

Network Working Group  
Internet-Draft  
Updates: [6376](#), [7208](#), [7489](#) (if approved)  
Intended status: Standards Track  
Expires: October 13, 2019

J. Levine  
Taughannock Networks  
April 11, 2019

**E-mail Authentication for Internationalized Mail**  
**draft-ietf-dmarc-eaiauth-06**

Abstract

SPF ([RFC7208](#)), DKIM ([RFC6376](#)), and DMARC ([RFC7489](#)) enable a domain owner to publish e-mail authentication and policy information in the DNS. In internationalized e-mail, domain names can occur both as U-labels and A-labels. This specification updates the SPF, DKIM, and DMARC specifications to clarify which form of internationalized domain names to use in those specifications.

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 <https://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 October 13, 2019.

Copyright Notice

Copyright (c) 2019 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in [Section 4](#).e of

the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">2.</a>	Definitions . . . . .	<a href="#">3</a>
<a href="#">3.</a>	General principles . . . . .	<a href="#">3</a>
<a href="#">4.</a>	SPF and internationalized mail . . . . .	<a href="#">3</a>
<a href="#">5.</a>	DKIM and internationalized mail . . . . .	<a href="#">4</a>
<a href="#">6.</a>	DMARC and internationalized mail . . . . .	<a href="#">5</a>
<a href="#">7.</a>	IANA Considerations . . . . .	<a href="#">5</a>
<a href="#">8.</a>	Security Considerations . . . . .	<a href="#">5</a>
<a href="#">9.</a>	Normative References . . . . .	<a href="#">5</a>
<a href="#">Appendix A.</a>	Change history . . . . .	<a href="#">6</a>
	Author's Address . . . . .	<a href="#">7</a>

## [1.](#) Introduction

SPF [[RFC7208](#)], DKIM [[RFC6376](#)], and DMARC [[RFC7489](#)] enable a domain owner to publish e-mail authentication and policy information in the DNS. SPF primarily publishes information about what host addresses are authorized to send mail for a domain. DKIM places cryptographic signatures on e-mail messages, with the validation keys published in the DNS. DMARC publishes policy information related to the domain in the From: header field of e-mail messages.

In conventional e-mail, all domain names are ASCII in all contexts so there is no question about the representation of the domain names. All internationalized domain names are represented as A-labels [[RFC5890](#)] in message header fields, in SMTP sessions, and in the DNS.

Internationalized mail [[RFC6530](#)], (generally called EAI for E-mail Address Internationalization), allows U-labels in SMTP sessions [[RFC6531](#)] and in message header fields [[RFC6532](#)].

Every U-label is equivalent to an A-label, so in principle the choice of label format will not cause ambiguities. But in practice, consistent use of label formats will make it more likely that mail senders' and receivers' code interoperates.

Internationalized mail also allows UTF-8 encoded Unicode characters in the local parts of mailbox names, which were historically only ASCII.



## 2. Definitions

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.

The term IDN, for Internationalized Domain Name, refers to a domain name containing either U-labels or A-labels.

Since DMARC is not currently a standards track protocol, this specification offers advice rather than requirements for DMARC.

## 3. General principles

In headers in EAI mail messages, domain names that were restricted to ASCII can be U-labels, and mailbox local parts can be UTF-8. Header field names and other text intended primarily to be interpreted by computers rather than read by people remains ASCII.

Strings stored in DNS records remain ASCII since there is no way to tell whether a client retrieving a DNS record expects an EAI or an ASCII result. When a domain name found in a mail header field includes U-labels, those labels are translated to A-labels before being looked up in the DNS, as described in [[RFC5891](#)].

## 4. SPF and internationalized mail

SPF [[RFC7208](#)] uses two identities from the SMTP session, the host name in the EHLO command, and the domain in the address in the MAIL FROM command. Since the EHLO command precedes the server response that tells whether the server supports the SMTPUTF8 extension, an IDN host name **MUST** be represented as A-labels. An IDN in MAIL FROM can be either U-labels or A-labels.

All U-labels **MUST** be converted to A-labels before being used for an SPF validation. This includes both the original DNS lookup, described in [Section 3 of \[RFC7208\]](#) and the macro expansion of domain-spec described in [section 7. Section 4.3 of \[RFC7208\]](#) states that all IDNs in an SPF DNS record **MUST** be A-labels; this rule is unchanged since any SPF record can be used to authorize either EAI or conventional mail.

SPF macros `%{s}` and `%{l}` expand the local-part of the sender's mailbox. If the local-part contains non-ASCII characters, terms that include `%{s}` or `%{l}` do not match anything, because non-ASCII local parts cannot be used as the DNS labels the macros are intended to



match. Since these macros are rarely used, this is unlikely to be an issue in practice.

## 5. DKIM and internationalized mail

DKIM [[RFC6376](#)] specifies a mail header field that contains a cryptographic message signature and a DNS record that contains the validation key.

[Section 2.11 of \[RFC6376\]](#) defines dkim-quoted-printable. Its definition is modified in messages with internationalized header fields so that non-ASCII UTF-8 characters need not be quoted. The ABNF for dkim-safe-char in those messages is replaced by the following, adding non-ASCII UTF-8 characters from [[RFC3629](#)]:

```
dkim-safe-char      = %x21-3A / %x3C / %x3E-7E /  
                      UTF8-2 / UTF8-3 / UTF8-4  
                      ; '!' - ':', '<', '>' - '~', non-ASCII
```

```
UTF8-2              = <Defined in Section 4 of RFC 3629>
```

```
UTF8-3              = <Defined in Section 4 of RFC 3629>
```

```
UTF8-4              = <Defined in Section 4 of RFC 3629>
```

[Section 3.5 of \[RFC6376\]](#) states that IDNs in the d=, i=, and s= tags of a DKIM-Signature header field MUST be encoded as A-labels. This rule is relaxed only for internationalized messages header fields [[RFC6532](#)] so IDNs SHOULD be represented as U-labels. This provides improved consistency with other header fields. (A-labels remain valid to allow a transition from older software.) The set of allowable characters in the local-part of an i= tag is extended in the same fashion as local parts of e-mail addresses as described in [section 3.2 of \[RFC6532\]](#). When computing or verifying the hash in a DKIM signature as described in [section 3.7](#), the hash MUST use the domain name in the format it occurs in the header field.

[Section 3.4.2 of \[RFC6376\]](#) describes relaxed header canonicalization. Its first step converts all header field names from upper case to lower case. Field names are restricted to printable ASCII (see [[RFC5322](#)] [section 3.6.8](#)) so this case conversion remains ASCII case conversion.

DKIM key records, described in [section 3.6.1](#), do not contain domain names, so there is no change to their specification.



## **6. DMARC and internationalized mail**

DMARC [[RFC7489](#)] defines a policy language that domain owners can specify for the domain of the address in a [RFC5322](#).From header field.

[Section 6.6.1](#) specifies, somewhat imprecisely, how IDNs in the [RFC5322](#).From address domain are to be handled. That section is updated to say that all U-labels in the domain are converted to A-labels before further processing. [Section 7.1](#) is similarly updated to say that all U-labels in domains being handled are converted to A-labels before further processing.

DMARC policy records, described in sections [6.3](#) and [7.1](#), can contain e-mail addresses in the rua and ruf tags. Since a policy record can be used for both internationalized and conventional mail, those addresses still have to be conventional addresses, not internationalized addresses.

## **7. IANA Considerations**

This document makes no request of IANA.

## **8. Security Considerations**

E-mail is subject to a vast range of threats and abuses. This document attempts to slightly mitigate some of them but does not, as far as the author knows, add any new ones. The updates to SPF, DKIM, and DMARC are intended to allow the respective specifications work as reliably on internationalized mail as they do on ASCII mail, so that applications that use them, such as some kinds of spam and phish filtering, can work more reliably on internationalized mail.

## **9. Normative References**

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://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, <<https://www.rfc-editor.org/info/rfc3629>>.
- [RFC5322] Resnick, P., Ed., "Internet Message Format", [RFC 5322](#), DOI 10.17487/RFC5322, October 2008, <<https://www.rfc-editor.org/info/rfc5322>>.





- [RFC5890] Klensin, J., "Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework", [RFC 5890](#), DOI 10.17487/RFC5890, August 2010, <<https://www.rfc-editor.org/info/rfc5890>>.
- [RFC5891] Klensin, J., "Internationalized Domain Names in Applications (IDNA): Protocol", [RFC 5891](#), DOI 10.17487/RFC5891, August 2010, <<https://www.rfc-editor.org/info/rfc5891>>.
- [RFC6376] Crocker, D., Ed., Hansen, T., Ed., and M. Kucherawy, Ed., "DomainKeys Identified Mail (DKIM) Signatures", STD 76, [RFC 6376](#), DOI 10.17487/RFC6376, September 2011, <<https://www.rfc-editor.org/info/rfc6376>>.
- [RFC6530] Klensin, J. and Y. Ko, "Overview and Framework for Internationalized Email", [RFC 6530](#), DOI 10.17487/RFC6530, February 2012, <<https://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, <<https://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, <<https://www.rfc-editor.org/info/rfc6532>>.
- [RFC7208] Kitterman, S., "Sender Policy Framework (SPF) for Authorizing Use of Domains in Email, Version 1", [RFC 7208](#), DOI 10.17487/RFC7208, April 2014, <<https://www.rfc-editor.org/info/rfc7208>>.
- [RFC7489] Kucherawy, M., Ed. and E. Zwicky, Ed., "Domain-based Message Authentication, Reporting, and Conformance (DMARC)", [RFC 7489](#), DOI 10.17487/RFC7489, March 2015, <<https://www.rfc-editor.org/info/rfc7489>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

## [Appendix A](#). Change history

- 05 to 06 more editorial nits
- 04 to 05 editorial nits



03 to 04 remove dangling A-R reference, add more i18nish and security goodness

02 to 03 minor edits per Alexey

01 to 02 update references

00 to 01 Relaxed canon, Typos

00 First WG version

#### Author's Address

John Levine  
Taughannock Networks  
PO Box 727  
Trumansburg, NY 14886

Email: [standards@taugh.com](mailto:standards@taugh.com)

URI: <http://jl.ly>

