LAMPS
Internet-Draft
Intended status: Standards Track
Expires: December 31, 2017

A. Melnikov, Ed.
Isode Ltd
W. Chuang, Ed.
Google, Inc.
June 29, 2017

Internationalized Email Addresses in X.509 certificates
draft-ietf-lamps-eai-addresses-12

Abstract

This document defines a new name form for inclusion in the otherName field of an X.509 Subject Alternative Name and Issuer Alternative Name extension that allows a certificate subject to be associated with an Internationalized Email Address.

Status of This Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on December 31, 2017.

Table of Contents

1. Introduction

[RFC5280] defines the rfc822Name subjectAltName name type for representing [RFC5321] email addresses. The syntax of rfc822Name is restricted to a subset of US-ASCII characters and thus can't be used to represent Internationalized Email addresses [RFC6531]. This document calls for a new otherName variant to represent Internationalized Email addresses. In addition this document calls for all email address domains in X.509 certificates to conform to IDNA2008 [RFC5890].

2. Conventions Used in This Document

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].

The formal syntax use the Augmented Backus-Naur Form (ABNF) [RFC5234] notation.

3. Name Definitions

The GeneralName structure is defined in [RFC5280], and supports many different name forms including otherName for extensibility. This section specifies the SmtpUTF8Name name form of otherName, so that Internationalized Email addresses can appear in the subjectAltName of a certificate, the issuerAltName of a certificate, or anywhere else that GeneralName is used.

```
id-on-SmtpUTF8Name OBJECT IDENTIFIER ::= { id-on 9 }

SmtpUTF8Name ::= UTF8String (SIZE (1..MAX))
```

When the subjectAltName (or issuerAltName) extension contains an Internationalized Email address with a non-ASCII local-part, the address MUST be stored in the SmtpUTF8Name name form of otherName. The format of SmtpUTF8Name is defined as the ABNF rule SmtpUTF8Mailbox. SmtpUTF8Mailbox is a modified version of the Internationalized Mailbox which was defined in Section 3.3 of [RFC6531] which was itself derived from SMTP Mailbox from Section 4.1.2 of [RFC5321]. [RFC6531] defines the following ABNF rules for Mailbox whose parts are modified for internationalization: <Local-part>, <Dot-string>, <Quoted- string>, <QcontentSMTP>, <Domain>, and <Atom>. In particular, <Local- part> was updated to also support UTF8-non-ascii. UTF8-non-ascii was described by Section 3.1 of [RFC6532]. Also, domain was extended to support U-label, as defined in [RFC5890].

This document further refines Internationalized [RFC6531] Mailbox ABNF rules and calls this SmtpUTF8Mailbox. In SmtpUTF8Mailbox, labels that include non-ASCII characters MUST be stored in U-label (rather than A-label) [RFC5890] form. This restriction removes the need to determine which label encoding A- or U-label is present in the Domain. As per Section 2.3.2.1 of [RFC5890], U-label are encoded as UTF-8 [RFC3629] in Normalization Form C and other properties specified there. In SmtpUTF8Mailbox, domain labels that solely use ASCII characters (meaning not A- nor U-labels) SHALL use NR-LDH restrictions as specified by Section 2.3.1 of [RFC5890] and SHALL be restricted to lower case letters. NR-LDH stands for "Non-Reserved Letters Digits Hyphen" and is the set LDH labels that do not have "--" characters in the third and forth character position, which excludes "tagged domain names" such as A-labels. Consistent with the treatment of rfc822Name in [RFC5280], SmtpUTF8Name is an envelope <Mailbox> and has no phrase (such as a common name) before it, has no comment (text surrounded in parentheses) after it, and is not surrounded by "<" and ">".

Due to operational reasons to be described shortly and name constraint compatibility reasons described in Section 6, SmtpUTF8Name subjectAltName MUST only be used when the local part of the email address contains contains non-ASCII characters. When the local-part is ASCII, rfc822Name subjectAltName MUST be used instead of SmtpUTF8Name. This is compatible with legacy software that supports only rfc822Name (and not SmtpUTF8Name).

SmtpUTF8Name is encoded as UTF8String. The UTF8String encoding MUST NOT contain a Byte-Order- Mark (BOM) [RFC3629] to aid consistency across implementations particularly for comparison.

4. IDNA2008

To facilitate comparison between email addresses, all email address domains in X.509 certificates MUST conform to IDNA2008 [RFC5890] (and avoids any "mappings" mentioned in that document). Use of non-conforming email address domains introduces the possibility of conversion errors between alternate forms. This applies to SmtpUTF8Name and rfc822Name in subjectAltName, issuerAltName and anywhere else that these are used.

5. Matching of Internationalized Email Addresses in X.509 certificates

In equivalence comparison with SmtpUTF8Name, there may be some setup work on one or both inputs depending of whether the input is already in comparison form. Comparing SmtpUTF8Names consists of a domain part step and a local-part step. The comparison form for local-parts always is UTF-8. The comparison form for domain parts depends on context. While some contexts such as certificate path validation in [RFC5280] specify transforming domain to A-label (Section 7.5 and 7.2 in [RFC5280] as updated by [ID-lamps-rfc5280-i18n-update]), this document RECOMMENDS transforming to UTF-8 U-label instead. This reduces the likelihood of errors by reducing conversions as more implementations natively support U- label domains.

Comparison of two SmtpUTF8Name is straightforward with no setup work needed. They are considered equivalent if there is an exact octet-for-octet match. Comparison with email addresses such as Internationalized email address or rfc822Name requires additional setup steps for domain part and local-part. The initial preparation for the email addresses is to remove any phrases or comments, as well as "<" and ">" present. This document calls for comparison of domain labels that include non-ASCII characters be tranformed to U-label if not already in that form. The first step is to detect use of the A-label by using Section 5.1 of [RFC5891]. Next if necessary, transform any A-labels to U-labels Unicode as specified in Section 5.2 of [RFC5891]. Finally if necessary convert the Unicode to UTF-8 as specified in Section 3 of [RFC3629]. For ASCII NR-LDH labels, upper case letters are converted to lower case letters. In setup for SmtpUTF8Mailbox, the email address local-part MUST conform to the requirements of [RFC6530] and [RFC6531], including being a string in UTF-8 form. In particular, the local-part MUST NOT be transformed in any way, such as by doing case folding or normalization of any kind. The <Local-part> part of an Internationalized email address is already in UTF-8. For rfc822Name

the local-part, which is IA5String (ASCII), trivially maps to UTF-8 without change. Once setup is complete, they are again compared octet-for-octet.

To summarize non-normatively, the comparison steps including setup are:

1. If the domain contains A-labels, transform them to U-labels.

2. If the domain contains ASCII NR-LDH labels, lowercase them.

3. Compare strings octet-for-octet for equivalence.

This specification expressly does not define any wildcard characters and SmtpUTF8Name comparison implementations MUST NOT interpret any character as wildcards. Instead, to specify multiple email addresses through SmtpUTF8Name, the certificate MUST use multiple subjectAltNames or issuerAltNames to explicitly carry any additional email addresses.

6. Name constraints in path validation

This section updates Section 4.2.1.10 of [RFC5280] to extend rfc822Name name constraints to SmtpUTF8Name subjectAltNames. A SmtpUTF8Name aware path validators will apply name constraint comparison to the subject distinguished name and both forms of subject alternative name rfc822Name and SmtpUTF8Name.

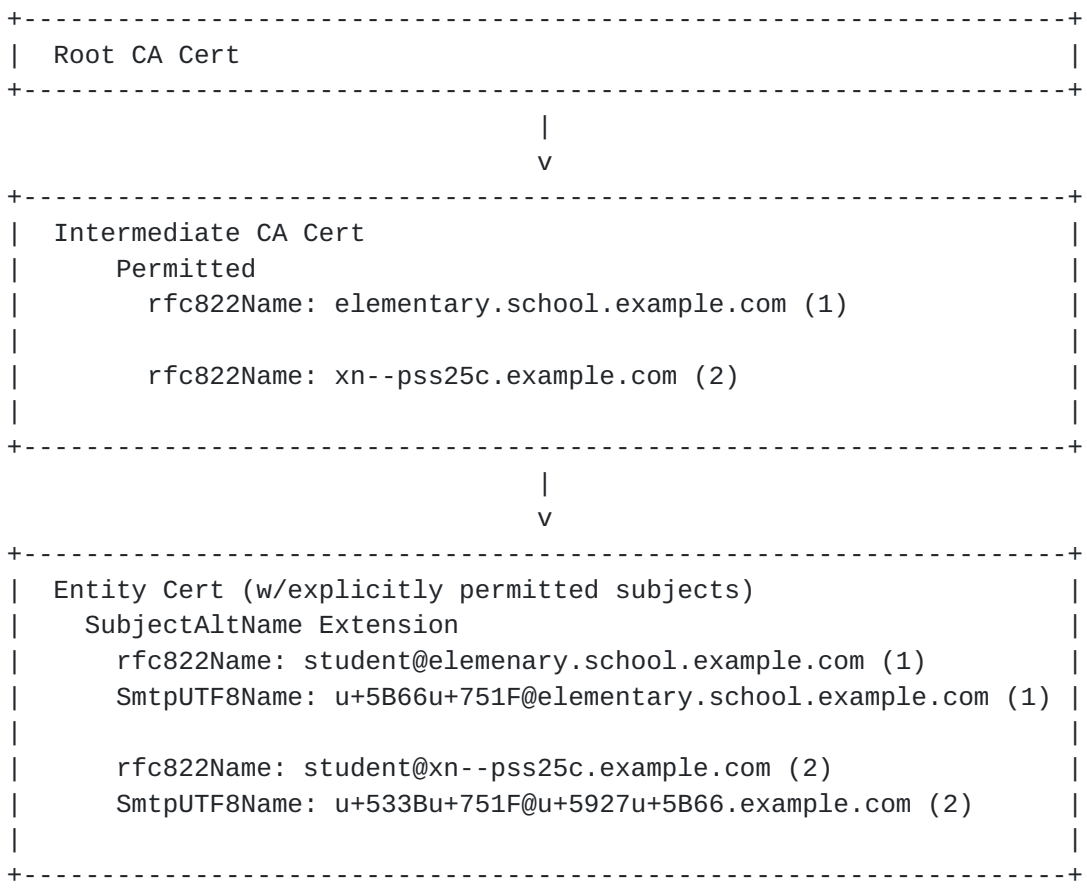
Both rfc822Name and SmtpUTF8Name subject alternative names represent the same underlying email address namespace. Since legacy CAs constrained to issue certificates for a specific set of domains would lack corresponding UTF-8 constraints, [ID-lamps-rfc5280-i18n-update] updates modifies and extends rfc822Name name constraints defined in [RFC5280] to cover SmtpUTF8Name subject alternative names. This ensures that the introduction of SmtpUTF8Name does not violate existing name constraints. Since it is not valid to include non-ASCII UTF-8 characters in the local-part of rfc822Name name constraints, and since name constraints that include a local-part are rarely, if at all, used in practice, name constraints updated in [ID-lamps-rfc5280-i18n-update] admit the forms that represent all addresses at a host or all mailboxes in a domain, and deprecates rfc822Name name constraints that represent a particular mailbox. That is, rfc822Name constraints with a local-part SHOULD NOT be used.

Constraint comparison with SmtpUTF8Name subjectAltName starts with the setup steps defined by Section 5. Setup converts the inputs of the comparison which is one of a subject distinguished name or a rfc822Name or SmtpUTF8Name subjectAltName, and one of a rfc822Name

name constraint, to constraint comparison form. For rfc822Name name constraint, this will convert any domain A-labels to U-labels. For both the name constraint and the subject, this will lower case any domain NR-LDH labels. Strip the local-part and "@" separator from each rfc822Name and SmtpUTF8Name, leaving just the domain-part. After setup, this follows the comparison steps defined in 4.2.1.10 of [RFC5280] as follows. If the resulting name constraint domain starts with a "." character, then for the name constraint to match, a suffix of the resulting subject alternative name domain MUST match the name constraint (including the leading ".") octet for octet. If the resulting name constraint domain does not start with a "." character, then for the name constraint to match, the entire resulting subject alternative name domain MUST match the name constraint octet for octet.

Certificate Authorities that wish to issue CA certificates with email address name constraint MUST use rfc822Name subject alternative names only. These MUST be IDNA2008 conformant names with no mappings, and with non-ASCII domains encoded in A-labels only.

The name constraint requirement with SmtpUTF8Name subject alternative name is illustrated in the non-normative diagram Figure 1. The first example (1) illustrates a permitted rfc822Name ASCII only hostname name constraint, and the corresponding valid rfc822Name subjectAltName and SmtpUTF8Name subjectAltName email addresses. The second example (2) illustrates a permitted rfc822Name hostname name constraint with A-label, and the corresponding valid rfc822Name subjectAltName and SmtpUTF8Name subjectAltName email addresses. Note that an email address with ASCII only local-part is encoded as rfc822Name despite also having unicode present in the domain.



Name constraints with SmtpUTF8Name and rfc822Name

Figure 1

7. Security Considerations

Use of SmtpUTF8Name for certificate subjectAltName (and issuerAltName) will incur many of the same security considerations as in Section 8 in [RFC5280] , but introduces a new issue by permitting non-ASCII characters in the email address local-part. This issue, as mentioned in Section 4.4 of [RFC5890] and in Section 4 of [RFC6532], is that use of Unicode introduces the risk of visually similar and identical characters which can be exploited to deceive the recipient. The former document references some means to mitigate against these attacks.

8. IANA Considerations

In Section 3 and the ASN.1 module identifier defined in Appendix A. IANA is kindly requested to make the following assignments for:

The LAMPS-EaiAddresses-2016 ASN.1 module in the "SMI Security for PKIX Module Identifier" registry (1.3.6.1.5.5.7.0).

The SmtpUTF8Name otherName in the "PKIX Other Name Forms" registry (1.3.6.1.5.5.7.8).

9. References

9.1. Normative References

[ID-lamps-rfc5280-i18n-update] Housley, R., "Internationalization Updates to RFC 5280", June 2017, <https://datatracker.ietf.org/doc/draft-housley-rfc5280-i18n-update/>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC3629] Yergeau, F., "UTF-8, a transformation format of ISO 10646", STD 63, RFC 3629, DOI 10.17487/RFC3629, November 2003, <http://www.rfc-editor.org/info/rfc3629>.

[RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <http://www.rfc-editor.org/info/rfc5234>.

[RFC5280] Cooper, D., Santesson, S., Farrell, S., Boeyen, S., Housley, R., and W. Polk, "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", RFC 5280, DOI 10.17487/RFC5280, May 2008, <http://www.rfc-editor.org/info/rfc5280>.

[RFC5321] Klensin, J., "Simple Mail Transfer Protocol", RFC 5321, DOI 10.17487/RFC5321, October 2008, <http://www.rfc-editor.org/info/rfc5321>.

[RFC5890] Klensin, J., "Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework", RFC 5890, DOI 10.17487/RFC5890, August 2010, <http://www.rfc-editor.org/info/rfc5890>.

[RFC5891] Klensin, J., "Internationalized Domain Names in Applications (IDNA): Protocol", RFC 5891, DOI 10.17487/RFC5891, August 2010, <http://www.rfc-editor.org/info/rfc5891>.

[RFC6530] Klensin, J. and Y. Ko, "Overview and Framework for Internationalized Email", RFC 6530, DOI 10.17487/RFC6530, February 2012, <http://www.rfc-editor.org/info/rfc6530>.

[RFC6531] Yao, J. and W. Mao, "SMTP Extension for Internationalized Email", RFC 6531, DOI 10.17487/RFC6531, February 2012, <http://www.rfc-editor.org/info/rfc6531>.

[RFC6532] Yang, A., Steele, S., and N. Freed, "Internationalized Email Headers", RFC 6532, DOI 10.17487/RFC6532, February 2012, <http://www.rfc-editor.org/info/rfc6532>.

9.2. Informative References

[RFC5912] Hoffman, P. and J. Schaad, "New ASN.1 Modules for the Public Key Infrastructure Using X.509 (PKIX)", RFC 5912, DOI 10.17487/RFC5912, June 2010, <http://www.rfc-editor.org/info/rfc5912>.

Appendix A. ASN.1 Module

The following ASN.1 module normatively specifies the SmtpUTF8Name structure. This specification uses the ASN.1 definitions from [RFC5912] with the 2002 ASN.1 notation used in that document. [RFC5912] updates normative documents using older ASN.1 notation.

```
  LAMPS-EaiAddresses-2016
    { iso(1) identified-organization(3) dod(6)
      internet(1) security(5) mechanisms(5) pkix(7) id-mod(0)
      id-mod-lamps-eai-addresses-2016(TBD) }

  DEFINITIONS IMPLICIT TAGS ::=
  BEGIN

  IMPORTS
    OTHER-NAME
    FROM PKIX1Implicit-2009
      { iso(1) identified-organization(3) dod(6) internet(1) security(5)
      mechanisms(5) pkix(7) id-mod(0) id-mod-pkix1-implicit-02(59) }

    id-pkix
    FROM PKIX1Explicit-2009
      { iso(1) identified-organization(3) dod(6) internet(1) security(5)
      mechanisms(5) pkix(7) id-mod(0) id-mod-pkix1-explicit-02(51) } ;

  --
  -- otherName carries additional name types for subjectAltName,
  -- issuerAltName, and other uses of GeneralNames.
  --

    id-on OBJECT IDENTIFIER ::= { id-pkix 8 }

    SmtpUtf8OtherNames OTHER-NAME ::= { on-SmtpUTF8Name, ... }

    on-SmtpUTF8Name OTHER-NAME ::= {
        SmtpUTF8Name IDENTIFIED BY id-on-SmtpUTF8Name
    }

    id-on-SmtpUTF8Name OBJECT IDENTIFIER ::= { id-on 9 }

    SmtpUTF8Name ::= UTF8String (SIZE (1..MAX))

  END
```

Appendix B. Example of SmtpUTF8Name

This non-normative example demonstrates using SmtpUTF8Name as an otherName in GeneralName to encode the email address "u+8001u+5E2B@example.com".

```
The hexadecimal DER encoding of the email address is:
A022060A 2B060105 05070012 0809A014 0C12E880 81E5B8AB 40657861
6D706C65 2E636F6D

The text decoding is:
  0  34: [0] {
  2  10:   OBJECT IDENTIFIER '1 3 6 1 5 5 7 0 18 8 9'
 14  20:   [0] {
 16  18:     UTF8String '..@example.com'
       :     }
       :   }
```

Figure 2

The example was encoded on the OSS Nokalva ASN.1 Playground and the above text decoding is an output of Peter Gutmann's "dumpasn1" program.

Appendix C. Acknowledgements

Thank you to Magnus Nystrom for motivating this document. Thanks to Russ Housley, Nicolas Lidzborski, Laetitia Baudoin, Ryan Sleevi, Sean Leonard, Sean Turner, John Levine, and Patrik Falstrom for their feedback. Also special thanks to John Klensin for his valuable input on internationalization, Unicode and ABNF formatting, to Jim Schaad for his help with the ASN.1 example and his helpful feedback, and to Viktor Dukhovni for his help with name constraints.

Authors' Addresses

Alexey Melnikov (editor)
Isode Ltd
14 Castle Mews
Hampton, Middlesex TW12 2NP
UK

Email: Alexey.Melnikov@isode.com

Weihaw Chuang (editor)
Google, Inc.
1600 Amphitheater Parkway
Mountain View, CA 94043
US

Email: weihaw@google.com