

Common Security Advisory Framework Version 2.0

# Committee Specification Draft-02

30 March 29 June 2022

#### This stage:

https://docs.oasis-open.org/csaf/csaf/v2.0/cs02/csaf-v2.0-cs02.md (Authoritative)

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In Memory of Eric Johnson, TIBCO Software Inc. and Mike Gorski, Cisco Systems both active members of the OASIS CSAF <u>Technical</u> Committee.

#### Additional artifacts:

This prose specification is one component of a Work Product that also includes:

Aggregator JSON schema: <a href="https://docs.oasis-open.org/csaf/csaf/v2.0/cs02/schemas/aggregator\_json\_schema.json\_on">https://docs.oasis-open.org/csaf/csaf/v2.0/cs02/schemas/aggregator\_json\_schema.json\_sche

Latest stage: <a href="https://docs.oasis-">https://docs.oasis-</a>
open.org/csaf/csaf/v2.0/aggregator ison schema.json.

CSAF JSON schema: <a href="https://docs.oasis-open.org/csaf/v2.0/cs02/schemas/csaf\_json\_schema.json">https://docs.oasis-open.org/csaf/v2.0/csaf\_json\_schema.json</a>.
 Latest stage: <a href="https://docs.oasis-open.org/csaf/v2.0/csaf\_json\_schema.json">https://docs.oasis-open.org/csaf/v2.0/csaf\_json\_schema.json</a>.

Provider JSON schema: <a href="https://docs.oasis-open.org/csaf/csaf/v2.0/cs02/schemas/provider\_json\_schema.json">https://docs.oasis-open.org/csaf/csaf/v2.0/provider\_json\_schema.json</a>.

#### Related work:

This specification replaces or supersedes:

 CSAF Common Vulnerability Reporting Framework (CVRF) Version 1.2. Edited by Stefan Hagen. Latest stage: <a href="https://docs.oasis-open.org/csaf/csaf-cvrf/v1.2/csaf-cvrf-v1.2.html">https://docs.oasis-open.org/csaf/csaf-cvrf/v1.2/csaf-cvrf-v1.2.html</a>

#### **Declared JSON namespaces:**

- <a href="https://docs.oasis-open.org/csaf/csaf/v2.0/aggregator">https://docs.oasis-open.org/csaf/csaf/v2.0/aggregator</a> json schema.json
- https://docs.oasis-open.org/csaf/csaf/v2.0/csaf json schema.json
- <a href="https://docs.oasis-open.org/csaf/csaf/v2.0/provider">https://docs.oasis-open.org/csaf/csaf/v2.0/provider</a> json schema.json

#### Abstract:

The Common Security Advisory Framework (CSAF) Version 2.0 is the definitive reference for the language which supports creation, update, and interoperable exchange of security advisories as structured information on products, vulnerabilities and the status of impact and remediation among interested parties.

#### Status:

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#### Citation format:

When referencing this specification the following citation format should be used:

#### [csaf-v2.0]

Common Security Advisory Framework Version 2.0. Edited by Langley Rock, Stefan Hagen, and Thomas Schmidt. 30 March 29 June 2022. OASIS Committee Specification Draft 02. https://docs.oasis-open.org/csaf/v2.0/cs02/csaf-v2.0-cs02.html. Latest stage: https://docs.oasis-open.org/csaf/v2.0/csaf-v2.0.html.

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# 1 Introduction

# 1.1 IPR Policy

This specification is provided under the <u>Non-Assertion</u> Mode of the <u>OASIS IPR Policy</u>, the mode chosen when the Technical Committee was established. For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the TC's web page (<a href="https://www.oasis-open.org/committees/csaf/ipr.php">https://www.oasis-open.org/committees/csaf/ipr.php</a>).

# 1.2 Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] and [RFC8174] when, and only when, they appear in all capitals, as shown here.

For purposes of this document, the following terms and definitions apply:

**advisory**: reporting item that describes a condition present in an artifact and that requires action by the consumers

advisory document: artifact in which an analysis tool reports a result

advisory management system: software system that consumes the documents produced by analysis tools, produces advisories that enable engineering and operating organizations to assess the quality of these software artifacts at a point in time, and performs functions such as filing security advisories and displaying information about individual advisories.

Note: An advisory management system can interact with a document viewer to display information about individual advisories.

**advisory matching**: process of determining whether two advisories are targeting the same products and conditions

**artifact**: sequence of bytes addressable via a URI. *Examples*: A physical file in a file system such as a source file, an object file, a configuration file or a data file; a specific version of a file in a version control system; a database table accessed via an HTTP request; an arbitrary stream of bytes returned from an HTTP request, a product URL, a common product enumeration value.

**CSAF asset matching system**: program that connects to or is an asset database and is able to manage CSAF documents as required by CSAF management system as well as matching them to assets of the asset database.

**CSAF basic validator**: A program that reads a document and checks it against the JSON schema and performs mandatory tests.

**CSAF consumer**: program that reads and interprets a CSAF document

**CSAF content management system**: program that is able to create, review and manage CSAF documents and is able to preview their details as required by CSAF viewer.

**CSAF converter**: CSAF producer that transforms the output of an analysis tool from its native output format into the CSAF format

CSAF direct producer: analysis tool which acts as a CSAF producer

**CSAF document**: security advisory text document in the format defined by this document.

**CSAF extended validator**: A CSAF basic validator that additionally performs optional tests.

**CSAF full validator**: A CSAF extended validator that additionally performs informative tests.

**CSAF management system**: program that is able to manage CSAF documents and is able to display their details as required by CSAF viewer.

**CSAF modifier**: CSAF post-processor which takes a CSAF document as input and modifies the structure or values of properties. The output is a valid CSAF document.

**CSAF post-processor**: CSAF producer that transforms an existing CSAF document into a new CSAF document, for example, by removing or redacting elements according to sharing policies.

**CSAF SBOM matching system**: A program that connects to or is an SBOM database and is able to manage CSAF documents as required by CSAF management system as well as matching them to SBOM components of the SBOM database.

**CSAF producer**: program that emits output in the CSAF format

**CSAF translator**: CSAF post-processor which takes a CSAF document as input and translates values of properties into another language. The output is a valid CSAF document.

**CSAF viewer**: CSAF consumer that reads a CSAF document, displays a list of the results it contains, and allows an end user to view each result in the context of the artifact in which it occurs.

**CVRF CSAF converter**: CSAF producer which takes a CVRF document as input and converts it into a valid CSAF document.

**document**: output file produced by an analysis tool, which enumerates the results produced by the tool

**driver**: tool component containing an analysis tool's or converter's primary executable, which controls the tool's or converter's execution, and which in the case of an analysis tool typically defines a set of analysis rules

**embedded link**: syntactic construct which enables a message string to refer to a location mentioned in the document

empty array: array that contains no elements, and so has a length of 0

empty object: object that contains no properties

empty string: string that contains no characters, and so has a length of 0

**(end) user**: person who uses the information in a document to investigate, triage, or resolve results

**engineering system**: software analysis environment within which analysis tools execute. **Note**: An engineering system might include a build system, a source control system, a result management system, a bug tracking system, a test execution system, and so on.

**extension**: tool component other than the driver (for example, a plugin, a configuration file, or a taxonomy)

**external property file**: file containing the values of one or more externalized properties

**externalizable property**: property that can be contained in an external property file

**externalized property**: property stored outside of the CSAF document to which it logically belongs

**false positive**: result which an end user decides does not actually represent a problem

**fingerprint**: stable value that can be used by a result management system to uniquely identify a result over time, even if a relevant artifact is modified

**formatted message**: message string which contains formatting information such as Markdown formatting characters

**fully qualified logical name**: string that fully identifies the programmatic construct specified by a logical location, typically by means of a hierarchical identifier.

**hierarchical string**: string in the format <component>{/<component>}\*

**line**: contiguous sequence of characters, starting either at the beginning of an artifact or immediately after a newline sequence, and ending at and including the nearest subsequent newline sequence, if one is present, or else extending to the end of the artifact

**line (number)**: 1-based index of a line within a file. **Note**: Abbreviated to "line" when there is no danger of ambiguity with "line" in the sense of a sequence of characters.

**localizable**: subject to being translated from one natural language to another

**message string**: human-readable string that conveys information relevant to an element in a CSAF document

nested artifact: artifact that is contained within another artifact

**newline sequence**: sequence of one or more characters representing the end of a line of text. **Note**: Some systems represent a newline sequence with a single newline character; others represent it as a carriage return character followed by a newline character.

**notification**: reporting item that describes a condition encountered by a tool during its execution

**opaque**: neither human-readable nor machine-parsable into constituent parts

parent (artifact): artifact which contains one or more nested artifacts

**plain text message**: message string which does not contain any formatting information

plugin: tool component that defines additional rules

**policy**: set of rule configurations that specify how results that violate the rules defined by a particular tool component are to be treated

**problem**: result which indicates a condition that has the potential to detract from the quality of the program. *Examples*: A security vulnerability, a deviation from contractual or legal requirements.

**product**: is any deliverable (e.g. software, hardware, specification,...) which can be referred to with a name. This applies regardless of the origin, the license model, or the mode of distribution of the deliverable.

**property**: attribute of an object consisting of a name and a value associated with the name

**redactable property**: property that potentially contains sensitive information that a CSAF direct producer or a CSAF post-processor might wish to redact

**reporting item**: unit of output produced by a tool, either a result or a notification

**reporting configuration**: the subset of reporting metadata that a tool can configure at runtime, before performing its scan. *Examples*: severity level, rank

repository container for a related set of files in a version control system

taxonomy: classification of analysis results into a set of categories

tag: string that conveys additional information about the CSAF document element to which it applies

**text artifact**: artifact considered as a sequence of characters organized into lines and columns

**text region**: region representing a contiguous range of zero or more characters in a text artifact

**tool component**: component of an analysis tool or converter, either its driver or an extension, consisting of one or more files

top-level artifact: artifact which is not contained within any other artifact

**translation**: rendering of a tool component's localizable strings into another language

**triage**: decide whether a result indicates a problem that needs to be corrected

user: see end user.

**VCS**: version control system

**vendor**: the community, individual, or organization that created or maintains a product (including open source software and hardware providers)

**VEX**: Vulnerability Exploitability eXchange - enables a supplier or other party to assert whether or not a particular product is affected by a specific vulnerability, especially helpful in efficiently consuming SBOM data.

viewer: see CSAF viewer.

**vulnerability**: functional behavior of a product or service that violates an implicit or explicit security policy (conforming to ISO/IEC 29147 [ISO29147])

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# 1.5 Typographical Conventions

Keywords defined by this specification use this monospaced font.

```
Normative source code uses this paragraph style.
```

Some sections of this specification are illustrated with non-normative examples introduced with "Example" or "Examples" like so:

#### Examples 4321:

```
Informative examples also use this paragraph style but preceded by the text "Example(s)".
```

All examples in this document are informative only.

All other text is normative unless otherwise labeled e.g. like the following informative comment:

This is a pure informative comment that may be present, because the information conveyed is deemed useful advice or common pitfalls learned from implementer or operator experience and often given including the rationale.

# 2 Design Considerations

The Common Security Advisory Framework (CSAF) is a language to exchange Security Advisories formulated in JSON.

The term Security Advisory as used in this document describes any notification of security issues in products of and by providers. Anyone providing a product is considered in this document as a vendor, i.e. developers or maintainers of information system products or services. This includes all authoritative product vendors, Product Security Incident Response Teams (PSIRTs), and product resellers and distributors, including authoritative vendor partners. A security issue is not necessarily constrained to a problem statement, the focus of the term is on the security aspect impacting (or not impacting) specific product-platformversion combinations. Information on presence or absence of workarounds is also considered part of the security issue. This document is the definitive reference for the language elements of CSAF version 2.0. The encompassing JSON schema file noted in the Additional Artifacts section of the title page SHALL be taken as normative in the case a gap or an inconsistency in this explanatory document becomes evident. The following presentation in this section is grouped by topical area, and is not simply derivative documentation from the schema document itself. The information contained aims to be more descriptive and complete. Where applicable, common conventions are stated and known common issues in usage are pointed out informatively to support implementers of document producers and consumers alike.

This minimal required information set does not provide any useful information on products, vulnerabilities, or security advisories. Thus, any real-world Security Advisory will carry additional information as specified in section 3 Schema elements.

Care has been taken, to design the containers for product and vulnerability information to support fine-grained mapping of security advisories onto product and vulnerability and minimize data duplication through referencing. The display of the elements representing Product

Tree and Vulnerability information has been placed in the sections named accordingly.

# 2.1 Construction Principles

A Security Advisory defined as a CSAF document is the result of complex orchestration of many players and distinct and partially difficult to play schemas.

The format chosen is [JSONSchema] which allows validation and delegation to sub schema providers. The latter aligns well with separation of concerns and shares the format family of information interchange utilized by the providers of product and vulnerability information which migrated from XML to JSON since the creation of CSAF CVRF version 1.2, the predecessor of this specification.

The acronym CSAF, "Common Security Advisory Framework", stands for the target of concerted mitigation and remediation accomplishment.

Technically, the use of JSON schema allows validation and proof of model conformance (through established schema based validation) of the declared information inside CSAF documents.

The CSAF schema structures its derived documents into three main classes of the information conveyed:

- 1. The frame, aggregation, and reference information of the document
- 2. Product information considered relevant by the creator
- 3. Vulnerability information and its relation to the products declared in 2.

Wherever possible repetition of data has been replaced by linkage through ID elements. Consistency on the content level thus is in the responsibility of the producer of such documents, to link e.g. vulnerability information to the matching product.

A dictionary like presentation of all defined schema elements is given in the section 3. Any expected relations to other elements (linkage) is described there. This linking relies on setting attribute values accordingly (mostly guided by industry best practice and conventions) and thus implies, that any deep validation on a semantic level (e.g. does the CWE match the described vulnerability) is to be ensured by the producer and consumer of CSAF documents. It is out of scope for this specification.

Proven and intended usage patterns from practice are given where possible.

Delegation to industry best practices technologies is used in referencing schemas for:

- Platform Data:
  - Common Platform Enumeration (CPE) Version 2.3 [CPE23-N]
- Vulnerability Scoring:
  - Common Vulnerability Scoring System (CVSS) Version 3.1 [CVSS31]
    - JSON Schema Reference https://www.first.org/cvss/cvss-v3.1.json
  - Common Vulnerability Scoring System (CVSS) Version 3.0 [CVSS30]
    - JSON Schema Reference <u>https://www.first.org/cvss/cvss-v3.0.json</u>
  - Common Vulnerability Scoring System (CVSS) Version 2.0 [CVSS2]
    - JSON Schema Reference https://www.first.org/cvss/cvss-v2.0.json
- Vulnerability Classification
  - Common Weakness Enumeration (CWE) [CWE]
    - CWE List: <a href="http://cwe.mitre.org/data/index.html">http://cwe.mitre.org/data/index.html</a>
- Classification for Document Distribution
  - Traffic Light Protocol (TLP)
    - Default Definition: https://www.first.org/tlp/

Even though the JSON schema does not prohibit specifically additional properties and custom keywords, it is strongly recommended not to use them. Suggestions for new fields SHOULD be made through issues in the TC's GitHub.

The standardized fields allow for scalability across different issuing parties and dramatically reduce the human effort and need for dedicated parsers as well as other tools on the side of the consuming parties.

Section 4 defined profiles that are used to ensure a common understanding of which fields are required in a given use case. Additional conventions are stated in section 5. The tests given in section 6 support CSAF producers and consumers to verify rules from the specification which can not be tested by the schema. Section 7 states how to distribute and where to find CSAF documents. Safety, Security and Data Protection are considered in section 8. Finally, a set of conformance targets describes tools in the ecosystem.

# 3 Schema Elements

The CSAF schema describes how to represent security advisory information as a JSON document.

The CSAF schema Version 2.0 builds on the JSON Schema draft 2020-12 rules.

```
"$schema": "https://json-schema.org/draft/2020-12/schema"
```

The schema identifier is:

```
"$id": "https://docs.oasis-
open.org/csaf/csaf/v2.0/csaf json schema.json"
```

The further documentation of the schema is organized via Definitions and Properties.

- Definitions provide types that extend the JSON schema model
- Properties use these types to support assembling security advisories

Types and properties together provide the vocabulary for the domain specific language supporting security advisories.

The single mandatory property is document. The optional two additional properties are product\_tree and vulnerabilities.

#### 3.1 Definitions

The definitions (\$defs) introduce the following domain specific types into the CSAF language: Acknowledgments (acknowledgments\_t), Branches (branches\_t), Full Product Name (full\_product\_name\_t), Language (lang\_t), Notes (notes\_t), Product Group ID (product\_group\_id\_t), Product Groups (product\_groups\_t), Product ID (product\_id\_t), Products (products t), References (references t), and Version (version t).

```
// ...
},
"lang t": {
 // ...
"notes t": {
  // ...
"product group id t": {
// ...
"product groups t": {
// ...
"product_id_t": {
 // ...
},
"products t": {
 // ...
"references t": {
 // ...
"version t": {
// ...
```

# 3.1.1 Acknowledgments Type

List of Acknowledgments (acknowledgments\_t) type instances of value type array with 1 or more elements contain a list of Acknowledgment elements.

```
"acknowledgments_t": {
    // ...
    "items": {
        // ...
    }
},
```

The value type of Acknowledgment is <code>object</code> with at least 1 and at most 4 properties. Every such element acknowledges contributions by describing those that contributed. The properties are: <code>names</code>, <code>organization</code>, <code>summary</code>, and <code>urls</code>.

# 3.1.1.1 Acknowledgments Type - Names

List of acknowledged names (names) has value type array with 1 or more items holds the names of entities contributors being recognized. Every such item of value type string with 1 or more characters represents the name of entity being recognized the contributor and contains the name of a single person contributor being recognized.

#### Examples 1:

```
Albert Einstein
Johann Sebastian Bach
```

# 3.1.1.2 Acknowledgments Type - Organization

The contributing organization (organization) has value type string with 1 or more characters and holds the name of the contributing organization being recognized.

#### Examples 2:

```
CISA
Google Project Zero
Talos
```

#### 3.1.1.3 Acknowledgments Type - Summary

Summary of the acknowledgment (summary) of value type string with 1 or more characters SHOULD represent any contextual details the document producers wish to make known about the acknowledgment or acknowledged parties.

### Example 3:

```
First analysis of Coordinated Multi-Stream Attack (CMSA)
```

#### 3.1.1.4 Acknowledgments Type - URLs

List of URLs (urls) of acknowledgment is a container (value type array) for 1 or more string of type URL that specifies a list of URLs or location of the reference to be acknowledged. Any URL of acknowledgment contains

the URL or location of the reference to be acknowledged. Value type is string with format URI (uri).

### 3.1.1.5 Acknowledgments Type - Example

#### Example 4:

```
"acknowledgments": [
    "names": [
      "Johann Sebastian Bach",
      "Georg Philipp Telemann",
      "Georg Friedrich Händel"
    "organization": "Baroque composers",
    "summary": "wonderful music"
    "organization": "CISA"",
    "summary": "coordination efforts",
    "urls": [
      "https://cisa.gov"
    "organization": "BSI",
    "summary": "assistance in coordination"
    "names": [
      "Antonio Vivaldi"
    "summary": "influencing other composers"
```

The example 4 above SHOULD lead to the following outcome in a human-readable advisory:

We thank the following parties for their efforts:

- Johann Sebastian Bach, Georg Philipp Telemann, Georg Friedrich Händel from Baroque composers for wonderful music
- CISA for coordination efforts (see: <a href="https://cisa.gov">https://cisa.gov</a>)
- BSI for assistance in coordination
- Antonio Vivaldi for influencing other composers

# 3.1.2 Branches Type

List of branches (branches\_t) with value type array contains 1 or more branch elements as children of the current element.

```
"branches_t": {
    //...
    "items": {
        // ...
    }
},
```

Every Branch holds exactly 3 properties and is a part of the hierarchical structure of the product tree. The properties name and category are mandatory. In addition, the object contains either a branches or a product property.

branches\_t supports building a hierarchical structure of products that allows to indicate the relationship of products to each other and enables grouping for simpler referencing. As an example, the structure MAY use the following levels: vendor -> product\_family -> product\_name -> product\_version. It is recommended to use the hierarchical structure of vendor -> product\_name -> product\_version whenever possible to support the identification and matching of products on the consumer side.

# 3.1.2.1 Branches Type - Branches

List of branches (branches) has the value type branches\_t.

# 3.1.2.2 Branches Type - Category

Category of the branch (category) of value type string and enum describes the characteristics of the labeled branch. Valid enum values are:

```
host_name
language
legacy
patch_level
product_family
product_name
product_version
product_version_range
service_pack
specification
vendor
```

The value architecture indicates the architecture for which the product is intended.

The value host name indicates the host name of a system/service.

The value language indicates the language of the product.

The value legacy indicates an entry that has reached its end of life.

The value patch level indicates the patch level of the product.

The value product\_family indicates the product family that the product falls into.

The value product name indicates the name of the product.

The value product\_version indicates exactly a single version of the product. The value of the adjacent name property can be numeric or some other descriptor. However, it MUST NOT contain version ranges of any kind.

It is recommended to enumerate versions wherever possible. Nevertheless, the TC understands that this is sometimes impossible. To reflect that in the specification and aid in automatic processing of CSAF documents the value product\_version\_range was introduced. See next section for details.

The value product\_version\_range indicates a range of versions for the product. The value of the adjacent name property SHOULD NOT be used to convey a single version.

The value service pack indicates the service pack of the product.

The value specification indicates the specification such as a standard, best common practice, etc.

The value <code>vendor</code> indicates the name of the vendor or manufacturer that makes the product.

#### 3.1.2.3 Branches Type - Name

Name of the branch (name) of value type string with 1 or more characters contains the canonical descriptor or 'friendly name' of the branch.

#### Examples 5:

```
10
365
Microsoft
Office
PCS 7
SIMATIC
Siemens
Windows
```

A leading v or v in the value of <code>name</code> SHOULD only exist for the categories <code>product\_version</code> or <code>product\_version\_range</code> if it is part of the product version as given by the vendor.

### 3.1.2.3.1 Branches Type - Name under Product Version

If adjacent property category has the value product\_version, the value of name MUST NOT contain version ranges of any kind.

Examples 6 for name when using product version:

```
10
17.4
v3
```

The product\_version is the easiest way for users to determine whether their version is meant (provided that the given ancestors in the product tree matched): If both version strings are the same, it is a match - otherwise not. Therefore, it is always recommended to enumerate product versions instead of providing version ranges.

Examples 7 for name when using product version which are invalid:

```
8.0.0 - 8.0.1

8.1.5 and later

<= 2

prior to 4.2

All versions < V3.0.29

V3.0, V4.0, V4.1, V4.2
```

All the examples above contain some kind of a version range and are therefore invalid under the category

```
product version.
```

# 3.1.2.3.2 Branches Type - Name under Product Version Range

If adjacent property category has the value product\_version\_range, the value of name MUST contain version ranges. The value of MUST obey to exactly one of the following options:

1. Version Range Specifier (vers)

vers is an ongoing community effort to address the problem of version ranges. Its draft specification is available at [VERS].

vers MUST be used in its canonical form. To convey the term "all versions" the special string vers:all/\* MUST be used.

Examples 8 for name when using product version range with vers:

```
vers:gem/>=2.2.0|!= 2.2.1|<2.3.0
vers:npm/1.2.3|>=2.0.0|<5.0.0
vers:pypi/0.0.0|0.0.1|0.0.2|0.0.3|1.0|2.0pre1
vers:tomee/>=8.0.0-M1|<=8.0.1</pre>
```

Through the definitions of the vers specification a user can compute whether a given version is in a given range.

#### 2. Vers-like Specifier (vls)

This option uses only the <version-constraint> part from the vers
specification. It MUST not have an URI nor the <versioningscheme> part. It is a fallback option and SHOULD NOT be used
unless really necessary.

The reason for that is, that it is nearly impossible for tools to reliable determine whether a given version is in the range or not.

Tools MAY support this on best effort basis.

Examples 9 for name when using product version range with vls:

```
<=2
<4.2
```

```
<V3.0.29
>=8.1.5
```

# 3.1.2.4 Branches Type - Product

Product (product) has the value type Full Product Name (full product name t).

# 3.1.3 Full Product Name Type

Full Product Name (full\_product\_name\_t) with value type object specifies information about the product and assigns the product ID. The properties name and product\_id are required. The property product identification helper is optional.

### 3.1.3.1 Full Product Name Type - Name

Textual description of the product (name) has value type string with 1 or more characters. The value SHOULD be the product's full canonical name, including version number and other attributes, as it would be used in a human-friendly document.

## Examples 10:

```
Cisco AnyConnect Secure Mobility Client 2.3.185
Microsoft Host Integration Server 2006 Service Pack 1
```

## 3.1.3.2 Full Product Name Type - Product ID

Product ID (product\_id) holds a value of type Product ID (product\_id\_t).

# 3.1.3.3 Full Product Name Type - Product Identification Helper

Helper to identify the product (product\_identification\_helper) of value type object provides in its properties at least one method which aids in identifying the product in an asset database. Of the given eight properties cpe, hashes, model\_numbers, purl, sbom\_urls, serial\_numbers, skus, and x generic uris, one is mandatory.

```
"product identification helper": {
 // ...
 "properties": {
   "cpe": {
     // ...
   },
   "hashes": {
    // ...
   "model numbers": {
    // ...
   },
   "purl": {
    // ...
    "sbom urls": {
    // ...
    "serial numbers": {
    // ...
    "skus": {
    // ...
   },
    "x generic uris": {
    // ...
    }
```

### 3.1.3.3.1 Full Product Name Type - Product Identification Helper - CPE

Common Platform Enumeration representation (cpe) of value type string of 5 or more characters with pattern (regular expression):

The Common Platform Enumeration (CPE) attribute refers to a method for naming platforms external to this specification. See [CPE23-N] for details.

#### 3.1.3.3.2 Full Product Name Type - Product Identification Helper - Hashes

List of hashes (hashes) of value type array holding at least one item contains a list of cryptographic hashes usable to identify files.

Cryptographic hashes of value type <code>object</code> contains all information to identify a file based on its cryptographic hash values. Any cryptographic hashes object has the 2 mandatory properties <code>file hashes</code> and <code>filename</code>.

List of file hashes (file\_hashes) of value type array holding at least one item contains a list of cryptographic hashes for this file.

```
"file_hashes": {
    // ...
    "items": {
        // ...
    }
    +},
```

Each File hash of value type <code>object</code> contains one hash value and algorithm of the file to be identified. Any File hash object has the 2 mandatory properties <code>algorithm</code> and <code>value</code>.

The algorithm of the cryptographic hash representation (algorithm) of value type string with one or more characters contains the name of the cryptographic hash algorithm used to calculate the value. The default value for algorithm is sha256.

## Examples 11:

```
blake2b512
sha256
sha3-512
sha384
sha512
```

These values are derived from the currently supported digests OpenSSL [OPENSSL]. Leading dashes were removed.

```
The command openssl dgst -list (Version 1.1.1f from
2020-03-31) outputs the following:
Supported digests:
-blake2b512
                            -blake2s256
-md4
-md5
                           -md5-sha1
-ripemd
-ripemd160
                            -rmd160
-sha1
-sha224
                            -sha256
-sha3-224
-sha3-256
                            -sha3-384
-sha3-512
-sha384
                           -sha512
-sha512-224
                           -shake128
-sha512-256
-shake256
-sm3
                           -ss13-md5
-ssl3-sha1
-whirlpool
```

The Value of the cryptographic hash representation (value) of value type string of 32 or more characters with pattern (regular expression):

```
^[0-9a-fA-F]{32,}$
```

The Value of the cryptographic hash attribute contains the cryptographic hash value in hexadecimal representation.

### Examples 12:

```
37df33cb7464da5c7f077f4d56a32bc84987ec1d85b234537c1c1a4d4fc8d09dc 29e2e762cb5203677bf849a2855a0283710f1f5fe1d6ce8d5ac85c645d0fcb3 4775203615d9534a8bfca96a93dc8b461a489f69124a130d786b42204f3341cc 9ea4c8200113d49d26505da0e02e2f49055dc078d1ad7a419b32e291c7afebbb8 4badfbd46dec42883bea0b2a1fa697c
```

The filename representation (filename) of value type string with one or more characters contains the name of the file which is identified by the hash values.

## Examples 13:

```
WINWORD.EXE
msotadddin.dll
sudoers.so
```

If the value of the hash matches and the filename does not, a user SHOULD prefer the hash value. In such cases, the filename SHOULD be used as informational property.

# 3.1.3.3.3 Full Product Name Type - Product Identification Helper - Model Numbers

The list of models (model\_numbers) of value type array with 1 or more unique items contains a list of parts, full or full abbreviated (partial) model numbers.

A list of models SHOULD only be used if a certain range of model numbers with its corresponding software version is affected, or the model numbers change during update.

This can also be used to identify hardware. If necessary, the software, or any other related part, SHALL be bind to that via a product relationship.

```
"model_numbers": {
    //...
    "items": {
        //...
    }
}
```

Any given model number of value type string with at least 1 character represents a part, full or a full abbreviated (partial) model number of the component to identify.

The terms "model", "model number" and "model variant" are mostly used synonymously. Often it is abbreviated as "MN", M/N" or "model no.".

If a part of a model number of the component to identify is given, it SHOULD begin with the first character of the model number and stop at any point. Characters which SHOULD NOT be matched MUST be replaced by either ? (for a single character) or \* (for zero or more

characters).

Two \* MUST NOT follow each other.

#### Examples 14:

```
6RA8096-4MV62-0AA0
6RA801?-??V62-0AA0
IC25T060ATCS05-0
```

### 3.1.3.3.4 Full Product Name Type - Product Identification Helper - PURL

The package URL (PURL) representation (purl) is a string of 7 or more characters with pattern (regular expression):

```
^pkg:[A-Za-z\\.\\-\\+][A-Za-z0-9\\.\\-\\+]*/.+
```

The given pattern does not completely evaluate whether a PURL is valid according to the [PURL] specification. It provides a more generic approach and general guidance to enable forward compatibility. CSAF uses only the canonical form of PURL to conform with section 3.3 of [RFC3986]. Therefore, URLs starting with pkg:// are considered invalid.

This package URL (PURL) attribute refers to a method for reliably identifying and locating software packages external to this specification. See [PURL] for details.

# 3.1.3.3.5 Full Product Name Type - Product Identification Helper - SBOM URLs

The list of SBOM URLs (sbom\_urls) of value type array with 1 or more items contains a list of URLs where SBOMs for this product can be retrieved.

The SBOMs might differ in format or depth of detail. Currently supported formats are SPDX, CycloneDX, and SWID.

```
"sbom_urls": {
    //...
    "items": {
        //...
    }
    +},
```

Any given SBOM URL of value type string with format uri contains a URL of one SBOM for this product.

# Examples 15:

```
https://raw.githubusercontent.com/CycloneDX/bom-examples/master/SBOM/keycloak-10.0.2/bom.json
https://swinslow.net/spdx-examples/example4/main-bin-v2
```

# 3.1.3.3.6 Full Product Name Type - Product Identification Helper - Serial Numbers

The list of serial numbers (serial\_numbers) of value type array with 1 or more unique items contains a list of parts, full or full abbreviated (partial) serial numbers.

A list of serial numbers SHOULD only be used if a certain range of serial numbers with its corresponding software version is affected, or the serial numbers change during update.

```
"serial_numbers": {
    //...
    "items": {
        //...
    }
}
```

Any given serial number of value type string with at least 1 character represents a part, full or a full abbreviated (partial) serial number of the component to identify.

If a part of a serial number of the component to identify is given, it SHOULD begin with the first character of the serial number and stop at any point. Characters which SHOULD NOT be matched MUST be replaced by either ? (for a single character) or \* (for zero or more characters).

Two \* MUST NOT follow each other.

#### 3.1.3.3.7 Full Product Name Type - Product Identification Helper - SKUs

The list of stock keeping units (skus) of value type array with 1 or more items contains a list of parts, full or full abbreviated (partial) stock keeping units.

A list of stock keeping units SHOULD only be used if the list of relationships is used to decouple e.g. hardware from the software, or the stock keeping units change during update. In the latter case the remediations SHALL include the new stock keeping units is or a description how it can be obtained.

The use of the list of relationships in the first case is important. Otherwise, the end user is unable to identify which version (the affected or the not affected / fixed one) is used.

Any given stock keeping unit of value type string with at least 1 character represents a part, full or a full abbreviated (partial) stock keeping unit (SKU) of the component to identify.

Sometimes this is also called "item number", "article number" or "product number".

If a part of a stock keeping unit of the component to identify is given, it SHOULD begin with the first character of the stock keeping unit and stop at any point. Characters which SHOULD NOT be matched MUST be replaced by either ? (for a single character) or \* (for zero or more characters).

Two \* MUST NOT follow each other.

# 3.1.3.3.8 Full Product Name Type - Product Identification Helper - Generic URIs

List of generic URIs ( $x_{generic\_uris}$ ) of value type array with at least 1 item contains a list of identifiers which are either vendor-specific or derived from a standard not yet supported.

```
"x_generic_uris": {
    // ...
    "items": {
        // ...
    }
}
```

Any such Generic URI item of value type <code>object</code> provides the two mandatory properties Namespace (<code>namespace</code>) and URI (<code>uri</code>).

The namespace of the generic URI (namespace) of value type string with format uri refers to a URL which provides the name and knowledge about the specification used or is the namespace in which these values are valid.

The URI (uri) of value type string with format uri contains the identifier itself.

These elements can be used to reference a specific component from an SBOM:

Example 16 linking a component from a CycloneDX SBOM using the bomlink mechanism:

# Example 17 linking a component from an SPDX SBOM:

# 3.1.4 Language Type

Language type (lang\_t) has value type string with pattern (regular expression):

```
^(([A-Za-z]{2,3}(-[A-Za-z]{3})(0,2))?|[A-Za-z]{4,8})(-[A-Za-z]{4})?(-([A-Za-z]{2}|[0-9]{3}))?(-([A-Za-z0-9]{5,8}|[0-9][A-Za-z0-9]{3}))*(-[A-WY-Za-wy-z0-9](-[A-Za-z0-9]{2,8})+)*(-[Xx](-[A-Za-z0-9]{1,8})+)?|[Xx](-[A-Za-z0-9]{1,8})+|[Ii]-[Dd][Ee][Ff][Aa][Uu][L1][Tt]|[Ii]-
[Mm][Ii][Nn][Gg][Oo])$
```

The value identifies a language, corresponding to IETF BCP 47 / RFC 5646. See IETF language registry:

https://www.iana.org/assignments/language-subtag-registry/language-subtag-registry

CSAF skips those grandfathered language tags that are deprecated at the time of writing the specification. Even though the private use language tags are supported they SHOULD not be used to ensure readability across the ecosystem. It is recommended to follow the conventions for the capitalization of the subtags even though it is not mandatory as most users are used to that.

# Examples 18:

```
de
en
fr
frc
jp
```

# 3.1.5 Notes Type

List of notes (notes\_t) of value type array with 1 or more items of type Note contains notes which are specific to the current context.

```
"notes_t": {
    // ...
    "items": {
        // ...
    }
},
```

Value type of every such Note item is <code>object</code> with the mandatory properties <code>category</code> and <code>text</code> providing a place to put all manner of text blobs related to the current context. A Note <code>object</code> MAY provide the optional properties <code>audience</code> and <code>title</code>.

```
}
}
```

Audience of note (audience) of value type string with 1 or more characters indicates who is intended to read it.

## Examples 19:

```
all
executives
operational management and system administrators
safety engineers
```

Note category (category) of value type string and enum indicates contains the choiceinformation of what kind of note this is. Valid enum values are:

```
description
details
faq
general
legal_disclaimer
other
summary
```

The value <code>description</code> indicates the note is a description of something. The optional sibling property <code>title</code> MAY have more information in this case.

The value details indicates the note is a low-level detailed discussion. The optional sibling property title MAY have more information in this case.

The value faq indicates the note is a list of frequently asked questions.

The value general indicates the note is a general, high-level note. The optional sibling property title MAY have more information in this case.

The value <code>legal\_disclaimer</code> indicates the note represents any possible legal discussion, including constraints, surrounding the document.

The value other indicates the note is something that doesn't fit the other categories. The optional sibling attribute title SHOULD have more information to indicate clearly what kind of note to expect in this case.

The value summary indicates the note is a summary of something. The optional sibling property title MAY have more information in this case.

Note contents (text) of value type string with 1 or more characters holds the contents of the note. Content varies depending on type.

Title of note (title) of value type string with 1 or more characters provides a concise description of what is contained in the text of the note.

#### Examples 20:

```
Details
Executive summary
Technical summary
Impact on safety systems
```

# 3.1.6 Product Group ID Type

The Product Group ID Type (product\_group\_id\_t) of value type string with 1 or more characters is a reference token for product group instances. The value is a token required to identify a group of products so that it can be referred to from other parts in the document. There is no predefined or required format for the Product Group ID (product\_group\_id) as long as it uniquely identifies a product group in the context of the current document.

```
"product_group_id_t": {
    // ...
},
```

### Examples 21:

```
CSAFGID-0001
CSAFGID-0002
CSAFGID-0020
```

Even though the standard does not require a specific format it is recommended to use different prefixes for the Product ID and the Product Group ID to support reading and parsing the document.

# 3.1.7 Product Groups Type

List of Product Group ID (product\_groups\_t) of value type array with 1 or more unique items (a set) of type Product Group ID (product\_group\_id\_t) specifies a list of product\_group\_ids to give context to the parent item.

```
"product_groups_t": {
    // ...
    "items": {
        // ...
}
```

# 3.1.8 Product ID Type

The Product ID Type (product\_id\_t) of value type string with 1 or more characters is a reference token for product instances. The value is a token required to identify a full\_product\_name so that it can be referred to from other parts in the document. There is no predefined or required format for the Product ID (product\_id) as long as it uniquely identifies a product in the context of the current document.

```
"product_id_t": {
    // ...
},
```

## Examples 22:

```
CSAFPID-0004
CSAFPID-0008
```

Even though the standard does not require a specific format it is recommended to use different prefixes for the Product ID and the Product Group ID to support reading and parsing the document.

# 3.1.9 Products Type

List of Product IDs (products\_t) of value type array with 1 or more unique items (a set) of type Product ID (product\_id\_t) specifies a list of product ids to give context to the parent item.

```
"products_t": {
    // ...
    "items": {
        // ...
    }
},
```

# 3.1.10 References Type

List of references (references\_t) of value type array with 1 or more items of type Reference holds a list of Reference objects.

```
"references_t": {
    // ...
    "items": {
        // ...
}
```

Value type of every such Reference item is <code>object</code> with the mandatory properties <code>url</code> and <code>summary</code> holding any reference to conferences, papers, advisories, and other resources that are related and considered related to either a surrounding part of or the entire document and to be of value to the document consumer. A reference <code>object</code> MAY provide the optional property <code>category</code>.

Category of reference (category) of value type string and enum indicates whether the reference points to the same document or vulnerability in focus (depending on scope) or to an external resource. Valid enum values are:

```
external self
```

The default value for category is external.

The value <code>external</code> indicates, that this document is an external reference to a document or vulnerability in focus (depending on scope).

The value self indicates, that this document is a reference to this same document or vulnerability (also depending on scope).

This includes links to documents with the same content but different file format (e.g. advisories as PDF or HTML).

Summary of the reference (summary) of value type string with 1 or more characters indicates what this reference refers to.

URL of reference (url) of value type string with format uri provides the URL for the reference.

# 3.1.11 Version Type

The Version (version\_t) type has value type string with pattern (regular expression):

```
^(0|[1-9][0-9]*)$\|^((0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\d*[a-zA-Z-][0-9a-zA-Z-]\)\(?:\\.(?:0|[1-9]\\d*|\\d*[a-zA-Z-][0-9a-zA-Z-]\)\)))?(?:\\+([0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+)*))?)$
```

The version specifies a version string to denote clearly the evolution of the content of the document. There are two options how it can be used:

- semantic versioning (preferred; according to the rules below)
- integer versioning

A CSAF document MUST use only one versioning system.

#### Examples 23:

```
1
4
0.9.0
1.4.3
2.40.0+21AF26D3
```

# 3.1.11.1 Version Type - Integer versioning

Integer versioning increments for each version where the <code>/document/tracking/status</code> is final the version number by one. The regular expression for this type is:

```
^(0|[1-9][0-9]*)$
```

The following rules apply:

- 1. Once a versioned document has been released, the contents of that version MUST NOT be modified. Any modifications MUST be released as a new version.
- Version zero (0) is for initial development before the initial\_release\_date. The document status MUST be draft.
   Anything MAY change at any time. The document SHOULD NOT be considered stable.
- 3. Version 1 defines the initial public release. Each new version where /document/tracking/status is final has a version number incremented by one.
- 4. Pre-release versions (document status draft) MUST carry the new version number. Sole exception is before the initial release (see

- rule 2). The combination of document status draft and version 1 MAY be used to indicate that the content is unlikely to change.
- 5. Build metadata is never included in the version.
- 6. Precedence MUST be calculate by integer comparison.

## 3.1.11.2 Version Type - Semantic versioning

Semantic versioning derived the rules from [SemVer]. The regular expression for this type is:

```
^((0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\.(0|[1-9]\\d*) (?:-((?:0|[1-9]\\d*|\\d*[a-zA-Z-]*)(?:\\.(?:0|[1-9]\\d*|\\d*[a-zA-Z-]*)(?:\\.(?:0|[1-9]\\d*|\\d*[a-zA-Z-]*))*))?(?:\\+([0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\\.[0-9a-zA-Z-]+(?:\]
```

The goal of this structure is to provide additional information to the end user whether a new comparison with the asset database is needed. The "public API" in regards to CSAF is the CSAF document with its structure and content. This results in the following rules:

- 1. A normal version number MUST take the form X.Y.Z where X, Y, and Z are non-negative integers, and MUST NOT contain leading zeroes. X is the major version, Y is the minor version, and Z is the patch version. Each element MUST increase numerically. For instance: 1.9.0 -> 1.10.0 -> 1.11.0.
- 2. Once a versioned document has been released, the contents of that version MUST NOT be modified. Any modifications MUST be released as a new version.
- 3. Major version zero (0.y.z) is for initial development before the initial\_release\_date. The document status MUST be draft. Anything MAY change at any time. The document SHOULD NOT be considered stable. Changes which would increment the major version according to rule 7 are tracked in this stage with (0.y.z) by incrementing the minor version y instead. Changes that would increment the minor or patch version according to rule 6 or 5 are both tracked in this stage with (0.y.z) by incrementing the patch version z instead.
- 4. Version 1.0.0 defines the initial public release. The way in which the version number is incremented after this release is dependent on the content and structure of the document and how it changes.
- 5. Patch version Z (x.y.Z | x > 0) MUST be incremented if only backwards compatible bug fixes are introduced. A bug fix is defined as an internal change that fixes incorrect behavior.

In the context of the document this is the case e.g. for spelling mistakes.

- 6. Minor version Y (x.Y.z | x > 0) MUST be incremented if the content of an existing element changes except for those which are covert through rule 7. It MUST be incremented if substantial new information are introduced or new elements are provided. It MAY include patch level changes. Patch version MUST be reset to 0 when minor version is incremented.
- 7. Major version X (X.y.z | X > 0) MUST be incremented if a new comparison with the end user's asset database is required. This includes:
  - changes (adding, removing elements or modifying content)
     in /product\_tree or elements which contain /product\_tree
     in their path
  - o adding or removing items of /vulnerabilities
  - adding or removing elements in:
    - /vulnerabilities[]/product\_status/first\_affecte d
    - /vulnerabilities[]/product\_status/known\_affected
    - /vulnerabilities[]/product status/last affected
  - o removing elements from:
    - /vulnerabilities[]/product status/first fixed
    - /vulnerabilities[]/product status/fixed
    - /vulnerabilities[]/product\_status/known\_not\_aff ected

It MAY also include minor and patch level changes. Patch and minor version MUST be reset to 0 when major version is incremented.

8. A pre-release version (document status draft) MAY be denoted by appending a hyphen and a series of dot separated identifiers immediately following the patch version. Identifiers MUST comprise only ASCII alphanumerics and hyphens [0-9A-Za-z-]. Identifiers MUST NOT be empty. Numeric identifiers MUST NOT include leading zeroes. Pre-release versions have a lower precedence than the associated normal version. A pre-release version indicates that the version is unstable and might not satisfy the intended compatibility requirements as denoted by its associated normal version.

# Examples 24:

```
1.0.0-0.3.7

1.0.0-alpha

1.0.0-alpha.1

1.0.0-x-y-z.-

1.0.0-x.7.z.92
```

- 9. Pre-release MUST NOT be included if /document/tracking/status is final.
- 10. Build metadata MAY be denoted by appending a plus sign and a series of dot separated identifiers immediately following the patch or pre-release version. Identifiers MUST comprise only ASCII alphanumerics and hyphens [0-9A-Za-z-]. Identifiers MUST NOT be empty. Build metadata MUST be ignored when determining version precedence. Thus two versions that differ only in the build metadata, have the same precedence.

## Examples 25:

```
1.0.0+20130313144700
1.0.0+21AF26D3--117B344092BD
1.0.0-alpha+001
1.0.0-beta+exp.sha.5114f85
```

- 11. Precedence refers to how versions are compared to each other when ordered.
  - 1. Precedence MUST be calculated by separating the version into major, minor, patch and pre-release identifiers in that order (Build metadata does not figure into precedence).
  - Precedence is determined by the first difference when comparing each of these identifiers from left to right as follows: Major, minor, and patch versions are always compared numerically.

## Example 26:

```
1.0.0 < 2.0.0 < 2.1.0 < 2.1.1
```

3. When major, minor, and patch are equal, a pre-release version has lower precedence than a normal version:

### Example 27:

```
1.0.0-alpha < 1.0.0
```

- 4. Precedence for two pre-release versions with the same major, minor, and patch version MUST be determined by comparing each dot separated identifier from left to right until a difference is found as follows:
  - 1. Identifiers consisting of only digits are compared numerically.
  - 2. Identifiers with letters or hyphens are compared lexically in ASCII sort order.

- 3. Numeric identifiers always have lower precedence than non-numeric identifiers.
- 4. A larger set of pre-release fields has a higher precedence than a smaller set, if all of the preceding identifiers are equal.

### Example 28:

```
1.0.0-alpha < 1.0.0-alpha.1 < 1.0.0-alpha.beta < 1.0.0-beta < 1.0.0-beta.2 < 1.0.0-beta.11 < 1.0.0-rc.1 < 1.0.0
```

# 3.2 Properties

These final three subsections document the three properties of a CSAF document. The single mandatory property document, as well as the optional properties product tree and vulnerabilities in that order.

# 3.2.1 Document Property

Document level meta-data (document) of value type object with the 5 mandatory properties Category (category), CSAF Version (csaf\_version), Publisher (publisher), Title (title), and Tracking (tracking) captures the meta-data about this document describing a particular set of security advisories. In addition, the document object MAY provide the 7 optional properties Acknowledgments (acknowledgments), Aggregate Severity (aggregate\_severity), Distribution (distribution), Language (lang), Notes (notes), References (references), and Source Language (source lang).

# 3.2.1.1 Document Property - Acknowledgments

Document acknowledgments (acknowledgments) of value type Acknowledgments Type (acknowledgments\_t) contains a list of acknowledgment elements associated with the whole document.

```
"acknowledgments": {
    // ...
},
```

# 3.2.1.2 Document Property - Aggregate Severity

Aggregate severity (aggregate\_severity) of value type object with the mandatory property text and the optional property namespace is a vehicle that is provided by the document producer to convey the urgency and criticality with which the one or more vulnerabilities reported should be addressed. It is a document-level metric and applied to the document as a whole — not any specific vulnerability. The range of values in this field is defined according to the document producer's policies and procedures.

The Namespace of aggregate severity (namespace) of value type string with format uri points to the namespace so referenced.

The Text of aggregate severity (text) of value type string with 1 or more characters provides a severity which is independent of - and in addition to - any other standard metric for determining the impact or severity of a given vulnerability (such as CVSS).

#### Examples 29:

```
Critical
Important
Moderate
```

# 3.2.1.3 Document Property - Category

Document category (category) with value type string of 1 or more characters with pattern (regular expression):

```
^[^\\s\\-_\\.](.*[^\\s\\-_\\.])?$
```

Document category defines a short canonical name, chosen by the document producer, which will inform the end user as to the category of document.

It is directly related to the profiles defined in section 4.

```
"category": {
    // ...
}
```

### Examples 30:

```
csaf_base
csaf_security_advisory
csaf_vex
Example Company Security Notice
```

## 3.2.1.4 Document Property - CSAF Version

CSAF version (csaf\_version) of value type string and enum gives the version of the CSAF specification which the document was generated for. The single valid value for this enum is:

2.0

## 3.2.1.5 Document Property - Distribution

Rules for sharing document (distribution) of value type object with at least 1 of the 2 properties Text (text) and Traffic Light Protocol (TLP) (tlp) describes any constraints on how this document might be shared.

If both values are present, the TLP information SHOULD be preferred as this aids in automation.

### 3.2.1.5.1 Document Property - Distribution - Text

The Textual description (text) of value type string with 1 or more characters provides a textual description of additional constraints.

## Examples 31:

```
Copyright 2021, Example Company, All Rights Reserved.
Distribute freely.
Share only on a need-to-know-basis only.
```

#### 3.2.1.5.2 Document Property - Distribution - TLP

Traffic Light Protocol (TLP) (tlp) of value type object with the mandatory property Label (label) and the optional property URL (url) provides details about the TLP classification of the document.

The Label of TLP (label) with value type string and enum provides the TLP label of the document. Valid values of the enum are:

```
AMBER
GREEN
RED
WHITE
```

The URL of TLP version (url) with value type string with format uri provides a URL where to find the textual description of the TLP version which is used in this document. The default value is the URL to the definition by FIRST:

```
https://www.first.org/tlp/
```

## Examples 32:

```
https://www.us-cert.gov/tlp
https://www.bsi.bund.de/SharedDocs/Downloads/DE/BSI/Kritis/Merkbl
att_TLP.pdf
```

# 3.2.1.6 Document Property - Language

Document language (lang) of value type Language Type (lang\_t) identifies the language used by this document, corresponding to IETF BCP 47 / RFC 5646.

# 3.2.1.7 Document Property - Notes

Document notes (notes) of value type Notes Type (notes\_t) holds notes associated with the whole document.

```
"notes": {
    // ...
},
```

# 3.2.1.8 Document Property - Publisher

Publisher (publisher) has value type object with the mandatory properties Category (category), Name (name) and Namespace (namespace) and provides information on the publishing entity. The 2 other optional properties are: contact\_details and issuing\_authority.

#### 3.2.1.8.1 Document Property - Publisher - Category

The Category of publisher (category) of value type string and enum provides information about the category of publisher releasing the document. The valid values are:

```
coordinator
discoverer
other
translator
user
vendor
```

The value <code>coordinator</code> indicates individuals or organizations that manage a single vendor's response or multiple vendors' responses to a vulnerability, a security flaw, or an incident. This includes all Computer Emergency/Incident Response Teams (CERTs/CIRTs) or agents acting on the behalf of a researcher.

The value discoverer indicates individuals or organizations that find vulnerabilities or security weaknesses. This includes all manner of researchers.

The value translator indicates individuals or organizations that translate CSAF documents. This includes all manner of language translators, also those who work for the party issuing the original advisory.

The value other indicates a catchall for everyone else. Currently this includes editors, reviewers, forwarders, republishers, and miscellaneous contributors.

The value user indicates anyone using a vendor's product.

The value <code>vendor</code> indicates developers or maintainers of information system products or services. This includes all authoritative product vendors, Product Security Incident Response Teams (PSIRTs), and product resellers and distributors, including authoritative vendor partners.

#### 3.2.1.8.2 Document Property - Publisher - Contact Details

Contact details (contact\_details) of value type string with 1 or more characters provides information on how to contact the publisher, possibly including details such as web sites, email addresses, phone numbers, and postal mail addresses.

#### Example 33:

Example Company can be reached at contact\_us@example.com, or via our website at https://www.example.com/contact.

#### 3.2.1.8.3 Document Property - Publisher - Issuing Authority

Issuing authority (issuing\_authority) of value type string with 1 or more characters Provides information about the authority of the issuing party to release the document, in particular, the party's constituency and responsibilities or other obligations.

#### 3.2.1.8.4 Document Property - Publisher - Name

The Name of publisher (name) of value type string with 1 or more characters contains the name of the issuing party.

#### Example 34:

BSI Cisco PSIRT Siemens ProductCERT

#### 3.2.1.8.5 Document Property - Publisher - Namespace

The Namespace of publisher (namespace) of value type string with format uri contains a URL which is under control of the issuing party and can be used as a globally unique identifier for that issuing party. The URL SHALL be normalized.

An issuing party can choose any URL which fulfills the requirements state above. The URL MAY be dereferenceable. If an issuing party has chosen a URL, it SHOULD NOT change. Tools can make use of the combination of /document/publisher/namespace and /document/tracking/id as it identifies a CSAF document globally unique.

If an issuing party decides to change its Namespace it SHOULD reissue all CSAF documents with an incremented (patch) version which has no other changes than:

- the new publisher information
- the updated revision history
- the updated item in /document/references[] which points to the new version of the CSAF document
- an added item in /document/references[] which points to the previous version of the CSAF document (if the URL changed)

## Example 35:

```
https://csaf.io
https://www.example.com
```

# 3.2.1.9 Document Property - References

Document references (references) of value type References Type (references\_t) holds a list of references associated with the whole document.

```
"references": {
    // ...
},
```

## 3.2.1.10 Document Property - Source Language

Source language (source\_lang) of value type Language Type (lang\_t) identifies if this copy of the document is a translation then the value of this property describes from which language this document was translated.

The property MUST be present and set for any CSAF document with the value translator in /document/publisher/category. The property SHALL NOT be present if the document was not translated.

If an issuing party publishes a CSAF document with the same content in more than one language, one of these documents SHOULD be deemed the "original", the other ones SHOULD be considered translations from the "original". The issuing party can retain its original publisher information including the <code>category</code>. However, other rules defined in the conformance clause "CSAF translator" SHOULD be applied.

### 3.2.1.11 Document Property - Title

Title of this document (title) of value type string with 1 or more characters SHOULD be a canonical name for the document, and sufficiently unique to distinguish it from similar documents.

### Examples 36:

```
Cisco IPv6 Crafted Packet Denial of Service Vulnerability
Example Company Cross-Site-Scripting Vulnerability in Example
Generator
```

# 3.2.1.12 Document Property - Tracking

Tracking (tracking) of value type object with the six mandatory properties: Current Release Date (current\_release\_date), Identifier (id), Initial Release Date (initial\_release\_date), Revision History (revision\_history), Status (status), and Version (version) is a container designated to hold all management attributes necessary to track a CSAF document as a whole. The two optional additional properties are Aliases (aliases) and Generator (generator).

```
"tracking": {
 // ...
 "properties": {
   "aliases": {
     // ...
   "current release date": {
    // ...
   },
    "generator": {
    // ...
   "id": {
    // ...
   "initial release date": {
    // ...
   "revision history": {
    // ...
    "status": {
    // ...
   },
   "version": {
    // ...
```

# 3.2.1.12.1 Document Property - Tracking - Aliases

Aliases (aliases) of value type array with 1 or more unique items (a set) representing Alternate Names contains a list of alternate names for the same document.

```
"aliases": {
    // ...
    "items": {
        // ...
    }
},
```

Every such Alternate Name of value type string with 1 or more characters specifies a non-empty string that represents a distinct optional alternative ID used to refer to the document.

## Example 37:

```
CVE-2019-12345
```

#### 3.2.1.12.2 Document Property - Tracking - Current Release Date

Current release date (current\_release\_date) with value type string with format date-time holds the date when the current revision of this document was released.

## 3.2.1.12.3 Document Property - Tracking - Generator

Document Generator (generator) of value type object with mandatory property Engine (engine) and optional property Date (date) is a container to hold all elements related to the generation of the document. These items will reference when the document was actually created, including the date it was generated and the entity that generated it.

Date of document generation (date) of value type string with format date-time SHOULD be the current date that the document was generated. Because documents are often generated internally by a document producer and exist for a nonzero amount of time before being released, this field MAY be different from the Initial Release Date and Current Release Date.

Engine of document generation (engine) of value type object with mandatory property Engine name (name) and optional property Engine version (version) contains information about the engine that generated the CSAF document.

Engine name (name) of value type string with 1 or more characters represents the name of the engine that generated the CSAF document.

#### Examples 38:

```
Red Hat rhsa-to-cvrf
Secvisogram
TVCE
```

Engine version (version) of value type string with 1 or more characters contains the version of the engine that generated the CSAF document.

Although it is not formally required, the TC suggests to use a versioning which compatible wth Semantic Versioning as described in the external specification [SemVer]. This could help the end user to identify when CSAF consumers have to be updated.

### Examples 39:

```
0.6.0
1.0.0-beta+exp.sha.a1c44f85
2
```

### 3.2.1.12.4 Document Property - Tracking - ID

Unique identifier for the document (id) of value type string with 1 or more characters with pattern (regular expression):

```
^[\\S](.*[\\S])?$
```

Unique identifier for the document holds the Identifier.

It SHALL NOT start or end with a white space and SHALL NOT contain a line break.

The ID is a simple label that provides for a wide range of numbering values, types, and schemes. Its value SHOULD be assigned and maintained by the original document issuing authority. It MUST be unique for that organization.

## Examples 40:

```
Example Company - 2019-YH3234
RHBA-2019:0024
cisco-sa-20190513-secureboot
```

The combination of /document/publisher/namespace and /document/tracking/id identifies a CSAF document globally unique.

This value is also used to determine the filename for the CSAF document (cf. section 5.1).

## 3.2.1.12.5 Document Property - Tracking - Initial Release Date

Initial release date (initial\_release\_date) with value type string with format date-time holds the date when this document was first published.

#### 3.2.1.12.6 Document Property - Tracking - Revision History

The Revision History (revision\_history) with value type array of 1 or more Revision History Entries holds one revision item for each version of the CSAF document, including the initial one.

```
"revision_history": {
    // ...
    "items": {
        // ...
    }
},
```

Each Revision contains all the information elements required to track the evolution of a CSAF document. Revision History Entry items are of value type <code>object</code> with the three mandatory properties: Date (<code>date</code>), Number (<code>number</code>), and Summary (<code>summary</code>). In addition, a Revision MAY expose the optional property <code>legacy version</code>.

The Date of the revision (date) of value type string with format date-time states the date of the revision entry.

Legacy version of the revision (legacy\_version) of value type string with 1 or more characters contains the version string used in an existing document with the same content.

This SHOULD be used to aid in the mapping between existing (human-readable) documents which might use a different version scheme and CSAF documents with the same content. It is recommended, to use the CSAF revision number to describe the revision history for any new human-readable equivalent.

The Number (number) has value type Version (version\_t).

The Summary of the revision (summary) of value type string with 1 or more characters holds a single non-empty string representing a short description of the changes.

Each Revision item which has a <code>number</code> of <code>0</code> or <code>0.y.z</code> MUST be removed from the document if the document status is <code>final</code>. Versions of the document which are pre-release SHALL NOT have its own revision item. All changes MUST be tracked in the item for the next release version. Build metadata SHOULD NOT be included in the <code>number</code> of any revision item.

# 3.2.1.12.7 Document Property - Tracking - Status

Document status (status) of value type string and enum defines the draft status of the document. The value MUST be one of the following:

```
draft
final
interim
```

The value draft indicates, that this is a pre-release, intended for issuing party's internal use only, or possibly used externally when the party is seeking feedback or indicating its intentions regarding a specific issue.

The value final indicates, that the issuing party asserts the content is unlikely to change. "Final" status is an indication only, and does not preclude updates. This SHOULD be used if the issuing party expects no, slow or few changes.

The value <code>interim</code> indicates, that the issuing party expects rapid updates. This SHOULD be used if the expected rate of release for this document is significant higher than for other documents. Once the rate slows down it MUST be changed to <code>final</code>. This MAY be done in a patch version.

This is extremely useful for downstream vendors to constantly inform the end users about ongoing investigation. It can be used as an indication to pull the CSAF document more frequently.

### 3.2.1.12.8 Document Property - Tracking - Version

Version has the value type Version (version\_t).

# 3.2.2 Product Tree Property

Product Tree (product\_tree) has value type object with 1 or more properties is a container for all fully qualified product names that can be referenced elsewhere in the document. The properties are Branches (branches), Full Product Names (full\_product\_names), Product Groups (product\_groups), and Relationships (relationships).

## 3.2.2.1 Product Tree Property - Branches

List of branches (branches) has the value type branches\_t.

## 3.2.2.2 Product Tree Property - Full Product Names

List of full product names (full\_product\_names) of value type array with 1 or more items of type full\_product\_name\_t contains a list of full product names.

# 3.2.2.3 Product Tree Property - Product Groups

List of product groups (product\_groups) of value type array with 1 or more items of value type object contains a list of product groups.

```
"product_groups": {
    // ...
    "items": {
        // ...
    }
},
```

The product group items are of value type <code>object</code> with the 2 mandatory properties Group ID (<code>group\_id</code>) and Product IDs (<code>product\_ids</code>) and the optional Summary (<code>summary</code>) property.

The summary of the product group (summary) of value type string with 1 or more characters gives a short, optional description of the group.

#### Examples 41:

```
Products supporting Modbus.
The x64 versions of the operating system.
```

Group ID (group\_id) has value type Product Group ID (product group id t).

List of Product IDs (product\_ids) of value type array with 2 or more unique items of value type Product ID (product\_id\_t) lists the product\_ids of those products which known as one group in the document.

## 3.2.2.4 Product Tree Property - Relationships

List of relationships (relationships) of value type array with 1 or more items contains a list of relationships.

```
"relationships": {
    // ...
    "items": {
        // ...
    }
}
```

The Relationship item is of value type <code>object</code> and has four mandatory properties: Relationship category (<code>category</code>), Full Product Name (<code>full\_product\_name</code>), Product Reference (<code>product\_reference</code>), and Relates to Product Reference (<code>relates\_to\_product\_reference</code>). The Relationship item establishes a link between two existing <code>full\_product\_name\_t</code> elements, allowing the document producer to define a combination of two products that form a new <code>full\_product\_name</code> entry.

The situation where a need for declaring a Relationship arises, is given when a product is e.g. vulnerable only when installed together with another, or to describe operating system components.

Relationship category (category) of value type string and enum defines the category of relationship for the referenced component. The valid values are:

```
default_component_of
external_component_of
```

```
installed_on
installed_with
optional_component_of
```

The value <code>default\_component\_of</code> indicates that the entity labeled with one Product ID (e.g. CSAFPID-0001) is a default component of an entity with another Product ID (e.g. CSAFPID-0002). These Product IDs SHOULD NOT be identical to provide minimal redundancy.

The value <code>external\_component\_of</code> indicates that the entity labeled with one Product ID (e.g. CSAFPID-0001) is an external component of an entity with another Product ID (e.g. CSAFPID-0002). These Product IDs SHOULD NOT be identical to provide minimal redundancy.

The value <code>installed\_on</code> indicates that the entity labeled with one Product ID (e.g. CSAFPID-0001) is installed on a platform entity with another Product ID (e.g. CSAFPID-0002). These Product IDs SHOULD NOT be identical to provide minimal redundancy.

The value <code>installed\_with</code> indicates that the entity labeled with one Product ID (e.g. CSAFPID-0001) is installed alongside an entity with another Product ID (e.g. CSAFPID-0002). These Product IDs SHOULD NOT be identical to provide minimal redundancy.

The value <code>optional\_component\_of</code> indicates that the entity labeled with one Product ID (e.g. CSAFPID-0001) is an optional component of an entity with another Product ID (e.g. CSAFPID-0002). These Product IDs SHOULD NOT be identical to provide minimal redundancy.

Full Product Name (full\_product\_name) of value type Full Product Name Type (full product name t).

Product Reference (product\_reference) of value type Product ID (product\_id\_t) holds a Product ID that refers to the Full Product Name element, which is referenced as the first element of the relationship.

Relates to Product Reference (relates\_to\_product\_reference) of value type Product ID (product\_id\_t) holds a Product ID that refers to the Full Product Name element, which is referenced as the second element of the relationship.

#### Example 42:

```
"name": "Cisco AnyConnect Secure Mobility Client
4.9.04053"
     },
        "product id": "CSAFPID-908070602",
       "name": "Microsoft Windows"
    ],
    "relationships": [
        "product reference": "CSAFPID-908070601",
        "category": "installed on",
        "relates to product reference": "CSAFPID-908070602",
        "full_product name": {
          "product id": "CSAFPID-908070603",
          "name": "Cisco AnyConnect Secure Mobility Client
2.3.185 installed on Microsoft Windows"
      }
   ]
```

The product Cisco AnyConnect Secure Mobility Client 4.9.04053" (Product ID: CSAFPID-908070601) and the product Microsoft Windows (Product ID: CSAFPID-908070602) form together a new product with the separate Product ID CSAFPID-908070603. The latter one can be used to refer to that combination in other parts of the CSAF document. In example 34, it might be the case that Cisco AnyConnect Secure Mobility Client 4.9.04053" is only vulnerable when installed on Microsoft Windows.

# 3.2.3 Vulnerabilities Property

Vulnerabilities (vulnerabilities) of value type array with 1 or more objects representing vulnerabilities and providing 1 or more properties represents a list of all relevant vulnerability information items.

```
"vulnerabilities": {
    // ...
    "items": {
        // ...
    }
}
```

The Vulnerability item of value type <code>object</code> with 1 or more properties is a container for the aggregation of all fields that are related to a single vulnerability in the document. Any vulnerability MAY provide the optional properties Acknowledgments (<code>acknowledgments</code>), Common Vulnerabilities and Exposures (CVE) (<code>cve</code>), Common Weakness Enumeration (CWE) (<code>cwe</code>), Discovery Date (<code>discovery date</code>), Flags (<code>flags</code>), IDs (<code>ids</code>),

Involvements (involvements), Notes (notes), Product Status (product\_status), References (references), Release Date (release\_date), Remediations (remediations), Scores (scores), Threats (threats), and Title (title).

```
"properties": {
 "acknowledgments": {
  // ...
 "cve": {
  // ...
 "cwe": {
 // ...
 "discovery date": {
  // ...
 "flags": {
  // ...
 "ids": {
  // ...
 "involvements": {
  // ...
 "notes": {
 // ...
 "product status": {
  // ...
 "references": {
 // ...
 "release date": {
  // ...
 "remediations": {
  // ...
 "scores": {
  // ...
 "threats": {
  // ...
 "title": {
  // ...
```

# 3.2.3.1 Vulnerabilities Property - Acknowledgments

Vulnerability acknowledgments (acknowledgments) of value type Acknowledgments Type (acknowledgments\_t) contains a list of acknowledgment elements associated with this vulnerability item.

```
"acknowledgments": {
    // ...
},
```

# 3.2.3.2 Vulnerabilities Property - CVE

CVE (cve) of value type string with pattern (regular expression):

```
^CVE-[0-9]{4}-[0-9]{4,}$
```

holds the MITRE standard Common Vulnerabilities and Exposures (CVE) tracking number for the vulnerability.

## 3.2.3.3 Vulnerabilities Property - CWE

CWE (cwe) of value type object with the 2 mandatory properties Weakness ID (id) and Weakness Name (name) holds the MITRE standard Common Weakness Enumeration (CWE) for the weakness associated. For more information cf. [CWE].

The Weakness ID (id) has value type string with pattern (regular expression):

```
^CWE-[1-9]\\d{0,5}$
```

and holds the ID for the weakness associated.

## Examples 43:

```
CWE-22
CWE-352
CWE-79
```

The Weakness name (name) has value type string with 1 or more characters and holds the full name of the weakness as given in the CWE specification.

#### Examples 44:

```
Cross-Site Request Forgery (CSRF)
Improper Limitation of a Pathname to a Restricted Directory
('Path Traversal')
Improper Neutralization of Input During Web Page Generation
('Cross-site Scripting')
```

## 3.2.3.4 Vulnerabilities Property - Discovery Date

Discovery date (discovery\_date) of value type string with format datetime holds the date and time the vulnerability was originally discovered.

## 3.2.3.5 Vulnerabilities Property - Flags

List of flags (flags) of value type array with 1 or more unique items (a set) of value type object contains a list of machine readable flags.

```
"flags": {
    // ...
    "items": {
        // ...
    }
```

Every Flag item of value type <code>object</code> with the mandatory property Label (label) contains product specific information in regard to this vulnerability as a single machine readable flag. For example, this could be a machine readable justification code why a product is not affected. At least one of the optional elements Group IDs (<code>group\_ids</code>) and Product IDs (<code>product\_ids</code>) must be present to state for which products or product groups this flag is applicable.

These flags enable the receiving party to automate the selection of actions to take.

In addition, any Flag items MAY provide the three optional properties Date (date), Group IDs (group\_ids) and Product IDs (product\_ids).

```
},
"label": {
    // ...
},
"product_ids": {
    // ...
}
```

Date of the flag (date) of value type string with format date-time contains the date when assessment was done or the flag was assigned.

Group IDs (group\_ids) are of value type Product Groups (product\_groups\_t). and contain a list of Product Groups the current flag item applies to.

Label of the flag (label) of value type string and enum specifies the machine readable label. Valid enum values are:

```
component_not_present
inline_mitigations_already_exist
vulnerable_code_cannot_be_controlled_by_adversary
vulnerable_code_not_in_execute_path
vulnerable_code_not_present
```

The given values reflect the VEX not affected justifications. See [VEX-Justification] for more details. The values MUST be used as follows:

- component\_not\_present: The software is not affected because the vulnerable component is not in the product.
- vulnerable\_code\_not\_present: The product is not affected because the code underlying the vulnerability is not present in the product.

Unlike <code>component\_not\_present</code>, the component in question is present, but for whatever reason (e.g. compiler options) the specific code causing the vulnerability is not present in the component.

- vulnerable\_code\_cannot\_be\_controlled\_by\_adversary: The
  vulnerable component is present, and the component contains the
  vulnerable code. However, vulnerable code is used in such a way
  that an attacker cannot mount any anticipated attack.
- vulnerable\_code\_not\_in\_execute\_path: The affected code is not reachable through the execution of the code, including nonanticipated states of the product.

Components that are neither used nor executed by the product.

• inline\_mitigations\_already\_exist: Built-in inline controls or mitigations prevent an adversary from leveraging the vulnerability.

Product IDs (product\_ids) are of value type Products (products\_t). and contain a list of Products the current flag item applies to.

### 3.2.3.6 Vulnerabilities Property - IDs

List of IDs (ids) of value type array with one or more unique ID items of value type object represents a list of unique labels or tracking IDs for the vulnerability (if such information exists).

```
"ids": {
    // ...
    "items": {
        // ...
    }
},
```

Every ID item of value type <code>object</code> with the two mandatory properties System Name (<code>system\_name</code>) and Text (<code>text</code>) contains a single unique label or tracking ID for the vulnerability.

System name (system\_name) of value type string with 1 or more characters indicates the name of the vulnerability tracking or numbering system.

### Example 45:

```
Cisco Bug ID
GitHub Issue
```

Text (text) of value type string with 1 or more characters is unique label or tracking ID for the vulnerability (if such information exists).

#### Example 46:

```
CSCso66472
oasis-tcs/csaf#210
```

General examples may include an identifier from a vulnerability tracking system that is available to customers, such as:

- a Cisco bug ID,
- a GitHub Issue number,
- an ID from a Bugzilla system, or
- an ID from a public vulnerability database such as the X-Force Database.

The ID MAY be a vendor-specific value but is not to be used to publish the CVE tracking numbers (MITRE standard Common Vulnerabilities and Exposures), as these are specified inside the dedicated CVE element.

## 3.2.3.7 Vulnerabilities Property - Involvements

List of involvements (involvements) of value type array with 1 or more items of value type object contains a list of involvements.

```
"involvements": {
    // ...
    "items": {
        // ...
    }
},
```

Every Involvement item of value type <code>object</code> with the 2 mandatory properties Party (<code>party</code>), Status (<code>status</code>) and the 2 optional properties Date of involvement (<code>date</code>) and Summary (<code>summary</code>) is a container that allows the document producers to comment on the level of involvement (or engagement) of themselves (or third parties) in the vulnerability identification, scoping, and remediation process. It can also be used to convey the disclosure timeline. The ordered tuple of the values of <code>party</code> and <code>date</code> (if present) SHALL be unique within <code>involvements</code>.

Date of involvement (date) of value type string with format date-time holds the date and time of the involvement entry.

Party category (party) of value type string and enum defines the category of the involved party. Valid values are:

```
coordinator
discoverer
other
user
vendor
```

These values follow the same definitions as given for the publisher category (cf. section 3.2.1.8.1).

Party status (status) of value type string and enum defines contact status of the involved party. Valid values are:

```
completed
contact_attempted
disputed
in_progress
not_contacted
open
```

Each status is mutually exclusive - only one status is valid for a particular vulnerability at a particular time. As the vulnerability ages, a party's involvement could move from state to state. However, in many cases, a document producer may choose not to issue CSAF documents at each state, or simply omit this element altogether. It is recommended, however, that vendors that issue CSAF documents indicating an open or inprogress involvement SHOULD eventually expect to issue a document containing one of the statuses disputed or completed as the latest one.

The two vulnerability involvement status states, contact\_attempted and not\_contacted are intended for use by document producers other than vendors (such as research or coordinating entities).

The value <code>completed</code> indicates that the party asserts that investigation of the vulnerability is complete. No additional information, fixes, or documentation from the party about the vulnerability should be expected to be released.

The value <code>contact\_attempted</code> indicates that the document producer attempted to contact the party.

The value <code>disputed</code> indicates that the party disputes the vulnerability report in its entirety. This status SHOULD be used when the party believes that a vulnerability report regarding a product is completely inaccurate (that there is no real underlying security vulnerability) or that the technical issue being reported has no security implications.

The value in\_progress indicates that some hotfixes, permanent fixes, mitigations, workarounds, or patches may have been made available by the party, but more information or fixes may be released in the future. The use of this status by a vendor indicates that future information from the vendor about the vulnerability is to be expected.

The value not\_contacted indicates that the document producer has not attempted to make contact with the party.

The value open is the default status. It doesn't indicate anything about the vulnerability remediation effort other than the fact that the party has acknowledged awareness of the vulnerability report. The use of this status by a vendor indicates that future updates from the vendor about the vulnerability are to be expected.

Summary of involvement (summary) of value type string with 1 or more characters contains additional context regarding what is going on.

## 3.2.3.8 Vulnerabilities Property - Notes

Vulnerability notes (notes) of value type Notes Type (notes\_t) holds notes associated with this vulnerability item.

```
"notes": {
    // ...
},
```

# 3.2.3.9 Vulnerabilities Property - Product Status

Product status (product\_status) of value type object with 1 or more properties contains different lists of product\_ids which provide details on the status of the referenced product related to the current vulnerability. The eight defined properties are First affected (first\_affected), First fixed (first\_fixed), Fixed (fixed), Known affected (known\_affected), Known not affected (known\_not\_affected), Last affected (last\_affected), Recommended (recommended), and Under investigation (under\_investigation) are all of value type Products (products\_t).

```
"product_status": {
   // ...
   "properties": {
```

```
"first affected": {
 // ...
},
"first fixed": {
// ...
"fixed": {
// ...
"known affected": {
// ...
},
"known not affected": {
// ...
"last affected": {
// ...
},
"recommended": {
// ...
"under investigation": {
 // ..
```

First affected (first\_affected) of value type Products (products\_t) represents that these are the first versions of the releases known to be affected by the vulnerability.

First fixed (first\_fixed) of value type Products (products\_t) represents that these versions contain the first fix for the vulnerability but may not be the recommended fixed versions.

Fixed (fixed) of value type Products (products\_t) represents that these versions contain a fix for the vulnerability but may not be the recommended fixed versions.

Known affected (known\_affected) of value type Products (products\_t) represents that these versions are known to be affected by the vulnerability. Actions are recommended to remediate or address this vulnerability.

```
This could include for instance learning more about the vulnerability and context, and/or making a risk-based decision to patch or apply defense-in-depth measures. See /vulnerabilities[]/remediations, /vulnerabilities[]/notes and /vulnerabilities[]/threats for more details.
```

Known not affected (known\_not\_affected) of value type Products (products\_t) represents that these versions are known not to be affected by the vulnerability. No remediation is required regarding this vulnerability.

This could for instance be because the code referenced in the vulnerability is not present, not exposed, compensating controls exist, or other factors. See /vulnerabilities[]/threats in category impact for more details.

Last affected (last\_affected) of value type Products (products\_t) represents that these are the last versions in a release train known to be affected by the vulnerability. Subsequently released versions would contain a fix for the vulnerability.

Recommended (recommended) of value type Products (products\_t) represents that these versions have a fix for the vulnerability and are the vendor-recommended versions for fixing the vulnerability.

Under investigation (under\_investigation) of value type Products (products\_t) represents that it is not known yet whether these versions are or are not affected by the vulnerability. However, it is still under investigation - the result will be provided in a later release of the document.

### 3.2.3.10 Vulnerabilities Property - References

Vulnerability references (references) of value type References Type (references\_t) holds a list of references associated with this vulnerability item.

```
"references": {
    // ...
},
```

## 3.2.3.11 Vulnerabilities Property - Release Date

Release date (release\_date) with value type string of format date-time holds the date and time the vulnerability was originally released into the wild.

#### 3.2.3.12 Vulnerabilities Property - Remediations

List of remediations (remediations) of value type array with 1 or more Remediation items of value type object contains a list of remediations.

```
"remediations": {
```

```
// ...
"items": {
    // ...
}
```

Every Remediation item of value type <code>object</code> with the 2 mandatory properties Category (<code>category</code>) and Details (<code>details</code>) specifies details on how to handle (and presumably, fix) a vulnerability. At least one of the optional elements Group IDs (<code>group\_ids</code>) and Product IDs (<code>product\_ids</code>) must be present to state for which products or product groups this remediation is applicable.

In addition, any Remediation MAY expose the six optional properties Date (date), Entitlements (entitlements), Group IDs (group\_ids), Product IDs (product\_ids), Restart required (restart\_required), and URL (url).

```
"properties": {
 "category": {
  // ...
 "date": {
  // ...
 "details": {
 // ...
 },
 "entitlements": {
  // ...
 "group_ids": {
  // ...
 "product ids": {
  // ...
 "restart required": {
  // ...
 "url": {
  // ...
 }
```

#### 3.2.3.12.1 Vulnerabilities Property - Remediations - Category

Category of the remediation (category) of value type string and enum specifies the category which this remediation belongs to. Valid values are:

```
mitigation
no_fix_planned
none_available
vendor_fix
```

The value workaround indicates that the remediation contains information about a configuration or specific deployment scenario that can be used to avoid exposure to the vulnerability. There MAY be none, one, or more workarounds available. This is typically the "first line of defense" against a new vulnerability before a mitigation or vendor fix has been issued or even discovered.

The value mitigation indicates that the remediation contains information about a configuration or deployment scenario that helps to reduce the risk of the vulnerability but that does not resolve the vulnerability on the affected product. Mitigations MAY include using devices or access controls external to the affected product. Mitigations MAY or MAY NOT be issued by the original author of the affected product, and they MAY or MAY NOT be officially sanctioned by the document producer.

The value <code>vendor\_fix</code> indicates that the remediation contains information about an official fix that is issued by the original author of the affected product. Unless otherwise noted, it is assumed that this fix fully resolves the vulnerability. <a href="https://doi.org/resolves.org/">This value contradicts with the categories</a>
<a href="mailto:none\_available\_and\_no\_fix\_planned">none\_available\_and\_no\_fix\_planned</a> for the same product. Therefore, such a combination can't be used in the list of remediations.

The value <code>none\_available</code> indicates that there is currently no fix or other remediation available. The description text in field <code>details</code> SHOULD contain details about why there is no fix or other remediation. The values <code>none\_available</code> and <code>vendor\_fix</code> are mutually exclusive per product.

An issuing party might choose to use this category to announce that a fix is currently developed. It is recommended that this also includes a date when a customer can expect the fix to be ready and distributed.

The value <code>no\_fix\_planned</code> indicates that there is no fix for the vulnerability and it is not planned to provide one at any time. This is often the case when a product has been orphaned, declared end-of-life, or otherwise deprecated. The <code>description\_text</code> in <code>field\_details</code> SHOULD contain details about why there will be no fix issued. The <code>values\_no\_fix\_planned</code> and <code>vendor\_fix</code> are mutually exclusive per product.

#### 3.2.3.12.2 Vulnerabilities Property - Remediations - Date

Date of the remediation (date) of value type string with format date-time contains the date from which the remediation is available.

#### 3.2.3.12.3 Vulnerabilities Property - Remediations - Details

Details of the remediation (details) of value type string with 1 or more characters contains a thorough human-readable discussion of the remediation.

#### 3.2.3.12.4 Vulnerabilities Property - Remediations - Entitlements

List of entitlements (entitlements) of value type array with 1 or more items of type Entitlement of the remediation as string with 1 or more characters contains a list of entitlements.

```
"entitlements": {
    // ...
    "items": {
        // ...
    }
},
```

Every Entitlement of the remediation contains any possible vendor-defined constraints for obtaining fixed software or hardware that fully resolves the vulnerability.

#### 3.2.3.12.5 Vulnerabilities Property - Remediations - Group IDs

Group IDs (group\_ids) are of value type Product Groups (product\_groups\_t). and contain a list of Product Groups the current remediation item applies to.

#### 3.2.3.12.6 Vulnerabilities Property - Remediations - Product IDs

Product IDs (product\_ids) are of value type Products (products\_t). and contain a list of Products the current remediation item applies to.

#### 3.2.3.12.7 Vulnerabilities Property - Remediations - Restart Required

Restart required by remediation (restart\_required) of value type object with the 1 mandatory property Category (category) and the optional property Details (details) provides information on category of restart is required by this remediation to become effective.

```
}
}
},
```

Category of restart (category) of value type string and enum specifies what category of restart is required by this remediation to become effective. Valid values are:

```
connected
dependencies
machine
none
parent
service
system
vulnerable_component
zone
```

#### The values MUST be used as follows:

- none: No restart required.
- vulnerable\_component: Only the vulnerable component (as given by the elements of product\_ids or group\_ids in the current remediation item) needs to be restarted.
- service: The vulnerable component and the background service used by the vulnerable component need to be restarted.
- parent: The vulnerable component and its parent process need to be restarted. This could be the case if the parent process has no build-in way to restart the vulnerable component or process values / context is only given at the start of the parent process.
- dependencies: The vulnerable component and all components which require the vulnerable component to work need to be restarted. This could be the case e.g. for a core service of a software.
- connected: The vulnerable component and all components connected (via network or any type of inter-process communication) to the vulnerable component need to be restarted.
- machine: The machine on which the vulnerable component is installed on needs to be restarted. This is the value which SHOULD be used if an OS needs to be restarted. It is typically the case for OS upgrades.
- zone: The security zone in which the machine resides on which the vulnerable component is installed needs to be restarted. This value might be useful for a remediation if no patch is available. If the malware can be wiped out by restarting the infected machines but the infection spreads fast the controlled shutdown of all machines

- at the same time and restart afterwards can leave one with a clean system.
- system: The whole system which the machine resides on which the vulnerable component is installed needs to be restarted. This MAY include multiple security zones. This could be the case for a major system upgrade in an ICS system or a protocol change.

Additional restart information (details) of value type string with 1 or more characters provides additional information for the restart. This can include details on procedures, scope or impact.

# 3.2.3.12.8 Vulnerabilities Property - Remediations - URL

URL (url) of value type string with format uri contains the URL where to obtain the remediation.

### 3.2.3.13 Vulnerabilities Property - Scores

List of scores (scores) of value type array with 1 or more items of type score holds a list of score objects for the current vulnerability.

Value type of every such Score item is <code>object</code> with the mandatory property <code>products</code> and the optional properties <code>cvss\_v2</code> and <code>cvss\_v3</code> specifies information about (at least one) score of the vulnerability and for which products the given value applies. Each Score item has at least 2 properties.

The property CVSS v2 (cvss\_v2) holding a CVSS v2.0 value abiding by the schema at <a href="https://www.first.org/cvss/cvss-v2.0.json">https://www.first.org/cvss/cvss-v2.0.json</a>.

The property CVSS v3 (cvss\_v3) holding a CVSS v3.x value abiding by one of the schemas at <a href="https://www.first.org/cvss/cvss-v3.0.json">https://www.first.org/cvss/cvss-v3.0.json</a> or <a href="https://www.first.org/cvss/cvss-v3.1.json">https://www.first.org/cvss/cvss-v3.1.json</a>.

Product IDs (products) of value type products\_t with 1 or more items indicates for which products the given scores apply. A score object SHOULD reflect the associated product's status (for example, a fixed product no longer contains a vulnerability and should have a CVSS score of 0, or simply no score listed; the known affected versions of that product can list the vulnerability score as it applies to them).

## 3.2.3.14 Vulnerabilities Property - Threats

List of threats (threats) of value type array with 1 or more items of value type object contains information about a vulnerability that can change with time.

```
"threats": {
    // ...
    "items": {
        // ...
    }
},
```

Every Threat item of value type <code>object</code> with the two mandatory properties Category (<code>category</code>) and Details (<code>details</code>) contains the vulnerability kinetic information. This information can change as the vulnerability ages and new information becomes available. In addition, any Threat item MAY expose the three optional properties Date (<code>date</code>), Group IDs (<code>group\_ids</code>), and Product IDs (<code>product\_ids</code>).

```
"properties": {
    "category": {
        // ...
    }
    "date": {
        // ...
    },
    "details": {
        // ...
    },
    "group_ids": {
        // ...
    },
    "product_ids": {
        // ...
}
```

Category of the threat (category) of value type string and enum categorizes the threat according to the rules of the specification. Valid values are:

```
exploit_status
impact
target_set
```

The value <code>exploit\_status</code> indicates that the <code>details</code> field contains a description of the degree to which an exploit for the vulnerability is known. This knowledge can range from information privately held among a very small group to an issue that has been described to the public at a major conference or is being widely exploited globally. For consistency and simplicity, this section can be a mirror image of the CVSS "Exploitability" metric. However, it can also contain a more contextual status, such as "Weaponized" or "Functioning Code".

The value impact indicates that the details field contains an assessment of the impact on the user or the target set if the vulnerability is successfully exploited or a description why it cannot be exploited. If applicable, for consistency and simplicity, this section can be a textual summary of the three CVSS impact metrics. These metrics measure how a vulnerability detracts from the three core security properties of an information system: Confidentiality, Integrity, and Availability.

The value <code>target\_set</code> indicates that the <code>details</code> field contains a description of the currently known victim population in whatever terms are appropriate. Such terms MAY include: operating system platform, types of products, user segments, and geographic distribution.

Date of the threat (date) of value type string with format date-time contains the date when the assessment was done or the threat appeared.

Details of the threat (details) of value type string with 1 or more characters represents a thorough human-readable discussion of the threat.

Group IDs (group\_ids) are of value type Product Groups (product\_groups\_t). and contain a list of Product Groups the current threat item applies to.

Product IDs (product\_ids) are of value type Products (products\_t). and contain a list of Products the current threat item applies to.

## 3.2.3.15 Vulnerabilities Property - Title

Title (title) has value type string with 1 or more characters and gives the document producer the ability to apply a canonical name or title to the vulnerability.

# 4 Profiles

CSAF documents do not have many required fields as they can be used for different purposes. To ensure a common understanding of which fields are required in a given use case the standard defines profiles. Each subsection describes such a profile by describing necessary content for that specific use case and providing insights into its purpose. The value of <code>/document/category</code> is used to identify a CSAF document's profile. The following rules apply:

- 1. Each CSAF document MUST conform the CSAF Base profile.
- Each profile extends the base profile "CSAF Base" directly or indirect through another profile from the standard - by making additional fields from the standard mandatory. A profile can always add, but never subtract nor overwrite requirements defined in the profile it extends.
- Any optional field from the standard can also be added to a CSAF document which conforms with a profile without breaking conformance with the profile. One and only exempt is when the profile requires not to have a certain set of fields.
- 4. Values of /document/category starting with csaf\_ are reserved for existing, upcoming and future profiles defined in the CSAF standard.
- 5. Values of /document/category that do not match any of the values defined in section 4 of this standard SHALL be validated against the "CSAF Base" profile.
- 6. Local or private profiles MAY exist and tools MAY choose to support them.
- 7. If an official profile and a private profile exists, tools MUST validate against the official one from the standard.

#### 4.1 Profile 1: CSAF Base

This profile defines the default required fields for any CSAF document. Therefore, it is a "catch all" for CSAF documents that do not satisfy any other profile. Furthermore, it is the foundation all other profiles are build on.

A CSAF document SHALL fulfill the following requirements to satisfy the profile "CSAF Base":

- The following elements MUST exist and be valid:
  - o /document/category
  - o /document/csaf version
  - o /document/publisher/category
  - o /document/publisher/name
  - o /document/publisher/namespace
  - o /document/title
  - o /document/tracking/current release date
  - o /document/tracking/id
  - o /document/tracking/initial release date
  - o /document/tracking/revision history[]/date
  - o /document/tracking/revision history[]/number
  - o /document/tracking/revision\_history[]/summary
  - o /document/tracking/status
  - o /document/tracking/version
- The value of /document/category SHALL NOT be equal to any value that is intended to only be used by another profile nor to the (case insensitive) name of any other profile from the standard. This does not differentiate between underscore, dash or whitespace. To explicitly select the use of this profile the value csaf\_base SHOULD be used.

Neither CSAF Security Advisory nor csaf security advisory are valid values for /document/category.

An issuing party might choose to set <code>/document/publisher/name</code> in front of a value that is intended to only be used by another profile to state that the CSAF document does not use the profile associated with this value. In this case, the (case insensitive) string "CSAF" MUST be removed from the value. This SHOULD be done if the issuing party is unable or unwilling to use the value <code>csaf base</code>, e.g. due to legal or cooperate identity reasons.

Both values Example Company Security Advisory and Example Company security\_advisory in /document/category use the profile "CSAF Base". This is important to prepare forward compatibility as later versions of CSAF might add new profiles. Therefore, the values which can be used for the profile "CSAF Base" might change.

# 4.2 Profile 2: Security incident response

This profile SHOULD be used to provide a response to a security breach or incident. This MAY also be used to convey information about an

incident that is unrelated to the issuing party's own products or infrastructure.

Example Company might use a CSAF document satisfying this profile to respond to a security incident at ACME Inc. and the implications on its own products and infrastructure.

A CSAF document SHALL fulfill the following requirements to satisfy the profile "Security incident response":

- The following elements MUST exist and be valid:
  - all elements required by the profile "CSAF Base".
  - o /document/notes with at least one item which has a category of description, details, general or summary

Reasoning: Without at least one note item which contains information about response to the event referred to this doesn't provide any useful information.

o /document/references with at least one item which has a category of external

The intended use for this field is to refer to one or more documents or websites which provides more details about the incident.

• The value of /document/category SHALL be csaf security incident response.

# 4.3 Profile 3: Informational Advisory

This profile SHOULD be used to provide information which are **not related to a vulnerability** but e.g. a misconfiguration.

A CSAF document SHALL fulfill the following requirements to satisfy the profile "Informational Advisory":

- The following elements MUST exist and be valid:
  - all elements required by the profile "CSAF Base".
  - o /document/notes with at least one item which has a category of description, details, general or summary

Reasoning: Without at least one note item which contains information about the "issue" which is the topic of the advisory it is useless.

o /document/references with at least one item which has a category of external

The intended use for this field is to refer to one or more documents or websites which provide more details about the issue or its remediation (if possible). This could be a hardening guide, a manual, best practices or any other helpful information.

- The value of /document/category SHALL be csaf informational advisory.
- The element /vulnerabilities SHALL NOT exist. If there is any
  information that would reside in the element /vulnerabilities the
  CSAF document SHOULD use another profile, e.g. "Security
  Advisory".

If the element /product\_tree exists, a user MUST assume that all products mentioned are affected.

# 4.4 Profile 4: Security Advisory

This profile SHOULD be used to provide information which is related to vulnerabilities and corresponding remediations.

A CSAF document SHALL fulfill the following requirements to satisfy the profile "Security Advisory":

- The following elements MUST exist and be valid:
  - all elements required by the profile "CSAF Base".
  - /product\_tree which lists all products referenced later on in the CSAF document regardless of their state.
  - o /vulnerabilities which lists all vulnerabilities.
  - o /vulnerabilities[]/notes

#### Provides details about the vulnerability.

o /vulnerabilities[]/product\_status

Lists each product's status in regard to the vulnerability.

• The value of /document/category SHALL be csaf\_security\_advisory.

### 4.5 Profile 5: VEX

This profile SHOULD be used to provide information of the "Vulnerability Exploitability eXchange". The main purpose of the VEX format is to state that and why a certain product is, or is not, affected by a vulnerability. See [VEX] for details.

A CSAF document SHALL fulfill the following requirements to satisfy the profile "VEX":

- The following elements MUST exist and be valid:
  - all elements required by the profile "CSAF Base".
  - /product\_tree which lists all products referenced later on in the CSAF document regardless of their state.
  - o /vulnerabilities which lists all vulnerabilities.
  - o at least one of
    - /vulnerabilities[]/product status/fixed
    - /vulnerabilities[]/product\_status/known\_affecte d
    - /vulnerabilities[]/product\_status/known\_not\_aff ected
    - /vulnerabilities[]/product\_status/under\_investigation
  - at least one of
    - /vulnerabilities[]/cve
    - /vulnerabilities[]/ids
  - o /vulnerabilities[]/notes

# Provides details about the vulnerability.

- For each item in
  - o /vulnerabilities[]/product\_status/known\_not\_affected an impact statement SHALL exist as machine readable flag in /vulnerabilities[]/flags or as human readable justification in /vulnerabilities[]/threats. For the latter one, the category value for such a statement MUST be impact and the details field SHALL contain a a description why the vulnerability cannot be exploited.
  - o /vulnerabilities[]/product\_status/known\_affected additional product specific information SHALL be provided in /vulnerabilities[]/remediations as an action statement. Optional, additional information MAY also be provide through

```
/vulnerabilities[]/notes and
/vulnerabilities[]/threats.
```

The use of the categories no\_fix\_planned and none\_available for an action statement is permitted.

- Even though Product status lists Product IDs, Product Group IDs can be used in the remediations and threats object. However, it MUST be ensured that for each Product ID the required information according to its product status as stated in the two points above is available. This implies that all products with the status known\_not\_affected MUST have an impact statement and all products with the status known\_affected MUST have additional product specific information regardless of whether that is referenced through the Product ID or a Product Group ID.
- The value of /document/category SHALL be csaf vex.

# **5 Additional Conventions**

This section provides additional rules for handling CSAF documents.

#### 5.1 Filename

The following rules MUST be applied to determine the filename for the CSAF document:

- 1. The value /document/tracking/id is converted into lower case.
- 2. Any character sequence which is not part of one of the following groups MUST be replaced by a single underscore ( ):
  - Lower case ASCII letters (0x61 0x7A)
  - o digits (0x30 0x39)
  - o special characters: + (0x2B), (0x2D)

The regex [^+\-a-z0-9]+ can be used to find a character sequence which has to be replaced by an underscore. However, it SHALL NOT be applied before completing the first step.

Even though the underscore \_ (0x5F) is a valid character in the filename it is replaced to avoid

situations where the conversion rule might lead to multiple consecutive underscores. As a result, a /document/tracking/id with the value 2022\_#01-A is converted into 2022\_01-a instead of 2022\_01-a.

3. The file extension .json MUST be appended.

### Examples 47:

```
cisco-sa-20190513-secureboot.json
example_company_-_2019-yh3234.json
rhba-2019 0024.json
```

It is currently considered best practice to indicate that a CSAF document is invalid by inserting <code>\_invalid</code> into the filename in front of the file extension.

### Examples 48:

```
cisco-sa-20190513-secureboot_invalid.json
example_company_-_2019-yh3234_invalid.json
rhba-2019 0024 invalid.json
```

# 5.2 Separation in Data Stream

If multiple CSAF documents are transported via a data stream in a sequence without requests inbetween, they MUST be separated by the Record Separator in accordance with [RFC7464].

# 5.3 Sorting

The keys within a CSAF document SHOULD be sorted alphabetically.

# 6 Tests

The following three subsections list a number of tests which all will have a short description and an excerpt of an example which fails the test.

# **6.1 Mandatory Tests**

Mandatory tests MUST NOT fail at a valid CSAF document. A program MUST handle a test failure as an error.

# 6.1.1 Missing Definition of Product ID

For each element of type <code>/\$defs/product\_id\_t</code> which is not inside a Full Product Name (type: <code>full\_product\_name\_t</code>) and therefore reference an element within the <code>product\_tree</code> it MUST be tested that the Full Product Name element with the matching <code>product\_id</code> exists. The same applies for all items of elements of type <code>/\$defs/products\_t</code>.

The relevant paths for this test are:

```
/product_tree/product_groups[]/product_ids[]
/product_tree/relationships[]/product_reference
/product_tree/relationships[]/relates_to_product_reference
/vulnerabilities[]/product_status/first_affected[]
/vulnerabilities[]/product_status/first_fixed[]
/vulnerabilities[]/product_status/fixed[]
/vulnerabilities[]/product_status/known_affected[]
/vulnerabilities[]/product_status/known_not_affected[]
/vulnerabilities[]/product_status/last_affected[]
/vulnerabilities[]/product_status/recommended[]
/vulnerabilities[]/product_status/under_investigation[]
/vulnerabilities[]/remediations[]/product_ids[]
/vulnerabilities[]/scores[]/products[]
/vulnerabilities[]/threats[]/product_ids[]
```

### Example 49 which fails the test:

Neither CSAFPID-9080700 nor CSAFPID-9080701 were defined in the product tree.

# 6.1.2 Multiple Definition of Product ID

For each Product ID (type /\$defs/product\_id\_t) in Full Product Name elements (type: /\$defs/full\_product\_name\_t) it MUST be tested that the product\_id was not already defined within the same document.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product/product_id
/product_tree/full_product_names[]/product_id
/product_tree/relationships[]/full_product_name/product_id
```

### Example 50 which fails the test:

CSAFPID-9080700 was defined twice.

#### 6.1.3 Circular Definition of Product ID

For each new defined Product ID (type  $\$  \\$\defs/\product\_id\_t) in items of relationships ( $\$  \product\_tree/relationships) it MUST be tested that the product\_id does not end up in a circle.

The relevant path for this test is:

```
/product tree/relationships[]/full product name/product id
```

As this can be quite complex a program for large CSAF documents, a program could check first whether a Product ID defined in a relationship item is used as product\_reference or relates\_to\_product\_reference. Only for those which fulfill this condition it is necessary to run the full check following the references.

#### Example 51 which fails the test:

```
"relates_to_product_reference": "CSAFPID-9080701"
}
]
```

CSAFPID-9080701 refers to itself - this is a circular definition.

## 6.1.4 Missing Definition of Product Group ID

For each element of type <code>/\$defs/product\_group\_id\_t</code> which is not inside a Product Group (<code>/product\_tree/product\_groups[]</code>) and therefore reference an element within the <code>product\_tree</code> it MUST be tested that the Product Group element with the matching <code>group\_id</code> exists. The same applies for all items of elements of type <code>/\$defs/product\_groups\_t</code>.

The relevant paths for this test are:

```
/vulnerabilities[]/remediations[]/group_ids
/vulnerabilities[]/threats[]/group_ids
```

### Example 52 which fails the test:

```
"product tree": {
    "full product names": [
        "product id": "CSAFPID-9080700",
        "name": "Product A"
    ]
  },
  "vulnerabilities": [
    {
      "threats": [
          "category": "exploit_status",
          "details": "Reliable exploits integrated in
Metasploit.",
          "group ids": [
            "CSAFGID-1020301"
        }
      ]
```

CSAFGID-1020301 was not defined in the Product Tree.

# 6.1.5 Multiple Definition of Product Group ID

For each Product Group ID (type /\$defs/product\_group\_id\_t) Product Group elements (/product\_tree/product\_groups[]) it MUST be tested that the group id was not already defined within the same document.

The relevant path for this test is:

```
/product_tree/product_groups[]/group_id
```

### Example 53 which fails the test:

```
"product tree": {
  "full product names": [
      "product id": "CSAFPID-9080700",
     "name": "Product A"
      "product id": "CSAFPID-9080701",
      "name": "Product B"
   } ,
      "product id": "CSAFPID-9080702",
     "name": "Product C"
 ],
  "product groups": [
      "group id": "CSAFGID-1020300",
      "product ids": [
       "CSAFPID-9080700",
       "CSAFPID-9080701"
     1
   } ,
     "group id": "CSAFGID-1020300",
      "product ids": [
       "CSAFPID-9080700",
        "CSAFPID-9080702"
 1
```

CSAFGID-1020300 was defined twice.

# **6.1.6 Contradicting Product Status**

For each item in <code>/vulnerabilities</code> it MUST be tested that the same Product ID is not member of contradicting product status groups. The sets formed by the contradicting groups within one vulnerability item MUST be pairwise disjoint.

### Contradiction groups are:

- Affected:
- /vulnerabilities[]/product status/first affected[]
- /vulnerabilities[]/product status/known affected[]
- /vulnerabilities[]/product status/last affected[]
- Not affected:
- /vulnerabilities[]/product status/known not affected[]
- Fixed
- /vulnerabilities[]/product status/first fixed[]
- /vulnerabilities[]/product status/fixed[]
- Under investigation:
- /vulnerabilities[]/product status/under investigation[]

# Note: An issuer might recommend

(/vulnerabilities[]/product\_status/recommended) a product version from any group - also from the affected group, i.e. if it was discovered that fixed versions introduce a more severe vulnerability.

### Example 54 which fails the test:

CSAFPID-9080700 is a member of the two contradicting groups "Affected" and "Not affected".

# 6.1.7 Multiple Scores with same Version per Product

For each item in <code>/vulnerabilities</code> it MUST be tested that the same Product ID is not member of more than one CVSS-Vectors with the same version.

The relevant path for this test is:

```
/vulnerabilities[]/scores[]
```

### Example 55 which fails the test:

```
"product tree": {
    "full_product_names": [
        "product id": "CSAFPID-9080700",
        "name": "Product A"
   1
  "vulnerabilities": [
    {
      "scores": [
          "products": [
           "CSAFPID-9080700"
          "cvss v3": {
            "version": "3.1",
            "vectorString":
"CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:C/C:H/I:H/A:H",
            "baseScore": 10,
            "baseSeverity": "CRITICAL"
        },
          "products": [
            "CSAFPID-9080700"
          "cvss v3": {
            "version": "3.1",
            "vectorString":
"CVSS:3.1/AV:L/AC:L/PR:H/UI:R/S:U/C:H/I:H/A:H",
            "baseScore": 6.5,
            "baseSeverity": "MEDIUM"
        }
     ]
```

Two CVSS v3.1 scores are given for CSAFPID-9080700.

## 6.1.8 Invalid CVSS

It MUST be tested that the given CVSS object is valid according to the referenced schema.

The relevant paths for this test are:

```
/vulnerabilities[]/scores[]/cvss_v2
/vulnerabilities[]/scores[]/cvss_v3
```

### Example 56 which fails the test:

```
"cvss_v3": {
    "version": "3.1",
    "vectorString":
"CVSS:3.1/AV:L/AC:L/PR:H/UI:R/S:U/C:H/I:H/A:H",
    "baseScore": 6.5
}
```

The required element baseSeverity is missing.

A tool MAY add one or more of the missing properties version, baseScore and baseSeverity based on the values given in vectorString as quick fix.

# 6.1.9 Invalid CVSS computation

It MUST be tested that the given CVSS object has the values computed correctly according to the definition.

```
The vectorString SHOULD take precedence.
```

The relevant paths for this test are:

```
/vulnerabilities[]/scores[]/cvss_v2/baseScore
/vulnerabilities[]/scores[]/cvss_v2/temporalScore
/vulnerabilities[]/scores[]/cvss_v2/environmentalScore
/vulnerabilities[]/scores[]/cvss_v3/baseScore
/vulnerabilities[]/scores[]/cvss_v3/baseSeverity
/vulnerabilities[]/scores[]/cvss_v3/temporalScore
/vulnerabilities[]/scores[]/cvss_v3/temporalSeverity
/vulnerabilities[]/scores[]/cvss_v3/environmentalScore
/vulnerabilities[]/scores[]/cvss_v3/environmentalSeverity
```

#### Example 57 which fails the test:

```
"cvss_v3": {
    "version": "3.1",
    "vectorString":
"CVSS:3.1/AV:L/AC:L/PR:H/UI:R/S:U/C:H/I:H/A:H",
    "baseScore": 10.0,
    "baseSeverity": "LOW"
```

Neither baseScore nor baseSeverity has the correct value according to the specification.

A tool MAY set the correct values as computed according to the specification as quick fix.

#### 6.1.10 Inconsistent CVSS

It MUST be tested that the given CVSS properties do not contradict the CVSS vector.

The relevant paths for this test are:

```
/vulnerabilities[]/scores[]/cvss_v2
/vulnerabilities[]/scores[]/cvss_v3
```

#### Example 58 which fails the test:

```
"cvss_v3": {
    "version": "3.1",
    "vectorString":
"CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:H/I:H/A:H",
    "baseScore": 9.8,
    "baseSeverity": "CRITICAL",
    "attackVector": "LOCAL",
    "attackComplexity": "LOW",
    "privilegesRequired": "NONE",
    "userInteraction": "NONE",
    "scope": "CHANGED",
    "confidentialityImpact": "HIGH",
    "integrityImpact": "HIGH",
    "availabilityImpact": "LOW"
}
```

The values in CVSS vector differs from values of the properties attackVector, scope and availabilityImpact.

A tool MAY overwrite contradicting values according to the vectorString as quick fix.

#### 6.1.11 CWE

It MUST be tested that given CWE exists and is valid.

The relevant path for this test is:

```
/vulnerabilities[]/cwe
```

### Example 59 which fails the test:

```
"cwe": {
   "id": "CWE-79",
   "name": "Improper Input Validation"
}
```

```
The CWE-79 exists. However, its name is Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting').
```

# 6.1.12 Language

For each element of type <code>/\$defs/language\_t</code> it MUST be tested that the language code is valid and exists.

The relevant paths for this test are:

```
/document/lang
/document/source_lang
```

### Example 60 which fails the test:

```
"lang": "EZ"
```

EZ is not a valid language. It is the subtag for the region "Eurozone".

For any deprecated subtag, a tool MAY replace it with its preferred value as a quick fix.

#### 6.1.13 PURL

It MUST be tested that given PURL is valid.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product_product_identifica
tion_helper/purl

/product_tree/full_product_names[]/product_identification_helper/
purl

/product_tree/relationships[]/full_product_name/product_identific
ation_helper/purl
```

#### Example 61 which fails the test:

Any valid purl has a name component.

# 6.1.14 Sorted Revision History

It MUST be tested that the value of number of items of the revision history are sorted ascending when the items are sorted ascending by date.

The relevant path for this test is:

```
/document/tracking/revision history
```

### Example 62 which fails the test:

The first item has a higher version number than the second.

#### 6.1.15 Translator

It MUST be tested that /document/source\_lang is present and set if the value translator is used for /document/publisher/category.

The relevant path for this test is:

```
/document/source_lang
```

Example 63 which fails the test:

```
"document": {
    // ...
    "publisher": {
        "category": "translator",
        "name": "CSAF TC Translator",
        "namespace": "https://csaf.io/translator"
    },
    "title": "Mandatory test: Translator (failing example 1)",
    // ...
}
```

The required element source\_lang is missing.

#### 6.1.16 Latest Document Version

It MUST be tested that document version has the same value as the the number in the last item of Revision History when it is sorted ascending by date. Build metadata is ignored in the comparison. Any pre-release part is also ignored if the document status is draft.

The relevant path for this test is:

```
/document/tracking/version
```

## Example 64 which fails the test:

The value of number of the last item after sorting is 2. However, the document version is 1.

#### 6.1.17 Document Status Draft

It MUST be tested that document status is draft if the document version is 0 or 0.y.z or contains the pre-release part.

The relevant path for this test is:

```
/document/tracking/status
```

## Example 65 which fails the test:

```
"tracking": {
    // ...
    "status": "final",
    "version": "0.9.5"
}
```

The /document/tracking/version is 0.9.5 but the document status is final.

# 6.1.18 Released Revision History

It MUST be tested that no item of the revision history has a number of 0 or 0.y.z when the document status is final or interim.

The relevant path for this test is:

```
/document/tracking/revision_history[]/number
```

# Example 66 which fails the test:

The document status is final but the revision history includes an item which has 0 as value for number.

# 6.1.19 Revision History Entries for Pre-release Versions

It MUST be tested that no item of the revision history has a number which includes pre-release information.

The relevant path for this test is:

```
/document/tracking/revision history[]/number
```

## Example 67 which fails the test:

The revision history contains an item which has a number that indicates that this is pre-release.

#### 6.1.20 Non-draft Document Version

It MUST be tested that document version does not contain a pre-release part if the document status is final or interim.

The relevant path for this test is:

```
/document/tracking/version
```

## Example 68 which fails the test:

```
"tracking": {
    // ...
    "status": "interim",
    "version": "1.0.0-alpha"
}
```

The document status is interim but the document version contains the pre-release part -alpha.

# 6.1.21 Missing Item in Revision History

It MUST be tested that items of the revision history do not omit a version number when the items are sorted ascending by date. In the case of

semantic versioning, this applies only to the Major version. It MUST also be tested that the first item in such a sorted list has either the version number 0 or 1 in the case of integer versioning or a Major version of 0 or 1 in the case of semantic versioning.

The relevant path for this test is:

```
/document/tracking/revision history
```

#### Example 69 which fails the test:

The item for version 2 is missing.

# **6.1.22 Multiple Definition in Revision History**

It MUST be tested that items of the revision history do not contain the same version number.

The relevant path for this test is:

```
/document/tracking/revision_history
```

## Example 70 which fails the test:

The revision history contains two items with the version number 1.

## 6.1.23 Multiple Use of Same CVE

It MUST be tested that a CVE is not used in multiple vulnerability items.

The relevant path for this test is:

```
/vulnerabilities[]/cve
```

## Example 71 which fails the test:

The vulnerabilities array contains two items with the same CVE identifier CVE-2017-0145.

## 6.1.24 Multiple Definition in Involvements

It MUST be tested that items of the list of involvements do not contain the same party regardless of its status more than once at any date.

The relevant path for this test is:

```
/vulnerabilities[]/involvements
```

#### Example 72 which fails the test:

```
}
]
}
]
```

The list of involvements contains two items with the same tuple party and date.

## 6.1.25 Multiple Use of Same Hash Algorithm

It MUST be tested that the same hash algorithm is not used multiple times in one item of hashes.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product/product_identifica
tion_helper/hashes[]/file_hashes

/product_tree/full_product_names[]/product_identification_helper/
hashes[]/file_hashes

/product_tree/relationships[]/full_product_name/product_identific
ation_helper/hashes[]/file_hashes
```

## Example 73 which fails the test:

```
"product tree": {
    "full product_names": [
        "name": "Product A",
        "product id": "CSAFPID-9080700",
        "product identification_helper": {
          "hashes": [
              "file hashes": [
                  "algorithm": "sha256",
                  "value":
"026a37919b182ef7c63791e82c9645e2f897a3f0b73c7a6028c7febf62e93838
                },
                  "algorithm": "sha256",
                  "value":
"0a853ce2337f0608489ac596a308dc5b7b19d35a52b10bf31261586ac368b175
              ],
              "filename": "product_a.so"
```

```
}
1
}
```

The hash algorithm sha256 is used two times in one item of hashes.

## 6.1.26 Prohibited Document Category Name

It MUST be tested that the document category is not equal to the (case insensitive) name (without the prefix <code>csaf\_</code>) or value of any other profile than "CSAF Base". Any occurrences of dash, whitespace, and underscore characters are removed from the values on both sides before the match. Also the value MUST NOT start with the reserved prefix <code>csaf\_except</code> if the value is <code>csaf\_base</code>.

This test does only apply for CSAF documents with the profile "CSAF Base". Therefore, it MUST be skipped if the document category matches one of the values defined for the profile other than "CSAF Base".

```
For CSAF 2.0, the test must be skipped for the following values in /document/category:

csaf_base
csaf_security_incident_response
csaf_informational_advisory
csaf_security_advisory
csaf_vex
```

This is the only mandatory test related to the profile "CSAF Base" as the required fields SHALL be checked by validating the JSON schema.

The relevant path for this test is:

```
/document/category
```

#### Examples 74 for currently prohibited values:

```
Csaf_a
Informational Advisory
security-incident-response
Security Advisory
veX
V_eX
```

#### Example 75 which fails the test:

```
"category": "Security_Incident_Response"
```

The value Security\_Incident\_Response is the name of a profile where the space was replaced with underscores.

#### 6.1.27 Profile Tests

This subsubsection structures the tests for the profiles. Not all tests apply for all profiles. Tests SHOULD be skipped if the document category does not match the one given in the test. Each of the following tests SHOULD be treated as they where listed similar to the other tests.

An application MAY group these tests by profiles when providing the additional function to only run one or more selected tests. This results in one virtual test per profile.

#### 6.1.27.1 Document Notes

It MUST be tested that at least one item in /document/notes exists which has a category of description, details, general or summary.

The relevant values for /document/category are:

```
csaf_informational_advisory
csaf_security_incident_response
```

The relevant path for this test is:

```
/document/notes
```

#### Example 76 which fails the test:

The document notes do not contain an item which has a category of description, details, general or summary.

#### 6.1.27.2 Document References

It MUST be tested that at least one item in /document/references exists that has links to an external source.

The relevant values for /document/category are:

```
csaf_informational_advisory
csaf_security_incident_response
```

The relevant path for this test is:

```
/document/references
```

## Example 77 which fails the test:

The document references do not contain any item which has the category <code>external</code>.

#### 6.1.27.3 Vulnerabilities

It MUST be tested that the element /vulnerabilities does not exist.

The relevant value for /document/category is:

```
csaf_informational_advisory
```

The relevant path for this test is:

```
/vulnerabilities
```

#### Example 78 which fails the test:

```
"vulnerabilities": [
    {
      "title": "A vulnerability item that SHALL NOT exist"
    }
]
```

The element /vulnerabilities exists.

A tool MAY change the /document/category to csaf\_base as a quick fix.

#### 6.1.27.4 Product Tree

It MUST be tested that the element /product tree exists.

The relevant values for /document/category are:

```
csaf_security_advisory
csaf_vex
```

The relevant path for this test is:

```
/product tree
```

Example 79 which fails the test:

```
{
   "document": {
        // ...
},
   "vulnerabilities": [
        // ...
]
```

The element /product tree does not exist.

## 6.1.27.5 Vulnerability Notes

For each item in /vulnerabilities it MUST be tested that the element notes exists.

The relevant values for /document/category are:

```
csaf_security_advisory
csaf_vex
```

The relevant path for this test is:

```
/vulnerabilities[]/notes
```

Example 80 which fails the test:

```
"vulnerabilities": [
     {
        "title": "A vulnerability item without a note"
     }
]
```

The vulnerability item has no notes element.

#### 6.1.27.6 Product Status

For each item in /vulnerabilities it MUST be tested that the element product status exists.

The relevant value for /document/category is:

```
csaf_security_advisory
```

The relevant path for this test is:

```
/vulnerabilities[]/product_status
```

## Example 81 which fails the test:

```
"vulnerabilities": [
    {
      "title": "A vulnerability item without a product status"
    }
]
```

The vulnerability item has no product status element.

#### 6.1.27.7 VEX Product Status

For each item in /vulnerabilities it MUST be tested that at least one of the elements fixed, known\_affected, known\_not\_affected, or under\_investigation is present in product\_status.

The relevant value for /document/category is:

```
csaf_vex
```

The relevant paths for this test are:

```
/vulnerabilities[]/product_status/fixed
/vulnerabilities[]/product_status/known_affected
/vulnerabilities[]/product_status/known_not_affected
/vulnerabilities[]/product_status/under_investigation
```

#### Example 82 which fails the test:

```
None of the elements fixed, known_affected, known_not_affected, or under_investigation is present in product status.
```

## 6.1.27.8 Vulnerability ID

For each item in /vulnerabilities it MUST be tested that at least one of the elements cve or ids is present.

The relevant value for /document/category is:

```
csaf_vex
```

The relevant paths for this test are:

```
/vulnerabilities[]/cve
/vulnerabilities[]/ids
```

## Example 83 which fails the test:

```
"vulnerabilities": [
     {
        "title": "A vulnerability item without a CVE or ID"
     }
]
```

None of the elements cve or ids is present.

## 6.1.27.9 Impact Statement

## For each item in

/vulnerabilities[]/product\_status/known\_not\_affected it MUST be tested that a corresponding impact statement exist in /vulnerabilities[]/flags or /vulnerabilities[]/threats. For the latter one, the category value for such a statement MUST be impact.

The relevant value for /document/category is:

```
csaf_vex
```

The relevant path for this test is:

```
/vulnerabilities[]/flags
/vulnerabilities[]/threats
```

#### Example 84 which fails the test:

```
"product_tree": {
```

```
"full product names": [
        "product id": "CSAFPID-9080700",
        "name": "Product A"
        "product id": "CSAFPID-9080701",
        "name": "Product B"
        "product id": "CSAFPID-9080702",
        "name": "Product C"
    ],
    "product_groups": [
        "group_id": "CSAFGID-0001",
        "product ids": [
          "CSAFPID-9080700",
          "CSAFPID-9080701"
    ]
  "vulnerabilities": [
    {
      // ...
      "product status": {
        "known not affected": [
          "CSAFPID-9080700",
          "CSAFPID-9080701",
          "CSAFPID-9080702"
        ]
      },
      "threats": [
          "category": "impact",
"details": "The vulnerable code is not present in these
products.",
          "group ids": [
            "CSAFGID-0001"
```

There is no impact statement for CSAFPID-9080702.

Note: The impact statement for CSAFPID-9080700 and CSAFPID-9080701 is given through CSAFGID-0001.

#### 6.1.27.10 Action Statement

# For each item in /vulnerabilities[]/product\_status/known\_affected it MUST be tested that a corresponding action statement exist in

/vulnerabilities[]/remediations.

The relevant value for /document/category is:

```
csaf vex
```

## The relevant path for this test is:

```
/vulnerabilities[]/remediations
```

## Example 85 which fails the test:

```
"product tree": {
  "full_product_names": [
      "product id": "CSAFPID-9080700",
      "name": "Product A"
    },
      "product id": "CSAFPID-9080701",
      "name": "Product B"
      "product id": "CSAFPID-9080702",
      "name": "Product C"
  ],
  "product groups": [
      "group id": "CSAFGID-0001",
      "product ids": [
        "CSAFPID-9080700",
       "CSAFPID-9080701"
      "summary": "EOL products"
  ]
} ,
"vulnerabilities": [
  {
    "product_status": {
      "known affected": [
        "CSAFPID-9080700",
        "CSAFPID-9080701",
        "CSAFPID-9080702"
      ]
    },
    "remediations": [
        "category": "no fix planned",
```

There is no action statement for CSAFPID-9080702.

Note: The action statement for CSAFPID-9080700 and CSAFPID-9080701 is given through CSAFGID-0001.

#### 6.1.27.11 Vulnerabilities

It MUST be tested that the element /vulnerabilities exists.

The relevant values for /document/category are:

```
csaf_security_advisory
csaf_vex
```

The relevant path for this test is:

```
/vulnerabilities
```

Example 86 which fails the test:

```
{
   "document": {
        // ...
},
   "product_tree": [
        // ...
]
```

The element /vulnerabilities does not exist.

#### 6.1.28 Translation

It MUST be tested that the given source language and document language are not the same.

The relevant path for this test is:

```
/document/lang
/document/source_lang
```

## Example 87 which fails the test:

```
"document": {
    // ...
    "lang": "en-US",
    // ...
    "source_lang": "en-US",
    // ...
}
```

The document language and the source language have the same value en-us.

Note: A translation from en-us to en-gb would pass the test.

A tool MAY remove the source language as quick fix.

#### 6.1.29 Remediation without Product Reference

For each item in /vulnerabilities[]/remediations it MUST be tested that it includes at least one of the elements group ids or product ids.

The relevant path for this test is:

```
/vulnerabilities[]/remediations[]
```

## Example 88 which fails the test:

The given remediation does not specify to which products it should be applied.

A tool MAY add all products of the affected group of this vulnerability to the remediation as quick fix.

# 6.1.30 Mixed Integer and Semantic Versioning

It MUST be tested that all elements of type <code>/\$defs/version\_t</code> follow either integer versioning or semantic versioning homogeneously within the same document.

The relevant paths for this test are:

```
/document/tracking/revision_history[]/number
/document/tracking/version
```

## Example 89 which fails the test:

The document started with semantic versioning (1.0.0) and switched to integer versioning (2).

A tool MAY assign all items their corresponding value according to integer versioning as a quick fix. In such case, the old number SHOULD be stored in legacy version.

# 6.1.31 Version Range in Product Version

For each element of type <code>/\$defs/branches\_t</code> with <code>category</code> of <code>product\_version</code> it MUST be tested that the value of <code>name</code> does not contain a version range.

To implement this test it is deemed sufficient that, when converted to lower case, the value of name does not contain any of the following strings:

```
<
<=
>>
>=
after
all-versions
before
later
prior
versions
```

The relevant paths for this test are:

```
/product tree/branches[](/branches[])*/name
```

Example 90 which fails the test:

The version range prior to 4.2 is given for the branch category product version.

## 6.1.32 Flag without Product Reference

For each item in /vulnerabilities[]/flags it MUST be tested that it includes at least one of the elements group ids or product ids.

The relevant path for this test is:

```
/vulnerabilities[]/flags[]
```

Example 91 which fails the test:

The given flag does not specify to which products it should be applied.

# 6.1.33 Multiple Flags with VEX Justification Codes per Product

For each item in <code>/vulnerabilities[]</code> it MUST be tested that a Product is not member of more than one Flag item with a VEX justification code (see section 3.2.3.5). This takes indirect relations through Product Groups into account.

Additional flags with a different purpose might be provided in later versions of CSAF. Through the explicit reference of VEX justification codes the test is specified to be forward-compatible.

## The relevant path for this test is:

```
/vulnerabilities[]/flags
```

## Example 92 which fails the test:

```
"product tree": {
    "full product names": [
        "product id": "CSAFPID-9080700",
        "name": "Product A"
        "product id": "CSAFPID-9080701",
        "name": "Product B"
      }
    ],
    "product groups": [
        "group id": "CSAFGID-0001",
        "product_ids": [
         "CSAFPID-9080700",
          "CSAFPID-9080701"
     }
   ]
  },
  "vulnerabilities": [
      // ...
      "flags": [
          "label": "component not present",
          "group ids": [
           "CSAFGID-0001"
          ]
        },
          "label":
"vulnerable code_cannot_be_controlled_by_adversary",
          "product ids": [
            "CSAFPID-9080700"
        }
     ],
      // ...
      "product_status": {
       "known_not_affected": [
         "CSAFPID-9080700",
          "CSAFPID-9080701"
     }
```

There are two flags given for for CSAFPID-9080700 - one indirect through CSAFGID-0001 and one direct.

## 6.2 Optional Tests

Optional tests SHOULD NOT fail at a valid CSAF document without a good reason. Failing such a test does not make the CSAF document invalid. These tests may include information about features which are still supported but expected to be deprecated in a future version of CSAF. A program MUST handle a test failure as a warning.

#### 6.2.1 Unused Definition of Product ID

For each Product ID (type /\$defs/product\_id\_t) in Full Product Name elements (type: /\$defs/full\_product\_name\_t) it MUST be tested that the product\_id is referenced somewhere within the same document.

This test SHALL be skipped for CSAF documents conforming the profile "Informational Advisory".

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product/product_id
/product_tree/full_product_names[]/product_id
/product_tree/relationships[]/full_product_name/product_id
```

#### Example 93 which fails the test:

CSAFPID-9080700 was defined but never used.

A tool MAY remove the unused definition as quick fix. However, such quick fix SHALL not be applied if the test was skipped.

# 6.2.2 Missing Remediation

For each Product ID (type /\$defs/product\_id\_t) in the Product Status groups Affected and Under investigation it MUST be tested that a remediation exists.

```
The remediation might be of the category none_available or no fixed planned.
```

The relevant paths for this test are:

```
/vulnerabilities[]/product_status/first_affected[]
/vulnerabilities[]/product_status/known_affected[]
/vulnerabilities[]/product_status/last_affected[]
/vulnerabilities[]/product_status/under_investigation[]
```

#### Example 94 which fails the test:

CSAFPID-9080700 has in Product Status last\_affected but there is no remediation object for this Product ID.

# 6.2.3 Missing Score

For each Product ID (type /\$defs/product\_id\_t) in the Product Status groups Affected it MUST be tested that a score object exists which covers this product.

The relevant paths for this test are:

```
/vulnerabilities[]/product_status/first_affected[]
/vulnerabilities[]/product_status/known_affected[]
/vulnerabilities[]/product_status/last_affected[]
```

## Example 95 which fails the test:

CSAFPID-9080700 has in Product Status first\_affected but there is no score object which covers this Product ID.

## 6.2.4 Build Metadata in Revision History

For each item in revision history it MUST be tested that number does not include build metadata.

The relevant path for this test is:

```
/document/tracking/revision_history[]/number
```

## Example 96 which fails the test:

The revision history contains an item which has a number that includes the build metadata +exp.sha.ac00785.

# **6.2.5 Older Initial Release Date than Revision History**

It MUST be tested that the Initial Release Date is not older than the date of the oldest item in Revision History.

The relevant path for this test is:

```
/document/tracking/initial_release_date
```

Example 97 which fails the test:

The initial release date 2021-04-22T10:00:00.000z is older than 2021-05-06T10:00:00.000z which is the date of the oldest item in Revision History.

## **6.2.6 Older Current Release Date than Revision History**

It MUST be tested that the Current Release Date is not older than the date of the newest item in Revision History.

The relevant path for this test is:

```
/document/tracking/current_release_date
```

#### Example 98 which fails the test:

The current release date 2021-05-06T10:00:00.000z is older than 2021-05-23T1100:00.000z which is the date of the newest item in Revision History.

## **6.2.7 Missing Date in Involvements**

For each item in the list of involvements it MUST be tested that it includes the property date.

The relevant path for this test is:

```
/vulnerabilities[]/involvements
```

## Example 99 which fails the test:

The list of involvements contains an item which does not contain the property date.

# 6.2.8 Use of MD5 as the only Hash Algorithm

It MUST be tested that the hash algorithm md5 is not the only one present.

Since collision attacks exist for MD5 such value should be accompanied by a second cryptographically stronger hash. This will allow users to double check the results.

The relevant paths for this test are:

```
/product_tree/branches[] (/branches[]) */product/product_identifica
tion_helper/hashes[]/file_hashes

/product_tree/full_product_names[]/product_identification_helper/
hashes[]/file_hashes

/product_tree/relationships[]/full_product_name/product_identific
ation_helper/hashes[]/file_hashes
```

## Example 100 which fails the test:

The hash algorithm md5 is used in one item of hashes without being accompanied by a second hash algorithm.

## 6.2.9 Use of SHA-1 as the only Hash Algorithm

It MUST be tested that the hash algorithm shal is not the only one present.

Since collision attacks exist for SHA-1 such value should be accompanied by a second cryptographically stronger hash. This will allow users to double check the results.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product_product_identifica
tion_helper/hashes[]/file_hashes

/product_tree/full_product_names[]/product_identification_helper/
hashes[]/file_hashes

/product_tree/relationships[]/full_product_name/product_identific
ation_helper/hashes[]/file_hashes
```

## Example 101 which fails the test:

The hash algorithm sha1 is used in one item of hashes without being accompanied by a second hash algorithm.

## 6.2.10 Missing TLP label

It MUST be tested that /document/distribution/tlp/label is present and valid.

TLP labels support the machine-readability and automated distribution.

The relevant path for this test is:

```
/document/distribution/tlp/label
```

Example 102 which fails the test:

```
"distribution": {
   "text": "Distribute freely."
}
```

The CSAF document has no TLP label.

# 6.2.11 Missing Canonical URL

It MUST be tested that the CSAF document has a canonical URL.

To implement this test it is deemed sufficient that one item in /document/references fulfills all of the following:

It has the category self.

- The url starts with https://.
- The url ends with the valid filename for the CSAF document according to the rules in section 5.1.

The relevant path for this test is:

```
/document/references
```

## Example 103 which fails the test:

```
"document": {
    // ...
    "references": [
        "category": "self",
        "summary": "A non-canonical URL.",
        "url":
"https://example.com/security/data/csaf/2021/OASIS CSAF TC-
CSAF 2.0-2021-6-2-11-01 1.json"
     }
   ],
    // ...
    "tracking": {
      // ...
      "id": "OASIS CSAF TC-CSAF 2.0-2021-6-2-11-01",
     "version": "1"
    },
    // ...
```

The only element where the <code>category</code> is <code>self</code> has a URL that does not fulfill the requirement of a valid filename for a CSAF document.

# **6.2.12 Missing Document Language**

It MUST be tested that the document language is present and set.

The relevant path for this test is:

```
/document/lang
```

#### Example 104 which fails the test:

```
"document": {
    "category": "csaf_base",
    "csaf_version": "2.0",
    "publisher": {
        // ...
},
```

```
// ...
}
```

The document language is not defined.

## **6.2.13 Sorting**

It MUST be tested that all keys in a CSAF document are sorted alphabetically.

The relevant path for this test is:

Example 105 which fails the test:

```
"document": {
    "csaf_version": "2.0",
    "category": "csaf_base",
    // ...
}
```

The key csaf\_version is not at the right place.

A tool MAY sort the keys as a quick fix.

# 6.2.14 Use of Private Language

For each element of type <code>/\$defs/language\_t</code> it MUST be tested that the language code does not contain subtags reserved for private use.

The relevant paths for this test are:

```
/document/lang
/document/source_lang
```

Example 106 which fails the test:

```
"lang": "qtx"
```

The language code gtx is reserved for private use.

A tool MAY remove such subtag as a quick fix.

# **6.2.15 Use of Default Language**

For each element of type <code>/\$defs/language\_t</code> it MUST be tested that the language code is not <code>i-default</code>.

The relevant paths for this test are:

```
/document/lang
/document/source_lang
```

## Example 107 which fails the test:

```
"lang": "i-default"
```

The language code i-default is used.

A tool MAY remove such element as a quick fix.

## **6.2.16 Missing Product Identification Helper**

For each element of type <code>/\$defs/full\_product\_name\_t</code> it MUST be tested that it includes the property <code>product\_identification\_helper</code>.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product
/product_tree/full_product_names[]
/product_tree/relationships[]/full_product_name
```

## Example 108 which fails the test:

The product CSAFPID-9080700 does not provide any Product Identification Helper at all.

#### 6.2.17 CVE in field IDs

For each item in <code>/vulnerabilities[]/ids</code> it MUST be tested that it is not a CVE ID.

It is sufficient to check, whether the property text matches the regex ^CVE-[0-9] {4}-[0-9] {4,}\$.

The relevant paths for this test are:

```
/vulnerabilities[]/ids[]
```

## Example 109 which fails the test:

The CVE-2021-44228 is listed in an item of the ids array instead under cve.

A tool MAY set such element as value for the <code>cve</code> property as a quick fix, if that didn't exist before. Alternatively, it MAY remove such element as a quick fix.

## **6.2.18 Product Version Range without vers**

For each element of type /\$defs/branches\_t with category of product\_version\_range it MUST be tested that the value of name conforms the vers specification.

To implement this test it is deemed sufficient that the value of name matches the following regex:

```
^vers:[a-z\\.\\-\\+][a-z0-9\\.\\-\\+]*/.+
```

The relevant paths for this test are:

```
/product tree/branches[](/branches[])*/name
```

#### Example 110 which fails the test:

The version range >4.2 is a valid vsl but not valid according to the vers specification.

#### 6.2.19 CVSS for Fixed Products

For each item the fixed products group (first\_fixed and fixed) it MUST be tested that a CVSS applying to this product has an environmental

score of 0. The test SHALL pass if none of the Product IDs listed within product status fixed or first\_fixed is found in products of any item of the scores element.

## The relevant path for this test is:

```
/vulnerabilities[]/product_status/first_fixed[]
/vulnerabilities[]/product_status/fixed[]
```

## Example 111 which fails the test:

```
"product tree": {
    "full product names": [
        "product id": "CSAFPID-9080700",
       "name": "Product A"
   ]
 "vulnerabilities": [
     "product status": {
       "fixed": [
         "CSAFPID-9080700"
      },
      "scores": [
          "cvss v3": {
           "baseScore": 6.5,
           "baseSeverity": "MEDIUM",
           "vectorString":
"CVSS:3.1/AV:L/AC:L/PR:H/UI:R/S:U/C:H/I:H/A:H",
           "version": "3.1"
         },
         "products": [
           "CSAFPID-9080700"
```

Neither the environmentalScore nor the properties modifiedIntegrityImpact, modifiedAvailabilityImpact, modifiedConfidentialityImpact nor the corresponding attributes in the vectorString have been set.

A tool MAY set the properties modifiedIntegrityImpact, modifiedAvailabilityImpact, modifiedConfidentialityImpact accordingly and compute the environmentalScore as quick fix.

## **6.2.20 Additional Properties**

It MUST be tested that there is no additional property in the CSAF document that was not defined in the CSAF JSON schema.

The relevant path for this test is:

To implement this test it is deemed sufficient to validate the CSAF document against a "strict" version schema that sets additionalProperties to false for every key of type object.

## Example 112 which fails the test:

```
"document": {
    "category": "csaf_base",
    "csaf_version": "2.0",
    "custom_property": "any",
    // ...
}
```

The key <code>custom\_property</code> is not defined in the JSON schema.

A tool MAY remove such keys as a quick fix.

#### 6.3 Informative Test

Informative tests provide insights in common mistakes and bad practices. They MAY fail at a valid CSAF document. It is up to the issuing party to decide whether this was an intended behavior and can be ignore or should be treated. These tests MAY include information about recommended usage. A program MUST handle a test failure as a information.

## 6.3.1 Use of CVSS v2 as the only Scoring System

For each item in the list of scores which contains the <code>cvss\_v2</code> object it MUST be tested that is not the only scoring item present. The test SHALL pass if a second scoring object is available.

The relevant path for this test is:

```
/vulnerabilities[]/scores
```

Example 113 which fails the test:

```
"product tree": {
  "full product names": [
      "product id": "CSAFPID-9080700",
      "name": "Product A"
 1
"vulnerabilities": [
 {
    "scores": [
        "products": [
          "CSAFPID-9080700"
        "cvss v2": {
          "version": "2.0",
          "vectorString": "AV:N/AC:L/Au:N/C:C/I:C/A:C",
          "baseScore": 10
      }
   ]
```

There is only a CVSS v2 score given for CSAFPID-9080700.

#### Recommendation:

It is recommended to (also) use the CVSS v3.1.

#### 6.3.2 Use of CVSS v3.0

For each item in the list of scores which contains the cvss\_v3 object it MUST be tested that CVSS v3.0 is not used.

The relevant paths for this test are:

```
/vulnerabilities[]/scores[]/cvss_v3/version
/vulnerabilities[]/scores[]/cvss_v3/vectorString
```

#### Example 114 which fails the test:

```
"cvss_v3": {
    "version": "3.0",
    "vectorString":
"CVSS:3.0/AV:L/AC:L/PR:H/UI:R/S:U/C:H/I:H/A:H",
    "baseScore": 6.5,
    "baseSeverity": "MEDIUM"
}
```

The CVSS v3.0 is used.

Recommendation:

It is recommended to upgrade to CVSS v3.1.

A tool MAY upgrade to CVSS v3.1 as quick fix. However, if such quick fix is supported the tool SHALL also recompute the baseScore and baseSeverity. The same applies for temporalScore and temporalSeverity respectively environmentalScore and environmentalSeverity if the necessary fields for computing their value are present and set.

## 6.3.3 Missing CVE

It MUST be tested that the CVE number is given.

The relevant path for this test is:

```
/vulnerabilities[]/cve
```

Example 115 which fails the test:

```
"vulnerabilities": [
     {
        "title": "BlueKeep"
     }
]
```

The CVE number is not given.

Recommendation:

It is recommended to provide a CVE number to support the users efforts to find more details about a vulnerability and potentially track it through multiple advisories. If no CVE exists for that vulnerability, it is recommended to get one assigned.

# 6.3.4 Missing CWE

It MUST be tested that the CWE is given.

The relevant path for this test is:

```
/vulnerabilities[]/cwe
```

Example 116 which fails the test:

```
"vulnerabilities": [
      {
        "cve": "CVE-2019-0708",
        "title": "BlueKeep"
      }
]
```

The CWE number is not given.

#### 6.3.5 Use of Short Hash

It MUST be tested that the length of the hash value is not shorter than 64 characters.

The relevant paths for this test are:

```
/product_tree/branches[](/branches[])*/product/product_identifica
tion_helper/hashes[]/file_hashes[]/value

/product_tree/full_product_names[]/product_identification_helper/
hashes[]/file_hashes[]/value

/product_tree/relationships[]/full_product_name/product_identific
ation_helper/hashes[]/file_hashes[]/value
```

## Example 117 which fails the test:

The length of the hash value is only 32 characters long.

# 6.3.6 Use of non-self referencing URLs Failing to Resolve

For each URL which is not in the category self it MUST be tested that it resolves with a HTTP status code from the 2xx (Successful) or 3xx (Redirection) class.

This test does not apply for any item in an array of type references\_t with the category self. For details about the HTTP status code classes see [RFC7231].

#### The relevant paths for this test are:

```
/document/acknowledgments[]/urls[]
  /document/aggregate severity/namespace
  /document/distribution/tlp/url
  /document/references[]/url
  /document/publisher/namespace
/product_tree/branches[]/product/product identification helper/sb
om urls[]
/product tree/branches[]/product/product identification helper/x
generic uris[]/namespace
/product tree/branches[]/product/product identification helper/x
generic uris[]/uri
/product tree/branches[](/branches[])*/product/product identifica
tion helper/sbom urls[]
/product tree/branches[](/branches[])*/product/product identifica
tion helper/x generic uris[]/namespace
/product tree/branches[](/branches[])*/product/product identifica
tion helper/x generic uris[]/uri
/product tree/full product names[]/product identification helper/
sbom urls[]
/product tree/full product names[]/product identification helper/
x generic uris[]/namespace
/product tree/full product names[]/product identification helper/
x generic uris[]/uri
/product tree/relationships[]/full product name/product identific
ation helper/sbom urls[]
/product tree/relationships[]/full product name/product identific
ation helper/x generic uris[]/namespace
/product tree/relationships[]/full product name/product identific
ation helper/x generic uris[]/uri
  /vulnerabilities[]/acknowledgments[]/urls[]
  /vulnerabilities[]/references[]/url
/vulnerabilities[]/remediations[]/url
```

## Example 118 which fails the test:

The <code>category</code> is not set and therefore treated as its default value <code>external</code>. A request to that URL does not resolve with a status code from the 2xx (Successful) or 3xx (Redirection) class.

## 6.3.7 Use of self referencing URLs Failing to Resolve

For each item in an array of type references\_t with the category self it MUST be tested that the URL referenced resolves with a HTTP status code less than 400.

This test will most likely fail if the CSAF document is in a status before the initial release. For details about the HTTP status code classes see [RFC7231].

The relevant paths for this test are:

```
/document/references[]/url
/vulnerabilities[]/references[]/url
```

## Example 119 which fails the test:

The category is self and a request to that URL does not resolve with a status code from the 2xx (Successful) or 3xx (Redirection) class.

## 6.3.8 Spell check

If the document language is given it MUST be tested that a spell check for the given language does not find any mistakes. The test SHALL be skipped if not document language is set. It SHALL fail it the given language is not supported. The value of <code>/document/category</code> SHOULD not be tested if the CSAF document does not use the profile "CSAF Base".

#### The relevant paths for this test are:

```
/document/acknowledgments[]/names[]
/document/acknowledgments[]/organization
/document/acknowledgments[]/summary
/document/aggregate severity/text
/document/category
/document/distribution/text
/document/notes[]/audience
/document/notes[]/text
/document/notes[]/title
/document/publisher/issuing authority
/document/publisher/name
/document/references[]/summary
/document/title
/document/tracking/aliases[]
/document/tracking/generator/engine/name
/document/tracking/revision history[]/summary
/product tree/branches[](/branches[])*/name
/product tree/branches[](/branches[])*/product/name
/product tree/branches[]/name
/product tree/branches[]/product/name
/product tree/full product names[]/name
/product tree/product groups[]/summary
/product tree/relationships[]/full product name/name
/vulnerabilities[]/acknowledgments[]/names[]
/vulnerabilities[]/acknowledgments[]/organization
/vulnerabilities[]/acknowledgments[]/summary
/vulnerabilities[]/involvements[]/summary
/vulnerabilities[]/notes[]/audience
/vulnerabilities[]/notes[]/text
/vulnerabilities[]/notes[]/title
/vulnerabilities[]/references[]/summary
/vulnerabilities[]/remediations[]/details
/vulnerabilities[]/remediations[]/entitlements[]
/vulnerabilities[]/remediations[]/restart required/details
/vulnerabilities[]/threats[]/details
/vulnerabilities[]/title
```

#### Example 120 which fails the test:

There is a spelling mistake in Secruity.

## 6.3.9 Branch Categories

For each element of type <code>/\$defs/full\_product\_name\_t</code> in <code>/product\_tree/branches</code> it MUST be tested that ancestor nodes along the path exist which use the following branch categories <code>vendor -> product\_name -> product\_version</code> in that order starting with the Product tree node.

Other branch categories can be used before, after or between the aforementioned branch categories without making the test invalid.

The relevant paths for this test are:

```
/product tree/branches
```

#### Example 121 which fails the test:

The product CSAFPID-9080700 does not have any ancestor with the branch category product version.

## **6.3.10 Usage of Product Version Range**

For each element of type /\$defs/branches\_t it MUST be tested that the category is not product\_version\_range.

It is usually hard decide for machines whether a product version matches a product version ranges. Therefore, it is recommended to avoid version ranges and enumerate versions wherever possible.

The relevant paths for this test are:

```
/product tree/branches[](/branches[])*/category
```

Example 122 which fails the test:

```
"category": "product_version_range",
```

The category product\_version\_range was used.

## **6.3.11 Usage of V as Version Indicator**

For each element of type <code>/\$defs/branches\_t</code> with <code>category</code> of <code>product\_version</code> it MUST be tested that the value of <code>name</code> does not start with <code>v</code> or <code>v</code> before the version.

To implement this test it is deemed sufficient that the value of name does not match the following regex:

```
^[vV][0-9].*$
```

The relevant paths for this test are:

```
/product tree/branches[](/branches[])*/name
```

#### Example 123 which fails the test:

## 7 Distributing CSAF documents

This section lists requirements and roles defined for distributing CSAF documents. The first subsection provides all requirements - the second one the roles. It is mandatory to fulfill the basic role "CSAF publisher". The last section provides specific rules for the process of retrieving CSAF documents.

## 7.1 Requirements

The requirements in this subsection are consecutively numbered to be able to refer to them directly. The order does not give any hint about the importance. Not all requirements have to be fulfilled to conform to this specification - the sets of requirements per conformance clause are defined in section 7.2.

## 7.1.1 Requirement 1: Valid CSAF document

The document is a valid CSAF document (cf. Conformance clause 1).

## 7.1.2 Requirement 2: Filename

The CSAF document has a filename according to the rules in section 5.1.

## 7.1.3 Requirement 3: TLS

The CSAF document is per default retrievable from a website which uses TLS for encryption and server authenticity. The CSAF document MUST not be downloadable from a location which does not encrypt the transport when crossing organizational boundaries to maintain the chain of custody.

## 7.1.4 Requirement 4: TLP:WHITE

If the CSAF document is labeled TLP:WHITE, it MUST be freely accessible.

This does not exclude that such a document is also available in an access protected customer portal. However, there MUST be one copy of the document available for people without access to the portal.

Reasoning: If an advisory is already in the media, an end user should not be forced to collect the pieces of information from a press release but be able to retrieve the CSAF document.

## 7.1.5 Requirement 5: TLP:AMBER and TLP:RED

CSAF documents labeled TLP:AMBER or TLP:RED MUST be access protected. If they are provided via a webserver this SHALL be done under a different path than for TLP:WHITE, TLP:GREEN and unlabeled CSAF documents. TLS client authentication, access tokens or any other automatable authentication method SHALL be used.

An issuing party MAY agree with the recipients to use any kind of secured drop at the recipients' side to avoid putting them on their own website. However, it mMUST be ensured that the documents are still access protected.

## 7.1.6 Requirement 6: No Redirects

Redirects SHOULD NOT be used. If they are inevitable only HTTP Header redirects are allowed.

Reasoning: Clients should not parse the payload for navigation and some, as e.g. curl, do not follow any other kind of redirects.

## 7.1.7 Requirement 7: provider-metadata.json

The party MUST provide a valid provider-metadata.json according to the schema CSAF provider metadata for its own metadata. The publisher object SHOULD match the one used in the CSAF documents of the issuing party but can be set to whatever value a CSAF aggregator SHOULD display over any individual publisher values in the CSAF documents themselves.

This information is used to collect the data for CSAF aggregators, listers and end users. The CSAF provider metadata schema ensures the consistency of the metadata for a CSAF provider across the ecosystem. Other approaches, like extracting the <code>publisher</code> object from CSAF documents, are likely to fail if the object differs between CSAf documents.

It is suggested to put the file provider-metadata.json adjacent to the ROLIE feed documents (requirement 15) or

in the main directory adjacent to the year folders (requirement 14), changes.csv (requirement 13) and the index.txt (requirement 12). Suggested locations to store the provider-metadata.json are:

- <a href="https://www.example.com/.well-known/csaf/provider-metadata.json">https://www.example.com/.well-known/csaf/provider-metadata.json</a>
- <a href="https://domain.tld/security/data/csaf/provider-metadata.json">https://domain.tld/security/data/csaf/provider-metadata.json</a>
- <a href="https://psirt.domain.tld/advisories/csaf/provider-metadata.json">https://psirt.domain.tld/advisories/csaf/provider-metadata.json</a>
- https://domain.tld/security/csaf/provider-metadata.json

#### Examples 124 Minimal with ROLIE document:

```
"canonical url": "https://www.example.com/.well-
known/csaf/provider-metadata.json",
    "distributions": [
        "rolie":{
          "feeds": [
              "summary": "All TLP: WHITE advisories of Example
Company.",
              "tlp label": "WHITE",
              "url": "https://www.example.com/.well-
known/csaf/feed-tlp-white.json"
    "last updated": "2021-07-12T20:20:56.169Z",
    "list on CSAF aggregators": true,
    "metadata version": "2.0",
    "mirror on CSAF aggregators": true,
    "public openpgp keys": [
        "fingerprint":
"8F5F267907B2C4559DB360DB2294BA7D2B2298B1",
        "url": "https://keys.example.net/vks/v1/by-
fingerprint/8F5F267907B2C4559DB360DB2294BA7D2B2298B1"
      }
    ],
    "publisher": {
      "category": "vendor",
      "name": "Example Company ProductCERT",
      "namespace": "https://psirt.example.com"
    "role": "csaf trusted provider"
```

If a CSAF publisher (cf. section 7.2.1) does not provide the provider-metadata.json, an aggregator SHOULD contact the CSAF publisher in question to determine the values for <code>list\_on\_CSAF\_aggregators</code> and <code>mirror\_on\_CSAF\_aggregators</code>. If that is impossible or if the CSAF publisher is unresponsive the following values MUST be used:

```
"list_on_CSAF_aggregators": true,
"mirror on CSAF aggregators": false
```

This prevents that CSAF documents of a CSAF publisher which have been collected by one CSAF aggregator A are mirrored again on a second CSAF aggregator B. Such cascades are prone to outdated information. If the first aggregator A collects the CSAF documents on best effort and B copies the files from A and announces that this is done weekly, one might assume that B's CSAF documents are more recent. However, that is not the case as B's information depends on A.

## 7.1.8 Requirement 8: security.txt

In the security.txt there MUST be at least one field CSAF which points to the provider-metadata.json (requirement 7). If this field indicates a web URI, then it MUST begin with "https://" (as per section 2.7.2 of [RFC7230]). See [SECURITY-TXT] for more details.

The security.txt was published as [RFC9116] in April 2022. At the time of this writing, the security.txt is still a proposed standard. The CSAF field has not been is in the process of being officially added yet.

#### Example 125:

```
CSAF: https://domain.tld/security/data/csaf/provider-
metadata.json
CSAF: https://psirt.domain.tld/advisories/csaf/provider-
metadata.json
CSAF: https://domain.tld/security/csaf/provider-metadata.json
CSAF: https://www.example.com/.well-known/csaf/provider-
metadata.json
```

It is possible to advertise more than one provider-metadata.json by adding multiple CSAF fields, e.g. in case of changes to the organizational structure through merges or acquisitions. However, this SHOULD NOT be done and removed as soon as possible. If one of the URLs fulfills requirement 9, this MUST be used as the first CSAF entry in the security.txt.

## 7.1.9 Requirement 9: Well-known URL for provider-metadata.json

The URL path /.well-known/csaf/provider-metadata.json under the main domain of the issuing authority serves directly the provider-metadata.json according to requirement 7. The use of the scheme "HTTPS" is required. See [RFC8615] for more details.

#### Example 126:

https://www.example.com/.well-known/csaf/provider-metadata.json

## 7.1.10 Requirement 10: DNS path

The DNS record <code>csaf.data.security.domain.tld</code> SHALL resolve as a webserver which serves directly the <code>provider-metadata.json</code> according to requirement 7. The use of the scheme "HTTPS" is required.

## 7.1.11 Requirement 11: One folder per year

The CSAF documents MUST be located within folders named <YYYY> where <YYYY> is the year given in the value of /document/tracking/initial release date.

Examples 127:

```
2021
2020
```

## 7.1.12 Requirement 12: index.txt

The index.txt file within MUST provide a list of all filenames of CSAF documents which are located in the sub-directories with their filenames.

#### Examples 128:

```
2020/example_company_-_2020-yh4711.json
2019/example_company_-_2019-yh3234.json
2018/example_company_-_2018-yh2312.json
```

This can be used to download all CSAF documents.

## 7.1.13 Requirement 13: changes.csv

The file changes.csv MUST contain the filename as well as the value of /document/tracking/current\_release\_date for each CSAF document in

the sub-directories without a heading; lines MUST be sorted by the current release date timestamp with the latest one first.

#### Examples 129:

```
2020/example_company_-_2020-yh4711.json, "2020-07-01T10:09:07Z" 2018/example_company_-_2018-yh2312.json, "2020-07-01T10:09:01Z" 2019/example_company_-_2019-yh3234.json, "2019-04-17T15:08:41Z" 2018/example_company_-_2018-yh2312.json, "2019-03-01T06:01:00Z"
```

## 7.1.14 Requirement 14: Directory listings

Directory listing SHALL be enabled to support manual navigation.

## 7.1.15 Requirement 15: ROLIE feed

Resource-Oriented Lightweight Information Exchange (ROLIE) is a standard to ease discovery of security content. ROLIE is built on top of the Atom Publishing Format and Protocol, with specific requirements that support publishing security content. All CSAF documents with the same TLP level MUST be listed in a single ROLIE feed. At least one of the feeds

- TLP:WHITE
- TLP:GREEN
- unlabeled

MUST exist. Each ROLIE feed document MUST be a JSON file that conforms with [RFC8322].

#### Example 130:

```
"entry": [
          "id": "2020-ESA-001",
          "title": "Example Security Advisory 001",
          "link": [
            {
              "rel": "self",
              "href":
"https://psirt.domain.tld/advisories/csaf/2020/2020-ESA-001.json"
              "rel": "hash",
              "href":
"https://psirt.domain.tld/advisories/csaf/2020/2020-ESA-
001.json.sha512"
              "rel": "signature",
              "href":
"https://psirt.domain.tld/advisories/csaf/2020/2020-ESA-
001.json.asc"
          "published": "2021-01-01T11:00:00.000Z",
          "updated": "2021-01-01T12:00:00.000Z",
          "summary": {
            "content": "Vulnerabilities fixed in ABC 0.0.1"
          "content": {
            "type": "application/json",
            "src":
"https://psirt.domain.tld/advisories/csaf/2020/2020-ESA-001.json"
          "format": {
            "schema": "https://docs.oasis-
open.org/csaf/csaf/v2.0/csaf json schema.json",
            "version": "2.0"
        }
     ]
    }
```

Any existing hash file (requirement 18) MUST be listed in the corresponding entry of the ROLIE feed as an item of the array link having the rel value of hash. Any existing signature file (requirement 19) MUST be listed in the corresponding entry of the ROLIE feed as an item of the array link having the rel value of signature.

## 7.1.16 Requirement 16: ROLIE service document

The use and therefore the existence of ROLIE service document is optional. If it is used, each ROLIE service document MUST be a JSON file that conforms with [RFC8322] and lists the ROLIE feed documents.

#### Example 131:

```
"service": {
      "workspace": [
          "title": "Public CSAF feed",
          "collection": [
            {
              "title": "Example CSAF feed (TLP:WHITE)",
              "href":
"https://psirt.domain.tld/advisories/csaf/feed-tlp-white.json",
              "categories": {
                "category": [
                    "scheme":
"urn:ietf:params:rolie:category:information-type",
                    "term": "csaf"
                ]
              }
            }
        }
      ]
```

## 7.1.17 Requirement 17: ROLIE category document

The use and therefore the existence of ROLIE category document is optional. If it is used, each ROLIE category document MUST be a JSON file that conforms with [RFC8322]. ROLIE categories SHOULD be used for to further dissect CSAF documents by one or more of the following criteria:

- document category
- document language
- values of the branch category within the Product Tree including but not limited to

```
o vendor
o product_family
o product_name
o product version
```

type of product

#### Example 132:

```
CPU
Firewall
Monitor
```

```
PLC
Printer
Router
Sensor
Server
```

· areas or sectors, the products are used in

#### Example 133:

```
Chemical
Commercial
Communication
Critical Manufacturing
Dams
Energy
Healthcare
Water
```

any other categorization useful to the consumers

#### Example 134:

## 7.1.18 Requirement 18: Integrity

All CSAF documents SHALL have at least one hash file computed with a secure cryptographic hash algorithm (e.g. SHA-512 or SHA-3) to ensure their integrity. The filename is constructed by appending the file extension which is given by the algorithm.

MD5 and SHA1 SHOULD NOT be used.

#### Example 135:

```
File name of CSAF document: example_company_-_2019-yh3234.json
File name of SHA-256 hash file: example_company_-_2019-
yh3234.json.sha256
File name of SHA-512 hash file: example_company_-_2019-
yh3234.json.sha512
```

The file content SHALL start with the first byte of the hexadecimal hash value. Any subsequent data (like a filename) which is optional SHALL be separated by at least one space.

#### Example 136:

```
ea6a209dba30a958a78d82309d6cdcc6929fcb81673b3dc4d6b16fac18b6ff38 example company - 2019-yh3234.json
```

If a ROLIE feed exists, each hash file MUST be listed in it as described in requirement 15.

## 7.1.19 Requirement 19: Signatures

All CSAF documents SHALL have at least one OpenPGP signature file which is provided under the same filename which is extended by the appropriate extension. See [RFC4880] for more details.

#### Example 137:

```
File name of CSAF document: example_company_-_2019-yh3234.json File name of signature file: example_company_-_2019-yh3234.json.asc
```

If a ROLIE feed exists, each signature file MUST be listed in it as described in requirement 15.

## 7.1.20 Requirement 20: Public OpenPGP Key

The public part of the OpenPGP key used to sign the CSAF documents MUST be available. It SHOULD also be available at a public key server.

```
For example, the public part of the OpenPGP key could be placed in a directory openpgp adjacent to the providermetadata.json.
```

The OpenPGP key SHOULD have a strength that is considered secure.

Guidance on OpenPGP key strength can be retrieved from technical guidelines of competent authorities.

## 7.1.21 Requirement 21: List of CSAF providers

The file aggregator.json MUST be present and valid according to the JSON schema <u>CSAF aggregator</u>. It MUST not be stored adjacent to a provider-metadata.json.

#### Suggested locations to store the aggregator.json are:

- <a href="https://www.example.com/.well-known/csaf-aggregator/aggregator.json">https://www.example.com/.well-known/csaf-aggregator/aggregator.json</a>
- <a href="https://domain.tld/security/data/aggregator/csaf/aggregator.json">https://domain.tld/security/data/aggregator/csaf/aggregator.json</a>
- <a href="https://psirt.domain.tld/advisories/aggregator/csaf/aggregator.json">https://psirt.domain.tld/advisories/aggregator/csaf/aggregator.json</a>
- https://domain.tld/security/aggregator/csaf/aggregator. ison

The file aggregator.json SHOULD only list the latest version of the metadata of a CSAF provider.

#### Example 138:

```
"aggregator": {
      "category": "lister",
      "contact details": "Example CSAF Lister can be reached at
contact us@lister.example, or via our website at
https://lister.example/security/csaf/aggregator/contact.",
      "issuing authority": "This service is provided as it is. It
is free for everybody.",
      "name": "Example CSAF Lister",
      "namespace": "https://lister.example"
    },
    "aggregator version": "2.0",
    "canonical url": "https://aggregator.example/.well-
known/csaf-aggregator/aggregator.json",
    "csaf_providers": [
        "metadata": {
          "last updated": "2021-07-12T20:20:56.169Z",
          "publisher": {
            "category": "vendor",
            "name": "Example Company ProductCERT",
            "namespace": "https://psirt.example.com"
          "url": "https://www.example.com/.well-
known/csaf/provider-metadata.json"
        }
      },
        "metadata": {
          "last updated": "2021-07-12T21:35:38.000Z",
          "publisher": {
            "category": "coordinator",
            "name": "Example Coordinator CERT",
            "namespace": "https://cert.example"
```

## 7.1.22 Requirement 22: Two disjoint issuing parties

The file aggregator.json (requirement 21) lists at least two disjoint CSAF providers (including CSAF trusted providers) or one CSAF publisher and one CSAF provider (including CSAF trusted provider).

## 7.1.23 Requirement 23: Mirror

The CSAF documents for each issuing party that is mirrored MUST be in a different folder. The folder name SHOULD be retrieved from the name of the issuing authority. This folders MUST be adjacent to the aggregator.json (requirement 21). Each such folder MUST at least:

- provide a provider-metadata.json for the current issuing party.
- provide the ROLIE feed document according to requirement 15 which links to the local copy of the CSAF document.

#### Example 139:

```
"aggregator": {
      "category": "aggregator",
      "contact details": "Example Aggregator can be reached at
contact us@aggregator.example, or via our website at
https://aggregator.example/security/csaf/aggregator/contact.",
      "issuing authority": "This service is provided as it is. It
is free for everybody.",
      "name": "Example Aggregator",
      "namespace": "https://aggregator.example"
    "aggregator version": "2.0",
    "canonical url": "https://aggregator.example/.well-
known/csaf-aggregator/aggregator.json",
    "csaf providers": [
        "metadata": {
          "last updated": "2021-07-12T20:20:56.169Z",
          "publisher": {
            "category": "vendor",
            "name": "Example Company ProductCERT",
            "namespace": "https://psirt.example.com"
          "url": "https://www.example.com/.well-
known/csaf/provider-metadata.json"
```

```
"mirrors": [
          "https://aggregator.example/.well-known/csaf-
aggregator/Example Company ProductCERT/provider-metadata.json"
      },
        "metadata": {
          "last updated": "2021-07-12T21:35:38.000Z",
          "publisher": {
            "category": "coordinator",
            "name": "Example Coordinator CERT",
            "namespace": "https://cert.example"
          "url": "https://cert.example/advisories/csaf/provider-
metadata.json"
        },
        "mirrors": [
         "https://aggregator.example/.well-known/csaf-
aggregator/Example Coordinator CERT/provider-metadata.json"
    ],
    "last updated": "2021-07-12T22:35:38.978Z"
```

#### 7.2 Roles

This subsection groups the requirements from the previous subsection into named sets which target the roles with the same name. This allows end users to request their suppliers to fulfill a certain set of requirements. A supplier can use roles for advertising and marketing.

The roles "CSAF publisher", "CSAF provider", and "CSAF trusted provider" are intended directly for issuing parties and form the first group. The second group consists of the roles "CSAF lister" and "CSAF aggregator". They collect data from the aforementioned issuing parties of the first group and provide them in a single place to aid in automation. Parties of the second group can also issue their own advisories. However, they MUST follow the rules for the first group for that.

Both, a CSAF lister and a CSAF aggregator, decide based on their own rules which issuing parties to list respectively to mirror. However, an issuing party MAY apply to be listed or mirrored.

Issuing parties MUST indicate through the value false in <code>list\_on\_CSAF\_aggregators</code> if they do not want to be listed. Issuing parties MUST indicate through the value <code>false</code> in <code>mirror\_on\_CSAF\_aggregators</code> if they do not want to be mirrored.

The values are independent. The combination of the value <code>false</code> in <code>list\_on\_CSAF\_aggregators</code> and <code>true</code> in <code>mirror\_on\_CSAF\_aggregators</code> implies that the issuing party does not want to be listed without having the CSAF documents mirrored. Therefore, a CSAF aggregator can list that issuing party if it mirrors the files.

## 7.2.1 Role: CSAF publisher

A distributing party satisfies the "CSAF publisher" role if the party:

- satisfies the requirements 1 to 4 in section 7.1.
- distributes only CSAF documents on behalf of its own.

## 7.2.2 Role: CSAF provider

A CSAF publisher satisfies the "CSAF provider" role if the party fulfills the following three groups of requirements:

Firstly, the party:

- satisfies the "CSAF publisher" role profile.
- additionally satisfies the requirements 5 to 7 in section 7.1.

Secondly, the party:

satisfies at least one of the requirements 8 to 10 in section 7.1.

Thirdly, the party:

• satisfies the requirements 11 to 14 in section 7.1 or requirements 15 to 17 in section 7.1.

If the party uses the ROLIE-based distribution, it MUST also satisfy requirements 15 to 17. If it uses the directory-based distribution, it MUST also satisfy requirements 11 to 14.

## 7.2.3 Role: CSAF trusted provider

A CSAF provider satisfies the "CSAF trusted provider" role if the party:

- satisfies the "CSAF provider" role profile.
- additionally satisfies the requirements 18 to 20 in section 7.1.

#### 7.2.4 Role: CSAF lister

A distributing party satisfies the "CSAF lister" role if the party:

- satisfies the requirements 6, 21 and 22 in section 7.1.
- uses the value lister for /aggregator/category.
- does not list any mirror pointing to a domain under its own control.

The purpose of this role is to provide a list of URLs where to find CSAF documents. It is not assumed that the list will be complete.

## 7.2.5 Role: CSAF aggregator

A distributing party satisfies the "CSAF aggregator" role if the party:

- satisfies the requirements <u>1 to 6 and 21 to 23 in section 7.1.</u>
- uses the value aggregator for /aggregator/category.
- lists a mirror for at least two disjoint issuing parties pointing to a domain under its own control.
- links the public part of the OpenPGP key used to sign CSAF documents for each mirrored issuing party in the corresponding provider-metadata.json.
- provides for each CSAF document that is mirrored a signature (requirement 19) and a hash (requirement 18). Both SHALL be listed in the ROLIE feed. If the issuing party provides those files for a CSAF document, they SHOULD be copied as well. If the issuing party does not provide those files, they SHALL be created by the CSAF aggregator. Such a signature does not imply any liability of CSAF aggregator for the content of the corresponding CSAF document. It just confirms that the CSAF document provided has not been modified after being downloaded from the issuing party. A CSAF aggregator MAY add additional signatures and hashes for a CSAF document.

Additionally, a CSAF aggregator MAY list one or more issuing parties that it does not mirror.

The purpose of this role is to provide a single point where CSAF documents can be retrieved. Multiple CSAF aggregators are expected to exist around the world. None of them is required to mirror all CSAF documents of all issuing parties. CSAF aggregators can be provided for free or as a paid service. To aid in automation, CSAF aggregators MAY mirror CSAF documents from CSAF publishers. Regarding the terms of use they SHOULD consult with the issuing party.

To aid in automation, CSAF aggregators MAY mirror CSAF documents from CSAF publishers. Regarding the terms of use they SHOULD consult with the issuing party. The purpose of this option is that a consumer can retrieve CSAF documents from a CSAF publisher as if this issuing party would be a CSAF trusted provider. To reach that goal, a CSAF aggregator collects the CSAF documents from the CSAF publisher and mirrors it. The collection process MAY be automated or manual. CSAF aggregators announce the collection interval through the field update interval in the corresponding item of the CSAF publishers list (csaf publishers) in their aggregator. json. To minimize the implementation efforts and process overhead, a CSAF aggregator MAY upload the CSAF documents of a CSAF publisher into an internal instance of a CSAF provider software. Such construct is called "CSAF proxy provider" as it can be mirrored by the CSAF aggregator software. However, such a CSAF proxy provider MUST NOT be accessible from anyone else than the CSAF aggregator itself. Otherwise, that would violate the second rule of section 7.2.1. Therefore, it is recommended to expose the CSAF proxy provider only on localhost and allow the access only from the CSAF aggregator software.

## 7.3 Retrieving rules

The retrieving process executes in two phases: Finding the provider-metadata.json (requirement 7 in section 7.1) and retrieving CSAF documents.

A retrieving party SHOULD do the first phase every time. Based on the setup and use case of the retrieving party it MAY choose to do it less often, e.g. only when adding new or updating distributing parties. In that case, it SHOULD to check regularly whether new information is available.

## 7.3.1 Finding provider-metadata.json

**Direct locating**: The following process SHOULD be used to determine the location of a provider-metadata.json (requirement 7 in section 7.1) based on the main domain of the issuing party:

- 1. Checking the Well-known URL (requirement 9 in section 7.1)
- 2. Checking the security.txt (requirement 8 in section 7.1)
- 3. Checking the DNS path (requirement 10 in section 7.1)

4. Select one or more provider-metadata.json to use.

The term "checking" used in the listing above SHOULD be understood as follows: Try to access the resource and test whether the response provides an expected result as defined in the requirement in section 7.1. If that is the case, the step was successful - otherwise not.

The first two steps SHOULD be performed in all cases as the security.txt MAY advertise additional provider-metadata.json. The third step SHOULD only be performed if the first two did not result in the location of at least one provider-metadata.json.

Indirect locating: A retrieving party MAY choose to determine the location of a provider-metadata.json by retrieving its location from an aggregator.json (requirement 21 in section 7.1) of a CSAF lister or CSAF aggregator.

## 7.3.2 Retrieving CSAF documents

Given a provider-metadata.json, the following process SHOULD be used to retrieve CSAF documents:

- 1. Parse the provider-metadata.json to determine whether the directory-based (requirements 11 to 14 in section 7.1) or ROLIE-based distribution (requirements 15 to 17 in section 7.1) is used. If both are present, the ROLIE information SHOULD be preferred.
- 2. For any CSAF trusted provider, the hash and signature files (requirements 18 to 19 in section 7.1) SHOULD be retrieved together with the CSAF document. They MUST be checked before further processing the CSAF document.
- 3. Test the CSAF document against the schema.
- 4. Execute mandatory tests on the CSAF document.

# 8 Safety, Security, and Data Protection Considerations

CSAF documents are based on JSON, thus the security considerations of [RFC8259] apply and are repeated here as service for the reader:

Generally, there are security issues with scripting languages. JSON is a subset of JavaScript but excludes assignment and invocation.

Since JSON's syntax is borrowed from JavaScript, it is possible to use that language's <code>eval()</code> function to parse most JSON texts (but not all; certain characters such as <code>u+2028 LINE SEPARATOR</code> and <code>u+2029 PARAGRAPH SEPARATOR</code> are legal in JSON but not JavaScript). This generally constitutes an unacceptable security risk, since the text could contain executable code along with data declarations. The same consideration applies to the use of eval()-like functions in any other programming language in which JSON texts conform to that language's syntax.

In addition, CSAF documents may be rendered by consumers in various human-readable formats like HTML or PDF. Thus, for security reasons, CSAF producers and consumers SHALL adhere to the following:

- CSAF producers SHOULD NOT emit messages that contain HTML, even though all variants of Markdown permit it. To include HTML, source code, or any other content that may be interpreted or executed by a CSAF consumer, e.g. to provide a proof-of-concept, the issuing party SHALL use Markdown's fenced code blocks or inline code option.
- Deeply nested markup can cause a stack overflow in the Markdown processor [GFMENG]. To reduce this risk, CSAF consumers SHALL use a Markdown processor that is hardened against such attacks. Note: One example is the GitHub fork of the cmark Markdown processor [GFMCMARK].
- To reduce the risk posed by possibly malicious CSAF files that do contain arbitrary HTML (including, for example, javascript: links), CSAF consumers SHALL either disable HTML processing (for example, by using an option such as the --safe option in the cmark Markdown processor) or run the resulting HTML through an HTML sanitizer. CSAF consumers that are not prepared to deal with the security implications of formatted messages SHALL NOT attempt to render them and SHALL instead fall back to the corresponding plain text messages. As also any other programming code can be contained within a CSAF document, CSAF consumers SHALL ensure that none of the values of a CSAF document is run as code. Moreover, it SHALL be treated as unsafe (user) input.

Additional, supporting mitigation measures like retrieving only CSAF documents from trusted sources and check their integrity and signature before parsing the document SHOULD be in place to reduce the risk further.

## 9 Conformance

In the only subsection of this section, the conformance targets and clauses are listed. The clauses, matching the targets one to one, are listed in separate sub-subsections of the targets listing subsection.

#### Informative Comments:

The order in which targets, and their corresponding clauses appear is somewhat arbitrary as there is no natural order on such diverse roles participating in the document exchanging ecosystem.

Except for the target **CSAF document**, all other 16 targets span a taxonomy of the complex CSAF ecosystems existing in and between diverse security advisory generating, sharing, and consuming communities.

In any case, there are no capabilities organized in increasing quality levels for targets because the security advisory sharing communities follow the chain link model. Instead, a single minimum capability level for every target is given to maintain important goals of providing a common framework for security advisories:

- Fast production, sharing, and actionable consumption of security advisories
- Consistent end to end automation through collaborating actors
- Clear baseline across the communities per this specification
- Additional per-community cooperative extensions which may flow back into future updates of this specification

## 9.1 Conformance Targets

This document defines requirements for the CSAF file format and for certain software components that interact with it. The entities ("conformance targets") for which this document defines requirements are:

- **CSAF document**: A security advisory text document in the format defined by this document.
- CSAF producer: A program which emits output in the CSAF format.

- CSAF direct producer: An analysis tool which acts as a CSAF producer.
- CSAF converter: A CSAF producer that transforms the output of an analysis tool from its native output format into the CSAF format.
- **CVRF CSAF converter**: A CSAF producer which takes a CVRF document as input and converts it into a valid CSAF document.
- CSAF content management system: A program that is able to create, review and manage CSAF documents and is able to preview their details as required by CSAF viewer.
- CSAF post-processor: A CSAF producer that transforms an existing CSAF document into a new CSAF document, for example, by removing or redacting elements according to sharing policies.
- CSAF modifier: A CSAF post-processor which takes a CSAF document as input and modifies the structure or values of properties. The output is a valid CSAF document.
- CSAF translator: A CSAF post-processor which takes a CSAF document as input and translates values of properties into another language. The output is a valid CSAF document.
- CSAF consumer: A program that reads and interprets a CSAF document.
- CSAF viewer: A CSAF consumer that reads a CSAF document, displays a list of the results it contains, and allows an end user to view each result in the context of the artifact in which it occurs.
- CSAF management system: A program that is able to manage CSAF documents and is able to display their details as required by CSAF viewer.
- CSAF asset matching system: A program that connects to or is an asset database and is able to manage CSAF documents as required by CSAF management system as well as matching them to assets of the asset database.
- CSAF basic validator: A program that reads a document and checks it against the JSON schema and performs mandatory tests.
- CSAF extended validator: A CSAF basic validator that additionally performs optional tests.
- **CSAF full validator**: A CSAF extended validator that additionally performs informative tests.
- CSAF SBOM matching system: A program that connects to or is an SBOM database and is able to manage CSAF documents as required by CSAF management system as well as matching them to SBOM components of the SBOM database.

#### 9.1.1 Conformance Clause 1: CSAF document

A text file or data stream satisfies the "CSAF document" conformance profile if it:

- conforms to the syntax and semantics defined in section 3.
- satisfies at least one profile defined in section 4.
- does not fail any mandatory test defined in section 6.1.

## 9.1.2 Conformance Clause 2: CSAF producer

A program satisfies the "CSAF producer" conformance profile if the program:

- produces output in the CSAF format, according to the conformance profile "CSAF document".
- satisfies those normative requirements in section 3 and 8 that are designated as applying to CSAF producers.

## 9.1.3 Conformance Clause 3: CSAF direct producer

An analysis tool satisfies the "CSAF direct producer" conformance profile if the analysis tool:

- satisfies the "CSAF producer" conformance profile.
- additionally satisfies those normative requirements in section 3 that are designated as applying to "direct producers" or to "analysis tools".
- does not emit any objects, properties, or values which, according to section 3, are intended to be produced only by converters.

#### 9.1.4 Conformance Clause 4: CSAF converter

A converter satisfies the "CSAF converter" conformance profile if the converter:

- satisfies the "CSAF producer" conformance profile.
- additionally satisfies those normative requirements in section 3 that are designated as applying to converters.
- does not emit any objects, properties, or values which, according to section 3, are intended to be produced only by direct producers.

#### 9.1.5 Conformance Clause 5: CVRF CSAF converter

A program satisfies the "CVRF CSAF converter" conformance profile if the program fulfills the following two groups of requirements:

#### Firstly, the program:

- satisfies the "CSAF producer" conformance profile.
- takes only CVRF documents as input.
- additionally satisfies the normative requirements given below.

#### Secondly, the program fulfills the following for all items of:

- type /\$defs/branches\_t: If any prod:Branch instance has the type
   Realm or Resource, the CVRF CSAF converter replaces those with
   the category product\_name. In addition, the converter outputs a
   warning that that those types do not exist in CSAF and have been
   replaced with the category product\_name.
- type /\$defs/version\_t: If any element doesn't match the semantic versioning, replace the all elements of type /\$defs/version\_t with the corresponding integer version. For that, CVRF CSAF converter sorts the items of /document/tracking/revision\_history by number ascending according to the rules of CVRF. Then, it replaces the value of number with the index number in the array (starting with 1). The value of /document/tracking/version is replaced by value of number of the corresponding revision item. The match MUST be calculated by the original values used in the CVRF document. If this conversion was applied, for each Revision the original value of cvrf:Number MUST be set as legacy\_version in the converted document.
- /document/acknowledgments[]/organization and /vulnerabilities[]/acknowledgments[]/organization: If more than one cvrf:Organization instance is given, the CVRF CSAF converter converts the first one into the organization. In addition, the converter outputs a warning that information might be lost during conversion of document or vulnerability acknowledgment.
- /document/lang: If one or more CVRF element containing an xml:lang attribute exist and contain the exact same value, the CVRF CSAF converter converts this value into lang. If the values of xml:lang attributes are not equal, the CVRF CSAF converter outputs a warning that the language could not be determined and possibly a document with multiple languages was produced. In addition, it SHOULD also present all values of xml:lang attributes as a set in the warning.
- /document/publisher/name and /document/publisher/namespace:
   Sets the value as given in the configuration of the program or the corresponding argument the program was invoked with. If values from both sources are present, the program should prefer the latter one. The program SHALL NOT use hard-coded values.

- /document/tracking/id: If the element cvrf:ID contains any line breaks or leading or trailing white space, the CVRF CSAF converter removes those characters. In addition, the converter outputs a warning that the ID was changed.
- /product\_tree/relationships[]: If more than one prod:FullProductName instance is given, the CVRF CSAF converter converts the first one into the full\_product\_name. In addition, the converter outputs a warning that information might be lost during conversion of product relationships.
- /vulnerabilities[]/cwe: If more than one vuln:CWE instance is given, the CVRF CSAF converter converts the first one into cwe. In addition, the converter outputs a warning that information might be lost during conversion of the CWE.
- /vulnerabilities[]/ids: If a vuln:ID element is given, the CVRF CSAF converter converts it into the first item of the ids array.
- /vulnerabilities[]/remediation[]: If no product\_ids or group\_ids is given, the CVRF CSAF converter appends all Product IDs which are listed under ../product\_status in the arrays known\_affected, first\_affected and last\_affected into product\_ids. If none of these arrays exist, the CVRF CSAF converter outputs an error that no matching Product ID was found for this remediation element.
- /vulnerabilities[]/scores[]:
  - For any CVSS v3 element, the CVRF CSAF converter MUST compute the baseSeverity from the baseScore according to the rules of the applicable CVSS standard.
  - o If no product\_id is given, the CVRF CSAF converter appends all Product IDs which are listed under ../product\_status in the arrays known\_affected, first\_affected and last\_affected. If none of these arrays exist, the CVRF CSAF converter outputs an error that no matching Product ID was found for this score element.
  - If a vectorString is missing, the CVRF CSAF converter outputs an error that the CVSS element could not be converted as the CVSS vector was missing. A CVRF CSAF converter MAY offer a configuration option to delete such elements.
  - If there are CVSS v3.0 and CVSS v3.1 Vectors available for the same product, the CVRF CSAF converter discards the CVSS v3.0 information and provide in CSAF only the CVSS v3.1 information.
  - To determine, which minor version of CVSS v3 is used, the CVRF CSAF converter uses the following steps:

1. Retrieve the CVSS version from the CVSS vector, if present.

#### Example 140:

```
CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:N/I:N/A:H => 3.1
```

 Retrieve the CVSS version from the CVSS element's namespace, if present. The CVRF CSAF converter outputs a warning that this value was guessed from the element's namespace.

#### Example 141:

```
xmlns:cvssv31="https://www.first.org/cvss/cvss-
v3.1.xsd"
    <!-- -->
    <cvssv31:ScoreSetV3>
```

is handled the same as

#### Example 142:

```
<ScoreSetV3
xmlns="https://www.first.org/cvss/cvss-
v3.1.xsd">
```

3. Retrieve the CVSS version from the CVSS namespace given in the root element, if present. The CVRF CSAF converter outputs a warning that this value was guessed from the global namespace. If more than one CVSS namespace is present and the element is not clearly defined via the namespace, this step MUST be skipped without a decision.

#### Example 143:

```
xmlns:cvssv3="https://www.first.org/cvss/cvss-
v3.0.xsd" => 3.0
```

4. Retrieve the CVSS version from a config value, which defaults to 3.0. (As CSAF CVRF v1.2 predates CVSS v3.1.) The CVRF CSAF converter outputs a warning that this value was taken from the config.

# 9.1.6 Conformance Clause 6: CSAF content management system

A CSAF content management system satisfies the "CSAF content management system" conformance profile if the content management system:

- satisfies the "CSAF producer" conformance profile.
- satisfies the "CSAF viewer" conformance profile.
- provides at least the following management functions:
  - create new CSAF documents
  - prefill CSAF documents based on values given in the configuration (see below)
  - o create a new version of an existing CSAF document
  - checkout old versions of a CSAF document
  - show all differences between versions of a CSAF document
  - list all CSAF documents within the system
  - delete CSAF documents from the system
  - review CSAF documents in the system
  - approve CSAF documents
  - search for CSAF documents by values of required fields at document-level or their children within the system
  - search for CSAF documents by values of cve within the system
  - search for CSAF documents based on properties of product\_tree
  - filter on all properties which it is required to search for
  - export of CSAF documents
  - show an audit log for each CSAF document
  - identify the latest version of CSAF documents with the same /document/tracking/id
  - suggest a /document/tracking/id based on the given configuration.
  - track of the version of CSAF documents automatically and increment according to the versioning scheme (see also subsections of 3.1.11) selected in the configuration.
  - check that the document version is set correctly based on the changes in comparison to the previous version (see also subsections of 3.1.11).
  - suggest to use the document status interim if a CSAF document is updated more frequent than the given threshold in the configuration (default: 3 weeks)
  - suggest to publish a new version of the CSAF document with the document status final if the document status was interim and no new release has be done during the the given threshold in the configuration (default: 6 weeks)

- o support the following workflows:
  - "New Advisory": create a new advisory, request a review, provide review comments or approve it, resolve review comments; if the review approved it, the approval for publication can be requested; if granted the document status changes to final (or interim based on the selection in approval or configuration) and the advisory is provided for publication (manual or time-based)
  - "Update Advisory": open an existing advisory, create new revision & change content, request a review, provide review comments or approve it, resolve review comments; if the review approved it, the approval for publication can be requested; if granted the document status changes to final (or interim based on the selection in approval or configuration) and the advisory is provided for publication (manual or time-based)
- offers both: publication immediately or at a given date/time.
- automates handling of date/time and version.
- provides an API to retrieve all CSAF documents which are currently in the status published.
- optionally provides an API to import or create new advisories from outside systems (e.g. bug tracker, CVD platform,...).
- provides a user management and support at least the following roles:
  - Registered: Able to see all published CSAF documents (but only in the published version).
  - Author: inherits Registered permissions and also can Create and Edit Own (mostly used for automated creation, see above)
  - Editor: inherits Author permissions and can Edit (mostly used in PSIRT)
  - Publisher: inherits Editor permissions and can Change state and Review any (mostly used as HEAD of PSIRT or team lead)
  - Reviewer: inherits Registered permissions and can Review advisories assigned to him (might be a subject matter expert or management)
  - Manager: inherits Publisher permissions and can Delete;
     User management up to Publisher
  - Administrator: inherits Manager permissions and can Change the configuration
- may use groups to support client separation (multitenancy) and therefore restrict the roles to actions within their group. In this case,

there MUST be a *Group configurator* which is able to change the values which are used to prefill fields in new advisories for that group. He might also do the user management for the group up to a configured level.

- prefills the following fields in new CSAF documents with the values given below or based on the templates from configuration:
  - o /document/csaf version with the value 2.0
  - o /document/language
  - o /document/notes
    - legal\_disclaimer (Terms of use from the configuration)
    - general (General Security recommendations from the configuration)
  - o /document/tracking/current\_release\_date with the current
     date
  - o /document/tracking/generator and children
  - o /document/tracking/initial\_release\_date with the current
     date
  - o /document/tracking/revision\_history
    - date with the current date
    - number (based on the templates according to the versioning scheme configured)
    - summary (based on the templates from configuration; default: "Initial version.")
  - o /document/tracking/status **With** draft
  - o /document/tracking/version with the value of number the latest /document/tracking/revision history[] element
  - o /document/publisher and children
  - o /document/category (based on the templates from configuration)
- When updating an existing CSAF document:
  - prefills all fields which have be present in the existing CSAF document
  - o adds a new item in
    /document/tracking/revision history[]
  - updates the following fields with the values given below or based on the templates from configuration:
    - /document/csaf version with the value 2.0
    - /document/language
    - /document/notes
      - legal\_disclaimer (Terms of use from the configuration)

- general (General Security recommendations from the configuration)
- /document/tracking/current\_release\_date with the current date
- /document/tracking/generator and children
- the new item in

/document/tracking/revision history[]

- date with the current date
- number (based on the templates according to the versioning scheme configured)
- /document/tracking/status With draft
- /document/tracking/version with the value of number the latest /document/tracking/revision\_history[] element
- /document/publisher and children

## 9.1.7 Conformance Clause 7: CSAF post-processor

A CSAF post-processor satisfies the "CSAF post-processor" conformance profile if the post-processor:

- satisfies the "CSAF consumer" conformance profile.
- satisfies the "CSAF producer" conformance profile.
- additionally satisfies those normative requirements in section 3 that are designated as applying to post-processors.

#### 9.1.8 Conformance Clause 8: CSAF modifier

A program satisfies the "CSAF modifier" conformance profile if the program fulfills the two following groups of requirements:

#### The program:

- satisfies the "CSAF post-processor" conformance profile.
- adds, deletes or modifies at least one property, array, object or value of a property or item of an array.
- does not emit any objects, properties, or values which, according to section 9, are intended to be produced only by CSAF translators.
- satisfies the normative requirements given below.

#### The resulting modified document:

 does not have the same /document/tracking/id as the original document. The modified document can use a completely new /document/tracking/id or compute one by appending the original /document/tracking/id as a suffix after an ID from the naming scheme of the issuer of the modified version. It SHOULD not use the original /document/tracking/id as a prefix.

• includes a reference to the original advisory as first element of the array /document/references[].

#### 9.1.9 Conformance Clause 9: CSAF translator

A program satisfies the "CSAF translator" conformance profile if the program fulfills the two following groups of requirements:

#### The program:

- satisfies the "CSAF post-processor" conformance profile.
- translates at least one value.
- preserves the same semantics and form across translations.
- satisfies the normative requirements given below and does not add or remove other elements than required below.

#### The resulting translated document:

- does not use the same /document/tracking/id as the original document. The translated document can use a completely new /document/tracking/id or compute one by using the original /document/tracking/id as a prefix and adding an ID from the naming scheme of the issuer of the translated version. It SHOULD not use the original /document/tracking/id as a suffix. If an issuer uses a CSAF translator to publish his advisories in multiple languages they MAY use the combination of the original /document/tracking/id and translated /document/lang as a /document/tracking/id for the translated document.
- provides the /document/lang property with a value matching the language of the translation.
- provides the /document/source\_lang to contain the language of the original document (and SHOULD only be set by CSAF translators).
- has the value translator set in /document/publisher/category
- includes a reference to the original advisory as first element of the array /document/references[].
- MAY contain translations for elements in arrays of references\_t
  after the first element. However, it MUST keep the original URLs as
  references at the end.

#### 9.1.10 Conformance Clause 10: CSAF consumer

A processor satisfies the "CSAF consumer" conformance profile if the processor:

- reads CSAF documents and interprets them according to the semantics defined in section 3.
- satisfies those normative requirements in section 3 and 8 that are designated as applying to CSAF consumers.

#### 9.1.11 Conformance Clause 11: CSAF viewer

A viewer satisfies the "CSAF viewer" conformance profile if the viewer fulfills the two following groups of requirements:

#### The viewer:

- satisfies the "CSAF consumer" conformance profile.
- satisfies the normative requirements given below.

For each CVSS-Score in /vulnerabilities[]/scores[] the viewer:

- preferably shows the vector if there is an inconsistency between the vector and any other sibling attribute.
- SHOULD prefer the item of scores[] for each product\_id which
  has the highest CVSS Base Score and newest CVSS version (in
  that order) if a product\_id is listed in more than one item of
  scores[].

## 9.1.12 Conformance Clause 12: CSAF management system

A CSAF management system satisfies the "CSAF management system" conformance profile if the management system:

- satisfies the "CSAF viewer" conformance profile.
- provides at least the following management functions:
  - add new CSAF documents (e.g. from file system or URL) to the system
  - list all CSAF documents within the system
  - delete CSAF documents from the system
  - comment on CSAF documents in the system
  - mark CSAF documents as read in the system.
  - search for CSAF documents by values of required fields at document-level or their children within the system
  - search for CSAF documents by values of cve within the system

- search for CSAF documents based on properties of /product\_tree
- o filter on all properties which it is required to search for
- o sort on all properties which it is required to search for
- o sort on CVSS scores and /document/aggregate severity/text
- identifies the latest version of CSAF documents with the same /document/tracking/id.
- is able to show the difference between 2 versions of a CSAF document with the same /document/tracking/id.

## 9.1.13 Conformance Clause 13: CSAF asset matching system

A CSAF asset matching system satisfies the "CSAF asset matching system" conformance profile if the asset matching system:

- satisfies the "CSAF management system" conformance profile.
- is an asset database or connects to one.
- matches the CSAF documents within the system to the respective assets. This might be done with a probability which gives the end user the chance to broaden or narrow the results. The process of matching is also referred to as "run of the asset matching module".
- provides for each product of the asset database a list of matched advisories.
- provides for each asset of the asset database a list of matched advisories.
- provides for each CSAF document a list of matched product of the asset database.
- provides for each CSAF document a list of matched asset of the asset database.
- provides for each vulnerability within a CSAF document the option to mark a matched asset in the asset database as "not remediated", "remediation in progress", or "remediation done". A switch to mark all assets at once MAY be implemented.
- does not bring up a newer revision of a CSAF document as a new match if the remediation for the matched product or asset has not changed.
- detects the usage semantic version (as described in section 3.1.11.2).
- is able to trigger a run of the asset matching module:
  - o manually:
    - per CSAF document
    - per list of CSAF documents
    - per asset

- per list of assets
- o automatically:
  - when a new CSAF document is inserted (for this CSAF document)
  - when a new asset is inserted (for this asset)
  - when the Major version in a CSAF document with semantic versioning changes (for this CSAF document)

These also apply if more than one CSAF document or asset was added. To reduce the computational efforts the runs can be pooled into one run which fulfills all the tasks at once (batch mode).

- Manually and automatically triggered runs SHOULD not be pooled.
- provides at least the following statistics for the count of assets:
  - matching that CSAF document at all
  - o marked with a given status

#### 9.1.14 Conformance Clause 14: CSAF basic validator

A program satisfies the "CSAF basic validator" conformance profile if the program:

- reads documents and performs a check against the JSON schema.
- performs all mandatory tests as given in section 6.1.
- does not change the CSAF documents.

A CSAF basic validator MAY provide one or more additional functions:

- Only run one or more selected mandatory tests.
- Apply quick fixes as specified in the standard.
- Apply additional quick fixes as implemented by the vendor.

#### 9.1.15 Conformance Clause 15: CSAF extended validator

A CSAF basic validator satisfies the "CSAF extended validator" conformance profile if the CSAF basic validator:

- satisfies the "CSAF basic validator" conformance profile.
- additionally performs all optional tests as given in section 6.2.

A CSAF extended validator MAY provide an additional function to only run one or more selected optional tests.

#### 9.1.16 Conformance Clause 16: CSAF full validator

A CSAF extended validator satisfies the "CSAF full validator" conformance profile if the CSAF extended validator:

- satisfies the "CSAF extended validator" conformance profile.
- additionally performs all informative tests as given in section 6.3.

A CSAF full validator MAY provide an additional function to only run one or more selected informative tests.

## 9.1.17 Conformance Clause 17: CSAF SBOM matching system

A CSAF SBOM matching system satisfies the "CSAF SBOM matching system" conformance profile if the SBOM matching system:

- satisfies the "CSAF management system" conformance profile.
- is an SBOM database or connects to one.

A repository or any other location that can be queried for SBOMs and their content is also considered an SBOM database.

- matches the CSAF documents within the system to the respective SBOM components. This might be done with a probability which gives the user the chance to broaden or narrow the results. The process of matching is also referred to as "run of the SBOM matching module".
- provides for each SBOM of the SBOM database a list of matched advisories.
- provides for each SBOM component of the SBOM database a list of matched advisories.
- provides for each CSAF document a list of matched SBOMs of the SBOM database.
- provides for each CSAF document a list of matched SBOM components of the SBOM database.
- provides for each vulnerability within a CSAF document the option to mark a matched SBOM component in the SBOM database as "not remediated", "remediation in progress", or "remediation done". A switch to mark all SBOM component at once MAY be implemented.

- does not bring up a newer revision of a CSAF document as a new match if the remediation for the matched SBOM or SBOM component has not changed.
- detects the usage semantic version (as described in section 3.1.11.2).
- is able to trigger a run of the asset matching module:
  - o manually:
    - per CSAF document
    - per list of CSAF documents
    - per SBOM component
    - per list of SBOM components
  - automatically:
    - when a new CSAF document is inserted (for this CSAF document)
    - when a new SBOM component is inserted (for this SBOM component)
    - when the Major version in a CSAF document with semantic versioning changes (for this CSAF document)

These also apply if more than one CSAF document or SBOM component was added. To reduce the computational efforts the runs can be pooled into one run which fulfills all the tasks at once (batch mode).

- Manually and automatically triggered runs should not be pooled.
- provides at least the following statistics for the count of SBOM component:
  - matching that CSAF document at all
  - marked with a given status

## Appendix A. Acknowledgments

The following individuals were members of the OASIS CSAF Technical Committee during the creation of this specification and their contributions are gratefully acknowledged:

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## **Appendix B. Revision History**

Revision	Date		Editor		Changes Made
csaf-v2.0- wd20210927- dev 2021- 09-27			Stefan Hagen and Thomas Schmidt		Preparing next Editor revision for TC review and submittal as CS for public review
csaf-v2.0- wd20220329- dev	2022- 03-29			Hagen and s Schmidt	Preparing next Editor revision for TC review and submittal as CSD02 for public review
<u>csaf-v2.0-</u> <u>wd20220514-dev</u>		202 14	22-05-	Stefan Hagen and Thomas Schmidt	Preparing next Editor revision for TC review and submittal as CS

# Appendix C. Guidance on the Size of CSAF Documents

This appendix provides informative guidance on the size of CSAF documents.

The TC carefully considered all known aspects to provide size limits for CSAF documents for this version of the specification with the result that hard limits SHOULD not be enforced. However, since there is the need for guidance to ensure interoperability in the ecosystem, the TC provides a set of soft limits. A CSAF document which exceeds those, can still be valid but it might not be processable for some parties.

All *CSAF* consumers SHOULD be able to process CSAF documents which comply with the limits below. All *CSAF* producers SHOULD NOT produce CSAF documents which exceed those limits.

If you come across a case where these limits are exceeded, please provide feedback to the TC.

## C.1 File size

A CSAF document in the specified JSON format encoded in UTF-8 SHOULD conform to known size limits of current technologies parsing JSON content, e.g.: 15 MB.

At least one database technology in wide use for storing CSAF documents rejects insert attempts when the transformed BSON size exceeds 16 megabytes. The BSON format optimizes for accessibility and not size. So, small integers and small strings may incur more overhead in the BSON format than in JSON. In addition, the BSON format adds length information for the entries inside the document, which adds to the size when storing CSAF document content in a BSON format.

## C.2 Array length

An array SHOULD NOT have more than:

## 10 000 items for

- o /document/acknowledgments
- o /document/acknowledgments[]/names
- o /document/acknowledgments[]/urls
- o /document/tracking/aliases
- o /product\_tree/branches[]/product/product\_identificati
   on helper/hashes
- o /product\_tree/branches[]/product/product\_identificati
   on helper/hashes[]/file hashes
- o /product\_tree/branches[]/product/product\_identificati
   on helper/sbom urls
- o /product\_tree/branches[]/product/product\_identificati
   on helper/x generic uris
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/hashes
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/hashes[]/file hashes
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/sbom urls
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/x generic uris
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/hashes
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/hashes[]/file\_hashes
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/sbom\_urls
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/x\_generic\_uris
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/hashes
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/hashes[]/file\_hashes
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/sbom urls

- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/x generic uris
- o /vulnerabilities[]/acknowledgments
- o /vulnerabilities[]/acknowledgments[]/names
- o /vulnerabilities[]/acknowledgments[]/urls
- o /vulnerabilities[]/ids
- o /vulnerabilities[]/remediations[]/entitlements

#### 40 000 items for

- o /document/notes
- o /document/references
- o /vulnerabilities[]/involvements
- o /vulnerabilities[]/notes
- o /vulnerabilities[]/references

#### 100 000 for

- o /document/tracking/revision history
- o /product tree/branches
- o /product tree(/branches[])\*/branches
- o /product\_tree/branches[]/product/product\_identificati
   on\_helper/model\_numbers
- o /product\_tree/branches[]/product/product\_identificati
   on helper/serial numbers
- o /product\_tree/branches[]/product/product\_identificati
   on helper/skus
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/model numbers
- o /product\_tree/branches[](/branches[])\*/product/produc t\_identification\_helper/serial\_numbers
- o /product\_tree/branches[](/branches[])\*/product/produc t\_identification\_helper/skus
- o /product tree/full product names
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/model numbers
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/serial numbers
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/skus
- o /product\_tree/product\_groups[]/product\_ids
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/model\_numbers
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/serial\_numbers
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/skus
- o /vulnerabilities

## • 10 000 000 for

- o /product\_tree/relationships
- o /product tree/product groups
- o /vulnerabilities[]/remediations[]/group ids

#### • 100 000 000 for

```
o /vulnerabilities[]/flags
o /vulnerabilities[]/flags[]/group ids
o /vulnerabilities[]/flags[]/product ids
o /vulnerabilities[]/product status/first affected
o /vulnerabilities[]/product status/first fixed
o /vulnerabilities[]/product status/fixed
o /vulnerabilities[]/product status/known affected
o /vulnerabilities[]/product status/known not affected
o /vulnerabilities[]/product status/last affected
o /vulnerabilities[]/product status/recommended
o /vulnerabilities[]/product status/under investigation
o /vulnerabilities[]/remediations
o /vulnerabilities[]/remediations[]/product ids
o /vulnerabilities[]/scores
o /vulnerabilities[]/scores[]/products
o /vulnerabilities[]/threats
o /vulnerabilities[]/threats[]/group ids
```

## C.3 String length

## A string SHOULD NOT have a length greater than:

o /vulnerabilities[]/threats[]/product ids

#### 1000 for

o /document/acknowledgments[]/names[] o /document/acknowledgments[]/organization o /document/aggregate severity/text o /document/category o /document/lang o /document/notes[]/audience o /document/notes[]/title o /document/publisher/name o /document/source lang o /document/title o /document/tracking/aliases[] o /document/tracking/generator/engine/name o /document/tracking/generator/engine/version o /document/tracking/id o /document/tracking/revision history[]/legacy version o /document/tracking/revision history[]/number o /document/tracking/version o /product tree/branches[]/name o /product tree/branches[]/product/name o /product tree/branches[]/product/product id o /product tree/branches[]/product/product identificati on helper/hashes[]/file hashes[]/algorithm

- o /product\_tree/branches[]/product/product\_identificati
   on helper/hashes[]/file hashes[]/value
- o /product\_tree/branches[]/product/product\_identificati
   on helper/hashes[]/filename
- o /product\_tree/branches[]/product/product\_identificati
   on helper/model numbers[]
- o /product\_tree/branches[]/product/product\_identificati
   on helper/serial numbers[]
- o /product\_tree/branches[]/product/product\_identificati
   on helper/skus[]
- o /product\_tree/branches[](/branches[])\*/name
- o /product tree/branches[](/branches[])\*/product/name
- o /product\_tree/branches[](/branches[])\*/product/produc
   t id
- o /product\_tree/branches[](/branches[])\*/product/produc t\_identification\_helper/hashes[]/file\_hashes[]/algori thm
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/hashes[]/file hashes[]/value
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/hashes[]/filename
- o /product\_tree/branches[](/branches[])\*/product/produc t\_identification\_helper/model\_numbers[]
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/serial numbers[]
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/skus[]
- o /product tree/full\_product\_names[]/name
- o /product\_tree/full\_product\_names[]/product\_id
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/hashes[]/file\_hashes[]/algorithm
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/hashes[]/file\_hashes[]/value
- o /product\_tree/full\_product\_names[]/product\_identifica tion\_helper/hashes[]/filename
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion\_helper/model\_numbers[]
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/serial numbers[]
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion\_helper/skus[]
- o /product tree/product groups[]/group id
- o /product\_tree/product\_groups[]/product\_ids[]
- o /product tree/relationships[]/full product name/name
- o /product\_tree/relationships[]/full\_product\_name/produ ct id
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/hashes[]/file\_hashes[]/algor ithm
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/hashes[]/file hashes[]/value

- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/hashes[]/filename
- o /product\_tree/relationships[]/full\_product\_name/produ ct\_identification\_helper/model\_numbers[]
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/serial numbers[]
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/skus[]
- o /product tree/relationships[]/product reference
- o /product\_tree/relationships[]/relates\_to\_product\_refe
   rence
- o /vulnerabilities[]/acknowledgments[]/names[]
- o /vulnerabilities[]/acknowledgments[]/organization
- o /vulnerabilities[]/cve
- o /vulnerabilities[]/cwe/id
- o /vulnerabilities[]/cwe/name
- o /vulnerabilities[]/flags[]/group\_ids[]
- o /vulnerabilities[]/flags[]/product ids[]
- o /vulnerabilities[]/ids[]/system name
- o /vulnerabilities[]/ids[]/text
- o /vulnerabilities[]/notes[]/audience
- o /vulnerabilities[]/notes[]/title
- o /vulnerabilities[]/product status/first affected[]
- o /vulnerabilities[]/product status/first fixed[]
- o /vulnerabilities[]/product status/fixed[]
- o /vulnerabilities[]/product status/known affected[]
- o /vulnerabilities[]/product status/last affected[]
- o /vulnerabilities[]/product status/recommended[]
- o /vulnerabilities[]/product\_status/under\_investigation
  []
- o /vulnerabilities[]/remediations[]/group\_ids[]
- o /vulnerabilities[]/remediations[]/product ids[]
- o /vulnerabilities[]/scores[]/cvss v2/vectorString
- o /vulnerabilities[]/scores[]/cvss v3/vectorString
- o /vulnerabilities[]/scores[]/products[]
- o /vulnerabilities[]/threats[]/group ids[]
- o /vulnerabilities[]/threats[]/product ids[]
- o /vulnerabilities[]/title

### 10 000 for

- o /document/acknowledgments[]/summary
- o /document/distribution/text
- o /document/publisher/contact details
- o /document/publisher/issuing authority
- o /document/references[]/summary
- o /document/tracking/revision history[]/summary
- o /product\_tree/branches[]/product/product\_identificati
   on\_helper/cpe

- o /product\_tree/branches[]/product/product\_identificati
   on helper/purl
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/cpe
- o /product\_tree/branches[](/branches[])\*/product/produc t identification helper/purl
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/cpe
- o /product\_tree/full\_product\_names[]/product\_identifica
   tion helper/purl
- o /product\_tree/product\_groups[]/summary
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/cpe
- o /product\_tree/relationships[]/full\_product\_name/produ ct identification helper/purl
- o /vulnerabilities[]/acknowledgments[]/summary
- o /vulnerabilities[]/involvements[]/summary
- o /vulnerabilities[]/references[]/summary
- o /vulnerabilities[]/remediations[]/entitlements[]

## • 30 000 for

- o /document/notes[]/text
- o /vulnerabilities[]/notes[]/text

#### 250 000 for

- o /vulnerabilities[]/remediations[]/details
- o /vulnerabilities[]/remediations[]/restart\_required/de
   tails
- o /vulnerabilities[]/threats[]/details

## C.4 URI length

A string with format uri SHOULD NOT have a length greater than 20000. This applies to:

- /document/acknowledgments[]/urls[]
- /document/aggregate severity/namespace
- /document/distribution/tlp/url
- /document/references[]/url
- /document/publisher/namespace
- /product\_tree/branches[]/product/product\_identification\_hel per/sbom\_urls[]
- /product\_tree/branches[]/product/product\_identification\_hel per/x\_generic\_uris[]/namespace
- /product\_tree/branches[]/product/product\_identification\_hel per/x generic uris[]/uri
- /product\_tree/branches[](/branches[])\*/product/product\_iden tification helper/sbom urls[]
- /product\_tree/branches[](/branches[])\*/product/product\_iden tification helper/x generic uris[]/namespace

- /product\_tree/branches[](/branches[])\*/product/product\_iden tification\_helper/x\_generic\_uris[]/uri
- /product\_tree/full\_product\_names[]/product\_identification\_h elper/sbom\_urls[]
- /product\_tree/full\_product\_names[]/product\_identification\_h elper/x generic uris[]/namespace
- /product\_tree/full\_product\_names[]/product\_identification\_h elper/x generic uris[]/uri
- /product\_tree/relationships[]/full\_product\_name/product\_ide ntification helper/sbom urls[]
- /product\_tree/relationships[]/full\_product\_name/product\_ide ntification helper/x generic uris[]/namespace
- /product\_tree/relationships[]/full\_product\_name/product\_ide ntification helper/x generic uris[]/uri
- /vulnerabilities[]/acknowledgments[]/urls[]
- /vulnerabilities[]/references[]/url
- /vulnerabilities[]/remediations[]/url

## C.5 Enum

A string which is an enum has a fixed maximum length given by its longest value.

Later versions of CSAF might add, modify or delete possible value which could change the longest value. Therefore, this sizes should not be implemented as fixed limits if forward compatibility is desired.

It seems to be safe to assume that the length of each value is not greater than 50. This applies to:

- /document/csaf\_version (3)
- /document/distribution/tlp/label (5)
- /document/notes[]/category (16)
- /document/publisher/category (11)
- /document/references[]/category (8)
- /document/tracking/status (7)
- /product\_tree/branches[]/category (15)
- /product\_tree/branches[] (/branches[]) \*/category (15)
- /product\_tree/relationships[]/category (21)
- /vulnerabilities[]/flags[]/label (49)
- /vulnerabilities[]/involvements[]/party (11)
- /vulnerabilities[]/involvements[]/status (17)
- /vulnerabilities[]/notes[]/category (16)

- /vulnerabilities[]/references[]/category (8)
- /vulnerabilities[]/remediations[]/category (14)
- /vulnerabilities[]/remediations[]/restart\_required/category
   (20)
- /vulnerabilities[]/scores[]/cvss\_v2/version (3)
- /vulnerabilities[]/scores[]/cvss\_v2/accessVector (16)
- /vulnerabilities[]/scores[]/cvss\_v2/accessComplexity (6)
- /vulnerabilities[]/scores[]/cvss v2/authentication (8)
- /vulnerabilities[]/scores[]/cvss\_v2/confidentialityImpact(8)
- /vulnerabilities[]/scores[]/cvss v2/integrityImpact (8)
- /vulnerabilities[]/scores[]/cvss\_v2/availabilityImpact (8)
- /vulnerabilities[]/scores[]/cvss\_v2/exploitability (16)
- /vulnerabilities[]/scores[]/cvss\_v2/remediationLevel (13)
- /vulnerabilities[]/scores[]/cvss\_v2/reportConfidence (14)
- /vulnerabilities[]/scores[]/cvss\_v2/collateralDamagePotenti al (11)
- /vulnerabilities[]/scores[]/cvss\_v2/targetDistribution (11)
- /vulnerabilities[]/scores[]/cvss\_v2/confidentialityRequirem ent (11)
- /vulnerabilities[]/scores[]/cvss\_v2/integrityRequirement
   (11)
- /vulnerabilities[]/scores[]/cvss\_v2/availabilityRequirement
   (11)
- /vulnerabilities[]/scores[]/cvss\_v3/version (3)
- /vulnerabilities[]/scores[]/cvss\_v3/attackVector (16)
- /vulnerabilities[]/scores[]/cvss\_v3/attackComplexity (4)
- /vulnerabilities[]/scores[]/cvss\_v3/privilegesRequired (4)
- /vulnerabilities[]/scores[]/cvss\_v3/userInteraction (8)
- /vulnerabilities[]/scores[]/cvss\_v3/scope (9)
- /vulnerabilities[]/scores[]/cvss\_v3/confidentialityImpact (4)
- /vulnerabilities[]/scores[]/cvss\_v3/integrityImpact (4)
- /vulnerabilities[]/scores[]/cvss\_v3/availabilityImpact (4)
- /vulnerabilities[]/scores[]/cvss\_v3/baseSeverity (8)
- /vulnerabilities[]/scores[]/cvss\_v3/exploitCodeMaturity (16)
- /vulnerabilities[]/scores[]/cvss\_v3/remediationLevel (13)
- /vulnerabilities[]/scores[]/cvss\_v3/reportConfidence (11)
- /vulnerabilities[]/scores[]/cvss\_v3/temporalSeverity (8)
- /vulnerabilities[]/scores[]/cvss\_v3/confidentialityRequirem ent (11)

- /vulnerabilities[]/scores[]/cvss\_v3/integrityRequirement
   (11)
- /vulnerabilities[]/scores[]/cvss\_v3/availabilityRequirement
   (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedAttackVector
   (16)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedAttackComplexit y (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedPrivilegesRequired (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedUserInteraction (11)
- /vulnerabilities[]/scores[]/cvss v3/modifiedScope (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedConfidentiality
   Impact (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedIntegrityImpact (11)
- /vulnerabilities[]/scores[]/cvss\_v3/modifiedAvailabilityImp act (11)
- /vulnerabilities[]/scores[]/cvss\_v3/environmentalSeverity(8)
- /vulnerabilities[]/threats[]/category (14)

## C.6 Date

The maximum length of strings representing a temporal value is given by the format specifier. This applies to:

- /document/tracking/current release date
- /document/tracking/generator/date
- /document/tracking/initial release date
- /document/tracking/revision history[]/date
- /vulnerabilities[]/discovery date
- /vulnerabilities[]/flags[]/date
- /vulnerabilities[]/release date
- /vulnerabilities[]/involvements[]/date
- /vulnerabilities[]/remediations[]/date
- /vulnerabilities[]/threats[]/date