

# **Frequently Asked Questions (FAQs): UA Readiness of Programming Languages and Email Tools**

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## Introduction

This document provides answers to Frequently Asked Questions (FAQs) regarding Universal Acceptance (UA) support in programming languages and frameworks, and support for Email Address Internationalization (EAI) in email tools and services. The document is intended for those who maintain programming languages, their libraries and frameworks, as well as those who provide and maintain email tools. This document aims to help fix bugs and enable support to allow software to become UA-ready and promote usability and access to a global audience.

Note: Translations of many of the documents referenced in these FAQs are available in different languages at <https://uasg.tech/>.

## General Questions

### 1. What is Universal Acceptance (UA)?

Universal Acceptance (UA) is the state in which all domain names and email addresses are accepted, validated, stored, processed, and displayed correctly and consistently by all applications, devices, and systems.

Applications should be able to handle domain names formed with new top-level domains, e.g. universal-acceptance-test.international, and internationalized domain names (IDNs), e.g. უნივერსალური-თავსობადობის-ტესტი.გე (universal-acceptance-test.ge in Georgian). Applications should also function properly with email addresses formed with such domain names, e.g. email-test@universal-acceptance-test.international and ფოსტის-ტესტი@უნივერსალური-თავსობადობის-ტესტი.გე (email-test@universal-acceptance-test.ge in Georgian).

View the [Introduction to Universal Acceptance \(UA\)](#) for additional technical details regarding UA, and visit <https://uasg.tech/> for more general information.

### 2. What is Email Address Internationalization (EAI)?

Email Address Internationalization (EAI) is the protocol that allows email addresses with Internationalized Domain Names (IDNs) in the domain part (after sign @) and/or Unicode (non-[ASCII](#)) characters in the local part or mailbox name (before sign @).

Email software and services need to make specific changes to support EAI, since EAI mail is conceptually a separate mail stream from legacy American Standard Code for Information Interchange (ASCII) mail. Examples of Internationalized Email Addresses (mailbox-name@domain-name) include:

- อีเมลทดสอบ@ยูเอทเอส.ไทย (email-test@universal-acceptance-test.thai in Thai).
- ηλεκτρονικό-μήνυμα-δοκιμή@καθολική-αποδοχή-δοκιμή.eu (email-test@universal-acceptance-test.eu in Greek).

See the [Quick Guide to EAI](#) for additional information and [Use Cases for UA Readiness Evaluation](#) for a longer list of IDNs and internationalized email addresses.



### 3. What are the relevant standards and Requests for Comments (RFCs) that I need to follow in order to adopt UA and EAI?

A complete list of standards and RFCs related to Universal Acceptance, including EAI, is provided in [Standards and Other Documents Related to Universal Acceptance](#).

### 4. Where can I get testing data for UA and EAI ?

The UASG has issued several research reports on how to test for UA and EAI compliance in the technology stack, including the following:

- A. [Universal Acceptance Readiness Framework](#) provides a framework to test applications for UA readiness, covering both domain names and email addresses.
- B. [Test Domain Names and Email Addresses for UA Readiness Evaluation](#) provides actual registered and functional domain names and email addresses in various scripts to conduct the testing for UA and EAI.
- C. [Evaluation of EAI Support in Email Software and Services Report \(Test Cases\)](#) studies the EAI support of different email systems and tools. It tests the different components of the email technology stack, the Mail User Agent (MUA), Mail Submission Agent (MSA), Mail Transfer Agent (MTA), Mail Delivery Agent (MDA), and Mail Service Provider (MSP). Different groups of tests were performed on different software packages beside additional tests for Webmail services.
- D. [Considerations for Naming Internationalized Email Mailboxes](#) is intended for email systems administrators to help them provision mailboxes, and configure and manage systems compatible with internationalized email addresses. It outlines the considerations for naming internationalized mailboxes and helps administrators make good choices when setting mailbox name policy.
- E. [Universal Acceptance Compliance of Programming Language Libraries and Frameworks – 2020 \(Test Cases\)](#) describes the test cases and results for verifying the UA readiness of programming languages, including C, C#, Go, Java, Javascript, Python3, Rust. The testing covers libraries processing domain names and emailing.

### 5. Where can I find more information on UA and EAI?

The Universal Acceptance Steering Group (UASG) publishes relevant data and technical details on UA and EAI at <https://uasg.tech/>.

## Programming Language Libraries and Frameworks

### 6. Is there a general procedure to process UA-related identifiers in an application?

The UA community developed a [UA Readiness Framework](#) that defines the following steps within an application to process UA-related identifiers, including domain names and email addresses:

- A. Accept: how an application accepts the user input which consists of a UA identifier.
- B. Validate: how an application validates the UA identifier.



- C. Process: after validation, how an application processes the UA identifier.
- D. Store: after processing, how an application stores the UA identifier.
- E. Process: after storing, how an application processes the UA identifier, typically for displaying.
- F. Display: how an application displays the UA identifier.

## 7. What type of domain names are valid?

Domain names were originally limited to a subset of ASCII characters (letters a-z, digits 0-9, and the hyphen "-"). Since the earliest .COM registration, symbolics.com in 1985, the number and characteristics of domain names have expanded to reflect the needs of the ever increasing global use of the Internet as a communal resource. Today, the majority of Internet users are non-English speakers. To help with the internationalization of the Internet, in 2003, the Internet Engineering Task Force (IETF) started releasing standards providing technical guidelines for the deployment of Internationalized Domain Names (IDNs) through a translation mechanism to support non-ASCII representations of domain names in any Unicode-supported script, e.g., ユニバーサルアクセプタンス.クラウド (universal-acceptance-test.cloud in Japanese) and ສາກົນ-ການຍອມຮັບ-ທົດລອງ.ລາວ (universal-acceptance-test.thai in Thai).

## 8. What are good practice guides for validating domain names and email addresses?

When you validate domain names, consider the following:

- A. Verify the top-level domain (TLD) portion of a domain name against an authoritative table issued by the Internet Assigned Numbers Authority (IANA). IANA maintains an updated list of top-level domains at: <https://data.iana.org/TLD/tlds-alpha-by-domain.txt>. See ICANN's Security and Stability Advisory Committee (SSAC) advisory on the use of static TLD lists/suffix lists here: <https://www.icann.org/en/system/files/files/sac-070-en.pdf>.
- B. Query the domain name against the Domain Name System (DNS). The GETDNS API (<http://getdnsapi.net/>) is a highly portable way to query the DNS. Most operating systems also have a native DNS query API.
- C. Require repeated entry of an email address to detect typing errors.
- D. Validate the characters in labels by checking that each label follows the Internationalizing Domain Names in Applications (IDNA 2008) rules. See [RFC 5892](#). Additional validation rules may be applicable, e.g., see [RFC 5893](#).
- E. Ensure that the product or feature handles numbers correctly. For example: Arabic-Indic digit characters should be treated as numbers in numeric input fields, as well as ASCII digits. Note that Arabic-Indic digits are valid in U-labels but are not considered equivalent to ASCII digits in that context.

More details on domain name validation is present in the [Introduction to Universal Acceptance](#).



## 9. How do you avoid using a static list of TLDs?

An important step in UA readiness is validation of UA identifiers input, especially domain names and top-level domains (TLDs). TLDs are validated by two methods:

- A. Using a static list of TLD.
- B. Using DNS requests.

The first method is based on a static list which is inefficient since the list has to be updated frequently, otherwise it will be outdated and will give inaccurate validation results. The second method, which is recommended, is based on DNS requests. When a user enters a URL into any browser, e.g. <https://uasg.tech/>, browsers conduct normalization on the user entry and convert it to an ASCII compatible representation called [Punycode \[RFC3492\]](#), and add 'xn--' in front of it to create the A-label. The browser then calls the DNS to match the IP address against the A-label. More details are available in the [Introduction to Universal Acceptance](#).

## Email Tools and Services

### 10. What are internationalized email headers?

The Internationalized Mail Header specification allows mailbox names in local languages and scripts by allowing Unicode characters in UTF-8 format to be used in mail header fields and Multipurpose Internet Mail Extensions (MIME) header fields. Messages in this format require the use of the SMTPUTF8 extension. More details are listed in [RFC6532](#) and [EAI: A Technical Overview](#).

### 11. What is the SMTPUTF8?

SMTPUTF8 is the SMTP extension for internationalized email. An SMTP server that announces the SMTPUTF8 extension must be prepared to accept a UTF-8 string in any position in which a mailbox can appear. Additionally, SMTPUTF8 represents a server's support for internationalized email headers and 8BITMIME extension. More details are listed in [RFC6531](#) and [EAI: A Technical Overview](#).

### 12. What is the difference between SMTPUTF8 and UTF8SMTP? Which one is relevant for EAI?

According to [RFC5336](#), an SMTP server that announces the UTF8SMTP extension must be prepared to accept a UTF-8 string in any position in which RFC2821 specifies that a mailbox can appear. According to [RFC6531](#), a server that announces the SMTPUTF8 extension follows RFC5321 instead of RFC2821. RFC6531 obsoletes RFC5336. However, RFC6531 inherits keyword UTF8SMTP from obsoleted RFC5336 in the different part - in the "WITH protocol types" entries of the field "Received" email message header. So, during server announcement, SMTPUTF8 is preferred over UTF8SMTP and received "with" clause in RFC6531 uses UTF8SMTP.



### 13. What are the general considerations in making MUA EAI-ready?

EAI-ready MUA should support these features:

- A. Store and display the local part and domain name in Unicode.
- B. Check that the MTA (Mail Transport Agent) handles EAI, i.e., advertises the SMTPUTF8 feature when sending EAI mail.
- C. Follow good practice guides for linkification within the body of the email.
- D. Follow good practice guides for validation of domain name.

More details on this topic are available in [EAI: A Technical Overview](#).

### 14. What are the general considerations in making MTA EAI-ready?

EAI-ready MTA should support these features:

- A. When receiving mail, advertise the SMTPUTF8 feature.
- B. When sending mail, check for the SMTPUTF8 feature on the remote mail server, use the SMTPUTF8 option when sending mail.
- C. Do not send EAI mail to remote servers that do not support it; provide readable error reports when users attempt to do so.
- D. Accept both U-label and A-label versions of domain names in email addresses.
- E. Allow “fuzzy” matching of local parts in incoming addresses, analogous to allowing upper or lower case when matching ASCII names.

More details on this topic are available in [EAI: A Technical Overview](#) and [Quick Guide to Email Address Internationalization \(EAI\)](#).

### 15. What are the general considerations in making MSA EAI-ready?

EAI-ready MSA should support these features:

- A. Advertise SMTPUTF8 EHLO keyword.
- B. Distinguish EAI from legacy messages by MAIL FROM: keyword.
- C. If sending an EAI message fails, downgrade the message and resend, but only if MSA has necessary address book info and DKIM signing keys.

More details on this topic are available in [EAI: A Technical Overview](#).

### 16. What are the general considerations in making IMAP servers EAI-ready?

EAI-ready Internet Message Access Protocol (IMAP) servers should support these features:

- A. Support UTF-8 folder names.
- B. Tag messages as EAI or legacy, either by tag set when a message is created or by scanning headers.
- C. Add UTF-8=ACCEPT IMAP feature.
- D. Downgrade EAI messages as needed for legacy clients (optional).

More details on this topic are available in [EAI: A Technical Overview](#).



## 17. What are the general considerations in making POP servers EAI-ready?

EAI-ready Post Office Protocol (POP) servers should support these features:

- A. Tag messages as EAI or legacy, either by tag set when message created or by scanning headers.
- B. Add UTF8 capability and UTF8: command.
- C. Downgrade EAI messages as needed for legacy clients (optional).

More details on this topic are available in [EAI: A Technical Overview](#).

## 18. What is the list of IMAP commands that represent support for EAI?

The following commands shows that the IMAP mail server supports EAI:

- A. "UTF8=ACCEPT" which indicates the ability to open mailboxes containing internationalized messages.
- B. "UTF8=ONLY" capability implies the "UTF8=ACCEPT" capability.
- C. UTF-8 headers in the "APPEND" command.
- D. IMAP "AUTHENTICATE" command to pass UTF-8 usernames and credentials.

More on IMAP support for UTF8 is available in [RFC6855](#) and in [EAI: A Technical Overview](#).

## 19. What is the list of the POP commands that represent support for EAI?

The following commands shows that the IMAP mail server supports EAI:

- A. The "UTF8" command which switches the session from the ASCII-only mode of POP3 to UTF8 mode.
- B. UTF8 USER capability.
- C. POP LANG command.

More on POP support for UTF8 is available in [RFC6856](#) and additional details in [EAI: A Technical Overview](#).

## 20. What is linkification? How is the linkification of internationalized email addresses achieved?

Linkification is the action in which an application accepts a string and dynamically determines whether it should create a hyperlink to an Internet Location (URL/IRL) or an email address (mailto:).

Linkification of URL is done according to rules defined in [RFC1738](#) and [RFC3987](#). See details in [A Quick Guide to Linkification](#).

## 21. What is meant by POP/IMAP downgrading for internationalized email?

Downgrading is a method for IMAP and POP servers to serve internationalized messages to conventional clients. The server is assumed to be internationalized internally and to store



messages that are internationalized messages natively. When it needs to present an internationalized message to a conventional client, the server synthesizes a conventional message containing most of the information and presents the "surrogate message." More details are listed in [RFC6858](#). If a downgraded message has DomainKeys Identified Mail(DKIM) signature, the downgrade will invalidate the signature.

Rather than trying every EAI message sent to a non-EAI address to see if it works, when a message fails and the recipient address is in an address book, tag the entry as legacy only.

## 22. What is the difference between EAI Level 1 (or Phase 1) and EAI Level 2 (or Phase 2)?

EAI Level 1 (or Phase 1) includes the ability of an email system to send to or receive from EAI addresses. EAI Level 2 (Phase 2) includes additional ability of the email system to provide local EAI addresses. In order to upgrade from EAI Level 1 to EAI Level 2, there is a need to support internationalized mailbox names.

See the [Considerations for Naming Internationalized Email Mailboxes](#) for setting up Unicode-based internationalized mailbox names.

## 23. How do you create a mailbox in UTF-8 with IMAP/POP?

Email standards [RFC6533](#) and [RFC6430](#) allow both mailbox names (the part of an email address before the '@' sign) and domain names (the part after the '@' sign) to use almost any language or writing system. The above RFC documents will help to configure and manage systems compatible with internationalized email addresses. Further details are available in [EAI: A Technical Overview](#) and the [Considerations for Naming Internationalized Email Mailboxes](#) for setting up Unicode-based internationalized mailbox names. This support can be provided only if the system is already Level 1 EAI-ready, i.e., it is able to send and receive EAI messages.