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YANG-CBOR: Allocating SID Ranges for Private Enterprise Number (PEN) Holders

Abstract

YANG-CBOR (RFC 9254, "Encoding of Data Modeled with YANG in the Concise Binary Object Representation (CBOR)") defines YANG Schema Item iDentifiers (YANG SIDs), globally unique 63-bit unsigned integers used to identify YANG items. RFC 9595 ("YANG Schema Item iDentifier (YANG SID)") defines ways to allocate these SIDs using IANA registries.

The present specification employs these SID allocation mechanisms to allocate ranges of 100 000 SIDs (representation size 64 bits) to each holder of an IANA Private Enterprise Number (PEN) of a value below 1 000 000. Holders of PENs of values smaller than 100 000 are also allocated ranges of 10 000 SIDs (representation size 32 bits).

Status of This Memo

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1. Introduction

YANG-CBOR [RFC9254] defines YANG Schema Item iDentifiers (YANG SID), globally unique 63-bit unsigned integers used to identify YANG items. [RFC9595] defines ways to allocate these SIDs using IANA registries.

The present specification employs these SID allocation mechanisms to allocate ranges of 100 000 SIDs (representation size 64 bits) to each holder of an IANA Private Enterprise Number (PEN) of a value below 1 000 000. Holders of PENs of values smaller than 100 000 are also allocated ranges of 10 000 SIDs (representation size 32 bits).

IANA has allocated a mega-range with 100 billion SIDs (representation size 64 bits) for the SID numbers 300 000 000 000 to 399 999 999 999.

IANA has also allocated a mega-range with 1 billion SIDs (representation size 32 bits) for the SID numbers 3 000 000 000 to 3 999 999 999.

PENs are registered in [[IANA.enterprise-numbers](#)] using a low-threshold, low-overhead registration process. At the time of writing (~38 years after registry creation), around 66 000 PENs are registered. In this document, the registrant for a PEN is referred to as the "PEN holder".

This specification makes the following SID ranges available to certain (current or future) PEN holders for allocation in a scheme defined by the holder:

- The holder of a PEN ppp ppp (< 1 000 000) can use the SID numbers 3pp ppp p00 000 to 3pp ppp p99 999.
- The holder of a PEN pp ppp (< 100 000) can also use the smaller SID numbers 3 ppp pp0 000 to 3 ppp pp9 999.

2. Example: SID Range Allocation for Holder of PEN 32473

[[RFC5612](#)] allocated Enterprise Number 32473 "for use in examples in RFCs, books, documentation, and the like".

If this Enterprise Number had an actual PEN holder, the present specification would confer control over the following SID ranges to the holder:

- **303 247 300 000** up to **303 247 399 999**, and
- **3 324 730 000** up to **3 324 739 999**.

(The plaintext form of this document shows "*" characters around the digits conveying the PEN, which are shown in **boldface** in the other renditions.)

As Enterprise Number 32473 is intended to be used in documentation, the SIDs in the two SID ranges are consequently also available for use in documentation.

3. Discussion

This document assigns two mega-ranges as an extremely-low-threshold (zero-interaction) way for a PEN holder to obtain a number space for the YANG SIDs used in their YANG modules. If a PEN is not already available to the entity needing such a number space, it can be obtained through a very low-threshold process. However, use of values in these mega-ranges is not always the recommended approach for a module author:

- In the larger of the two spaces, each SID number needs a representation size of 64 bits ("64-bit SIDs"). (This larger representation size of the absolute value of the SID is of comparatively little consequence due to the delta-encoding used for SIDs in YANG-CBOR.)
- For the holders of PENs with values less than 100 000 in the "Private Enterprise Numbers (PENs)" registry, there is another smaller space of SID numbers that need a representation size of 32 bits ("32-bit SIDs"). By or around 2040, the PENs with a value less than 100 000 are likely to be exhausted; the expectation is that there will be enough opportunities by that time to request SID ranges within mega-ranges already allocated by other registrants that this mechanism is less needed.

- This document does not define infrastructure to discover the YANG module behind a SID in one of its ranges. Of course, each PEN holder can provide such infrastructure, but even then the problem of how to find that infrastructure for a SID remains. (Search engines may mitigate this somewhat.) On the other hand, in some cases this relative obscurity may be exactly what a PEN holder wants to achieve by using this mechanism.

If obscurity is not the intention, one or both of the following approaches are encouraged:

- The PEN holder can provide a public repository where their YANG models can be found alongside the applicable SID files. Such a repository may be easy to set up using a popular git forge such as, at the time of writing, GitHub.
- Implementations that employ PEN-based SIDs can facilitate information discovery by providing a form of a YANG library [RFC8525], possibly a constrained version [core-yang-library].

Relying on the PEN registry might theoretically trigger a land grab of PEN assignments by prospective writers of YANG modules. However, PENs have been around for decades (see Section 3.1.4 of [RFC1065], which continues to be in force with no technical changes as Section 3.1.4 of RFC 1155 [STD16]), and such a land grab has not occurred for the other allocations implicitly provided by obtaining a PEN.

4. IANA Considerations

As summarized in Table 1, this document allocates the following two mega-ranges (Section 6.3 of [RFC9595]) in the "YANG-SID Mega-Ranges" registry within the "YANG SIDs" registry group [IANA.yang-sid]:

- 1 billion SIDs ranging from 3 000 000 000 up to 3 999 999 999 (32-bit representation size)
- 100 billion SIDs ranging from 300 000 000 000 up to 399 999 999 999 (64-bit representation size)

Entry Point	Size	Allocation	Org Name	URL
3 000 000 000	1 000 000 000	Private	IANA	https://rfc-editor.org/info/rfc9997
300 000 000 000	100 000 000 000	Private	IANA	https://rfc-editor.org/info/rfc9997

Table 1: YANG-SID Mega-Range Allocations for Use by PEN Holders

IANA has marked the following ranges as Reserved for Documentation:

- 303 247 300 000 up to 303 247 399 999
- 3 324 730 000 up to 3 324 739 999

An additional contact for the allocation is: IETF CORE Working Group (core@ietf.org) or IETF Applications and Real-Time Area (art@ietf.org).

The allocation policy inside the mega-range is "Private" (see [Section 6.3.2](#) of [\[RFC9595\]](#)). The URL is that of the present specification.

The management of each SID block of 100 000 SIDs, ranging from 3pp ppp p00 000 to 3pp ppp p99 999, is delegated to the PEN holder for PEN ppp ppp (i.e., the PEN holder for ppp ppp controls SID 3pp ppp p00 000 to 3pp ppp p99 999).

Similarly, the management of each SID block of 10 000 SIDs, ranging from 3 ppp pp0 000 to 3 ppp pp9 999, is delegated to the PEN holder for PEN pp ppp (i.e., the PEN holder for pp ppp controls SID 3 ppp pp0 000 to 3 ppp pp9 999).

[Section 6.3.2](#) of [\[RFC9595\]](#) requires an organization that requests an entry in the "YANG-SID Mega-Ranges" registry to ensure the technical capacity to manage the SID ranges within those mega-ranges for a period of at least 10 years (Private ranges). The individual SID ranges within the mega-ranges allocated in this document are assigned through the registration of PEN numbers. The technical capacity to ensure the sustained operation of the PEN number registry is derived from the demonstrated capacity of IANA to maintain this registry as well as the importance of a functioning PEN number registry in other contexts.

5. Security Considerations

The Security Considerations of [Section 5](#) of [\[RFC9595\]](#) and [Section 8](#) of [\[RFC9254\]](#) apply. In particular, the fact that a certain Private Enterprise Number appears in a SID is not an indicator of provenance, i.e., it does not guarantee that the SID or underlying YANG model actually originates from the holder of that PEN. The requirement to ascertain the authoritative source of this information, as discussed in the above security considerations, remains.

6. References

6.1. Normative References

[IANA.enterprise-numbers] IANA, "Private Enterprise Numbers (PENs)", <<https://www.iana.org/assignments/enterprise-numbers>>.

[IANA.yang-sid] IANA, "YANG SIDs", <<https://www.iana.org/assignments/yang-sid>>.

[RFC9254] Veillette, M., Ed., Petrov, I., Ed., Pelov, A., Bormann, C., and M. Richardson, "Encoding of Data Modeled with YANG in the Concise Binary Object Representation (CBOR)", RFC 9254, DOI 10.17487/RFC9254, July 2022, <<https://www.rfc-editor.org/info/rfc9254>>.

[RFC9595] Veillette, M., Ed., Pelov, A., Ed., Petrov, I., Ed., Bormann, C., and M. Richardson, "YANG Schema Item iDentifier (YANG SID)", RFC 9595, DOI 10.17487/RFC9595, July 2024, <<https://www.rfc-editor.org/info/rfc9595>>.

6.2. Informative References

- [core-yang-library]** Veillette, M. and I. Petrov, "Constrained YANG Module Library", Work in Progress, Internet-Draft, draft-ietf-core-yang-library-03, 11 January 2021, <<https://datatracker.ietf.org/doc/html/draft-ietf-core-yang-library-03>>.
- [RFC1065]** McCloghrie, K. and M. Rose, "Structure and identification of management information for TCP/IP-based internets", RFC 1065, DOI 10.17487/RFC1065, August 1988, <<https://www.rfc-editor.org/info/rfc1065>>.
- [RFC5612]** Eronen, P. and D. Harrington, "Enterprise Number for Documentation Use", RFC 5612, DOI 10.17487/RFC5612, August 2009, <<https://www.rfc-editor.org/info/rfc5612>>.
- [RFC8525]** Bierman, A., Bjorklund, M., Schoenwaelder, J., Watsen, K., and R. Wilton, "YANG Library", RFC 8525, DOI 10.17487/RFC8525, March 2019, <<https://www.rfc-editor.org/info/rfc8525>>.
- [STD16]** Internet Standard 16, <<https://www.rfc-editor.org/info/std16>>.
At the time of writing, this STD comprises the following:
- Rose, M. and K. McCloghrie, "Structure and identification of management information for TCP/IP-based internets", STD 16, RFC 1155, DOI 10.17487/RFC1155, May 1990, <<https://www.rfc-editor.org/info/rfc1155>>.
- Rose, M. and K. McCloghrie, "Concise MIB definitions", STD 16, RFC 1212, DOI 10.17487/RFC1212, March 1991, <<https://www.rfc-editor.org/info/rfc1212>>.

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