

Evaluation of EAI Support in Email Software and Services Report (UASG030)

8 December 2020



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Introduction

The UASG Email Addresses Internationalization (EAI) working group identified Twelve software packages to be tested to determine how well they support internationalized email, also known as EAI. The testing results were varied as some software passed most of the tests, while some passed none at all, and none passed every test. While EAI support is advancing, there is still a long way to go.

The below chart lists the legend used to visualize the test results and the types of EAI support (Levels 1 and 2). The blank cells in the results tables indicate a component that does not exist.

| | | | | |
|---|-------------|--------|--------|------------|
| EAI level 1 (L1) - sends to and receives from EAI addresses | All or Most | Part * | Few ** | Not tested |
| EAI level 2 (L2) - L1 plus provides local EAI addresses | All or Most | Part * | None | Not tested |

Notes:

* Part: Some tests passed; component has partial EAI support.

** Few: Few tests passed; component does not have usable EAI support.

The EAI support test results summary:

| Name | MUA | MSA | MTA | MDA | MSP | Webmail |
|-----------------------------|---------|------------|------------|------------|--------|---------|
| Coremail | Few | All L2 | Most L2 | Few | All L2 | Most L2 |
| MS Outlook.com | Most L1 | Most L1 | Most L1 | None | None | Most L1 |
| Yandex Mail | Few | None | None | Few | Part | Few |
| Roundcube | Most L2 | | | | | |
| Apple Mail | Few | | | | | |
| Apple iOS Mail 14.x | Most L2 | | | | | |
| Mozilla Thunderbird | Few | | | | | |
| MS Outlook | Most L1 | | | | | |
| MS Exchange Server (hosted) | | All L1 | All L1 | Few | | |
| Exim | | Most L2 | All L2 | | | |
| Postfix | | All L2 | All L2 | | | |
| Sendmail | | Not tested | Not tested | | | |
| Fetchmail | | | | Not tested | | |
| Courier | | All L2 | All L2 | All L2 | | |
| Gmail | All L1 | All L1 | All L1 | Few | | |



| | | | | | | |
|----------|--|------------|------------|------------|--------|------------|
| XgenPlus | | Not tested | Not tested | Not tested | All L2 | Not tested |
|----------|--|------------|------------|------------|--------|------------|

Testing Strategy

Tests were divided into five groups: 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 depending on the features they offer. An additional group of tests was added for Webmail consisting of 60 of the 72 MUA tests, omitting ones that made no sense for webmail clients that are integrated with mail systems.

The MUA and webmail tests were done manually. For MUAs, we installed any required software and configured it to work with a reference mail server running an instrumented version of Courier. Then we performed the tests and recorded the results in a local database. Some of the tests, such as EAI-MUA-046 through -049, check particular commands and options that the MUA sends to the mail server; our Courier server was patched to log the commands so we could see what the MUA sent.

The MSA, MTA, and MDA tests were done using scripts we wrote to perform each test and check the results. This made it easier to test consistently and sped up later tests.

Many of the tests involve sending a test message and checking particular features of the message, in which our scripts pick up the test message from the system under test or from our server which is the server that sent the message, as appropriate.

Terminology

In this report, when we refer to an *EAI address*, we mean an address with non-ASCII characters in the mailbox – the part preceding the @ sign. An *EAI message* is one with an EAI address as an envelope sender and/or recipient, or with unencoded UTF-8 text in a message header. An *EAI mail system* is one that generally supports sending and receiving EAI messages.

One system, Yandex, provided addresses with ASCII local parts and an Internationalized Domain Name (IDN), e.g., local1@ёпочта.рф. We do not consider this to be an EAI address because it is equivalent to the ASCII address, local1@xn--80a1acny1d.xn--p1ai, using A-labels rather than U-labels in the domain. We understand that Yandex plans more complete EAI support in the future, but we could only test what was available at the time.

Test Addresses

We registered several domains to be used as test addresses – one in Chinese and one in Arabic. We created subdomains in each language for our Courier test server and for mail accounts on our Postfix and Exim servers, e.g., 邮件.电子邮件测试.中国 and برید.اختبارالبرید.شبكة. We did not create mixed script test addresses, but since neither Postfix or Exim does any script processing, we expected that any UTF-8 address would work the same.

Coremail provided EAI test addresses in Chinese. Yandex, as mentioned above, provided ASCII test addresses with A-label Cyrillic domains.

For each package we tested whether they could:

- Send to and retrieve mail from EAI addresses (Phase 1 EAI Readiness).
- Host an EAI address (Phase 2 EAI Readiness)



Included in these summaries are the results of tests done last year by Catalyst.Net, Ltd., on Gmail, Courier, and XgenPlus. Catalyst's report was published as UASG document UASG021B, and is available [here](#).

| | Name | MUA | MSA | MTA | MDA | MSP | Webmail |
|----|-----------------------------|-----|-----|-----|-----|-----|---------|
| 1 | Coremail | X | X | X | X | X | X |
| 2 | MS Outlook.com | X | X | X | X | X | X |
| 3 | Yandex Mail | X | X | X | X | X | X |
| 4 | Roundcube | X | | | | | |
| 5 | Apple Mail | X | | | | | |
| 5A | Apple iOS Mail 14.x | X | | | | | |
| 6 | Mozilla Thunderbird | X | | | | | |
| 7 | MS Outlook | X | | | | | |
| 8 | MS Exchange Server (hosted) | | X | X | X | | |
| 9 | Exim | | X | X | | | |
| 10 | Postfix | | X | X | | | |
| 11 | Sendmail | | (X) | (X) | | | |
| 12 | Fetchmail | | | | (X) | | |
| | Courier | | P | P | P | | |
| | Gmail | P | A | A | A | | |
| | XgenPlus | | | | | P | |

- X Tests done
- (X) Test determined not useful
- P Previous test results from the report UASG021B
- A Additional tests done in this report (UASG030)

Individual Tests

There were issues found with some of the tests and are included in the “Links to the Detailed ResultsLinks to the Detailed Results” section.

MUA Tests

EAI-MUA-002: the test says, when viewing address book entries, the MUA “should display the local parts of EAI addresses in U-label form.” Local parts are not domain names, so U-labels and A-labels are not relevant. We interpreted this to mean that the MUA should successfully display non-ASCII UTF-8 mailboxes.



EAI-MUA-017 through -036: the tests refer to an SMTP server. No MUA we know uses SMTP servers; they use mail submission (RFC 6409.) We interpret the tests to refer to a submission server rather than SMTP server.

MSA Tests

The MSA tests all refer to an SMTP server rather than a submission server. We interpret the tests to refer to the submission server.

All of the MSAs we tested are integrated with MTAs, rather than a separate program that relays mail to an MTA. MSA-003 and MSA-004 are client tests that would only apply to standalone MSAs.

Some tests require sending a non-EAI message, which requires a non-EAI test address. Our Coremail account only had EAI addresses so we were unable to do those tests.

MTA Tests

Some tests require that the MTA have an IDN hostname, or that the test account on the MTA is an EAI address. MS Outlook.com, hosted MS Exchange, and Yandex do not provide EAI addresses so those tests did not apply. Coremail's server did not have an IDN host name.

MDA Tests

Several of the tests don't make sense in the common case that messages are delivered to the mailstore by the MTA, and the POP and IMAP servers only manipulate the contents of the mailstore. EAI-MDA-001 through -006 are in practice MTA tests. Tests EAI-MDA-014 through -022, which check IMAP access to mailboxes with Unicode names, don't strictly test EAI features since IMAP has supported Unicode named mailboxes for decades, and EAI only changes the way they are accessed.

We found that none of the software we agreed to test implemented the IMAP extensions described in RFC 6855, and only Coremail implemented the POP extensions described in RFC 6856. Coremail implemented the experimental IMAP extensions in obsoleted RFC 5738, but with a lot of bugs.

Nonetheless, we found that in most cases, POP and IMAP servers retrieved and stored messages with arbitrary contents, so they were able to pass many of the other tests anyway.

Results of MUA Tests

MUAs tested in this phase:

- Apple Mail for MacOS and iOS 13
- Apple iOS Mail 14.x
- Thunderbird
- Outlook
- Yandex
- Coremail

Apple Mail, Thunderbird, and Outlook are not tied to a mail service, so they were configured to use an account on our Courier server to send and receive test messages.

Yandex and Coremail apps are tied to a particular service, so they were configured with accounts on their respective services. The Yandex app appears to allow configuration with other IMAP servers but we did not test it that way.



Roundcube is an MUA implemented as a web service. Since it looks to users like webmail interface, we discuss it with webmail section below.

In all cases, tests were manually performed to evaluate sending mail and retrieving mail from the Chinese and Arabic test accounts on our Courier server, and each MUA was tested on its ability to handle additional EAI readiness tasks, including:

- Correctly managing Unicode subject lines and Unicode folder names.
- Consistently creating and using Mailto links.
- Saving and using EAI addresses in the address book.
- Using Unicode in message headers where expected,

| | Apple Mail | Thunder bird | Outlook | Yandex | Coremail | Apple iOS Mail 14.x |
|--|----------------|----------------|-----------|---------------------------------|----------|---------------------|
| Client receives messages from EAls | Yes | Sometimes | Yes | No | Yes | Yes |
| Client sends messages to EAls | No | No | Yes | Sometimes | No | Yes |
| Unicode addresses displayed in Unicode (sent and received) | Yes (received) | Yes (received) | Mostly | Some (displays only local part) | No | Yes |
| Address book handles EAls normally (save, send, search) | Some | Yes | Mostly | Yes | Yes | Yes |
| Mailto links of EAls handled normally (sent and received) | No | Sometimes | Yes | Yes | No | No |
| Subject line can be Unicode | Yes | Yes | Yes | Yes | Yes | Yes |
| Folders can be named with Unicode | Yes | Yes | Yes | Yes | NA | Yes |
| Message headers are Unicode where appropriate | NA | No | No | No | NA | NA |
| EAls can be set up to receive and send mail using IMAP | No | No | Sometimes | No | No | Yes |
| EAls can be set up to receive and send mail using POP | No | No | Sometimes | No | No | No |
| Username can be Unicode | No | No | Sometimes | No | No | Yes |
| Server names and domains can be Unicode | No | No | Yes | No | No | Yes |
| Server names and domains can be A-label | No | No | No | No | No | Yes |



Microsoft Desktop Outlook

Outlook is Phase 1 EAI-ready and has some Phase 2 EAI-ready features.

Tests were completed using a Windows PC running Outlook ver. 2008 Build 13127.20408 during July of 2020.

Outlook sends to and receives from EAI addresses.

Outlook does not reliably handle EAI addresses when setting up an account. The process is successful when the username is the same as the local part of the email address, or the username is in ASCII. Using a server name in A-label format fails.

Outlook supports Unicode subject lines and folder names. EAI addresses in outgoing messages are correctly linked, and mailto links in received messages can be used to create new outgoing messages in one click. Outlook can store, display, and use EAI values in the address book. Address book does not support Unicode searches. When the header is viewed, header values are not displayed in Unicode.

From Microsoft:



The Exchange Team Microsoft

02-26-2018 09:36 AM



EAI support announcement - Update

In late December 2017, we announced [support for EAI in Q1 2018](#).

We are happy to announce that EAI is now enabled in Exchange Online and Exchange Online Protection for Office 365. Office 365 users can now send messages to and receive messages from internationalized email addresses.

In addition, we are pleased to announce that EAI is also enabled for outlook.com customers (including hotmail.com, live.com, etc.).

In the meantime, we are working to enable EAI for [Exchange Server 2019](#), the new on-premises version of Exchange that's coming out later this year.

Carolyn Liu

Apple Mail

Apple Mail in MacOS and iOS 13.1 is neither Phase 1 nor Phase 2 EAI-ready. Apple Mail, tested on an iPad with iPadOS 13.5, can retrieve messages sent from EAI addresses but finds EAI addresses in destination fields invalid. Apple Mail 12.4 on MacOS also treats EAI addresses as an error, for example:



Apple Mail does retrieve mail sent from EAI addresses for IMAP servers that will do so without UTF8=ENABLE (nearly all of them).

Apple Mail supports Unicode subject lines and folder names. While clicking a mailto EAI link works, the message cannot be sent. Apple Mail does not linkify EAI addresses like it does conventional addresses. EAI addresses can be stored in and recalled from the address book, but Unicode searches of the address book fail.



iOS Apple Mail does not display headers or the message source, so many of the tests checking for Unicode in the header could not be completed. Based on the behavior of Apple Mail compared to other client packages, Apple Mail is unlikely to store headers as Unicode.

Apple iOS Mail 14.x

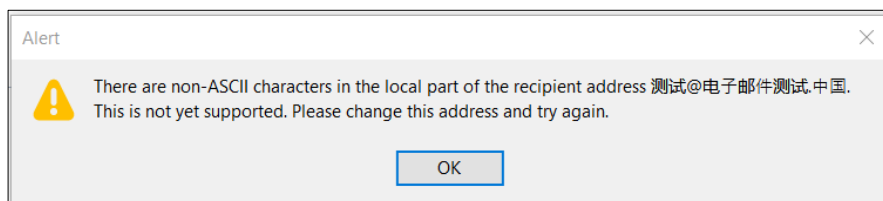
As of iOS 14 and iPadOS 14, Apple's mail client has good support for EAI Level 2. It passes most tests for message entry, display, and sending. Like all of the other mail clients we tested, it does not support EAI features for IMAP or POP. The legacy character set support in IMAP is enough that it passes most tests related to IMAP message stores.

Thunderbird Version 68

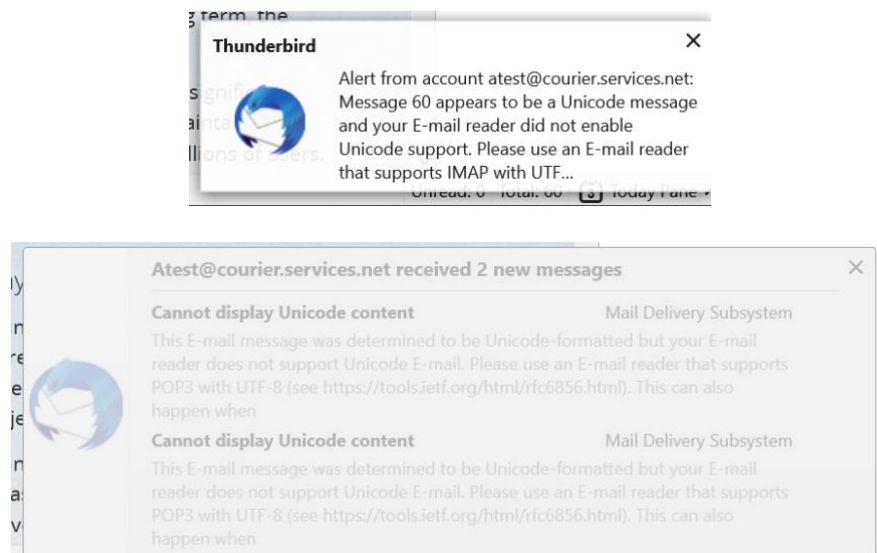
Thunderbird is neither Phase 1 nor Phase 2 EAI-ready.

Tests were completed using a Windows PC running Thunderbird version 68 during June of 2020.

Thunderbird cannot send to EAI email addresses such as 重新测试@电子邮件测试.中国 and اختبار@اختبار البريد.شبكة.



Thunderbird can retrieve mail from international addresses, although it also generates errors in response to Unicode addresses and header text.



Thunderbird supports Unicode subject lines and folder names. Mailto links that are received in a message are treated normally. Thunderbird does not link EAI addresses in message text in the same way that it links conventional addresses. EAI values can be saved to the Address book and appear in Unicode, and can be recalled for use in creating email messages. Unicode searches work in the address book. Header values are not displayed in Unicode.



```
From: 050@050@xn--mgbacc1anpc1swc.xn--ngbc5azd
To: atest@courier.services.net
Cc: æµ<è`*@xn--5nqx41au4nqohsp3axcg.xn--fiqs8s,
    ùŠÛ...ùfÛ+@xn--mgbacc1anpc1swc.xn--ngbc5azd
Subject: =?UTF-8?Q?=D8=A7=D8=AE=D8=AA=D8=A8=D8=A7=D8=B1=D8=A7=D9=84=D8=A8?=
        =?UTF-8?Q?=D8=B1=D9=8A=D8=AF=2E=D8=B4=D8=A8=D9=83=D8=A9?=
Received: from webmail.services.net ([2606:4300:0:4::1007])
        (AUTH: LOGIN 050@050@xn--mgbacc1anpc1swc.xn--ngbc5azd)
        by courier.services.net with UTF8SMTPA
        id 000000000626EF.00000005EFF26A9.0000202E; Fri, 03 Jul 2020 08:38:00 -0400
MIME-Version: 1.0
Date: Fri, 03 Jul 2020 08:38:00 -0400
From: 050@050@xn--mgbacc1anpc1swc.xn--ngbc5azd
To: atest@courier.services.net
Subject: =?UTF-8?Q?=40=E7=94=B5=E5=AD=90=E9=82=AE=E4=BB=B6?=-
```

Thunderbird cannot set up email accounts with U-label domains, A-label domains, or Unicode usernames or local addresses.

We tested Thunderbird version 68. The Thunderbird project plans to release version 78 in late 2020, but the release notes say nothing about any new EAI support so we expect the test results to be the same.

Coremail

We tested Coremail Lunkr, their Android mail client. It is neither Phase 1 nor Phase 2 EAI-ready – it does not send to or receive from EAI addresses.

Tests were completed using Android Coremail Lunkr version 4.0.0.4 App on Android to log in to 中文邮测试2@互联网.中国, one of the provided Coremail email addresses.

Coremail accepts EAI addresses in the recipient fields, but the messages are not received by the EAI accounts. Messages sent from EAI addresses are not received.

Configuring Coremail Lunkr with Chinese and Arabic EAI addresses failed.

Coremail Lunkr does not allow the creation of new folders. It does not linkify email addresses and does not treat mailto-linked EAI addresses correctly.

Yandex Mail

Yandex offers an Android app, a webmail application, and access via other MUAs using POP, IMAP, and submission servers at pop.yandex.com, imap.yandex.com, and smtp.yandex.com. None of the three servers advertise EAI features on the initial handshake, so we were not surprised when they failed many of the MSA, MTA, and MDA tests. In the webmail, we found that Yandex supported IDN domain names as A-labels but had no support for UTF-8 email addresses.

Yandex is neither Phase 1 nor Phase 2 EAI-ready.

Web tests were completed using Chrome on a Windows PC during July 2020 using the URL yandex.webmail.com. The Android app was version 5.2.3.

Yandex can sometimes send mail to both Arabic and Chinese Unicode addresses. However, replies to those emails result in errors in the package used to send them.



Configuring Yandex with Chinese and Arabic EAI addresses failed.

Yandex supports Unicode subject lines and folder names. Yandex headers do not display Unicode. The address book passed the EAI tests. EAI mailto links work when received and are created automatically.

Results of Webmail Tests

| | Roundcube | MS Outlook.com | Coremail | Yandex | Gmail |
|--|-----------|----------------|-----------|-----------|-----------|
| Client receives messages from EAI | Yes | Yes | Yes | No | Yes |
| Client sends messages to EAI | Yes | Yes | No | Sometimes | Mostly |
| Unicode addresses displayed in Unicode (sent and received) | Mostly | Yes | Yes | Yes | Yes |
| Address book handles EAI normally (save, send, search) | Yes | Some | Yes | Yes | Yes |
| Mailto links of EAI handled normally (sent and received) | No | Yes | Sometimes | Yes | Sometimes |
| Subject line can be Unicode | Yes | Yes | Yes | Yes | Yes |
| Folders can be named with Unicode | Yes | Yes | Yes | Yes | NA |
| Message headers are Unicode where appropriate | Sometimes | No | No | No | Yes |
| EAI can be set up to receive and send mail using IMAP | Yes | No | No | No | No |
| EAI can be set up to receive and send mail using POP | NA | No | No | No | No |
| Username can be Unicode | Yes | No | No | No | Yes |
| Server names and domains can be Unicode | Yes | No | No | No | No |
| Server names and domains can be A-label | Yes | No | No | No | Yes |

Microsoft Outlook.com

Outlook.com is Phase 1 EAI-ready.

Testing was done in the Microsoft Edge browser at outlook.live.com during June 2020. Outlook.com can send to and receive from EAI addresses (U-label only), and the destination field displays them as they are entered. Outlook.com supports Unicode subject lines and folder names.

EAI addresses cannot be set up to send and receive mail in Outlook.com. Unicode cannot be used to specify either the username or the domain of a synced account. Neither A-label or U-label domains are accepted.



EAI addresses can be saved to the address book, but the stored Unicode addresses are not displayed in the same way as conventional addresses are when looking at the address book listing. Outlook.com is inconsistent in using EAI address book listings to send emails. The “Send Email” on the saved address book contact page is disabled for EAI addresses. Selecting EAI saved addresses from the “Create” email window works inconsistently.

Mailto link targets are supported but Outlook.com does not create mailto links automatically for any kind of email address. The manual process works equally well for EAI addresses as for conventional addresses.

Headers values do not display Unicode.

Roundcube

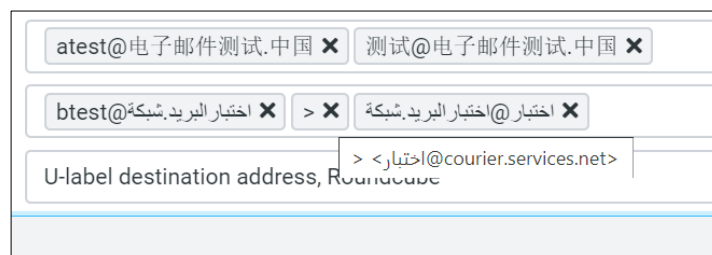
Roundcube is an open source webmail application written in the popular PHP scripting language that acts as an MUA. Tests were performed using Roundcube 1.4.6 on a FreeBSD 12.1 VPS from the FreeBSD ports system with the Apache 2.4 web server and PHP 7.4, and configured it to use our Courier reference server for IMAP and mail submission. The package has an active open source development community that would likely accept patches to improve its already good EAI compliance.

Roundcube uses IMAP and not POP; POP tests EAI-MUA-61 through -72 were not performed.

Roundcube is Phase 1 and Phase 2 EAI-ready.

Roundcube can send to and receive from EAI addresses (U-label and A-label), and the destination field displays text as it is entered. It supports Unicode subject lines and folder names.

Roundcube displays U-label destination addresses correctly, but note the one anomaly where the Arabic@conventionaldomain was not displayed fully until the popup appears:



EAI addresses can be set up as IMAP (but not POP) accounts to send and receive mail. Login with the A-label equivalent address also works.

Roundcube does not create mailto links for EAI addresses although it does for conventional addresses. Roundcube displays headers with some Unicode:



Message headers ✕

Delivered-To: atest@courier.services.net
Return-Path: <اختبار@xn--mgbaacci1anpc1swc.xn--ngbc5azd>
Received: from webmail.services.net ([2606:4300:0:4::1007])
(AUTH: LOGIN اختبار@xn--mgbaacci1anpc1swc.xn--ngbc5azd)
by courier.services.net with UTF8SMTPA
id 00000000000626EF.000000005EFF26A9.0000202E; Fri, 03 Jul 2020 08:38:00 -0400
MIME-Version: 1.0
Date: Fri, 03 Jul 2020 08:38:00 -0400
From: اختبار@xn--mgbaacci1anpc1swc.xn--ngbc5azd
To: atest@courier.services.net
Subject: =?UTF-8?Q?=40=E7=94=B5=E5=AD=90=E9=82=AE=E4=BB=B6?=
User-Agent: Roundcube Webmail/1.4.6
Message-ID: <b93cd1df7ac8aad00645dc8d0f714a54@xn--mgbaacci1anpc1swc.xn--ngbc5azd>
X-Sender: =?UTF-8?Q?=D8=A7=D8=AE=D8=AA=D8=A8=D8=A7=D8=B1=40xn--mgbaacci1a?=
=?UTF-8?Q?npc1swc=2Exn--ngbc5azd?=
Content-Type: text/plain; charset=UTF-8;
format=flowed
Content-Transfer-Encoding: 8bit

Unicode addresses may retain some Unicode. A Unicode subject field does not.

Yandex Webmail

Yandex webmail is neither Phase 1 nor Phase 2 EAI-ready because Yandex webmail does not receive messages from EAI addresses.

Tests were completed using Chrome on a Windows PC during July of 2020 using the URL yandex.webmail.com.

Yandex can sometimes send mail to both Arabic and Chinese Unicode addresses if the recipient mail servers accept the mail without the UTF8SMTP SMTP extension. However, replies to those emails result in errors in the package used to send them.

Yandex supports Unicode subject lines. Yandex headers do not display Unicode. The address book passed the EAI tests, and folders with Arabic or Chinese names can be created. EAI mailto links work when received and are created automatically.



UNDELIVERABLE MAIL

Your message to the following recipients cannot be delivered:

<allyb.r@yandex.com>:

mx.yandex.ru [2a02:6b8::89]:

<<< 553-The recipient's mail server does not support E-mail

<<< 553-messages with international Unicode E-mail addresses or

<<< 553-E-mail messages in the international Unicode E-mail format.

<<< 553 Unable to deliver Unicode E-mail to a non-Unicode mail server.

Coremail Webmail

Coremail Webmail is Phase 2 EAI-ready.

Tests were completed using Chrome on a Windows PC during August 2020 using the URL <http://xn--blq510jgwa.xn--fiqs8s/>.

Coremail allows creation and use of Unicode folders. It does linkify email addresses but does not treat mailto-linked EAI addresses correctly.

Configuring Coremail with Chinese and Arabic EAI addresses, other than the provided Coremail addresses, failed.

Results of MSA, MTA, and MDA Tests

| MSA MTA summary | Gmail | Coremail | MS Outlook .com | MS Exchange server | Yandex | Exim | Postfix | Courier |
|--------------------------------------|-------|----------|-------------------|--------------------|-----------------------------|------|---------|---------|
| MSA UTF8SMTP support | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |
| MSA 8BITMIME support | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sends EAI forward path | Yes | Yes | No, sent A-labels | No, sent A-labels | No | Yes | Yes | Yes |
| Sends UTF-8 subject | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Reject or downgrade msg to non-EAI | No | No | No | No | No | No | Yes | Yes |
| ASCII messages sent without UTF8SMTP | No | No | Yes | No | Yes, all messages are ASCII | Yes | Yes | No |
| MTA UTF8SMTP support | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |
| MTA 8BITMIME support | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |



| | | | | | | | | |
|--------------------------------------|-----|----|----|----|----|-----|-----|-----------------|
| MTA Received indicates EAI | Yes | No | No | No | No | Yes | Yes | Yes, misspelled |
| MTA EAI msgs to non-EAI are rejected | No | No | No | No | No | Yes | Yes | Yes |

| MDA summary | Gmail | Coremail | MS Outlook .com | MS Exchange server | Yandex | Courier |
|--------------------------------|-------|----------|-----------------|--------------------|--------|---------|
| IMAP EAI extensions advertised | No | No | No | No | No | Yes |
| IMAP EAI enable | No | No | No | No | No | Yes |
| IMAP AUTHENTICATE | Yes | No | Yes | Yes | Yes | Yes |
| IMAP UTF-8 username | NA | Yes | NA | NA | Yes | Yes |
| POP LANG capability | No | Yes | No | No | No | No |
| POP UTF8 capability | No | Yes | No | No | No | Yes |

We performed all of the MSA, MTA, and MDA tests using python test scripts we wrote. For the open source packages Exim, Postfix, and Sendmail, we installed the software on a test server. For all packages, we set up the test scripts to connect to the submission, SMTP, and where available IMAP and POP servers, for each package to run the scripts.

Creating the test scripts was an iterative process as we discovered unexpected, or in a few cases, buggy behavior. For example, we were using unique Message-ID headers in our test messages to recognize each message when it arrived at the target server, until we discovered that MS Exchange always inserted its own Message-ID instead, replacing ours. We switched to putting a unique string in the subject header which worked reliably. We also found that some services were marking our incoming test messages as junk or spam. We worked around that by having the test scripts look for the messages in both the main inbox and the junk folder.

Coremail

Coremail is both Phase 1 and Phase 2 EAI-ready, providing Chinese language EAI addresses and successfully exchanging EAI mail. It was the only service we found that downgraded messages to non-EAI mail servers, using a replacement mailbox of the form xn--<text> that resembled an A-label.

Coremail's IMAP server implemented only the obsolete experimental IMAP extensions rather than the current standards track extension, and we also found that its implementation of the IMAP ENABLE command was buggy and did not return a result. We added a special case to our test scripts to recover and continue other tests.



MS Outlook.com

Outlook.com is Microsoft's consumer mail service, formerly known as Hotmail. It is Phase 1 EAI-ready and can exchange mail with EAI systems but can only host ASCII addresses. The IMAP and POP servers do not have EAI support, but nonetheless, we found that they often handled EAI mail adequately with the legacy UTF-7 support for Unicode mailbox names and storing and retrieving UTF-8 messages using the legacy character set support.

Yandex Mail

Yandex Mail is neither Phase 1 nor Phase 2 EAI-ready, neither exchanging EAI mail or hosting EAI addresses. Its ASCII mail support is fine, but it has no support for UTF8SMTP mail nor UTF-8 addresses. We look forward to an opportunity to retest once its EAI support improves.

MS Exchange Server (hosted)

Hosted Exchange server is part of Microsoft's Office 365 suite. We created an O365 account and configured it to handle one of our IDN domains. We found it is Phase 1 but not Phase 2 EAI-ready. All addresses handled by hosted Exchange server are ASCII addresses and it handled our domain as an ASCII domain with A-labels. Exchanging mail with other EAI mail systems worked. As with MS Outlook.com, the POP and IMAP servers do not have EAI support but often handled EAI messages adequately anyway.

Exim

Exim is a widely used open source mail server that provides an MSA and MTA. We installed it on a test host and configured it with several EAI addresses in IDN domains. Exim provides both Phase 1 and Phase 2 EAI support and passed most tests.

Exim's developers consider an EAI message to be one with UTF-8 envelope addresses and an ASCII message to be one without UTF-8 envelope addresses, even if the message's headers include UTF-8. While we disagree with their interpretation, we think it is unlikely to cause problems in practice since messages with ASCII envelopes and UTF-8 headers are uncommon.

Exim does not provide a POP or IMAP server. It is typically used with the Dovecot or Cyrus IMAP/POP servers neither of which currently has EAI support.

Postfix

Postfix is a widely used open source mail server that provides an MSA and MTA. We installed it on a test host and configured it with several EAI addresses. Exim provides both Phase 1 and Phase 2 support and passed most tests.

We were surprised to find that Postfix does not automatically treat U-label and A-label versions of domains the same. For example, 用户2@xn--fqr621h.services.net and 用户2@后缀.services.net are not considered equivalent. It is not hard to configure them so they are effectively equivalent, delivering to the same mailbox and authenticating the same to the MSA, but it could be a trap for the unwary.

Postfix does not provide a POP or IMAP server. It is typically used with the Dovecot or Cyrus IMAP/POP servers neither of which currently has EAI support.



Results of MSP Tests

| MSP summary | Coremail | MS Outlook .com | MS Exchange server | Yandex | Xgenplus |
|------------------------------|----------|-----------------|--------------------|--------|----------|
| Unicode local part | Yes | No | No | No | Yes |
| Unicode domain | Yes | Yes | No | Yes | NA |
| ASCII alt address | Yes | NA | NA | Yes | Yes |
| Unicode folders | Yes | Yes | Yes | Yes | Yes |
| EAI address send and receive | Yes | NA | NA | NA | Yes |

We did MSP tests on four packages with mixed results. One bright spot was that all the packages allow users to create folders (mailboxes) with Unicode names.

Coremail and Xgenplus (tested by Catalyst) passed all of the tests using addresses in their own respective IDN domains.

MS Outlook.com only handles ASCII addresses in their existing set of domains. Hosted Exchange server allowed us to use our own IDN domain but only with ASCII addresses. Yandex has their own Cyrillic IDN domains, but again, only with ASCII addresses.

Software Not Tested

For two packages, it was evident that there was no point in doing EAI tests because they have no EAI support.

Sendmail

The group that maintains Sendmail, led by Claus Aßman, has just released version 8.16.1. Sendmail has no EAI support at all. Some Linux distributions are shipped with EAI patches, but the patches are so buggy that they are unusable. Hence, we did not further test sendmail since there was no reason to expect any of the tests to succeed.

Claus is testing experimental EAI support for a future 8.17 release so it will likely be worth testing sendmail 8.17 when it is available.

Fetchmail

Fetchmail is a relatively small package. We looked through the source code and found no references to SMTPUTF8 or other EAI features. Discussions with Fetchmail's maintainers confirms no EAI support, although they may add it in a future version if time permits.

This ticket in the Gitlab source archive should track any fetchmail EAI work:
<https://gitlab.com/fetchmail/fetchmail/-/issues/14>.

Previous and Additional Tests

We have included the results of some tests performed in the previous UASG021B report, along with additional tests to complement them.



Courier Mail Server

Courier is found to be Phase 1 and Phase 2 EAI-ready.

Gmail

Gmail's webmail was tested previously and found to be Phase 1 EAI-ready. We did additional MSA, MTA, and MDA tests and found that they are also Phase 1 EAI-ready. Gmail's IMAP server is the only hosted service we tested that implements IMAP EAI extensions.

XgenPlus

MSP tests were done on XgenPlus and found that it is Phase 2 EAI-ready.

Links to the Detailed Results

The individual test results are available in spreadsheets (one per product tested) both as downloadable Excel XLSX files. The downloadable compressed (zip format) which contain all the test result files is available at: <https://uasg.tech/wp-content/uploads/documents/UASG030-results.zip>

| Product/System Name | Test Result Spreadsheet Link |
|-----------------------------|------------------------------------|
| Coremail | Result spreadsheet |
| MS Outlook.com | Result spreadsheet |
| Yandex Mail | Result spreadsheet |
| Roundcube | Result spreadsheet |
| Apple Mail | Result spreadsheet |
| Apple iOS Mail 14.x | Result spreadsheet |
| Mozilla Thunderbird | Result spreadsheet |
| MS Outlook | Result spreadsheet |
| MS Exchange Server (hosted) | Result spreadsheet |
| Exim | Result spreadsheet |
| Postfix | Result spreadsheet |
| Gmail | Result spreadsheet |
| Courier | Result spreadsheet |
| XgenPlus | Result spreadsheet |

Test Software

The scripts we used to manage the tests are available on Github at <https://github.com/jrlevine/eaitesttools>. They are offered with a permissive BSD two-clause license.