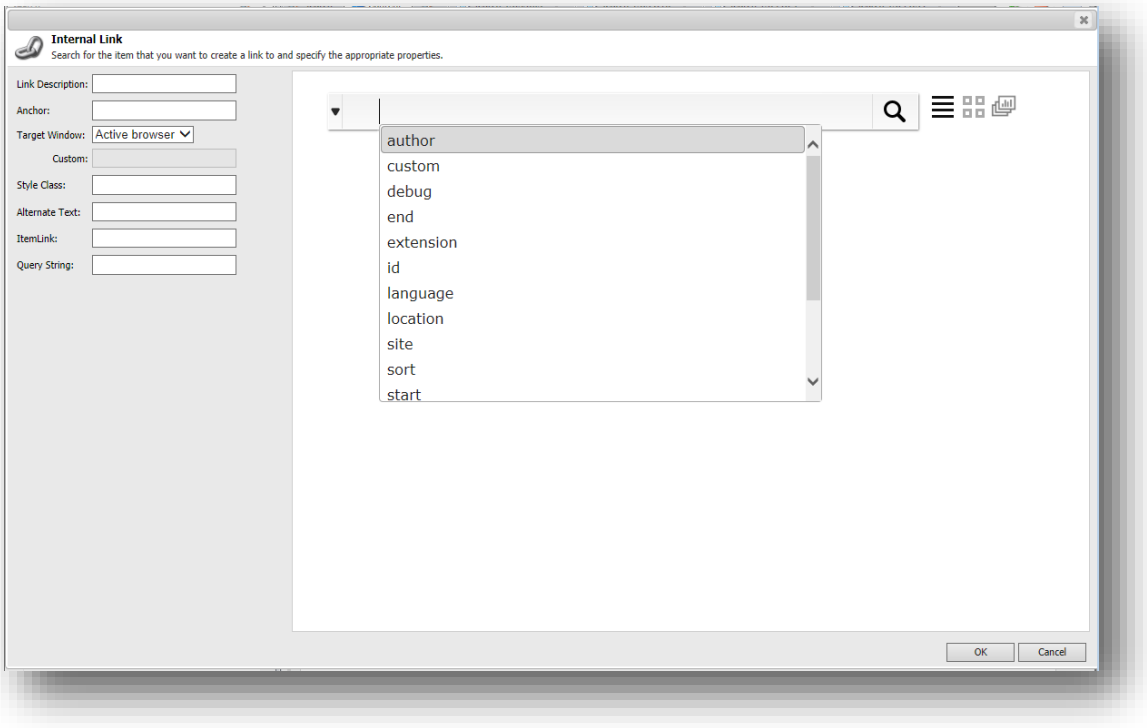


If you want to insert an image that is stored in an item bucket into a rich text field, the **Insert Media Item** dialog box also contains a **Search** tab that you can use to find the image.

Inserting a General Link with Search

The Item Buckets functionality has also introduced some new field types. One of these is the **General Link with Search** field.

To insert a link into a *General Link with Search* field, click **Search for a Link** and the **Internal Link dialog** box opens.



For more information about the *bucket link* field types, see the chapter *Developing with Item Buckets*.

4.3 Tagging Associations across Many Items

Because the parent to child relationship is removed, content items that are stored in an item bucket need a way to connect to other content items. The item buckets functionality supports a semantic tagging system which allows you to tag associations on every item.

To support item tagging, add a field to the template and call it, for example, *tags*. This field should be a *Multilist with Search* field. To comply with best practices, we recommend that you add this field to a base template. If you want to tag every item in the content tree, add this field to the standard template.

For example, if you want to tag media items, set the *tags* field on the *File* template and set the source of the field type to:

```
StartSearchLocation={Tag Repository ID} } (if you are using the sharded
approach to indexes then you can add) &IndexName=itembuckets_sitecore
```

This is where semantics come in. You can add any tag to any content item. If you create a tag called *Work in Progress,* you can tag all of the content items that are not yet ready for publication as *Work in Progress.* You can then search for all items that are marked *Work in Progress*.

4.3.1 Creating a Tag

The tags are stored in the `/sitecore/system/settings/buckets/tag repositories` folder. You can create as many tags in this folder as you want. These tags can be based on any template that you think is appropriate. You can use these items to tag the content items that make up your website.

Sitecore searches on the tag field of an item by default. If you add your own field and would like it to also work with the tag repository, you must add this new field as shown below. You must also go through all the config files and add your field to the indexes so that it is aggregated into the `_tags` field in the index.

```
<fields hint="raw:AddCustomField">
    <field luceneName="_tags" storageType="no" indexType="tokenized">semantics</field>
    <field luceneName="_tags" storageType="no"
indexType="tokenized">mycustomtaggingfield</field>
</fields>
```

Chapter 5

Developing with Item Buckets

This chapter describes how to use develop with item buckets, and how to the Sitecore API to work with item buckets.

This chapter contains the following sections:

- New Field Types
- Creating a Tag Repository
- LINQ to Sitecore
- Adding a New Search Provider
- Linq to Provider
- Searching
- Rule-based Boosting
- Multiple Index Support
- Adding a New View

5.1 New Field Types

There are some new field types available that have been extended so that they can support vast amounts of content without degrading performance.

Sitecore contains a multilist field that can scale to hundreds of items. However, performance starts to degrade when there are more than a hundred items in the field.

Note the following about the parameters in the source field:

StartSearchLocation: This is the location where the search will start from (the place in the content tree).

TemplateFilter: You can specify a Template ID or a pipe delimited list of Template ID and it will filter the result to only those templates.

PageSize: You can set a number, and the result of the search will be returned this many items at a time.

Multilist with Search Field

A Multilist with Search field has no limitation and can scale to thousands of items. We recommend that you use a Multilist with Search field to list items that are stored in an item bucket.

Use this field to attach a search query to a multilist field and display the search results as selectable items. For example, if you want a multilist of all the product items, you can set the source field of the field to `TemplateFilter=”Product ID”` and it returns the items in the list.

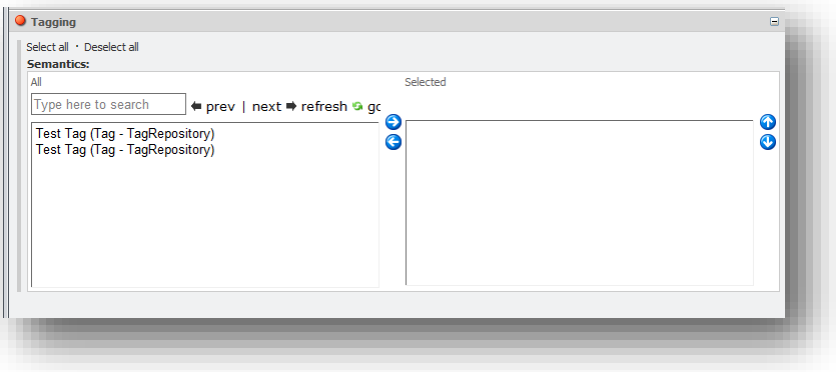
You can use optional filters as in this example:

```
StartSearchLocation=<GUID>&Filter=text:jim
```

You can specify that it is possible for users to change the starting location dynamically. You do this by entering this in the Source field:

```
EnableSetNewStartLocation=True
```

These queries populate the list and you can then select the items from the list. You can also use a search filter to filter the list even more.

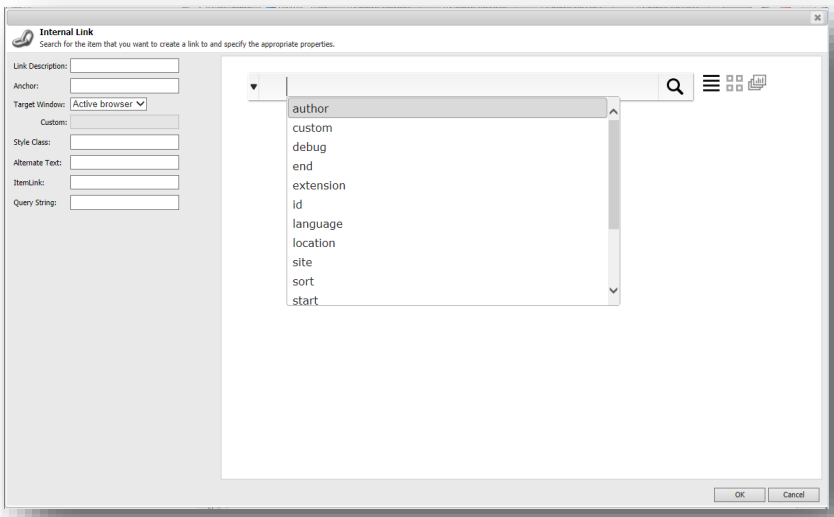


For more information about the search filters that are available, see the section *Using Search Filters*.

You can set a field to sort the list on by adding `SortField=_name` to the Source property of the field. You can add a sorting direction like this: `SortField=_name[asc|desc]`. If you specify a SortField without a sorting direction, Sitecore uses `asc` sorting.

General Link with Search Field

Use this field to create a link to an item that is stored in an item bucket.



Treelist with Search Field

Treelist with Search is a new field type that allows you to reference items in much the same way as a multilist field. However, unlike the multilist field, you can search within this field. In addition, you can enter a GUID to determine the start location of the search.

This will override the default filter that has been set on the template. The text field will search for the key item in this field, including any filters applied.

5.2 Creating a Tag Repository

To create a tag repository and to enable the tag filter in searches, you must create a new class in your Visual Studio solution and implement the `ITagRepository` interface.

You must implement methods that return *All Tags*, *Single Tags*, *First Tag*, *Tags by Name*, *Tags by Value*.

You can have as many tag repositories as you need and they can also come from different sources. After you have written your code, you must create a tag repository item in the content tree, under `/sitecore/system/Modules/Item Buckets/Tag Repositories`. You must point to the class you just compiled with the `namespace.class` assembly syntax.

Sitecore comes with a built-in tag repository.

To enable the built-in tag repository on your website:

1. In any template, create a field called **Tags**. This must be a multilist or multilist woith search field.
2. Navigate to the `/sitecore/system/Settings/Buckets/Item Buckets Settings` item.
3. In the **Tag Parent** field, point to the parent item that stores all the tags.

   The parent item that stores all the tags can also be an item bucket. The parent item that stores all the tags is a suitable candidate for an item bucket.

5.3 LINQ to Sitecore

- Sort by standard string, integer, float, or any type that implements IComparable

The Linq to Items layer does not implement all of IQueryable. The following methods have been implemented:

- All
- Any
- Between — with an extra overload for including or excluding the start and end ranges.
- Boost — makes this part of the query more important than the other parts.
- Cast — you can use this instead of Select.
- Contains
- Count
- ElementAt
- EndsWith
- Equal
- Facets — an extension that fetches the facets of predicates.
- First
- FirstOrDefault
- Last
- LastOrDefault
- Min
- Max
- Match — an extension for running regular expression queries.
- OrderBy
- OrderByDescending
- Select
- Single
- SingleOrDefault
- Skip
- Reverse
- Take
- ToList()
- ToLookUp()
- ToDictionary()
- Page — an extension that does Skip and Take automatically for you.
- StartsWith

Not supported

- Join
- GroupBy
- GroupByJoin
- Intersect
- Sum
- Average
- Concat
- TakeWhile
- SkipWhile
- Union

Lucene Syntax	Linq to Sitecore	
Terms & Phrases	`"test"` or `"hello dolly"`	`c.Where("test")` or `c.Where("hello dolly")` or `c.Where("test" || "hello dolly")`
Fields	`title:"The Right way"` and `text:"go"`	`c.Title == "The Right way"` or `c.Text == "go"` or `c.Equals("go")`
WildCard	`*amber*`	`c.ContactName.Contains ("amber")`
Prefix	`amber* *amber`	`c.ContactName.StartsWith("amber")` or `c.ContactName.EndsWith("amber")`
Fuzzy	`roam~` or `roam~0.8`	`c.ContactName.Like("roam")` or `c.ContactName.Like("roam", 0.8)`
Proximity	`"jakarta apache"~10`	`c.ContactName.Like("jakarta apache", 10)`
Inclusive Range	`mod_date:[20020101 TO 20030101]`	`c.ModifiedDate.Between("20020101", "20030101", Inclusion.Both)`
Exclusive Range	`title:{Aida TO Carmen}`	`c.Title.Between("Aida", "Carmen", Inclusion.None)`

Boosting	`jakarta^4 apache`	`c.Title.Equals("jakarta".Boost(4)) || c.Title.Equals("apache")`
Boolean Or	`"jakarta apache" OR jakarta`	`where c.Title.Equals("jakarta apache") || c.Equals("jakarta")`
Boolean And	`"jakarta apache" AND "Apache Lucene"`	`where c.Equals("jakarta apache") && c.Equals("Apache Lucene")`
Boolean Not	`"jakarta apache" NOT "Apache Lucene"`	`where c.Equals("jakarta apache") && !c.Equals("Apache Lucene")`
Grouping	`(jakarta OR apache) AND website`	`where (c.Title == "jakarta" || c.Title == "apache") && (c.Title == "website")`

Sitecore supports two search providers:

- Lucene.net
- SOLR — shipped separately

The Linq layer is an abstract layer that converts common queries to something that a search provider understands.

For example, with a query like

```
var query = context.GetQueryable<Product>.Where(item => item.Name == "Sample Item")
```

the Linq layer resolves it to something that SOLR or Lucene.net understands. If you implement a new search provider, this provider can also understand the query. Although the Linq layer converts it to a common query, the implementation of your search provider determines exactly what comes back.

The Linq layer is used internally by Sitecore but can also be used by developers. You can use this layer in your sublayouts.

To start a search, you must set up a search context:

```
        using (var context = ContentSearchManager.GetIndex(item).CreateSearchContext())
        {
            IQueryable<SearchResultItem> searchQuery =
context.GetQueryable<SearchResultItem>().Where(item => item.Name == "Sitecore")
        }
```

This returns the results of a query on your search index and returns it as a `SearchResultItem` type.

You can also use the indexer to run queries:

```
        using (var context = ContentSearchManager.GetIndex(item).CreateSearchContext())
        {
            IQueryable<SearchResultItem> searchQuery =
context.GetQueryable<SearchResultItem>().Where(item => item["_name"] == "Sitecore")
        }
```

This converts the query to something your provider understands. For example, for Lucene it is converted to:

```
_name:sitecore
```

This is something that Lucene understands and can work with.

Complex Searches

```
        using (var context = ContentSearchManager.GetIndex(item).CreateSearchContext())
        {
            IQueryable<SearchResultItem> searchQuery =
context.GetQueryable<SearchResultItem>().Where(item => item[" name"] == "Sitecore").Where(item
=> item.Title == "Test || item.Body.Contains("CMS"))
        }
        OR
        using (var context = ContentSearchManager.GetIndex(item).CreateSearchContext())
        {
            IQueryable<SearchResultItem> searchQuery =
context.GetQueryable<SearchResultItem>().Where(item => item.Name == "Sitecore").Where(item =>
item.Title == "Test || item.Body.Contains("CMS"))
        }
```

For Lucene, the Linq layer converts it to:

```
        +(+_name:sitecore) +(title:test body:*cms*)
```

For Solr, the Linq layer converts it to:

```
        (+(+_name:sitecore) +(title:test body:*cms*))
```

There is no great difference; they should both return the same results. The SOLR provider needs to parse the queries differently.

You can use the Predicate Builder Helper that comes with Sitecore 7.0 to make subtle changes to the way the Linq Queries are built. The Linq Layer uses expression trees to evaluate the LINQ to a lower level that any provider can understand.

Adding a New Linq Provider

You can add a new Linq Provider by creating a new project in Visual Studio, and then adding a reference to `Sitecore.ContentSearch.Linq` to the project.

If you use a RESTFul layer, you do not need anything else. If not, you must add a reference to your provider to the project, as well.

There are a few classes that you must construct, at a minimum. These classes are listed below. You can implement others as well, to have more control.

QueryObject

```
        YourNewQuery : IDumpable
```

The IDumpable interface allows you to dump debug information into Visual Studio.

Index

```
        YourNewIndex<TItem> : Index<TItem, YourNewQuery>
```

This interface is responsible for constructing your QueryMapper and QueryOptimizer.

Override QueryMapper, QueryOptimizer, Execute, FindElements

QueryMapper

```
        YourNewQueryMapper : QueryMapper<YourNewQuery>
```

This is where all the magic happens. This is where you map an `IQueryable` method to the logic that your search provider uses to solve this functionality.

The `Strip` methods in this class pass the query in your Query object to an `IEnueramble` collection of query method objects and prevent the query from being directly implemented.

For example, if you run `Count` on `IQueryable` within the Lucene provider, it cannot just pass `count:10` or `size:10` in the query and expect Lucene to understand. However, it can use the input when it is ready to resolve the Linq Query to Lucene.

```
        TopDocs hits = indexSearcher.Search(parser.Parse(query), null, count);
```

The `Visit` methods are used in expression trees to build up a query in Linq and convert it to something else.

An example that uses `StartsWith`:

```
protected virtual Query VisitStartsWith(StartsWithNode node)
{
  var fieldNode = QueryHelper.GetFieldNode(node);
  var valueNode = QueryHelper.GetValueNode<string>(node);

  return new WildcardQuery(new Term(fieldNode.FieldKey, valueNode.Value + "*"));
}
```

The LuceneProvider for Linq maps `StartsWith` in `IQueryable` to a `WildcardQuery` in Lucene and produces the following output:

```
Fieldname:fieldvalue*
```

If you were to implement, for example, a search provider for MongoDB, it would look something like this for `EndsWith`:

```
protected virtual Query VisitStartsWith(EndsWithNode node)
{
  var fieldNode = QueryHelper.GetFieldNode(node);
  var valueNode = QueryHelper.GetValueNode<string>(node);
 return Query<TItem>.Find(b => b[fieldNode.FieldKey], "/^" + valueNode.Value);

}
```

QueryOptimizer

This is an abstract class that is used to optimize queries.

QueryOptimizerState

This is used to store the state of every query, for example, the default boost of 1 on every query. This can also be used to store things like the default analyzer and so on.

Boosting Items

Every content item contains a **Boost** Field. This field is used to increase the relative importance of items in the content tree. The values start at 1.0 — default — and can go up to, for example, 1.0 or 2.3. After you set this value, save the item and the order of your results will immediately reflect the new boost values.

Note
You must not dispose manually of Lucene indexes that implement the IDisposable interface. Sitecore disposes of these indexes when the CMS is restarted. Doing it manually can cause index data inconsistency.

5.4 Adding a New Search Provider

Sitecore has been designed with flexibility in mind and it is quite easy to add your own search provider.

There are many end points that you must implement, and you need to *translate* back and forth between Sitecore syntax and semantics and the syntax and semantics of the search provider. It is not mandatory to *translate* all the features in Sitecore, only the ones you want to use.

Abstract Document Builder

`Sitecore.ContentSearch.AbstractDocumentBuilder` is the entry point for mapping the configuration.

Computed Fields

In its simplest form, an index takes a text and places it in an index. Sometimes you may need more control over the way that data is stored or, more importantly, what data is stored. Sitecore uses computed fields to perform lookups and complex logic to determine what gets placed in your index.

For example, Sitecore uses computed fields to store the parsed Created Dates of items, whether or not an item has a lock or whether or not an item is a clone. To create your own computed fields, you need to create a new class and implement the `IComputedIndexField` interface.

The `IComputedIndexField` interface is quite simple. It expects a string and an object. The `FieldName` string is the name that the field uses in your index. The object is the value. `ComputeFieldValue` takes the item that is being indexed. It is from here that you can use it to look up other things to index — for example, the presentation data sources of the items.

```
        public class IsClone : IComputedIndexField
        {
            public object ComputeFieldValue(IIndexable indexable)
            {
                Item item = (Item) (indexable as SitecoreIndexableItem);
                return item.IsClone;
            }

            public string FieldName { get; set; }

            public string ReturnType { get; set; }
        }
```

Computed fields are useful for storing data that needs to be calculated or logic for looking values up from an item. They can also be used for faceting and scaling inbuilt fields or for scaling facets.

Converters

In a classic data in and data out situation, it can sometimes be a good idea to convert your data so that it is stored in a certain way and then extracted in another way. For example, if you want to store dates in the index in a certain format — *20121212* — and fetch them from the index as a strongly typed DateTime, this is the job of a converter.

To create a new converter for a type, create a class that inherits from `Sitecore.ContentSearch.Convertors.TypeConvertor` and override the methods as necessary.

For example, to cast a GUID in the index to a `Sitecore.Item.ID` in code, use the following converter:

```
        public class IndexFieldIDValueConverter : TypeConverter
            {
                public override bool CanConvertFrom(ITypeDescriptorContext context, Type
sourceType)
                {
                    if (sourceType == typeof(ID))
                        return true;

                    return base.CanConvertFrom(context, sourceType);
```

```
                }

                public override bool CanConvertTo(ITypeDescriptorContext context, Type
destinationType)
                {
                    if (destinationType == typeof(string))
                        return true;

                    return base.CanConvertTo(context, destinationType);
                }

                public override object ConvertTo(ITypeDescriptorContext context,
System.Globalization.CultureInfo culture, object value, Type destinationType)
                {

                    return ((ID)value).ToShortID().ToString().ToLowerInvariant();
                }
            }
```

New Logging Classes

Sitecore comes with a logging framework called Log4net. This is wrapped up in the `Sitecore.Diagnostics` namespace, and you can use it to write to log files. Sitecore 7.0 introduces two new log files for searching and crawling.

To write to the search and crawling log files, use `SearchLog.Log.xxx` and `CrawlingLog.Log.xxx` respectively. They write to separate files.

In the `Sitecore.Buckets.config` file, set the `BucketConfiguration.EnableBucketDebug` setting to true and Sitecore uses these files to log all your searches. All the crawling is also logged by default so that developers can see exactly what is being placed in the index and what is being searched for.

Query Warm-up

When Sitecore starts up for the first time, it runs through a list of pre-defined queries that warm up the index cache of your search provider. The warm-up queries are listed in the `Sitecore.Buckets.WarmupQueries.config.example` file:

```
<configuration>
  <sitecore>
    <search>
      <warmup>
        <query>-
 template:adb6ca4f03ef4f47b9ac9ce2ba53ff97|+( path:110d559fdea542ea9c1c8a5df7e70ef9)|+ lastest
version:1|-_id:110d559fdea542ea9c1c8a5df7e70ef9*</query>
        <query>-_template:adb6ca4f03ef4f47b9ac9ce2ba53ff97|+_lastestversion:1</query>
        <query>+_language:en|-
_template:adb6ca4f03ef4f47b9ac9ce2ba53ff97|+(_path:3c1715fe6a134fcf845fde308ba9741d)|+(+is
displayed in search results:1)|+ lastestversion:1|-
 id:3c1715fe6a134fcf845fde308ba9741d*</query>
        <query>__smallupdateddate:[20121111 TO 20121113]</query>
        <query>__smallcreateddate:[20121111 TO 20121113]</query>
        <query>  smallcreateddate:[20121111 TO 20121113]</query>
      </warmup>
    </search>
  </sitecore>
</configuration>
```

To add new queries, delimit every search term with a pipe “|” symbol and then normalize and escape the queries — that is, prevent *strange characters* from being passed on.

You can use the search log files to identify the most common searches and then place them in the warm-up phase so that the indexes are already warm when the users start to use them.

Field Readers

You can use field readers to convert known Sitecore field types to other values that you would prefer to store in the index. For example, a check box that is selected stores a *1* in the index and a cleared check box stores a blank.

You can use field readers to map both existing and any new field types that you create to different values in the index.

ContentSearchManager

The `ContentSearchManager` class is useful for getting access to everything you can do with your indexes.Use this class when you need to update, delete, search, or simply fetch information from an index.

The `ContentSearchManager` class has many useful properties and also gives you access to the `IQueryable` interface. It also gives you access to all the indexes so that you can rebuild them or get statistics about the health of each index.

5.4.1 Pipelines

Sitecore uses pipelines for searching, crawling, and UI interaction. This makes it very easy for you to plug in your own code when you need to.

contentSearch.getContextIndex

You can use the `contentSearch.getContextIndex` pipeline to control where Sitecore starts to search from. Sitecore currently uses `Context.Item` to determine where it should search. You can use this pipeline, for example, to specify that Sitecore should start searching from a certain part of the content tree in certain situations.

contentSearch.getGlobalSearchFilters

Searches run through the Linq Layer have some default filters. These filters contain things like ignoring certain templates, setting the path to start the search from and always returning the latest version of the item in the search results. You can add your own global filters here. You have access to the IQueryable collection where you are able to add your own filters.

contentSearch.QueryWarmup

Run specific queries when the application pool starts for the first time.

contentSearch.translateQuery

This pipeline gives you the raw query that is sent from the UI or from a query to the `Search.ashx` handler, and it allows you to manipulate the query before it is consumed by the Linq layer.

For example, Solr supports dynamic queries and this pipeline can be used to change a UI query from, for example, `title:sitecore` to `title_string:sitecore` before the Linq layer converts it to `IQueryable`.

buckets.createBucket

When an item bucket is created through the UI or through code, you can hook onto this pipeline to manipulate the bucketing process.

buckets.removeBucket

When an item bucket is converted into a normal container through the UI or through code, you can hook onto this pipeline to manipulate the unbucketing process.

buckets.syncBucket

When an item bucket is synchronized through the UI or through code, you can hook onto this pipeline to manipulate the synchronization process.

Buckets.isBucket

This pipeline is used to determine whether or not a content item is an item bucket. This pipeline allows you to modify the way in which you determine whether a content item is an item bucket or not.

buckets.isItemContainedWithinBucket

This pipeline is used to determine whether or not a content item is stored in an item bucket.

buckets.isTemplateBucketable

This pipeline is used to determine whether or not an item is bucketable. There are many ways to determine this.

You can modify this behavior so that it uses complex logic to specify that if the item is based on a template that has a very large numbers of items, it should be bucketable.

buckets.addSearchTabToItem

This pipeline is used add a search tab to an item. You can modify this to add many tabs or even have tabs that contain predefined searches that are already run when you open the tab.

buckets.cloneItemIntoBucket

This pipeline is used for cloning items into an item bucket.

buckets.copyItemIntoBucket

This pipeline is used for copying items into an item bucket.

buckets.moveItemIntoBucket

This pipeline is used for moving items into an item bucket.

buckets.getFacets

This pipeline is used to return facets in results.

buckets.dynamicFields

This pipeline is used to fill the SearchResultItem DynamicFields Dictionary with values that can be dynamically displayed in the search results.

This is useful if you are building new views for the UI, as you use this pipeline to dynamically generate values to display.

buckets.fillItem

This pipeline is used internally by Sitecore to add all the built-in fields that can be displayed in the search UI, for example, Template, Author, Created Date, and so on.

This pipeline is similar to the Dynamic Fields pipeline.

buckets.dynamicQuickActions

This pipeline is used to return quick actions. Quick actions are helper links that are displayed in search results. They allow you to quickly perform operations on items in the search results without having to open the item. You can use the QuickActions pipeline to create dynamic QuickActions, for example, an action that allows users to quickly translate an item. It could also be used to show a quick link to the next workflow state of items.

buckets.uiLaunchResult

This pipeline makes it possible to open search results from different data sources in different views. You do this by adding your own processor to the uiLaunchResult pipeline and implement how an item from a specific data source is opened.

The intended use is where you have implemented a crawler that indexes data from external data sources and the crawler saves these index entries with a value such as, for example, “media” in datasource.

You update the “buckets.resolveUIDocumentMapperFactoryRules” pipeline and add your own processor that defines a new rule that makes it possible to search for items with a datasource that is not “sitecore” (for example, “media”). The processor you have implemented in uiLaunchResult can manage how these items are opened.

5.4.2 Miscellaneous

SearchStringModel

This is the model that is passed between the UI and the Linq Layer to determine which query to run. The model contains three simple properties:

Property	Description
Type	The name of the field that you want to use in the search.
Value	The value of the field.
Operation	Whether the search should use this value, must use this value, or must not use this value.

When you make requests directly to `Search.ashx` that do not go through the Sitecore search API, you must use this model.

For example, if you are using JavaScript to make an AJAX post to the ASHX handler to return search results, you must use this model to run your searches.

Create an array in JavaScript:

```
       var searchQuery = new Array();
       searchQuery.push({
                                type: “text”,
                                value: “sitecore”,
                                operation: “must”
                           })
       function runQuery(o, pageNumber, onSuccessFunction, onErrorFunction) {
           $.ajax({
               type: "GET",
        url: QueryServer +
"/sitecore/shell/Applications/Buckets/Services/Search.ashx?callback=?",
               contentType: "application/json; charset=utf-8",
               dataType: "jsonp",
               cache: false,
               data: {
                   selections: searchQuery,
                   pageNumber: pageNumber,
                   type: "Query",
                   pageSize: 20,
                   version: "1"
               },
               responseType: "json",
               success: onSuccessFunction,
               error: onErrorFunction
           });
       }
```

5.5 Linq to Provider

The Linq search API provides access to search the indexes using standard Linq queries in the same way that other Linq providers works like Linq to SQL, Linq to Objects, and so on.

The search API is using the standard `IQueryable<T>` interface and has support for most of the available operations. For a general introduction to Linq, see http://msdn.microsoft.com/en-us/library/vstudio/bb397926.aspx.

Note
There are some operations that are not supported even though they are available through the `IQueryable<T>` interface. If these methods are called, a `NotSupportedException` or `InvalidOperationException` exception is thrown at runtime.

5.5.1 Accessing the Linq to Sitecore API

All searches are performed through `IProviderSearchContext` search context. The search context exposes the method `GetQueryable<T>` method which returns an instance of `IQueryable<T>`.

Example

```
        public IEnumerable< MySearchResultItem > PerformSearch()
        {
        var index = ContentSearchManager.GetIndex ("[My Index ]");

        using (var context =
index.CreateSearchContext(SearchSecurityOptions.EnableSecurityCheck))

        {
        var queryable = context.GetQueryable<MySearchResultItem>();

        var results = queryable.Where(d => d.Name == "Sitecore");

        return results;
        }
        }
```

5.5.2 Custom Search Type / Object Mapping

Because the search API uses the generic `IQueryable<T>` interface to expose the search indexes, it is possible to use custom classes/POCO classes to describe the information in the indexes.

To implement custom search types, the class *must*:

- Have an empty constructor.
- Expose public properties with getters and setters and/or a public indexer to hold the search result data.

The Linq provider automatically maps document fields in the index to properties on the custom search type by the names of the properties. Properties or fields from the index that have not been matched together by name are skipped during the object creation/mapping.

It is also possible to map properties that do not match to fields in the index by decorating the properties with the `IndexField` attribute. You can use this, for example, to expose special Sitecore fields like *_name* as a property called *Name*. A different use case is field names with spaces, because they cannot be mapped directly to a property by name.

Furthermore, you can implement an indexer that is populated with the field name as key and the value for each field in the index document. There is also an `ObjectIndexerKey` that you can use to wrap indexers as different types. This is useful if you only have the string version of a property name but need to use it as an indexer for a property type which is actually something like an int.

Depending on the search provider being used, the indexed and stored data in the index might not be the native types for the value. For Lucene everything is stored and indexed as strings.

Supported Types

The following types are supported for automatic type conversion when mapping index document fields to properties:

- .NET built-in integral types
- .NET built-in floating-point types
- Boolean
- String
- DateTime
- Guid
- Sitecore ID
- Sitecore ShortID
- Sitecore ItemUri
- IEnumerable<T>
- DateTimeOffset
- Language
- Version
- Database
- CultureInfo
- TimeSpan

Custom Search Type Example

```
public class MySearchResultItem
{

// Fields
private readonly Dictionary<string, stringfields = new Dictionary<string, string>();


// Properties


// Will match the _name field in the index
[IndexField(" name")]
public string Name { get; set; }

// Will match the myid field in the index
public Guid MyId { get; set; }

public int MyNumber { get; set; }
public float MyFloatingPointNumber { get; set; }
public double MyOtherFloatingPointNumber { get; set;}
public DateTime MyDate { get; set; }
public ShortID MyShortID { get; set; }
public ID SitecoreID { get; set; }

// Will be set with key and value for each field in the index document
public string this[string key]
{
get
{
return this.fields[key.ToLowerInvariant()];
}
```

```
        set
        {
        this.fields[key.ToLowerInvariant()] = value;
        }
        }
        }
```

5.5.3 Supported IQueryable methods

Restriction Operators

Where

```
        var results = from d in queryable where d.Name == "Sitecore" select d;
```

or

```
        var results = queryable.Where(d => d.Name == "Sitecore");
```

Projection Operators

Select

```
        var results = from d in queryable select d.Name;
```

or

```
        var results = queryable.Select(d => d.Name);
```

Anonymous types

```
        results = queryable.Select(d => new { d.Name, d.Id });
```

Unsupported

```
        SelectMany
```

Partitioning Operators

Take

```
        results = queryable.Take(10);
```

Skip

```
        results = queryable.Skip(10);
```

Page

```
        results = queryable.Page(2, 100);
```

Ordering Operators

OrderBy

```
        results = queryable.OrderBy(d => d.Name);
```

OrderBy Descending

```
        results = queryable.OrderByDescending(d => d.Name);
```

ThenBy

```
        results = queryable.OrderBy(d => d.Name).ThenBy(d => d.Id);
```

ThenBy Descending

```
        results = queryable.OrderBy(d => d.Name).ThenByDescending(d => d.Id);
```

Unsupported

```
        Reverse
```

Grouping Operators

Unsupported

```
GroupBy -Simple 1
GroupBy -Simple 2
GroupBy -Simple 3
GroupBy -Nested
GroupBy -Comparer
GroupBy -Comparer, Mapped
```

Set Operators

Unsupported

```
Distinct
Union
Intersect
Except
```

Element Operators

First -Simple

```
results = queryable.First();
```

First -Condition

```
results = queryable.First(d => d.Name == "Sitecore");
```

FirstOrDefault -Simple

```
results = queryable.FirstOrDefault();
```

FirstOrDefault -Condition

```
results = queryable.FirstOrDefault(d => d.Name == "Sitecore");
```

ElementAt

```
results = queryable.ElementAt(10);
```

Last

```
result = queryable.Last();
result = queryable.Last(d => d.Id > 10);
```

LastOrDefault

```
result = queryable.LastOrDefault();
result = queryable.LastOrDefault(d => d.Id > 10);
```

Single

```
result = queryable.Single();
result = queryable.Single(d => d.Id > 10);
```

SingleOrDefault

```
result = queryable.SingleOrDefault();
result = queryable.SingleOrDefault(d => d.Id > 10);
```

Quantifiers

Any -Simple

```
results = queryable.Any();
```

Any -Grouped

```
results = queryable.Any(d => d.Name == "Sitecore");
```

Unsupported

```
All
```

Aggregate Operators

Count -Simple

```
results = queryable.Count();
```

Count -Conditional

```
        results = queryable.Count(d => d.Id < 10);
```

Unsupported

```
        Sum
        Min
        Max
        Average
        Aggregate
```

Join Operators

Unsupported

```
        Cross Join
        Group Join
        Cross Join with Group Join
        Left Outer Join
```

5.5.4 IQueryable Extensions

Filtering

Filtering is similar to using `Where` to restrict the result list. Both methods will affect the result in the same result list, but when you use a `Filter` the scoring/ranking of the search hits is not affected by the filters.

Note
To avoid affecting the ranking of the search results, use `Filter` when applying restrictions to search queries in the `GetGlobalFilters` pipeline.

Furthermore, filters can be cached to optimize search performance.

Example:

```
        results = queryable.Filter(d => d.Id > 4 && d.Id < 8);
```

Facets

Simple Faceting

```
        var results = queryable.FacetOn(d => d.Name);
        var facets = results.GetFacets();

        foreach (var category in facets.Categories) {
        Console.WriteLine(category .Name);

        foreach (var facetValue in category.Values) {
        Console.WriteLine("{0}: {1}", facetValue.Name, facetValue.Aggregate);
        }
        }
```

Pivot Faceting

```
        var results = queryable.FacetPivotOn(p => p.FacetOn(d => d.Name).FacetOn(d =>
d.Year));

        var facets = results.GetFacets();

        foreach (var category in facets.Categories) {
        Console.WriteLine(category .Name);

        foreach (var facetValue in category.Values) {
        Console.WriteLine("{0}: {1}", facetValue.Name, facetValue.Aggregate);
        }
        }
```

Boosting

```
        results = queryable.Where(d => d.Id == 7.Boost(2f)).Where(d =>
d.Template.Contains("o"));
```

Other

Between

```
        results = queryable.Where(item => item.Price.Between(50.0f, 400.0f, Inclusion.Both));
```

```
        results = queryable.Where(item => item.Price.Between(2.0f, 12.0f, Inclusion.Both) ||
item.Price.Between(80.0f, 400.0f, Inclusion.Both));
```

```
        results = queryable.Where(d => d.Date.Between(new DateTime(2004, 12, 31),
DateTime.Now, Inclusion.Both));
```

```
        results = queryable.Where(d => d.Id.Between(1, 4, Inclusion.Both));
```

```
        results = queryable.Where(d => d.Id.Between(1, 4, Inclusion.Lower));
```

```
        results = queryable.Where(d => d.Id.Between(1, 4, Inclusion.Upper));
```

```
        results = queryable.Where(d => d.Id.Between(1, 4, Inclusion.None));
```

string.Contains

```
        results = queryable.Where(d => !d.Template.Contains("Hello:));
```

string.CompareTo

```
        results = queryable.Where(d => !d.Name.CompareTo("Hello") == 1);
```

Equal

```
        results = queryable.Where(d => d.Id.Equal(4));
```

Matches

```
        results = queryable.Where(i => i.Template.Matches("^.*$"));
```

MatchWildcard

```
        results = queryable.Where(i => i.Template.Where(i =>
i.Template.MatchWildcard("H?li*m")));
```

Like

```
        results = queryable.Where(i => i.Template.Like("Citecoar"));
```

string.StartsWith

```
        results = queryable.Where(d => !d.Name.StartsWith("Hello"));
```

string.EndsWith

```
        results = queryable.Where(d => !d.Name.EndsWith("Hello"));
```

GetResults

```
        results = queryable.GetResults().Hits.Where(i =>
i.Document.Name.Contains("o")).Where(hit => hit.Score > 0.6);
```

GetFacets

```
        results = queryable.Where(d => d.Id > 0).FacetOn(d => d.Template, 0).GetFacets();
```

5.6 Searching

5.6.1 Searching in the Default Language

When you enter a search query, Sitecore searches every language by default. If you would only like to search in one language, you can add a filter to your search query, for example, *language:da*. If you would like the system to only return results in the context language of the UI, in the `Sitecore.Buckets.config` file, set the `BucketConfiguration.ForceClientLanguageInSearch` setting to `true`. This only enforces this filter in the Sitecore UI, not in your code.

5.6.2 Searching and Facets

There are two ways to add a facet to your searches through the UI:

- Add facets for every possible value.

  However, this will not scale for facets that have huge amounts of variants.

- Limit the facets to specific values.

To limit the facet values that search should use, open the facet item — `sitecore/system/Settings/Buckets/Facets/Author` — and in the **Facet Filter** field, enter a reference to the class that implements the ISimpleFacet interface. You have to create this class yourself.

For example, if you have a list of colors — Red, Black, Green, Blue, and Yellow.

If you add a facet for *color* and leave the **Facet Filter** field empty, when you search for *cars,* the search results tell you how many of the cars are Red, Black, and so on.

If you create a facet filter you could tell the facet to only return results for Red, Black, and Green.

To do this, create a new class in your project and implement the `ISimpleFacet` interface. This interface simply returns a string. Use the logic in the class to determine the list of values that the facet should search for.

5.6.3 Using a Field as a Tag Repository

Sitecore comes with a tag repository — `/sitecore/system/settings/buckets/tag repository`. This repository can contain any type of item. You use these tags to tag any content item. You can tag a content item with one or more of these tags. This allows you to search for content items by their tags.

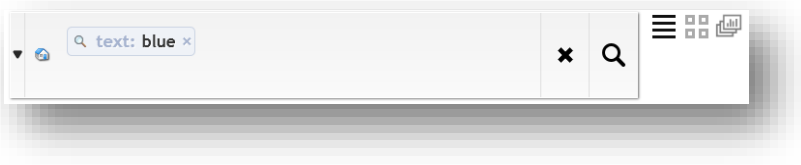
Sitecore searches the **Semantics** field of every item by default. If you add your own field and would like it to also act with the inbuilt tag repository, you must add the new field to the appropriate template, and open the index config files, for example, `Sitecore.ContentSearch.Lucene.Index.Master.config` — and add your field to ensure that it is aggregated into the **_semantics** field in the index.

```
<fields hint="raw:AddCustomField">
                  <field luceneName=" tags" storageType="no"
indexType="tokenized">semantics</field>
                  <field luceneName="_tags" storageType="no"
indexType="tokenized">mycustomtaggingfield</field>
</fields>
```

We recommend that you keep these items hidden in the content tree.

5.6.4 Including and Excluding Search Filters

When you enter a search filter in a search box, you can specify whether or not it should be included in the search query. If you enter a text filter to search for items that contain the key word *blue* — *text:blue*, a magnifying glass icon appears to the left of the search filter by default.



Click on the filter icon to specify whether or not it should be included.

There are three options:

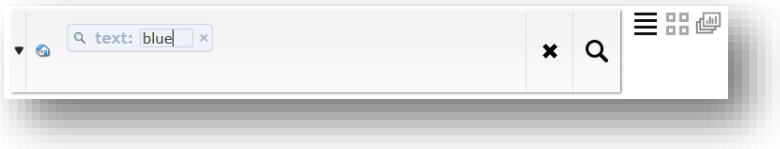
- Must include — 

- Must not include — 

- Should include — 

5.6.5 Editing Search Filters

You can edit the search filter by clicking on the search term (“blue” in the example above):



5.6.6 In-Memory Index

You can use in-memory indexes to solve many different problems. If you need to store text somewhere temporarily and then query it quickly, you could use an InMemoryLuceneIndex.

Of the search providers that Sitecore currently supports, Lucene is the only one that supports in-memory indexes.

```
var index = new InMemoryLuceneIndex("products");
            index.Analyzer = new StandardAnalyzer(Lucene.Net.Util.Version.LUCENE_30);
            index.IndexDocumentMapper = new DefaultLuceneDocumentTypeMapper();

            var repository = new TestRepository();
            IEnumerable<TestDocument> information = repository.GetTestDocuments();

            using (var context = index.CreateUpdateContext())
            {
                foreach (TestDocument testDocument in information)
                {
                    var document = new Document();
                    document.Add(new Field("ID", testDocument.Id, Field.Store.YES,
Field.Index.NOT ANALYZED));
                    document.Add(new Field("Name", testDocument.Name, Field.Store.YES,
Field.Index.ANALYZED));
                    document.Add(new Field("Template", testDocument.Template, Field.Store.YES,
Field.Index.ANALYZED));
                    document.Add(new Field("TemplateSortable", testDocument.TemplateSortable,
Field.Store.YES, Field.Index.NOT ANALYZED));
                    document.Add(new Field("Body", testDocument.Body, Field.Store.YES,
Field.Index.ANALYZED));
                    document.Add(new Field("Date", testDocument.Date, Field.Store.YES,
Field.Index.ANALYZED));
```

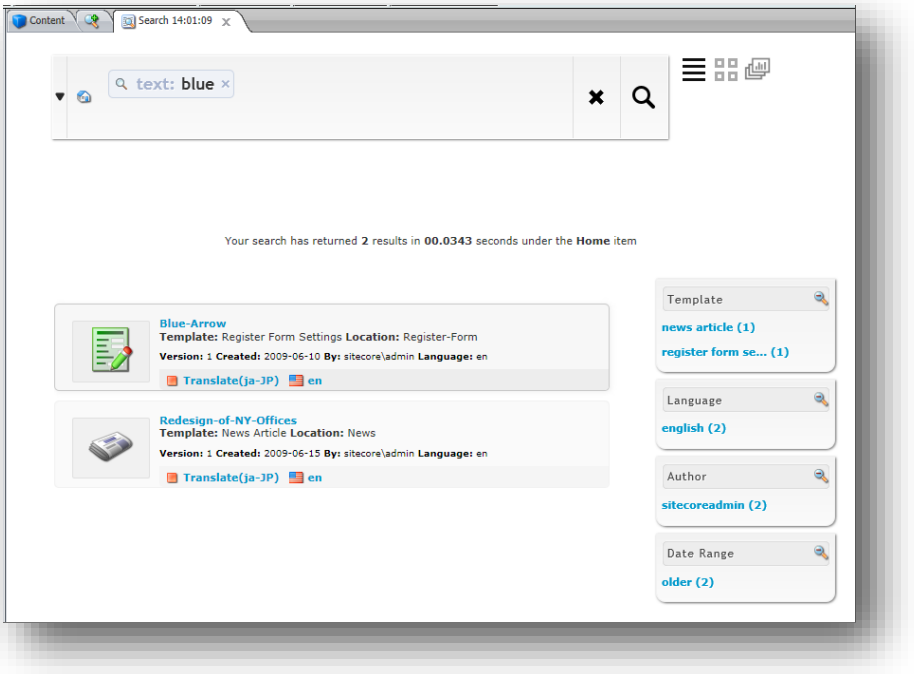
```
                context.AddDocument(document);
            }

            context.Optimize();
            context.Commit();
        }
```

5.6.7 Applying Quick Actions to Search Results

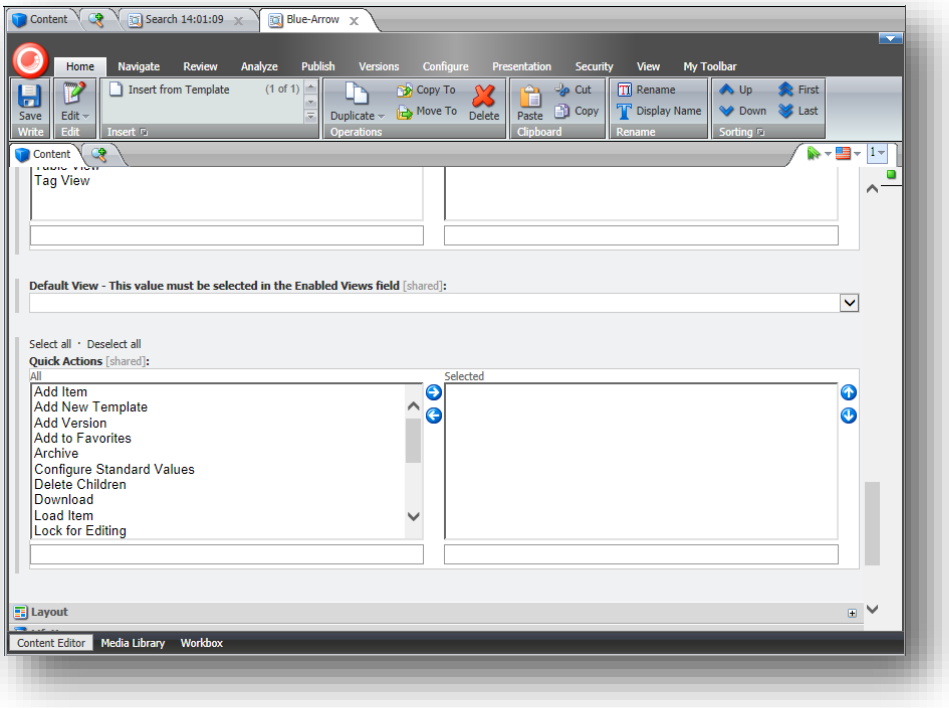
There are a number of quick actions that you can apply to a content item that are available when the item appears in search results.

To add a quick action to a content item:

1. In the Content Editor, search for the item that you want to add the quick action to.



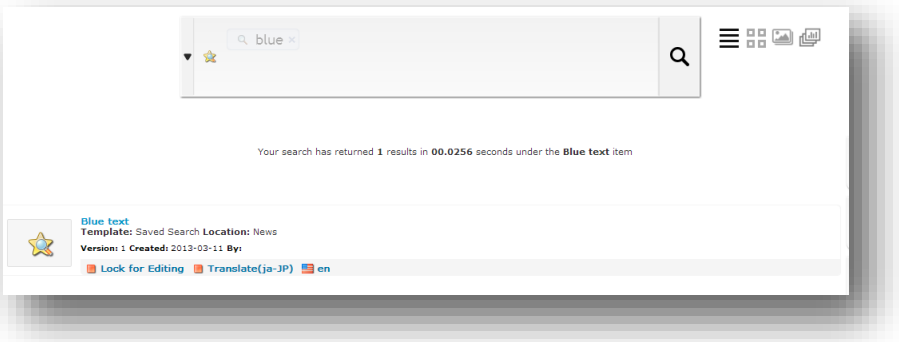
2. In the search results, select the content item and it opens in another tab.



3. Expand the Item Buckets section and scroll down to the Quick Actions field.
4. Select the quick actions that you want to add to this content item.
5. Save your changes.

> **Important**
> You must click Save in the tab that you edited the content item in.

The next time that this item appears in some search results the quick actions are displayed with the item in the search results.



Add New Quick Actions

You can also add extra quick actions to the list of available actions.

To add a quick action:

1. In the content tree, navigate to `/sitecore/System/Settings/Buckets/Settings/Quick Actions`.
2. Insert a new quick action and give it a suitable name.

3. On the **Content** tab, in the **Command** group, in the **Command** field, enter the command name, for example: *item:save*.

Alternatively, in the configuration file, use the dynamic `QuickActions` pipeline to allow much more complex and dynamic Quick Actions, for example *Bring back all current workflow commands*.

5.6.8 Showing Dynamic Fields in Search Results

If you want to create a dynamic field that you can display in search results, you must specify this in the *buckets.dynamicFields* pipeline. For example, if you want to display *Facebook likes* for a specific item you can use this pipeline to display this information in the search results.

The *DynamicFields* pipeline aggregates a dictionary of keys and values. To obtain the information you want, you must refer to the relevant key and value in the dictionary. In the Facebook example, the key should be *Flikes* and the value should be the number of likes specified by the Facebook API.

To display a dynamic field in a specific search view:

1. In the content tree, go to `/sitecore/system/Settings/Buckets/Views` and select the search view.
2. On the **Content** tab, in the **View Details** section, select the **Item Template** field.

   This field contains the HTML output for the search view.
3. Insert a placeholder that displays the number of Facebook likes in the search view.
4. To insert the placeholder, enter the key followed by `DynamicPlaceholder`.

   For example if the key for Facebook likes is *Flikes* in the dictionary, the placeholder should be called `FlikesDynamicPlaceholder`.

When Sitecore displays the search results, it looks at all the dynamic placeholders and replaces them with the value of each specific key.

5.6.9 Adding New Filters and Setting up Alias Filters

To add a new filter to the search UI:

1. In the content tree, navigate to `/sitecore/system/Settings/Buckets/Search Types`.

   It is best practice to add the new search filter in the *User Defined* folder.
2. Select the *User Defined* folder, and on the **Home** tab, in the **Insert** group click **Field Search Type**.
3. Give the new search type an appropriate name.

   This is the name that users are required to type into the search box to apply the filter.

   For example if the search type is called *Date* the user must type in *Date:* in the search box when they want to apply the filter. Remember that the name is case sensitive and you should ensure that case is consistent across all names.

   In the new search type, in the **Search Type** section, in the **Control Type** field select the type of control that is most appropriate for your search. Under the item's field value, locate the relevant field type and add it to the selected column.

   You may need to create a new field type that matches your new search type. For example a calendar would be best suited to a filter that uses dates.
4. In the **Display Text** field, enter some appropriate text and ensure that the wording is consistent with all the other search filters.

   This text is displayed in the drop-down menu when you browse the search filters in the search UI.

5. If you want to apply a custom syntax to the **Control Type** field to create specific outcomes, enter this in the **Web Method** field.

   For example, if the **Control Type** field is a calendar, the **Web Method** field can make a request to a web service to tell Sitecore to display a calendar control that only allows you to select a date from the last 2 calendar years.

Alias Filters

Sometimes, you have field names that are long and descriptive and therefore not very easy to type into a search box when you want to search on them.

Alias Filters are a way of setting up an alias for another search field to solve this problem. For example, a field called *Product Price* should probably be shortened to *price* when searching. You may also want to add a slider control to be able to slide between prices or to a particular price. Aliases will help you do this. These could be the control type parameters for this slider:

```
min:0&max:20000&value:40&range:true&start:0&end:2000
```

5.6.10 Creating a New Search Facet

You can use facets to drill down to more specific results in any list of search results. The default facets are displayed in the facets menu on the right side of the search results.

To create a custom facet, navigate to the `/sitecore/system/Settings/Buckets/Facets` item of the content tree. Right click on the *Facets* item and in the context menu, click **Insert**, **Facet**.

You now have to specify the name of the field in your index, in the parameters field in the content tab. You can apply hierarchical faceting by listing many fields separated by commas. This is useful if you want to facet on, for example, *Clothes Type* first, and then on *Color* so the facets display like this:

- Belts/Black (1)
- Belts/Green (9)
- Belts/Blue (12)
- Jumper/Black (33)

You can create folders your facets, It is easier to get an overview this way, and it also makes it clearer which facets you have created and which facets Sitecore has provided.

5.6.11 Default Bucket Queries

Default bucket queries are run automatically when the search UI is accessed. It is possible for content authors to remove the default query from the search field if they chose.

5.6.12 A Persistent Bucket Filter

Default filters can be set on any item by accessing the content tab and entering a search string in the Default Filter field. A notable difference between default queries and default filters is that default filters *cannot* be removed from the search UI.

5.6.13 Default Queries and Filters

The supported filters are:

- tag
- template
- location

- sort
- custom
- tag
- start
- end

To implement multiple filters, you must insert a semicolon between each filter.

Note
Every filter is case sensitive.

For example, to search for the keyword *pineapple* between a start date of 03/03/2012 and an end date of 04/04/2012, the filter string is:

```
text:pineapple;start=03/03/2012;end=04/04/2012
```

5.7 Rule-based Boosting

Rule-Based Boosting relies on the set of out of the box conditions that Sitecore ships with. You can, however, create custom conditions as described in the in the *Rules Engine Cookbook*, in the section *How to Implement a Condition*.

You can also reuse the conditions from the Sitecore Stuff shared source module that is available on the Sitecore Marketplace (http://marketplace.sitecore.net/.) This module will give you the following conditions:

- Item Name.
- Item ID.
- Item Level
- Parent Name.
- Parent Template.
- Item Path.
- Ancestor-or-Self.
- Item is Publishable.
- Item Language.
- Item Version.
- Item Version Count.
- Item Is Hidden.
- Item Is Protected.
- Item Has a Layout.
- Field is Empty.
- Can Read Item.
- Can Write Item.
- Can Delete Item.
- Can Rename Item.
- Can Create Subitems.
- Item Is In a Workflow.
- Item Is In a Workflow State.
- Item Is In a Final Workflow State.
- Item Is Locked.
- Item Is Locked by Me.
- Item Is Locked by User.
- True (actions execute always).
- Call Script.

5.7.1 Creating a New Boosting Rule Condition

It is not necessary to create custom actions in general and for most implementations, since the action related to this functionality, “Adjust Boost by Select”, is sufficient. However, you can implement a custom boosting rule action if you need to.

Here is a basic description of how to implement a custom boosting rule action:

```
public class CustomBoostAction<T> : RuleAction<T> where T : Sitecore.ContentSearch.Boosting.
       RuleBoostingContext
           {
               public float Boost { get; set; }

               public override void Apply([NotNull] T ruleContext)
               {
                   Assert.ArgumentNotNull(ruleContext, "ruleContext");

                   // the value of the Boost property will be set via the macro
                   // if your action is not using the macro approach,
                   // you will have to set this property based on some other logic

                   // your code goes here:

                   // you have to set the ruleContext.Boost before the method returns
                   // here is how it is set in the out of the box action:
                   // ruleContext.Boost += this.Boost;
               }
            }
```

From here, you can use the description in the *How to Implement an Action* section of the *Rules Engine Cookbook*.

5.7.2 Implementing Rule-Based Boosting for Fields

You can implement rule-based boosting for fields.

1. Implement the `indexing.resolveFieldBoost` pipeline processor class:

```
           public class RuleBasedFieldBoostResolver : BaseResolveFieldBoostPipelineProcessor
           {
               public override void Process(ResolveFieldBoostArgs args)
               {
                   Assert.ArgumentNotNull(args, "args");
                   Assert.ArgumentNotNull(args.FieldDefinitionItem, "field definition item");

                   var fieldItem = args.FieldDefinitionItem;

                   var ruleContext = new RuleBoostingContext(fieldItem);
                   var ruleItems = this.GetLocalBoostingRules(fieldItem);

                   if (ruleItems == null || !ruleItems.Any())
                   {
                       CrawlingLog.Log.Debug(string.Format("No local rules were resolved for
field {0}", fieldItem.Uri));
                       return;
                   }

                   var rules = this.ConvertToBoostingRules<RuleBoostingContext>(ruleItems);

                   try
                   {
                       if (rules != null)
                       {
                           rules.Run(ruleContext);
                       }
                   }
                      catch (Exception exception)
                   {
                       CrawlingLog.Log.Error(string.Format("Cannot resolve boost for item {0}
.", fieldItem.Uri), exception);
                   }
```

```
                    args.ResolvedBoost += ruleContext.Boost;
                }
            }
```

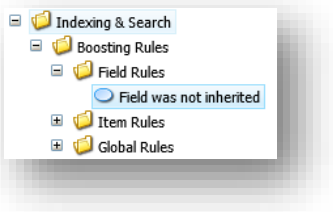
2. Insert the processor *after* `StaticFieldBoostResolver`:

```
                <processor
type="Sitecore.ContentSearch.Pipelines.ResolveBoost.ResolveFieldBoost.SystemFieldFilter,
Sitecore.ContentSearch"/>
                <processor
type="Sitecore.ContentSearch.Pipelines.ResolveBoost.ResolveFieldBoost.FieldDefinitionItemResol
ver, Sitecore.ContentSearch"/>
                <processor
type="Sitecore.ContentSearch.Pipelines.ResolveBoost.ResolveFieldBoost.StaticFieldBoostResolver
, Sitecore.ContentSearch"/>
        <processor
type="Sitecore.ContentSearch.Pipelines.ResolveBoost.ResolveFieldBoost.RuleBasedFieldBoostResol
ver, Sitecore.ContentSearch"/>
```

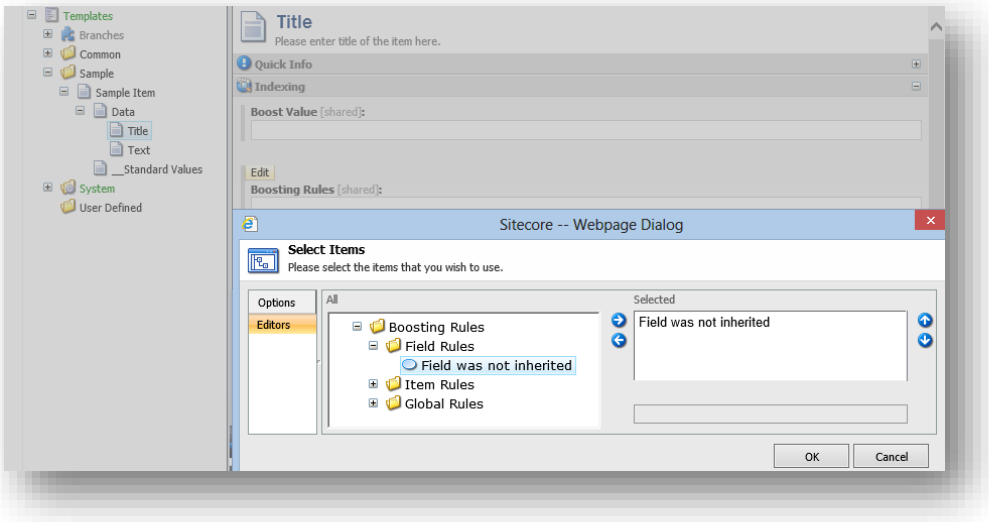
This activates rule-based boosting for fields. You can now create the field boosting rule and associate it with a field.

1. In the content tree, navigate to `/sitecore/system/Settings/Indexing and Search/Boosting Rules`.

   We recommended that you create a designated folder for the field rules like to the one for Item Rules:



2. Locate the field that you want to attach this rule to.
3. Enable *Standard Fields*.
4. In the **Boosting Rules** field, click **Edit** and associate the new rule with the field:



5.8 Multiple Index Support

The introduction of item buckets allows you to use multiple indexes to support the content tree. A practical example would be that you may want to have a separate index for the content section, the system section, and the media library. Having one index will satisfy most requirements but if you expect to have millions of content items, millions of media items, and so on, using multiple indexes is the solution.

For more information about using and configuring multiple indexes, see the *Sitecore Search Scaling Guide*.

5.9 Adding a New View

The search results can be displayed in several different views. The default views are *Grid, List, Gallery,* and *Image*.

Developers can add new views to the search results to cater for different situations, for example, browsing an image gallery, and having a small image in the results.

To add a new view:

1. Navigate to the `/sitecore/system/Settings/Buckets/Views` item and create a new view item.
2. Set the **Header Template**, **Item Template**, and **Footer Template** fields to the HTML tags that you want to return in the search results.

You can use the following placeholder names to display the values of the items. These are considered built-in Placeholders that will always be available to your views. For more fields you can use the `DynamicFields` pipeline to achieve this.

Placeholder	Description
`MetaPlaceholder`	The CSS style that you want to use when the results are displayed.
`LaunchTypePlaceholder`	Whether it will launch the result in a new tab or in a new Content Editor window.
`ItemIdPlaceholder`	The item ID.
`ImagePathPlaceholder`	The path to the image of the item.
`NamePlaceholder`	The name of the item
`TemplatePlaceholder`	The name of the template that the item is based on.
`BucketPlaceholder`	The bucket that this result comes from.
`ContentPlaceholder`	The content of the result.
`VersionPlaceholder`	The version of the content item.
`CreatedPlaceholder`	The date that the content item was created.
`CreatedByPlaceholder`	The person who created this item.

Chapter 6

Contact Search

This chapter describes a number of features that are useful for working with contacts in the analytics database.

- Null and Empty String Support
- Joins
- QueryParserr
- LINQ vs DynamicExpressions
- Embedded/Collapsed Types
- NGram Support (Autocomplete)
- Observing Aggregation Data - Best Practice
- Building a custom UI with a rule style
- Rule to IQueryable
- Queries

6.1 Null and Empty String Support

The nature of the analytics data means that you sometimes want to run queries for null or empty string values.

Sitecore has support for this in the LINQ layer and in the Indexing layer by storing physical values of “EMPTYVALUE” and “NULLVALUE”. Sitecore translates it for you in the LINQ layer, so all you need to do is to write LINQ queries as usual.

You also need to set up which fields you would like to have empty string and null support for in the FieldMap. We recommend that you do not store empty strings and nulls in your index because they will, take up space.

There are use cases where you want to do it anyway. One example is that you want to be able to search for all customers that do not have a specified gender. You may want to use this query to email these customers to ask them about their gender.

First, you need to set up the FieldMap to store empty strings in the “Gender” field.

In Lucene, you do this in the `Sitecore.ContentSearch.Lucene.DefaultIndexConfiguration.config` file in the `<fieldNames hint="raw:AddFieldByFieldName">` section.

Here is an example:

```
        <field fieldName="gender" storageType="NO"  indexType="TOKENIZED"    vectorType="NO"
boost="1f" type="System.String" nullValue="NULLVALUE" emptyString="EMPTYVALUE"
settingType="Sitecore.ContentSearch.LuceneProvider.LuceneSearchFieldConfiguration,
Sitecore.ContentSearch.LuceneProvider" />
```

For Solr, you do this in the `Sitecore.ContentSearch.Solr.Indexes.config` file in the `<fieldNames hint="raw:AddFieldByFieldName">` section.

Here is an example:

```
              <fieldType fieldName="title" returnType="text" nullValue="NULLVALUE"
emptyString="EMPTYVALUE"/>
               <fieldType fieldName="title t" returnType="text" nullValue="NULLVALUE"
emptyString="EMPTYVALUE"/>
```

When you run the following query, it will map “” to “`EMPTYVALUE`” and null to “`NULLVALUE`”

```
        return context.GetQueryable<Contact>().Where(i => i.Gender == "").Take(10).ToList();
```

6.2 Joins

This section has various information about how and when you use joins, and what you have to consider when you use them.

6.2.1 Joining Data

The LINQ layer supports **Join**, **Self Join**, **Group Join** and **Select Many**.

Lucene.Net does not support JOIN natively, and Solr only supports certain aspects. These four methods use subqueries that are evaluated as you page through the data.

You have to consider certain things when you use this. You must try to avoid using these methods as much as you can. Performance is expensive for both time, I/O and memory. This is true for both Lucene and Solr.

An example:

If you join a Contact with the Engagement States they have been in, you will prepare a JOIN query with Linq and then when you page through the data it will ONLY execute the join or subquery for that first page.Tha is: given an ID, it will run a subquery to look up another document via that ID.

When you run a JOIN in Linq, it will effectively return a union set of one or many documents. If you have experience with SQL JOINS (inner, outer, left, right), then you know that must write your LINQ queries with regard to how they perform.

This also requires that you store or index your data properly. Sitecore do not support many-to-1 or many-to-many queries in LINQ (for example, a Contact that stores multiple references to Engagement States and then joins those on the Engagement States documents).

You can attach the “foreign-key” to the Engagement State so that you can join by something like the ContactId instead:

```
public class Contact {
 public string Name { get; set; }
 public Guid ContactId { get; set; }
}

public class EngagementState {
 public string Name { get; set; }
 public Guid ContactId { get; set; }
 public Guid Id { get; set; }
}
```

Given the classes above, and even though it results in duplication of data, this allows you to join Contacts to Engagement States via the ContactId. The LINQ layer supports this, for example:

```
 var repo = this.CreateVisitors();
   var repoPlans = this.GetStates();
   var result = from t in repo
   join x in repoPlans on t.ContactId equals x.ContactId
   where x.Id == new Guid("E1B604F1-EE0E-408E-A344-869CC45D25D9")
   select t;
```

6.2.2 Testing in the LINQScratchPad

If you want to test joining on large amounts of data, you can run your queries in LinqScratchPad.aspx.

The following query open a context:

```
using (var context =
ContentSearchManager.GetIndex("sitecore master index").CreateSearchContext())
                                {

                                 using (var context2 =
ContentSearchManager.GetIndex("sitecore_web_index").CreateSearchContext())
                                {
```

```
                                        return
context.GetQueryable<SearchResultItem>().Join(context2.GetQueryable<SearchResultItem>()
                                                .Where(i => i.Name.StartsWith("S")), i =>
i.ItemId, o => o.ItemId, (o, i) => o).Take(10).ToList();
                                       }
                                       }
```

This opens two separate search contexts and then runs a join on them, based off the item id. This query check which items are in both the web and master index that start with S for the name field and then returning the results of the web index (outer).

6.2.3 Extra Join Notes

If you are using the Solr provider, then the SelfJoin is the only join that will run a real Solr Join. The other methods (such as. Join and GroupJoin) will use the enumeration technique that the Lucene.net provider uses, that is: at enumeration time, subqueries will be executed to get the other documents.

6.2.4 When is it OK to Use a Join?

You need to use a join in the LINQ layer when you have a document that contains a reference to another document. The reference is typically an ID reference.

Sitecore does not flatten the objects that are crawled. The crawler implementation has to tell Sitecore how to store its data. The `JOIN`, `SELFJOIN` or `GROUPJOIN` run a subquery for the join to get another document and evaluate it based on the ID/Key.

You must make sure that you store your data properly. You can prepare your data so that it is ready for joining, or you can prepare it for a completely join-free retrieval. Both approached has advantages as well as disadvantages.

Follow these rules to ensure that you solution scales well:

- Limit the amount of joins you require
- Instead of using a join, consider flattening data instead. This will result in multivalued fields and potentially many columns.
- If you use a join, keep your paging of the data small –10 items or 20 items at a time. The reason is that if you have a query that takes 100ms to run, it could take 1.1 seconds to return the sub-queries and the initial query.
- Only store or index what is 100% necessary (unless this has performance implications.)

6.2.5 What is the Difference Between JOIN, SELFJOIN and GROUPJOIN

If you have two lists like this:

Id	**Value**
1	A
2	B
3	C
Id	**ChildValue**
1	a1
1	a2
1	a3
2	b1
2	b2

and you `Join` the two lists on the `Id` field, the result is this:

Value	ChildValue
A	a1
A	a2
A	a3
B	b1
B	b2

If you `GroupJoin` the two lists on the `Id` field the result is:

Value	ChildValues
A	[a1, a2, a3]
B	[b1, b2]
C	[]

If you `SelfJoin` the two lists on the `Id` field the result is:

Value	ChildValue
A	a1
A	a2
A	a3
B	b1
B	b2

`SelfJoin` does not require you to provide a resultSelector. It is inferred that it returns the outer. This is essentially the difference between an inner and outer join.

When you run JOIN queries, we recommend that your inner or outer has a filter that limits the results. Otherwise, the JOIN will try to join on every single document in your index.

6.3 QueryParser

The QueryParser takes a string and converts it into an IQueryable<T> representation that supports all types of things like grouping, different value types e.g. (int, bool, float, DateTime).

The QueryParser is a static class that has a simple `Parse<T>` method. The overloads are a string and optional object params. The object params can be used to fill the variables in for placeholders within the string e.g.

```
        “Product.Price = @0”, 123.4f
        "Product.Weight > 115 OR (Product.StockCount > 3 AND Product.Weight > 50) OR
Product.StockCount != 3"
```

Notice the use of parentheses: this allows you to group the Boolean logic that occurs within the query intelligently. You are not required to pass all values in with the params object[], it is, however, recommended that you do because the QueryParser does its best to type the values, whereas the object[] can infer it from the Type that you pass through in T.

If you want to talk through a UI, you have many options:

- **LINQ** – This becomes difficult as a lot of the time you will build up a string query in the UI and then send it to the server to be resolved.
- **OData** – OData can talk directly to IQueryable stubs that you expose.
- **LinqHelper** – For simple search queries that do not contain parentheses logic for grouping parts of the arch.
- **QueryParser** – For complex searches with the ability to also trigger LINQ based methods through strings. Because it is strongly typed it is slightly more difficult to write queries for than the LinqHelper.

Here is an example of a complex query that the QueryParser will be able to understand.

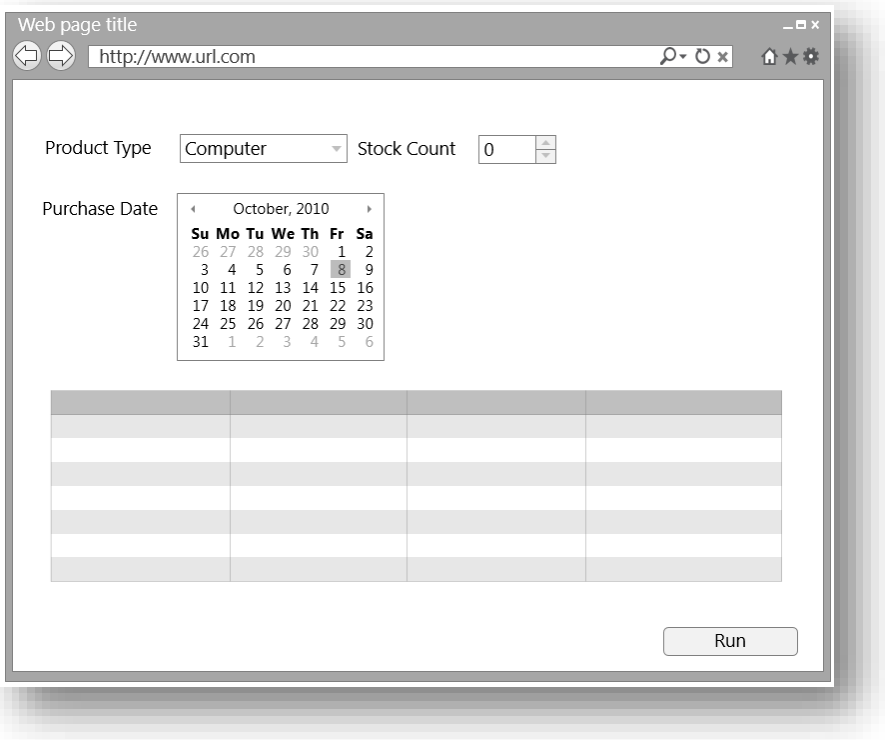
```
        "((((()()()()Person.Weight > 115) OR (Person.Age > 3 AND Person.Weight > 50)) OR
Person.Age != 3)"
```

The implementation does not use a parse generator tool for this (such as ANTLR or YACC). It parses the expression tree to generate an IQueryable representative of a string query instead.

The QueryParser supports all primitive types as well as Enum and Indexers. Indexers are not used a lot because you can specify the actual property name in the string. There are, however, certain situations where you need to access a field from the index that is not a property available on your Type.

6.3.1 Typical Use Case

This is a typical use case: you want to create a UI that allows users to search for content by field values and then run the query, and have a strongly typed collection of results returned.



You use the form elements to build a string query, and expect to receive an IQueryable that you use to page through the data and potentially run other filters/queries on the IQueryable.

You can do this with the QueryParser. Create a string const like this:

```
       "Product.Type == @0 AND Product.StockCount > @1 AND Product.PurchaseDate == @2",
productType.SelectetItemValue, productStockCount.Value, productCalendar.Value
```

The first part of the string is the query to run, and the following parameters are the values to inject when the query is run.

This is the queries that are supported:

```
       "Person.FavouriteDay >= DateTime(1999, 1, 1)"
       "(((Person[\"Name\"] == \"Bob\") OR (Person.Age > 3 AND Person.Weight > 50)) OR
Person.Age != 3)"
       "Person.Name[0] == 'B'"
       "Person.Retired == true"
       "iif(Person.Age > 4, Person.Name == \"Bob\", Person.Name == \"Tim\") || (Person.Age >
3 && Person.Weight > 50) || Person.Age != 3"
       @"Person.Weight > 115 || (Person.Age > 3 && Person.Weight > 50) || Person.Age != 3"
       @"Person.Weight > 115 OR (Person.Age > 3 AND Person.Weight > 50) OR Person.Age != 3"
```

6.4 LINQ vs DynamicExpressions

You have many options choosing how to query the data available within the indexes. There are benefits of each query language.

Comparing Queries ->

LINQ

```
        var index = this.InitializeIndex();
                    var queryable = index.CreateSearchContext().GetQueryable<Contact>();
                    var query = queryable.Where(i => i.Region == "BRI");
                    Assert.AreEqual(1, query.Count());
```

DynamicExpression

```
        var index = this.InitializeIndex();
                    var queryable = index.CreateSearchContext().GetQueryable<Contact>();
                    var p1 = Expression.Parameter(typeof(IQueryable<Contact>), "queryable");

                    var e = DynamicExpression.ParseLambda(new[] { p1 }, null,
"queryable.Where(Region == @0)", "BRI");
                    var results = e.Compile().DynamicInvoke(queryable) as IQueryable<Contact>;

                    Assert.AreEqual(results.Count(), 1);
```

The main difference is that with the DynamicExpression you build up an Expression Tree using a known format very similar to LINQ queries, however in the form of a string.

Currently we do not support every single method on IQueryable/IEnumerable in the DynamicExpression library. Therefore, you need to create code stubs to be able to detect if you need to run a certain method and simply inject the values into the LINQ queries.

6.4.1 Example Dynamic Queries

When you create the Dynamic Queries, you must consider the following when you use them:

- TInner, TOuter and TResult
- Casting
- Supported IEnumerableSignatures
- Parameters
- DynamicInvoke

DynamicExpression is a static class that has a method called ParseLambda(). This is the main method you use to resolve your string queries. ParseLambda takes an array of ParameterExpression, a return Type, the string query and finally, optional parameters. To turn it into an IQueryable you need to compile and invoke this and then cast it to the TOuter type.

```
        var index = this.InitializeIndex();
         var queryable = index.CreateSearchContext().GetQueryable<Contact>();
         var p1 = Expression.Parameter(typeof(IQueryable<Contact>), "queryable");

         var e = DynamicExpression.ParseLambda(new[] { p1 }, null, "queryable.Where(Region ==
@0)", "KBH");
        var blah = e.Compile().DynamicInvoke(queryable) as IQueryable<Contact>;
```

Explanation of this code

The first line builds up some dummy data to query on. In real-life, you will open a search context to an already existent index.

The second line tells the search context that you will be searching for the Contact model. Therefore it will give you the Intellisense to work on that object.

The third line of code calls DynamicExpression.ParseLambda and tells the string that “queryable” is of type IQueryable<Contact>. Therefore, when parsing it, it is assumed that Region is a property on the Contact Model. Notice that you do not need to specify the full lambda i.e. `p => p.Region == @0.`

The last line compiles the expression tree and invokes the expression to run, given the queryable parameter and then cast the result as an IQueryable<Contact>.

This is all it takes to turn your query of `"queryable.Where(Region == \”KBH\”)"` into an `IQueryable<Contact>.`

6.4.2 Complex Examples of Dynamic Queries

This is an example of injecting a value that is not a string but an integer. When you do it this way, the objects can guarantee the right type.

```
                    var e = DynamicExpression.ParseLambda(new[] { p1 }, null,
"queryable.Where(EngagementValue <= @0)", 43);
```

This is an example of joining two queryable instances within a string.

```
            var e = Sitecore.ContentSearch.Utilities.DynamicExpression.ParseLambda(new[] { q1,
q2 }, null, "queryable.Where(BusinessName.Contains(@0)).Join(\"X\", queryable1, \"Y\",
\"X.ContactId\", \"Y.ContactId\", \"X\")", "r");
```

The following methods are supported as methods in the DynamicExpression library

void All(bool predicate);

void Any();

void Any(bool predicate);

void Average(int selector);

void Average(int? selector);

void Average(long selector);

void Average(long? selector);

void Average(float selector);

void Average(float? selector);

void Average(double selector);

void Average(double? selector);

void Average(decimal selector);

void Average(decimal? selector);

void Contains(object selector);

void Count();

void Count(bool predicate);

void DefaultIfEmpty();

void Equal(object selector);

```
  void Filter(object predicate);

  void Filter(bool predicate);

  void First();

  void First(bool predicate);

  void Join(object predicate, object selector, object selector1, object selector2);

  void Join(object predicate, object selector, object selector1, object selector2, object
selector3, object selector4);

void GroupJoin(object predicate, object selector, object selector1, object selector2);

void GroupJoin(object predicate, object selector, object selector1, object selector2, object
selector3, object selector4);

void Max(object selector);

void Min(object selector);

void OrderBy(object selector);

void OrderByDescending(object selector);

void SelfJoin(object predicate, object selector, object selector1);

void SelfJoin(object predicate, object selector, object selector1, object selector2, object
selector3);

void Single();

void Single(bool predicate);

void Sum(int selector);

void Sum(int? selector);

void Sum(long selector);

void Sum(long? selector);

void Sum(float selector);

void Sum(float? selector);

void Sum(double selector);

void Sum(double? selector);

void Sum(decimal selector);

void Sum(decimal? selector);

void ThenBy(object selector);

void ThenByDescending(object selector);
```

```
void Where(bool predicate);

void Where(object predicate);
```

6.5 Embedded/Collapsed Types

If you query and use a type uses the collapsed fields OR embedded types, as for example:

```
public class Contact {
public string Name { get; set; }
public Guid ContactId { get; set; }
public EngagementState EState {get; set;}
}
```

```
public class EngagementState {
public string Name { get; set; }
public Guid ContactId { get; set; }
public Guid Id { get; set; }
}
```

then you must add a Constructor for the sub types so that the document mapper can set the properties for them, in this way:

```
public class Contact {
public string Name { get; set; }
public Guid ContactId { get; set; }
public EngagementState EState {get; set;}
public Contact() {
EState = new EngagementState();
}
}
```

```
public class EngagementState {
public string Name { get; set; }
public Guid ContactId { get; set; }
public Guid Id { get; set; }
}
```

In this way, when you want to output the property values for something like i.EState.Name then the property will be filled (if it exists with the index and is stored) and the EState will not be null.

This should be the same when you have many nested or nested within nested. Each level should construct the subdocument objects so they can be filled.

6.6 Other features

6.6.1 Showing Percentage of Audience

You can show the percentage of people in a segment compared to all other segments quite easily.

You have to use two queries to do this.

First, you need to find out how many of the documents in your index represent a contact. You can do this by storing a field that keeps track of the document type or template. You can cache this because even if your document size changes, it probably does not change drastically. The small amount that the resulting percentage could be wrong is a minor inconvenience compared to the overhead of running an extra query.

Secondly, you run another query that filters the list and then just run GetResults() at the end of the LINQ statement. This will give you your hits and the hit counts. Just divide the hitCount by the total number and this is your percentage.

6.6.2 Get Number of Results

You can avoid running two queries when you need both the results of a query as well as the count of the results. The GetResults() method of IQueryable gives you the results and the count in one call.

6.6.3 Get All Fields from an Index

This can be used for Solr as well as for Lucene. The following call:

```
ContentSearchManager.GetIndex("Index_Name").Schema.AllFieldNames
```

returns a collection of Strings that you can show in a UI. It brings back all (hard-coded) fields with in the index – not just for one document.

6.6.4 Get All Facets from an Index

This corresponds to Get All Fields from an Index. You can use all fields of an index for a facet, but you have to selective. A field that can have many different field values is not a good candidate for a facet. You may also want to store different fields for field queries and facet queries because the tokenization that Sitecore does each field could differ.

6.6.5 Get All Autocomplete fields from an Index

This corresponds to Get All Fields.

6.7 NGram Support (Autocomplete)

Sitecore ships with an N-Gram Analyzer for Lucene.Net:
Sitecore.ContentSearch.LuceneProvider.Analyzers

If you use Solr, you can set this up in the Solr Schema.xml file.

You typically use the Ngram Analyzer for autosuggest. It breaks up tokens into unigrams, bigrams, trigrams, and so forth. Users can type a word, and the NGram Analyzer looks that word up in different positions with the tokens that it generates.

You add support for autosuggest by adding a new field to the index and mapping this field to use the NGram Analyzer instead of the default. When you run the LINQ query to query that field, use the following code:

```
        using (IProviderSearchContext context = Index.CreateSearchContext())
                    {
                        result = context.GetQueryable<SearchResultItem>().
                            .Where(i => i.Name.StartsWith("some"))
                            .Take(20)
                            .ToList();
                    }
```

Sitecore ships with an implementation that uses Tri-Grams (3) and the English Stop Word set. If your requirements are different, you can build a new Analyzer and change these settings.

There is an example of how to do this here:

https://www.youtube.com/watch?feature=player_detailpage&v=T-B3gAypUzo&t=3255

6.8 IndexCrawler

The IndexCrawler is a crawler that takes an already existing index and runs a group of functions over it. The IndexCrawler inherits from the FlatDataCrawler<T> so it can take a big list of IIndexables and can iterate through them and run a function on that IIndexable and then commit it back to the index.

Here is an example of its use: Go through every document in the index and add “!!” to the name of every document.

```
                var crawler = new IndexCrawler(this.sourceIndexName);
                crawler.CrawlFunctions += this.CallMe;

                this.DestinationIndex.AddCrawler(crawler);
                this.DestinationIndex.Rebuild();

            public IEnumerable<IIndexable> CallMe(IProviderSearchContext context)
            {
                var list = new List<IIndexable>();

                foreach (var item in context.GetQueryable<InsertDocument>())
                {
                    item.Name = item.Name + "!!";
                    list.Add(new ObjectIndexable(item, null));
                }

                return list.AsEnumerable();

            }
```

6.9 Observing Aggregation Data - Best Practice

This section contains some best practices for observing aggregation data.

6.9.1 Definitions

- `ObservableAggregator<T>` - An special instance of an `AggregationProcessor` which implements the `IObservable<T>` interface.
- `ObserverCrawler<T>` - A special instance of a `FlatDataCrawler<T>` which implements the `IObserver<T>` interface.
- `T` - For both of the above is a type of `IIndexable` that may be inserted into an index.

6.9.2 Overview

Aggregation data is accessible through the `Aggregation` pipeline. To listen to the data you add an `AnalyticsVisitAggregator` to the pipeline processor collection. This processor implements `ObservableAggregator<T>`: each time the aggregator *observes* data, it *publishes* the data to its *subscribers*.

When an index is configured in Sitecore it has one or more crawlers associated with it. An `ObserverCrawler<T>` can be associated with an index and will *subscribe* to an `ObservableAggregator<T>`. In this way, items *published* by the aggregator will be received by the *observer* and made available to the index when an index operation is called.

This allows the crawler to receive data in a near real-time fashion.

When an index is manually rebuilt or an *index strategy* is triggered, the data which the crawler has *observed* will be made available to the index.

6.9.3 ObservableAggregator<T>

Implementation

The `ObservableAggregator<T>` inherits from the `AggregationProcessor` class. It is implemented as an `abstract` so cannot be instantiated directly.

Properties

The following properties are exposed:

- `Name` - The name of the `ObservableAggregator<T>`. Used by instances of `ObserverCrawler<T>` to identify the correct aggregator when subscribing.
- ObserverCount - The number of currently registered *observers*

Constructor

The constructor takes a single string parameter and it uses this to set the `Name` property.

Methods

Aside from the methods exposed by the `AggregationProcessor` class, you can override the following methods:

```
IDisposable Subscribe(IObserver<T> observer)
void Abort
abstract T ResolveIndexable(AggregationPipelineArgs args)
```

Note
`ResolveIndexable` is an abstract method and you *must* implement it in a superclass.

Custom Class

To implement your own class, inherit from `ObservableAggregator<T>` providing the `IIndexable` type and implement the `ResolveIndexable` abstract method.

The `AnalyticsVisitAggregator` used for xDB data is defined below:

```
        public class AnalyticsVisitAggregator: ObservableAggregator<VisitIndexable>
{
    public AnalyticsVisitAggregator(string name) : base(name) {}

    protected override VisitIndexable ResolveIndexable(AggregationPipelineArgs args)
    {
        return new VisitIndexable(args.Context);
    }
}
```

In the `ResolveIndexable` method you create a new instance of the indexable type `VisitIndexable`. This type takes the context from the given `args` parameter and returns the new `VisitIndexable`. If you create your own aggregator, you probably want to resolve all data for your indexable here and pass in to the indexable constructor.

Configuration

You configure aggregators configured in XML configuration include files by adding a reference to the `Aggregation` pipeline.

The following adds an `AnalyticsVisitAggregator` to the collection of processors (this is in the file `Sitecore.ContentSearch.Analytics.Processing.Aggregation.config`):

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <pipelines>
      <aggregation>
        <processor
type="Sitecore.ContentSearch.Analytics.Aggregators.AnalyticsVisitAggregator,
Sitecore.ContentSearch.Analytics">
      <param desc="name">VisitObservable</param>
    </processor>
      </aggregation>
    </pipelines>
  </sitecore>
</configuration>
```

6.9.4 ObserverCrawler<T>

Implementation

The `ObserverCrawler<T>` inherits from the `FlatDataCrawler<T>` class, implementing the base class methods as required.

Properties

The `ObserverCrawler<T>` requires the following properties to be set before you call the `Initialize` method:

- `ObservableName` - This is the name of the `IObservable<T>` that the crawler will subscribe to
- `CrawlerName` - This is the name of the `ObserverCrawler<T>` instance itself.

Methods

Aside from the `FlatDataCrawler<T>` methods, the `ObserverCrawler<T>` exposes the following overridable methods:

```
void OnNext(T value)
void OnError(Exception error)
void OnCompleted()
void SubscribeTo(string name, object observable)
void Unsubscribe()
void ResolveObservable()
```

Custom Class

To implement a custom class, inherit the base `ObserverCrawler<T>` class, and provided the `IIndexable` type you want processed.

The `AnalyticsVisitCrawler` used for xDB data aggregation is defined below.

```
        namespace Sitecore.ContentSearch.Analytics
{
    public class AnalyticsVisitCrawler: ObserverCrawler<VisitIndexable>{}
}
```

Note
The base implementation of all methods is all that is required. In general, you will not need to change how they function.

Configuration

You can configure crawlers at start-up ye providing details in the XML configuration include files.

The following adds an `AnalyticsVisitCrawler` to the Lucene configuration for the *sitecore_atlas_index* (this is contained in the file *Sitecore.ContentSearch.Lucene.Index.xAtlas.config*)

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <contentSearch>
      <configuration>
        <indexes hint="list:AddIndex">
          <index id="sitecore atlas index"
type="Sitecore.ContentSearch.LuceneProvider.LuceneIndex,
Sitecore.ContentSearch.LuceneProvider">
            <!-- ... other configuration ... -->
            <locations hint="list:AddCrawler">
              <crawler type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsVisitCrawler,
Sitecore.ContentSearch.Analytics">
                <CrawlerName>Lucene Visit Crawler</CrawlerName>
                <ObservableName>VisitObservable</ObservableName>
              </crawler>
            </locations>
          </index>
        </indexes>
      </configuration>
    </contentSearch>
  </sitecore>
</configuration>
```

Note
The `ObservableName` parameter matches the value given to the name of the aggregator configured earlier.

6.9.5 Filtering

Instances of `ObservableAggregator<T>` can be configured to filter out items that should not be sent to *observers*. The global pipeline `aggregation.filter.inbound` is used by all *observables*. Additional *observable* specific pipelines can be added too.

Configuration

You can implement the global aggregation filter in XML. The following adds two filters, one filters out by contact id, the other by the path visited:

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <pipelines>
      <!-- global aggregation inbound filters-->
      <aggregation.filter.inbound>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundContactIdFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>ca82109f-30cd-4414-956e-caea41c7510c</filter>
          </filters>
        </processor>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundVisitPathFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>/default.aspx</filter>
          </filters>
        </processor>
      </aggregation.filter.inbound>
    </pipelines>
  </sitecore>
</configuration>
```

Note
You can configure each processor above with multiple `<filter>` values.

Observable specific filter

In addition to the global filter pipeline, you can configure an *observable* specific pipeline. If you configure an *observable* called `DefaultObservable`, you simply configure a pipeline called `defaultobservable.filter.inbound`.

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <pipelines>
      <!-- define the aggregator -->
      <aggregation>
        <processor patch:before="*[1]"
                   type="Sitecore.ContentSearch.Analytics.AnalyticsObservableAggregator,
Sitecore.ContentSearch.Analytics">
          <!-- here we name the aggregator -->
          <param desc="name">DefaultObservable</param>
        </processor>
      </aggregation>
      <!-- specific inbound filter for an aggregator -->
      <!-- we use the aggregator name from above in the pipeline name -->
      <defaultobservable.filter.inbound>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundVisitPathFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>/other.aspx</filter>
          </filters>
        </processor>
      </defaultobservable.filter.inbound>
    </pipelines>
  </sitecore>
</configuration>
```

The configuration uses exactly the same `processor` types used in the global pipeline. The processors used in this pipeline are only applied when the `DefaultObservable` processor is filtering items.

6.9.6 IIndexable

Both the `ObservableAggregator` and the `ObserverCrawler` are generic and they require that you provide that implements `IIndexable` when implementing.

The indexable provided encapsulates all the data required to be inserted into an index.

Custom Class

To implement a custom class, inherit the base `IHashedIndexable` class. You have to populate several properties because they are required by all items that are indexed:

```
Id
UniqueId
DataSource
AbsolutePath
Culture
```

Taking the `VisitIndexable` as an example, the properties are set in the constructor as follows:

```
        public VisitIndexable(IVisitAggregationContext context)
{
    Id = (IndexableId<Guid>) context.Visit.InteractionId;
    UniqueId = (IndexableUniqueId<Guid>) context.Visit.InteractionId;
    DataSource = "sitecore_aggregation";
    AbsolutePath = string.Empty;
    Culture = CultureInfo.CurrentCulture;

    LoadFields(context);
}
```

Note
We pass an instance of `IVisitAggregationContext` into the constructor as this is what the *xDB* pipeline makes available to the *Aggregator*. It is the aggregator that creates an instance of the indexable.

Setting the fields to index

At the end of your `VisitIndexable` constructor, you call `LoadFields`. All fields are loaded into the object here so that all *subscribers* receive a complete object with no additional data to populate. If the object was published to five subscribers and then populated with additional data, five additonal calls per object would be made. This has a negative impact on performance.

Adding a property as an indexable field

Instances of `IIndexable` will have a property `IEnumerable<IIndexableDataField> Fields`. This collection contains all the fields to be indexed for the item.

Because you are not working with a Sitecore item but an actual object that you want to populate, this collection with the object properties. For convenience, you can use the `IndexableDataField.CreateFromProperties` static method.

For example:

```
        var visit = context.Visit;
var fields = IndexableDataField.CreateFromProperties(visit, string.Empty, "StartDateTime",
"EndDateTime");
Fields.AddRange(fields);
```

The above code takes the visit from the given context and passes it to our static method. It also passes the names of two properties (*StartDateTime* and *EndDateTime*).

The result of the call will be a collection of `IIndexableDataField` that contains two entries. One for a field called `StartDateTime` and one for a field called `EndDateTime`. These items are then added to the `IIndexable Field` collection.

Adding a property as a collapsed field

If you want to use the `CollapsedIndexFieldAttribute` in your result objects, you can pass the name of the collapsed field into the static method call:

```
        var operatingSystem = ontext.Visit.OperatingSystem;
var fields = IndexableDataField.CreateFromProperties(operatingSystem, "os", "Name",
"MajorVersion", "MinorVersion");
Fields.AddRange(fields);
```

In the above call, the names of the fields created will be `os.Name, os.MajorVersion, os.MinorVersion`

Note
You are not required to use collapsed fields: they are only an option.

6.9.7 Indexing

When using *observable crawlers* you need to consider the implications of an index operation.

Observable crawlers constantly listen for new items. As a crawler receives notice of a new item it will cache the item in memory until an index operation is processed.

This has the following implications:

- **Rebuilding**: If you rebuild your index (clear all existing content and index new items) only the items currently held by the crawler will be inserted.
- **Index Frequency**: As each crawler will cache each crawled item in memory, you should index at a consistent frequency to ensure that items are flushed from memory before the memory usage becomes too large.
- **Update only**: As your source of data is only a feed and you do not have access to all the data at once, you should only call update methods on your index.

6.9.8 TimedIndexRefreshStrategy

To resolve the issues discussed above you can use the `TimedIndexRefreshStrategy` on an index. This strategy refreshes an index with data from the crawlers, but it does not cause the index to be reset.

Configuration

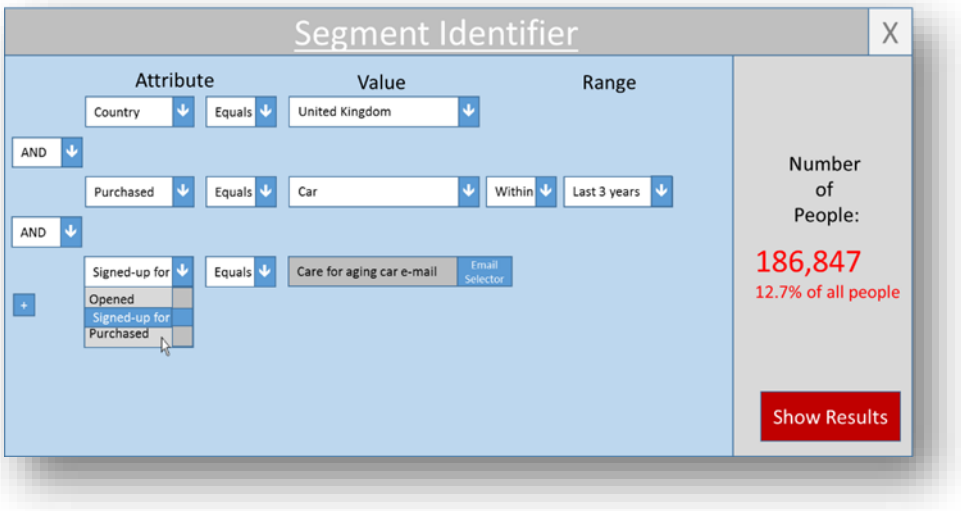
To configure the strategy, set in the xml configuration as follows:

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <contentSearch>
      <configuration>
        <indexes hint="list:AddIndex">
          <index id="sitecore atlas index"
type="Sitecore.ContentSearch.LuceneProvider.LuceneIndex,
Sitecore.ContentSearch.LuceneProvider">
            <!-- ... other configuration ... -->
            <strategies hint="list:AddStrategy">
              <timed type="Sitecore.ContentSearch.Analytics.TimedIndexRefreshStrategy,
Sitecore.ContentSearch.Analytics">
                <param desc="interval">00:01:00</param>
              </timed>
            </strategies>
            <locations hint="list:AddCrawler">
              <crawler type="Sitecore.ContentSearch.Analytics.AnalyticsObserverCrawler,
Sitecore.ContentSearch.Analytics">
                <ObservableName>DefaultObservable</ObservableName>
                <CrawlerName>Lucene Crawler</CrawlerName>
              </crawler>
            </locations>
          </index>
```

```
        </indexes>
      </configuration>
    </contentSearch>
  </sitecore>
</configuration>
```

Note
You must provide the `interval` parameter. Here it is configured to run every minute.

6.10 Building a custom UI with a rule style



To build a UI similar to the one shown above, you can use the existing rules engine that ships with Sitecore, but it is a better solution to use the new DynamicExpressions that takes a string and turns it into an IQueryable.

The UI developers have to build the string and send it to the server. Your server side code is responsible for calling the DynamicExpressions with the string.

You can also implement functionality to fill drop-downs with the appropriate values. This involves server calls so consider caching these queries. This works well because the field values probably do not change very often. You cache for a specified time interval.

To populate the “Attribute” dropdown, please look earlier in this document for the information on “Get all Fields from an Index”.

You can use the following code to populate the Value:

```
        var index = ContentSearchManager.GetIndex("index_name");

                    using (var context = index.CreateSearchContext())
                    {
                        return context.GetTermsByFieldName("fieldname", prefix).Select(x =>
x.Term).ToList();
                    }
```

The prefix allows you to pass in some characters if the user has already started typing.

6.11 Rule to IQueryable

Sitecore provides a rules implementation that allows you to convert certain rules into an IQueryable. The idea is that you build up rules and that your UI triggers that RuleContext to run. The Context will contain the IProviderSearchContext and the IQueryable, so before the rule context is run, the IQueryable is empty. After it has run, it has the predicates that have been built up. The Rule Context is called the QueryableRuleContext.

6.12 Queries

6.12.1 Full Text Query

You create full text queries by using LINQ over the aggregated field called “content”. This field aggregates other field values into this one field. This effectively gives you full text query over the index. When you want to append your values to this field, you either do this with a computed field or simply do this in code:

```
        return context.GetQueryable<SearchResultItem>().Where(i =>
i.Content.Contains("Tim")).Take(10).ToList();

        return context.GetQueryable<SearchResultItem>().Where(i =>
i[" content"].Contains("Tim")).Take(10).ToList();
```

6.12.2 Field Query

Field queries are run through the LINQ layer.

```
        return context.GetQueryable<SearchResultItem>().Where(i =>
i.Name.StartsWith("Tim")).Take(10).ToList();

        return context.GetQueryable<SearchResultItem>().Where(i =>
i["_name"].StartsWith("Tim")).Take(10).ToList();
```

6.12.3 Performance Expectations

Some queries that you wrote with LINQ will be expensive to run. You have to test you LINQ queries under load to see how they perform.

To test, you can use the LinqScratchPad or LINQPad to write and test the performance of your queries without touching a line of code. You will have to plan your UI around this fact and for any query that is long running, you have to make sure your server side calls are asynchronous.

Warnings
Currently, JOIN queries will result in the COUNT of hits being the count of the original query (outer) and not the combination of the outer and the inner. This is simply because the performance implications of doing this with the technology used is too great. Instead, we recommend that you give approximations of results for JOIN and GROUPJOIN queries. All other types of queries are 100% supported for getting the exact hit count.

Recommendation
When running the queries you wish to run on your UI, make sure that you also take a look at the process being run and how much I/O, memory and CPU is being used. For expensive LINQ queries these values will spike and you to ensure that your machines are robust enough to handle these types of queries.

Chapter 7

Crawlers

This chapter discusses crawlers.

- Types of crawler
- Defining what is crawled
- The Cleanup Pipeline
- Configuration

7.1 Types of crawler

Atlas adds ObservableCrawlers to Sitecore indexing.

You use the ObservableCrawler to subscribe to a feed. It crawls the data that flows through until you unsubscribe the feed from the ObservableCrawler.

You must configure the crawler to tell it where to crawl, how to crawl, and what to crawl.

An example:

```
       <fieldNames hint="raw:AddFieldByFieldName">
           <field fieldName="businessname" storageType="YES" indexType="TOKENIZED"
vectorType="NO" boost="1f" type="System.String"
settingType="Sitecore.ContentSearch.LuceneProvider.LuceneSearchFieldConfiguration,
Sitecore.ContentSearch.LuceneProvider">
               <Analyzer
type="Sitecore.ContentSearch.LuceneProvider.Analyzers.LowerCaseKeywordAnalyzer,
Sitecore.ContentSearch.LuceneProvider" />
           </field>
           <field fieldName="location" storageType="YES" indexType="TOKENIZED"
vectorType="NO" boost="1f" type="System.String"
settingType="Sitecore.ContentSearch.LuceneProvider.LuceneSearchFieldConfiguration,
Sitecore.ContentSearch.LuceneProvider">
               <Analyzer
type="Sitecore.ContentSearch.LuceneProvider.Analyzers.LowerCaseKeywordAnalyzer,
Sitecore.ContentSearch.LuceneProvider" />
           </field>
       </fieldNames>
```

This tells the crawler that to store and index using the `LowerCaseKeywordAnalyzer` when it crawls the “businessname” and “location” fields.

If you do not specify any mappings then it will take the default based off the *TYPE* of the property. Telling the index HOW to store the data is completely up to the client. How you store and index your data will determine what is possible when you query the data.

The crawler can only index the data you give it. It does not look up data based on IDs: it simply takes an object and stores it. Sitecore has pipelines that you can use to manipulate data, but these pipelines are empty. They are entry points for you to use.

Therefore, if you want to store fields, your crawler must acquire this information. You should not store the ID references and then lookup later. We do not recommend this for performance reasons.

There is a list field names here: Field Names.

7.2 Defining what is crawled

Sitecore can crawl instances of IIndexable. IIndexable has many other interfaces that make it possible to crawl fields, set a unique ID,and so forth. Your crawler needs to conform to this interface for us to understand it.

For example, if you want to crawl a Contact in xDB, you need an IIndexable implementation similar to this:

```
        public class ContactIndexable: AbstractIndexable
            {
                public ContactIndexable(IVisitAggregationContext context)
                {
                    Id = (IndexableId<Guid>)context.Contact.ContactId;
                    UniqueId = (IndexableUniqueId<Guid>)context.Contact.ContactId;
                    DataSource = "sitecore aggregation";
                    AbsolutePath = string.Empty;
                    Culture = CultureInfo.CurrentCulture;

                    LoadFields(context);
                }

                private void LoadFields(IVisitAggregationContext context)
                {
                    var fields = new List<IIndexableDataField>
                        {
                            new IndexableDataField<string>("type", "contact")
                        };
                    var fieldNames = new[] {"IdentificationLevel", "Classification",
"VisitCount", "Value", "ContactId", "ExternalUser", "IntegrationLabel"};
                    fields.AddRange(IndexableDataField.CreateFromProperties(context.Contact,
"contact", fieldNames));

                    this.Fields = fields;
                }

                public override void LoadAllFields()
                {
                    // do nothing
                }
            }
```

Atlas gives Sitecore implementations of crawlers, aggregators and indexables under the Sitecore.ContentSearch.Analytics namespace.

7.3 The Cleanup Pipeline

Sitecore executes the Cleanup pipeline every time an item is added to or updated in the index. This pipeline will be passed the IIndexable and the IProviderUpdateContext. The UpdateContext is passed through, and you can use it to update, merge, or deduplicate the row in question. It is up to you to open an IProviderSearchContext if you need to look up an index. Because you are passed an IIndexable you can use this to fetch the context index using ContentSearchManager.GetIndex(IIndexable). We have added a Hash property to the IIndexable which allows you to look up a document in an index to see if the hash is the same. You can use the Hash to quickly determine if a field in a document has changed or if two documents are identical in all their fields.

Sitecore generates the Hash when it is indexing and the Hash changes when a document changes. If you find a match on the Hash, you know that you have found an exact match and you can use this to skip the update.

If you look up an item with the UniqueID and the Hash is different, then you know that the values of the fields are different as well. You can use this logic to then lookup some field values and determine which ones you should merge, update or skip in the update.

An example would be that you get a new row of data from the crawler, and you look up the index via the UniqueID and the Hash. If you can find the UniqueID but the hash is different, you know that there is a difference in the fields and that you go into “cleanup mode”. It is completely up to you as to *how* to cleanup. For example, if the email fields are different, you will use the latest value. The logic would look something like this pseudocode:

If Unique ID == uniqueid && Hash != indexable.Hash

Then you know that a field has changed

Lookup the First() result of the IQueryable and compare their email field.

If the value of the first field is hello@hell.com and the second is chris@ebay.com

Then update the row to be chris@ebay.com and commit that

The cleanup pipeline is open and can have as many processors as it needs. To create a new processor, follow these steps:

1. Create a class called “ECMCleanupStrategy.cs”

```
        Implement the CleanUpProcessor class

namespace Sitecore.ContentSearch.Pipelines.CleanUp
        {
            public class SubscriberDeduplication : CleanUpProcessor
            {
                public override void Process(CleanUpArgs args)
                {
                    //Place code in here that will determine if the args.Indexable is
different to one that already exists within the Index or another datasource, how it will merge
the fields so that the correct data goes into the index.

                }
            }
        }
```

3. Place this into the config to run.

```
            <contentSearch.CleanUp>
                  <processor
                type="Sitecore.ContentSearch.Pipelines.CleanUp.SubscriberDeduplication,
                Sitecore.Extensions"/>
        </contentSearch.CleanUp>
```

2. Either start a rebuild or simply re-establish the subscribe on the observable crawler by calling the Subscribe method through code.

7.4 Configuration

You can configure crawlers at start-up in the XML configuration include files like this:

The following adds multiple ObservableCrawlers to the Lucene configuration for the *sitecore_atlas_index*:

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <contentSearch>
      <configuration>
        <indexes hint="list:AddIndex">
          <index id="sitecore_atlas_index" type="Sitecore.ContentSearch.LuceneProvider.LuceneIndex,
Sitecore.ContentSearch.LuceneProvider">
            <!-- ... other configuration ... -->

        <locations hint="list:AddCrawler">
                      <crawler type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsVisitCrawler,
Sitecore.ContentSearch.Analytics">
                        <CrawlerName>Lucene Visit Crawler</CrawlerName>
                        <ObservableName>VisitObservable</ObservableName>
                      </crawler>
                      <crawler
type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsVisitPageCrawler,
Sitecore.ContentSearch.Analytics">
                        <CrawlerName>Lucene Visit Page Crawler</CrawlerName>
                        <ObservableName>VisitPageObservable</ObservableName>
                      </crawler>
                      <crawler
type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsVisitPageEventCrawler,
Sitecore.ContentSearch.Analytics">
                        <CrawlerName>Lucene Visit Page Event Crawler</CrawlerName>
                        <ObservableName>VisitPageEventObservable</ObservableName>
                      </crawler>
                      <crawler
type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsContactCrawler,
Sitecore.ContentSearch.Analytics">
                        <CrawlerName>Lucene Contact Crawler</CrawlerName>
                        <ObservableName>ContactObservable</ObservableName>
                      </crawler>
                      <crawler
type="Sitecore.ContentSearch.Analytics.Crawlers.AnalyticsContactTagCrawler,
Sitecore.ContentSearch.Analytics">
                        <CrawlerName>Lucene Contact Tag Crawler</CrawlerName>
                        <ObservableName>ContactTagObservable</ObservableName>
                      </crawler>
                    </locations>
          </index>
        </indexes>
      </configuration>
    </contentSearch>
  </sitecore>
</configuration>
```

Chapter 8

Configuration and Tuning

This chapter describes some of the configuration files that are used for item buckets, as well as some tools that can help tune performance.

- Configuration Files
- Scaling Test Tool
- Index Analyzer

8.1 Configuration Files

Item Buckets has a `Sitecore.Buckets.config` file that contains configuration settings. This file is mainly documented by the comments inside the file itself.

Custom Index

This configuration declares a new index called *buckets*. It then uses a custom crawler to tokenize and list the field types. This enables you to search within list items.

```
<search>
      <configuration>
        <indexes>
          <index id="buckets" type="Sitecore.Search.Index, Sitecore.Kernel">
            <param desc="name">$(id)</param>
            <param desc="folder">buckets</param>
            <Analyzer ref="search/analyzer" />
            <locations hint="list:AddCrawler">
              <ItemSearch
type="Sitecore.ItemBucket.Kernel.Crawlers.CustomCrawler,Sitecore.ItemBucket.Kernel">
              <Database>master</Database>
                <Root>/sitecore/content</Root>
                <IndexAllFields>true</IndexAllFields>
                <fieldTypes hint="raw:AddFieldTypes">
                  <fieldType name="multilist" storageType="NO" indexType="TOKENIZED"
vectorType="NO" boost="1f" />
                        <fieldType name="treelist" storageType="NO" indexType="TOKENIZED"
vectorType="NO" boost="1f" />
                        <fieldType name="treelistex" storageType="NO" indexType="TOKENIZED"
vectorType="NO" boost="1f" />
                        <fieldType name="checklist" storageType="NO" indexType="TOKENIZED"
vectorType="NO" boost="1f" />
                        <fieldType name="tree list" storageType="NO" indexType="TOKENIZED"
vectorType="NO" boost="1f" />
                </fieldTypes>
                <include hint="list:ExcludeTemplate">
                  <layout>{ADB6CA4F-03EF-4F47-B9AC-9CE2BA53FF97}</layout>
                </include>
              </ItemSearch>
            </locations>
          </index>
        </indexes>
      </configuration>
    </search>
```

Custom Cache

Some preliminary work has been done to preconfigure the cache levels for a site that contains 100,000 items or more. You may need to tweak these numbers depending upon the number of items in your content tree. For more information, see the *Sitecore Search Scaling Guide*.

```
<database id="master" singleInstance="true" type="Sitecore.Data.Database, Sitecore.Kernel">
        <cacheSizes hint="setting">
          <data>100MB</data>
          <items>100MB</items>
          <paths>4MB</paths>
          <standardValues>4MB</standardValues>
        </cacheSizes>
      </database>
      <!-- web -->
      <database id="web" singleInstance="true" type="Sitecore.Data.Database, Sitecore.Kernel">
        <cacheSizes hint="setting">
          <data>20MB</data>
          <items>20MB</items>
          <paths>4MB</paths>
          <standardValues>4MB</standardValues>
        </cacheSizes>
      </database>
```

Custom Settings

The `Sitecore.Buckets.config` file contains some custom settings. They are inside the `<settings> ...</settings>` and they are documented in the file itself.

The Sitecore `web.config` file contains the following setting:

```
      <setting name="Indexing.UpdateInterval" value="00:00:30"/>

//This is the index update interval that is set when unstructured items are created, deleted, modified etc. in the Web database. If you have item creation, deletion or modification on your Web database, the items won´t automatically be included in your index. This interval determines how often the index is updated on the Web database. This is necessary once you start working with over 100,000 unstructured items in your index.
```

8.2 Scaling Test Tool

Sitecore comes with a tool that allows you to test the scalability of your new search providers or the way the way the indexes have been set up. You can also use this tool to test facets, new search types, new query types, and the way your indexes are cached in large content environments.

To enable this tool:

1. Go to the `Sitecore rev. xxx\Website\sitecore\admin\sqlscripts` folder.
2. Run the `ItemGenerator.sql` script on the databases in your test environment.
3. Create a folder in your data directory called “words” and then place some .txt files in here for dummy data.

   For example, use some of the freely available books on the net in .txt format.

In a browser, open http://<sitename>/sitecore/admin/FillDB.aspx and fill in the form and then run. After the process has finished, reset IIS and your newly items will appear in the content tree. The tool will create approximately 120,000 items in 10 seconds.

We recommend that you disable the FillDB.aspx page in a production environment. You do this in the config file:

```
<setting name="EnableFillDB" value="false" />
```

8.3 Index Analyzer

Every index uses the default analyzer — StandardAnalyzer. An analyzer is a software component that is used for writing and querying the index as well. The analyzer determines how things are stored and how things are queried.

The StandardAnalyzer:

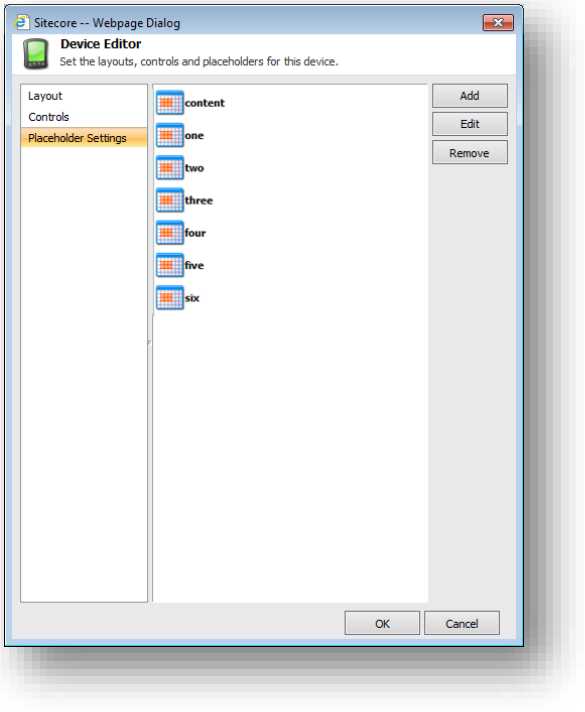
- Ensures that all the search queries and values in the index are in lowercase.
- Splits up bodies of text into small chunks.
- Removes any unnecessary stop words, such as, *the*, *is* and any other words that typically don't add any value to a search query.

8.4 Scaling with Placeholders

Because that you could potentially have many items in an item bucket, you need to make sure that you set placeholder settings for all the placeholders within your site, or you will get a performance decrease in the Page Editor. This will prevent Sitecore from having to search for components that can be added – they are already known.

To do this, assign a placeholder settings item for each placeholder on the page like this:

1. Click the **Presentation** tab, and then click **Details** in the **Layout Group**.
2. Click **Edit** for the layout, and then add the placeholder settings you need:



8.5 Indexing

You need to consider the implications of an index operation when you use observable crawlers. Observable crawlers listen for new items constantly. As a crawler receives notice of a new item, it will cache it in memory until an index operation is processed.

This has the following implications:

1. If you rebuild your index (clear all existing content and index new items) only the items currently held by the crawler will be inserted.
2. As each crawler will cache each crawled item in memory, you should index at a consistent frequency to ensure the items are flushed from memory before the memory usage grows too large.
3. As your source of data is a feed and you do not have access to all the data at once, you should only call update methods on your index.

8.5.1 TimedIndexRefreshStrategy

You can use the `TimedIndexRefreshStrategy` on an index to resolve the issues discussed in the introduction of this chapter. This strategy refreshes an index with data from the crawlers but it does not cause the index to be reset.

8.5.2 Configuration

Add this to the configuration to configure the strategy:

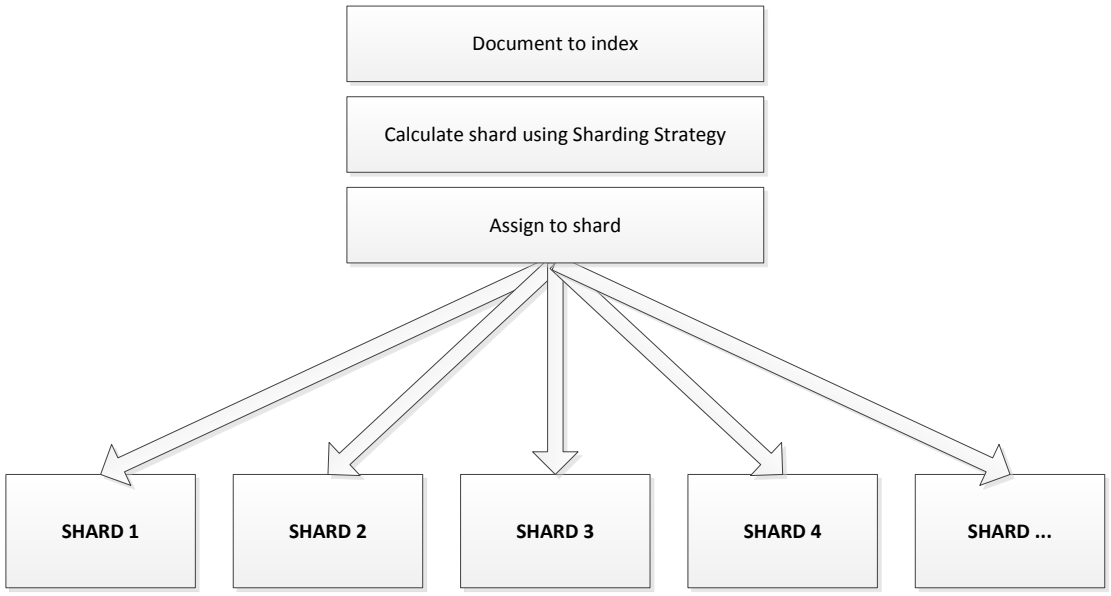
```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <contentSearch>
      <configuration>
        <indexes hint="list:AddIndex">
          <index id="sitecore atlas index"
type="Sitecore.ContentSearch.LuceneProvider.LuceneIndex,
Sitecore.ContentSearch.LuceneProvider">
            <!-- ... other configuration ... -->
            <strategies hint="list:AddStrategy">
              <timed type="Sitecore.ContentSearch.Analytics.TimedIndexRefreshStrategy,
Sitecore.ContentSearch.Analytics">
                <param desc="interval">00:01:00</param>
              </timed>
            </strategies>
            <locations hint="list:AddCrawler">
              <crawler type="Sitecore.ContentSearch.Analytics.AnalyticsObserverCrawler,
Sitecore.ContentSearch.Analytics">
                <ObservableName>DefaultObservable</ObservableName>
                <CrawlerName>Lucene Crawler</CrawlerName>
              </crawler>
            </locations>
          </index>
        </indexes>
      </configuration>
    </contentSearch>
  </sitecore>
</configuration>
```

You must provide the interval parameter. It is configured to run every minute in this example.

8.6 Sharding

Index sharding splits the documents an index contains over smaller partitions or *shards*. This means that instead of one large index, the documents are distributed between shards. The sharding strategy has logic that decides which shard to allocate each document to.

Basic sharding process:



8.6.1 When to use sharding

Before you decide to use sharding you have to evaluate whether splitting an index into shards and subsequently searching each shard is more efficient than searching the index as a whole.

Sharding is an advantage when an index is extremely large and searching becomes slower because of the number of documents. Searching two (or more) smaller shards will be better.

Do not shard unnecessarily. You will not always get an increase in performance. An alternative is to filter certain documents into certain indexes. Use the include/exclude templates features of the index configuration to do this.

8.6.2 How to configure sharding for an index

Sharding is an optional behavior for a Lucene index. >You must update the definition of the index that you want to use sharding on in order to enable sharding. By default, Sitecore uses a single index to store documents. You could think of this as an index with only one shard.

Locate the index you wish to enable sharding on and add a 'shardingStrategy' section:

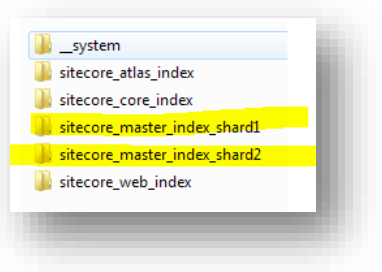
```
        <index id="[indexNameHere]">
…
<shardingStrategy
type="Sitecore.ContentSearch.LuceneProvider.Sharding.LucenePartitionShardingStrategy,
Sitecore.ContentSearch.LuceneProvider">
    <param desc="shardDistribution">2</param>
          <shardFolders hint="list:AddShardFolderPath">
                    <shard shardName="shard1" shardFolderPath="C:\Shard_1" />
                    <shard shardName="shard2" shardFolderPath="D:\Shard_2" />
                  </shardFolders>-->
</shardingStrategy>
        …
</index>
```

8.6.3 Default Strategy

Sitecore provides a default sharding strategy called the 'LucenePartitionShardingStrategy'. This strategy takes a document and calculates a hash of the ID to determine which shard to put it into. This hashing is very fast and does not rely on any shared state or ID generation. This removes many of the usual bottlenecks. Because of this, this approach does not give a 100% even distribution (for example, 100 documents will not be split 50/50). The distribution will be slightly more uneven but it guarantees that all documents are indexed and distributed as evenly as possible.

This strategy only has one option: the 'shardDistribution' parameter. You must set it to be a factor of 2 (2, 4, 8,16, …) and denotes how many shards the index will be split into.

You can see the shards in the 'indexes' directory of your data folder.



We recommend that you rebuild your index after applying a strategy. It is not essential, but it will give the index a more even distribution of documents.

8.6.4 Sharding Strategies

Sitecore has a new type of index that allows you to specify multiple shards of one index. The default strategy is a FileSize (index size) based strategy. This means that if you change the FileSize then Sitecore does not need to rebalance the indexes. Rebalancing is required if you are sharding by an alphabetical character or a date range.

You define a shard in configuration files.

When you search for a shard, you simply put in the name of the shard instead of the index you want to search. Therefore, there is no need for a new signature for searching multiple indexes at the one time.

```
        var index = ContentSearchManager.GetIndex("shard_name");

                using (var context = index.CreateSearchContext())
                   {
                       return context.GetTermsByFieldName("fieldname", prefix).Select(x =>
x.Term).ToList();
                   }
```

You typically use Sharding for performance and scalability reasons. It is most relevant to use sharding when you use Lucene.Net as your provider.

8.6.5 How to Create Your Own Sharding Strategy

If the default strategy is not what you need, you can implement your own strategy. You do this by using the 'Sitecore.ContentSearch.Sharding.IShardingStrategy' interface and passing the implementation into the index as specified above.

8.6.6 Sharding and Solr

When you use Solr instead of Lucene, Sitecore does not handle the sharding. Instead, the SolrCloud feature of the Solr application handles the sharding.

Solr can therefore automatically assign documents to shards (in a similar way to how Sitecore does it for Lucene) and make extra features like replicated shards available. Replicated shards are useful for handling failure and fail-over scenarios.

We recommend that you configure the Solr application to handle the sharding of documents. The Sitecore implementation of Solr will handle a sharded endpoint in the same way it handles an unsharded endpoint. You do not need any extra configuration to work with Solr sharded indexes.

You can find more information about the configuration of SolrCloud here:

http://wiki.apache.org/solr/SolrCloud /

https://cwiki.apache.org/confluence/display/solr/SolrCloud

You can use *SolrShardingFactory* to explore custom sharding in Solr but we recommend that you leave the sharding to SolrCloud.

8.7 Filtering

You can configure instances of `ObservableAggregator<T>` to filter out items that you do want to be not be sent to *observers*. All *observables* used the global pipeline `aggregation.filter.inbound`. You can add additional *observable* specific pipelines.

8.7.1 Configuration

You can implement the global aggregation filter in XML. The following adds two filters, one filters by contact id, the other by the path visited:

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <pipelines>
      <!-- global aggregation inbound filters-->
      <aggregation.filter.inbound>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundContactIdFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>ca82109f-30cd-4414-956e-caea41c7510c</filter>
          </filters>
        </processor>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundVisitPathFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>/default.aspx</filter>
          </filters>
        </processor>
      </aggregation.filter.inbound>
    </pipelines>
  </sitecore>
</configuration>
```

You can configure each processor above with additional `<filter>` values.

8.7.2 Observable specific filter

You can configure an *observable* specific pipeline in addition to the global filter pipeline. If you configure an *observable* called `DefaultObservable`, you simply configure a pipeline called `defaultobservable.filter.inbound`.

```
        <configuration xmlns:patch="http://www.sitecore.net/xmlconfig/">
  <sitecore>
    <pipelines>
      <!-- define the aggregator -->
      <aggregation>
        <processor patch:before="*[1]"
                   type="Sitecore.ContentSearch.Analytics.AnalyticsObservableAggregator,
Sitecore.ContentSearch.Analytics">
          <!-- here we name the aggregator -->
          <param desc="name">DefaultObservable</param>
        </processor>
      </aggregation>
      <!-- specific inbound filter for an aggregator -->
      <!-- we use the aggregator name from above in the pipeline name -->
      <defaultobservable.filter.inbound>
        <processor
type="Sitecore.ContentSearch.Analytics.Pipelines.AggregationFilters.InboundVisitPathFilter,
Sitecore.ContentSearch.Analytics">
          <filters hint="list:AddFilter">
            <filter>/other.aspx</filter>
          </filters>
        </processor>
      </defaultobservable.filter.inbound>
    </pipelines>
  </sitecore>
</configuration>
```

This configuration uses exactly the same `processor` types as the global pipeline. Sitecore only applies the processors in the pipeline when the `DefaultObservable` processor is filtering items.

Chapter 9

Backup and Maintenance of Contact Search Indexes

This chapter tells you how to contact search indexes. These indexes are used long-term, and you cannot just loose them and rebuild them.

- When you use Lucene
- When you use Solr
- What happens when you change the schema for the Observable index?
- Moving between search providers

9.1 When you use Lucene

You cannot use the built-in Windows Snapshots.

We have tested the following method, and it does work:

9.1.1 Hobocopy

You can use the open source product called Hobocopy. You can download it here:

http://candera.github.io/hobocopy/

Hobocopy can run Shadow Copies of files that still are being written to. Essentially this is capturing a snapshot in time of committed indexes.

9.1.2 Using Hobocopy

You can learn more about using Hobocopy here:

http://www.howtogeek.com/howto/windows-vista/backupcopy-files-that-are-in-use-or-locked-in-windows/

The simplest backup you can do, you do like this:

Open Powershell and type the following command in:

```
        PS C:\> .\HoboCopy.exe
C:\Development\Update2\testground\Data\indexes\sitecore master index
c:\Backup\sitecore_master_index /y
        HoboCopy (c) 2006 Wangdera Corporation. hobocopy@wangdera.com
        Starting a full copy from
C:\Development\Update2\testground\Data\indexes\sitecore master index to
c:\Backup\sitecore master index
        Copied directory
        Backup successfully completed.
        Backup started at 2013-07-17 12:44:22, completed at 2013-07-17 12:44:56.
        8 files (8.59 MB, 1 directories) copied, 0 files skipped
```

This will take a snapshot of what the index has committed, but not what is still in memory.

The default commit policy is time-based. It commits data to disk every 5 minutes. Therefore, we only recommend this for the ObservableCrawler. This crawler has data committed to disk at any time, but constant flows are coming in.

For backing up of the Flat and Hierarchical Crawlers, we suggest that you stop writing to the index, wait 10 minutes to be sure that the commit policy has run, and then run the Hobocopy command. Your documents are all committed to disk. If you have implemented your own commit policy, you need to make sure that it also commits.

You can also run an incremental backup using a lastupdate.dat file that you can use to run schedulev backups with Hobocopy.

9.2 When you use Solr

9.2.1 Backup

You can find information about backing up Solr here:
https://cwiki.apache.org/confluence/display/solr/Backing+Up

For example: http://localhost:8983/solr/replication?command=backup.

9.2.2 Restore

Stop the Solr Core via the container that is hosting it (Jetty, for example). Copy the restored index back into the data directory within Solr and start Solr up again.

9.2.3 Alternative

Sitecore 7 Update 1 supports a SwitchOnRebuildIndex in Solr. Instead restoring the index by shutting down the Solr instance, you can copy the index into the secondary index folder and then issue the SWAP command through a direct URL request. For example:

http://localhost:8983/solr/admin/cores?action=SWAP&core=core1&other=core0

9.3 What happens when you change the schema for the Observable index?

It is problematic to change the schema for an Observable index. The problem is that you cannot be certain that you get the same data back when you rebuild the index. This is because all the crawls that you have ever run have to be run again, and some of the data may no longer be available. We recommend that you push all data you want to be re-crawled through the DMS XDB. This way, Sitecore can crawl all the data again.

Schema changes can be adding fields, changing field properties, changing analyzers, adding computed fields, changing storage or index properties, and many more.

The first and most obvious option is to agree on a schema *before* you put it into production. This way, you will never have to rebuild your index under normal circumstance. Corruption of indexes is very rare, but you should look at the section about backup so that you can learn how to always take live snapshots of your indexes.

Here are a list of all the schema changes and responsive actions:

Add a new property that will be added to the index:

- If you are not interested in making sure that all your records contain this new property then you don't need to do anything. This can happen without having to stop production.

Changing field properties:

- Changing Tokenized or Storage Properties: This requires a full rebuild of the index.
- Changing Analyzer for a field: This requires a full rebuild.
- Adding Computed Fields: If the computed fields are only required for all the data that as added from that point on then a rebuild is *not* necessary.

Any Schema changes within Solr will require a restart of the Solr Service. Changing Schemas for Lucene will hit the application pool and will take a few seconds to come back up.

A common question is: Can I use the switch on rebuild index to have one index with one schema and one with another schema?

The answer is no.

What you can do if you believe that your schema will change a lot is to store two indexes, with different schemas that are both in play at the one time. Then, you can take one offline, change the schema, update it on another machine, and then bring it back in.

If you need to rebuild a full index after a schema change then we recommend that you rebuild this in a separate environment and bring the indexes back when they have finished updating. The rebuild process is processor, memory, and IO intensive. You should not run it on the same machine that, for example, runs the xDB aggregation pipeline.

Sitecore does not ship with an auto-migration or auto-update tool.

9.4 Moving between search providers

This is a manual task and requires a full rebuild of the indexes. Because the index does not contain all the necessary information about types, document type, and so forth, Sitecore cannot assume how to transfer data when moving between search providers.

Chapter 10

Appendix

This chapter describes how various internal processes work and contains information that will help you to extend or modify the module.

This chapter contains the following sections:

- Tips and Tricks
- Default Fields in Lucene
- Contact Search Field Names

10.1 Tips and Tricks

Publishing

- How does Sitecore publish of millions of items?

  The simple answer is: nothing special is done. The rationale is in the answer to this question: “Why would you need to publish 1 million items *all* the time?” The first time you publish from authoring to delivery and if you were to use the Full Publish option, then the answer is: “Yes, this would take some time.” But after that, you only need to run publish added content incrementally.

- If I publish a single item in a bucket, but its bucket folders are not published, what happens?

  Sitecore has added an extra pipeline step to the publishing process to detect if an item requires its bucket folders to be published and will add them to the publishing queue as well automatically. This also applies to items that are in workflow. There is no need to add in an extra workflow action for this.

- What publishing should I be doing for Item Buckets?

  The answer to this question does not change because of Item Buckets.

Standard Web.Config Tweaks

- You should periodically tweak the cache depending on how many items are in the content tree and how many similar searches have been processed.

Setup Tweaks

- When you import a lot of content programmatically, you must truncate the *PublishingQueue*, *History,* and *Event Queue* tables in the *Master* and *Web* databases and rebuild the indexes on the database tables. If you don’t do this, the *PublishingQueue*, *History,* and *EventQueue* tables will get very large, slow down processing, and your Sitecore installation may not start.

  After clearing the tables, you must rebuild the index and run a smart publish instead of an incremental publish.

Environment Tweaks

- If possible, disable the inbuilt Windows Search Index as well as any other indexer that is running on the computer that runs the index or on the web server itself. This index uses essential Disk I/O resources that Lucene.net needs.
- Don’t run processes on the index to create a backup. The index should not be part of regular backup procedures. Chances are that the backup will be outdated if it is ever needed, so it is a waste of resources.
- It is very important that you set up a SQL Maintenance plan that rebuilds your indexes. When you create a lot of content, index fragmentation will increase, especially with the bulk importation of content.

  The hotspots will be the *Items*, *Versioned*, *Unversioned*, *Shared*, *Blobs,* and *Links* tables. To be on the safe side, you should set rebuilds for every table. If you don’t do this, performance of the CMS will degrade.

  Here is a script for rebuilding all the indexes in your databases.

```
-- Show fragmentation for all tables
EXEC sp MSforeachtable @command1="print '?' DBCC SHOWCONTIG('?')"

--Rebuild all indexes (this method locks the tables while the indexes are rebuilt)

USE [Sitecore_Master] --Change this to your database name
DECLARE @TableName varchar(255)
DECLARE TableCursor CURSOR FOR
```

```
SELECT table name FROM information schema.tables
WHERE table type = 'base table'

OPEN TableCursor
FETCH NEXT FROM TableCursor INTO @TableName
WHILE @@FETCH_STATUS = 0

BEGIN
DBCC DBREINDEX(@TableName,' ',90)
FETCH NEXT FROM TableCursor INTO @TableName
END

CLOSE TableCursor
DEALLOCATE TableCursor
```

Importing Data Tweaks

- When you import a lot of content into Sitecore, it is best to use the `BulkUpdateContext` class. When you have imported the content, rebuild the Lucene index.
- If you import a lot of content, do it in batches of, for example, one thousand, and then bucket or re-sync the bucket to avoid overloading the process with items.

Uploading Files to the Media Library

- The media library now supports the indexing of all files that support IFilter. For more information about IFilter, see http://en.wikipedia.org/wiki/IFilter.

  Note
  Sitecore does not by default provide search in PDF documents on MSSQL databases, and in neither PDF nor Word documents on Oracle databases.

  In short, IFIlter is a generic interface for indexing documents. Sitecore 7 ships configured to use IFilters to index text in the binary content of media items. To use this feature, you must install IFilters for the types of media items that you want your solution to index. You can use software such as the free IFilter Explorer from Citeknet to investigate the IFilters installed on your system.

  If the system hosting a Sitecore solution does not have an IFilter for a given media type, Sitecore can only index the metadata stored in that media item, not its binary content. Additionally, whether search results include media items can depend on the encoding of the format of data contained in those media. For example, IFilters may not be able to convert images of text in media items to structured text to parse.

  Finally, you must install IFilters on the relevant hosts in your production environments (both content management and delivery); having an IFilter installed in a development environment will not allow indexing of that data type in your production environments.

Bucket Config Tweaks

- You can tweak your index so that it doesn't index certain things that you don't want in the index. This will decrease rebuild time and improve search time.
- Consider rebuilding your indexes on a computer that has a solid state disk. Incremental updates do not have to be performed on SSD but they will benefit from this as well. If you have one dedicated server that rebuilds indexes and deploys them to an environment, ensure that this server has an SSD. Indexes will not be so big, so a small SSD will suffice — for example 64GB.
- Don't shard too many indexes. Sitecore must context switch between these shards and this slows down search time.
- If you have very large caches, you can see large memory spikes when you run a search. This is normal as a search is filling the ItemCache for the results. Be careful of under-optimized

caches — they keep as much of the search results in cache as possible and this may not be optimal.

- If you see a lag in searches or results that are taking a long time to facet, enable Debug mode in the `Sitecore.Buckets.config` file. All queries are logged in debug mode, as well as how long the queries take to run and how many clauses they contain. This can help identify the issue. Wildcard and range queries are probably the main culprits.
- Optimize the out-of-the-box indexes.

  Optimization speeds up index rebuilding time and to some small degree, query time as well.
- Disable all the dropdowns that you are not using in the `/sitecore/system/Modules/Item Buckets/Settings/Search Box Dropdown` item. The most expensive lookups are *recently modified* and *recently created*.
- Add all the items in `/Sitecore/System/Modules/Buckets` to your prefetch cache.
- If you have disabled Debug mode but would like to debug a single query, in the search field enter *debug:1,* press tab and then enter the search term. Sitecore only adds that search query to your log file.
- Sitecore 7.0 ships with a slower version of the bucketing process in order to be backwards-compabile. If you do not need this, you should uncomment this from the configuration file:

  ```
  <setting name="FastQueryDescendantsDisabled" value="true" />
  ```

  This will improve unbucketing performance.

10.2 Default Fields in Lucene

The following is a list of the required fields in Lucene:

```
ID = "_id";
Sites = "site";
Database = "_database";
Path = "_path";
Name = "_name";
DisplayName = "_displayname";
Language = "_language";
Creator = "_creator";
UpdatedBy = "parsedupdatedby";
CreatedBy = "parsedcreatedby";
Editor = "_editor";
Created = "_created";
Updated = "_updated";
Hidden = "_hidden";
Template = "_template";
AllTemplates = "_templates";
TemplateName = "_templatename";
Icon = "_icon";
Links = "_links";
Tags = "_tags";
Group = "_group";
LatestVersion = "_latestversion";
Lock = "lock";
Version = "_version";
IsClone = "_isclone";
FullPath = "_fullpath";
IndexName = "_indexname";
UniqueId = "_uniqueid";
DataSource = "_datasource";
Parent = "_parent";
Bucket = "_bucket";
SmallCreatedDate = "__smallcreateddate";
SmallUpdatedDate = "__smallupdateddate";
Url = "urllink";
Semantics = "__semantics";
IndexTimestamp = "_indextimestamp";
HasChildren = "haschildren";
"__bucketable"
"__workflow_state"
"__known_hit
"__is_bucket”
```

10.3 Contact Search Field Names

This is a list of the field names used in contact search.

Contact

```
Contact.IdentificationLevel
Contact.Classification
Contact.VisitCount
contact.Value
contact.ContactId
Contact.ExternalUser
Contact.IntegrationLabel
Contact.PreferredEmail
Contact.Emails
Contact.PreferredAddress
Contact.FirstName
Contact.MiddleName
Contact.Surname
Contact.Title
Contact.Suffix
Contact.Nickname
Contact.BirthDate
Contact.Gender
Contact.JobTitle
```

ContactTag

```
Contact.ContactId
ContactTag.Name
ContactTag.Value
ContactTag.DateTime
contactTag.AcquaintanceId
```

Visit

```
Visit.StartDateTime
Visit.EndDateTime
Visit.TrafficType
Visit.UserAgent
Visit.CampaignId
Visit.InteractionId
Visit.Referrer
```

```
Visit.ReferringSite
Visit.SiteName
Visit.Value
Visit.LocationId
Visit.VisitPageCount
Contact.ContactId
WhoIs.AreaCode
WhoIs.BuisinessName
WhoIs.City
WhoIs.Country
whoIs.IspName
WhoIs.MetroCode
WhoIs.Postalcode
WhoIs.Region
WhoIs.Ip
Browser.BrowserMajorName
Browser.BrowserMinorName
Browser.BrowserVersion
Os.Name
Os.MajorVersion
Os.MinorVersion
Visit.ProfilePatternIds
```

VisitPage

```
Visit.InteractionId
VisitPage.DateTime
VisitPage.Duration
VisitPage.Url
VisitPage.VisitPageIndex
```

VisitPageEvent

```
Visit.InteractionId
VisitPage.Url
VisitPageEvent.Name
VisitPageEvent.ItemId
VisitPageEvent.DateTime
VisitPageEvent.TimeStamp
VisitPageEvent.PageEventDefinitionId
```

Address
Contact.ContactId
Address.Key
Address.Country
Address.StateProvince
Address.city
Address.PostalCode
Address.StreetLine1
Address.StreetLine2
Address.StreetLine3
Address.streetLine4