wcm.io Context-Aware Configuration

PVTRAIN-167

Technical Training – wcm.io

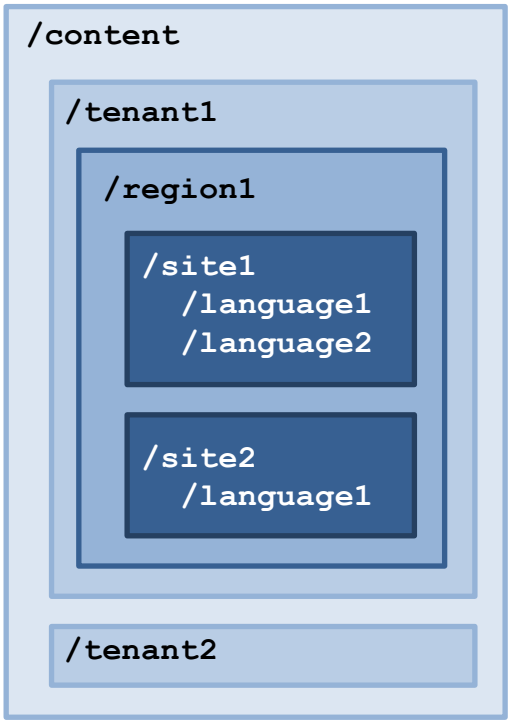
Last Updated: November 2017

http://training.wcm.io/caconfig/

What is Context-Aware Configuration

Short overview

Configuration example



Tenant-specific configuration

Region-specific configuration

Site-specific configuration

Context-aware = **different configuration for different subtrees in resource hierarchy**

Context-Aware Configuration

- Context-aware configurations are configurations that are **related to a content resource or a resource tree**, e.g. a web site or a tenant site.
- An application may need different configuration for different sites, regions and tenants = different contexts.
- Some parameters may be shared, so inheritance for nested contexts and from global fallback values is supported as well.

See also:

- Apache Sling documentation: Apache Sling Context-Aware Configuration
- pro!vision Training: PVTRAIN-166 Sling Context-Aware Configuration

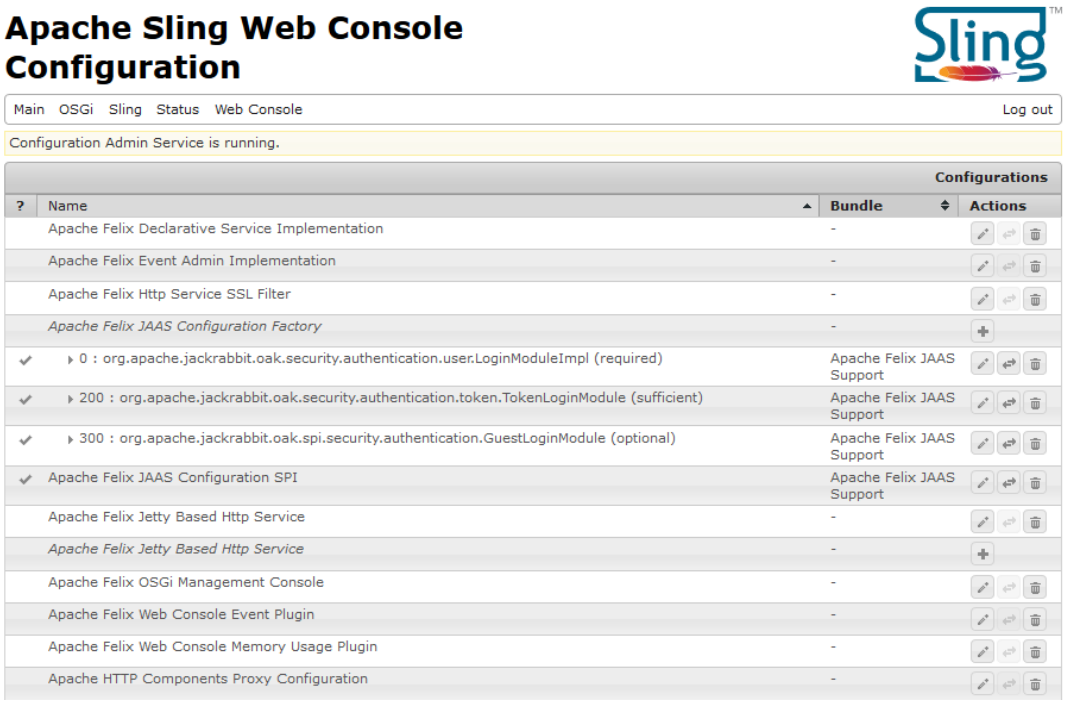
Configuration solutions in AEM

Configuration Solutions in AEM

Solution	Organization	Platform	System-level configuration	Context-aware configuration
OSGi configuration	OSGi	Sling, AEM	✓	✗
Cloud Service Configurations (CSC)	Adobe	AEM (since 5.5)	✗	✓
AEM ConfMgr	Adobe	AEM (since 6.1)	✗	✓
wcm.io Configuration 0.x	wcm.io	AEM (6.0 and up)	✗	✓
Apache Sling Context-Aware Configuration	Apache	Sling, AEM (6.1 and up)	✗	✓

- For system-level always OSGi is the standard solution
- For context-aware configuration different solutions emerged over the time

OSGi configuration



- Editor GUI
- Flexible deployment: filesystem, repository, web console, factory configurations
- “Self-describing" with metadata
- Good API support (esp. in OSGi R6)
- Runmode-specific configuration

AEM ConfMgr

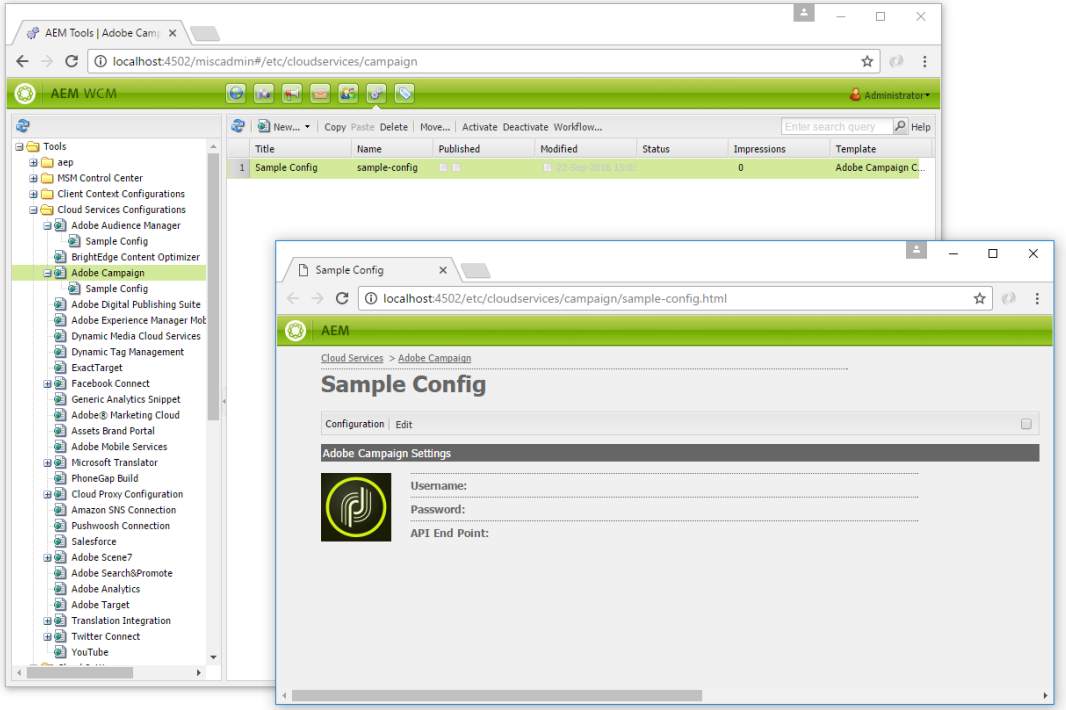
- Simple API
- Flexible inheritance support
- No Editor GUI
- Lacks documentation
- Used mainly by (some parts of) AEM itself
- Storage: `/conf`

- **Since AEM 6.3 replaced by Apache Sling Context-Aware Configuration**
  - AEM ConfMgr API still exists, but is deprecated and delegates to the Sling Context-Aware Configuration API internally

http://www.nateyolles.com/blog/2016/03/aem-slash-conf-and-confmgr

Cloud Service Configurations (CSC)

- Edit configuration via AEM templates
- Primary target: Adobe Marketing Cloud integrations
- Custom configurations possible as well
- Storage: `/etc/cloudservices`

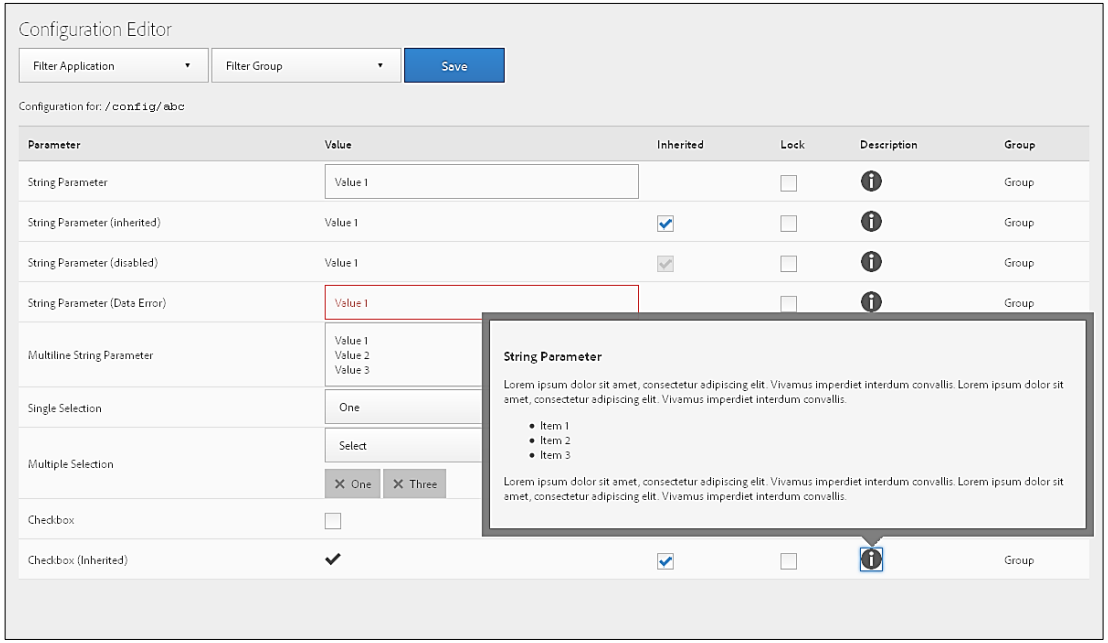


- Initially created only to configure Adobe Marketing Cloud Solutions in AEM (hence the name)
- But can by used for application-specific purposes as well

https://docs.adobe.com/docs/en/aem/6-3/develop/extending/cloud-service-configurations.html

wcm.io Configuration 0.x

- API and SPI for managing context-aware configurations
- Pluggable architecture
- Editor GUI



- **wcm.io Configuration 0.x is deprecated**
  - Replaced by Sling Context Aware-Configuration plus wcm.io Context-Aware Configuration Extensions and Editor, Compatibility Layer provided as well

http://wcm.io/config/

Configuration solution comparison

Feature	OSGi Config	AEM ConfMgr	AEM CSC	wcm.io Cfg 0.x	Sling CAConfig
Global / fallback configuration	✓	✓	✗	✓	✓
Hierarchy-based inheritance	✗	✓	✗	✓	✓
Property inheritance merging	✗	✗	✗	✓	✓
Provide properties and data types	✓	✗	✓	✓	✓
Additional metadata for editors	✓	✗	✓	✓	✓
Define Configuration metadata via code	✓	✗	✗	✗	✓
Key/value pairs (ValueMap)	✓	✓	✓	✓	✓
Resource-based access	✗	✓	✓	✗	✓
Map to Java class	✓	✗	✗	✗	✓
Configuration collections	✓	✓	✗	✗	✓
Editor GUI	✓	✗	✓	✓	✓

Recommendation

- Use **OSGi configuration** for **system-level configuration**
- Use **Apache Sling Context-Aware Configuration** for the other configuration purposes
  - for projects using AEM 6.1 or higher
  - with the help of wcm.io Context-Aware Configuration Extensions and Editor
- Do no longer use AEM ConfMgr or wcm.io Configuration 0.x
- Use Cloud Service Configurations only for “Marketing-Cloud-like” integration use cases

Context-Aware Configuration in AEM

Sling Context-Aware Configuration in AEM

- AEM 6.3 is the first version that ships with Sling Context-Aware Configuration
  - But you should deploy the latest bundles
- AEM 6.1 and AEM 6.2 is supported
  - You have to deploy all related bundles
- Some additional OSGi configurations are required

Instructions how to deploy and configure Sling Context-Aware Configuration in AEM:

http://wcm.io/caconfig/deploy-configure-caconfig-in-aem.html

Out-of-the-box support since AEM 6.3

- Supports reading context-aware configuration:
  - Storage at **`/conf`**
  - Using the default content model from Sling Context-Aware Configuration
  - Using the content model from AEM ConfMgr (with configurations wrapped in **`cq:Page`** nodes)
- Supports writing context-aware configuration
  - Only using the default content model from Sling Context-Aware Configuration
- Implements some subtle additions to the resource inheritance logic to be backward-compatible with AEM ConfMgr
  - Lookup in all parent paths below **`/conf`**, even if not explicitly defined by a context configuration reference or context paths strategy
  - Special inheritance decider for **`mergeList`** property from AEM ConfMgr

Managing configuration in /conf

- All context-aware configuration is stored by default in **`/conf`**
- In AEM 6.3 there is **no support in the GUI for editing or replicating** context-aware configuration
  - AEM 6.3 introduces a new tool “Configuration Browser”, but this allows only to create “structure” and not to manipulate the contained configuration. It is mainly target at template editor-related configuration, and does not have a “publish” button for replication.
  - The “Activate Tree” feature could be use for replication, but it is a bit tricky to use for context-aware configurations, and normally should not be accessible to anyone except the system administrator
- So the only built-in support is:
  - Edit configurations in CRX DE Lite
  - Creating a package of **`/conf`** or a subtree of it and replicate it to the publisher

wcm.io Context-Aware Configuration

wcm.io Context-Aware Config Overview

Since 2017 the wcm.io Configuration 0.x is deprecated, and replaced by Apache Sling Context-Aware Configuration.

On top of this the wcm.io provides additional context-aware features:

- **Configuration Editor**
- **AEM-specific extensions** for context path strategies, persistence and overriding
- **Compatibility layer** for wcm.io Configuration 0.x

All AEM versions since AEM 6.1 are supported.

wcm.io Configuration 0.x Compatibility Layer

If you have a wcm.io-based Application that uses wcm.io Configuration 0.x, you can either:

- Directly migrate your application to Sling Context-Aware Configuration and use the new configuration editor (recommended)
- Use the compatibility layer as drop-in replacement to wcm.io Configuration 0.x, it delegates that calls internally the Sling Context-Aware Configuration API
- Or a mix of both approaches if you have parts of your application or 3rdparty libraries that you cannot yet migrate

This wiki page describes the necessary steps.

Context-Aware Configuration Editor

wcm.io

Configuration Editor Features

- Manage Context-Aware Configuration by creating an editor page in the content context
- Manage singleton configuration, configuration collections and nested configurations
- Display all configuration metadata and default values
- Support all data types and arrays of values
- Control collection and property inheritance and support overridden values
- Allows to define custom widgets for configuration properties like pathbrowser
- It uses the Sling Context-Aware Management API internally

Placing configuration editor page

- The configuration editor is created as AEM page within the context, using the Configuration Editor template
- But it reads and writes the configuration from **`/conf`**
- When multiple contexts are nested an editor page is created for each of them

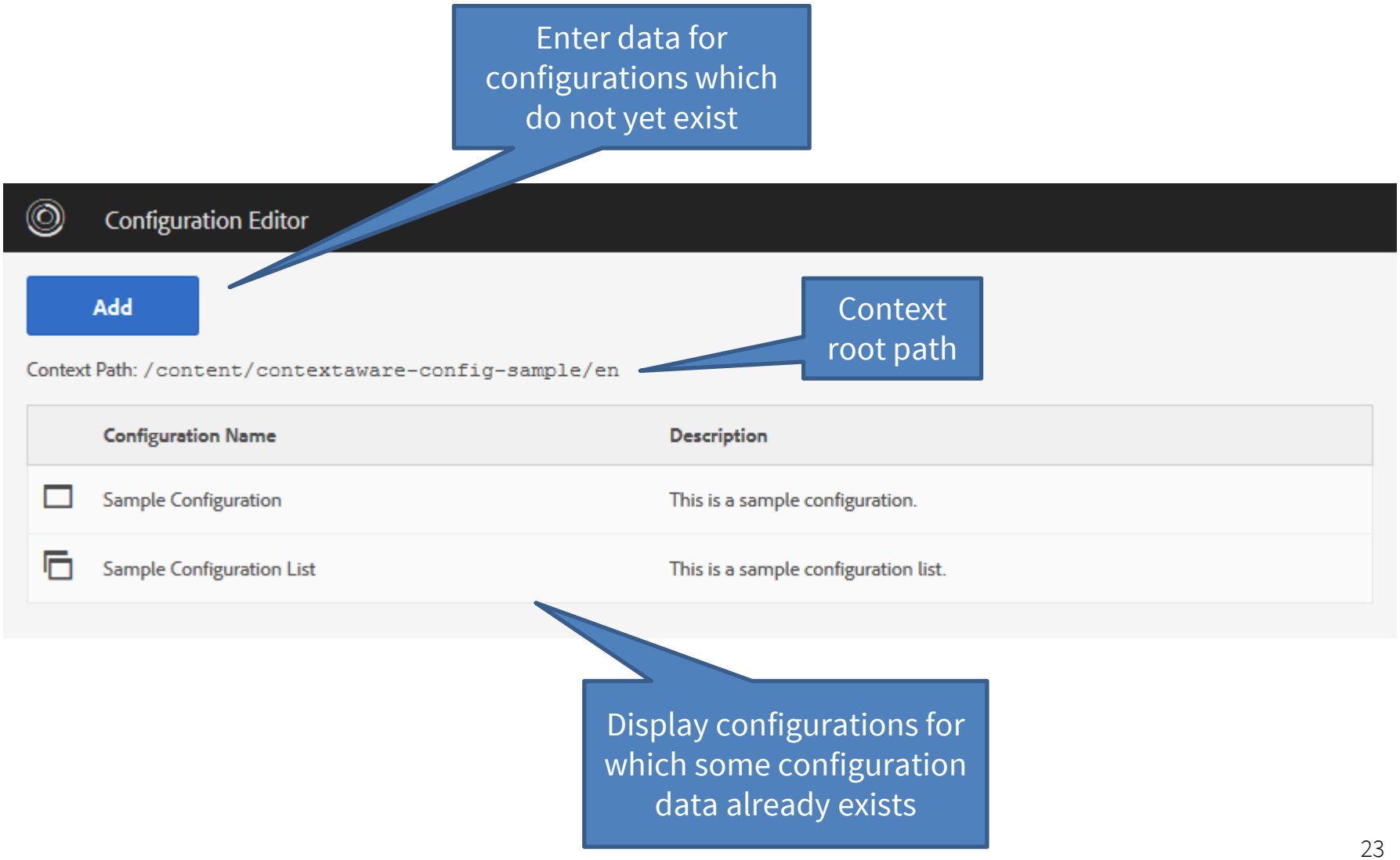
```
/content
    /mysite
      @sling:configRef = "/conf/mysite"
        /tools
           /config
```

Configuration editor page is created here (anywhere within context subtree)

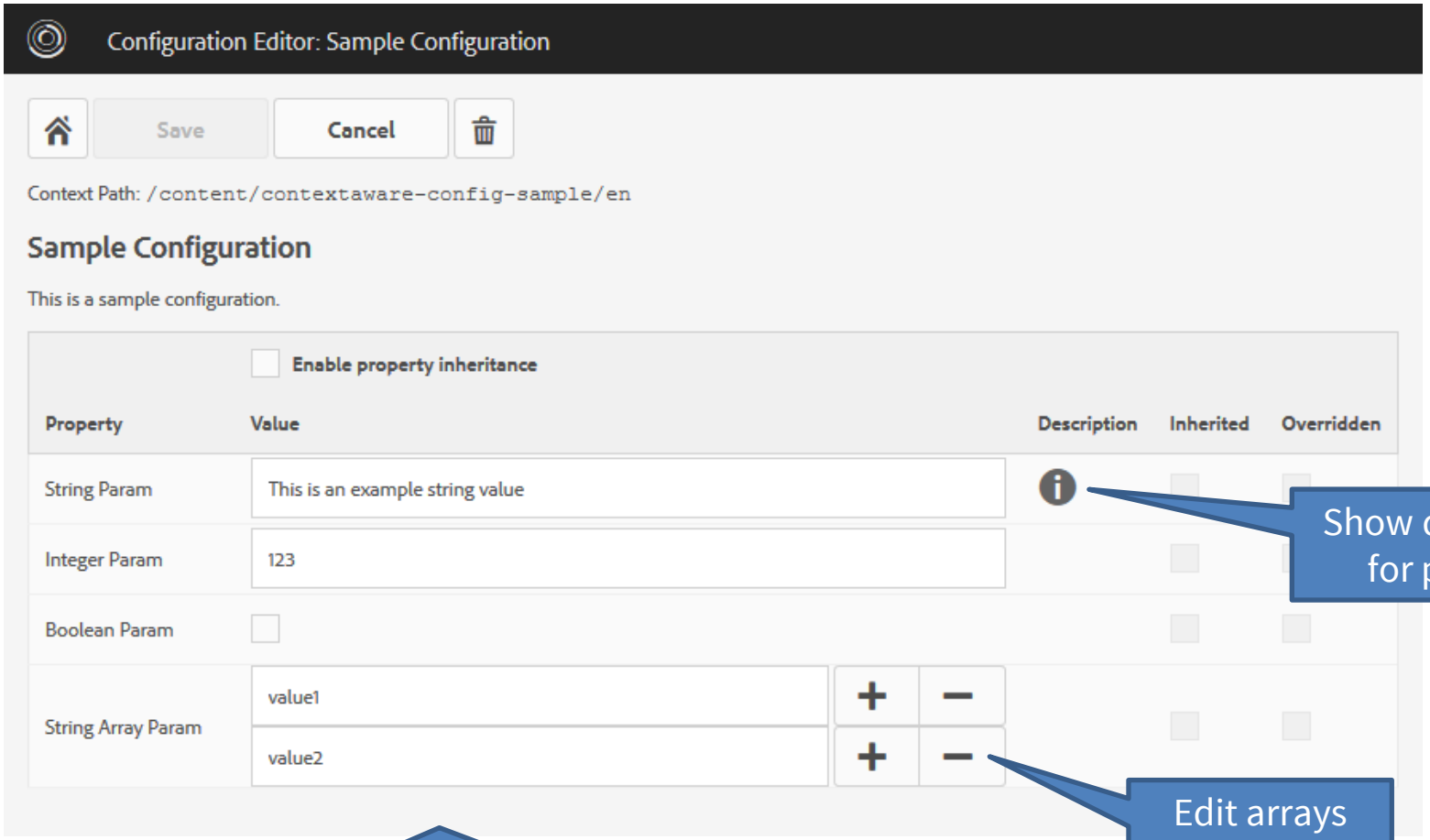
```
/conf
    /mysite
        /sling:configs
            /x.y.z.MyConfig
              @param1 = "value1"
```

Configuration is read from and written to /conf (or whatever persistence strategy is configured)

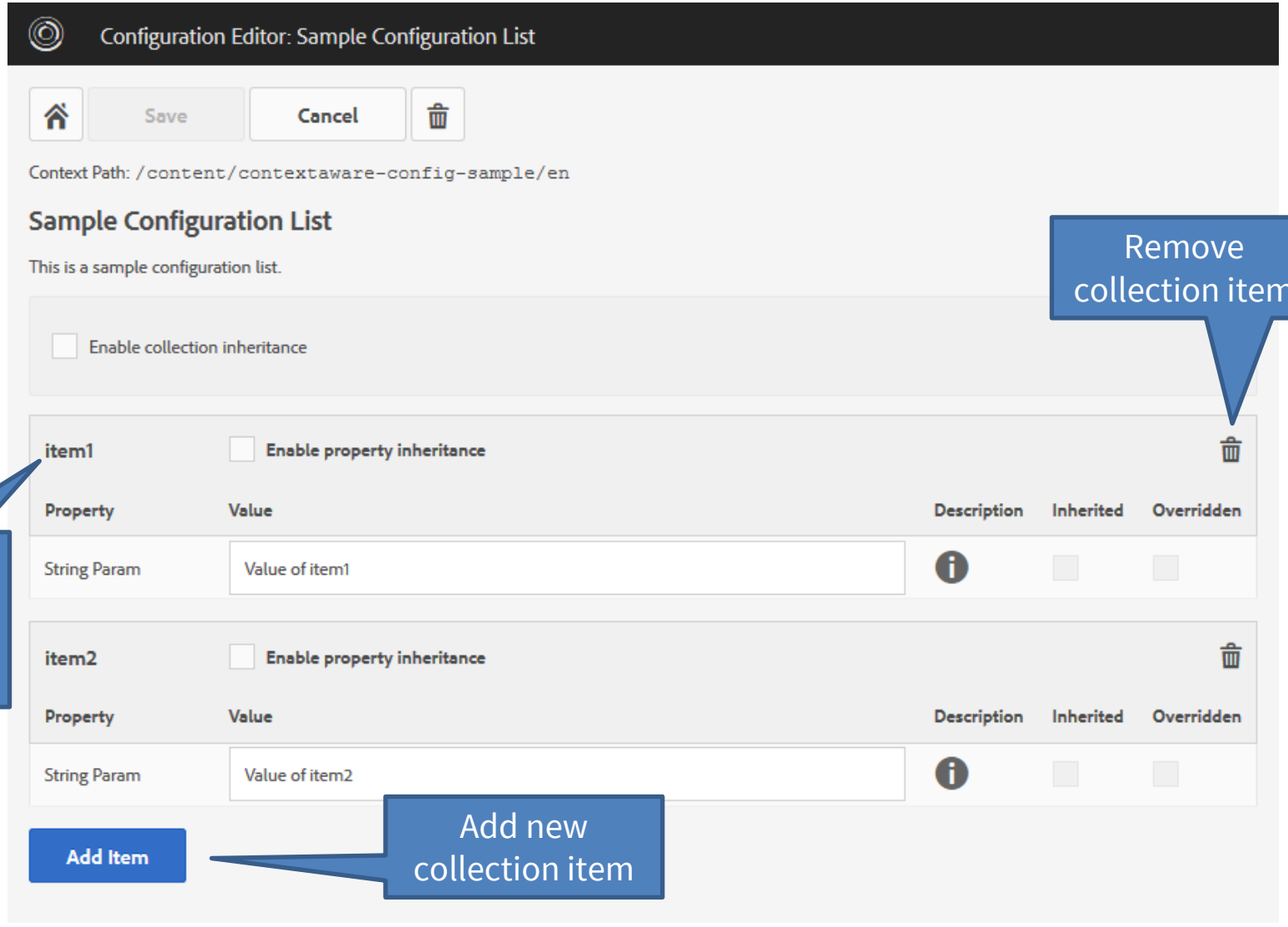
Configuration overview



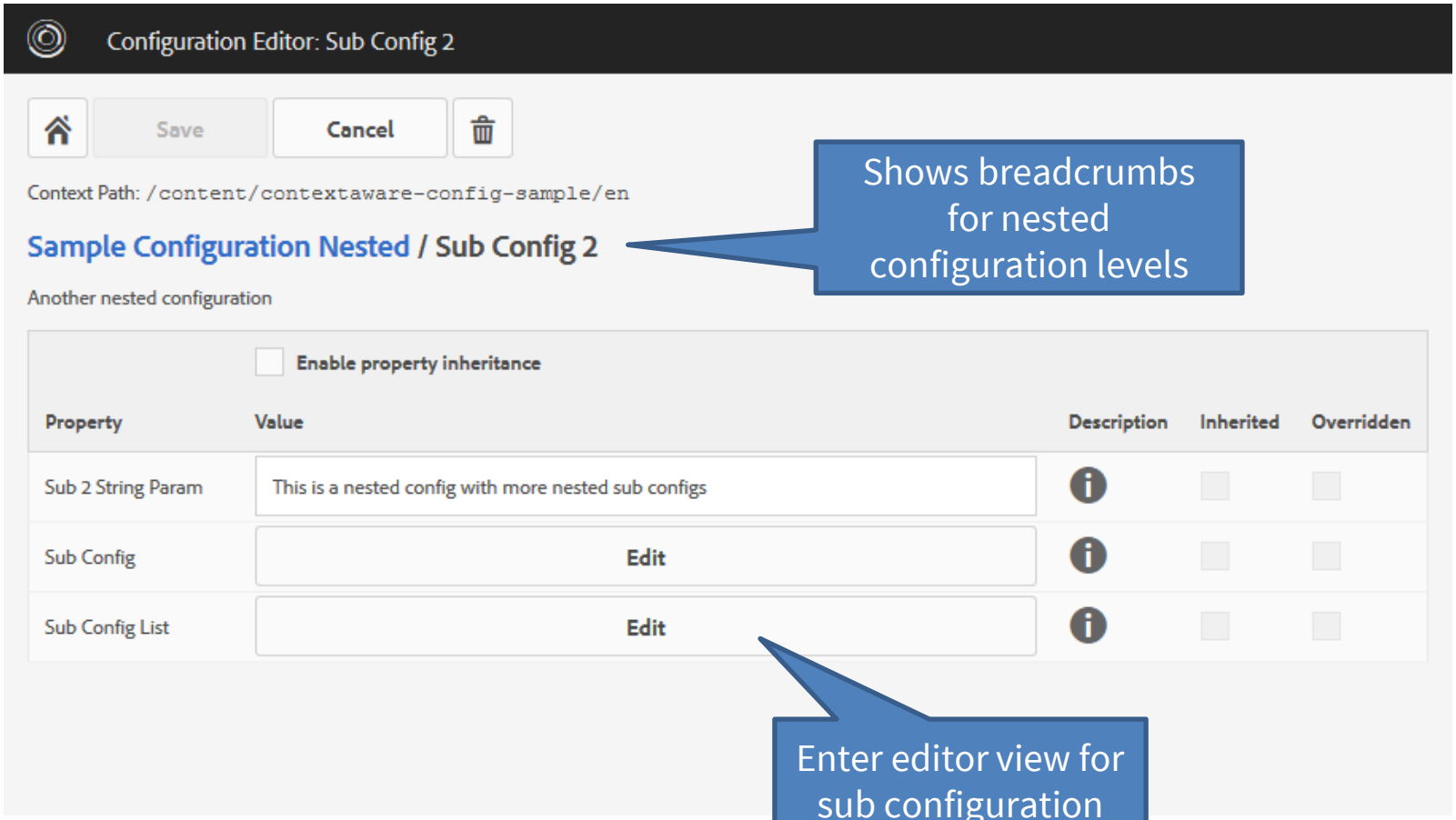
Singleton configuration



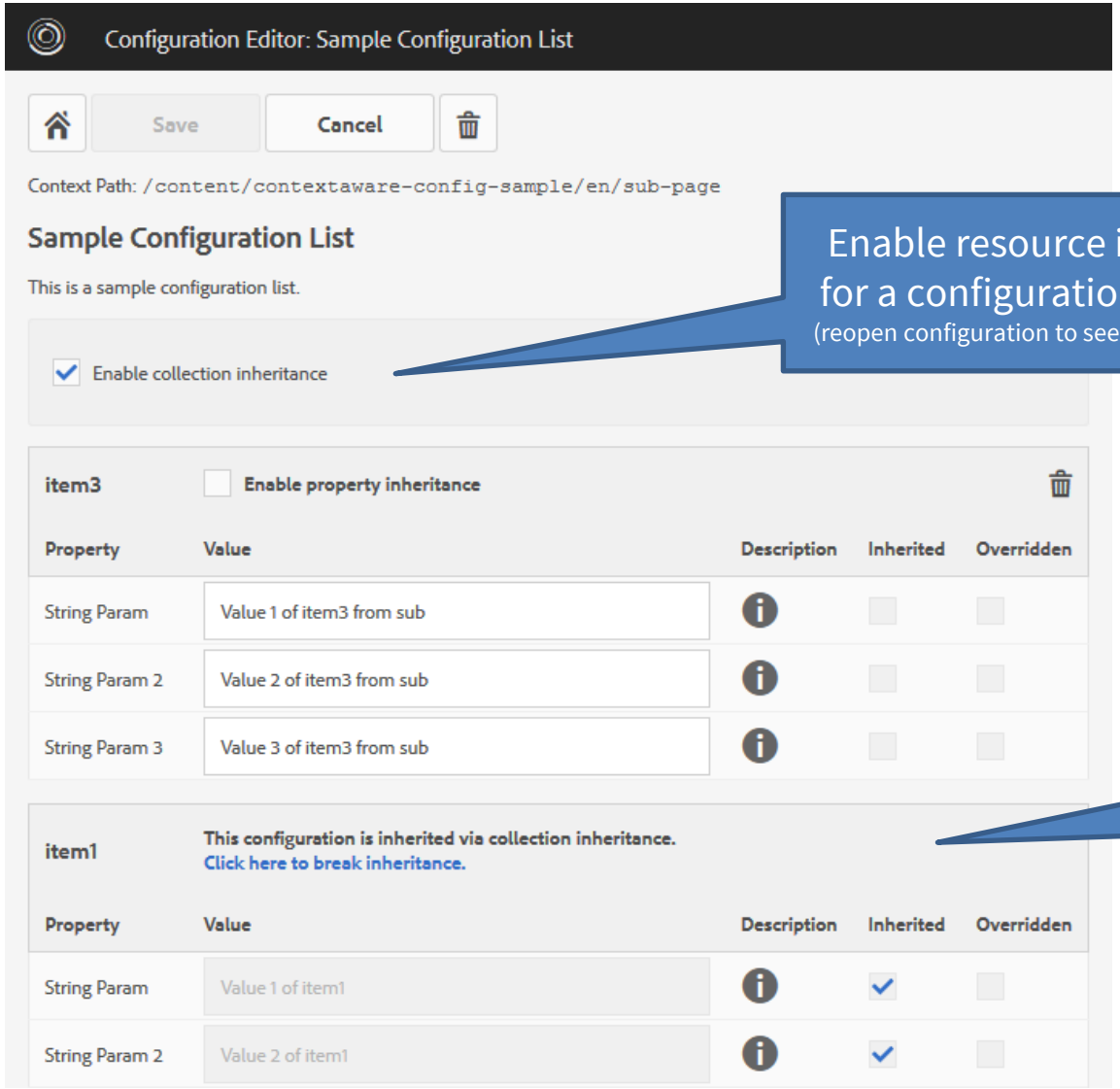
Configuration collection



Nested configuration



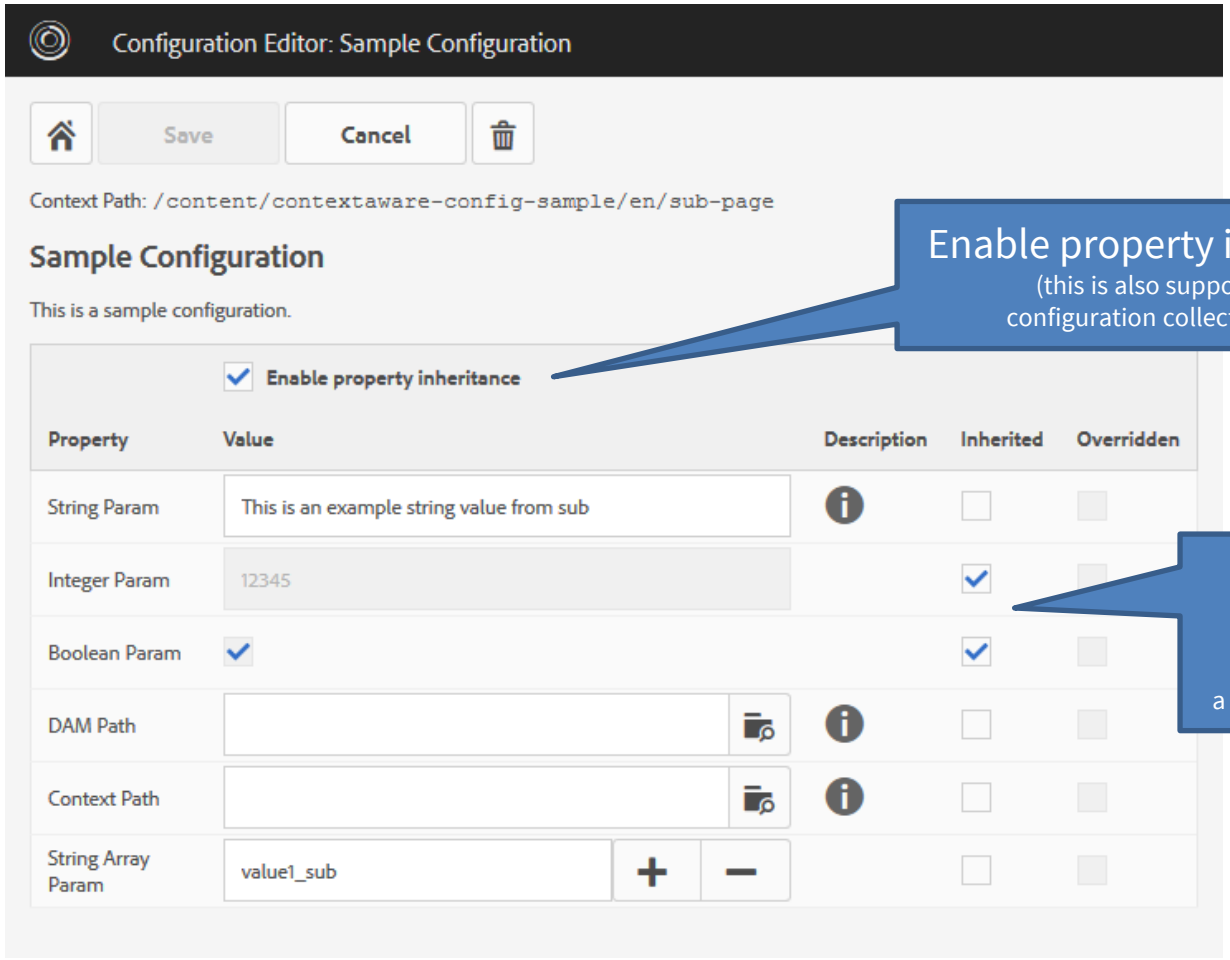
Resource inheritance



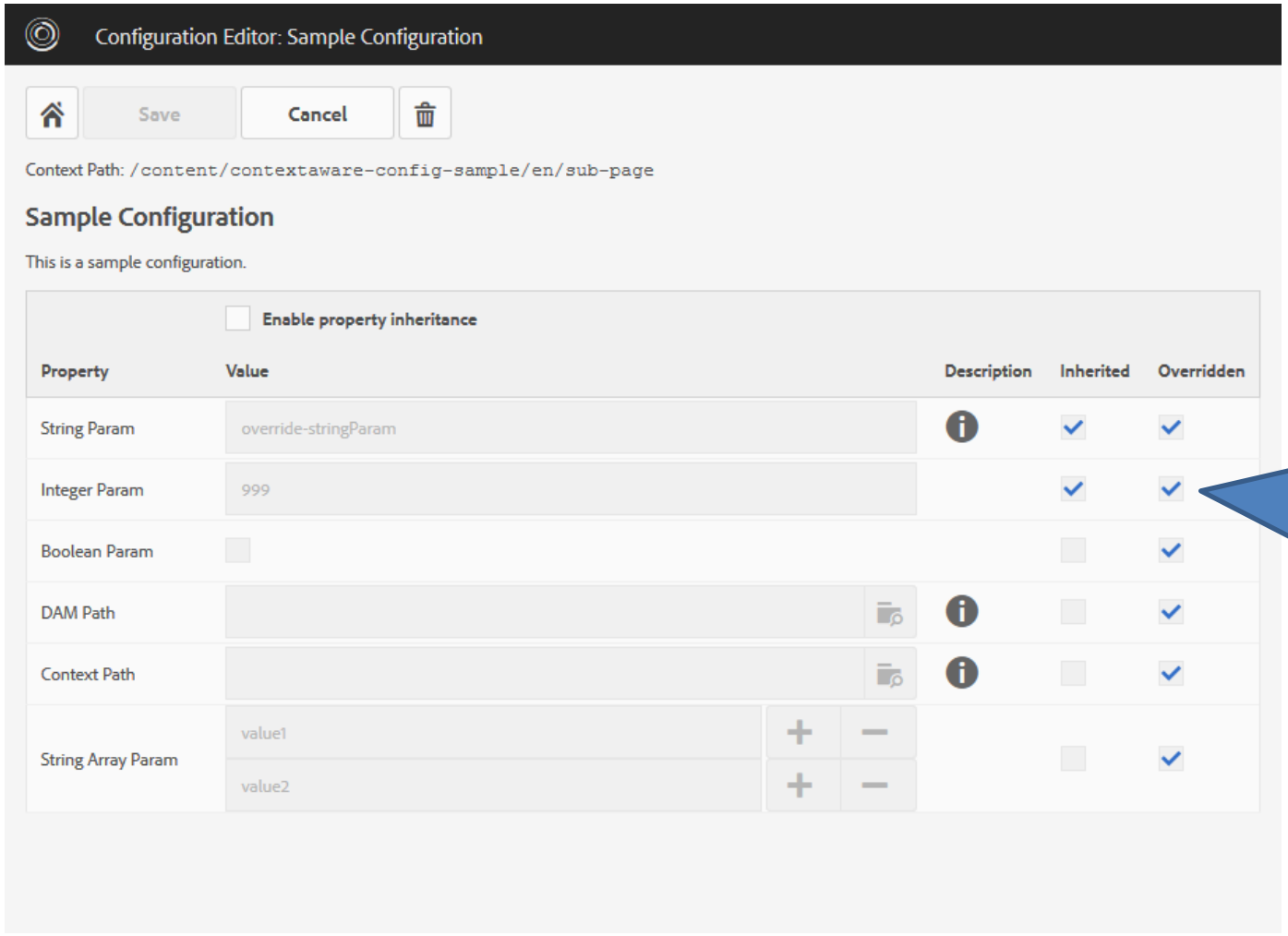
Enable resource inheritance for a configuration collection
(reopen configuration to see inherited children)

This item is inherited.
(break inheritance to copy and edit it on this configuration level)

Property inheritance



Configuration override



When an override is configured for the current content path the properties are **read-only**.

Custom edit widgets

- You can define custom edit widgets for the configuration properties.
  - Currently only one “widgetType” is supported: “pathbrowser”

```
@Property(label = "DAM Path", property = {
      "widgetType=pathbrowser",
      "pathbrowserRootPath=/content/dam"
 })
 String damPath();

 @Property(label = "Context Path", property = {
      "widgetType=pathbrowser",
      "pathbrowserRootPathContext=true"
 })
 String contextPath();
```

Use custom properties to configure the “widgetType” and it’s properties.

Sets root path to inner-most context-past

Open path browser dialog

Integrate the editor into your application

- In most cases you will deploy the configuration editor bundle **`io.wcm.caconfig.editor`** together with your application.
- In this case you have to define your own template definition for it which controls where editor config pages can created – example:

```
{
  "jcr:primaryType": "cq:Template",
  "jcr:title": "My Application Configuration Editor",

  "allowedPaths": "^/content/myapp(/.*)?$",

  "jcr:content": {
    "jcr:primaryType": "cq:PageContent",
    "sling:resourceType": "/apps/wcm-io/caconfig/editor/components/page/editor"
  }
}
```

- Alternatively you can deploy an AEM package with a preconfigured template: **`io.wcm.caconfig.editor.package`**

Configuration editor sample application

If you want to try out the configuration editor on local AEM instance and test the different configuration use cases, you can use this sample application:

https://github.com/wcm-io/wcm-io-caconfig/tree/develop/sample-app

Use the script **`clean_install_deploy_package.sh`** to deploy the application and sample content to your AEM instances on port 4502.

Context-Aware Configuration Extensions

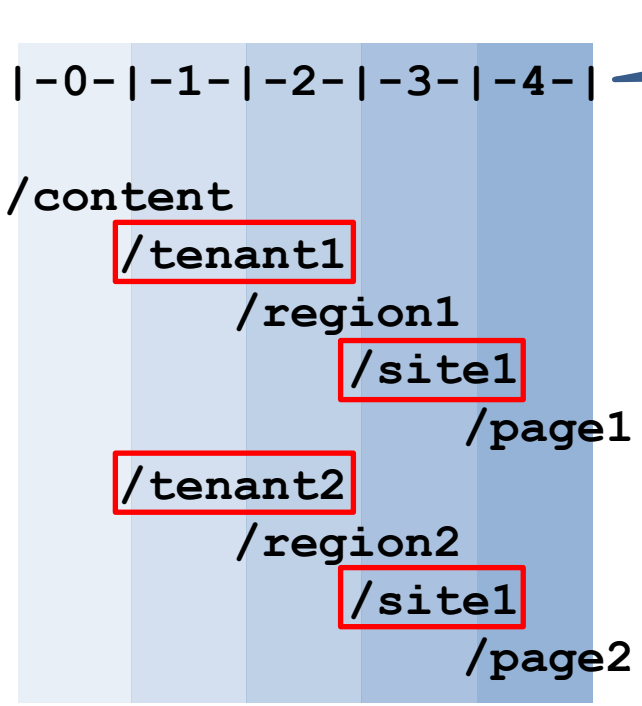
wcm.io

Context Path Strategies

- The Sling Context-Aware Configuration default implementation requires a **`sling:configRef`** property on the root of each context.
  - It's tedious and error-prone to define all those properties manually if you have a lot of sites
  - It does not enforce a well-ordered structure of site and configuration paths
- wcm.io provides alternative context path strategy implementations that detect the context roots automatically in a declarative way.
- You can have multiple strategies in place at the same time, separating them by path patterns or service ranking.

Context Path Strategy: Absolute Parents

- A fixed set of “absolute parent” path levels is used to define the context roots
- Example: Levels **1, 3** mark the following pages as context path roots



- Additionally you can define context path whitelist and blacklist regular expressions to limit the strategy to certain subtrees of your repository

Context Path Strategy: Root Templates

- Whenever a parent page uses a template matching a list of “root template paths” it defines the inner-most context root
- Example: Define the “Homepage Template”, min. level 1, max. level 4

```
|-0-|-1-|-2-|-3-|-4-|
/content
    /tenant1 <Structure Template>
        /region1 <Structure Template>
            /site1 <Homepage Template>
                /page1 <Content Template>
```

- All parent pages (or only those matching the templates) between min and max level up to a page with this configured template are detected as context paths.
- Additionally you can define context path whitelist expressions to limit the strategy to certain subtrees of your repository.

Context Path Strategies: Derive config paths

- Both “Absolute Parent” and “Root Template” context path strategies derive the configuration path from the context path.
- Regular expression groups and group references can be used for this

Example:

contextPathRegex	= `"^/content(/.+)$"`
configPathPatterns	= `["/conf$1"]`
Context root path	= `/content/tenant1/region1/site1`
Derived configuration path	= `/conf/tenant1/region1/site1`

- You can define multiple configPathPatterns – the paths are used from last to first for reading configuration, only the last one for writing.

Persistence Strategies

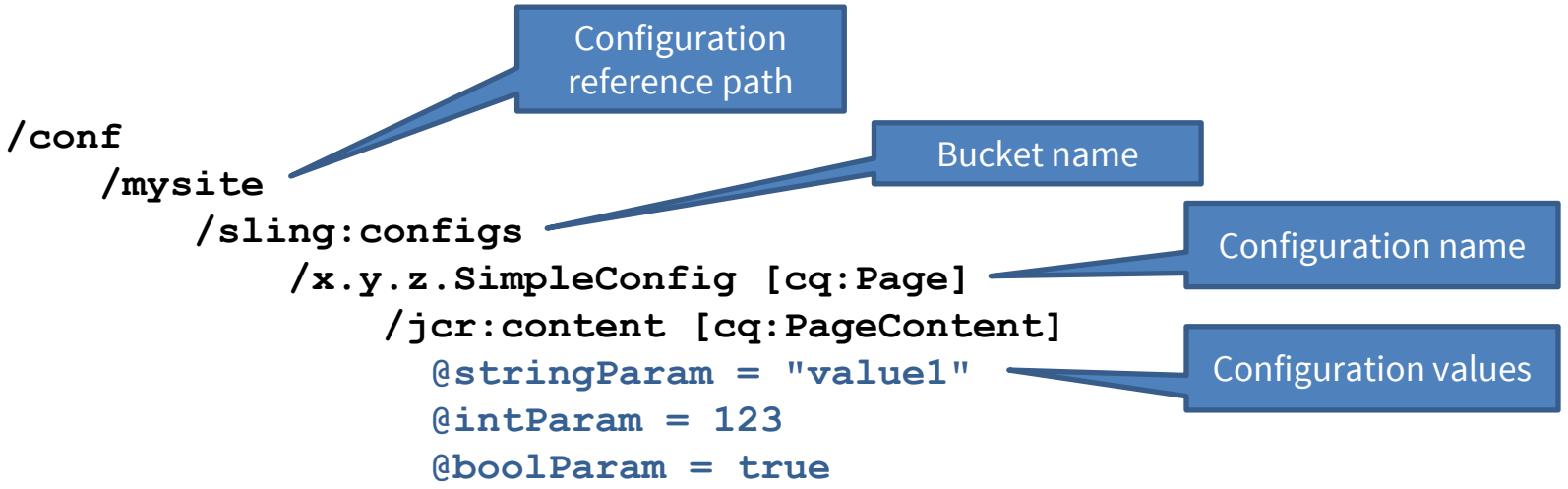
- By default Sling Context-Aware Configuration stores configuration in a hierarchy of nodes below `/conf` using `nt:unstructured` node types. This is simple enough, but it makes it difficult to apply operations like replication on it in AEM.
- Thus it would be good when configuration can be stored in cq:Page nodes as it is done by the “AEM ConfMgr” for AEM. AEM 6.3 ships with such an Persistence Strategy, but it only supports read access to configuration, no write access.
- wcm.io provides additional persistence strategy implementations.

Persistence Strategy: AEM Page

- Stores configurations in **`cq:Page/jcr:content`** nodes instead of **`nt:unstructured`**
- Makes it easier to replicate them to publish individually
- Uses similar content model as AEM ConfMgr
- Disabled by default, can be enabled via OSGi configuration

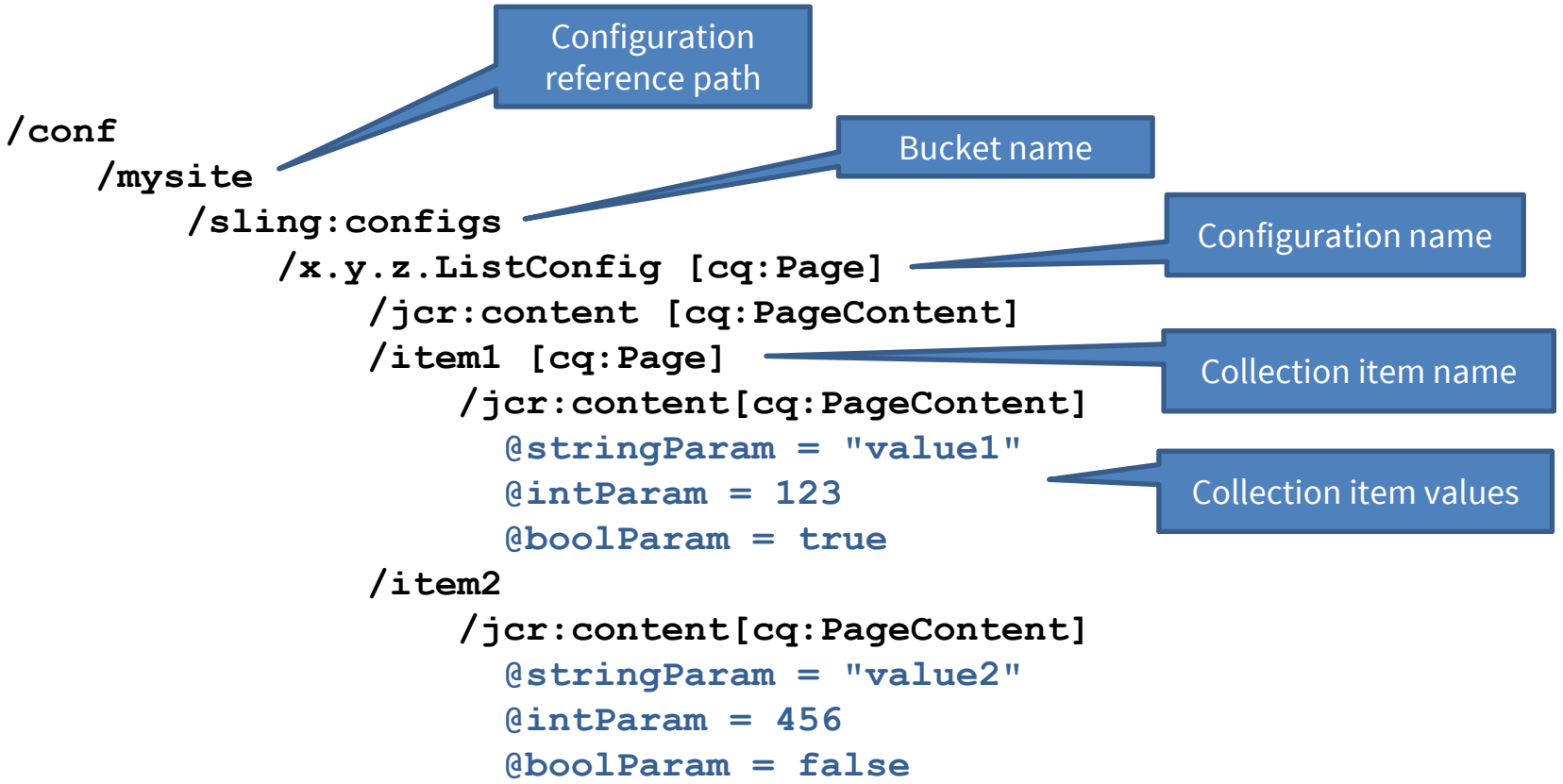
Persistence Strategy: AEM Page

Example resource structure for a **singleton configuration**:



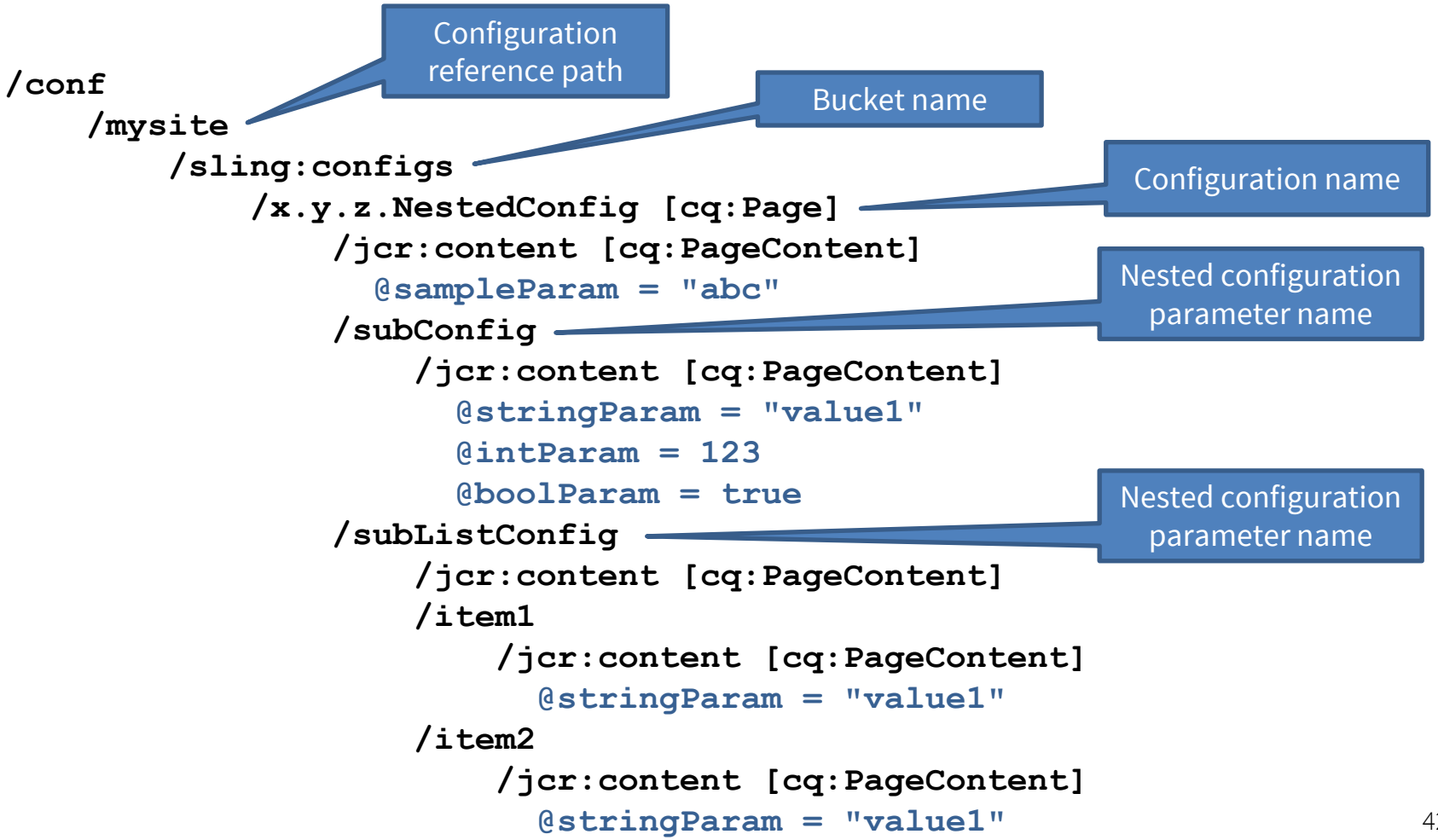
Persistence Strategy: AEM Page

Example resource structure for a **configuration collection**:



Persistence Strategy: AEM Page

Example resource structure for a **nested configuration**:



Persistence Strategy: Tools Config Page

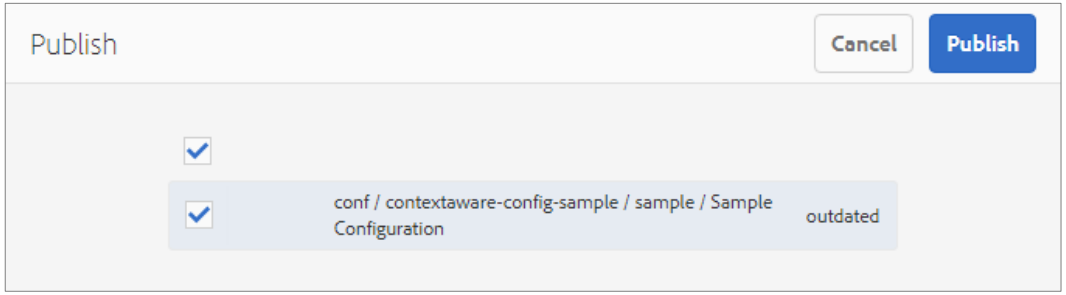
- Stores configurations in **`tools/config`** pages as **part of the content**, and **not** below **`/conf`**
- Advantages:
  - Configuration can be packaged or replicated easily together with content
  - Configuration can be activated, versioned etc. directly from Author GUI
  - Same concept as in wcm.io Configuration 0.x
- Disadvantages:
  - Configuration cannot be easily protected via ACLs
  - Not following best-practices (mixes content and configuration)
- Disabled by default, can be enabled via OSGi configuration
- For detailed setup instructions see wcm.io documentation

Override Provider: Request Header

- Injects configuration overrides from HTTP headers incoming HTTP requests.
- This is useful on QA instances with automated tests which expect a certain context-aware configuration.
  - **It should never be activated on production instances.**
- Via the “Header Name” configuration property the name of the header is defined. The header can be included multiple times in the request, each containing an configuration override string.
- This provider is deactivated by default.

Reference Provider

- The ReferenceProvider is an AEM service interface to report reference to AEM pages (e.g. AEM assets referenced by a page). wcm.io CAConfig Configuration Extensions provides an implementation for configuration pages below /conf.
- If you use the “AEM Page” persistence strategy the configuration is stored as AEM pages below /conf. If they are outdated they are offered for publication when you activate a page of a related configuration context:



- Enabled by default, can be disabled by configuration.

Unit Test Support

Unit Tests with Context-Aware Configuration

- When your code depends on wcm.io Context-Aware Configuration Extensions and you want to write **AEM Mocks**-based unit tests running against the Context-Aware configuration implementation you have to register the proper OSGi services to use them.

- To make this easier, a "**wcm.io Context-Aware Configuration Mock Helper**" is provided which does this job for you.

```
<dependency>
  <groupId>io.wcm</groupId>
  <artifactId>io.wcm.testing.wcm-io-mock.caconfig</artifactId>
  <scope>test</scope>
</dependency>
<dependency>
  <groupId>org.apache.sling</groupId>
  <artifactId>org.apache.sling.testing.caconfig-mock-plugin</artifactId>
  <scope>test</scope>
</dependency>
```

You need both plugins – from Sling and wcm.io.

Unit test example

```
import static io.wcm.testing.mock.wcmio.caconfig.ContextPlugins.WCMIO_CACONFIG;
import static org.apache.sling.testing.mock.caconfig.ContextPlugins.CACONFIG;

public class MyTest {

  @Rule
  public AemContext context = new AemContextBuilder()
      .plugin(CACONFIG)
      .plugin(WCMIO_CACONFIG)
      .build();

  @Before
  public void setUp() {
    // register configuration annotation class
    MockContextAwareConfig.registerAnnotationPackages(context, "com.myapp.config");

    // shortcut for registering a context path strategy for unit test
    MockCAConfig.contextPathStrategyRootTemplate(context, "/apps/myapp/templates/home");
  }

  ...

}
```

This plugs in the necessary Context-Aware configuration setup/teardown methods.

Helper method for quickly setting up a context path strategy.

Recommendations for AEM projects

Recommendations for AEM projects

- Always install the latest Sling Context-Aware Bundles
  - Those included in AEM 6.3 are too old; not contained at all in AEM 6.1, 6.2
  - Apply the proper OSGi configuration
- Use wcm.io Context-Aware Configuration Editor
  - Otherwise you can edit the configuration only via CRX DE Lite
  - Define your own template definition to control where it can be created
  - Disable it on publish via OSGi configuration
- Use wcm.io Context-Aware Configuration Extensions
  - Use “Root Template” or “Absolute Parent” context path strategy
  - Use “AEM Page” persistence strategy
- Apply metadata (labels, descriptions) to your configuration classes
  - It’s helpful for the user when using the configuration editor

ACLs

By default, most users have no read access to `/conf`. When you store context-aware configurations in this folder you need to setup proper ACLs on author and publish side.

- Be as explicit as possible and grant ACLs only the required subtrees of `/conf`, and only to the required groups
- On the author side:
  - all author users should have **jcr:read** access to subtree.
    Users allowed to change and publish configurations need:
    jcr:versionManagement, crx:replicate, rep:write, jcr:lockManagement
  - Access rights for `version-manager-service`:
    jcr:versionManagement, rep:write
- On the publish side the `everyone` user needs **jcr:read** access.