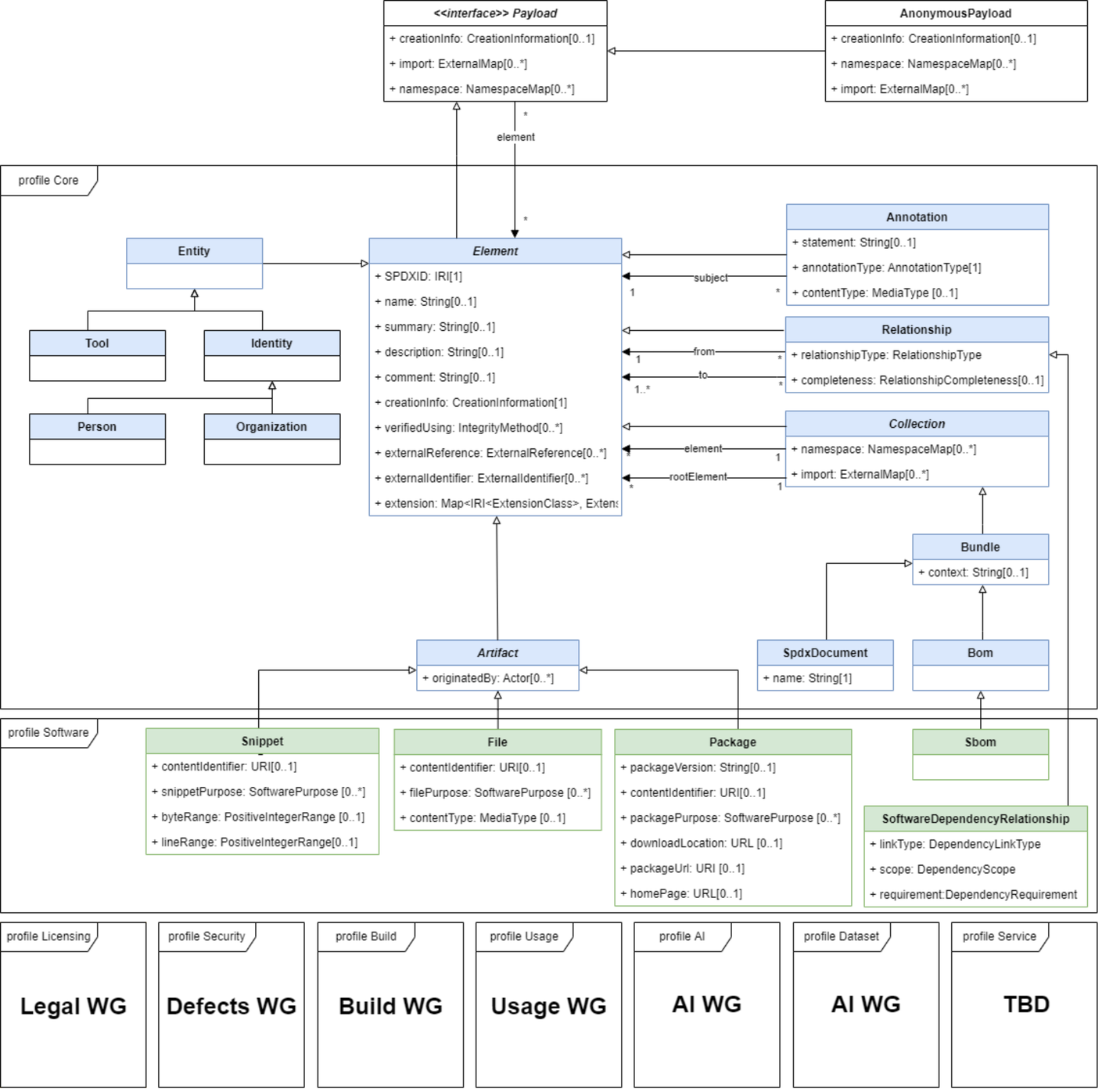



## Minimal Document Example (JSON)

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "name": "Minimal Document Example
(JSON)",

  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy":
["urn:spdx.dev:iamwillbar"],
  },
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## Minimal Single Element Example (JSON)

```
{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy":
["urn:spdx.dev:iamwillbar"]
  }
}
```

## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[{@type: "Hash", }]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "externalIdentifiers": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "externalIdentifiers": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```

Data Types

**These types have value type/struct semantics - equality is determined by comparing values and they MUST NOT by referenced by name across documents. Serialization formats MAY enable de-duplication within a single document.**

**CreationInformation**
- specVersion: SemVer
- profile: ProfileIdentifier[1..*]
- created: DateTime
- dataLicense: 'CC0'
- createdBy: Actor[1..*]
- comment: String[0..1]

**NamespaceMap**
- prefix: String
- namespace: IRI

**AnnotationType**
```
review
other
```

**ExternalMap**
- externalId: IRI
- locationHint: URL[0..1]
- verifiedUsing: IntegrityMethod[

**SemVer: String**
String constrained to SemVer 2.0.0 specification.

**ActorType**
```
person
organization
tool
noAssertion
```

**MediaType: String**
String constrained to RFC 2046 specification.

**ProfileIdentifier: String**
- name: String

**PositiveIntegerRange**
- start: PositiveInteger
- end: PositiveInteger

**ExternalIdentifier**
- externalIdentifierType: ExternalIdentifierType
- identifier: IRI
- comment: String[0..1]

**ExternalIdentifierType**
```
cpe_2.2
cpe_2.3
purl
swid [deprecate?]
swhid [deprecate?]
gitoid [deprecate?]
other
```

**ExternalReference**
- externalReferenceType: ExternalReferenceTy
- locator: IRI
- contentType: MediaType [0..1]
- comment: String[0..1]

**ExternalReferenceType**
```
altDownloadLocation
altWebPage
securityAdvisory
securityFix
securityOther
other
```

**RelationshipType**
```
Meta
describes [bundle->artifact]
amends [collection->collection]
other [element->element] (comment)

Structure
contains [artifact->artifact]

Behavioral
dependsOn [artifact->artifact]
patches [artifact->artifact]
tests [artifact->artifact]

Pedigree
generates [artifact->artifact]
expandedFromArchive
fileAdded
fileDeleted
fileModified
copy [artifact->artifact]
packages (obsolete?)

Provenance
ancestor [artifact->artifact]
suppliedBy [artifact->identity]
variant [artifact->artifact]


Obsolete?
buildTool
devTool
testTool
dependencyManifest
distributionArtifact
example
dataFile
testCase
documentation
metafile
test
requirementFor
specificationFor
```

**RelationshipCompleteness**
```
complete [Default]
incomplete
noAssertion
```

**SoftwarePurpose**
```
application
archive
bom
configuration
container
data
device
documentation
executable
file
firmware
framework
install
library
module
operatingSystem
patch
source
other
```

**DependencyLinkType**
```
noAssertion [default]
static
dynamic
tool
other
```

**DependencyScope**
```
noAssertion [default]
build
dev
test
runtime
other
```

**DependencyRequirement**
```
noAssertion [default]
optional
required
provided
preRequisite
```

***IntegrityMethod***
- comment: String[0..1]

**Hash**
- algorithm: HashAlgorithm
- hashValue: byte[1..*]

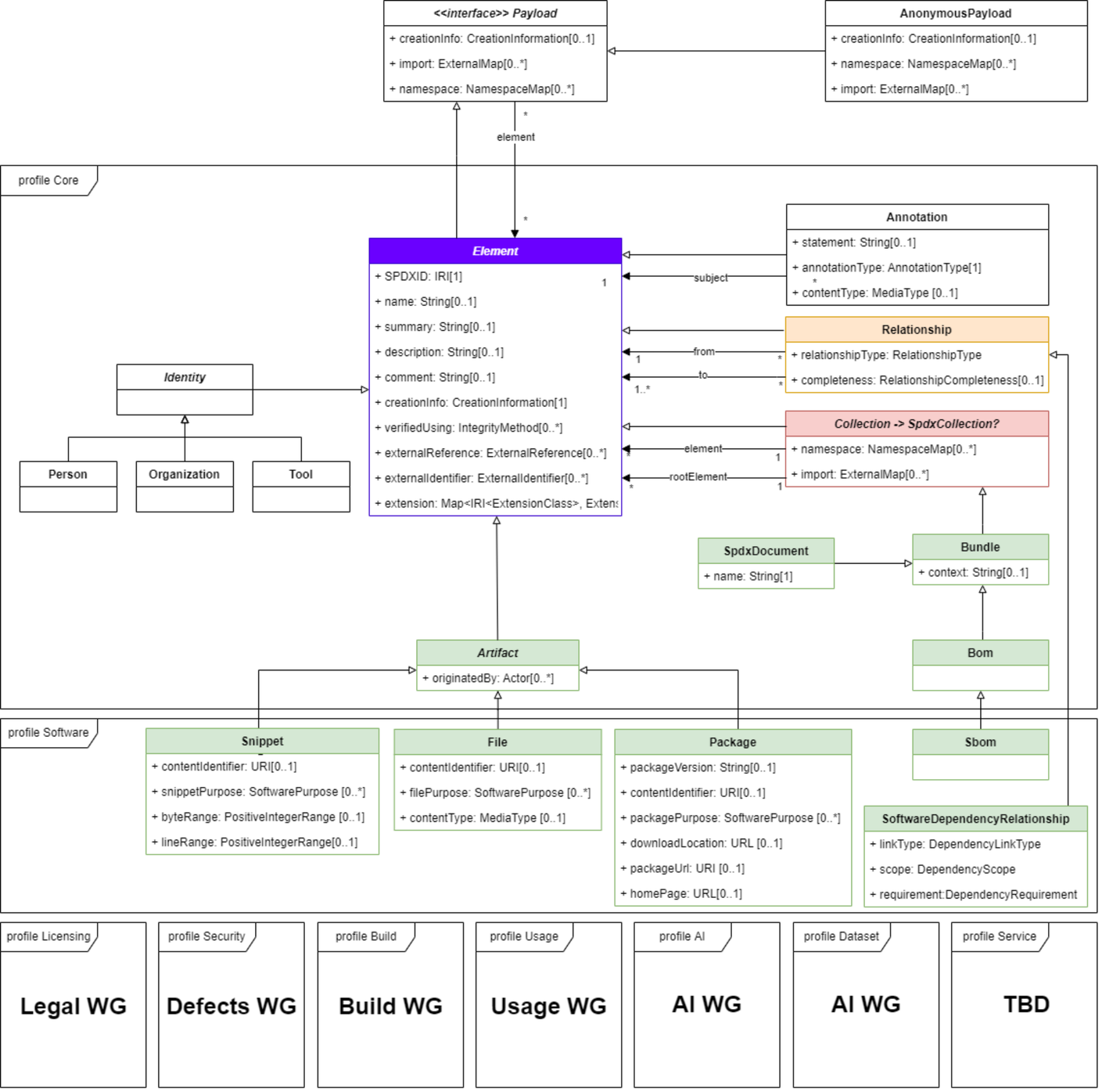
**HashAlgorithm**
```
sha1
sha224
sha256 [default]
sha384
sha512
sha3_224
sha3_256
sha3_384
sha3_512
md2
md4
md5
md6
spdx_pvc_sha1
spdx_pvc_sha256
blake2b_256
blake2b_384
blake2b_512
blake3
other
```

## Legend

***Italics*** - abstract, you must use a subclass

**Underscore** - value type/struct semantics, equality determined by comparing values

### Core Data Types




## Minimal Document Example (JSON)

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "name": "Minimal Document Example
(JSON)",

  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy":
["urn:spdx.dev:iamwillbar"],
  },
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## Minimal Single Element Example (JSON)

```
{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy":
["urn:spdx.dev:iamwillbar"]
  }
}
```

## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[{@type: "Hash", }]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "externalIdentifiers": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "externalIdentifiers": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```

Data Types

**These types have value type/struct semantics - equality is determined by comparing values and they MUST NOT by referenced by name across documents. Serialization formats MAY enable de-duplication within a single document.**

**CreationInformation**
- specVersion: SemVer
- profile: ProfileIdentifier[1..*]
- created: DateTime
- dataLicense: 'CC0'
- createdBy: Actor[1..*]
- comment: String[0..1]

**NamespaceMap**
- prefix: String
- namespace: IRI

**AnnotationType**
```
review
other
```

**ExternalMap**
- externalId: IRI
- locationHint: URL[0..1]
- verifiedUsing: IntegrityMethod[

**SemVer: String**
String constrained to SemVer 2.0.0 specification.

**Actor**
- name: String[0..1]
- actorType: ActorType [0..1]
- externalIdentifier: ExternalIdentifier[0..*]
- externalReference: ExternalReference[0..*]
- comment: String[0..1]
- identity: SPDXID[0..1]

DRAFT

**ActorType**
```
person
organization
tool
noAssertion
```

**MediaType: String**
String constrained to RFC 2046 specification.

**ProfileIdentifier: String**
- name: String

**PositiveIntegerRange**
- start: PositiveInteger
- end: PositiveInteger

**ExternalIdentifier**
- externalIdentifierType: ExternalIdentifierType
- identifier: IRI
- comment: String[0..1]

**ExternalIdentifierType**
```
cpe_2.2
cpe_2.3
purl
swid [deprecate?]
swhid [deprecate?]
gitoid [deprecate?]
other
```

**ExternalReference**
- externalReferenceType: ExternalReferenceTy
- locator: IRI
- contentType: MediaType [0..1]
- comment: String[0..1]

**ExternalReferenceType**
```
altDownloadLocation
altWebPage
securityAdvisory
securityFix
securityOther
other
```

**RelationshipType**
```
describes
amends

contains
ancestor [do we need both?]
descendent [do we need both?]
variant*

dependsOn
dependencyManifest

buildTool
devTool
testTool

generates

distributionArtifact
example
dataFile
testCase
documentation
metafile
test
optionalComponent
packages

patch
copy* (may or may not be directiona
expandedFromArchive
fileAdded
fileDeleted
fileModified

requirementFor
specificationFor

suppliedBy *new*
other
```

**RelationshipCompleteness**
```
complete [Default]
incomplete
noAssertion
```

***IntegrityMethod***
- comment: String[0..1]

**Hash**
- algorithm: HashAlgorithm
- hashValue: byte[1..*]

**SoftwarePurpose**
```
application
archive
bom
configuration
container
data
device
documentation
executable
file
firmware
framework
install
library
module
operatingSystem
patch
source
other
```

**HashAlgorithm**
```
sha1
sha224
sha256 [default]
sha384
sha512
sha3_224
sha3_256
sha3_384
sha3_512
md2
md4
md5
md6
spdx_pvc_sha1
spdx_pvc_sha256
blake2b_256
blake2b_384
blake2b_512
blake3
other
```

**DependencyLinkType**
```
noAssertion [default]
static
dynamic
other
```

**DependencyScope**
```
noAssertion [default]
build
dev
test
runtime
other
```

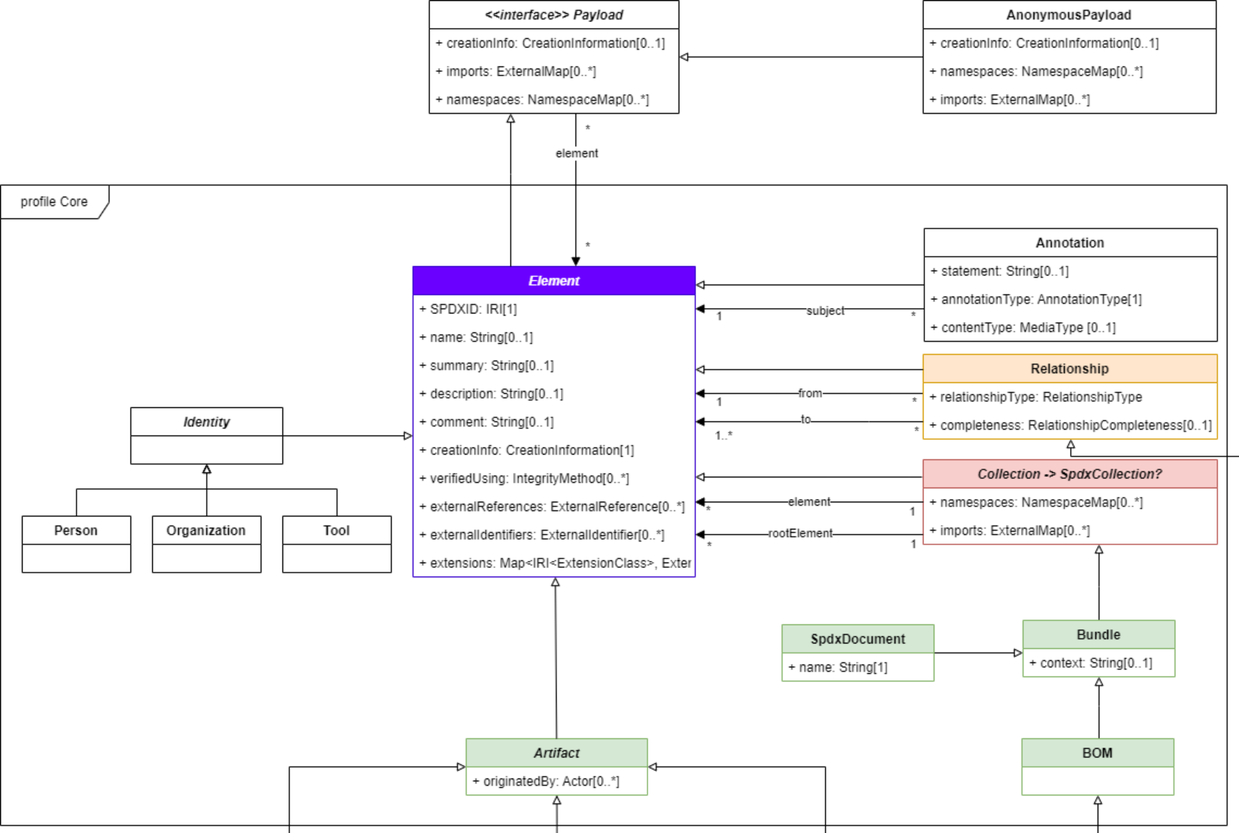
**DependencyRequirement**
```
noAssertion [default]
optional
required
provided
preRequisite
```

## Legend

***Italics*** - abstract, you must use a subclass

**Underscore** - value type/struct semantics, equality determined by comparing values

### Core Data Types




## Minimal Document Example (JSON)

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "name": "Minimal Document Example (JSON)",

  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"],
  },
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## Minimal Single Element Example (JSON)

```
{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  }
}
```

## Minimal Multiple Element Example (JSON)

## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[{@type: "Hash", }]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "externalIdentifiers": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "externalIdentifiers": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    },
    {
```

Data Types

**These types have value type/struct semantics - equality is determined by comparing values and they MUST NOT by referenced by name across documents. Serialization formats MAY enable de-duplication within a single document.**

**ExternalIdentifier**
- externalIdentifierType: ExternalIdentifierType
- identifier: IRI
- comments: String[0..1]

**ExternalReference**
- externalReferenceType: ExternalReferenceType
- locator: IRI
- contentType: MediaType [0..1]
- comments: String[0..1]

**CreationInformation**
- specVersion: SemVer
- profile: ProfileIdentifier[1..*]
- created: DateTime
- dataLicense: 'CC0'
- createdBy: Actor[1..*]

*IntegrityMethod*
- comments: String[0..1]

**Hash**
- algorithm: HashAlgorithm
- hashValue: byte[1..*]

**Actor**
- name: String[0..1]
- actorType: ActorType [1]
- externalIdentifiers: ExternalIdentifier[0..*]
- externalReferences: ExternalReference[0..*]

DRAFT

**NamespaceMap**
- prefix: String
- namespace: IRI

**ExternalMap**
- externalId: IRI
- locationHint: URL[0..1]
- verifiedUsing: IntegrityMethod[0..*]

**ActorType: String**

```
PERSON
ORGANIZATION
TOOL
NOASSERTION
```

**HashAlgorithm: String**

```
SHA1
SHA224
SHA256 [default]
SHA384
SHA512
SHA3-224
SHA3-256
SHA3-384
SHA3-512
MD2
MD4
MD5
MD6
SPDX-PVC-SHA1
SPDX-PVC-SHA256
BLAKE2b-256
BLAKE2b-384
BLAKE2b-512
BLAKE3
OTHER
```

**RelationshipType: String**

```
DESCRIBES
AMENDS

CONTAINS
ANCESTOR [do we need both?]
DESCENDANT [do we need both?]
VARIANT*

DEPENDS_ON
  BUILD_DEPENDENCY
  DEV_DEPENDENCY
  OPTIONAL_DEPENDENCY
  PROVIDED_DEPENDENCY
  TEST_DEPENDENCY
  RUNTIME_DEPENDENCY
DEPENDENCY_MANIFEST
  DYNAMIC_LINK
  STATIC_LINK
  PREREQUISITE

BUILD_TOOL
DEV_TOOL
TEST_TOOL

GENERATES

DISTRIBUTION_ARTIFACT
EXAMPLE
DATA_FILE
TEST_CASE
DOCUMENTATION
METAFILE
TEST
OPTIONAL_COMPONENT
PACKAGES

PATCH
COPY* (may or may not be directional)
EXPANDED_FROM_ARCHIVE
FILE_ADDED
FILE_DELETED
FILE_MODIFIED

REQUIREMENT_FOR
SPECIFICATION_FOR
```

**ExternalReferenceType: String**

```
ALT_DOWNLOAD_LOCATION
ALT_WEB_PAGE
SECURITY_ADVISORY
SECURITY_FIX
SECURITY_OTHER
OTHER
```

**ExternalIdentifierType: String**

```
CPE-2.2
CPE-2.3
PURL
SWID [deprecate?]
SWHID [deprecate?]
GITOID [deprecate?]
OTHER
```

**AnnotationType: String**

```
REVIEW
OTHER
```

**SoftwarePurpose: String**

```
APPLICATION
ARCHIVE
BOM
CONFIGURATION
CONTAINER
DATA
DEVICE
DOCUMENTATION
EXECUTABLE
FILE
FIRMWARE
FRAMEWORK
INSTALL
LIBRARY
MODULE
OPERATING-SYSTEM
PATCH
SOURCE
OTHER
```

**SemVer: String**

String constrained to SemVer 2.0.0 specification.

**MediaType: String**

String constrained to RFC 2046 specification.

**ProfileIdentifier: String**
- name: String

**PositiveIntegerRange**
- start: PositiveInteger
- end: PositiveInteger

**RelationshipCompleteness: String**

```
KNOWN [Default]
INCOMPLETE
UNKNOWN
```

## Legend

*Italics* - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

## Core Data Types

## Serialization

* Collections MAY nest contained elements (i.e. elements referenced by the "element" property but the hash of the canonical representation MUST be equivalent to those elements not being nested. Nesting SHOULD NOT be extended beyond a single level (Q: Is this restriction possible for aggregated documents?).

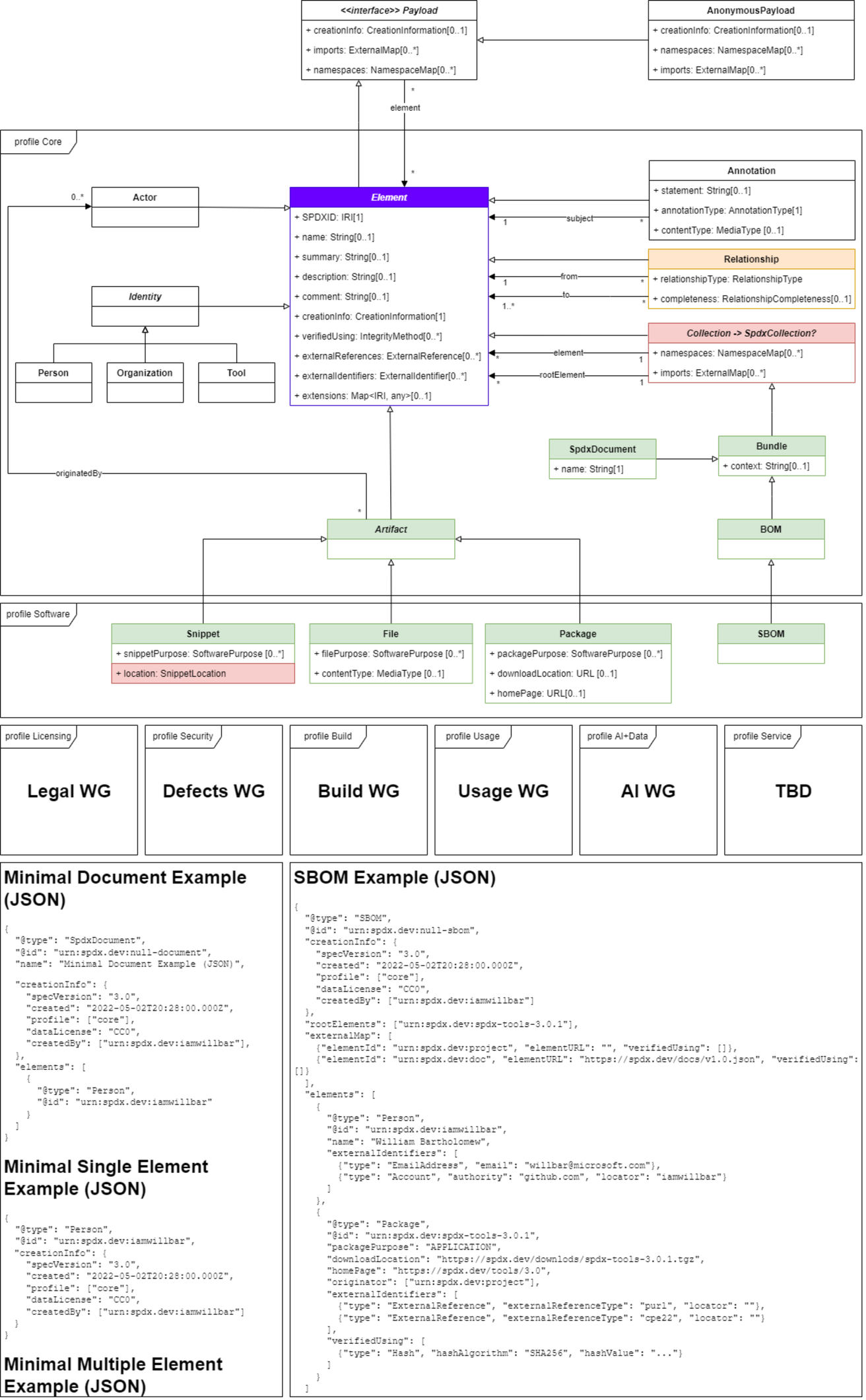
## 2022-09-20 Meeting

* Added contentType to ExternalReference and Annotation - AGREED
* Split external reference types across ExternalReferenceType and ExternalIdentifierType
* Added ALT_DOWNLOAD_LOCATION as ExternalReferenceType - AGREED
* Added missing SoftwarePurpose FILE and INSTALL - AGREED
* Remove ALSO_KNOWN_AS from RELATIONSHIP_TYPE - AGREED
* Deprecate SWID, SWHID, and GITOID, if, they're adopted by PURL.

Questions:
* Are locator on ExternalReference now a URL not IRI?
* If identifier is an IRI then I don't think we need a type, if we have a type it's possible we want the IRI to be a string w/ schema instead.
* We have lots of overlapping relationship types for dependencies, should we have a DependencyRelationship subclass?

**SoftwareDependencyRelationship**
- linkType: NOASSERTION [default] | STATIC | DYNAMIC | OTHER
- scope:NOASSERTION [default] | BUILD | DEV | TEST | RUNTIME | OTHER
- requirement:NOASSERTION [default] | OPTIONAL | REQUIRED | PROVIDED | PREREQUISITE

2022-11-10: 7e51bfd After 2022-11-04 Ad Hoc Meeting




## Minimal Document Example (JSON)

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "name": "Minimal Document Example (JSON)",

  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"],
  },
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## Minimal Single Element Example (JSON)

```
{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  }
}
```

## Minimal Multiple Element Example (JSON)

## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": ["urn:spdx.dev:iamwillbar"]
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "externalIdentifiers": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "externalIdentifiers": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```

Data Types

**These types have value type/struct semantics - equality is determined by comparing values and they MUST NOT by referenced by name across documents. Serialization formats MAY enable de-duplication within a single document.**

***IntegrityMethod***

**Hash**
+ algorithm: HashAlgorithm
+ hashValue: String

***ExternalReference***
+ externalReferenceType: ExternalReferenceType
+ locator: IRI
+ contentType: MediaType [0..1]
+ comments: String[0..1]

***ExternalIdentifier***
+ externalIdentifierType: ExternalIdentifierType
+ identifier: IRI
+ comments: String[0..1]

**NamespaceMap**
+ prefix: String
+ namespace: IRI

**ExternalMap**
+ externalId: IRI
+ locationHint: URL[0..1]
+ verifiedUsing: IntegrityMethod[0..*]

**ProfileIdentifier**
+ name: String
+ version: SemVer

**CreationInformation**
+ specVersion: SemVer
+ profile: ProfileIdentifier[1..*]
+ created: DateTime
+ dataLicense: 'CC0'
+ createdBy: Actor[1..*]

**HashAlgorithm: String**

```
SHA1
SHA224
SHA256 [default]
SHA384
SHA512
SHA3-224
SHA3-256
SHA3-384
SHA3-512
MD2
MD4
MD5
MD6
SPDX-PVC-SHA1
SPDX-PVC-SHA256
BLAKE2b-256
BLAKE2b-384
BLAKE2b-512
BLAKE3
```

**SoftwarePurpose: String**

```
APPLICATION
ARCHIVE
BOM
CONFIGURATION
CONTAINER
DATA
DEVICE
DOCUMENTATION
EXECUTABLE
FILE
FIRMWARE
FRAMEWORK
INSTALL
LIBRARY
MODULE
OPERATING-SYSTEM
PATCH
SOURCE
OTHER
```

**RelationshipType: String**

```
DESCRIBES
AMENDS

CONTAINS
ANCESTOR [do we need both?]
DESCENDANT [do we need both?]
VARIANT

DEPENDS_ON
BUILD_DEPENDENCY
DEV_DEPENDENCY
OPTIONAL_DEPENDENCY
PROVIDED_DEPENDENCY
TEST_DEPENDENCY
RUNTIME_DEPENDENCY
DEPENDENCY_MANIFEST
DYNAMIC_LINK
STATIC_LINK
PREREQUISITE

BUILD_TOOL
DEV_TOOL
TEST_TOOL

GENERATES

DISTRIBUTION_ARTIFACT
EXAMPLE
DATA_FILE
TEST_CASE
DOCUMENTATION
METAFILE
TEST
OPTIONAL_COMPONENT
PACKAGES

PATCH
COPY
EXPANDED_FROM_ARCHIVE
FILE_ADDED
FILE_DELETED
FILE_MODIFIED

SUPPLIED_BY *new*
OTHER
```

**RelationshipCompleteness: String**

```
KNOWN [Default]
INCOMPLETE
UNKNOWN
```

**ExternalReferenceType: String**

```
ALT_DOWNLOAD_LOCATION
SECURITY_ADVISORY
SECURITY_FIX
SECURITY_OTHER
OTHER
```

**ExternalIdentifierType: String**

```
CPE-2.2
CPE-2.3
PURL
SWID [deprecate?]
SWHID [deprecate?]
GITOID [deprecate?]
OTHER
```

**AnnotationType: String**

```
REVIEW
OTHER
```

**SemVer: String**

String constrained to SemVer 2.0.0 specification.

**MediaType: String**

String constrained to RFC 2046 specification.

## Legend

***Italics*** - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

## Core Data Types

## Serialization

* Collections MAY nest contained elements (i.e. elements referenced by the "element" property but the hash of the canonical representation MUST be equivalent to those elements not being nested. Nesting SHOULD NOT be extended beyond a single level (Q: Is this restriction possible for aggregated documents?).

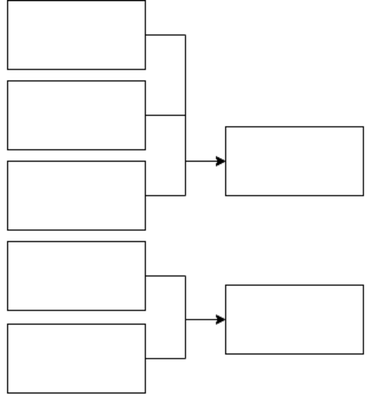
## 2022-09-20 Meeting

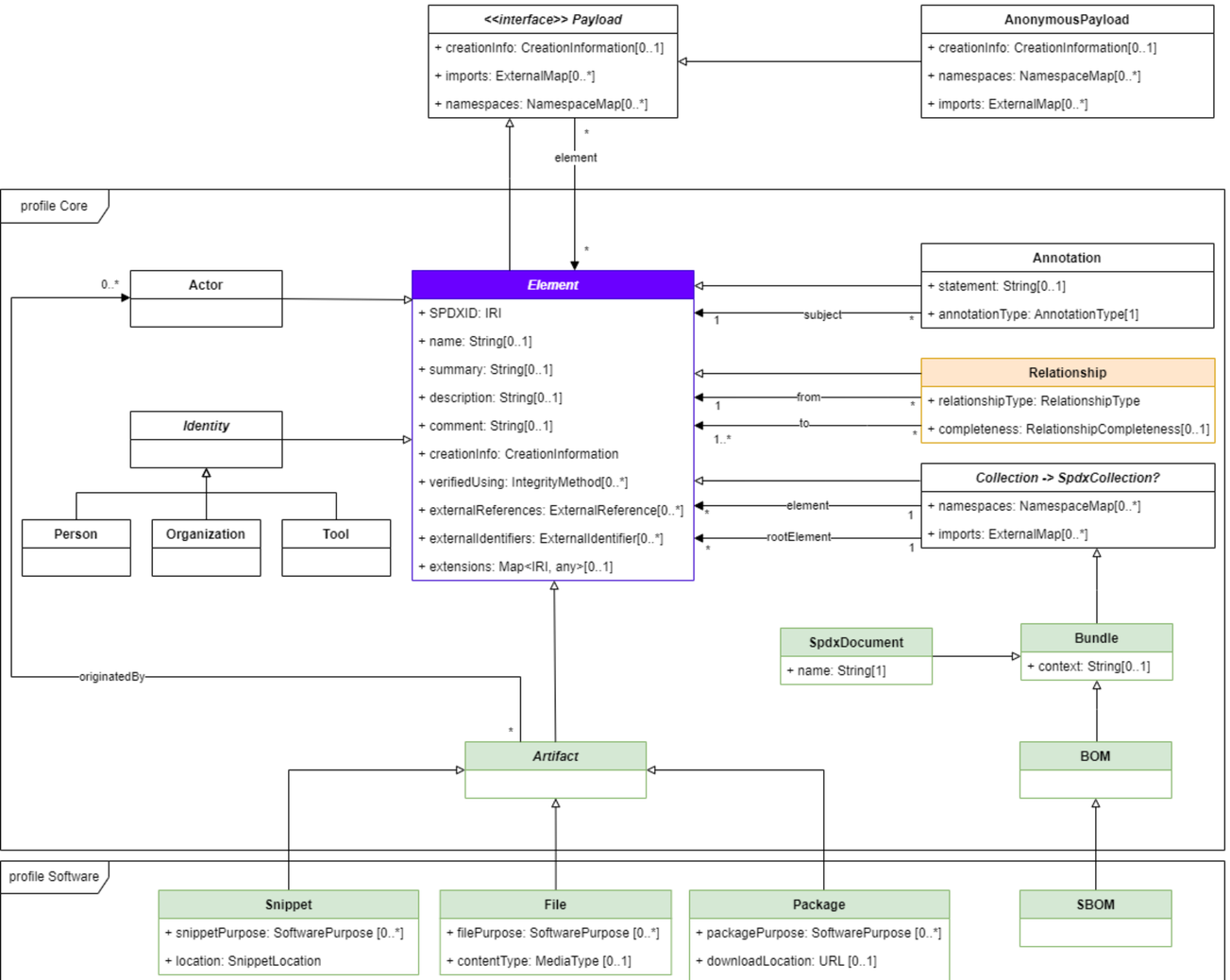
* Added contentType to ExternalReference and Annotation - AGREED
* Split external reference types across ExternalReferenceType and ExternalIdentifierType
* Added ALT_DOWNLOAD_LOCATION as ExternalReferenceType - AGREED
* Added missing SoftwarePurpose FILE and INSTALL - AGREED
* Remove ALSO_KNOWN_AS from RELATIONSHIP_TYPE - AGREED
* Deprecate SWID, SWHID, and GITOID, if, they're adopted by PURL.

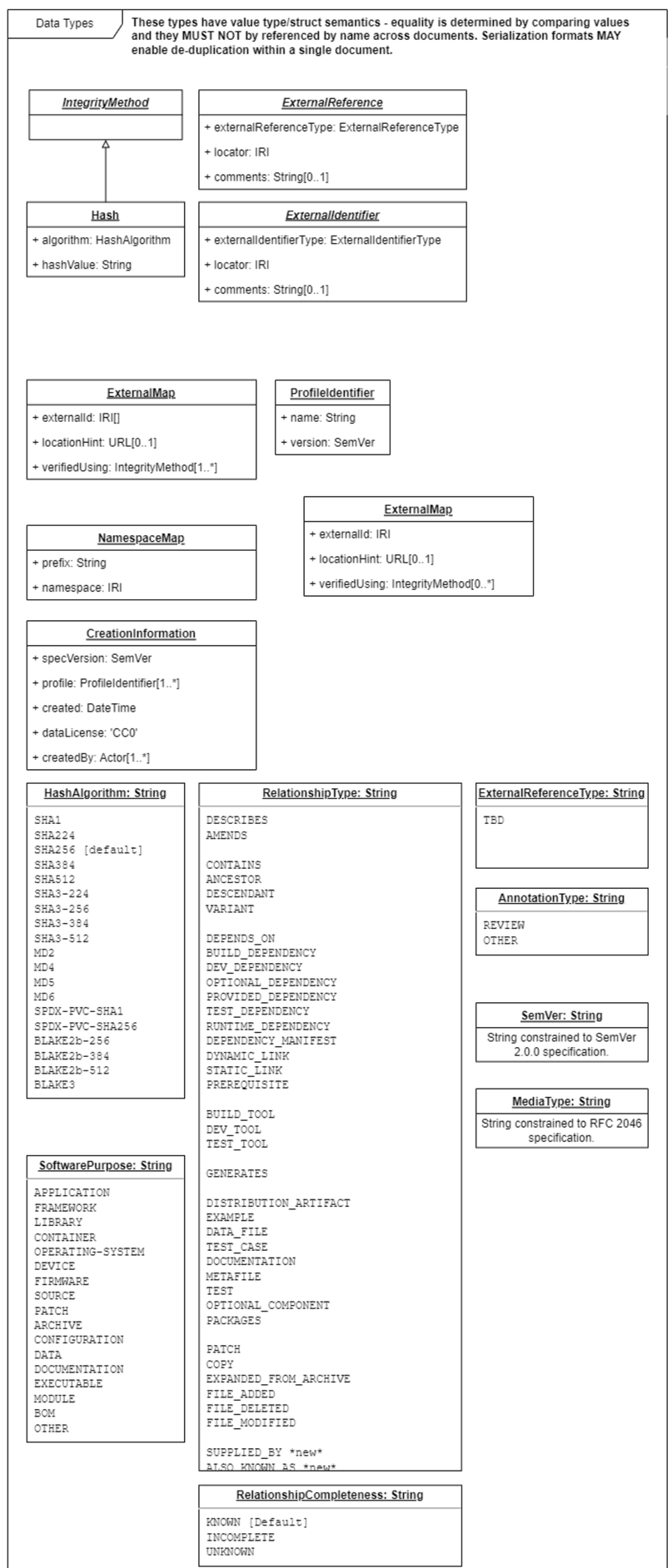
Questions:
* Are locator on ExternalReference now a URL not IRI?
* If identifier is an IRI then I don't think we need a type, if we have a type it's possible we want the IRI to be a string w/ schema instead.
* We have lots of overlapping relationship types for dependencies, should we have a DependencyRelationship subclass?

**SoftwareDependencyRelationship**
+ linkType: STATIC | DYNAMIC | OTHER
+ environment: BUILD | DEV | TEST | RUNTIME
+ requirement: OPTIONAL | REQUIRED | PROVI

2022-09-20: 1df6f25 Tech Meeting 2022-09-20






## Legend

***Italics*** - abstract, you must use a subclass

<u>Underscore</u> - value type/struct semantics, equality determined by comparing values

## Core Data Types

## Serialization

* Collections MAY nest contained elements (i.e. elements referenced by the "element" property but the hash of the canonical representation MUST be equivalent to those elements not being nested. Nesting SHOULD NOT be extended beyond a single level (Q: Is this restriction possible for aggregated documents?).

profile Licensing

**Legal WG**

profile Security

**Defects WG**

profile Build

**Build WG**

profile Usage

**Usage WG**

profile AI+Data

**AI WG**

profile Service

**TBD**

## Minimal Document Example (JSON)

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": "urn:spdx.dev:iamwillbar",
  },
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## Minimal Single Element Example (JSON)

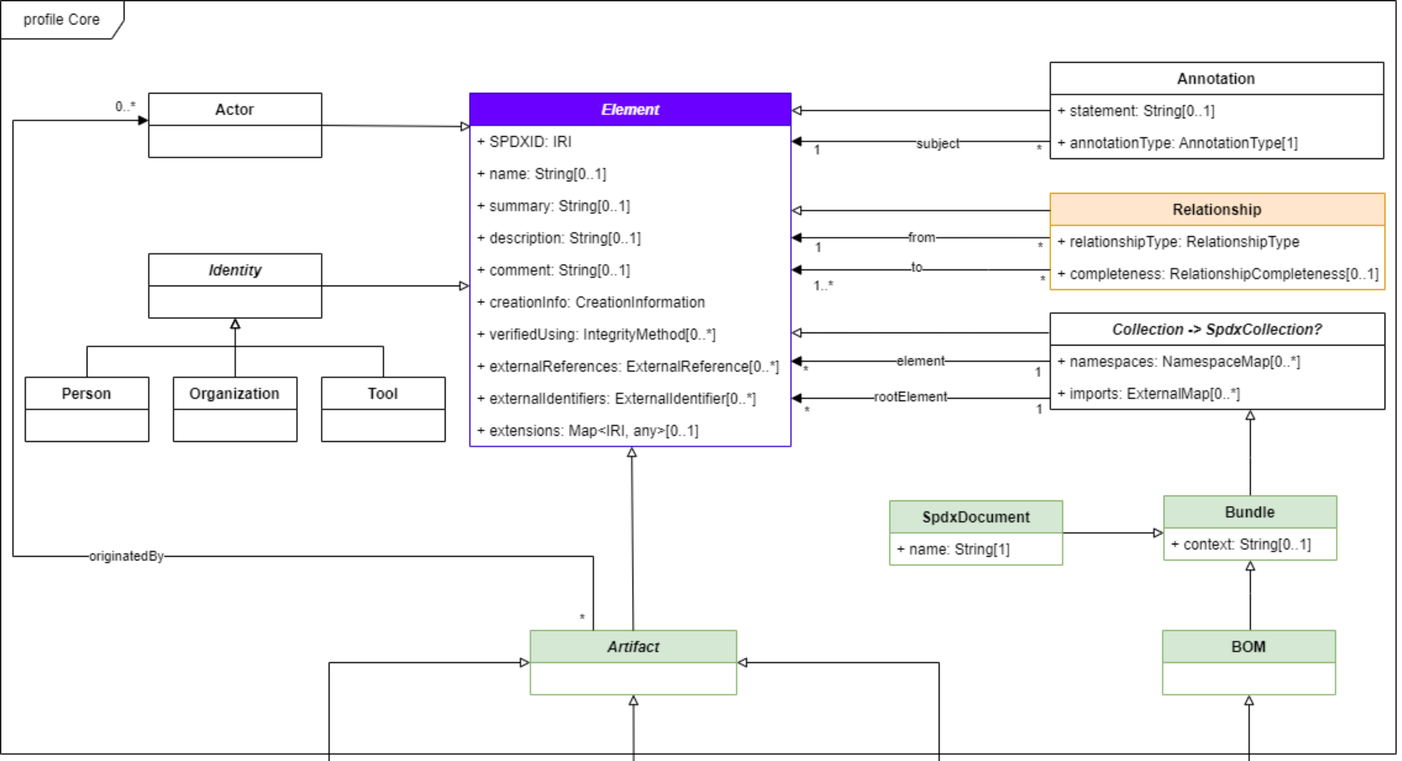
```
{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": "urn:spdx.dev:iamwillbar"
  }
}
```

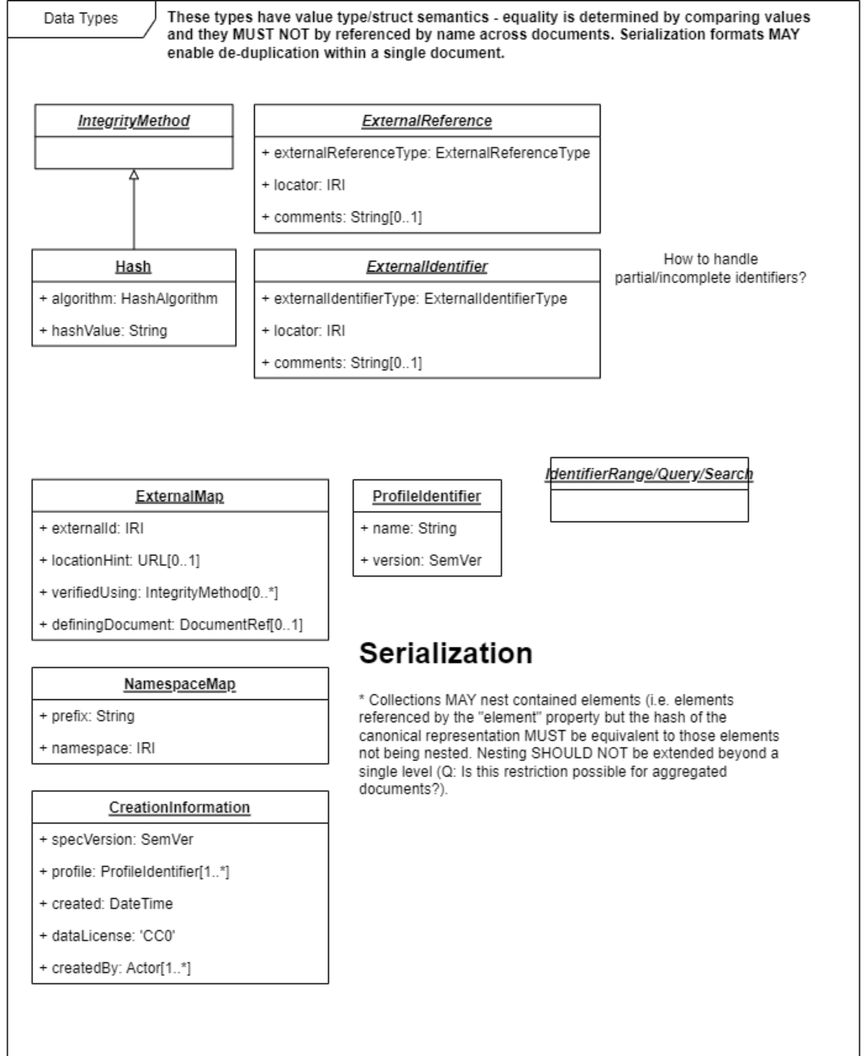
## Minimal Multiple Element Example (JSON)

## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": "urn:spdx.dev:iamwillbar"
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "externalIdentifiers": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "externalIdentifiers": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```

2022-09-13: 87075bd Update model.png




## Legend

*Italics* - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

### Core Data Types

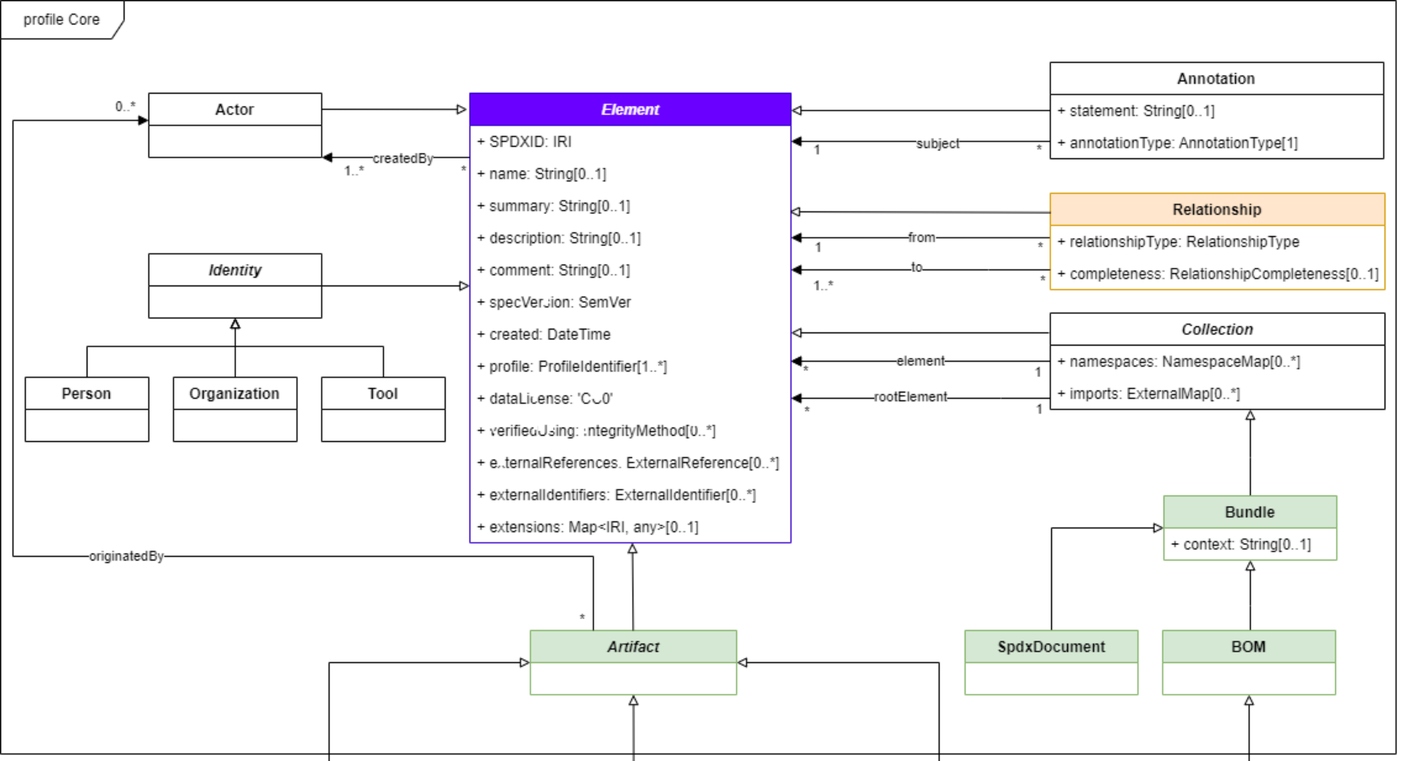
## Minimal Example (JSON)

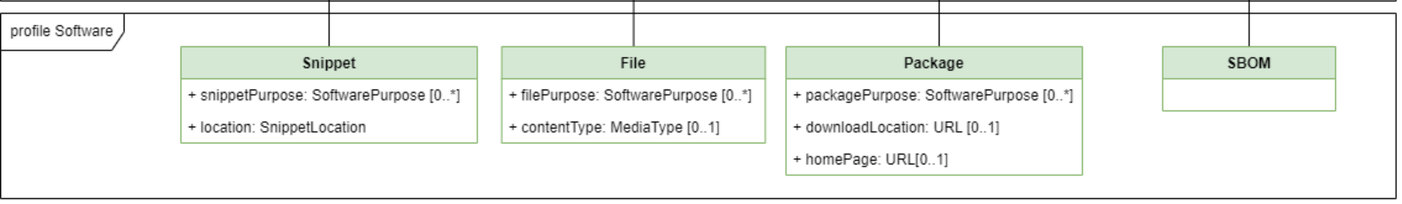
```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}



{
  "@type": "Person",
  "@id": "urn:spdx.dev:iamwillbar",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar"
}



[



]
```

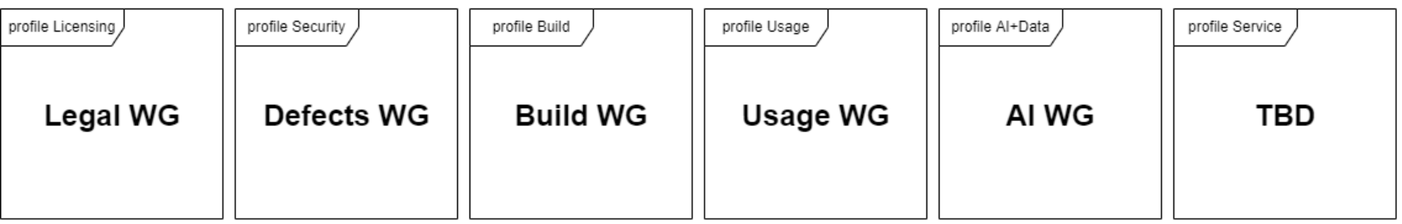
## SBOM Example (JSON)

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "creationInfo": {
    "specVersion": "3.0",
    "created": "2022-05-02T20:28:00.000Z",
    "profile": ["core"],
    "dataLicense": "CC0",
    "createdBy": "urn:spdx.dev:iamwillbar"
  },
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[]}
  ],
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "identifiedBy": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "identifiedBy": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
```

2022-08-03: 4178d12 Update model.png



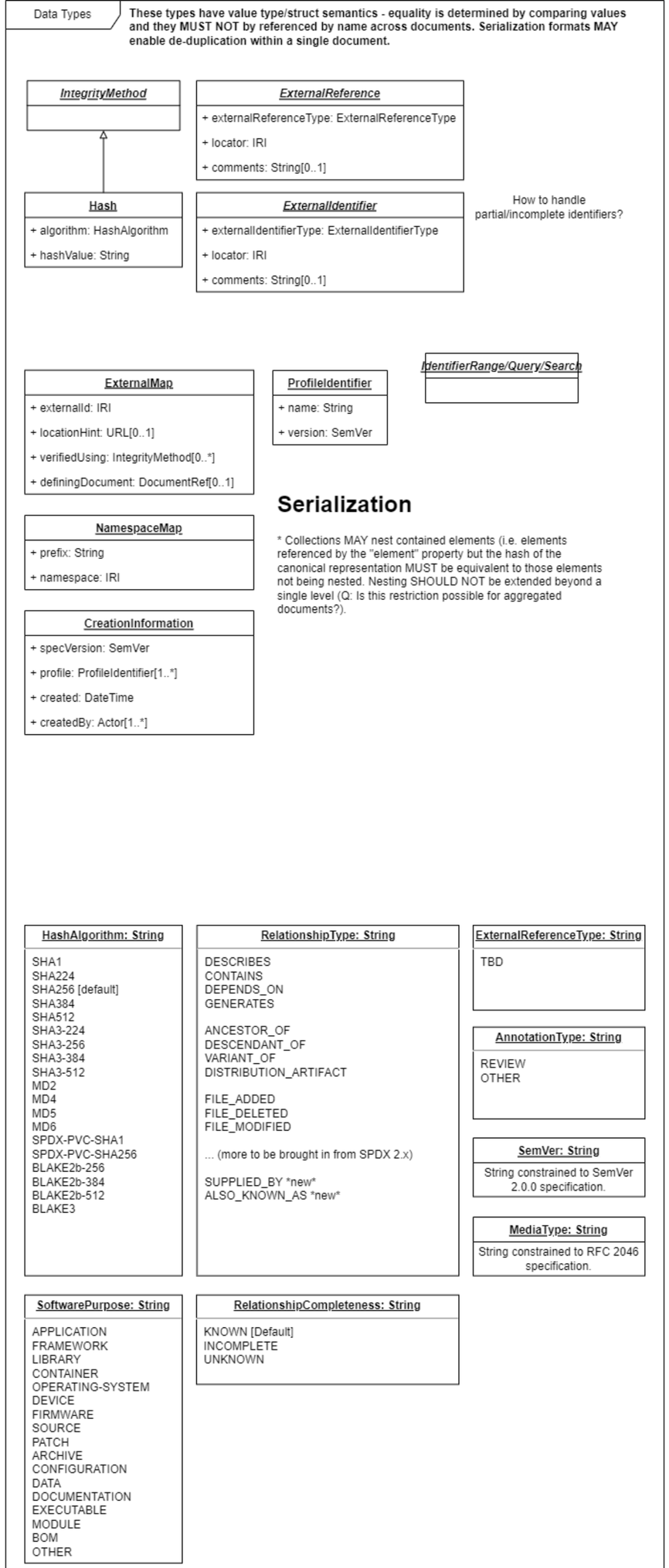




## Minimal Example

```
{
  "@type": "SpdxDocument",
  "@id": "urn:spdx.dev:null-document",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "elements": [
    {
      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## SBOM Example

```
{
  "@type": "SBOM",
  "@id": "urn:spdx.dev:null-sbom",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "externalMap": [
    {"elementId": "urn:spdx.dev:project", "elementURL": "", "verifiedUsing": []},
    {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json", "verifiedUsing":
[]}
  ]
  "elements": [
    {

      "@type": "Person",
      "@id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "identifiedBy": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "@type": "Package",
      "@id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downloads/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "identifiedBy": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```



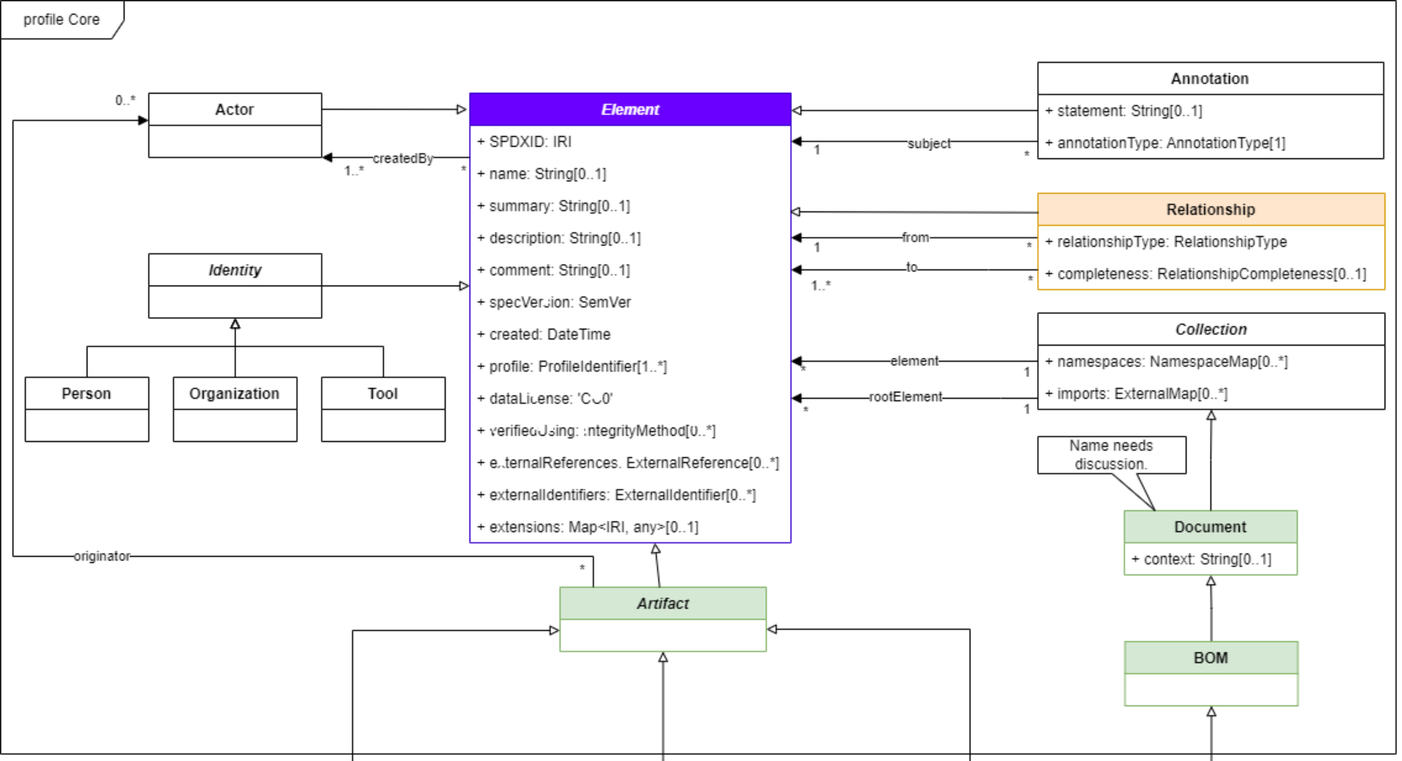

## Legend

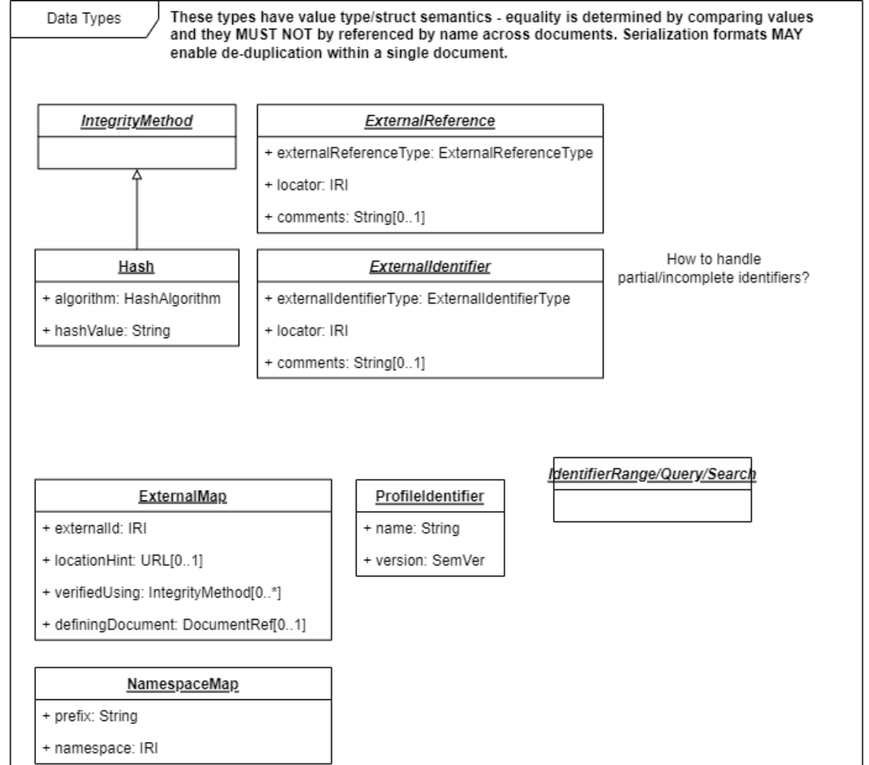
*Italics* - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

### Core Data Types

2022-07-26: 048e1c9 2022-07-26 Tech Meeting




## Legend

*Italics* - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

### Core Data Types

## Minimal Example

```
{
  "type": "Document",
  "id": "urn:spdx.dev:null-document",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "elements": [
    {
      "type": "Person",
      "id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## SBOM Example

```
{
  "type": "SBOM",
  "id": "urn:spdx.dev:null-sbom",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],

  "externalMap": [
      {"elementId": "urn:spdx.dev:project", "elementURL": "", verified},
      {"elementId": "urn:spdx.dev:doc", "elementURL": "https://spdx.dev/docs/v1.0.json",
"verifiedIUsing": []}

  ]
  "elements": [
    {
      "type": "Person",
      "id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "identifiedBy": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },

    {
      "type": "Package",
      "id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "identifiedBy": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
```

**HashAlgorithm: String**

SHA1
SHA224
SHA256 [default]
SHA384
SHA512
SHA3-224
SHA3-256
SHA3-384
SHA3-512
MD2
MD4
MD5
MD6
SPDX-PVC-SHA1
SPDX-PVC-SHA256
BLAKE2b-256
BLAKE2b-384
BLAKE2b-512
BLAKE3

**RelationshipType: String**

DESCRIBES
CONTAINS
DEPENDS_ON
GENERATES

ANCESTOR_OF
DESCENDANT_OF
VARIANT_OF
DISTRIBUTION_ARTIFACT

FILE_ADDED
FILE_DELETED
FILE_MODIFIED

... (more to be brought in from SPDX 2.x)

SUPPLIED_BY *new*
ALSO_KNOWN_AS *new*

**ExternalReferenceType: String**

TBD

**AnnotationType: String**

REVIEW
OTHER

**SemVer: String**

String constrained to SemVer 2.0.0 specification.

**MediaType: String**

String constrained to RFC 2046 specification.

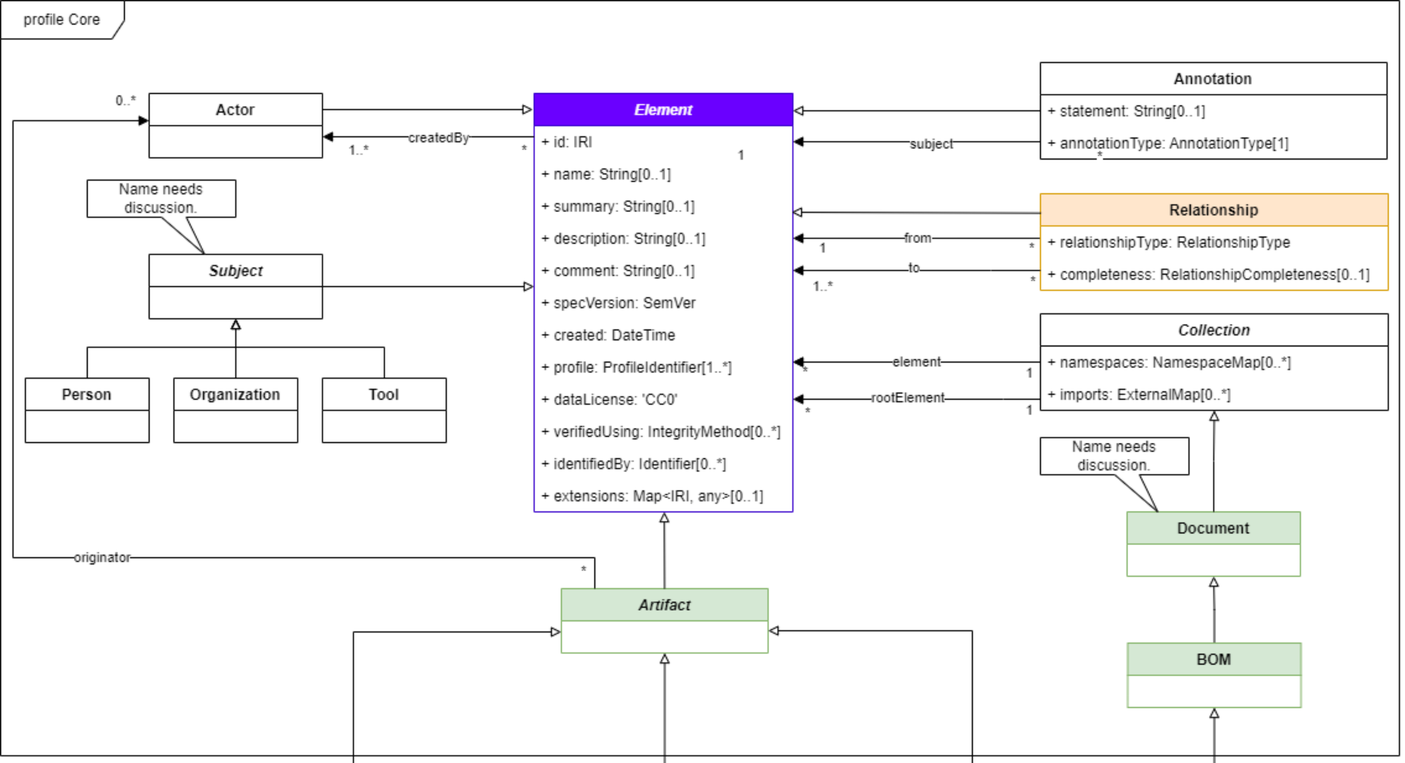
**SoftwarePurpose: String**

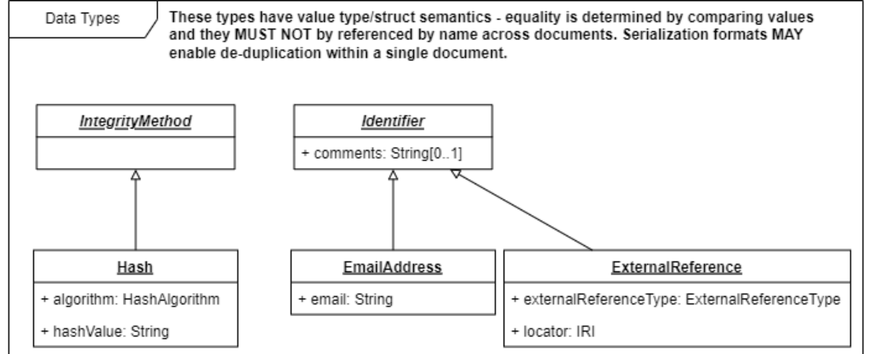
APPLICATION
FRAMEWORK
LIBRARY
CONTAINER
OPERATING-SYSTEM
DEVICE
FIRMWARE
SOURCE
PATCH
ARCHIVE
CONFIGURATION
DATA
DOCUMENTATION
EXECUTABLE
MODULE
BOM
OTHER

**RelationshipCompleteness: String**

KNOWN [Default]
INCOMPLETE
UNKNOWN

2022-07-19: 2082824 Last tech meeting




## Legend

***Italics*** - abstract, you must use a subclass

Underscore - value type/struct semantics, equality determined by comparing values

## Minimal Example

```
{
  "type": "Document",
  "id": "urn:spdx.dev:null-document",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "elements": [
    {
      "type": "Person",
      "id": "urn:spdx.dev:iamwillbar"
    }
  ]
}
```

## SBOM Example

```
{
  "type": "SBOM",
  "id": "urn:spdx.dev:null-sbom",
  "specVersion": "3.0",
  "created": "2022-05-02T20:28:00.000Z",
  "profile": ["core"],
  "dataLicense": "CC0",
  "createdBy": "urn:spdx.dev:iamwillbar",
  "rootElements": ["urn:spdx.dev:spdx-tools-3.0.1"],
  "elements": [
    {
      "type": "Person",
      "id": "urn:spdx.dev:iamwillbar",
      "name": "William Bartholomew",
      "identifiedBy": [
        {"type": "EmailAddress", "email": "willbar@microsoft.com"},
        {"type": "Account", "authority": "github.com", "locator": "iamwillbar"}
      ]
    },
    {
      "type": "Organization",
      "id": "urn:spdx.dev:project",
      "name": "SPDX Project"
    },
    {
      "type": "Package",
      "id": "urn:spdx.dev:spdx-tools-3.0.1",
      "packagePurpose": "APPLICATION",
      "downloadLocation": "https://spdx.dev/downlods/spdx-tools-3.0.1.tgz",
      "homePage": "https://spdx.dev/tools/3.0",
      "originator": ["urn:spdx.dev:project"],
      "identifiedBy": [
        {"type": "ExternalReference", "externalReferenceType": "purl", "locator": ""},
        {"type": "ExternalReference", "externalReferenceType": "cpe22", "locator": ""}
      ],
      "verifiedUsing": [
        {"type": "Hash", "hashAlgorithm": "SHA256", "hashValue": "..."}
      ]
    }
  ]
}
```

**HashAlgorithm: String**

SHA1
SHA224
SHA256 [default]
SHA384
SHA512
SHA3-224
SHA3-256
SHA3-384
SHA3-512
MD2
MD4
MD5
MD6
SPDX-PVC-SHA1
SPDX-PVC-SHA256
BLAKE2b-256
BLAKE2b-384
BLAKE2b-512
BLAKE3

**RelationshipType: String**

DESCRIBES
CONTAINS
DEPENDS_ON
GENERATES

ANCESTOR_OF
DESCENDANT_OF
VARIANT_OF
DISTRIBUTION_ARTIFACT

FILE_ADDED
FILE_DELETED
FILE_MODIFIED

... (more to be brought in from SPDX 2.x)

SUPPLIED_BY *new*
ALSO_KNOWN_AS *new*

**ExternalReferenceType: String**

TBD

**AnnotationType: String**

REVIEW
OTHER

**SemVer: String**

String constrained to SemVer 2.0.0 specification.

**MediaType: String**

String constrained to RFC 2046 specification.

**SoftwarePurpose: String**

APPLICATION
FRAMEWORK
LIBRARY
CONTAINER
OPERATING-SYSTEM
DEVICE
FIRMWARE
SOURCE
PATCH
ARCHIVE
CONFIGURATION
DATA
DOCUMENTATION
EXECUTABLE
MODULE
BOM
OTHER

**RelationshipCompleteness: String**

KNOWN [Default]
INCOMPLETE
UNKNOWN

2022-05-17: 4db2df8 Proposed model post 2022-05-17 tech meeting

pkg Core

ExternalReference
+ externalReferenceType: ExternalReferenceType
+ locator: URI
+ comments: String[0..1]

Hash
+ algorithm: HashAlgorithm
+ hashValue: String

*Extension*

Annotation
+ annotationType: AnnotationType[1]
+ statement: String[0..1]

*Element*
+ id: IRI
+ name: String[0..1]
+ summary: String[0..1]
+ description: String[0..1]
+ comment: String[0..1]
+ specVersion: SemVer
+ created: DateTime
+ profile: ProfileIdentifier[1..*]
+ dataLicense: 'CC0'

*IntegrityMethod*

NamespaceMap
+ prefix: String
+ namespace: IRI

Should namespace map be on collection or doc?

Relationship
+ relationshipType: RelationshipType
+ completeness: RelationshipCompleteness[0..1]

*Collection*

ExternalMap
+ externalId: IRI
+ elementURL: URL

Tool
+ userAgent: String

Organization

Person

*Identity*
+ email: String[0..1]

*Artifact*
+ artifactUri: ArtifactUri[0..1]

ContextualCollection
+ context: String[0..1]

BOM

Document

pkg Software

Snippet
+ snippetPurpose: SoftwarePurpose [0..*]
+ location: SnippetLocation

File
+ filePurpose: SoftwarePurpose [0..*]
+ contentType: MediaType [0..1]

Package
+ packagePurpose: SoftwarePurpose [0..*]
+ downloadLocation: URL [0..1]
+ homePage: URL[0..1]

SBOM

**SoftwarePurpose: String**

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profile Licensing

**Legal working group**

profile Defects

**Defects working group**

**HashAlgorithm: String**

SHA1
SHA224
SHA256 [default]
SHA384
SHA512
SHA3-224
SHA3-256
SHA3-384
SHA3-512
MD2
MD4
MD5
MD6
SPDX-PVC-SHA1
SPDX-PVC-SHA256
BLAKE2b-256
BLAKE2b-384
BLAKE2b-512
BLAKE3

**RelationshipType: String**

DESCRIBES
CONTAINS
DEPENDS_ON
GENERATES

ANCESTOR_OF
DESCENDANT_OF
VARIANT_OF
DISTRIBUTION_ARTIFACT

FILE_ADDED
FILE_DELETED
FILE_MODIFIED

OTHER

SUPPLIED_BY *new*

**RelationshipCompleteness: String**

KNOWN [Default]
INCOMPLETE
UNKNOWN

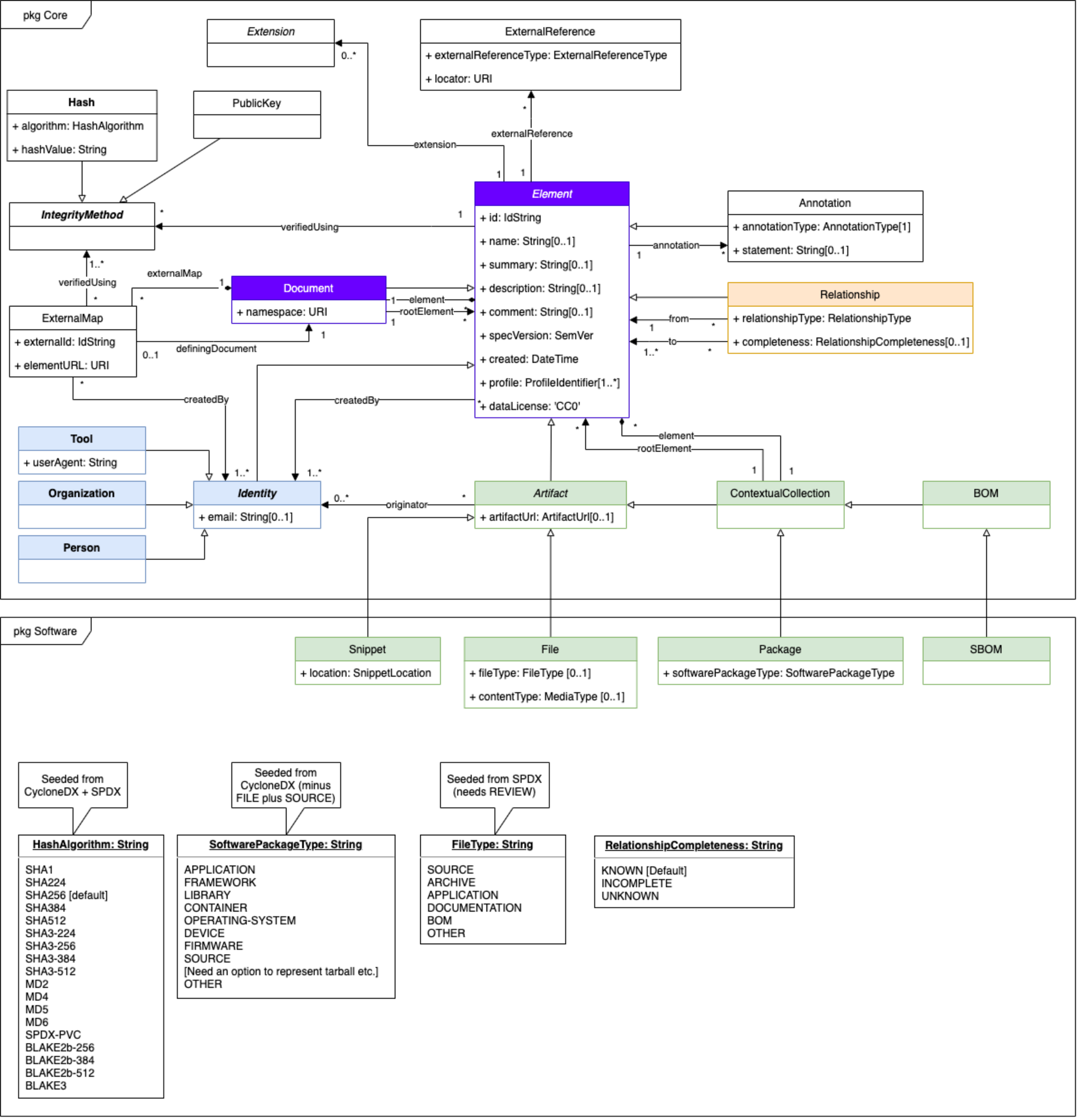
**AnnotationType: String**

REVIEW
OTHER

**ExternalReferenceType: String**

TBD

# 2022-04-18: 7837031 Model update (pre Identity changes)




2021-10-20: 2d63180 added a copy of the diagram of the model