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SCIM Profile for Security Event Tokens
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Abstract

This specification defines a set of SCIM Security Events using the Security Event Token Specification RFC8417 to enable the asynchronous exchange of messages between SCIM Service Providers and receivers. SCIM Security Events are typically used for: asynchronous request completion, resource replication, and provisioning co-ordination.

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1. Introduction and Overview

This specification defines Security Events for SCIM Service Providers and receivers as specified by the Security Event Tokens (SET) [RFC8417] specification. SCIM Security Events in this specification include: asynchronous request completion, resource replication, and provisioning co-ordination.

This specification also profiles the use of the HTTP Header "Prefer: Async-response" [RFC7240] to allow a SCIM Protocol Client [RFC7644] to request an asynchronous response (see Section 2.5.1.1).

In a typical HTTP client-server relationship, a SCIM Protocol Client issues commands to a SCIM Service Provider using HTTP methods such as POST, PATCH, and DELETE [RFC7644] that cause a state change to a SCIM Resource. When multiple independent SCIM Clients update SCIM Resources, individual clients become out of date as state changes occur. Some clients may need to be informed of these changes for co-ordination or reconciliation purposes. This could be done using periodic SCIM GET requests over time, but this rapidly becomes problematic as the number of changes and the number of resources increases.

Security Event Tokens [RFC8417] and SCIM Events offer the ability to exchange messages that act as triggers for receivers to monitor over time in an asynchronous approach. This enables greater scale and timeliness, where only changed information is exchanged between parties.

A SET conveys information about a state change that has occurred in a publishing SCIM Service Provider. That token may be of interest to one or more receivers and can be delivered asynchronously to the originating SCIM Client making the change. Unlike SCIM Protocol requests which convey protocol commands, Security Events describe statements of fact about changes by the SCIM Service Provider. This approach allows the Event Receiver to determine the best local follow-up action to take within its own context. For example, the receiver can reconcile intentional schema and population differences between the domain.

1.1. Requirements Language

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] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.2. Notational Conventions

For purposes of readability examples are not URL encoded. Implementers MUST percent encode URLs as described in Section 2.1 of [RFC3986].

Throughout this document all figures MAY contain spaces and extra line-wrapping for readability and space limitations. Similarly, some URI's contained within examples, have been shortened for space and readability reasons.

1.3. Definitions

This specification uses definitions from the following specifications:

- * JSON Web Tokens (JWT) [RFC7519],
- * Security Event Tokens (SET) [RFC8417], and
- * System for Cross-Domain Identity Management Protocol [RFC7644].

In JSON Web Tokens and Security Event Tokens, the term "claim" refers to JSON attribute values in a JSON Web Token [RFC7519] structure. The term "claim" in tokens is used to indicate that an attribute value may not be verified and its accuracy can be questioned. In the context of SCIM, claims are referred to as attributes. For the purposes of this specification claims and attributes are interchangeable. For consistency, JWT and SET IANA registered attributes will continue to be called claims, while event attributes (i.e. those in an event payload) will be referred to as attributes.

Additionally, the following terms are defined:

Attributes and Claims

The JWT specification [RFC7519] upon which SET is based uses the term "claims" to refer to attributes in a JSON token. SCIM in contrast uses the term "attributes" to refer to JSON attributes. For the purposes of this draft, the terms "attributes" and "claims" are equivalent.

CP

Abbreviation for "Co-ordinated Provisioning" as defined in Appendix A.2. In these relationships, an Event Publisher and Receiver typically exchange resource change events without exchanging data. For a receiver to know the value of the data, the Event Receiver usually calls back to the SCIM Event Publisher domain to receive a new copy of data (e.g. Uses a SCIM GET request).

DBR

Abbreviation for "Domain Based Replication" as defined in Appendix A.1. In this mode because there is an administrative relationship spanning multiple operational domains, data shared in Events typically uses the full mode variation of change events including the data payload attribute. This eliminates the need for a callback to retrieve additional data.

Event Feed / Event Stream

This describes the quality that a feed (aka stream) MAY be managed per receiving client. A SET transfer (see [RFC8935] [RFC8936]) Service Provider MAY offer to allow Event Receivers to "subscribe" to specific event types or events about specific resources (see Feed Management events Section 2.3).

Event Receiver

An entity receives events typically via [RFC8935], [RFC8936], or HTTP GET (see Section 2.5.1.1). In the case of SET Push Transfer [RFC8935], the Event Receiver is an HTTP Service Endpoint that receives requests. In the case of SET Poll-Based Transfer [RFC8936], the receiver is an HTTP client that initiates HTTP request to an Event Publisher endpoint.

Event Publisher

A system that issues SETs based on a resource state change that has occurred at a SCIM Service Provider. For example, events MAY be the result of a SCIM Create, Modify, or Delete as defined in [RFC7644]. A SCIM Service Provider MAY be an Event Publisher or an independent service that aggregates events into Event Receiver feeds. As described above, when using [RFC8935], the Event Publisher is an HTTP Client that initiates HTTP POST requests to a defined Event Receiver endpoint. When using [RFC8936], the Event Publisher provides an HTTP endpoint which a receiver MAY use to "poll" for Security Events.

SCIM Client

An HTTP client that initiates SCIM Protocol [RFC7644] requests and receives responses.

SCIM Service Provider

An HTTP server that implements SCIM Protocol [RFC7644] and SCIM Schema [RFC7643].

SET

Abbreviation for "Security Event Token" as defined in [RFC8417]

2. SCIM Events

A SCIM event is a signal, in the form of a Security Event Token [RFC8417], that describe some event that has occurred. A SET event consists of a set of standard JWT "top-level" claims and an "events" claim that contains one or more event URI subclaims (JSON attributes) each with a JSON object containing relevant event information.

This specification defines a new URI prefix `urn:ietf:params:SCIM:event` which is used as the prefix for the following defined SCIM Events (see Section 6.2). Events are grouped into one of two sub-namespaces: "feed" (feed control notices) or "prov" (provisioning).

2.1. Identifying the Subject of an Event

SCIM Events SHALL use the "sub_id" claim defined by Subject Identifiers for Security Event Tokens [RFC9493] specification to identify the subject of events. The sub_id claim MUST be contained within the main JWT claims body and SHALL NOT be located within an Event payload within the events claim. A SET with multiple event URIs indicates that the events arise from the same transaction or resource state change for a single resource or subject. Finally, as recommended in [RFC8417] the JWT "sub" claim SHALL NOT be used to prevent confusion with JWT authorization tokens.

```
{
  "iss": "issuer.example.com",
  "iat": 1508184845,
  "aud": "aud.example.com",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2b2f880af6674ac284bae9381673d462",
    "externalId": "alice@example.com"
  },
  "events": {
    ...
  }
}
```

Figure 1: SCIM Subject Id Example

Instead of "sub", the top-level claim "sub_id" SHALL be used. "sub_id" contains the subclaim "format" whose value is set to scim to indicate the other attributes present are SCIM attributes. The following sub_id attributes are defined:

uri

The SCIM relative path for the resource which usually consists of the resource type endpoint plus the resource id. For example /Users/2b2f880af6674ac284bae9381673d462. This attribute MUST be provided in a SCIM Event sub_id claim. Note the relative path is the path component after the SCIM Service Provider Base URI as defined in Section 1.3 [RFC7644]. In cases where the Event Receiver is unable to match a URI, the Event Receiver MAY issue a callback to a previously agreed SCIM Service Provider Base URI plus the relative uri value and perform a SCIM GET request per Section 3.4.1 [RFC7644].

externalId

If known, the externalId value of the SCIM Resource that MAY be used by a receiver to identify the corresponding resource in the Event Receiver's domain.

id

The SCIM Id attribute MAY be used for backwards compatibility reasons in addition to the uri claim.

emails, username, ...

A SCIM attribute that is unique to both the Event Publisher and Receiver. Typically, attributes like email or usernames are used in situations where normal SCIM identifiers (id and externalId) are insufficient to identify a common resource between an Event Publisher and Event Receiver.

2.2. Common Event Attributes

The following attributes are available for all events defined. Some attributes are defined as SET/JWT claims, while others are "Event Payload" claims as defined in Section 1.2 [RFC8417]. Only one of data or attributes claims SHALL be provided depending on the event definition.

txn

For the purposes of SCIM, this SET defined claim identifies a unique transaction originating at a SCIM Service Provider and/or its underlying data repository or database. The claim is used to detect duplicate transactions that may have been received (e.g. in the case of a re-transmitted or recovered event). The txn claim is REQUIRED. The SET jti claim MAY be used in addition to the txn

claim. Where txn identifies a unique transaction within a SCIM Service Provider, multiple SETs MAY be issued each with distinct JTI's stemming from a common originating transaction with identical txn values.

version

The Etag version of the resource as a result of the event and corresponds to the Etag response header described in Section 3.14 of SCIM Protocol [RFC7644].

data

This event payload attribute contains information described in SCIM Bulk Operations data attribute, Section 3.7 [RFC7644]. The JSON object contains the equivalent SCIM command processed by the SCIM Service Provider. For example, after processing a SCIM Create operation, the data contained includes the final representation of the created entity by the SCIM Service Provider including the assigned id value.

attributes

This payload contains an array of attributes that were added, revised, or removed. Values of modified attributes SHOULD conform to the ABNF syntax rule for path> (Section 3.5.2 [RFC7644]). For example:

```
"attributes": ["username", "emails", "name.familyName"]
```

2.3. SCIM Feed Events

This section defines events related to changes in the content of an event feed. Such as, SCIM Resources that are being added or removed from an event feed or events used in Co-operative Provisioning scenarios where only a sub-set of entities are shared across an Event Feed. The URI prefix for these events is
urn:ietf:params:SCIM:event:feed

2.3.1. urn:ietf:params:SCIM:event:feed:add

The specified resource has been added to the Event Feed. A feed:add does not indicate a resource is new or has been recently created. For example, an existing user has had a new role (e.g. CRM_User) added to their profile which has caused their resource to join a feed.


```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "txn": "b7b953f11cc6489bbfb87834747cc4c1",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2b2f880af6674ac284bae9381673d462",
    "externalId": "jdoe"
  },
  "events":{
    "urn:ietf:params:SCIM:event:feed:add": {}
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 2: Example SCIM Feed Add Event

2.3.2. urn:ietf:params:SCIM:event:feed:remove

The specified resource has been removed from the feed. Removal does not indicate that the resource was deleted or otherwise deactivated. This event has minimal disclosure.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2b2f880af6674ac284bae9381673d462",
    "externalId": "jdoe",
  },
  "events":{
    "urn:ietf:params:SCIM:event:feed:remove": {}
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 3: Example SCIM Feed Remove Event

2.4. SCIM Provisioning Events

This section defines resource changes that have occurred within a SCIM Service Provider. These events are used in both Domain Based Replication (DBR) and Co-operative Provisioning (CP) mode. The URI prefix for these events is urn:ietf:params:SCIM:event:prov.

2.4.1. urn:ietf:params:SCIM:event:prov:create:{notice|full}

Indicates a new SCIM resource has been created by the SCIM Service Provider and has been added to the Event Feed. When the data payload attribute is included, the event URI SHALL end with full, otherwise the event URI ends with notice. In full mode, the set of values reflecting the final state of the resource at the Service Provider are provided using the data attribute. In notice mode, attributes is returned disclosing the list of attributes included in the create request. Note that because the event MAY be used for replication, the final id attribute that was assigned by the SCIM Service Provider is shared so that all replicas in the domain MAY use the same resource identifier.

```
{
  "jti": "4d3559ec67504aaba65d40b0363faad8",
  "iat": 1458496404,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754",
    "https://scim.example.com/Feeds/5d7604516b1d08641d7676ee7"
  ],
  "sub_id": {
    "format": "scim",
    "uri": "/Users/44f6142df96bd6ab61e7521d9",
    "externalId": "jdoe"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:create:full": {
      "data": {
        "schemas": [ "urn:ietf:params:scim:schemas:core:2.0:User" ],
        "emails": [
          { "type": "work", "value": "jdoe@example.com" }
        ],
        "userName": "jdoe",
        "name": {
          "givenName": "John",
          "familyName": "Doe"
        }
      }
    }
  }
}
```

Figure 4: Example SCIM Create (Full)

```
{
  "jti": "4d3559ec67504aaba65d40b0363faad8",
  "iat": 1458496404,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754",
    "https://scim.example.com/Feeds/5d7604516b1d08641d7676ee7"
  ],
  "sub_id": {
    "format": "scim",
    "uri": "/Users/44f6142df96bd6ab61e7521d9",
    "externalId": "jdoe"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:create:notice": {
      "attributes": [
        "id",
        "name",
        "userName",
        "password",
        "emails"
      ]
    }
  }
}
```

Figure 5: Example SCIM Create Event (Notice)

The event above notifies the Event Receiver which attributes have changed but does not convey the actual information. The Event Receiver MAY retrieve that information by performing a SCIM GET to the sub value specified.

2.4.2. urn:ietf:params:SCIM:event:prov:patch:{notice|full}

The specified resource has been updated using SCIM PATCH. In full mode, the data payload attribute is included. When the event URI ends with notice, the list of modified attributes is provided.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Groups/176f397ec4c44b94b2cfcb759780b8c2",
    "externalId": "crmUsers"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:patch:full": {
      "version": "a330bc54f0671c9",
      "data": {
        "schemas":
        [ "urn:ietf:params:scim:api:messages:2.0:PatchOp" ],
        "Operations": [ {
          "op": "add",
          "path": "members",
          "value": [ {
            "display": "Babs Jensen",
            "$ref": "/Users/2819c223...413861904646",
            "value": "2819c223-7f76-453a-919d-413861904646"
          } ]
        } ]
      }
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 6: Example SCIM Patch Event (Full)

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Groups/176f397ec4c44b94b2cfcb759780b8c2",
    "externalId": "crmUsers"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:patch:notice": {
      "attributes": ["members"],
      "version": "a330bc54f0671c9"
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 7: Example SCIM Patch Event (Notice)

2.4.3. urn:ietf:params:SCIM:event:prov:put:{notice|full}

The specified resource has been updated (e.g. one or more attributes has changed). In full mode, the SCIM PUT request body is included in the data attribute. In notice mode, the modified attributes are listed using attributes.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2819c223-7f76-453a-919d-413861904646"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:put:full": {
      "version": "a330bc54f0671c9",
      "data": {
        "schemas": ["urn:ietf:params:scim:schemas:core:2.0:User"],
        "userName": "jdoe",
        "externalId": "jdoe",
        "name": {
          "formatted": "Mr. Jon Jack Doe III",
          "familyName": "Doe",
          "givenName": "Jon",
          "middleName": "Jack"
        },
        "roles": [],
        "emails": [
          { "value": "jdoe@example.com" },
          { "value": "anon@jdoe.org" }
        ]
      }
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 8: Example SCIM Put Event (Full)

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2819c223-7f76-453a-919d-413861904646"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:put:notice": {
      "version": "a330bc54f0671c9",
      "attributes": ["userName", "externalId", "name", "roles", "emails"]
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 9: Example SCIM Put Event (Notice)

2.4.4. urn:ietf:params:SCIM:event:prov:delete

The specified resource has been deleted from the SCIM Service Provider. The resource is also removed from the feed. When a DELETE is sent, a corresponding feedRemove SHALL NOT be issued. A delete event has no payload attributes. Note that because the delete event has no attributes, the qualifiers full and notice SHALL NOT be used.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2b2f880af6674ac284bae9381673d462",
    "externalId": "jDoe"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:delete": {}
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 10: Example SCIM Delete Event

2.4.5. urn:ietf:params:SCIM:event:prov:activate

The specified resource (e.g. User) has been "activated". This does not necessarily reflect any particular state change at the SCIM Service Provider but may simply indicate the account defined by the SCIM resource is ready for use as agreed upon by the Event Publisher and Event Receiver. For example, an activated resource can represent an account that may be logged in.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2b2f880af6674ac284bae9381673d462"
  },
  "events": {
    "urn:ietf:params:SCIM:event:prov:activate": {}
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 11: Example SCIM Activate Event

2.4.6. urn:ietf:params:SCIM:event:prov:deactivate

The specified resource (e.g. User) has been deactivated and disabled. The exact meaning SHOULD be agreed to by the Event Publisher and its corresponding Event Receiver. Typically, this means the subject may no longer have an active security session. As with the activate event, this event has minimal disclosure requirements.

2.5. Miscellaneous Events

This section defines related miscellaneous events such as Asynchronous Request completion that has occurred within a SCIM Service Provider. The URI prefix for these events is urn:ietf:params:SCIM:event:misc.

2.5.1. Asynchronous Events

2.5.1.1. Making an Asynchronous SCIM Request

A SCIM Client making SCIM HTTP requests defined in [RFC7644] MAY request "asynchronous" processing using the "Prefer" HTTP Header as defined in Section 4.1 [RFC7240]. The client may do this for a number of reasons such as: avoiding holding HTTP connections open during long requests, because the result of the request is not needed, or for co-ordination reasons where the result is delivered to another entity for further action.

To initiate an async SCIM request, a normal SCIM protocol POST, PUT, PATCH, or DELETE request is performed with the HTTP Header Prefer with a value of respond-async as defined in [RFC9110]. The HTTP Accept header SHALL be ignored.

In response, and as indicated in the SCIM Service Provider Configuration (see Section 3, the SCIM Service Provider responds with either a normal SCIM response or asynchronously by returning HTTP Status 202 Accepted. The asynchronous response SHOULD contain no response body. To enable correlation of the future event, the HTTP response header "Set-txn" is returned with a value corresponding to a future Security Event Token to be received whose "txn" claim SHALL match. Per Section 3 [RFC7240], the response will also include the header Preference-Applied. The Location header returned SHALL be one of the following:

- * A location URI where the completion token MAY be retrieved using HTTP GET
- * The normal SCIM location header response specified by [RFC7644]

In the following non-normative example, a "Prefer" header is set to "respond-async":

```
PUT /Users/2819c223-7f76-453a-919d-413861904646
Host: scim.example.com
Prefer: respond-async
Content-Type: application/scim+json
Authorization: Bearer h480djs93hd8
{
  "schemas":["urn:ietf:params:scim:schemas:core:2.0:User"],
  "id":"2819c223-7f76-453a-919d-413861904646",
  "userName":"bjensen",
  "externalId":"bjensen",
  "name":{"
    "formatted":"Ms. Barbara J Jensen III"
  },
  "roles":[],
  "emails":[
    {
      "value":"bjensen@example.com"
    }
  ]
}
```

Figure 12: Example Asynchronous SCIM Protocol Request

The SCIM Service Provider responds with HTTP 202 Accepted and includes the Set-txn header:

```
HTTP/1.1 202 Accepted
Set-txn: 734f0614e3274f288f93ac74119dcf78
Preference-Applied: respond-async
Location:
  "/Users/2819c223-7f76-453a-919d-413861904646"
```

Figure 13

2.5.1.2. Asynchronous Bulk Endpoint Requests

SCIM Protocol Section 3.7 [RFC7644] provides the ability to submit multiple SCIM operations in a single request. When an asynchronous response is requested, a single Async Request Completion Event SHALL be generated for each requested operation. For example, if a single SCIM Bulk request had 10 operations, then 10 Async Event completions events would be generated.

The "txn" claim MUST be set to the value originally returned to the requesting SCIM Client (see Section 2.5.1.1) appended with a colon (":") followed by the request operation number. For example, if the "txn" claim value was "2d80e537a3f64622b0347b641ebc8f44", then the first Async Response Event Token representing the first operation

SHALL have a "txn" claim value of "2d80e537a3f64622b0347b641ebc8f44:1", the second operation SHALL have a value of "2d80e537a3f64622b0347b641ebc8f44:2", and so on.

If a SCIM Service Provider elects to optimize the sequence of operations (per Section 3.7 [RFC7644]), the Async Request Completion events generated MAY also be generated out of sequence from the order of operations in the original request. In this case, the "txn" claims generated SHALL use operation numbers that correspond to the original request order.

2.5.1.3. urn:ietf:params:SCIM:event:misc:asyncResp

The Async Response event signals the completion of a SCIM request. The event payload contains the attributes defined in SCIM Bulk Section 3.7 [RFC7644] and is the same as a single SCIM Bulk Response Operation as per Section 3.7.3. In the event, the "txn" claim must be set to the value originally returned to the requesting SCIM Client (see Section 2.5.1.1).

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2819c223-7f76-453a-919d-413861904646"
  },
  "txn": "734f0614e3274f288f93ac74119dcf78",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "PUT",
      "version": "W\/"huJj29dMNgu3WXPd\"",
      "status": "200"
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 14: Example SCIM Async Response Event

An error may occur in the SCIM Service Provider's asynchronous processing of the SCIM request. In that case, the event's operation MUST include a "response" attribute to indicate a non-200-series HTTP status as defined in Section 3.7 [RFC7644]. The response attribute MUST contain the sub-attributes defined in Section 3.12 [RFC7644]. Note that the "status" attribute of the event operation should match the "status" attribute of the response.

```
{
  "jti": "6164f3bbf6ff41a88dc94f18cb0620e8",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/2819c223-7f76-453a-919d-413861904646"
  },
  "txn": "734f0614e3274f288f93ac74119dcf78",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "PUT",
      "version": "W\ /\ "huJj29dMNgu3WXPd\ ",
      "status": "400",
      "response": {
        "schemas": [
          "urn:ietf:params:scim:api:messages:2.0:Error"
        ],
        "scimType": "invalidSyntax",
        "detail": "Request is unparsable",
        "status": "400"
      }
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 15: Example SCIM Async Error Response Event

The following 4 figures show Async Completion events for the example in Section 3.7.3 of [RFC7644].

```
{
  "jti": "dbae9d7506b34329aa7f2f0d3827848b",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/92b725cd-9465-4e7d-8c16-01f8e146b87a"
  },
  "txn": "2d80e537a3f64622b0347b641ebc8f44:1",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "POST",
      "bulkId": "qwerty",
      "version": "W\ /\ \"oY4m4wn58tkVjJxK\\"",
      "status": "201"
    }
  },
  "iat": 1458505044,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 16: Example SCIM Async Response Event Operation 1/4

```
{
  "jti": "ca977d05ba5c43929e3a69023d5392a9",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/b7c14771-226c-4d05-8860-134711653041"
  },
  "txn": "2d80e537a3f64622b0347b641ebc8f44:2",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "PUT",
      "version": "W\ /\ \"huJj29dMNgu3WXPd\\"",
      "status": "200"
    }
  },
  "iat": 1458505045,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 17: Example SCIM Async Response Event Operation 2/4

```
{
  "jti": "4bb87d70a4ab463bbdcd1f99111cbbf1",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/5d8d29d3-342c-4b5f-8683-a3cb6763ffcc"
  },
  "txn": "2d80e537a3f64622b0347b641ebc8f44:3",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "PATCH",
      "version": "W\ /\ "huJj29dMNgu3WXPd\ ",
      "status": "200"
    }
  },
  "iat": 1458505046,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 18: Example SCIM Async Response Event Operation 3/4

```
{
  "jti": "6a7843a7f5244d0eb62ca38b641d9139",
  "sub_id": {
    "format": "scim",
    "uri": "/Users/e9025315-6bea-44e1-899c-1e07454e468b"
  },
  "txn": "2d80e537a3f64622b0347b641ebc8f44:4",
  "events": {
    "urn:ietf:params:SCIM:event:misc:asyncResp": {
      "method": "DELETE",
      "status": "204"
    }
  },
  "iat": 1458505047,
  "iss": "https://scim.example.com",
  "aud": [
    "https://scim.example.com/Feeds/98d52461fa5bbc879593b7754"
  ]
}
```

Figure 19: Example SCIM Async Response Event Operation 4/4

3. Events Discovery Schema for Service Provider Configuration

Section 5 of [RFC7643] defines SCIM Service Provider configuration schemas. This section defines additional attributes that enable a SCIM Client to discover the additional capabilities defined by this specification.

securityEvents

A SCIM Complex attribute that specifies the available capabilities related to asynchronous Security Events based on [RFC8417]. This attribute is OPTIONAL and when absent indicates the SCIM Service Provider does not support or is not currently configured for Security Events. The following sub-attributes are defined:

asyncRequest

A string value specifying one of the following:

- * NONE indicates async SCIM requests defined in Section 2.5.1.1 are not supported;
- * LONG indicates the SCIM Service Provider MAY complete asynchronously at its discretion (e.g. based on a max wait time);
- * REQUEST indicates the request SHALL complete asynchronously when requested by the SCIM Client.

eventUris

A multivalued string listing the SET Event URIs (defined in [RFC8417]) that the server is capable of generating and deliverable via a SET Stream (see [RFC8935] and [RFC8936]). This information is informational only. Stream registration and configuration are out of scope of this specification.

4. Security Considerations

As this specification is based upon the Security Event Tokens specification and the associated delivery specifications the following Security Considerations SHALL be applied:

- * Section 5 of [RFC8417] (Security Event Token)
- * Section 5 of [RFC8935] (Push-based Delivery Using HTTP)
- * Section 4 of [RFC8936] (Poll-Based Delivery Using HTTP)

SETs may contain sensitive information, including Personally Identifiable Information (PII). In such cases, SET Transmitters and SET Recipients MUST protect the confidentiality of the SET contents. TLS MUST be used to secure the transmitted SETs. Event delivery endpoints MUST support at least TLS version 1.3 and support the newest version of TLS that meets its security requirements, which as of the time of this publication is TLS 1.3 [RFC8446]. The client MUST perform a TLS/SSL server certificate check using DNS-ID [RFC6125] and/or DANE [RFC6698]. The implementation security considerations for TLS in "Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)" [RFC7525] MUST be followed.

When co-ordinating provisioning between entities, the long-term series of changes may be critical to the information integrity and recovery requirements of both sides. To address this, Event Publishers SHOULD consider storing events for receivers for longer periods of time than might typically be used for recovering from momentary delivery failures and retries per [RFC8935] or [RFC8936]. Similarly, Event Receivers MUST ensure events are persisted directly or indirectly to meet local recovery needs before acknowledging the SET Events were received.

An attacker might leverage transaction and/or signal information contained in SET Event Publisher or Receiver system. To mitigate this, access to event recovery and forwarding MUST be limited to the parties needed to support recovery or SET forwarding.

When SET Events are transferred in such a way as the Event Publisher is not communicating directly to the Event Receiver, it may become possible for an attacker or other system to insert an event. To mitigate, the use of JWS [RFC7515] signed SET Events MUST be used to verify the originator of a SET Event. Validating event signatures is both useful on the initial transfer of SET Events, and may also be useful for auditing purposes. Signed SET Events are protected from tampering in the event that an intermediate system, such as a TLS-terminating proxy, decrypts the SET payload before sending it onward to its intended recipient.

In operation, some SCIM Resources such as SCIM Groups may have a high rate of change. For examples groups with more than a few thousand member values could lead to excessive change rates that could lead to a loss of SET Events between Event Publishers and Event Receivers. To mitigate this risk, consider the following to help mitigate throughput issues:

- * Avoid use of SCIM PUT (Section 3.5.1 [RFC7644]) operations on large groups as this may require excessive locking in data store systems as well as large Security Event payloads. Use SCIM PATCH (Section 3.5.2) to focus on updating and notifying about changed information.
- * Use Patch Notice (urn:ietf:params:SCIM:event:prov:patch:notice) to reduce event content combined with periodic SCIM GETs (see section 3.4 [RFC7644]) to retrieve current group state.
- * Aggregate multiple PATCH Events into a single event. Providing the exact date of each membership change is not critical but instead that the information content remains intact.

When using Asynchronous SCIM Requests (see Section 2.5.1.1), a SCIM Service provider returns a SCIM Accepted response with a URI for retrieving the event result. An unauthorized entity or attacker could obtain asynchronous request completion event information by querying the asynchronous operation result endpoint used by a SCIM Service Provider. To mitigate, the returned URI endpoint MUST be protected requiring an HTTP Authorization header or some other form of client authentication.

5. Privacy Considerations

As this specification is based upon the Security Event Tokens and the associated delivery specifications the following Privacy Considerations SHALL be applied:

- * Section 6 of [RFC8417] (Security Event Token)
- * Section 6 of [RFC8935] (Push-based Delivery Using HTTP)
- * Section 5 of [RFC8936] (Poll-Based Delivery Using HTTP)

This specification enables the sharing of information between domains. The specification assumes that implementers and deployers are operating under one of the following scenarios:

- * A common administrative domain where there is one administrative owner of the data. In these cases, the goal is to protect privacy and security of the owner and user data by keeping information systems co-ordinated and up-to-date. For example, the domains decide to use Domain Based Replication mode to keep employee information synchronized.

- * In a co-operative or co-ordinated relationship, parties have decided to share a limited amount of data and/or signals for the benefits of their users. Depending on end-user consent, information is shared on an as-authorized and/or as-needed basis. For example, the domains agree to use Co-ordinated Provision mode that exchanges things like account status or specific minimal attribute information that must be fetched on request after receiving notice of a change. This enables authorization to be verified each time data is transferred.

In general, the sharing of SCIM Event information falls within a pre-existing SCIM Client and Service Provider relationship and carry no additional personal information.

6. IANA Considerations

6.1. SCIM Async Txn Header Registration

This specification registers the HTTP Set-txn field name in the "HTTP Field Name Registry" defined in Section 16.3.1 [RFC9110].

Field name:
Set-txn

Status:
Permanent

Specification Document:
this specification, Section 2.2 and Section 2.5.1.1.

Comments:
See also Section 2.2 [RFC8417] Security Event Tokens.

6.2. Registration of the SCIM Event URIs Sub-Registry

IANA will add a new registry called "SCIM Event URIs" to the "System for Cross-domain Identity Management (SCIM) Schema URIs" registry group initiated by Section 10.1 of [RFC7643] at <https://www.iana.org/assignments/scim>.

Unless otherwise stated, the procedures and definitions for this sub-registry are inherited from the parent registry.

Namespace ID:
The sub-namespace ID of "event" is assigned within the "scim" namespace.

Syntactic Structure:

The Namespace Specific String (NSS) of all URNs that use the "event" Namespace ID SHALL have the following structure:

```
"urn:ietf:params:scim:event:{class}:{name}:{other}"
```

The keywords have the following meaning:

class

The class of events which is one of: "feed", "prov", "sig", or "misc".

name

A US-ASCII string that conforms to URN syntax requirements (see [RFC8141]) and defines a descriptive event name (e.g. "create").

other

An optional US-ASCII string that conforms to URN syntax requirements (see [RFC8141]) and serves as an additional sub-category or qualifier. For example "full" and "notice".

Identifier Uniqueness Considerations:

The designated contact shall be responsible for reviewing and enforcing uniqueness.

Identifier Persistence Considerations:

Once a name has been allocated it MUST NOT be re-allocated for a different purpose. The rules provided for assignments of values within a sub-namespace MUST be constructed so that the meaning of values cannot change. This registration mechanism is not appropriate for naming values whose meaning may change over time.

Registration format:

An event registration MUST include the following fields:

- * Event Uri
- * Descriptive Name
- * Reference to event definition

Initial values to be added to the SCIM Events Registry
Section 6.3.

6.3. Initial Events Registry

Summary of Event URI registrations:

Event URI	Name	Ref.
urn:ietf:params:SCIM:event:feed:add	Resource added to Feed Event	Section 2.3.1
urn:ietf:params:SCIM:event:feed:remove	Remove resource From Feed Event	Section 2.3.2
urn:ietf:params:SCIM:event:prov:create:notice	New Resource Event (notice only)	Section 2.4.1
urn:ietf:params:SCIM:event:prov:create:full	New Resource Event (full data)	Section 2.4.1
urn:ietf:params:SCIM:event:prov:patch:notice	Resource Patch Event (notice only)	Section 2.4.2
urn:ietf:params:SCIM:event:prov:patch:full	Resource Patch Event (full data)	Section 2.4.2
urn:ietf:params:SCIM:event:prov:put:notice	Resource Put Event (notice only)	Section 2.4.3
urn:ietf:params:SCIM:event:prov:put:full	Resource Put Event (full data)	Section 2.4.3
urn:ietf:params:SCIM:event:prov:delete	Resource Deleted Event	Section 2.4.4

urn:ietf:params:SCIM:event:prov:activate	Resource Activated Event	Section 2.4.5
urn:ietf:params:SCIM:event:prov:deactivate	Resource Deactivated Event	Section 2.4.6
urn:ietf:params:SCIM:event:misc:asyncResp	Async Request Completion	Section 2.5.1

Table 1

7. References

7.1. Normative References

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7.2. Informative References

- [RFC8935] Backman, A., Ed., Jones, M., Ed., Scurtescu, M., Ansari, M., and A. Nadalin, "Push-Based Security Event Token (SET) Delivery Using HTTP", RFC 8935, DOI 10.17487/RFC8935, November 2020, <<https://www.rfc-editor.org/info/rfc8935>>.
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Appendix A. Use Cases

SCIM Events may be used in a number of ways. The following non-normative sections describe some of the expected uses.

A.1. Domain Based Replication

The objective of "Domain Based Replication" events (DBR) is to synchronize resource changes between SCIM Service Providers in a common administrative domain. In this mode, complete information about modified resources are shared between replicas for immediate processing.

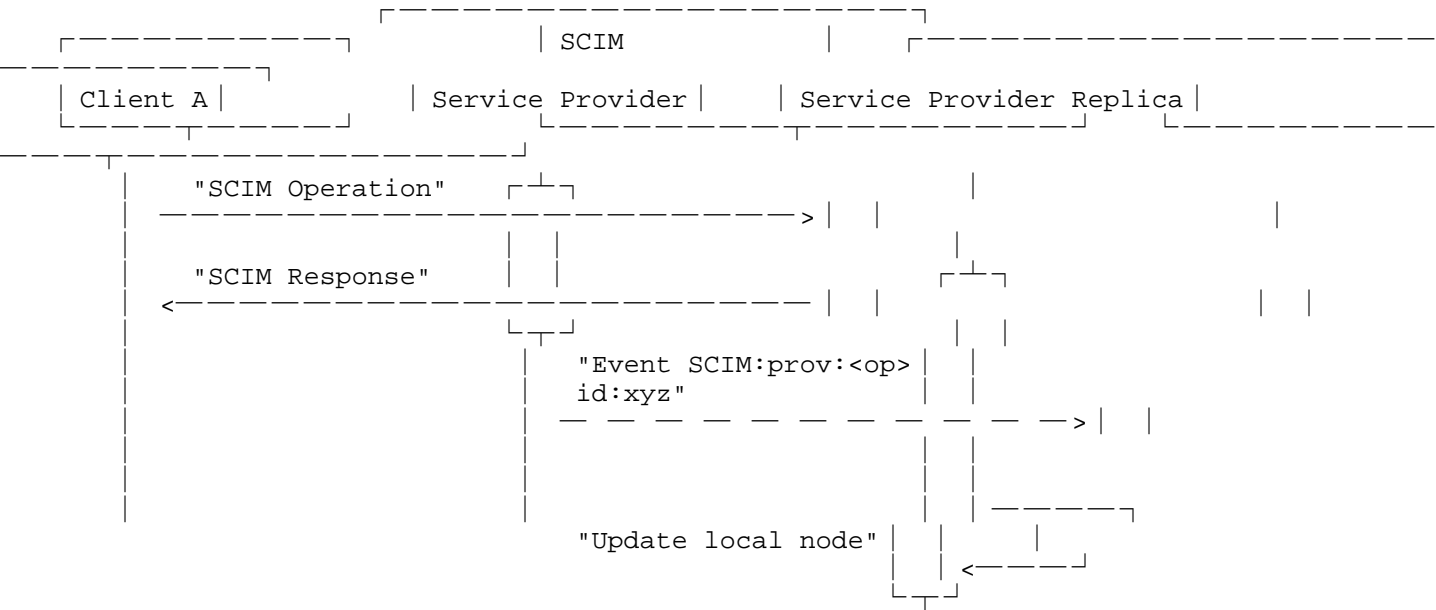


Figure 20: Domain Based Replication Sequence

From a security perspective, it is assumed that servers sharing DBR events are secured by a common access policy and all servers are required to be up-to-date. From a privacy perspective, because all servers are in the same administrative domain, the primary objective is to keep individual Service Provider nodes or cluster synchronized.

A.2. Co-ordinated Provisioning

In "Co-ordinated Provisioning" (CP), SCIM resource change events perform the function of change notification without the need to provide raw data. In any Event Publisher and Receiver relationship, the set of SCIM Resources (e.g. Users) that are linked or co-ordinated is managed within the context of an event feed and MAY be a subset of the total set of resources on either side. For example, an event feed could be limited to users who have consented to the sharing of information between domains. To support capability, "feed" specific events are defined to indicate the addition and removal of SCIM Resources from a feed. For example, when a user consents to the sharing of information between domains, events about the User MAY be added to the feed between the Event Publisher and Receiver.

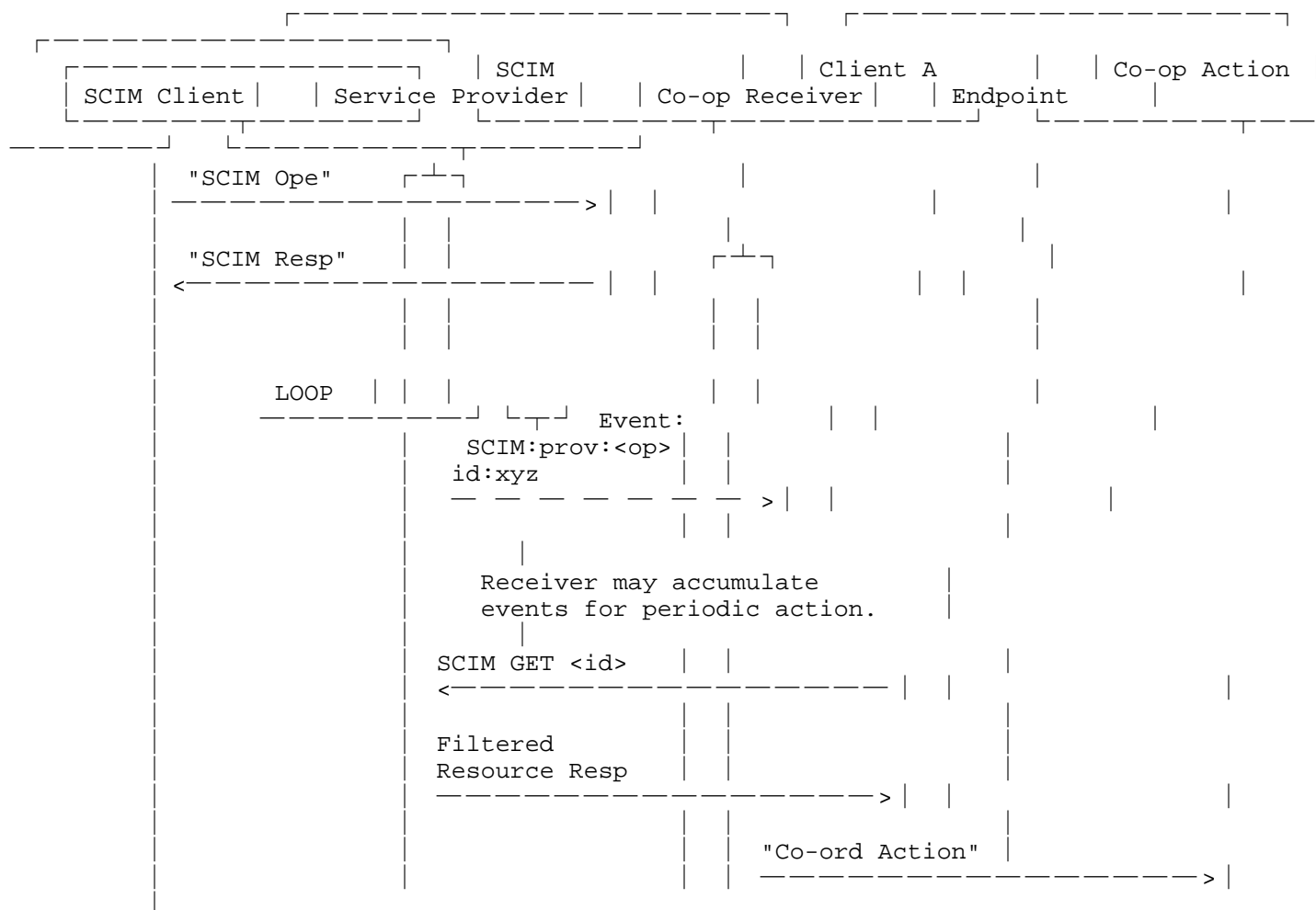


Figure 21: Co-Ordinated Provisioning Sequence

In CP mode, the receiver of an event must callback to the originating SCIM Service Provider (e.g. using a SCIM GET request) to reconcile the newly changed resource in order to obtain the changes.

Co-ordinated provisioning has the following benefits:

- * Differences in schema (e.g. attributes) between domains. For example, a receiving domain may only be interested in or allowed to access to a few attributes (e.g. role based access data) to enable access to an application.

- * Different Event Receivers MAY have differing needs when accessing information and thus be assigned varying access rights. Minimal information events combined with callbacks for data allows data filtering to be applied.
- * Receivers can take independent action. Such as deciding which attributes or resource lifecycle changes to accept. For example, in the case of a conflict, a receiver can prioritize one domain source over another.
- * A receiver MAY throttle or buffer changes rather than act immediately on a notification. For example, for a frequently changing resource, the receiver MAY choose to make a scheduled SCIM GET for resources that have been marked "dirty" by events received in the last scheduled cycle.

A disadvantage of the CP approach is that it may be considered costly in the sense that each event received might trigger a callback to the event issuer. This cost should be weighed against the cost producing filtered information in each event for each receiver. Furthermore, a receiver is not required to make a callback on every provisioning event.

It is assumed that an underlying relationship between domains exists that permits the exchange of personal information and credentials. For example, in a cross-domain scenario a SCIM Service Provider would have been previously authorized to perform SCIM provisioning operations and publish change events. As such, appropriate confidentiality and privacy agreements should be in place between the domains.

When sharing information between parties, CP Events minimize the information shared in each message and require the Security Event Receiver to receive more information from the Event Publisher as needed. In this way, the Event Receiver is able to have regular access to information through normal SCIM protocol access restrictions. The Event Receiver and Publisher may agree to communicate these updates through a variety of transmission methods such as push and pull based HTTP like in [RFC8935], [RFC8936], or HTTP GET (see Section 2.5.1.1), streaming technologies (e.g., Kafka or Kinesis), or via webhooks like in the Shared Signals Framework [SSF].

Appendix B. Acknowledgments

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Appendix C. Change Log

Draft 00 - PH - First WG Draft

Draft 01 - PH - Moved non-normative sections to Appendix, Security and Privacy Considerations

Draft 02 - PH - Clarifications on Async Events, IANA Considerations

Draft 03 - PH - Fixed Header Field registration to RFC9110."Preference-Applied" header in async response. Support for Async Bulk requests. Added IANA SCIM Event Registry

Draft 04 - PH - Removed Event Delivery Feeds and Appendix A(not normative), Removed "sig" events, change bulk txn separator to ":", Updated SubId Reference to RFC9493, other comments, fixed IANA registry paragraph, SCIM Signals Removed

Draft 05 - PH - Removed Signals Events, Removed Delivery Section (not normative), Version(etag) definition added, Security Considerations revisions, Syntax for Attributes

Draft 06 - PH - Editorial edits and clarifications, add SSF reference

Draft 07 - PH - Document date update only

Draft 08 - PH - Update to Security Considerations to frame as risk/correction

Draft 09 - PH - Incorporating feedback from AD

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