Poll-Based Security Event Token (SET) Delivery Using HTTP

draft-ietf-secevent-http-poll-02

Abstract

This specification defines how a series of Security Event Tokens (SETs) may be delivered to an intended recipient using HTTP POST over TLS initiated as a poll by the recipient. The specification also defines how delivery can be assured, subject to the SET Recipient’s need for assurance.

Status of This Memo

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1. Introduction and Overview

This specification defines how a stream of Security Event Tokens (SETs) [RFC8417] can be transmitted to an intended SET Recipient using HTTP [RFC7231] over TLS. The specification defines a method to poll for SETs using HTTP POST.

1.1. Notational Conventions

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.

Throughout this document, all figures MAY contain spaces and extra line wrapping for readability and due to space limitations.

1.2. Definitions

This specification utilizes terminology defined in [RFC8417], as well as the terms defined below:

**SET Transmitter**
An entity that delivers SETs in its possession to one or more SET Recipients.

2. SET Delivery

When an event occurs, the SET Transmitter constructs a SET [RFC8417] that describes the event. The SET Transmitter determines the SET Recipients that the SET should be distributed to.

How SETs are defined and the process by which events are identified for SET Recipients is out of scope of this specification.

When a SET is available for a SET Recipient, the SET Transmitter attempts to deliver the SET by queueing it in a buffer so that a SET Recipient can poll for SETs using HTTP/1.1 POST.

In Poll-Based SET Delivery Using HTTP, zero or more SETs are delivered in a JSON [RFC8259] document to a SET Recipient in response to an HTTP POST request to the SET Transmitter. Then in a following request, the SET Recipient acknowledges received SETs and can poll for more. All requests and responses are JSON documents and use a "Content-Type" of "application/json", as described in Section 2.1.

After successful (acknowledged) SET delivery, SET Transmitters are not be required to retain or record SETs for recovery. Once a SET is acknowledged, the SET Recipient SHALL be responsible for retention and recovery.

Transmitted SETs SHOULD be self-validating (e.g., signed) if there is a requirement to verify they were issued by the SET Transmitter at a later date when de-coupled from the original delivery where
authenticity could be checked via the HTTP or TLS mutual authentication.

Upon receiving a SET, the SET Recipient reads the SET and validates it. The SET Recipient MUST acknowledge receipt to the SET Transmitter.

The SET Recipient SHALL NOT use the event acknowledgement mechanism to report event errors other than relating to the parsing and validation of the SET.

2.1. Polling Delivery using HTTP

This method allows a SET Recipient to use HTTP POST (Section 4.3.3 of [RFC7231]) to acknowledge SETs and to check for and receive zero or more SETs. Requests MAY be made at a periodic interval (short polling) or requests MAY wait, pending availability of new SETs using long polling, per Section 2 of [RFC6202].

The delivery of SETs in this method is facilitated by HTTP POST requests initiated by the SET Recipient in which:

- The SET Recipient makes a request for available SETs using an HTTP POST to a pre-arranged endpoint provided by the SET Transmitter. Or,
- After validating previously received SETs, the SET Recipient initiates another poll request using HTTP POST that includes acknowledgement of previous SETs and waits for the next batch of SETs.

The purpose of the acknowledgement is to inform the SET Transmitter that delivery has succeeded and redelivery is no longer required. Before acknowledgement, SET Recipients SHOULD ensure that received SETs have been validated and retained in a manner appropriate to the recipient’s requirements. The level and method of retention of SETs by SET Recipients is out of scope of this specification.

2.2. Polling HTTP Request Attributes

When initiating a poll request, the SET Recipient constructs a JSON document that consists of polling request parameters and SET acknowledgement parameters in the form of JSON attributes. The request payloads are delivered in a JSON document, as described in Section 2.4 and Section 2.5.

When making a request, the HTTP header "Content-Type" is set to "application/json".
The following JSON attributes are used in a polling request:

Request Processing Parameters

maxEvents
An OPTIONAL JSON integer value indicating the maximum number of unacknowledged SETs that SHOULD be returned. If more than the maximum number of SETs are available, the oldest SETs available SHOULD be returned first. A value of "0" MAY be used by SET Recipients that would like to perform an acknowledge only request. This enables the Recipient to use separate HTTP requests for acknowledgement and reception of SETs. If this parameter is omitted, no limit is placed on the number of SETs to be returned.

returnImmediately
An OPTIONAL JSON boolean value that indicates the SET Transmitter SHOULD return an immediate response even if no results are available (short polling). The default value is "false" indicates the request is to be treated as an HTTP Long Poll, per Section 2 of [RFC6202]. The timeout for the request is part of the configuration between the participants, which is out of scope of this specification.

SET Acknowledgment Parameters

ack
Which is an array of Strings that each correspond to the "jti" of a successfully received SET. If there are no outstanding SETs to acknowledge, the attribute MAY be omitted. When acknowledging a SET, the SET Transmitter is released from any obligation to retain the SET (e.g., for a future retry to receive).

setErrs
A JSON Object that contains one or more nested JSON attributes that correspond to the "jti" of each invalid SET received. The value of each is a JSON object whose contents is an "err" attribute and "description" attribute whose value correspond to the errors described in Section 2.6.

2.3. Polling HTTP Response Attributes

In response to a poll request, the SET Transmitter checks for available SETs and responds with a JSON document containing the following JSON attributes:

sets
A JSON object that contains zero or more nested JSON attributes. Each nested attribute corresponds to the "jti" of a SET to be delivered and whose value is a JSON String containing the value of the encoded corresponding SET. If there are no outstanding SETs to be transmitted, the JSON object SHALL be empty.

moreAvailable
A JSON boolean value that indicates if more unacknowledged SETs are available to be returned.

When making a response, the HTTP header "Content-Type" is set to "application/json".

2.4. Poll Request

The SET Recipient performs an HTTP POST (see Section 4.3.4 of [RFC7231]) to a pre-arranged polling endpoint URI to check for SETs that are available. Because the SET Recipient has no prior SETs to acknowledge, the "ack" and "errs" request parameters are omitted.

If after a period of time, negotiated between the SET Transmitter and Recipient, a SET Transmitter MAY redeliver SETs it has previously delivered. The SET Recipient SHOULD accept repeat SETs and acknowledge the SETs regardless of whether the Recipient believes it has already acknowledged the SETs previously. A SET Transmitter MAY limit the number of times it attempts to deliver a SET.

If the SET Recipient has received SETs from the SET Transmitter, the SET Recipient SHOULD parse and validate received SETs to meet its own requirements and SHOULD acknowledge receipt in a timely fashion (e.g., seconds or minutes) so that the SET Transmitter can mark the SETs as received. SET Recipients SHOULD acknowledge receipt before taking any local actions based on the SETs to avoid unnecessary delay in acknowledgement, where possible.

Poll requests have three variations:

Poll Only
In which a SET Recipient asks for the next set of events where no previous SET deliveries are acknowledged (such as in the initial poll request).

Acknowledge Only
In which a SET Recipient sets the "maxEvents" attribute to "0" along with "ack" and "err" attributes indicating the SET Recipient is acknowledging previously received SETs and does not want to receive any new SETs in response to the request.
Combined Acknowledge and Poll
In which a SET Recipient is both acknowledging previously received
SETs using the "ack" and "err" attributes and will wait for the
next group of SETs in the SET Transmitters response.

2.4.1. Poll Only Request

In the case where no SETs were received in a previous poll (see
Figure 7), the SET Recipient simply polls without acknowledgement
parameters ("sets" and "setErrs").

The following is an example request made by a SET Recipient that has
no outstanding SETs to acknowledge and is polling for available SETs.

The following is a non-normative example poll request to the
endpoint: "https://nofity.exampleidp.com/Events".

POST /Events HTTP/1.1
Host: notify.exampleidp.com
Authorization: Bearer h480djs93hd8
Accept: application/json

{  
  "returnImmediately": true
}

Figure 1: Example Initial Poll Request

A SET Recipient can poll using default parameter values by passing an
empty JSON object.

The following is a non-normative example default poll request to the
endpoint: "https://nofity.exampleidp.com/Events".

POST /Events HTTP/1.1
Host: notify.exampleidp.com
Authorization: Bearer h480djs93hd8
Accept: application/json

{}

Figure 2: Example Default Poll Request
2.4.2. Acknowledge Only Request

In this variation, the SET Recipient acknowledges previously received
SETs and indicates it does not want to receive SETs in response by
setting the "maxEvents" attribute to "0".

This variation might be used, for instance, when a SET Recipient
needs to acknowledge received SETs independently (e.g., on separate
threads) from the process of receiving SETs.

The following is a non-normative example poll with acknowledgement of
SETs received (for example as shown in Figure 6).

POST /Events HTTP/1.1
Host: notify.exampleidp.com
Authorization: Bearer h480djs93hd8
Content-Type: application/json
Authorization: Bearer h480djs93hd8

{
    "ack": [
        "4d3559ec67504aaba65d40b03faad8",
        "3d0c3cf797584bd0fb1bd4e7d30"
    ],
    "maxEvents": 0,
    "returnImmediately": true
}

Figure 3: Example Acknowledge Only Request

2.4.3. Poll with Acknowledgement

This variation allows a recipient thread to simultaneously
acknowledge previously received SETs and wait for the next group of
SETs in a single request.
The following is a non-normative example poll with acknowledgement of SETs received in Figure 6.

POST /Events HTTP/1.1
Host: notify.exampleidp.com
Authorization: Bearer h480djs93hd8
Content-Type: application/json
Authorization: Bearer h480djs93hd8

{
  "ack": [
    "4d3559ec67504aaba65d40b0363faad8",
    "3d0c3cf797584bd193bd0fb1bd4e7d30"
  ],
  "returnImmediately": false
}

Figure 4: Example Poll with Acknowledgement and No Errors

In the above acknowledgement, the SET Recipient has acknowledged receipt of two SETs and has indicated it wants to wait until the next SET is available.

2.4.4. Poll with Acknowledgement and Errors

In the case where errors were detected in previously delivered SETs, the SET Recipient MAY use the "setErrs" attribute to communicate the errors in the following poll request.
The following is a non-normative example of a response acknowledging one successfully received SET and one SET with an error from the two SETs received in in Figure 6.

POST /Events HTTP/1.1
Host: notify.exampleidp.com
Authorization: Bearer h480djs93hd8
Content-Type: application/json
Authorization: Bearer h480djs93hd8

{
  "ack": ["3d0c3cf797584bd193bd0fb1bd4e7d30"],
  "setErrs": {
    "4d3559ec67504aaba65d40b0363faad8": { 
      "err": "jwtAud",
      "description": "The audience value was invalid."
    }
  },
  "returnImmediately": true
}

Figure 5: Example Poll Acknowledgement with Error

2.5. Poll Response

In response to a poll request, the service provider MAY respond immediately if SETs are available to be delivered. If no SETs are available at the time of the request, the SET Transmitter SHALL delay responding until a SET is available or the timeout interval has elapsed unless the poll request parameter "returnImmediately" is "true".

As described in Section 2.3, a JSON document is returned containing a number of attributes including "sets" which SHALL contain zero or more SETs.
The following is a non-normative example response to the request shown Section 2.4. This example shows two SETs are returned.

HTTP/1.1 200 OK
Content-Type: application/json
Location: https://notify.exampleidp/Events

```json
{
"sets": {
"4d3559ec67504aaba65d40b0363faad8": "eyJhbGciOiI3NDQ5NiJwQxWNCwiaXZlciIjIiwiaHR0cHM6Ly9vY2F0YWJsZS5uZXh0LmNvbS9zY2VtZW50OmNhcmFtc2tpZXR0OmNyZWF0ZSI6IjQ0ZjYxNDJkZjk2YmQ2YWI2MWU3NTIiLCJldmVudHMiOnsidXJuOmNvbS9zY2VtZW50L3Bhc3N3b3JkOl90aW1lc3RlcjIiXSwic3ViIjoiaHR0cHM6Ly90aW1lc3RlcjIiLCJlbmRvY3M6cGFyYW1zOnNjaW06ZXZlbnQ6cGFzc3dvcmRSZXNldC15ZCI6eCJzZXJ2ZXJzOmVtYWlscyJdfX19.

"3d0c3cf797584bd193bd0fb1bd4e7d30": "eyJhbGciOiI3NDQ5NiJwQxWNCwiaXZlciIjIiwiaHR0cHM6Ly9vY2F0YWJsZS5uZXh0LmNvbS9zY2VtZW50OmNhcmFtc2tpZXR0OmNyZWF0ZSI6IjQ0ZjYxNDJkZjk2YmQ2YWI2MWU3NTIiLCJldmVudHMiOnsidXJuOmNvbS9zY2VtZW50L3Bhc3N3b3JkOl90aW1lc3RlcjIiXSwic3ViIjoiaHR0cHM6Ly90aW1lc3RlcjIiLCJlbmRvY3M6cGFyYW1zOnNjaW06ZXZlbnQ6cGFzc3dvcmRSZXNldC15ZCI6eCJzZXJ2ZXJzOmVtYWlscyJdfX19.

}``

Figure 6: Example Poll Response

In the above example, a two SETs whose "jti" are "4d3559ec67504aaba65d40b0363faad8" and "3d0c3cf797584bd193bd0fb1bd4e7d30" are delivered.
The following is a non-normative example response to the request shown Section 2.4 showing no new SETs or unacknowledged SETs are available.

HTTP/1.1 200 OK
Content-Type: application/json
Location: https://notify.exampleidp/Events

{
  "sets": {}
}

Figure 7: Example No SETs Poll Response

Upon receiving the JSON document (e.g., as shown in Figure 6), the SET Recipient parses and verifies the received SETs and notifies the SET Transmitter via the next poll request to the SET Transmitter, as described in Section 2.4.3 or Section 2.4.4.

2.6. Error Response Handling

If a SET is invalid, error codes from the IANA "Security Event Token Delivery Error Codes" registry established by [I-D.ietf-secevent-http-push] are used in error responses. An error response SHALL include a JSON object that provides details about the error. The JSON object includes the JSON attributes:

err
  A value from the IANA "Security Event Token Delivery Error Codes" registry that identifies the error.

description
  A human-readable string that provides additional diagnostic information.

When included as part of a batch of SETs, the above JSON is included as part of the "setErrs" attribute, as defined in Section 2.3 and Section 2.4.4.

3. Authentication and Authorization

The SET delivery method described in this specification is based upon HTTP and depends on the use of TLS and/or standard HTTP authentication and authorization schemes as per [RFC7235]. For example, the following methodologies could be used among others:

TLS Client Authentication
Event delivery endpoints MAY request TLS mutual client authentication, per Section 7.3 of [RFC5246].

Bearer Tokens
Bearer tokens [RFC6750] MAY be used when combined with TLS and a token framework such as OAuth 2.0 [RFC6749]. For security considerations regarding the use of bearer tokens in SET delivery, see Section 4.4.1.

Basic Authentication
Use of HTTP BASIC authentication should be avoided due to its use of a single factor that is based upon a relatively static, symmetric secret. When used, implementers SHOULD combine the use of basic authentication with other factors. The security considerations of HTTP BASIC are well documented in [RFC7617] and SHOULD be considered along with using signed SETs (see SET Payload Authentication below).

As per Section 4.1 of [RFC7235], a SET delivery endpoint SHALL indicate supported HTTP authentication schemes via the "WWW-Authenticate" header.

Because SET Delivery describes a simple function, authorization for the ability to pick-up or deliver SETs can be derived by considering the identity of the SET issuer, or via an authentication method above. This specification considers authentication as a feature to prevent denial-of-service attacks. Because SETs are not commands, SET Recipients are free to ignore SETs that are not of interest after acknowledging their receipt.

For illustrative purposes only, SET delivery examples show an OAuth2 bearer token value [RFC6750] in the authorization header. This is not intended to imply that bearer tokens are preferred. However, the use of bearer tokens in the specification does reflect common practice.

3.1. Use of Tokens as Authorizations

When using bearer tokens or proof-of-possession tokens that represent an authorization grant such as issued by OAuth (see [RFC6749]), implementers SHOULD consider the type of authorization granted, any authorized scopes (see Section 3.3 of [RFC6749]), and the security subject(s) that SHOULD be mapped from the authorization when considering local access control rules. Section 6 of the OAuth Assertions draft [RFC7521], documents common scenarios for authorization including:
Clients using an assertion to authenticate and/or act on behalf of itself;
Clients acting on behalf of a user; and,
A Client acting on behalf of an anonymous user (e.g., see next section).

When using OAuth access tokens, implementers MUST take into account the threats and countermeasures documented in the security considerations for the use of client authorizations (see Section 8 of [RFC7521]). When using other token formats or frameworks, implementers MUST take into account similar threats and countermeasures, especially those documented by the relevant specifications.

4. Security Considerations

4.1. Authentication Using Signed SETs

In scenarios where HTTP authorization or TLS mutual authentication are not used or are considered weak, JWS signed SETs SHOULD be used (see [RFC7515] and Security Considerations [RFC8417]). This enables the SET Recipient to validate that the SET issuer is authorized to deliver the SET.

4.2. HTTP Considerations

SET delivery depends on the use of Hypertext Transfer Protocol and thus subject to the security considerations of HTTP Section 9 of [RFC7230] and its related specifications.

As stated in Section 2.7.1 of [RFC7230], an HTTP requestor MUST NOT generate the "userinfo" (i.e., username and password) component (and its "@" delimiter) when an "http" URI reference is generated with a message as they are now disallowed in HTTP.

4.3. TLS Support Considerations

SETs may contain sensitive information that is considered PII (e.g., subject claims). In such cases, SET Transmitters and SET Recipients MUST encrypt the SET, either with a transport-layer security mechanism, with JWE [RFC7516], or both. Event delivery endpoints MUST support TLS 1.2 [RFC5246] and MAY support additional transport-layer mechanisms meeting its security requirements. When using TLS, the client MUST perform a TLS/SSL server certificate check, per [RFC6125]. Implementation security considerations for TLS can be found in "Recommendations for Secure Use of TLS and DTLS" [RFC7525].
4.4. Access Token Considerations

When using access tokens such as those issued by OAuth 2.0 [RFC6749], implementers MUST take into account threats and countermeasures documented in Section 8 of [RFC7521].

4.4.1. Bearer Token Considerations

Due to the possibility of interception, Bearer tokens MUST be exchanged using TLS.

Bearer tokens MUST have a limited lifetime that can be determined directly or indirectly (e.g., by checking with a validation service) by the service provider. By expiring tokens, clients are forced to obtain a new token (which usually involves re-authentication) for continued authorized access. For example, in OAuth2, a client MAY use an OAuth refresh token to obtain a new bearer token after authenticating to an authorization server, per Section 6 of [RFC6749].

Implementations supporting OAuth bearer tokens need to factor in security considerations of this authorization method [RFC7521]. Since security is only as good as the weakest link, implementers also need to consider authentication choices coupled with OAuth bearer tokens. The security considerations of the default authentication method for OAuth bearer tokens, HTTP BASIC, are well documented in [RFC7617], therefore implementers are encouraged to prefer stronger authentication methods. Designating the specific methods of authentication and authorization are out of scope for the delivery of SETs, however this information is provided as a resource to implementers.

5. Privacy Considerations

If a SET needs to be retained for audit purposes, a JWS signature MAY be used to provide verification of its authenticity.

SET Transmitters SHOULD attempt to deliver SETs that are targeted to the specific business and protocol needs of subscribers.

When sharing personally identifiable information or information that is otherwise considered confidential to affected users, SET Transmitters and Recipients MUST have the appropriate legal agreements and user consent or terms of service in place.

The propagation of subject identifiers can be perceived as personally identifiable information. Where possible, SET Transmitters and Recipients SHOULD devise approaches that prevent propagation, for
example, the passing of a hash value that requires the subscriber to already know the subject.

6. IANA Considerations

There are no IANA considerations.

7. References

7.1. Normative References

[I-D.ietf-secevent-http-push]


7.2. Informative References


Appendix A. Acknowledgments

The editors would like to thank the members of the SCIM working group, which began discussions of provisioning events starting with draft-hunt-scim-notify-00 in 2015.

The editors would like to thank Phil Hunt and the other the authors of draft-ietf-secevent-delivery-02, on which this draft is based.

The editors would like to thank the participants in the SecEvents working group for their contributions to this specification.

Appendix B. Change Log

[[ to be removed by the RFC Editor before publication as an RFC ]]

Draft 00 - AB - Based on draft-ietf-secevent-delivery-02 with the following additions:

- Renamed to "Poll-Based SET Token Delivery Using HTTP"
- Removed references to the HTTP Push delivery method.

Draft 01 - mbj:

- Addressed problems identified in my 18-Jul-18 review message titled "Issues for both the Push and Poll Specs".
Changes to align terminology with RFC 8417, for instance, by using the already defined term SET Recipient rather than SET Receiver.

Applied editorial and minor normative corrections.

Updated Marius’ contact information.


Draft 02 - mbj:

Removed vestigial language remaining from when the push and poll delivery methods were defined in a common specification.

Replaced remaining uses of the terms Event Transmitter and Event Recipient with the correct terms SET Transmitter and SET Recipient.

Removed uses of the unnecessary term "Event Stream".

Removed dependencies between the semantics of "maxEvents" and "returnImmediately".

Said that PII in SETs is to be encrypted with TLS, JWE, or both.

Corrected grammar and spelling errors.

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Push-Based Security Event Token (SET) Delivery Using HTTP

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Abstract

This specification defines how a Security Event Token (SET) may be delivered to an intended recipient using HTTP POST. The SET is transmitted in the body of an HTTP POST request to an endpoint operated by the recipient, and the recipient indicates successful or failed transmission via the HTTP response.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction and Overview

This specification defines a mechanism by which a transmitter of a Security Event Token (SET) [RFC8417] may deliver the SET to an intended recipient via HTTP POST [RFC7231].

Push-Based SET Delivery over HTTP POST is intended for scenarios where all of the following apply:
The transmitter of the SET is capable of making outbound HTTP requests.

The recipient is capable of hosting an HTTP endpoint that is accessible to the transmitter.

The transmitter and recipient are known to one another.

A mechanism for exchanging configuration metadata such as endpoint URLs and cryptographic key parameters between the transmitter and recipient is out of scope for this specifications.

1.1. Notational Conventions

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.

Throughout this document, all figures may contain spaces and extra line-wrapping for readability and due to space limitations.

1.2. Definitions

This specification utilizes terminology defined in [RFC8417], as well as the terms defined below:

SET Transmitter
An entity that delivers SETs in its possession to one or more SET Recipients.

SET Recipient
An entity that receives SETs through some distribution method.

2. SET Delivery

To deliver a SET to a given SET Recipient, the SET Transmitter makes a SET transmission request to the SET Recipient, with the SET itself contained within the request. The SET Recipient replies to this request with a response either acknowledging successful transmission of the SET or indicating that an error occurred while receiving, parsing, and/or validating the SET.

Upon receipt of a SET, the SET Recipient SHALL validate that all of the following are true:

- The SET Recipient can parse the SET.
The SET is authentic (i.e., it was issued by the issuer specified within the SET).

The SET Recipient is identified as an intended audience of the SET.

The SET Issuer is recognized as an issuer that the SET Recipient is willing to receive SETs from (e.g., the issuer is whitelisted by the SET Recipient).

The SET Recipient is willing to accept the SET when transmitted by the SET Transmitter (e.g., the SET Transmitter is expected to send SETs with the subject of the SET in question).

The mechanisms by which the SET Recipient performs this validation are out of scope for this document. SET parsing and issuer and audience identification are defined in [RFC8417]. The mechanism for validating the authenticity of a SET is deployment specific, and may vary depending on the authentication mechanisms in use, and whether the SET is signed and/or encrypted (See Section 3).

SET Transmitters MAY transmit SETs issued by another entity. The SET Recipient may accept or reject (i.e., return an error response such as "access_denied") a SET at its own discretion.

The SET Recipient SHOULD ensure that the SET is persisted in a way that is sufficient to meet the SET Recipient’s own reliability requirements, and MUST NOT expect or depend on a SET Transmitter to re-transmit or otherwise make available to the SET Recipient a SET once the SET Recipient acknowledges that it was received successfully.

Once the SET has been validated and persisted, the SET Recipient SHOULD immediately return a response indicating that the SET was successfully delivered. The SET Recipient SHOULD NOT perform extensive business logic that processes the event expressed by the SET prior to sending this response. Such logic SHOULD be executed asynchronously from delivery, in order to minimize the expense and impact of SET delivery on the SET Transmitter.

The SET Transmitter MAY re-transmit a SET if the responses from previous transmissions timed out or indicated potentially recoverable error (such as server unavailability that may be transient). In all other cases, the SET Transmitter SHOULD NOT re-transmit a SET. The SET Transmitter SHOULD delay retransmission for an appropriate amount of time to avoid overwhelming the SET Recipient (see Section 4).
2.1. Transmitting a SET

To transmit a SET to a SET Recipient, the SET Transmitter makes an HTTP POST request to an HTTP endpoint provided by the SET Recipient. The "Content-Type" header of this request MUST be "application/secevent+jwt" as defined in Sections 2.2 and 6.2 of [RFC8417], and the "Accept" header MUST be "application/json". The request body MUST consist of the SET itself, represented as a JWT [RFC7519].

The SET Transmitter MAY include in the request an "Accept-Language" header to indicate to the SET Recipient the preferred language(s) in which to receive error messages.

The mechanisms by which the SET Transmitter determines the HTTP endpoint to use when transmitting a SET to a given SET Recipient are not defined by this specification and are deployment specific.

The following is a non-normative example of a SET transmission request:

POST /Events HTTP/1.1
Host: notify.rp.example.com
Accept: application/json
Accept-Language: en-US, en;q=0.5
Content-Type: application/secevent+jwt

eyJ0eXAiOiJzZWNldmVudCtqd3QiLCJhbGciOiJIUzI1NiJ9.
eyJwdWJsaXNoZXJVcmkiOiJodHRwc2NoL3NjaW0uZXhhbXBsZS5jb20iLCJjb20i
kVXJpcyI6WyJodHRwc2NoL2podW1uZXhhbXBsZS5jb20vRmV1ZHMvOTk1NTI0WEY2
FmYTViYmM4Nzk1OTNiNzciNCIsImlhdHlwIjoiYm9vaHpiYW4iLCJleGFtcGxlIjoiYW1
viZmZmIiLCJpYXZsZSI6IiIsIm5hbWFsZSI6IiIsInN1YiI6IiIsImF1dGhvcml0eU9
bIjoiYW1vbWFsZSI6IiIsIm9uaWRzIjoiYW1vbWFsZSI6IiIsInN0YXR1cmVzIjoiYW1
vbWFsZSI6IiIsIm9uaXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIs
InN0YXRzIjoiYW1vbWFsZSI6IiIsImF1dGhvcml0eU90bIjoiYW1vbWFsZSI6IiIsInN0
YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vb
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInV
yaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN0YXRzIjoiYW1v
WFsZSI6IiIsInN0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIjoiYW1vbWFsZSI6IiIsInN
0YXRzIjoiYW1vbWFsZSI6IiIsInVyaWVzIj}
2.2. Success Response

If the SET is determined to be valid, the SET Recipient SHALL acknowledge successful transmission by responding with HTTP Response Status Code 202 (Accepted) (see Section 6.3.3 of [RFC7231]). The body of the response MUST be empty.

The following is a non-normative example of a successful receipt of a SET.

HTTP/1.1 202 Accepted

Figure 2: Example Successful Delivery Response

Note that the purpose of the acknowledgement response is to let the SET Transmitter know that a SET has been delivered and the information no longer needs to be retained by the SET Transmitter. Before acknowledgement, SET Recipients SHOULD ensure they have validated received SETs and retained them in a manner appropriate to information retention requirements appropriate to the SET event types signaled. The level and method of retention of SETs by SET Recipients is out of scope of this specification.

2.3. Failure Response

In the event of a general HTTP error condition, the SET Recipient SHOULD respond with an appropriate HTTP Status Code as defined in Section 6 of [RFC7231].

When the SET Recipient detects an error parsing, validating or authenticating a SET transmitted in a SET Transmission Request, the SET Recipient SHALL respond with an HTTP Response Status Code of 400 (Bad Request). The "Content-Type" header of this response MUST be "application/json", and the body MUST be a UTF-8 encoded JSON [RFC8259] object containing the following name/value pairs:

err  A Security Event Token Error Code (see Section 2.4).

description  A UTF-8 string containing a human-readable description of the error that MAY provide additional diagnostic information. The exact content of this field is implementation-specific.

The response MUST include a "Content-Language" header, whose value indicates the language of the error descriptions included in the response body. If the SET Recipient can provide error descriptions in multiple languages, they SHOULD choose the language to use according to the value of the "Accept-Language" header sent by the SET Transmitter in the transmission request, as described in
Section 5.3.5 of [RFC7231]. If the SET Transmitter did not send an "Accept-Language" header, or if the SET Recipient does not support any of the languages included in the header, the SET Recipient MUST respond with messages that are understandable by an English-speaking person, as described in Section 4.5 of [RFC2277].

The following is an example non-normative error response indicating that the key used to encrypt the SET has been revoked.

HTTP/1.1 400 Bad Request
Content-Language: en-US
Content-Type: application/json

{
  "err": "invalid_key",
  "description": "Key ID 12345 has been revoked."
}

Figure 3: Example Error Response (invalid_key)

The following is an example non-normative error response indicating that the access token included in the request is expired.

HTTP/1.1 400 Bad Request
Content-Language: en-US
Content-Type: application/json

{
  "err": "authentication_failed",
  "description": "Access token is expired."
}

Figure 4: Example Error Response (authentication_failed)

The following is an example non-normative error response indicating that the SET Receiver is not willing to accept SETs issued by the specified issuer from this particular SET Transmitter.

HTTP/1.1 400 Bad Request
Content-Language: en-US
Content-Type: application/json

{
  "err": "access_denied",
  "description": "Not authorized for issuer http://iss.example.com/".
}

Figure 5: Example Error Response (access_denied)
2.4. Security Event Token Delivery Error Codes

Security Event Token Delivery Error Codes are strings that identify a specific category of error that may occur when parsing or validating a SET. Every Security Event Token Delivery Error Code MUST have a unique name registered in the IANA "Security Event Token Delivery Error Codes" registry established by Section 7.1.

The following table presents the initial set of Error Codes that are registered in the IANA "Security Event Token Delivery Error Codes" registry:

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>invalid_request</td>
<td>The request body cannot be parsed as a SET, or the event payload within the SET does not conform to the event’s definition.</td>
</tr>
<tr>
<td>invalid_key</td>
<td>One or more keys used to encrypt or sign the SET is invalid or otherwise unacceptable to the SET Recipient. (e.g., expired, revoked, failed certificate validation, etc.)</td>
</tr>
<tr>
<td>authentication_failed</td>
<td>The SET Recipient could not authenticate the SET Transmitter from the contents of the request.</td>
</tr>
<tr>
<td>access_denied</td>
<td>The SET Transmitter is not authorized to transmit the provided SET to the SET Recipient.</td>
</tr>
</tbody>
</table>

Table 1: SET Delivery Error Codes

3. Authentication and Authorization

The SET delivery method described in this specification is based upon HTTP and depends on the use of TLS and/or standard HTTP authentication and authorization schemes, as per [RFC7235].

Because SET Delivery describes a simple function, authorization for the ability to pick-up or deliver SETs can be derived by considering the identity of the SET Issuer, or via other employed authentication methods. Because SETs are not commands, SET Recipients are free to ignore SETs that are not of interest.
4. Delivery Reliability

Delivery reliability requirements may vary from implementation to implementation. This specification defines the response from the SET Recipient in such a way as to provide the SET Transmitter with the information necessary to determine what further action is required, if any, in order to meet their requirements. SET Transmitters with high reliability requirements may be tempted to always retry failed transmissions, however it should be noted that for many types of SET delivery errors, a retry is extremely unlikely to be successful. For example, "invalid_request" indicates a structural error in the content of the request body that is likely to remain when re-transmitting the same SET. Others such as "access_denied" may be transient, for example if the SET Transmitter refreshes expired credentials prior to re-transmission.

Implementers SHOULD evaluate their reliability requirements and the impact of various retry mechanisms on the performance of their systems to determine the correct strategy for various error conditions.

5. Security Considerations

5.1. Authentication Using Signed SETs

In scenarios where HTTP authorization or TLS mutual authentication are not used or are considered weak, JWS signed SETs SHOULD be used (see [RFC7515] and Security Considerations [RFC8417]). This enables the SET Recipient to validate that the SET Transmitter is authorized to deliver the SET.

5.2. Confidentiality of SETs

SETs may contain sensitive information that is considered Personally Identifiable Information (e.g., subject claims). In such cases, SET Transmitters and SET Recipients MUST protect the confidentiality of the SET contents by encrypting the SET as described in JWE [RFC7516], using a transport-layer security mechanism such as TLS, or both. If an Event delivery endpoint supports TLS, it MUST support at least TLS version 1.2 [RFC5246] and SHOULD support the newest version of TLS that meets its security requirements. When using TLS, the client MUST perform a TLS/SSL server certificate check, per [RFC6125]. Implementation security considerations for TLS can be found in "Recommendations for Secure Use of TLS and DTLS" [RFC7525].
5.3. Denial of Service

The SET Recipient may be vulnerable to a denial-of-service attack where a malicious party makes a high volume of requests containing invalid SETs, causing the endpoint to expend significant resources on cryptographic operations that are bound to fail. This may be mitigated by authenticating SET Transmitters with a mechanism with low runtime overhead, such as mutual TLS.

5.4. Authenticating Persisted SETs

At the time of receipt, the SET Recipient can rely upon transport layer mechanisms, HTTP authentication methods, and/or other context from the transmission request to authenticate the SET Transmitter and validate the authenticity of the SET. However, this context is typically unavailable to systems that the SET Recipient forwards the SET onto, or to systems that retrieve the SET from storage. If the SET Recipient requires the ability to validate SET authenticity outside of the context of the transmission request, then the SET Recipient SHOULD ensure that such SETs have been signed in accordance with [RFC7515].

6. Privacy Considerations

If a SET needs to be retained for audit purposes, a JWS signature MAY be used to provide verification of its authenticity.

When sharing personally identifiable information or information that is otherwise considered confidential to affected users, SET Transmitters and Recipients MUST have the appropriate legal agreements and user consent or terms of service in place.

In some cases subject identifiers themselves may be considered sensitive information, such that its inclusion within a SET may be considered a violation of privacy. SET Transmitters should consider the ramifications of sharing a particular subject identifier with a SET Recipient (e.g., whether doing so could enable correlation and/or de-anonymization of data), and choose appropriate subject identifiers for their use case.

7. IANA Considerations

7.1. Security Event Token Delivery Error Codes

This document defines Security Event Token Delivery Error Codes, for which IANA is asked to create and maintain a new registry titled "Security Event Token Delivery Error Codes". Initial values for the Security Event Token Delivery Error Codes registry are given in

Table 1. Future assignments are to be made through the First Come First Served registration policy ([RFC8126]) and shall follow the template presented in Section 7.1.1.

Error Codes are intended to be interpreted by automated systems, and therefore SHOULD identify classes of errors to which an automated system could respond in a meaningfully distinct way (e.g., by refreshing authentication credentials and retrying the request).

7.1.1. Registration Template

Error Code

The name of the Security Event Token Delivery Error Code, as described in Section 2.4. The name MUST be a case-sensitive ASCII string consisting only of letters, digits and underscore, these are the characters whose codes fall within the inclusive ranges 0x30-39, 0x41-5A, 0x5F and 0x61-7A.

Description


Change Controller

For error codes registered by the IETF or its working groups, list "IETF SecEvent Working Group". For all other error codes, list the name of the party responsible for the registration. Contact information such as mailing address, email address, or phone number may also be provided.

Defining Document(s)

A reference to the document or documents that define the Security Event Token Delivery Error Code. The definition MUST specify the name and description of the error code, and explain under what circumstances the error code may be used. URIs that can be used to retrieve copies of each document at no cost SHOULD be included.

7.1.2. Initial Registry Contents

Error Code: invalid_request

Description: The request body cannot be parsed as a SET or the event payload within the SET does not conform to the event’s definition.

Change Controller: IETF SecEvent Working Group

Defining Document(s): Section 2.4 of this document

Error Code: invalid_key
Description: One or more keys used to encrypt or sign the SET is invalid or otherwise unacceptable to the SET Recipient. (e.g., expired, revoked, failed certificate validation, etc.)
Change Controller: IETF Secevent Working Group
Defining Document(s): Section 2.4 of this document

Error Code: authentication_failed
Description: The SET Recipient could not authenticate the SET Transmitter from the contents of the request.
Change Controller: IETF Secevent Working Group
Defining Document(s): Section 2.4 of this document

Error Code: access_denied
Description: The SET Transmitter is not authorized to transmit the SET to the SET Recipient.
Change Controller: IETF Secevent Working Group
Defining Document(s): Section 2.4 of this document

8. References

8.1. Normative References


8.2. Informative References


Appendix A. Other Streaming Specifications

[[EDITORS NOTE: This section to be removed prior to publication]]

The following pub/sub, queuing, streaming systems were reviewed as possible solutions or as input to the current draft:

Poll-Based Security Event Token (SET) Delivery Using HTTP

In addition to this specification, the WG is defining a polling-based SET delivery protocol. That protocol's draft (draft-ietf-secevent-http-poll) describes it as:

This specification defines how a series of Security Event Tokens (SETs) may be delivered to an intended recipient using HTTP POST over TLS initiated as a poll by the recipient. The specification also defines how delivery can be assured, subject to the SET Recipient's need for assurance.

XMPP Events

The WG considered the XMPP events and its ability to provide a single messaging solution without the need for both polling and push modes. The feeling was the size and methodology of XMPP was too far apart from the current capabilities of the SECEVENTs community which focuses in on HTTP based service delivery and authorization.

Amazon Simple Notification Service

Simple Notification Service, is a pub/sub messaging product from AWS. SNS supports a variety of subscriber types: HTTP/HTTPS endpoints, AWS Lambda functions, email addresses (as JSON or plain text), phone numbers (via SMS), and AWS SQS standard queues. It doesn't directly support pull, but subscribers can get the pull model by creating an SQS queue and subscribing it to the topic. Note that this puts the cost of pull support back onto the subscriber, just as it is in the push model. It is not clear that one way is strictly better than the other; larger, sophisticated developers may be happy to own message persistence so they can have their own internal delivery guarantees. The long tail of OIDC clients may not care about that, or may fail to get it right. Regardless, I think we can learn something from the Delivery Policies supported by SNS, as well as the delivery controls that SQS offers (e.g., Visibility Timeout, Dead-Letter Queues). I'm not suggesting that we need all of these things in the spec, but they give an idea of what features people have found useful.

Other information:
Apache Kafka

Apache Kafka is an Apache open source project based upon TCP for distributed streaming. It prescribes some interesting general purpose features that seem to extend far beyond the simpler streaming model SECEVENTs is after. A comment from MS has been that Kafka does an acknowledge with poll combination event which seems to be a performance advantage. See: https://kafka.apache.org/intro

Google Pub/Sub

Google Pub/Sub system favors a model whereby polling and acknowledgement of events is done as separate endpoints as separate functions.

Information:

- Cloud Overview - https://cloud.google.com/pubs
- Subscriber Overview - https://cloud.google.com/pubs/docs/subscriber
- Subscriber Pull(poll) - https://cloud.google.com/pubs/docs/pull

Appendix B. Acknowledgments

The editors would like to thank the members of the SCIM working group, which began discussions of provisioning events starting with draft-hunt-scim-notify-00 in 2015.

The editors would like to thank Phil Hunt and the other authors of draft-ietf-secevent-delivery-02, on which this draft is based.

The editors would like to thank the participants in the the SecEvents working group for their contributions to this specification.
Appendix C. Change Log

Draft 00 - AB - Based on draft-ietf-secevent-delivery-02 with the following changes:

- Renamed to "Push-Based SET Token Delivery Using HTTP"
- Removed references to the HTTP Polling delivery method.
- Removed informative reference to RFC6202.

Draft 01 - AB:

- Fixed area and workgroup to match secevent.
- Removed unused definitions and definitions already covered by SET.
- Renamed Event Transmitter and Event Receiver to SET Transmitter and SET Receiver, respectively.
- Added IANA registry for SET Delivery Error Codes.
- Removed enumeration of HTTP authentication methods.
- Removed generally applicable guidance for HTTP, authorization tokens, and bearer tokens.
- Removed redundant instruction to use WWW-Authenticate header.
- Removed further generally applicable guidance for authorization tokens.
- Removed bearer token from example delivery request, and text referencing it.
- Broke delivery method description into separate request/response sections.
- Added missing empty line between headers and body in example request.
- Removed unapplicable notes about example formatting.
- Removed text about SET creation and handling.
o Removed duplication in protocol description.

o Added "non-normative example" text to example transmission request.

o Fixed inconsistencies in use of Error Code term.

Draft 02 - AB:

o Rewrote abstract and introduction.

o Rewrote definitions for SET Transmitter, SET Receiver.

o Renamed Event Delivery section to SET Delivery.

o Readability edits to Success Response and Failure Response sections.

o Consolidated definition of error response under Failure Response section.

o Removed Event Delivery Process section and moved its content to parent section.

o Readability edits to SET Delivery section and its subsections.

o Added callout that SET Receiver HTTP endpoint configuration is out-of-scope.

o Added callout that SET verification mechanisms are out-of-scope.

o Added retry guidance, notes regarding delivery reliability requirements.

o Added guidance around using JWS and/or JWE to authenticate persisted SETs.

Draft 03 - mbj:

o Addressed problems identified in my 18-Jul-18 review message titled "Issues for both the Push and Poll Specs".

o Changes to align terminology with RFC 8417, for instance, by using the already defined term SET Recipient rather than SET Receiver.

o Applied editorial and minor normative corrections.

o Updated Marius’ contact information.
Draft 04 - AB:
  - Replaced Error Codes with smaller set of meaningfully differentiated codes.
  - Added more error response examples.
  - Removed un-referenced normative references.
  - Added normative reference to JSON in error response definition.
  - Added text clarifying that the value of the "description" attribute in error responses is implementation specific.
  - Added requirement that error descriptions and responses are UTF-8 encoded.
  - Added error description language preferences and specification via "Accept-Language" and "Content-Language" headers.
  - Added "recognized issuer" validation requirement in section 2.
  - Added time outs as an acceptable reason to resend a SET in section 2.
  - Edited text in section 1 to clarify that configuration is out of scope.
  - Made minor editorial corrections.

Draft 05 - AB:
  - Made minor editorial corrections.
  - Updated example request with a correct SET header and signature.
  - Revised TLS guidance to allow implementers to provide confidentiality protection via JWE.
  - Revised TLS guidance to require *at least* TLS 1.2.
  - Revised TLS guidance to recommend supporting the newest version of TLS that meets security requirements.
  - Revised SET Delivery Error Code format to allow the same set of characters as is allowed in error codes in RFC6749.
o Added mention of HTTP Poll spec to list of other streaming specs in appendix.

o Added validation step requiring SET Recipient to verify that the SET is one which the SET Transmitter is expected to send to the SET Recipient.

o Changed responding to errors with an appropriate HTTP status code from optional to recommended.

o Changed Error Codes registry change policy from Expert Review to First Come First Served; added guidance that error codes are meant to be consumed by automated systems.

o Added text making clear that it is up to SET Recipients whether or not they will accept SETs where the SET Issuer is different from the SET Transmitter.

o Reworded guidance around signing and/or encrypting SETs for integrity protection.

o Renamed TLS "Support Considerations" section to "Confidentiality of SETs".

o Reworded guidance around subject identifier selection and privacy concerns.

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Subject Identifiers for Security Event Tokens  
draft-ietf-secevent-subject-identifiers-03

Abstract

Security events communicated within Security Event Tokens may support a variety of identifiers to identify the subject and/or other principals related to the event. This specification formalizes the notion of subject identifiers as named sets of well-defined claims describing the subject, a mechanism for representing subject identifiers within a [JSON] object such as a JSON Web Token [JWT] or Security Event Token [SET], and a registry for defining and allocating names for these claim sets.

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1. Introduction

As described in section 1.2 of [SET], the subject of a security event may take a variety of forms, including but not limited to a JWT principal, an IP address, a URL, etc. Furthermore, even in the case where the subject of an event is more narrowly scoped, there may be multiple ways by which a given subject may be identified. For example, an account may be identified by an opaque identifier, an email address, a phone number, a JWT "iss" claim and "sub" claim, etc., depending on the nature and needs of the transmitter and receiver. Even within the context of a given transmitter and receiver relationship, it may be appropriate to identify different accounts in different ways, for example if some accounts only have email addresses associated with them while others only have phone numbers. Therefore it can be necessary to indicate within a SET the mechanism by which the subject of the security event is being identified.
2.  Notational Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3.  Subject Identifiers

A Subject Identifier Type is a light-weight schema that describes a set of claims that identifies a subject. Every Subject Identifier Type MUST have a unique name registered in the IANA "Security Event Subject Identifier Types" registry established by Section 6.1. A Subject Identifier Type MAY describe more claims than are strictly necessary to identify a subject, and MAY describe conditions under which those claims are required, optional, or prohibited.

A Subject Identifier is a [JSON] object containing a "subject_type" claim whose value is the name of a Subject Identifier Type, and a set of additional "payload claims" which are to be interpreted according to the rules defined by that Subject Identifier Type. Payload claim values MUST match the format specified for the claim by the Subject Identifier Type. A Subject Identifier MUST NOT contain any payload claims prohibited or not described by its Subject Identifier Type, and MUST contain all payload claims required by its Subject Identifier Type.

The following Subject Identifier Types are registered in the IANA "Security Event Subject Identifier Types" registry established by Section 6.1.

3.1.  Account Subject Identifier Type

The Account Subject Identifier Type describes a user account at a service provider, identified with an "acct" URI as defined in [RFC7565]. Subject Identifiers of this type MUST contain a "uri" claim whose value is the "acct" URI for the subject. The "uri" claim is REQUIRED and MUST NOT be null or empty. The Account Subject Identifier Type is identified by the name "account".

Below is a non-normative example Subject Identifier for the Account Subject Identifier Type:
3.2. Email Subject Identifier Type

The Email Subject Identifier Type describes a principal identified with an email address. Subject Identifiers of this type MUST contain an "email" claim whose value is a string containing the email address of the subject, formatted as an "addr-spec" as defined in Section 3.4.1 of [RFC5322]. The "email" claim is REQUIRED and MUST NOT be null or empty. The value of the "email" claim SHOULD identify a mailbox to which email may be delivered, in accordance with [RFC5321]. The Email Subject Identifier Type is identified by the name "email".

Below is a non-normative example Subject Identifier for the Email Subject Identifier Type:

```json
{
  "subject_type": "email",
  "email": "user@example.com",
}
```

Figure 2: Example: Subject Identifier for the Email Subject Identifier Type.

3.2.1. Email Canonicalization

Many email providers will treat multiple email addresses as equivalent. For example, some providers treat email addresses as case-insensitive, and consider "user@example.com", "User@example.com", and "USER@example.com" as the same email address. This has led users to view these strings as equivalent, driving service providers to implement proprietary email canonicalization algorithms to ensure that email addresses entered by users resolve to the same canonical string. When receiving an Email Subject Identifier, the recipient SHOULD use their implementation's canonicalization algorithm to resolve the email address to the same subject identifier string used in their system.
3.3. Phone Number Subject Identifier Type

The Phone Number Subject Identifier Type describes a principal identified with a telephone number. Subject Identifiers of this type MUST contain a "phone" claim whose value is a string containing the full telephone number of the subject, including international dialing prefix, formatted according to E.164 [E164]. The "phone" claim is REQUIRED and MUST NOT be null or empty. The Phone Number Subject Identifier Type is identified by the name "phone".

Below is a non-normative example Subject Identifier for the Email Subject Identifier Type:

```json
{
  "subject_type": "phone",
  "phone": "+12065550100",
}
```

Figure 3: Example: Subject Identifier for the Phone Number Subject Identifier Type.

3.4. Issuer and Subject Subject Identifier Type

The Issuer and Subject Subject Identifier Type describes a principal identified with a pair of "iss" and "sub" claims, as defined by [JWT]. These claims MUST follow the formats of the "iss" claim and "sub" claim defined by [JWT], respectively. Both the "iss" claim and the "sub" claim are REQUIRED and MUST NOT be null or empty. The Issuer and Subject Subject Identifier Type is identified by the name "iss-sub".

Below is a non-normative example Subject Identifier for the Issuer and Subject Subject Identifier Type:

```json
{
  "subject_type": "iss-sub",
  "iss": "http://issuer.example.com/",
  "sub": "145234573",
}
```

Figure 4: Example: Subject Identifier for the Issuer and Subject Subject Identifier Type.

3.5. Aliases Subject Identifier Type

The Aliases Subject Identifier Type describes a subject that is identified with a list of different Subject Identifiers. It is intended for use when a variety of identifiers have been shared with
the party that will be interpreting the Subject Identifier, and it is
unknown which of those identifiers they will recognize or support.
Subject Identifiers of this type MUST contain an "identifiers" claim
whose value is a JSON array containing one or more Subject
Identifiers. Each Subject Identifier in the array MUST identify the
same entity. The "identifiers" claim is REQUIRED and MUST NOT be
null or empty. It MAY contain multiple instances of the same Subject
Identifier Type (e.g., multiple Email Subject Identifiers), but
SHOULD NOT contain exact duplicates. This type is identified by the
name "aliases".

Below is a non-normative example Subject Identifier for the Aliases
Subject Identifier Type:

```
{
    "subject_type": "aliases",
    "identifiers": [
        {
            "subject_type": "email",
            "email": "user@example.com",
        },
        {
            "subject_type": "phone",
            "phone": "+12065550100",
        },
        {
            "subject_type": "email",
            "email": "user+qualifier@example.com",
        }
    ],
}
```

Figure 5: Example: Subject Identifier for the Aliases Subject
Identifier Type.

4. Privacy Considerations

There are no privacy considerations.

5. Security Considerations

There are no security considerations.

6. IANA Considerations
6.1. Security Event Subject Identifier Types Registry

This document defines Subject Identifier Types, for which IANA is asked to create and maintain a new registry titled "Security Event Subject Identifier Types". Initial values for the Security Event Subject Identifier Types registry are given in Section 3. Future assignments are to be made through the Expert Review registration policy [BCP26] and shall follow the template presented in Section 6.1.1.

6.1.1. Registration Template

Type Name
The name of the Subject Identifier Type, as described in Section 3. The name MUST be an ASCII string consisting only of lower-case characters ("a" - "z"), digits ("0" - "9"), and hyphens ("-"), and SHOULD NOT exceed 20 characters in length.

Type Description
A brief description of the Subject Identifier Type.

Change Controller
For types defined in documents published by the OpenID Foundation or its working groups, list "OpenID Foundation RISC Working Group". For all other types, list the name of the party responsible for the registration. Contact information such as mailing address, email address, or phone number may also be provided.

Defining Document(s)
A reference to the document or documents that define the Subject Identifier Type. The definition MUST specify the name, format, and meaning of each claim that may occur within a Subject Identifier of the defined type, as well as whether each claim is optional or required, or the circumstances under which the claim is optional or required. URIs that can be used to retrieve copies of each document SHOULD be included.

6.1.2. Initial Registry Contents

6.1.2.1. Account Subject Identifier Type

- Type Name: "account"
- Type Description: Subject identifier based on "acct" URI.
- Change Controller: IETF secevent Working Group
6.1.2.2. Email Subject Identifier Type

- Type Name: "email"
- Type Description: Subject identifier based on email address.
- Change Controller: IETF secevent Working Group
- Defining Document(s): Section 3 of this document.

6.1.2.3. Issuer and Subject Subject Identifier Type

- Type Name: "iss-sub"
- Type Description: Subject identifier based on an issuer and subject.
- Change Controller: IETF secevent Working Group
- Defining Document(s): Section 3 of this document.

6.1.2.4. Phone Number Subject Identifier Type

- Type Name: "phone"
- Type Description: Subject identifier based on an phone number.
- Change Controller: IETF secevent Working Group
- Defining Document(s): Section 3 of this document.

6.1.2.5. Aliases Subject Identifier Type

- Type Name: "aliases"
- Type Description: Subject identifier that groups together multiple different subject identifiers for the same subject.
- Change Controller: IETF secevent Working Group
- Defining Document(s): Section 3 of this document.
6.1.3. Guidance for Expert Reviewers

The Expert Reviewer is expected to review the documentation referenced in a registration request to verify its completeness. The Expert Reviewer must base their decision to accept or reject the request on a fair and impartial assessment of the request. If the Expert Reviewer has a conflict of interest, such as being an author of a defining document referenced by the request, they must recuse themselves from the approval process for that request. In the case where a request is rejected, the Expert Reviewer should provide the requesting party with a written statement expressing the reason for rejection, and be prepared to cite any sources of information that went into that decision.

Subject Identifier Types need not be generally applicable and may be highly specific to a particular domain; it is expected that types may be registered for niche or industry-specific use cases. The Expert Reviewer should focus on whether the type is thoroughly documented, and whether its registration will promote or harm interoperability. In most cases, the Expert Reviewer should not approve a request if the registration would contribute to confusion, or amount to a synonym for an existing type.

7. Normative References


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Change Log

(This section to be removed by the RFC Editor before publication as an RFC.)

Draft 00 - AB - First draft

Draft 01 - AB:
  o Added reference to RFC 5322 for format of "email" claim.
  o Renamed "iss_sub" type to "iss-sub".
  o Renamed "id_token_claims" type to "id-token-claims".
  o Added text specifying the nature of the subjects described by each type.

Draft 02 - AB:
  o Corrected format of phone numbers in examples.
  o Updated author info.

Draft 03 - AB:
- Added "account" type for "acct" URIs.
- Replaced "id-token-claims" type with "aliases" type.
- Added email canonicalization guidance.
- Updated semantics for "email", "phone", and "iss-sub" types.

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