Virtual Room #1

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(OSCAL Webpage)

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OSCAL "Deep Diff“

- a model-agnostic OSCAL tool and the concept behind it -

National Institute of Standards and Technology
U.S. Department of Commerce

ITL/CSD/OSCAL Team

3rd OSCAL Workshop

The Problem: Large Documents are Difficult to Digest

Authors

How do I track changes that my team has made between revisions of a document?

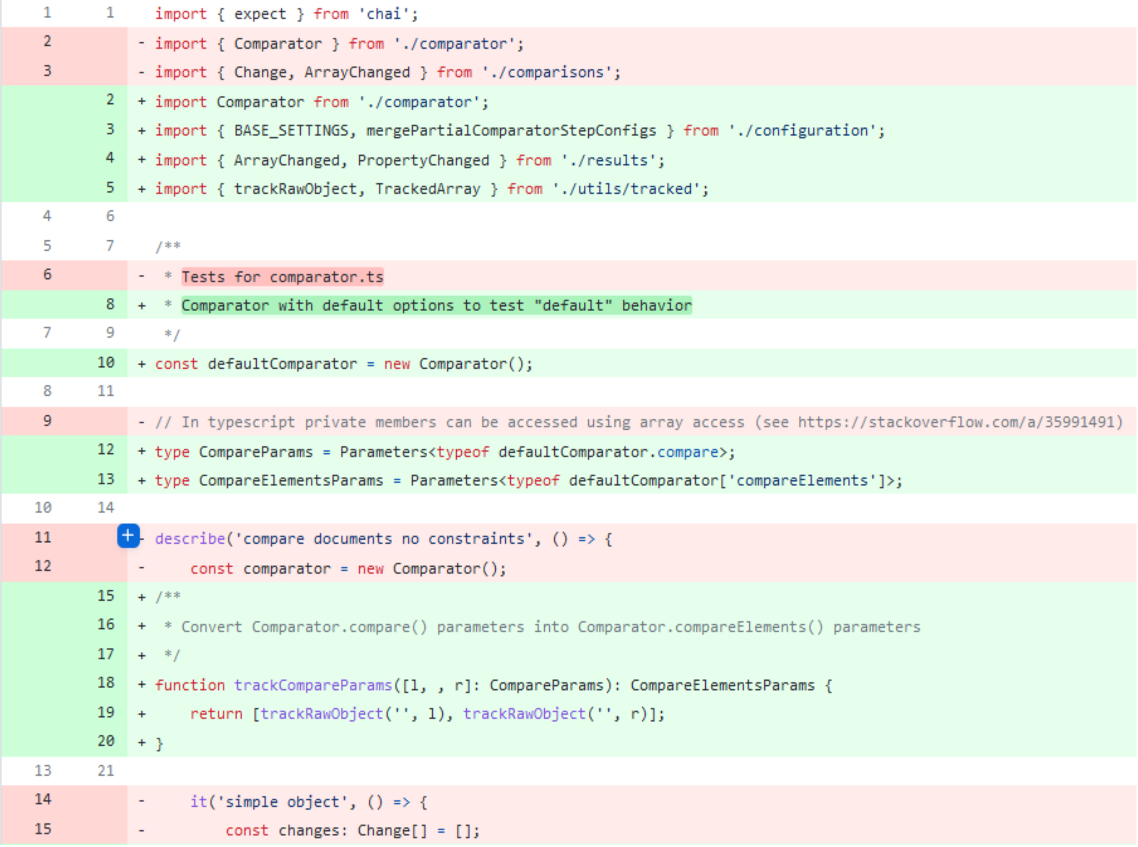
Catalog Consumers

How can I produce a checklist of controls with relevant changes when a new revision of a control catalog comes out?

Developers

How can I track when certain types of changes to a document happens, and make decisions based on those change-lists (such as in a CI/CD pipeline)?

The Solution: A “Diff” Tool for OSCAL Documents

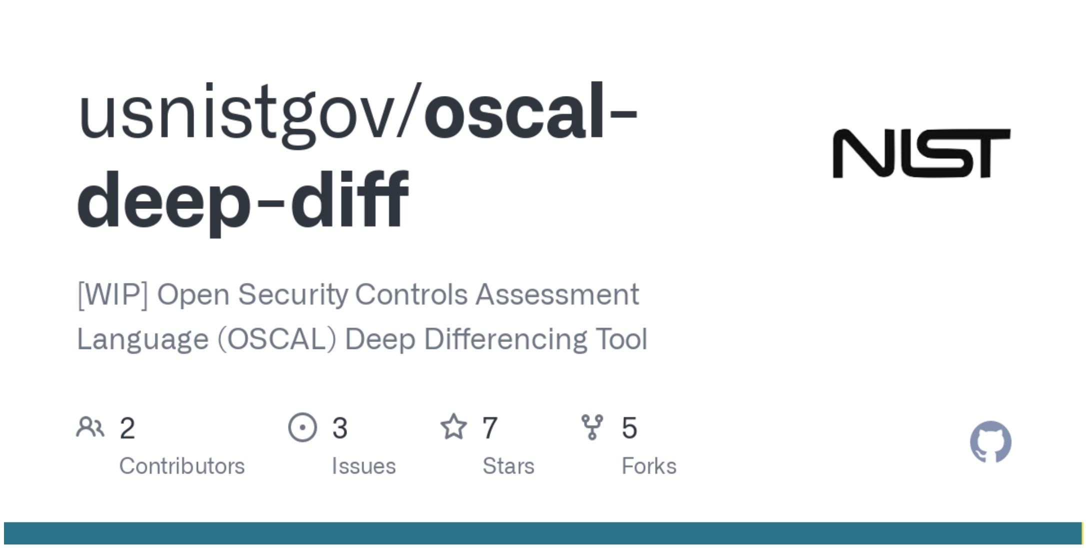


```
  import { expect } from 'chai';
- import { Comparator } from './comparator';
- import { Change, ArrayChanged } from './comparisons';
+ import Comparator from './comparator';
+ import { BASE_SETTINGS, mergePartialComparatorStepConfigs } from './configuration';
+ import { ArrayChanged, PropertyChanged } from './results';
+ import { trackRawObject, TrackedArray } from './utils/tracked';

  /**
-  * Tests for comparator.ts
+  * Comparator with default options to test "default" behavior
   */
+ const defaultComparator = new Comparator();

- // In typescript private members can be accessed using array access (see https://stackoverflow.com/a/35991491)
+ type CompareParams = Parameters<typeof defaultComparator.compare>;
+ type CompareElementsParams = Parameters<typeof defaultComparator['compareElements']>;

- describe('compare documents no constraints', () => {
-     const comparator = new Comparator();
+ /**
+  * Convert Comparator.compare() parameters into Comparator.compareElements() parameters
+  */
+ function trackCompareParams([l, , r]: CompareParams): CompareElementsParams {
+     return [trackRawObject('', l), trackRawObject('', r)];
+ }

-     it('simple object', () => {
-         const changes: Change[] = [];
```

GitHub’s diff view, an example of a diff tool used daily by developers

- A tool that can generate a comparison between two OSCAL documents
- Configurable enough to be applied in multiple scenarios
- Must be able to generate output documents that are easy to digest and share
- Portable and extendable so that it can be integrated into other tools (such as web applications)

OSCAL Deep Diff Introduction



usnistgov/**oscal-deep-diff**

[WIP] Open Security Controls Assessment Language (OSCAL) Deep Differencing Tool

2 Contributors

3 Issues

7 Stars

5 Forks

OSCAL-deep-diff GitHub card

- **An open-source JavaScript/TypeScript CLI application and library that can be used to compare arbitrary JSON documents**
- **Does not rely on a schema to compare objects, can be configured to compare documents in a reproducible manner**
- **Generates outputs in multiple formats including easy-to-distribute Excel spreadsheets**
- **Can be integrated into other tools, including web and desktop applications**

Scenario: Comparing two SSPs

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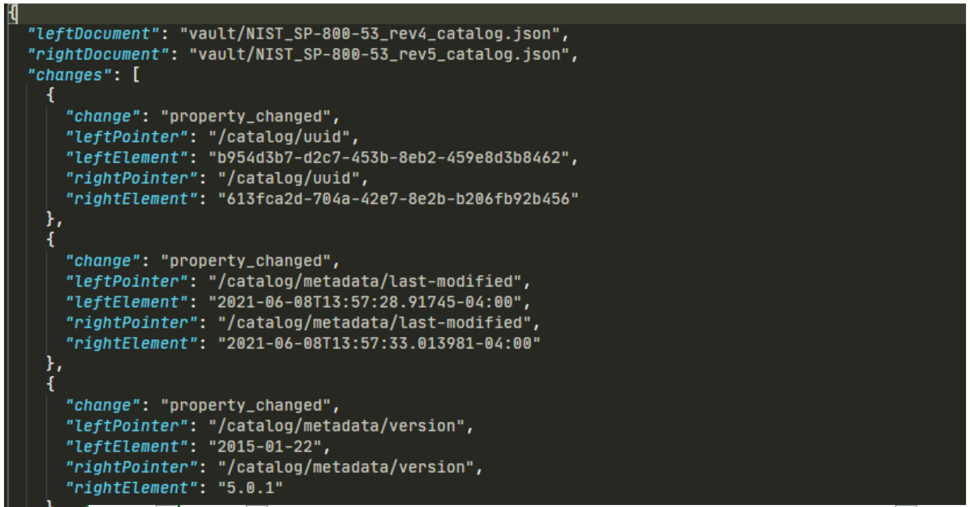
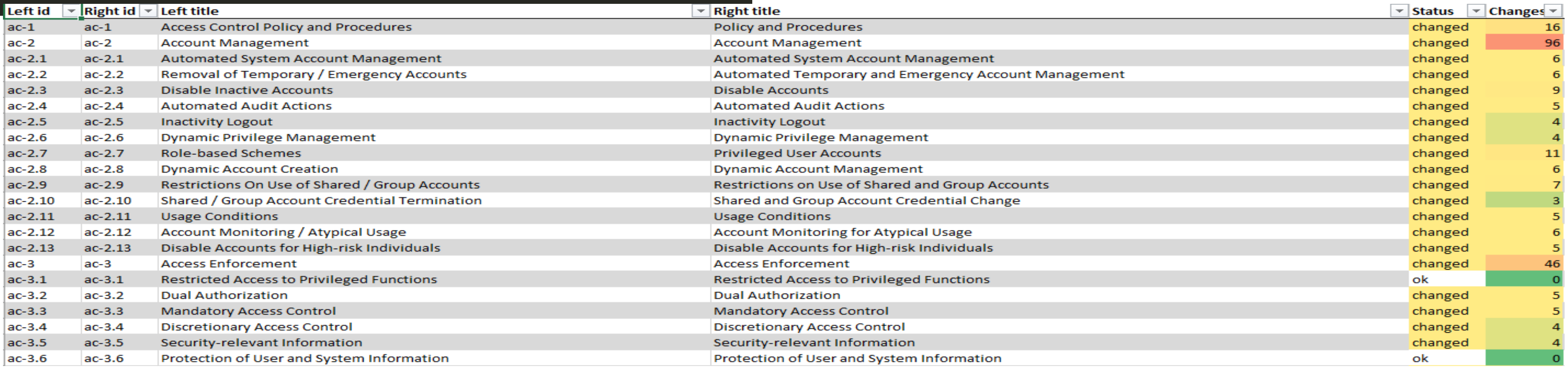
Output Format



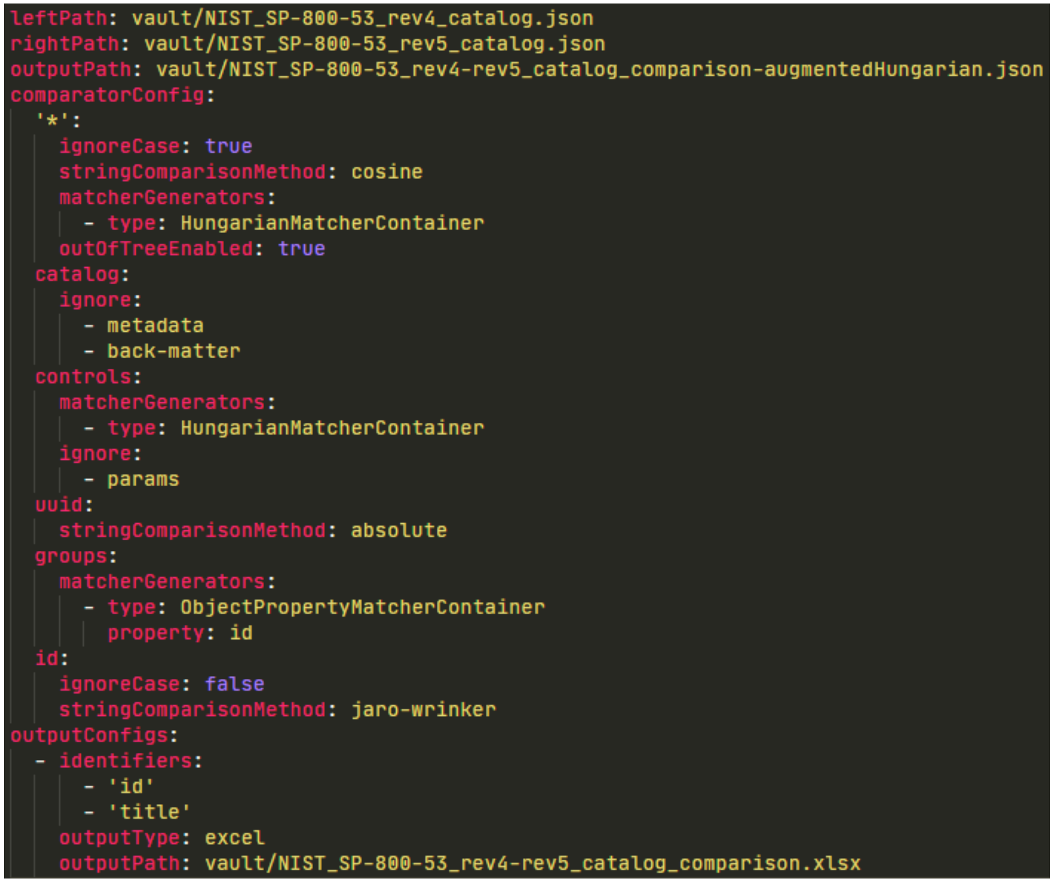
```
{
  "leftDocument": "vault/NIST_SP-800-53_rev4_catalog.json",
  "rightDocument": "vault/NIST_SP-800-53_rev5_catalog.json",
  "changes": [
    {
      "change": "property_changed",
      "leftPointer": "/catalog/uuid",
      "leftElement": "b954d3b7-d2c7-453b-8eb2-459e8d3b8462",
      "rightPointer": "/catalog/uuid",
      "rightElement": "613fca2d-704a-42e7-8e2b-b206fb92b456"
    },
    {
      "change": "property_changed",
      "leftPointer": "/catalog/metadata/last-modified",
      "leftElement": "2021-06-08T13:57:28.91745-04:00",
      "rightPointer": "/catalog/metadata/last-modified",
      "rightElement": "2021-06-08T13:57:33.013981-04:00"
    },
    {
      "change": "property_changed",
      "leftPointer": "/catalog/metadata/version",
      "leftElement": "2015-01-22",
      "rightPointer": "/catalog/metadata/version",
      "rightElement": "5.0.1"
    },
```

- **By default, OSCAL deep diff produces a JSON document listing the differences between the two documents**
  - Valid change types are “property_left_only”, “property_right_only”, “property_changed”, and “array_changed”.
  - Each “array_changed” type has a sub-list of changes for each matched pair of items.
- **The raw JSON document can be used to produce friendlier output documents**
  - Excel output collects all of one object type (like controls) and displays them in an Excel document.
  - The tool can be extended to produce other comparison views (such as a web-application or pdf report)



Left id	Right id	Left title	Right title	Status	Changes
ac-1	ac-1	Access Control Policy and Procedures	Policy and Procedures	changed	16
ac-2	ac-2	Account Management	Account Management	changed	96
ac-2.1	ac-2.1	Automated System Account Management	Automated System Account Management	changed	6
ac-2.2	ac-2.2	Removal of Temporary / Emergency Accounts	Automated Temporary and Emergency Account Management	changed	6
ac-2.3	ac-2.3	Disable Inactive Accounts	Disable Accounts	changed	9
ac-2.4	ac-2.4	Automated Audit Actions	Automated Audit Actions	changed	5
ac-2.5	ac-2.5	Inactivity Logout	Inactivity Logout	changed	4
ac-2.6	ac-2.6	Dynamic Privilege Management	Dynamic Privilege Management	changed	4
ac-2.7	ac-2.7	Role-based Schemes	Privileged User Accounts	changed	11
ac-2.8	ac-2.8	Dynamic Account Creation	Dynamic Account Management	changed	6
ac-2.9	ac-2.9	Restrictions On Use of Shared / Group Accounts	Restrictions on Use of Shared and Group Accounts	changed	7
ac-2.10	ac-2.10	Shared / Group Account Credential Termination	Shared and Group Account Credential Change	changed	3
ac-2.11	ac-2.11	Usage Conditions	Usage Conditions	changed	5
ac-2.12	ac-2.12	Account Monitoring / Atypical Usage	Account Monitoring for Atypical Usage	changed	6
ac-2.13	ac-2.13	Disable Accounts for High-risk Individuals	Disable Accounts for High-risk Individuals	changed	5
ac-3	ac-3	Access Enforcement	Access Enforcement	changed	46
ac-3.1	ac-3.1	Restricted Access to Privileged Functions	Restricted Access to Privileged Functions	ok	0
ac-3.2	ac-3.2	Dual Authorization	Dual Authorization	changed	5
ac-3.3	ac-3.3	Mandatory Access Control	Mandatory Access Control	changed	5
ac-3.4	ac-3.4	Discretionary Access Control	Discretionary Access Control	changed	4
ac-3.5	ac-3.5	Security-relevant Information	Security-relevant Information	changed	4
ac-3.6	ac-3.6	Protection of User and System Information	Protection of User and System Information	ok	0

Configurability



```
leftPath: vault/NIST_SP-800-53_rev4_catalog.json
rightPath: vault/NIST_SP-800-53_rev5_catalog.json
outputPath: vault/NIST_SP-800-53_rev4-rev5_catalog_comparison-augmentedHungarian.json
comparatorConfig:
  '*':
    ignoreCase: true
    stringComparisonMethod: cosine
    matcherGenerators:
      - type: HungarianMatcherContainer
    outOfTreeEnabled: true
  catalog:
    ignore:
      - metadata
      - back-matter
  controls:
    matcherGenerators:
      - type: HungarianMatcherContainer
    ignore:
      - params
  uuid:
    stringComparisonMethod: absolute
  groups:
    matcherGenerators:
      - type: ObjectPropertyMatcherContainer
        property: id
  id:
    ignoreCase: false
    stringComparisonMethod: jaro-wrinker
outputConfigs:
  - identifiers:
      - 'id'
      - 'title'
    outputType: excel
    outputPath: vault/NIST_SP-800-53_rev4-rev5_catalog_comparison.xlsx
```

An example configuration file for comparing control catalogs

The tool can be configured to change the behavior of the comparison:

- **Ignore objects that are irrelevant to the comparison**
- **Change the way properties are compared (select a string similarity algorithm, ignore case, etc.)**
- **Swap out the algorithms used to "match" array items to each other**

…as well as the output format:

- **Change which objects will be collected for the comparison**
- **Choose which metadata should be displayed in the output document**
- **Output to JSON, Excel, etc.**

This is all configured via a YAML file

Scenario: Comparing Component Definitions

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Scenario: Comparing SP 800-53 Revisions

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Shortcomings

- **Speed of comparisons**
  - Array comparison algorithms are computationally expensive.
  - For example, depending on the settings used, comparisons between SP 800-53 revisions can take upwards of 10 minutes.
- **Comparison behavior tuning**
  - Getting the tool fit a particular comparison scenario may require tweaking.
  - This can be solved with community support and examples.
- **Comparison results**
  - Some scenarios are not supported yet, such as object demotion/promotion. (ex. A control becoming an enhancement)

Call to Action

If this tool is exciting or potentially useful to you:

- **Please provide feedback, report bugs, and suggest improvements!**
- **Feel free to submit issues, PRs, and discussions to https://github.com/usnistgov/oscal-deep-diff**

Please note: The version of OSCAL Deep Diff shown here is still experimental, see https://github.com/usnistgov/oscal-deep-diff/pull/34

Questions?