



# Universal Acceptance- Readiness Report FY22

25 August 2022



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# 1 UNIVERSAL ACCEPTANCE: MEANINGFUL ACCESS THROUGH A DIVERSE AND MULTILINGUAL INTERNET

Domain names, like [example.com](https://www.example.com), provide Internet users with the opportunity to create a unique online identity of their choice. The Internet Corporation for Assigned Names and Numbers (ICANN) has supported the work of the ICANN community to increase the options for such identifiers through the expansion of the Internet's Domain Name System (DNS).

In addition to the earlier generic top-level domains (gTLDs) such as .com and .org, more than 1,200 new gTLDs are now available for consumers through the New gTLD Program, which is managed by ICANN. Some of these gTLDs are longer than three characters (long TLDs). Individuals, businesses, and organizations are now able to choose gTLDs that represent a specific geography, profession, interest, community, and more (e.g., .cooking, .dentist, .fashion, .international, .istanbul). These gTLDs provide global consumers and end users more choice for forming domain names while also increasing competition in the domain name industry.

The expansion of the DNS has also made the Internet more multilingual and inclusive of communities around the world. Domain names are now also available in a number of different languages and scripts, called Internationalized Domain Names (IDNs). More than 150 IDN top-level domains (TLDs), including both generic and country code TLDs (ccTLDs), have been delegated, including [.موقع](https://www.site.me) (.site in Arabic), [.онлайн](https://www.online.ru) (.online in Russian), [.みんな](https://www.minnana.jp) (.everyone in Japanese), [.ලංකා](https://www.lanka.lk) (.lanka in Sinhala), [.ລາວ](https://www.lao.la) (.lao in Lao), and [.中国](https://www.china.cn) (.china in Chinese), and more.

Despite the availability of domain names and their corresponding email addresses in local languages and scripts, their acceptance (i.e., usability) is not well supported by current software and applications. These include many programming languages, email tools, online applications, social media applications, content management systems, and others. This presents a significant gap in current technology to allow users globally to meaningfully access the online resources and communicate effectively. It is also an opportunity for the public and private sectors to upgrade their applications and systems to accept these domain names and email addresses to give Internet users real choice and representation online, while enabling a multilingual Internet.

Universal Acceptance (UA) is the state in which all valid domain names and email addresses, including IDNs and those formed with the new gTLDs, are accepted and treated consistently by all software and applications. Achieving UA ensures that Internet users can effectively navigate and communicate online using a chosen domain name and email address that best aligns with their interests, business, culture, language, and script. Therefore, UA is a foundational requirement for achieving meaningful online access by enabling consumer choice and digital inclusion.

This report documents the state of UA-readiness of different software applications, technologies and frameworks being developed and deployed globally. The report also summarizes the outreach and training efforts conducted in the past year to address the gaps in UA-readiness.



## 2 OUR COMMITMENT

Dr. Ajay Data  
Chair, Universal Acceptance Steering Group (UASG)



“The UASG is committed to remediating UA issues, based on the gaps identified, through the continued development of educational and training resources for technical professionals readying their systems to support domain names of all types, regardless of length, language, or script. This includes calling on individuals to educate their local communities on the importance of Universal Acceptance so they can prepare to leverage the benefits of a more linguistically diverse Internet.”

Edmon Chung  
Chair, ICANN Board IDN-UA Working Group



“Universal Acceptance of IDNs and new gTLDs is a matter of consumer trust in the global DNS. UA is also at the heart of the sustainable development of a multilingual, inclusive, open and interoperable Internet. ICANN alone cannot solve the UA issue. ICANN is committed to support the UASG and is excited to see the expansion of UASG's remediation efforts as well as gap analysis in social media platforms, standards and best practices, which are important steps that move the needle for UA-readiness across Internet applications.”

Göran Marby  
President and CEO, ICANN  
Honorary UA Ambassador, UASG



“I congratulate the UASG and its many volunteers for the outstanding progress they have made in developing the tools needed to become UA-ready. We must now work together with businesses, technical organizations, and governments to drive the deployment of this extensive technical library of solutions and enable a multilingual, digitally inclusive Internet.”



### 3 UNIVERSAL ACCEPTANCE STEERING GROUP (UASG)

In 2015, the ICANN community formed the Universal Acceptance Steering Group (UASG), a volunteer-led organization supported by ICANN org, that aims to promote UA awareness and address UA remediation. In order to address the multifaceted challenges of UA, the UASG has identified multiple stakeholders, including technology developers, email tools and services providers, the public sector, TLD registries and their registrars, and academia.

The UASG has organized itself into six working groups to help engage with the various stakeholders and tackle the different stages in the UA remediation process. The UA Measurement Working Group (WG) focuses on identifying relevant technology and undertaking gap analyses to identify the extent and nature of the UA issues in them. The UA Technology and Email Address Internationalization (EAI) WGs develop technical recommendations, determine remediation measures, and develop training materials. The UA Communications WG plans and drafts messaging that is used in outreach to relevant stakeholders. The UA Local Initiatives and UA Ambassadors raise awareness, conduct trainings, and motivate local stakeholders to update their technology to be UA-ready.

To help reach a global audience, the UASG has published several UA and EAI-related reports and resources in different languages available at [uasg.tech](https://uasg.tech). The UASG also translates many of its [blogs and announcements](#) showcasing UASG efforts, events, and achievements. This report summarizes the scope of UA, documents current gaps in technology related to UA-readiness, and provides an update on the activities undertaken by the UASG in FY22 (July 2021 – June 2022). This work builds on the [UA-Readiness Report for FY21](#). More detailed information on how the UASG plans and organizes its work in the future is available in its [FY23 Action Plan](#).

For more information about the UASG visit <https://uasg.tech/> or email [info@uasg.tech](mailto:info@uasg.tech). You can also get involved by:

- Joining a UASG working group: <https://uasg.tech/join/>
- Participating in UA general discussions: <https://uasg.tech/subscribe>
- Reporting UA problems with applications: <https://uasg.tech/global-support-centre/>
- Following the UASG on its social channels: [Twitter](#) | [Facebook](#) | [LinkedIn](#)
- For further information about the UASG visit <https://uasg.tech/>
- Contact the UASG at [info@uasg.tech](mailto:info@uasg.tech)



## 4 THE PROCESS FOR ACHIEVING UA

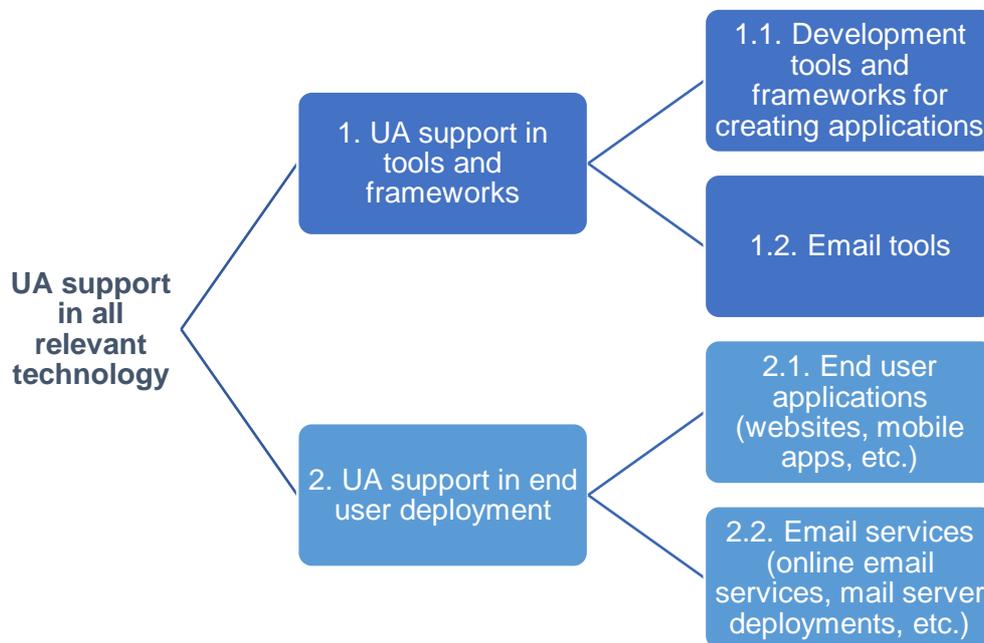
The UASG has been working on addressing UA challenges. As the work of the UASG has evolved, it can be categorized in determining gaps and fixing them at two layers of software:

1. The underlying software development tools, frameworks, etc., which are used to create the software solutions for end users.
2. The actual software applications deployed and used by end users, e.g., mobile apps, websites, email services, etc.

The end user applications, websites, email services, and more, that are deployed are in turn dependent on the underlying development tools and frameworks. If the underlying technology is not UA-ready, the end user software application development and its deployment will be harder to make UA-ready.

Even if the underlying technology is UA-ready, the end user software application development and deployment does not automatically become UA-ready. The software engineers, programmers, and system administrators still need to make sure they are using UA-ready tools and frameworks properly and configuring these appropriately during the software application development and deployment process. Only proper software design, development, and deployment would make mobile apps, websites, email services, UA-ready for end users.

At each layer, UA-readiness means supporting both domain names (including IDNs) and internationalized email addresses or EAI. This creates a four-way categorization of work for addressing UA-readiness, as illustrated in Figure 1.



**Figure 1: Steps for Updating Technology to Support Universal Acceptance**

UA-readiness translates into the requirement that software applications should be able to accept, validate, process, store, and display all valid domain names and email addresses in all languages and scripts.



**Figure 2: Software Requirements for Universal Acceptance of Domain Names and Email Addresses**

The underlying technology is developed by the stakeholder groups identified by the UASG as technology enablers and email tool providers. For end user development and deployment, the UASG identifies the relevant stakeholder groups as technology developers, email service providers and email administrators.

For software applications to work for end users, the UASG engages with all stakeholders. For technology enablers and email tool providers, the UASG conducts gap analysis of various tools, identifies and prioritizes issues, and then reaches out to encourage them to address these issues. For technology developers, email service providers and email administrators, the UASG conducts gap analysis and conducts outreach to encourage them to address these issues, and develops technical trainings and materials. Further details of these activities are provided in this report.

## 5 UA-READINESS SCOPE AND TESTING FRAMEWORK

Multiple layers of technology may need to be fixed in order to achieve UA-readiness. Figure 3 shows how such technology may be categorized at a high level with examples for each layer. The layers highlighted in gray are examples of end user applications and websites. The other layers represent the underlying technology and associated standards.

The UA-readiness of an end user applications has dependency on the UA-readiness of the underlying technology. Therefore, the whole technology stack would need to be reviewed and upgraded, where needed, to be able to accept, validate, process, store, and display all domain names and email addresses. The figure only provides a limited list that may be extended to include database management systems, authentication services, additional system tools, and more.



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### **Applications and Websites**

- Wikipedia.org, ICANN.org, Amazon.com, custom websites globally

- PowerPoint, Google Docs, Safari, Acrobat, custom apps

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### **Social Media and Search Engines**

- Chrome, Bing, Safari, Firefox, local (e.g., Chinese) browsers

- Facebook, Instagram, Twitter, Skype, WeChat, WhatsApp, Viber

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### **Programming Languages and Frameworks**

- JavaScript, Java, Swift, C#, PHP, Python

- Angular, Spring, .NET core, J2EE, WordPress, SAP, Oracle

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### **Platforms, Operating Systems, and System Tools**

- iOS, Windows, Linux, Android, App Stores

- Active Directory, OpenLDAP, OpenSSL, Ping, Telnet

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### **Standards and Best Practices**

- IETF RFCs, W3C HTML, Unicode CLDR, WHATWG

- Industry-based standards (health, aviation, ...)

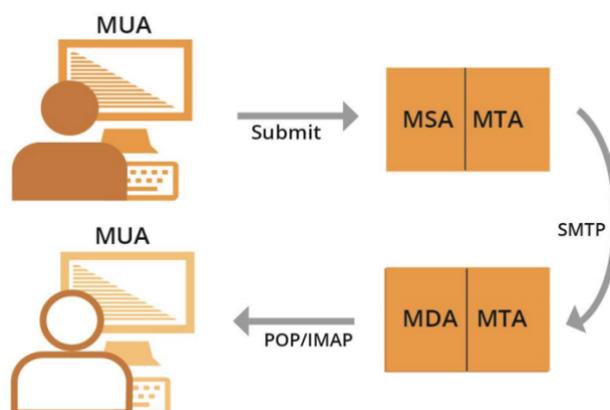
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## **Figure 3: Layers of Technology Relevant for Universal Acceptance Testing**

Similarly, email systems and services would also need to be updated to adopt the recent changes in the standard for Email Address Internationalization (EAI). Figure 4 shows the different email components (explained below), all of which need to be upgraded and configured to support EAI.

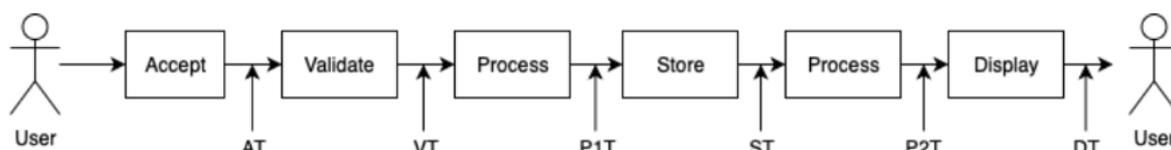
- MUA – Mail User Agent: A client program that a person uses to send, receive, and manage mail.
- MSA – Mail Submission Agent: A server program that receives mail from a MUA and prepares it for transmission and delivery.
- MTA – Mail Transfer Agent: A server program that sends and receives mail to and from other Internet hosts.
- MDA – Mail Delivery Agent: A server program that handles incoming mail and typically stores it in a mailbox or folder.

In addition, the email ecosystem also contains additional tools, including spam filtering, calendars, and others related to emailing systems.



**Figure 4: Layers of Technology Relevant for Universal Acceptance Testing**

The UA of all domain names and email addresses requires that all software applications are able to accept, validate, process, store, and display them correctly. The [Universal Acceptance Readiness Framework](#) lays out details on how to check for UA-readiness using a gating approach to verify UA conformance of an application (shown in Figure 5). This gating approach is based on applying tests at the various steps, named gates, and on the various components. Accept Tests (AT), Validate Tests (VT), Process Tests on the Input and Output (P1T, P2T), Store Tests (ST), and Display Tests (DT) are identified. The following figure shows the proposed gating approach.



**Figure 5: Universal Acceptance Testing Framework**

Details of these tests and how they are applicable to the different categories of applications are provided in the framework document. Developers can use this framework to plan specific test cases and check the UA-readiness of their applications.

UA-readiness issues can happen if software applications are not able to handle any one of the following categories of a domain name or email address at any of the stages outlined in the UA-readiness Framework.

### 1. Domain Names

1. **New short** top-level domain names: example.sky
2. **New long** top-level domain names: example.international
3. Internationalized Domain Names: παράδειγμα.eu

### 2. Email Addresses

1. ASCII@ASCII; new short or long TLD: ekrem@misal.istanbul
2. ASCII@IDN: john@société.org
3. **Unicode@ASCII**: 测试@example.com
4. **Unicode@IDN**: ईमेल@उदाहरण.भारत
5. **Unicode@IDN**; right-to-left scripts: اي-ميل@مثال.موقع



To allow for global UA testing, a set of domain names has been registered covering the various categories and scripts, including Arabic, Armenian, Bengali, Chinese (Simplified, Traditional), Cyrillic, Devanagari, Ethiopic, Georgian, Greek, Gujarati, Gurmukhi, Hangul, Hebrew, Hiragana, Kannada, Katakana, Lao, Latin, Malayalam, Myanmar, Oriya, Sinhala, Tamil, Telugu, Thaana, Thai, and Tibetan. In addition, an email test-bed has also been set up using these domain names. This provides a comprehensive dataset to test applications for UA as captured in [UASG004](#). Some example email categories and addresses are listed below from the companion [UASG004A](#) document with this dataset in UTF8 format:

- Example Domain Names

- #2, ASCII.ASCII, new-short, Short ASCII  
[universal-acceptance-test.icu](#)
- #4, IDN.IDN, Armenian  
[համընդհանուր-ընկալում-թեստ.հայ](#)
- #10, IDN.IDN, Gujarati  
[સાર્વત્રિક-સ્વીકૃતિ-પરીક્ષણ.ભારત](#)
- #12, IDN.IDN, Hangul  
[다국어도메인이용환경테스트.한국](#)
- #13, IDN.IDN, RTL, Hebrew  
[מבנה-הלב-אוניברסלי.קו.ק](#)
- #16, IDN.IDN, Katakana  
[ユニバーサルアクセプタンス.クラウド](#)
- #17, IDN.IDN, Lao  
[ສາກົນ-ການຍອມຮັບ-ທົດລອງ.ລາວ](#)
- #18, ASCII.IDN, Latin  
[Universales-Akzeptanz-Test.vermögensberatung](#)

- Example Email Addresses

- #32, ASCII@ASCII.ASCII, new-long, Long ASCII  
[email-test@universal-acceptance-test.international](#)
- #34, Unicode@IDN.IDN, RTL, Arabic  
[تجربة-بريد-الالكتروني@تجربة-القبول-الشامل-موريتانيا](#)
- #37, Unicode@IDN.IDN, Cyrillic  
[почта-тест@универсальное-принятие-тест.москва](#)
- #38, Unicode@IDN.IDN, Devanagari  
[ईमेल-परीक्षण@सार्वभौमिक-स्वीकृति-परीक्षण.संगठन](#)
- #39, Unicode@IDN.IDN, Georgian  
[ფოსტის-ტესტი@უნივერსალური-თავსობადობის-ტესტი.გე](#)
- #40, Unicode@IDN.IDN, Greek  
[ηλεκτρονικό-μήνυμα-δοκιμή@καθολική-αποδοχή-δοκιμή.ευ](#)
- #52, Unicode@IDN.IDN, Sinhala  
[ඉ-තැපැල්-පිරික්සීම@විශ්ව-සම්මුති-පිරික්සීම.ලංකා](#)
- #55, Unicode@IDN.IDN, Thai  
[อีเมลทดสอบ@ยูเอททดสอบ.ไทย](#)
- #56, Unicode@IDN.IDN, Simplified Chinese  
[电子邮件测试@普遍适用测试.我爱你](#)





## 6 UA-READINESS GAP ANALYSIS

Recent work done by the UASG has focused on understanding the gaps in technology related to UA-readiness. The UASG has investigated the following technology:

1. Technical Platforms and Applications
  - a. Platforms used to enable and develop applications: Standards, Frameworks, Libraries, and Tools.
    - i. [UA-Readiness of Programming Languages and Frameworks](#) (updated in FY22)
    - ii. [UA-Readiness Evaluation of Standards and Best Practices](#) (published in FY22)
    - iii. [UA-Readiness of Networking Command Line Tools](#)
    - iv. [Universal Acceptance \(UA\) of Content Management Systems \(CMS\) Phase 1 - WordPress](#)
  - b. Actual deployment: Applications, including websites.
    - i. [UA-Readiness of Browsers](#) (updated in FY22)
    - ii. [UA-Readiness of Social Media Platforms](#) (published in FY22)
    - iii. [EAI Acceptance Rates of the Top 2,000 Global Websites in 2022](#) (updated in FY22)
    - iv. [UA-Readiness of Open-Source Code Pilot](#)
2. Email Software and Services
  - a. Platforms used to enable and develop applications: Standards, Frameworks, Libraries, and Tools.
    - i. [Testing Email Tools for EAI Support](#)
    - ii. [Considerations for Naming Internationalized Email Mailboxes](#)
  - b. Actual deployment: email services and servers deployed.
    - i. [EAI-Readiness of Email Servers](#) (measured quarterly in FY22)

The following sections present a summary of the findings from these studies. Details are available in the reports linked above. It should be noted that the software tools and applications discussed may become UA-ready over time so it is advised to always check the documentation of the latest version to see the degree of support for UA.

### 6.1 UA-READINESS OF PROGRAMMING LANGUAGES AND FRAMEWORKS

Programming languages and their specific libraries are used to develop applications. These software applications can provide a host of Internet services. For example, an application can ask for an email address as a username to register a new user, send an email to confirm the request, and then set up the new user using the email address as the user's identity. The software application can be on a variety of operating systems like Linux, Windows, iOS or on mobile platforms like Android. Many applications make use of Internet identifiers which - while historically represented only in characters in American Standard Code for Information Interchange (ASCII) - can now be fully multilingual. These identifiers include:

- Domain names, e.g., example.com or 普遍适用测试.我爱你
- Email addresses, e.g., email@example.com or อีเมลทดสอบ@ยูเอททดสอบ.ไทย

It is important that all stakeholders involved in the development of a software application are aware of the available libraries for their chosen development environment that can be used



for processing Internet identifiers and how to use them to support UA. Additionally, it's important to have a clear basis to assess those libraries for technical and business suitability with regard to UA-readiness and compliance.

The UASG conducted a study on [Reviewing Programming Languages and Frameworks for Compliance with Universal Acceptance Good Practice](#) in 2019. This study documented the test cases for evaluating UA support of programming languages and frameworks based on the requirements from different protocols, including those for IDNA2008 and EAI. This work was used to test widely used programming languages and platforms in 2020, and the findings were published in [UASG018A: Universal Acceptance Compliance of Some Programming Language Libraries and Frameworks](#). More recently in 2022, the study was extended to also review PHP and to investigate the app development on mobile platforms, both iOS and Android. The results have been published in [UASG037: UA-Readiness of Some Programming Language Libraries and Frameworks \(Phase 3\)](#).

The findings from the latest report on PHP as well as iOS and Android platforms are summarized in Table 1. Red signifies not being UA-ready; pink signifies being UA-ready but some details need to be managed; and green signifies being UA-ready.

**Table 1: Level of UA Support in Programming Language Libraries in 2022**

Language	Library Name	Platform	Type of Test
Swift	MessageUI	IOS	Email
Swift	URLSession	IOS	Domain Name
Swift	Alamofire	IOS	Domain Name
Swift	IDNA-Cocoa	IOS	Domain Name
PHP	cURL*	Windows	Domain Name
		Linux	Domain Name
PHP	mail	Windows	Email
PHP	emailValidator	Windows & Linux	Email
PHP	Guzzle	Windows & Linux	Domain Name
PHP	intl	Windows & Linux	Unicode
PHP	PHPMailer	Windows & Linux	Email
PHP	Symfony	Http-client	Domain Name
		Polyfill-intl-idn	Unicode, Domain Name
		Mailer	Email
Kotlin	okHttp	Android	Domain Name
Kotlin	HttpURLConnection	Android	Domain Name
Kotlin	Retrofit	Android	Domain Name
Kotlin	fuel	Android	Domain Name
Kotlin	Volley	Android	Domain Name
Kotlin	Apache HttpClient	Android	Domain Name
Kotlin	Jakarta Mail	Android	Email
Kotlin	Email Intent	Android	Email

The results show that despite good compliance with EAI and IDNA2008 from native iOS apps like Mail or Safari, Apple doesn't seem to provide libraries with the same level of acceptance for developers. Perhaps Apple always converts to an A-Label before using their



HTTP libraries. For email libraries, a workaround is to go through the Mail native app, bypassing the standard way of popping an email composition modal (obsolete as noticed), and everything works fine from there. For Android, most of the tested HTTP libraries are using the same base code, therefore the results are quite similar except for Apache HTTPClient, which should not be used. Therefore, no library that uses the base Android network stack would be IDNA2008 compliant. An IDNA2008 compliant solution could be achieved as Android already contains and uses `icu.text.IDNA` that offers that compliance. The most used SMTP library on Android offers a good compliance with EAI. A more detailed analysis is presented in the report, along with the test results. PHP has multiple options for libraries which are UA-ready.

The findings from the earlier report on additional languages and frameworks are summarized in Table 2 below, with further details in the [report](#). The results show that programming languages Java, JavaScript, and Python3 have support for processing IDNs and EAI. Some additional platforms support IDNs but EAI is not supported by the remaining libraries.

**Table 2: Level of UA Support in Programming Language Libraries in 2021**

Language	Library Name	Type of Test
C	<code>libcurl</code>	Email
C	<code>libidn2</code>	Unicode
C#	<code>mailkit</code>	Email
C#	<code>microsoft</code>	Unicode
Go	<code>idna</code>	Domain Name
Go	<code>mail</code>	Email
Go	<code>smtp</code>	Email
Java	<code>commons-validator</code>	Domain Name and Email
Java	<code>guava</code>	Domain Name
Java	<code>icu</code>	Unicode
Java	<code>jakartamail</code>	Email
Java	<code>jre</code>	Unicode
JavaScript	<code>idna-uts46</code>	Unicode, Domain Name
JavaScript	<code>nodemailer</code>	Email
JavaScript	<code>validator</code>	Domain Name and Email
Python3	<code>django_auth</code>	Email
Python3	<code>email_validator</code>	Email
Python3	<code>encodings_idna</code>	Unicode
Python3	<code>idna</code>	Unicode, Domain Name
Python3	<code>smtplib</code>	Email
Rust	<code>idna</code>	Unicode, Domain Name
Rust	<code>lettre</code>	Email



## 6.2 UA-READINESS EVALUATION OF STANDARDS AND BEST PRACTICES

An initial investigation was conducted to identify and prioritize the technical standards bodies and groups that might be relevant for work on Universal Acceptance as well as identify any indexes and indicators that could include UA-readiness as a data point. The end goal of this work was to identify opportunities for engagement and collaboration for the advancement of the UASG's goals.

The work identified key organizations and studied their work streams, eventually generating a comprehensive list, labeled with categories and priority levels as well as containing relevant descriptions, recommendations, and other relevant information. Some of the organizations and their work identified for conducting a more detailed analysis include, but are not limited to, the following:

- W3C Accessibility Education and Outreach Working Group (EOWG)
- W3C Internationalization Working Group (i18n)
- WHATWG HTML Living Standard
- IETF art-dmarc
- IETF art-regext: Registration Protocols Extensions
- IRTF Hrpc: Human Rights Protocol Considerations Research Group
- Unicode International Components for Unicode (ICU)
- ITU-T Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)
- Python Software Foundation PEPs
- Cybersecurity organizations engagement

The UASG aims to conduct a more detailed analysis of the suggested standards by these organizations and then determine how to prioritize and engage with them. For the indexes and indicators studied, these require a high degree of commitment from the organization that intends to provide the data, as well as the involvement of governments. Working on enhancing the indexes is more challenging and will be looked into by UASG further. More details are available in the [UASG040: UA-Readiness Evaluation of Standards and Best Practices](#).

## 6.3 UA-READINESS OF NETWORKING COMMAND LINE TOOLS

Modern operating systems have a variety of command line tools used in system management and program development. Many of these tools operate on domain names, while a few do so on email addresses. The study [UASG024: UA Readiness of Command Line Networking Tools](#) was conducted in 2019 and looked at these tools to see how well they support UA.

The UA-related support for the tools reviewed is summarized in Table 3. See the report for further details. **Yes** means that the command at least accepts, validates, and processes. **Yes(D)** means it also displays domain names and shows IDNs as U-labels. **Yes** means that the command accepts IDNs but processes them with IDNA2003 rather than IDNA2008. An empty box means that the system is not distributed with that tool. **No** means IDNs as U-labels are not supported. An empty box means that the system is not distributed with that tool.



**Table 3: Level of UA Support by Some Networking Tools in 2019**

Tool	MacOS 10.14 (BSD/Mach)	FreeBSD 12 (BSD)	Ubuntu 18 (linux)	Centos 7 (linux)	Windows 10
host	No	No	No	Yes*(D)	
ping	Yes*	No	Yes*(D)	Yes*(D)	Yes
ping6	Yes*	No	Yes*(D)	Yes(D)	
tracert	Yes*	No	Yes*(D)	Yes(D)	
tracert6	Yes*	No	Yes*(D)	Yes(D)	
dig	No		No	Yes*(D)	
nslookup	No		No	Yes*(D)	No
telnet	Yes*	No	No		
openssl	Yes*	No	Yes*	No	
gnutls-cli		Yes	Yes		
tracert					Yes

#### 6.4 UA-READINESS OF CONTENT MANAGEMENT SYSTEMS

Content Management Systems (CMS) allow for quick development, deployment and maintenance of websites, and are popular tools to develop websites globally. There are many Content Management Systems available, both open source and proprietary. Examples include WordPress, Joomla, Drupal, and many more. The UASG recently conducted a pilot study with the intention to carry out UA-readiness testing in CMS, specifically WordPress and its associated plugins, for IDNs, path [Internationalized Resource Identifiers \(IRIs\)](#), and EAI. The results are documented with additional details in [UASG032: UA of Content Management Systems \(CMS\) Phase 1 - WordPress](#) published in 2021.

Table 4 summarizes UA support in the WordPress core system and the plugins tested. A-level means that all tests passed; B-level means end-to-end works but some tests fail; and C-level means that end-to-end testing did not pass, although some individual tests may have passed. The results indicate reasonable (though not complete) support for IDNs and IRIs, but no support for EAI.

**Table 4: Level of UA Support by WordPress and Some Plugins**

	Plugin Name	IDN UA Readiness	Path IRI UA Readiness	EAI UA Readiness
<b>CMS</b>	WordPress Instance	B-Level	A-Level	C-Level
	MailChimp	C-Level	B-Level	C-Level



<b>Extensions for Subscription Management</b>	Mailster	C-Level	C-Level	C-Level
	OptinMonster	B-Level	B-Level	C-Level
	Newsletter	B-Level	A-Level	C-Level
	Sumo List Builder	C-Level	C-Level	C-Level
<b>Extensions for Membership Management</b>	MemberPress	B-Level	A-Level	C-Level
	WooCommerce	B-Level	A-Level	C-Level
	Restrict Content Pro	B-Level	A-Level	C-Level
	Paid Memberships Pro	B-Level	A-Level	C-Level
	S2Member	C-Level	C-Level	C-Level
<b>Extensions for Event Management</b>	Events Manager	B-Level	A-Level	C-Level
	WP Event Manager	C-Level	C-Level	C-Level
	Event Organizer	B-Level	A-Level	C-Level
	All - in - One Event Calendar	B-Level	B-Level	C-Level
	Event Espresso 4 Decaf	B-Level	C-Level	C-Level

## 6.5 UA-READINESS OF POPULAR WEB BROWSERS

A recent study was conducted to understand how the Internet could better accommodate users' choice of script by analyzing the current usability of IDNs and internationalized email addresses in browsers. The results are described in [UASG036: UA-Readiness of Browsers](#). Following the previous report [UASG016: UA of Popular Browsers](#) done in 2017 on the Universal Acceptance of Popular Browsers, this report intended to not only capture more recent behavior, but also expand the testing to include additional browsers, especially those used locally in different geographic regions, as well as test browsers on mobile platforms. The following testing was conducted and tabulated:

A	Confirm URL is displayed correctly as pasted into the bar
B	Confirm that the correct page was loaded
C	Confirm that the URL is displayed correctly in the bar
D	Confirm that the page title is displayed correctly in the window/tab
E	Add the URL to browser bookmarks/favorites - operation completes without error
F	Confirm that the URL (and where supported page title) displays correctly in the correct format as added





### (d) Android

URL/ Browser	360	Amigo Mail	Atom Mail	Chrome	Edge	Epic Privacy Bro	Firefox	Internet Explorer	Opera	Safari	Samsung Brows	Sogou	UC Browser	Yandex
universal-acceptance-test.international	N/A	N/A	N/A	Y	Y	Y	Y	N/A	Y	Y	N/A	N/A	N/A	Y
universal-acceptance-test.icu	N/A	N/A	N/A	Y	Y	Y	Y	N/A	Y	N/A	Y	N/A	Y	Y
تعريف القبول للشامل موريتانيا	N/A	N/A	N/A	F	B, C, D, E, F	B, C, D, E, F	F	N/A	F	N/A	F	N/A	B, C, D, E, F	Y
универсальное-принятие-тест.москва	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	C, F	N/A	F	Y
सर्वभौमिक-स्वीकृति-परीक्षण.संराय	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	F	N/A	F	Y
Universales-Akzeptanz-Test.vermögensberatung	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	F	N/A	B, C, D, E, F	Y
普通适用测试.我爱你	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	F	N/A	F	Y
كبرس مبرك قورقوش شوش	N/A	N/A	N/A	C, F	A, C, F	A, C, F	F	N/A	F	N/A	C, F	N/A	F	F
تعريف القبول للشامل	N/A	N/A	N/A	C, F	B, C, D, E, F	B, C, D, E, F	C, F	N/A	C, F	N/A	C, F	N/A	B, C, D, E, F	C, F
xn----ctdbabcfhuc2b9f1accor4c.xn--mgbah1a3hjkrd	N/A	N/A	N/A	C	B, C, D, E, F	B, C, D, E, F	C, F	N/A	C, F	N/A	C	N/A	B, C, D, E, F	C, F
universal-acceptance-test.icu/测试	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	C, F	N/A	F	C, F
ပထမအဆင့် လမ်း	N/A	N/A	N/A	F	F	Y	F	N/A	F	N/A	F	N/A	F	Y
സ്വീഡൻ-സ്വീഡൻ-ട്രൈ-ട്രൈ	N/A	N/A	N/A	F	B, C, D, E, F	B, C, D, E, F	F	N/A	Y	N/A	B, C, D, E, F	N/A	B, C, D, E, F	B, C, D, E, F
համընդհանուր-ընկալում-թեստ.հայ	N/A	N/A	N/A	F	Y	Y	F	N/A	Y	N/A	F	N/A	B, C, D, E, F	Y
സ്വീഡൻ-സ്വീഡൻ-ട്രൈ-ട്രൈ	N/A	N/A	N/A	Y	F	Y	F	N/A	Y	N/A	F	N/A	B, C, D, E, F	Y
સર્વભૌમિક-સ્વીકૃતિ-પરીક્ષણ.સંરાય	N/A	N/A	N/A	Y	F	Y	F	N/A	Y	N/A	F	N/A	C, F	Y
સર્વભૌમિક-સ્વીકૃતિ-પરીક્ષણ.સંરાય	N/A	N/A	N/A	Y	F	Y	F	N/A	Y	N/A	F	N/A	C, F	Y
どこでもつかえる.みんな	N/A	N/A	N/A	Y	F	Y	F	N/A	Y	N/A	F	N/A	C, F	Y
épreuve-acceptation-universelle.org	N/A	N/A	N/A	Y	F	Y	F	N/A	Y	N/A	F	N/A	C, F	F
普通适用测试.我爱你	N/A	N/A	N/A	C, F	F	B, F	C, F	N/A	C, F	N/A	E, F	N/A	C, F	C, F

### (e) iOS

URL/ Browser	360	Amigo Mail	Atom Mail	Chrome	Edge	Epic Privacy Bro	Firefox	Internet Explorer	Opera	Safari	Samsung Brows	Sogou	UC Browser	Yandex
universal-acceptance-test.international	N/A	N/A	N/A	Y	Y	Y	Y	N/A	Y	Y	N/A	N/A	N/A	Y
universal-acceptance-test.icu	N/A	N/A	N/A	Y	Y	Y	Y	N/A	Y	Y	N/A	N/A	N/A	Y
تعريف القبول للشامل موريتانيا	N/A	N/A	N/A	F	B, C, D, E, F	F	C, F	N/A	B, C, D, E, F	C, F	N/A	N/A	N/A	Y
универсальное-принятие-тест.москва	N/A	N/A	N/A	F	B, C, D, E, F	C, F	C, F	N/A	C, F	B, C, D, E, F	N/A	N/A	N/A	Y
सर्वभौमिक-स्वीकृति-परीक्षण.संराय	N/A	N/A	N/A	F	B, C, D, E, F	C, F	C, F	N/A	C, F	F	N/A	N/A	N/A	Y
Universales-Akzeptanz-Test.vermögensberatung	N/A	N/A	N/A	F	B, C, D, E, F	C, F	C, F	N/A	C, F	F	N/A	N/A	N/A	Y
普通适用测试.我爱你	N/A	N/A	N/A	F	B, C, D, E, F	C, F	C, F	N/A	C, F	F	N/A	N/A	N/A	Y
كبرس مبرك قورقوش شوش	N/A	N/A	N/A	F	C, F	C, F	C, F	N/A	A, C, F	A, C, F	N/A	N/A	N/A	F
تعريف القبول للشامل	N/A	N/A	N/A	C, F	B, C, D, E, F	C, F	C, F	N/A	A, B, C, D, E, F	A, C, F	N/A	N/A	N/A	C, F
xn----ctdbabcfhuc2b9f1accor4c.xn--mgbah1a3hjkrd	N/A	N/A	N/A	C, F	B, C, D, E, F	C, F	F	N/A	B, C, D, E, F	C, F	N/A	N/A	N/A	C, F
universal-acceptance-test.icu/测试	N/A	N/A	N/A	C, F	C, F	C, F	F	N/A	F	C, F	N/A	N/A	N/A	C, F
ပထမအဆင့် လမ်း	N/A	N/A	N/A	F	B, C, D, E, F	B, C, F	C, F	N/A	C, F	F	N/A	N/A	N/A	Y
സ്വീഡൻ-സ്വീഡൻ-ട്രൈ-ട്രൈ	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, D, E, F	C, F	N/A	N/A	N/A	Y
համընդհանուր-ընկալում-թեստ.հայ	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, F	Y	N/A	N/A	N/A	Y
സ്വീഡൻ-സ്വീഡൻ-ട്രൈ-ട്രൈ	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, F	C, F	N/A	N/A	N/A	Y
სર્ვभૌમિક-સ્વીકૃતિ-પરીક્ષણ.સંરાય	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, F	Y	N/A	N/A	N/A	Y
સર્વભૌમિક-સ્વીકૃતિ-પરીક્ષણ.સંરાય	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, F	Y	N/A	N/A	N/A	Y
どこでもつかえる.みんな	N/A	N/A	N/A	F	B, C, D, E, F	C, F	F	N/A	C, F	Y	N/A	N/A	N/A	Y
épreuve-acceptation-universelle.org	N/A	N/A	N/A	F	C, F	Y	F	N/A	C, F	Y	N/A	N/A	N/A	Y
普通适用测试.我爱你	N/A	N/A	N/A	C, F	B, C, D, E, F	C, D, E, F	B, C, D, E, F	N/A	B, C, D, E, F	B, C, D, E, F	N/A	N/A	N/A	C, F

In considering the results for this study, the general outlook of UA-readiness within modern web browsers is largely positive with almost every tested browser handling the paste and subsequent navigation of all internationalized URLs correctly, resulting in a perfectly usable browsing experience for sites hosted using IDNs.

These findings are perhaps unsurprising due to the strong support for Unicode in modern operating systems and therefore in software platforms used to develop browsers allowing for reliable presentation of internationalized content. However, it was especially encouraging to note that both right-to-left scripts and technically challenging examples such as the Chinese Open Dot use case resulted in a valid resolution of the URL to the correct page in almost every instance.

The one obvious area for improvement for browser vendors is in the handling of bookmarking for IDNs with a number of vendors listing previously stored bookmarks using Punycode conversions, which have little or no significance to a reader. This was in some ways an unexpected finding due to the strong adherence to Unicode presentation observed in the other tests, including frequent promotion to Unicode for display in URL bars when pasting Punycode URLs.

## 6.6 UNIVERSAL ACCEPTANCE OF SOCIAL MEDIA PLATFORMS

UA-readiness of different social network platforms was also recently measured, published in [UASG035: UA Readiness of Social Media Platforms](#). The following social media applications were tested in this study in different browser and operating systems:

- Facebook
- Facebook Messenger
- Twitter





support for the posting of both internationalized email addresses and IDN-based URLs using built in public posting and private messaging channels including RTL scripts. This is perhaps unsurprising due to the very high level of support for Unicode provided by modern browsers and mobile devices, as well as server-side programming languages used to engineer these platforms. Future improvements and enhancements in this area for some social media applications might include the avoidance of displayed Punycode conversions visible in some circumstances, and additional work to support some of the language edge cases such as the Chinese Open Dot which suffers from lack of support at the device level as well as in software.

## 6.7 EMAIL ACCEPTANCE BY WEBSITES

In 2017 and 2019, the UASG conducted studies to check how many of the top 1,000 websites globally could accept email addresses based on a variety of TLDs including new, long, and IDN TLDs. The study also evaluated EAI with non-ASCII mailbox names represented in Unicode. The results showed that there is much work to be done before the websites are UA-ready. In 2020, the study was repeated with a slightly different design for choosing the 1,000 websites but with the same testing strategy.

The 2020 testing, [UASG027: Country-Based Evaluation of Websites for Accepting Email Addresses](#), did analysis of 50 popular websites in 20 different countries and provided the overall acceptance rates of different types of email addresses. It should be noted that this testing was limited to whether a website accepts a particular email address – it does not cover whether the website can store the email address or respond to it. The countries included in the current phase of the study are Argentina, Bahrain, Benin, Brazil, China, Egypt, Germany, Ghana, India, Israel, Japan, Kenya, Korea, Kuwait, Mexico, Nigeria, Russia, Sweden, Thailand, and Turkey.

In 2022, the study retested the 1,000 global websites as well as the 1,000 additional websites selected for the 20 different countries. Figure 7 compares the 2022 results to the earlier 2017, 2019 and 2020 testing results, noting that different email addresses were tested (but they were of the same category). These results show similar levels of acceptance, suggesting that the website developers are not upgrading their websites for catering to UA related features. The detailed results are reported in [UASG039: EAI Acceptance Rates of the Top 2,000 Global Websites in 2022](#).

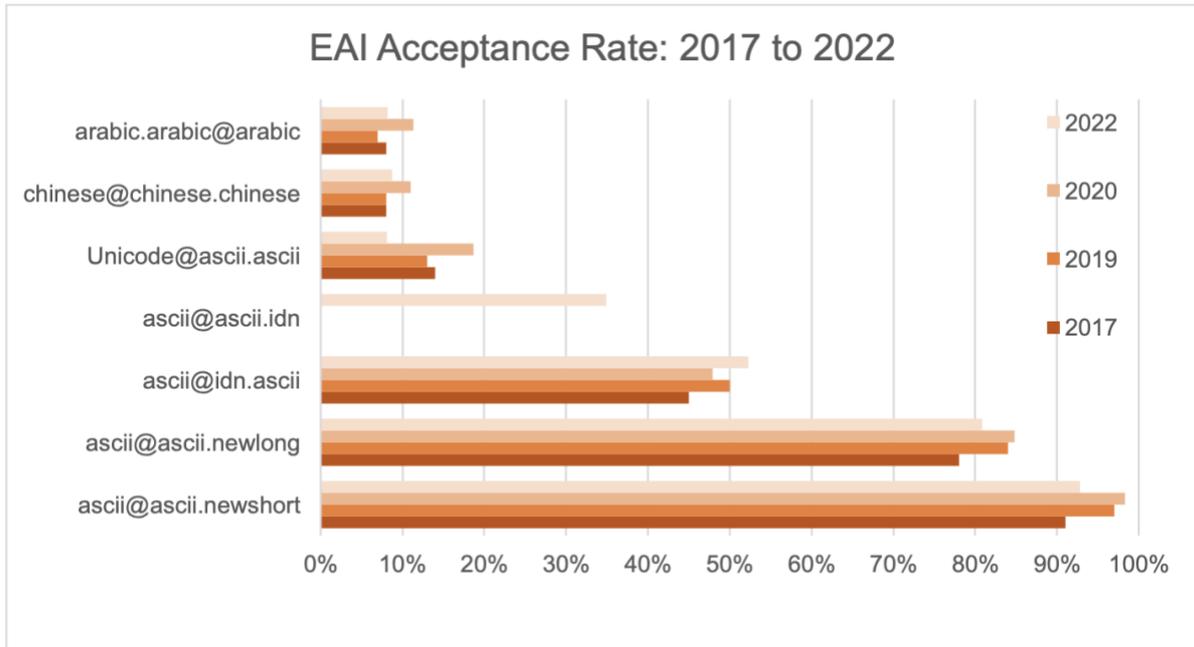


Figure 7: Email Acceptance of 1,000 Global and 1,000 National Popular Websites

Work is currently underway to try to reach out to these website developers to inform them of the UA issues with their websites and possibly to engage with them to encourage them to address these issues.

### 6.8 UA-READINESS OF OPEN-SOURCE SYSTEMS

A survey of 10,000 popular open-source projects in GitHub shows that most of the applications in Java use outdated methods and libraries for domain names and email addresses. However, the applications in Python use libraries that provide UA support as indicated in Figure 8. Many Java-based applications use regular applications (regex) which are generally not UA-compliant and should be checked carefully before using for validating domain names or email addresses. It should be noted that the projects were not compiled and tested individually so it cannot be deduced if they are UA-compliant, though using a UA-compliant library is a step in that direction. A study with this data has been published as [UASG033: UA-Readiness of Open-Source Code](#).

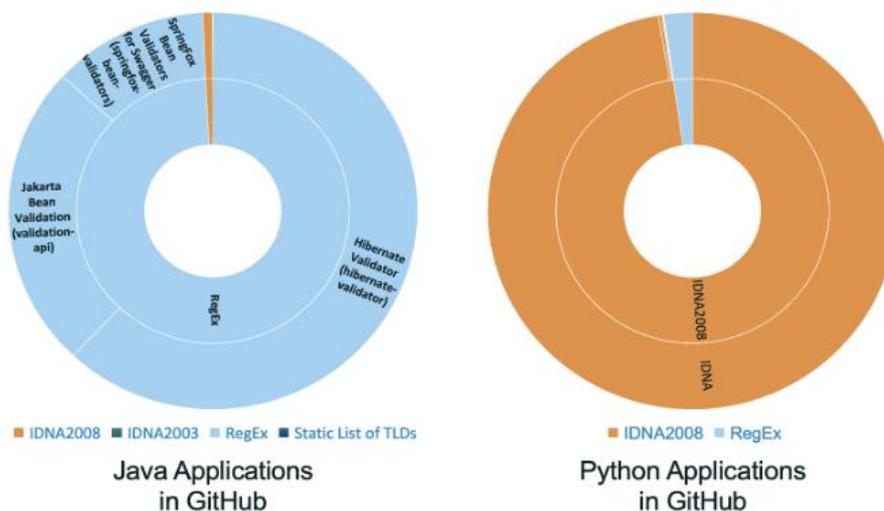


Figure 8: Usage of UA-Relevant Libraries in Open-Source Software



Table 7 lists the UA-relevant libraries in popular use by the open source projects surveyed in the study, along with their occurrence and their UA-compliance status based on results in the UASG018 report or their own documentation available online. Focusing remediation efforts on non-UA-compliant libraries which are more frequently used can create greater impact on UA-readiness.

**Table 7: Occurrence of UA-Relevant Libraries in Open Source Projects Surveyed**

Language	Library	Occurrence in Projects	Status (Source)
Java	hibernate-validator	62963	IDNA2003 implied, RegEx via annotations; Hibernate implementation of validation-api. (Documentation)
Java	validation-api	25190	IDNA2003 implied, RegEx via annotations. (Documentation)
Java	Springfox-bean-validators	12501	IDNA2003 implied, RegEx via annotations; SpringFox implementation of validation-api. (Documentation)
Java	commons-validator	4906	Relies on a static list of TLDs from 2017. (UASG018A)
Java	icu4j	886	IDNA2008. (UASG018A)
Java	libidn	29	IDNA2003, deprecated and ported to the Java language as "java.net.IDN". (Documentation)
Python	idna module	70789	IDNA2008. (UASG018A)
Python	email_validator	1178	IDNA2008. (UASG018A)
Python	validators	1660	Email validation based on Django validator, Not compliant; URL validation based on regex-weurl.js, which is a RegEx. (Code analysis)
Python	PyICU	243	IDNA2008. (Documentation)
Python	idna_ssl	10	IDNA2008. (Documentation)

## 6.9 EAI SUPPORT OF MAJOR EMAIL SOFTWARE AND SERVICES

Because email constitutes a significant part of online communications, it's important that email software and email service providers meet UA requirements. EAI is the protocol that allows email addresses to use Unicode-based mailbox names (in UTF-8) format before the "@" sign and IDNs or ASCII domain names after the "@" sign. A series of studies have been conducted to evaluate the existing EAI capabilities of the email ecosystem, which have been published cumulatively in the most recent report in this series in 2021: [UASG030A: EAI Software Test Results](#).



The summary of EAI support in email tools from the report is presented in Table 8. Blank cells in the table indicate a component that does not exist. A tool or service is considered to have Level 1 (L1) support if it can send to or receive from an internationalized email address but cannot create an internationalized email address. Level 2 (L2) is assigned if the tool or service can also create an internationalized email address in addition to sending and receiving emails from such addresses.

**Table 8: EAI Support by Various Email Tools and Services**

Name	MUA	MSA	MTA	MDA	MSP	Webmail
Apple iOS Mail 14.x	Most L2					
Apple Mail	Few					
Coremail	Few	All L2	Most L2	Few	All L2	Most L2
Courier		All L2	All L2	All L2		
Dovecot				None*		
Exim		Most L2	All L2			
Gmail	All L1	All L1	All L1	Few		
Halon		Most L2	Most L2			
Mozilla Thunderbird	Few					
MS Exchange Server (hosted)		All L1	All L1	Few		
MS Outlook	Most L1					
MS Outlook.com	Most L1	Most L1	Most L1	None	None	Most L1
Postfix		All L2	All L2			
Roundcube	Most L2					
Sendmail 8.17 Alpha		Most L2	Most L2			
Thunderbird 89 beta	Most L1					
XgenPlus		Most L2	Most L2	Most	All L2	Most L2
Yandex Mail	Few	None	None	Few	Part L1	Few

\*Dovecot is a unique case as it does not support the EAI standard but can still provide L1 support due to its ability to handle different legacy character sets allowing it to support Unicode UTF-8 format.

The study shows that there is now good L1 support for EAI in many tools, while some tools are also providing L2 compliance.

This study also investigated the EAI support of a few spam filters, especially those that advertise EAI support. The aim was to develop test cases and do initial testing to finalize them. The results of the pilot testing are promising as two of the three systems tested provide good EAI support, as shown in Table 9.



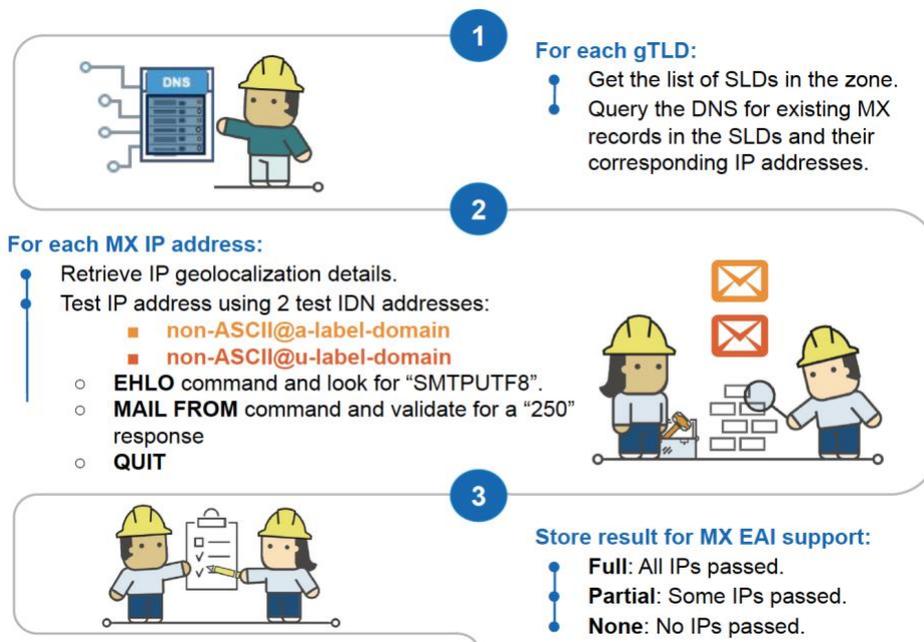
**Table 9: EAI Support by Various Spam Filters**

Name	Spam
Spamassassin 3.4.5	All L2
Mailchannels	Part L1
Spamjadoo (Xgenplus)	All L2

## 6.10 EAI-READINESS OF EMAIL SERVERS

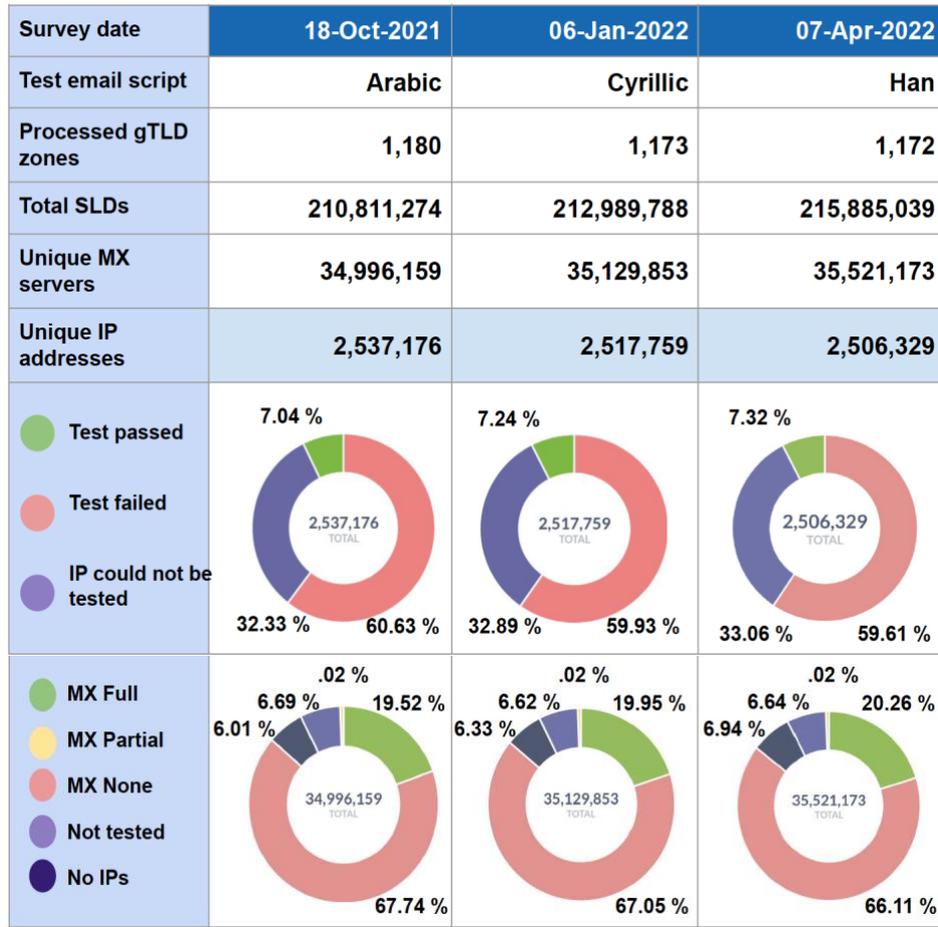
The initial study [UASG021D: EAI-Readiness in TLDs](#), published in 2019, tested mail servers under a TLD that was responding with EAI support flag SMTPUTF8 on a request to connect. Details of the methodology are presented in the report. A small number of domains were sampled which showed that 9.7% of the domains may be EAI-ready.

The study has been scaled up to cover all domain names to get broader coverage and is repeated quarterly to gauge progress. It is done with a two-step review process: first, check how many mail servers respond with SMTPUTF8 flag on EHLO request; and second, how many of these can accept a MAIL FROM request with an internationalized email address (with domain name part in either A-label or U-label format). The process is illustrated in Figure 10.



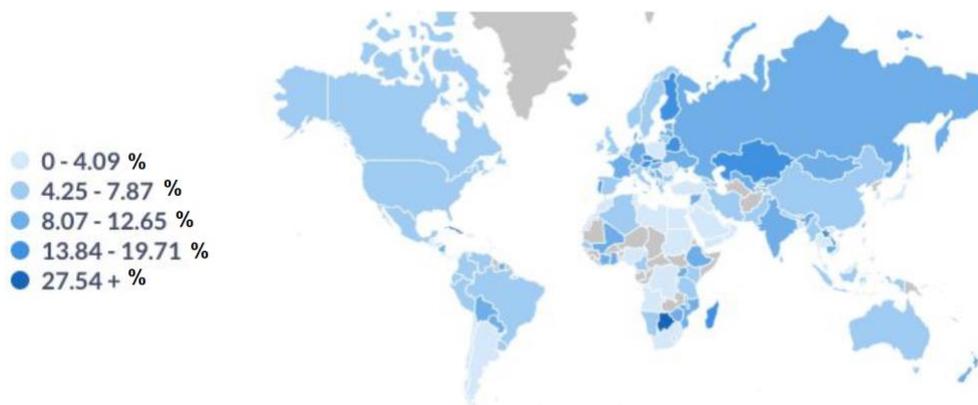
**Figure 10: Process to Determine EAI Support in Mail Servers**

Figure 11 below shows the test results from the past three quarters. Email addresses in different scripts were used and results show that the IP addresses pointing to EAI supported email servers increased marginally over the past year from 7.04% to 7.32%. Support in email servers has increased from 19.52% to 20.26%.



**Figure 11: EAI Support in Mail Servers Listed in gTLD Zones**

Localizing the IPs shows the geographical distribution of email servers which support EAI in Figure 12 on 7 April 2022.



**Figure 12: Geographical Distribution of EAI Support in Mail Servers**

Table 10 presents the actual numbers for the top 15 geographies (using ISO 3166 codes) by IP addresses in the gTLD zones pointing to mail servers with the number of these IP addresses supporting EAI on 7 April 2022.



**Table 10: EAI-Ready Mail Servers Across Geographies**

Country	IP total	IP passed EAI tests	EAI support %
US	931,740	58,758	6.31
DE	291,601	35,007	12.01
FR	140,221	17,451	12.45
JP	122,957	4,650	3.78
NL	103,578	7,316	7.06
GB	96,335	5,966	6.19
CA	77,104	4,891	6.34
RU	46,926	4,950	10.55
ES	44,567	2,139	4.8
PL	43,294	1,687	3.9
SG	41,239	4,186	10.15
CN	41,201	3,135	7.61
TR	38,349	981	2.56
IT	30,419	1,690	5.56

## 7 GUIDANCE, TRAINING, AND REMEDIATION FOR UA

The UASG working groups have been developing guidelines and training materials to address UA. Although the focus has still been on gap analysis for FY21, some remediation work to fix the technical issues in the software tools and applications was started in FY22. The remediation efforts will become more significant moving forward as the gap analysis indicates what needs to be fixed. This section provides an overview of these activities by the UASG.

### 7.1 UA-READINESS FRAMEWORK

The UA of all domain names and email addresses requires that all software can accept, validate, process, store, and display them correctly. The [Universal Acceptance Readiness Framework](#) provides guidance on how to implement UA-readiness and test it using a gating approach to verify UA conformance of an application (shown in Figure 5). More details on this are discussed earlier in this report.

### 7.2 NAMING INTERNATIONALIZED EMAIL MAILBOXES

Mailbox names – the part of the email address before the “@” symbol – are important as to how useful, user-friendly, and secure an email system will be. Therefore, it’s important that email administrators adopt good policies for naming mailboxes. Historically, email addresses have been limited to ASCII letters and digits but email technology has evolved to allow both mailbox names and domain names to be written in multiple languages and scripts. This flexibility makes policy choices more complex. The UASG has investigated and published guidelines for implementing mailbox names in its report on [Considerations for Naming Internationalized Email Mailboxes](#). This report aims to guide email administrators in adapting mailbox name policy to cover email addresses outside of Latin-script letters and digits.

Ultimately, the business purpose of email systems, along with the language needs of users and their correspondents, will decide policy choices and determine what scripts (writing systems for languages) will be allowed in mailbox names and their length. Since some



spellings, character combinations, signs, or symbols are confusing or deceptive, the policy used by administrators should forbid them (details depend on the language used for the mailbox name). Technical issues about how names that look the same to users but might actually consist of different characters require special attention. Right-to-left (RTL) scripts have unique possibilities for confusing name spellings, so if your system allows these scripts there are additional policy topics that should be addressed.

Users may exchange emails with people who experience difficulty reading the particular script used in an email address. To reduce these difficulties, implementing a policy that allows users to choose display names (the personal name displayed) and use aliases (alternate addresses for the same user) is recommended. This document also includes resources and references that provide more detail on several of these policy topics. It also includes a glossary of terms, some of which may be new to administrators when adopting multiple scripts and languages for mailbox names.

### 7.3 ROLE OF CCTLDS IN ACHIEVING UA-READINESS

The [Asia Pacific Top Level Domain Association](#) (APTLD) partnered with the [Internet Corporation for Assigned Names and Numbers](#) (ICANN) and conducted a UA training program for members of the Asia Pacific (APAC) community. As part of the series of webinars, the final one convened a panel of country code top-level domain (ccTLD) managers to discuss the role of ccTLDs in achieving UA-readiness.

The panel discussion presented a consensus about the significant role ccTLD managers need to play in supporting and promoting UA. First and foremost, ccTLD managers should make their own systems UA-ready, especially in local languages. In addition, ccTLD managers should play an active role in promoting UA in their communities by working with a broad range of stakeholders, planning outreach, and conducting technical training activities for stakeholders. There are many national, regional, and global efforts already underway to promote UA adoption resulting in readily available resources and best practices for both ccTLDs and other stakeholders. Working to achieve UA is an evolving process so ccTLD managers should stay up to date on the latest UA resources and initiatives as they work to make UA-readiness a reality in their local communities.

The panel's recommendations have been compiled into a [White Paper on The Role of ccTLDs in Achieving Universal Acceptance](#). The white paper can help other ccTLDs managers achieve UA-readiness as well.

### 7.4 ACHIEVING UA-READINESS IN REGISTRY AND REGISTRAR SYSTEMS

Software applications have to be built or updated to support UA capabilities. Among those applications are the registration of domain names, such as domain name registry and registrar software systems. ICANN organization (ICANN org) is conducting a study to explore a methodology to address the UA-readiness of these domain name registration systems. This study builds on the white paper for ccTLDs and is of a technical nature, targeting registry and registrar operators, registry backend providers, developers, and technical managers.

While this work can apply to both gTLD and ccTLD registry and registrar systems, the specifics also include the requirements of the ICANN gTLD environment, such as required reports and data escrow. Protocols and interfaces to the protocols involved in the registration ecosystem, such as EPP, WHOIS and RDAP are addressed. Finally, considerations for properly testing such systems are detailed with detailed appendices sharing results of such testing for actual registry and registrar systems.



## 7.5 CASE STUDIES ON UA ADOPTION

The UASG publishes case studies to document how an organization can promote UA and EAI adoption in order to provide motivation and guidance for others.

In 2022, the Thai Network Information Center Foundation (THNIC) published a [case study](#) on how it is working to promote UA training locally. THNIC organized a GitHub hackathon focused on UA. In this week-long virtual event, developers competed to modify a series of popular, public GitHub repositories to be UA-ready. The event resulted in the successful merging of one of the pull requests into the GitHub origin repository, as well as more widespread awareness among the Thai developer community of the importance of UA and the steps needed to update systems to be UA-ready.

In 2021, a case study was published on the journeys of Coremail and THNIC towards EAI-readiness. While Coremail and THNIC's EAI journeys were unique, there were common key learnings which were captured in the study: [Supporting a Culturally and Linguistically Diverse Internet Through Email Address Internationalization \(EAI\)](#).

ICANN org has also been assessing and updating its systems since 2017 to ensure all its systems become UA-ready. A [case study](#) was published in 2020 on ICANN's journey to UA-readiness, which is divided into three stages:

- Stage 1: Support both new short and long ASCII TLDs
- Stage 2: Support Internationalized Domain Names (IDNs)
- Stage 3: Support non-ASCII email addresses

ICANN org has completed the first stage and is in the process of accomplishing Stage 2. Work has also progressed to achieve Stage 3 goals by working with other relevant organizations to make their own email systems support EAI.

## 7.6 UA TRAINING MATERIALS

The UASG has developed technical training materials for relevant UA stakeholders. Three distinct training modules are now available at the UASG's [training wiki page](#). The first training provides an overall technical overview of UA and how to support it for technology managers. The second training aims to provide technical details on how to configure email servers for supporting and deploying email addresses in local languages and scripts for email and system administrators. The third training covers the technical details on how to program websites and applications with UA support aimed at software developers. The training was originally using examples from Java programming language and has been enhanced in 2022 to cover Python programming language as well.

Another training on role of ccTLDs was also developed based on the joint work with APTLD published in the [White Paper on The Role of ccTLDs in Achieving Universal Acceptance](#).

These training materials are summarized in Table 11. See the "Outreach" section below for details on conducting UA training programs.



**Table 11: Summary of UA Training Materials**

Training	Audience	Description	Duration
UA Technical Overview	- CIOs - IT managers - System administrators - Software developers - Email administrators	An overview about UA and EAI-readiness issues	1.5 hours
Configuring Email Address Internationalization	- Email administrators - System administrators - IT managers	Technical configuration and setup of EAI supported email service	3 hours
UA for Programmers and Software developers	- Software developers - IT managers	Develop current best practices for UA compliant Java and Python applications	3 hours
Role of ccTLDs in Achieving UA	- ccTLD Managers	Role of ccTLDs in adopting and promoting UA, based on the <a href="#">White Paper on The Role of ccTLDs in Achieving Universal Acceptance</a>	1.5 hours

### 7.6.1 UA COURSE ON ICANN LEARN

An Introduction to Universal Acceptance (UA) course was developed for the [ICANN Learn platform](#) in FY21 and launched in August 2021. The course is intended for a wide audience including the general Internet community, technology enablers and developers, email service providers, governments, and policymakers. By completing this course, participants will develop a basic understanding of UA and its technical challenges, the current state of UA-readiness globally, and the economic and social benefits of being UA-ready. The course also serves as a great resource for people who want to get involved in regional and global efforts to address UA, and for those who want to make their own systems UA-ready.

### 7.7 UA REMEDIATION EFFORTS

UA gap analysis of existing technology and applications has identified areas that need to be remediated. As reasons for issues become more evident, the UASG's focus has started shifting to fixing them. The remediation efforts can be categorized into three areas:

1. Direct outreach to tool and framework providers, either through the bug-reporting channels available and/or more directly to the organizations or open-source communities maintaining them.
2. Direct outreach to end user application or service providers, either through the online channels available and/or more directly to the organizations offering them.
3. Interact with the broader developer community on the software developer networks and conference.



### 7.7.1 INTERACTING WITH TOOL AND FRAMEWORK PROVIDERS

Bugs are generally reported through bug reporting systems online. As part of the testing work on PHP, Swift, and Kotlin platforms in UASG037, the issues found were put in as bug reports on the relevant channels. A summary of these reports are given in the table below.

**Table 12: Summary of Bug Reports Filed after Testing of Programming Languages**

Language	Platform	Library	Report	Resolution
Swift	iOS	MessageUI	<a href="#">StackOverflow report</a>	No answer yet
Swift	iOS	URLSession & Alamofire	<a href="#">StackOverflow report</a>	Being discussed
Swift	iOS	URLSession & Alamofire	<a href="#">Bug report on Swift bugtracker</a>	Assigned to a maintainer
PHP	Windows	mail	<a href="#">Bug report on RFC6531 compliance</a>	Changed to feature request
PHP	Windows	cURL	<a href="#">Bug report on IDNA 2008 compliance</a>	This is a Windows issue
PHP	Windows	cURL	<a href="#">Bug report on IDN 2008 compliance</a>	No answer yet
PHP	Windows & Linux	intl	<a href="#">Bug report on IDNA 2008 compliance</a>	Suspended as this is an ICU issue
PHP	Windows & Linux	PHP Mailer	<a href="#">Bug report for IDNA 2008 compliance</a>	Pull request submitted and merged upstream
PHP	Windows & Linux	Symfony HttpClient	<a href="#">Bug report on IDNA 2008 compliance</a>	Pull request submitted and merged upstream
PHP	Windows & Linux	Symfony Mailer	<a href="#">Bug report on IDNA 2008 compliance</a>	Pull request submitted and merged upstream
PHP	Windows & Linux	Symfony Mailer	<a href="#">Bug report on RFC5322 compliance</a>	Being discussed
PHP	Windows & Linux	Symfony Mailer	<a href="#">Bug report on RFC6531 compliance</a>	No answer yet
Kotlin	Android	Jakarta Mail	<a href="#">Bug report on RFC6531 compliance</a>	No answer yet
Kotlin	Android	URLConnection	<a href="#">Bug report on IDNA 2008 compliance</a>	Transmitted to the engineering teams
Kotlin	Android	OkHttp	<a href="#">Bug report on IDNA 2008 compliance</a>	Closed after Q&A
Kotlin	Android	Fuel	<a href="#">Bug report on IDNA 2008 compliance</a>	Pull request submitted and pending to be merged upstream
Kotlin	Android	Apache HttpClient	<a href="#">Apache HttpClient</a>	No answer yet

Earlier, many types of email software were tested as part of UASG030A. The systems tested do not have ticketing systems to report bugs, so in such cases their developers were



contacted. Minor bugs were found while testing the sendmail MTA and MSA and Mailchannels mail filter. Those bugs were reported to the developers by email and in each case they responded and fixed the bugs promptly.

Postfix and Exim MTAs, which failed a few of the tests done as part of UASG030A, were also contacted. In those cases, the authors disagreed with the interpretation of the standards and did not change their software (the issues are minor and do not affect EAI compatibility for the vast majority of users.) A small error in the “Received” header added by Courier was also communicated which the developer has fixed. While developing the Python test scripts, one bug and one limitation were found that were fixed locally. The bugs were then reported and patches were provided.

### 7.7.2 INTERACTING WITH END USER APPLICATION AND SERVICE PROVIDERS

ICANN Global Support provides support to the UASG by receiving and triaging cases based on issues submitted through <https://uasg.tech> website reporting page, and reaching out to service providers. Whenever reports indicate that a digital service does not support UA, ICANN Global Support attempts to contact their customer support or other teams that support those services. The two key activities are to inform and educate. Some of the organizations are not aware of UA and therefore the team provides relevant information and resources to explain the scope of UA issues and recommended solutions. From 1 July 2021 to 30 June 2022, a total of 29 UA cases were reported. These 29 cases created within the system resulted in 9 outreach cases. The Global Support team reached out to the various domain name holders to make them aware of the concerns that were reported.

The UASG is also attempting to reach out to those publishing the top 2,000 websites which were studied in [UASG039: EAI Acceptance Rates of the Top 2,000 Global Websites in 2022](#). The relevant generic email IDs for these websites were contacted to report that their sites do not support internationalized email addresses. Though the mail delivery success rate was around 90%, and with 36% unique opens, only 26% responses on unique opens were received. However, the responses were mostly auto-generated which is not encouraging. Also, around 64% of emails were not opened at all. Therefore, other outreach mechanisms to engage with the website developers is currently being looked into.

### 7.7.3 INTERACTING ON DEVELOPER NETWORKS

One of the major reasons behind the issues and challenges of UA is the lack of awareness of the software developers developing and deploying the end user applications and services. There are some decisions made at the micro-level that often make a big difference for UA support, e.g., the character set that needs to be allowed while validating a domain name field. Software design documents, however detailed, can often leave these decisions to the software developer. Hence it is critical that the developer community at-large, regardless of the programming language they use, is made aware of these challenges. One of the major sources from which a developer gathers this know-how is from their “Discussion Forums,” web-platforms that are tailor-made for facilitating these conversations.

Typically, on such forums, developers ask questions about things they need immediate help with or perspective. These forums have active user communities that engage with each other and take the discourse ahead. “Stackoverflow,” a popular forum, has been active since 2008 and has a large number of such problem-solving conversations. Many questions have been asked on such forums that have a direct bearing on UA. If the conversation and discourse around it is not up to date, then new developers will keep making the same mistakes, resulting in continued UA problems.



Through the EAI Technical Education and Awareness to the Developers' Community Websites project, six such prominent platforms were analyzed and engaged with. The analysis phase involved identification of relevant forums, identification of relevant topics/tags, and identification of relevant questions. The engagement phase involved creating model answers for the identified questions and posting the answers on the relevant forums.

The last phase of the project involves ensuring that the relevant responses gain enough traction to get into the active discourse of the developer community. That phase is currently underway.

Table 13 presents a summary list of the questions and answers and forums engaged with so far.

**Table 13: Outreach to Developers on Development Platforms**

No.	Question	Forum
1.	<a href="#">How to use IDN domain with swedish åäö when sharing on Facebook?</a>	Stackoverflow
2.	<a href="#">Example URIs for unit testing IDN domains</a>	Stackoverflow
3.	<a href="#">Nodejs Detect Punycode IDN language</a>	Stackoverflow
4.	<a href="#">What is a regular expression which will match a valid domain name without a subdomain?</a>	Stackoverflow
5.	<a href="#">Validation code for IDN (Domain) with regex (regular expression)</a>	Stackoverflow
6.	<a href="#">IDN (Domain) validation with regular expression</a>	Stackoverflow
7.	<a href="#">Domain Name Regex Including IDN Characters c#</a>	Stackoverflow
8.	<a href="#">non-latin email address validation</a>	Stackoverflow
9.	<a href="#">How to validate an e-mail address in swift?</a>	Stackoverflow
10.	<a href="#">How to validate an email address in PHP</a>	Stackoverflow
11.	<a href="#">How can I validate an email address using a regular expression?</a>	Stackoverflow
12.	<a href="#">How can I validate an email address in JavaScript?</a>	Stackoverflow
13.	<a href="#">C# code to validate email address</a>	Stackoverflow
14.	<a href="#">How to validate an e-mail address in swift?</a>	Stackoverflow
15.	<a href="#">How to validate an email address in PHP</a>	Stackoverflow
16.	<a href="#">Unicode Ranges of Indian Language Characters</a>	Stackoverflow
17.	<a href="#">Your email validation logic is wrong</a>	Stackoverflow
18.	<a href="#">Email Address Validation: Please Stop</a>	Stackoverflow
19.	<a href="#">It is impossible to validate an email address</a>	Stackoverflow
20.	<a href="#">Properly validating e-mail addresses</a>	Stackoverflow
21.	<a href="#">Case sensitive hostnames</a>	Stackoverflow
22.	<a href="#">.htaccess file, blocking IDN domains</a>	Stackoverflow
23.	<a href="#">Is there a list of Unicode character categories included/excluded in IDNs?</a>	Stackoverflow
24.	<a href="#">Validating email addresses using jQuery and regex</a>	Stackoverflow
25.	<a href="#">Which Unicode characters are allowed in IDN host labels?</a>	Stackoverflow
26.	<a href="#">Your email validation logic is wrong</a>	Reddit
27.	<a href="#">Email Address Validation: Please Stop</a>	Reddit
28.	<a href="#">It is impossible to validate an email address</a>	Reddit
29.	<a href="#">Properly validating e-mail addresses</a>	Reddit
30.	<a href="#">Is my new gTLD causing it to get filtered as spam?</a>	Serverfault
31.	<a href="#">Case sensitive hostnames</a>	Serverfault



In addition to the questions, two informative blog posts were written by a contractor on two important aspects of UA:

1. ["Universal Acceptance of Domain Names and E-mail Addresses" - What is the issue?](#)
2. [What is the ultimate goal of the Domain Name and Email ID Validation?](#)

As a part of this exercise, a list of Frequently Asked Questions (FAQs) were identified. A list of such questions along with the model answers is also being prepared which will soon be incorporated into the FAQs section at the <https://uasg.tech>.

#### 7.7.4 SOCIAL MEDIA CAMPAIGN TO REACH OUT TO DEVELOPERS

The UASG Communications Working Group carried out a paid social media campaign from 5-12 January 2022. The campaign was aimed at Python developers and open-source coders to raise UA awareness and to direct them to remediation resource UASG033 document that evaluates strategies to discover and improve UA-associated code in open-source software. The working group identified targeted audiences and regions to run the campaign on the UASG's Facebook and Twitter channels. Most engagement with the campaign was seen in the 18-34 age range from India, the U.S, and Egypt. The campaign yielded successful results in a short amount time.

The campaign reached over 460k people, 195.2k through Twitter, and 265.7k through Facebook. The UASG033 link was clicked on 21,316 times in total for both social media platforms. The campaign also attracted new visitors to the [uasg.tech](https://uasg.tech) website.

The UA Communications WG aims to continue with additional campaigns on additional documents produced by UASG.



Figure 13: Outreach through Twitter on UASG033 Report



## 8 OUTREACH AND TRAINING FOR UA ADOPTION

Outreach to promote UA is done through multiple channels. The major ones include:

- UA Ambassador Program
- UA Local Initiatives
- UASG website and social media channels
- UA-related reports and publications
- UA awareness, training, and capacity building events

Due to the COVID-19 pandemic, there have been few in-person events organized. However, the UASG community has remained active online to promote UA-readiness. The outreach conducted during FY22 is summarized in this section.

### 8.1 UA AMBASSADOR PROGRAM

The UASG has identified several ways to promote UA and EAI issues and solutions, one of which is through the UA Ambassador Program. The UASG Ambassador Program was created in 2018 to recruit industry leaders and UA experts who are committed to raising awareness around UA and EAI within their respective spheres. Designated UA Ambassadors are empowered to raise awareness of UA and EAI issues to target stakeholders. There are currently 12 UA Ambassadors located in Benin, China, Egypt, India, Nigeria, South Africa, and Turkey. Their details are posted at [uasg.tech](https://uasg.tech). The COVID-19 pandemic had an impact on their outreach, but many were still able to do awareness sessions online during the year along with some face to face sessions. This section shares examples of the outreach and training done by some of the UA Ambassadors.

In this past year Abdulkarim Oloyede, based in Nigeria, presented at the Ghana School of Internet Governance (SIGF) on 29 June 2022. The session introduced UA and how to become a UA ambassador. He also engaged with over 120 students at University of Abuja, Nigeria on 10 November 2021 to introduce IDNs and to explain the role of students and programmers in achieving UA. He also presented to over 200 students at Kwara State University on 7 April 2022 on IDNs and UA, and also conducted three training sessions for 3,000 students participating in the digital skills program in collaboration with Google between 21-27 April 2022. Abdulkarim gave a presentation on IDNs and UA to the Nigerian delegates to the ITU World Telecommunication Development Conference on the need for a resolution on how ITU can support IDNs on 5 May 2022. The event was attended by 30 participants.



**Figure 14: Outreach by Abdulkarim Oloyede, UA Ambassador**



Harish Chowdhary, based in India, presented at the Workshop on Multilingual Internet held by the Ministry of Electronics and IT, Government of India on 4 December 2021. The workshop was attended by members from academia, government, ICT industry, industry associations, and the research community. He played a key role in enabling the Hindi versions of government websites <https://एमईआईटीवाई.सरकार.भारत/> (<https://www.meity.gov.in/>) and <https://एनआईसी.भारत/> (<https://www.nic.in/>). He presented on UA at the monthly meeting of Asia Pacific At-Large Organization (APRALO) in January 2022. He has also contributed to the start of a Post Graduate Diploma in Internet Governance at the National Forensic Sciences in August 2022, which includes a complete unit on the multilingual Internet and Universal Acceptance.

Harish has conducted a course on Internet governance for senior government officers in June 2022, which included a session on the UA-related issues and the role to government officers play in mitigating them. He also contributed to the committee on capacity building on UA and multilingual Internet during the first India IGF in 2021. He has been collaborating with the UA Local Initiative of India to conduct workshops on EAI technical capacity building on 31 May and 30 July 2022. He has also been providing input to the National Hindi Newspaper Dainik Bhaskar on the multilingual Internet and Universal Acceptance.



**Figure 15: Outreach by Harish Chowdhary, UA Ambassador**

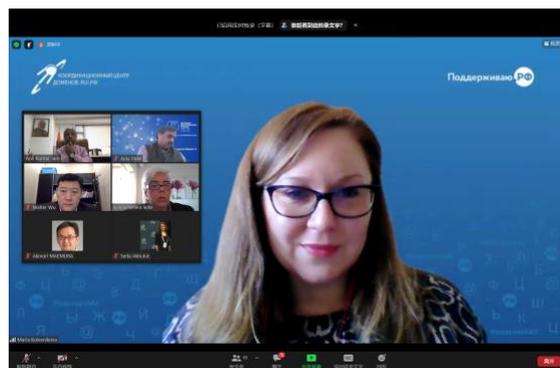
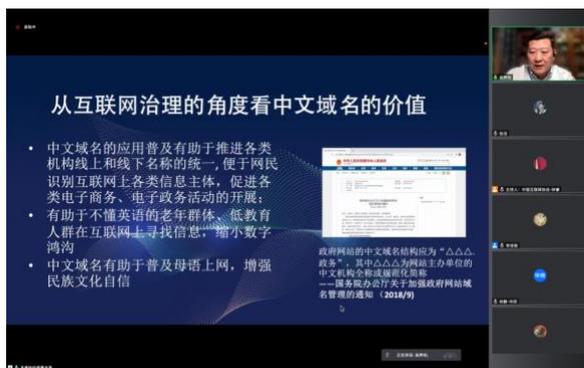
Marvin Woo, based in China, introduced EAI at the Fintech forum in November of 2021 and use of EAI was approved by [ICBC](#), which is preparing to support it. He participated in organizing the Innovation Competition for College students in Guangdong, Hong Kong, Macao and Taiwan, between 19 October - 3 December 2021 and recommended IDNs and EAI. Marvin also introduced the advantages of Chinese domain names when introducing Coremail overseas in Liepin live studio. Marvin introduced UA and EAI to Sun Yat-sen University students visiting Coremail on 10 June 2022, and shared the prospects of Chinese domain names at a session on Cyber Security at Jinan University on 14 June 2022.



**Figure 16: Outreach by Marvin Woo, UA Ambassador**

Vijay Shekhar Sharma, based in India, participated in multiple discussions, including a [session](#) on Digital India with Ajay Data (in Hindi language), organized by the UA Local Initiative.

Walter Wu, based in China, presented on IDN Development and Global Internet Governance at an online seminar hosted by the Internet Society of China and Beijing Normal University on 24 May 2022. He also presented during the UASG's IGF session on 10 December 2021.



**Figure 17: Outreach by Walter Wu, UA Ambassador**

## 8.2 UA LOCAL INITIATIVES

The UA Local Initiatives work in close consultation with UASG leadership and working groups, and with the support and collaboration of ICANN org. The purpose of these initiatives is to plan and undertake outreach to and collaborate with the local stakeholders identified by the UASG in their region to promote UA-readiness. The initiatives also engage with local stakeholders to encourage them to become UA-ready.

The UA Local Initiatives program started in 2019 in two regions, later expanding to four in FY20. These include initiatives in China, Commonwealth of Independent States and Eastern Europe (CIS-EE), India, and Thailand.

### 8.2.1 CHINA UA LOCAL INITIATIVE

The Chinese Domain Names Initiative (CDNI) of the [Internet Society of China](#) (ISC) continued to promote UA-readiness in China through efforts of outreach, training, and public education.



## Outreach

For the long-term outreach efforts, the policy advice of “Promoting Chinese IDN Application” by the CDNI was successfully written into the 14th Five Year Plan on ICT Development released by the Ministry of Industry and Information Technology (MIIT) of China in November 2021. To follow the development guideline, different Internet companies’ applications are gradually realizing the support of Chinese domain names. For example, for Tencent, Chinese domain names could be recognized both in the QQ mail body and in the WeChat official accounts. QQ browser and Tencent Clouds already support the Chinese domain names. However, QQ email's still needs to support EAI.



Figure 18: Support of Chinese Domain Names in QQ Mail Body and Browser

Baidu is also improving the search service for Chinese domain names and already recorded 660,000 Chinese domain names. Meanwhile, Baidu's Input Method already supports the identification of Chinese domain names. The Sogou browser already supports Chinese domain names while the Sogou search needs to improve its search results to display solution. Alibaba's UC Browser supports the Chinese domain names and will urge the Ali-Cloud to carry out promotion and marketing event for the Chinese domain names. Moreover, the 360 Search/browser and Bytedance Search already support the Chinese domain names.



Figure 19: Support of Chinese Domain Names in Sogou and 360 Browsers

## Training

To promote the dissemination of knowledge of UA and Chinese domain names, the CDNI organized different training sessions for its members and university students. CDNI worked jointly with the Beijing University of Posts and Telecommunications, the Beijing Normal University, and the Jinan University. Experts from different stakeholder groups were invited to present, with topics covering global Internet governance, DNS governance, Chinese domain names, and UA, and also discussed engagement of the younger generation. Over 150 students in average participated in each training event.



Figure 20: Outreach to University Students by CDNI

## Public Education

CDNI organized video training programs through the public social media account of the Internet Society of China. Meanwhile, a best practice program was organized to show different Chinese domain name registries' efforts or successful experience on promoting the Chinese domain names. To promote the community education regularly, the CDNI also organized a media campaign for this industry strategy, and organized interviews of industry experts. For example, the event "Promoting Chinese IDN Application" was reported by the mainstream media such as Peopledaily.com.cn and the newspaper The People's Post and Telecommunications.

### 8.2.2 CIS-EE UA LOCAL INITIATIVE

The Commonwealth of Independent States and Eastern Europe (CIS-EE) UA Local Initiative was established by the Regional Coordination Group on Universal Acceptance in CIS and Eastern European countries and approved by UASG in December 2019. It has gathered local experts from seven countries: Armenia, Belarus, Georgia, Latvia, Russia, Serbia, Ukraine. The members of the CIS-EE UA Local Initiative are mostly representatives of IDN ccTLD and new gTLD registries, registrars, and local IT companies of the region.

In 2020, the Russian chapter of the UA Local Initiative, the Russian Working Group on Universal Acceptance, has started to work on EAI/IDN implementation in Russia (<https://универсальноепринятие.рф/>, the WG's website was launched in August 2021). The CIS-EE UA Local Initiative activities during FY22 were focused on three main areas: technical collaboration and support, UA outreach, and public sector engagement.

### UA Remediation Efforts and Technical Consultancy

For increased collaboration and consultancy of stakeholders interested in UA implementation process, the CIS-EE UA Local Initiative has developed the following UA guidelines to be used in further communications on the local level:

- (For developers) *Guidelines on deployment support for non-ASCII domain names and email addresses in a software* (based on IDN and EAI standards and UA best



practices), May 2022. The document is prepared in three languages – Armenian, Russian, English. [English version \(.pdf\)](#).

- (For policymakers) *Recommendations on IDN/EAI requirements inclusion in contractual and tender documentation for software procurement*, June 2022. The document is prepared in three languages – Armenian, Russian, English. [English version \(.pdf\)](#).

In terms of UA remediation, the CIS-EE UA Local Initiative members worked on UA-readiness achievement in software and standards as follows:

- *Manuals for EAI-ready mail service setting up (on OS FreeBSD 10.2, Debian 11 amd64, Ubuntu 22.04 LTS and CentOS 7)* and recordings of UA/EAI trainings were published on the new wiki-resource (<https://вики.поддерживаю.рф>), launched for local developers and system administrators in Russia, June 2022.
- Publication of new how-to materials series “*Universal Acceptance in practice*” has been started on the UA-related local online resource in Russia (<https://поддерживаю.рф/>), June 2022. The articles provide step-by-step guides on how to deal with UA challenges while IDN and EAI usage.
- Collaboration with vendor of *ISPManager web hosting panel* to evaluate its support for Cyrillic IDN/EAI, May 2022.
- Implementation of Cyrillic domain names and email addresses support at the content management system *1C:Bitrix* since v21.300.0 was announced in July 2021.
- Continued work on the draft Internet standard *Use of Internationalized Email Addresses in EPP protocol* within IETF community (co-authors Dmitry Belyavsky and James Gould) since 2020.

In FY22, the CIS-EE UA Local Initiative has also started a *Research on UA compliance of ccTLD registry software solutions* to analyze the most popular solutions in use and their current level of UA-readiness. The [draft report](#) has gathered the initial list of registry software solutions being used to provide five critical registry services: EPP SRS, DNS, DNSSEC, RDDS, Data Escrow. At FY23 the CIS EE Local Initiative is going to continue this project.

### **UA-Readiness Index Measurement**

To measure some progress and evaluate UA/EAI/IDN compliance achievement, the CIS-EE UA Local Initiative members provided several studies during the FY22 period:

- March 2022, *Report on IDN Survey 2021 Results* followed the annual IDN Survey on support for IDN and EAI conducted among members of regional ccTLD organizations such as CENTR, APTLD, LACTLD and AFTLD in 2021 ([PDF, in Russian](#)). The IDN Survey 2021 was organized by the CENTR, EURid and Coordination Center for TLD .RU/.РФ as part of the IDN World Report project, a joint global study by UNESCO, EURid and Coordination Center for TLD .RU/.РФ on Internationalized Domain Names growth.



- April 2022, the *Evaluation of Cyrillic EAI Support on Socially Significant Online Resources* aimed to evaluate the acceptance of Cyrillic email addresses on the websites considered for providing free internet access to end users in Russia. The evaluation was conducted by the Coordination Center for TLD .RU/.РФ ([PDF, in Russian](#)).
- May 2022, the *Research on homoglyphs usage in internet identifiers* was published, the report provided information on homoglyphs examples and best practices to mitigate cybercrimes with their usage ([PDF, in Russian](#)).

## UA Outreach and Training

To train the Serbian local technical community, the online *WHOIS Hackathon* was organized by National Internet Domain Foundation of Serbia (RNIDS) with the support of UASG and ICANN from 25-26 September 2021. It gathered 10 teams of local developers (up to 5 members in each team) and resulted in 10 developed mobile applications for providing WHOIS service with full IDN support.



**Figure 21: Hackathon to Support IDNs in WHOIS Service in Serbia**

To raise UA awareness among the Armenian local Internet community, Internet Society (Armenia) held UA session at the *6th Armenian IGF* (October 2021) with participation of Ajay Data, the chair of UASG, and organized a workshop on UA technical solutions for local hosting providers and registrars at *REGITHON 2022* annual meeting in May 2022.



**Figure 22: Outreach on UA in Armenia**

To promote IDNs and UA for the Latvian community, a PR campaign was initiated by NIC.LV from February- March 2022. It was based on publication of annual .LV growth report showed the total number of IDNs doubled (increased by 144%) and followed by wide discussion at local mass media and reaction of domain investors and local business community resulted in more new registrations.

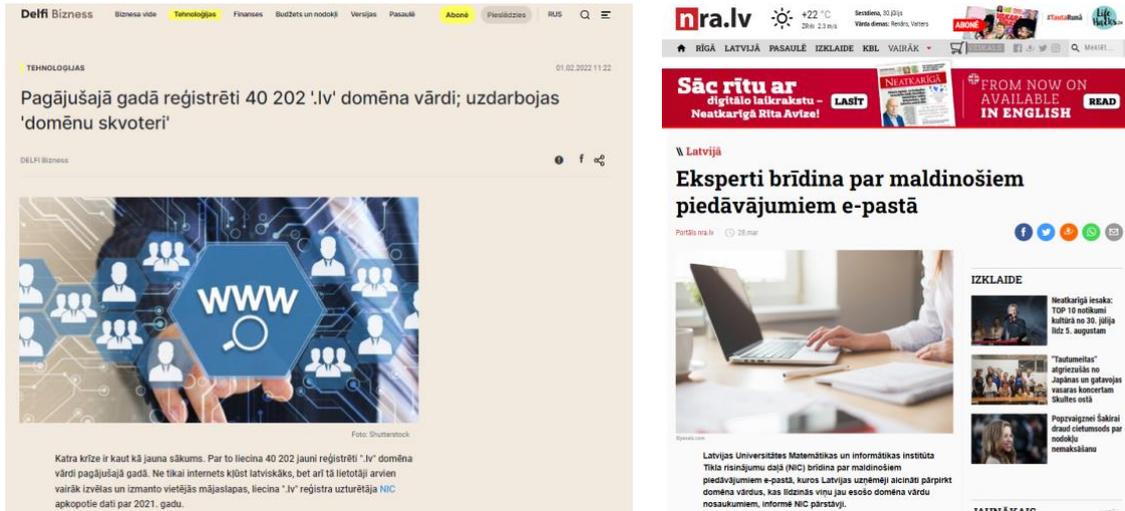


Figure 23: Outreach on UA in Latvia

To engage more stakeholders in the UA adoption process, including public sector, business, civil society, and academia, as well as end users, the Coordination for TLD .RU/.PФ organized several UA sessions at the main Russian Internet industry events during 2021-2022, such as *Russian Internet Week 2021* in December 2021 and *Russian Internet Forum 2022* in May 2022. An interactive UA workshop for students of the *Russian Summer School on Internet Governance* was held in July-August 2021. Moreover, a *series of open lectures* on multilingualism, UA technology aspects and internationalization, were presented for students and professors of Moscow State Linguistic University in May 2022.



Figure 24: Outreach on UA in Russia

For UA outreach, the CIS-EE UA Local Initiative members also participated in variety local and global events to present on UA during FY22, including IGF 2021, Korean IGF 2021, ICANN72, ICANN73, ICANN74, APTLD81, TLDCON 2021, and others.

### 8.2.3 INDIA UA LOCAL INITIATIVE

The [FICCI-Indian Language Internet Alliance](#) is a multistakeholder alliance established with the aim of sustainable development of the Indic Internet and Language Technology Sector of India. Carrying forward the same momentum, and with the support of ICANN, FICCI-ILIA started hosting the Local India Chapter of Universal Acceptance in 2019-20. The prime objective of this initiative was to promote UA in India so that more people can come online and leverage the Internet in their local languages.

The India UA Local Initiative led by FICCI-ILIA, has undertaken several successful initiatives for the digital development of the Indian Languages industry sector, focusing on areas like



UA Implementation, EAI, and IDNs. Multiple sessions around IDNs and UA were organized as part of the India IGF. These include the following:

- The Importance of Multilingual Internet as a Socio-Economic Tool of Empowerment was organized as a pre-India IGF session on 31 August 2021. The session focused on the importance of multilingual Internet and introduced Universal Acceptance.
- The Changing Landscape of Indic-Internet and Importance of Universal Acceptance was organized as a pre-IIGF event on 14 September 2021, focusing on Universal Acceptance and the benefits of UA implementation for businesses and other stakeholders.
- The Value of Multilingual Internet in Today's Fast Pace Digital World was organized as a pre-IIGF session on 24 September 2021. This focused on the role of multilingual Internet in today's digital age and how Universal Acceptance and EAI can contribute.
- The Workshop on Multilingual Internet - The Foundation of Next Phase of Digital Transformation created UA awareness workshop and was organized during the main IIGF on 25 November 2021. The workshop highlighted the importance of a multilingual Internet and UA in forwarding the agenda of Digital India and Internet governance.

A special session at Bhashantara meeting was organized on Universal Acceptance the Foundation of Multilingual and Inclusive Internet on 13 December 2021. The session focused on how UA and EAI can make the Internet in India more inclusive, making the next phase of the digital revolution for the country. An interactive session was also organized at the National Forensic Science University on Internet governance on 22 March 2022. The objective of the session was to discuss the importance of UA in Internet governance, and how it can add to the security aspects of multilingual Internet. In addition, a special Fire-side Chat on Universal Acceptance - The Foundation of Multilingual Internet of India on 28 April 2022 was addressed by Ajay Data and Paytm CEO Vijay Shekhar Sharma. The chat focused on UA and its implementation benefits. Finally, India UA Local Initiative also conducted a workshop on Capacity Building and Technical Skill Development for Universal Acceptance in India. The workshop focused on the technical aspects of UA and EAI.



**Figure 25: Speaker Gallery for India UA Local Initiative Events**

#### 8.2.4 THAILAND UA LOCAL INITIATIVE

The Thailand UA Local Initiative is spearheaded by the Thai Network Information Center Foundation ([THNIC](#)). In FY22, THNIC engaged with local Thai developers and email



administrators to raise their awareness about UA, Thai IDNs, and Thai EAI. THNIC focused on four working areas: Technology (T), Email Address Internalization or EAI (E), Communications (C) and Measurement (M) through the following activities.

For technology, the following activities were conducted.

1. THNIC developed a self-paced learning course, “Setting up an Email Server with EAI Support on Ubuntu”, so learners don’t have to prepare a learning/testing environment themselves. [Link](#).
2. In Aug. 2021, THNIC organized an online workshop for developers, students and developers with around 70 active participants, run by THNIC and Somkiat Puisungnoen, a well-known blogger at [SOMKIAT.CC](#) and Siam Chamnankit.
3. In Dec. 2021, THNIC conducted a hybrid - online and offline - reseller meeting. THNIC discussed the importance of universal acceptance of local domain names and email addresses along with THNIC UA activities that would occur in 2022. Resellers were encouraged to improve their systems to be UA-ready and join the upcoming UA activities so they can better understand and support UA.
4. In Apr. 2022, THNIC organized a free, online three-hour workshop for system administrators/developers, students and developers. This Email Server with EAI Support workshop taught participants to set up an email server with PHPMailer and configure parameters to support EAI. There were 21 participants who actively attended the workshop. [Link](#).
5. THNIC sponsored the “Botnoi Chatbot Marahackathon” with a special prize of 5,000 Baht for all finalists who developed a chatbot that can support IDN and EAI. On the hackathon day, 10 teams joined to develop a chatbot to understand ASCII domains, IDN domains and link these to websites correctly.

For Email Address Internalization the following activities were conducted.

6. In Jan. 2022, THNIC organized a free, online three-hour workshop for system administrators/developers, students and interested persons on Email Server with EAI Support. The workshop was delivered in Thai language. This workshop taught participants to set up an email server using Postfix, Dovecot, MySQL and Roundcube on the Ubuntu operating system and configure parameters to support EAI. There were 76 participants who actively attended the workshop. [Link](#).
7. THNIC has been modifying, developing and publishing EAI-ready (Thai Language only) materials for the following projects: Roundcube, Postfix, Dovecot, MySQL configuration and PHPMailer, since January 2022. THNIC is now ready to make this material available to the public via GitHub so Thai developers can make required improvements themselves. The work is available at <https://github.com/THNICF>.



For communications, the following activities were conducted.

8. In Oct. 2021, THNIC organized an online webinar, “WebPresso: Create Business Digital Identity”, with 60 interested participants. The session discussed unlocking business’ digital identity from social media platforms such as Facebook, LINE, Twitter, etc. THNIC explained the benefits of creating websites and using Thai domain names and emails as another method for businesses to help build trust and digital identity.
9. In Feb. 2022, THNIC served as a panelist at ICANN73 where he gave an update on UA local initiative activities and achievements in Thailand in 2021 and plans for 2022.
10. In Feb. 2022, THNIC served as a panelist representing Thailand at the APTLD81 where they brainstormed and discussed how to develop the UA market in Thailand and what practical approaches and cases should be considered and followed as good examples of success.
11. 23 Mar. 2022, THNIC shared views on Clubhouse as a co-host with the Thai IoT Association. The importance of the domain name system to IoT was discussed, which is vital for the Internet. Additionally, the importance of developing the domain name and email address system using local languages was also discussed.
12. In Mar. 2022, THNIC delivered a speech at the 53rd Asia Pacific Advanced Networks Meeting (APAN53). The importance of developing the domain name and email address using local languages such as Thai or Universal Acceptance was presented, stressing the importance of further development of Universal Acceptance as well as using internationalized email for identification.
13. In Apr. 2022, THNIC held a meeting with The National Press Council of Thailand to seek their cooperation in encouraging their members to use Thai domain names and emails as well as implement their systems to support IDN and EAI.
14. THNIC produced a technology review about IDNs, EAI and UA by a famous Thai Youtuber from the “KhongPangKhongKwan” channel comprising a group of young generation graduates of Princeton University, USA. Passionate about computer programming, they have more than 60,000 subscribers to their YouTube channel. Most of their subscribers are developers and C-level management in Thailand. The content of their videos consist of a literature review about IDN, EAI and UA followed by an explanation of how to develop a UA-ready system. Interested persons can find more information about IDNs, EAI and UA as well as programming challenges through various social media platforms used by THNIC, Facebook, Instagram and, YouTube influencers.
15. Techtalkthai, a famous IT influencer with more than 100,000 subscribers wrote and published an article about the importance and necessity of IDNs and EAI as well as how to develop a system to be UA-ready [Link](#). Youtube: <https://youtu.be/Wr9PETyon3Y> Facebook: <https://fb.watch/e256ruKbCf/>.



For measurement, the following activities were conducted.

16. Gap analysis of top Thai websites was done to see how they have improved over time: Collection and analysis of 100 popular Thai websites to determine if they are Thai UA-ready, examining if users can register using Thai email addresses and can put Thai email addresses in their contact form.

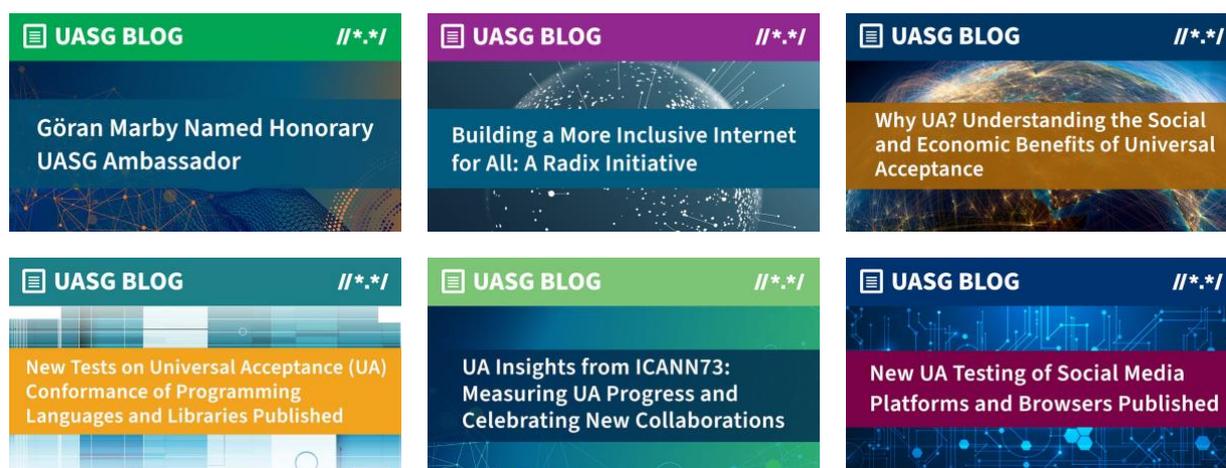
Year	No. of Website	Have a form to input Email? (A)	Can input EAI into the form? (B)	Can reply to EAI? (C)	Input EAI Ratio (B)/(A)	Reply EAI Ratio (C)/(A)
2021	100	43	2	1	5%	2%
2022	280	149	11	1	7%	1%



**Figure 26: Thailand UA Local Initiative Outreach and Training Activities**

### 8.3 UASG WEBSITE AND SOCIAL MEDIA CHANNELS

The UASG continued to produce and publish blogs and technical documents online at its website: [uasg.tech](https://uasg.tech) to globally showcase UA efforts and highlight events and achievements. Many of these are also translated into different languages based on the needs of the community (e.g., Arabic, Chinese, French, Russian, Spanish). The UASG published a total of [12 blogs and announcements](#) in the fiscal year aimed at disseminating important UASG reports and analysis, events, and news to a general audience.



**Figure 27: Sample Blogs Published by the UASG in FY22**



The UASG has active social media channels and generated organic content about UA for followers on [Facebook](#), [LinkedIn](#), and [Twitter](#) throughout the year. This includes promoting community events, available UA resources, and UA-related news.

ICANN org has also updated its UA-related webpages, now available at <https://icann.org/ua>. The page overviews and connects with UASG work as well as introduces the training programs and resources available for promoting UA.

#### 8.4 UA-RELATED REPORTS AND PUBLICATIONS

The UASG has published several UA and EAI-related reports and articles in different languages to reach a global and diverse audience to raise awareness about UA. Table 14 shows the UA research reports published from July 2021-June 2022. Click [here](#) for a complete list of publications.

**Table 14: UASG Reports and Publications in FY22**

Document Title	Summary	Link	Language
UASG 035 UA-Readiness of Social Media Platforms	UA-readiness evaluation of the most popular social media applications used worldwide.	<a href="https://uasg.tech/download/uasg-035-ua-readiness-of-socialmedia-platforms-en/">https://uasg.tech/download/uasg-035-ua-readiness-of-socialmedia-platforms-en/</a> <a href="https://uasg.tech/download/uasg-035a-ua-readiness-of-socialmedia-platforms-en/">https://uasg.tech/download/uasg-035a-ua-readiness-of-socialmedia-platforms-en/</a> (PPT)	English
UASG 036 UA-Readiness of Browsers	Updated UA-readiness evaluation of widely used browsers that now includes bookmark and favorites testing.	<a href="https://uasg.tech/download/uasg-036-ua-readiness-of-browsers-en/">https://uasg.tech/download/uasg-036-ua-readiness-of-browsers-en</a> <a href="https://uasg.tech/download/uasg-036a-ua-readiness-ofbrowsers-en/">https://uasg.tech/download/uasg-036a-ua-readiness-ofbrowsers-en/</a> (PPT)	English
UASG 037 UA-Readiness of Some Programming Language Libraries and Frameworks	Test results from additional UA related testing of PHP and programming language and frameworks on Android and iOS platforms.	<a href="https://uasg.tech/download/uasg-037-ua-readiness-of-someprogramming-language-libraries-and-frameworks-en/">https://uasg.tech/download/uasg-037-ua-readiness-of-someprogramming-language-libraries-and-frameworks-en/</a>	English
UASG 038 UA Messaging for Social Relevancy, Business Opportunities and Career Opportunities	Universal Acceptance (UA) messaging for various stakeholders on how UA enables digital inclusivity, provides business opportunities, and delivers career growth.	<a href="https://uasg.tech/download/uasg-038-universal-acceptance-uamessaging-for-social-relevancy-business-opportunities-andcareer-opportunities/">https://uasg.tech/download/uasg-038-universal-acceptance-uamessaging-for-social-relevancy-business-opportunities-andcareer-opportunities/</a>	Arabic, Chinese, English, French, Spanish



UASG 039 EAI Acceptance Rates of the Top 2,000 Global Websites in 2022	Updated EAI testing of the top 2,000 global websites.	<a href="https://uasg.tech/download/uasg-039-eai-acceptance-rates-of-the-top-2000-global-websites-in-2022-en/">https://uasg.tech/download/uasg-039-eai-acceptance-rates-of-the-top-2000-global-websites-in-2022-en/</a>  <a href="https://uasg.tech/download/uasg-039a-eai-acceptance-rates-of-the-top-2000-global-websites-in-2022-en/">https://uasg.tech/download/uasg-039a-eai-acceptance-rates-of-the-top-2000-global-websites-in-2022-en/</a> (PPT)	English
UASG 040 UA-Readiness Evaluation of Standards and Best Practices	Shortlisting and prioritization of some relevant standards and their organizations for UA	<a href="https://uasg.tech/download/uasg-040-ua-readiness-evaluation-of-standards-and-best-practices/">https://uasg.tech/download/uasg-040-ua-readiness-evaluation-of-standards-and-best-practices/</a>	English

## 8.5 UA AWARENESS, TRAINING, AND CAPACITY BUILDING EVENTS

In 2019-20, the UASG developed technical training related to UA which is available at the UASG [training wiki page](#). These training materials, along with more general information about UA, have been used to conduct outreach by UASG members and the ICANN org team. Due to the COVID-19 pandemic, most of the outreach activities were conducted online.

A major training initiative on UA has been the [Regional Universal Acceptance Training Program](#), which was launched in 2021. Following the training conducted in Asia Pacific and Latin America and Caribbean regions in FY21, two additional regional awareness and training programs were organized in Africa and North America in FY22.

ICANN, the Africa Top Level Domain Association ([AFTLD](#)), and UASG partnered together to host a UA training series for the Africa region. Sessions introduced UA challenges and conducted technical training to address them. The training series also included a session for ccTLD managers to discuss how they can support UA. Details of the sessions are given in Table 15.

**Table 15: Africa Regional Training Program in Collaboration with AFTLD**

Date	Session	Description	Recording
14 December 2021	Email Address Internationalization (EAI) Configuration	A detailed training on how to configure email systems to support Email Address Internationalization (EAI).	<a href="#">Recording</a> <a href="#">Slides</a>
18 January 2022	Programming (in Java) to Support Universal Acceptance	A detailed training on how to design and develop applications and systems to support UA.	<a href="#">Recording</a> <a href="#">Slides</a>
15 February 2022	Universal Acceptance: Its Impact and Next Steps	A discussion on how UA issues impact African communities, how best to address these issues, and the business opportunities presented by being UA-ready.	<a href="#">Recording</a> <a href="#">Slides</a>

The [program for the North American region](#) and was organized with the collaboration of North American Regional At-Large Organization (NARALO), ICANN, and UASG. This



program had a series of four technical training sessions, which were well attended with trainees included professionals and students from universities in the region. The agenda and recording links of the regional training program are provided in Table 16.

**Table 16: North American Regional Training Program by NARALO**

Date	Session	Description	Recording
20 January 2022	Introduction to UA	An introduction to the fundamentals of UA and EAI.	<a href="#">Session recording</a> <a href="#">Slides</a>
27 January 2022	EAI Configuration	A detailed training on how to configure email systems to support EAI.	<a href="#">Session recording</a> <a href="#">Slides</a>
3 February 2022	UA for Java Software and Application Developers	A detailed training on how to design and develop applications and systems to support UA.	<a href="#">Session recording</a> <a href="#">Slides</a>
10 February 2022	Outreach and Engagement: The Life of a UA Ambassador	A session to discuss how participants can stay involved in UA efforts across the NA region.	<a href="#">Session recording</a> <a href="#">Slides</a>

Table 17 lists additional UA-related outreach conducted during 2021-2022 by the UASG and ICANN org.

**Table 17: Additional Outreach and Training Activities on UA in 2020-2021**

Date	Event Name
20 June 2022	<a href="#">MOU between ICANN and EURID on IDN and UA</a>
20 June 2022	ICANN's contribution in the AICTO <a href="#">SMART magazine</a> on UA
2 June 2022	ICANN74 Prep Week - <a href="#">UASG Community Update session</a>
18 May 2022	<a href="#">LAC Digital 2022 Call</a>
18 May 2022	<a href="#">IDN and UA session</a> at Middle East DNS Forum
10 May 2022	<a href="#">AFRALO Online Discussion on UA</a>
10 May 2022	<a href="#">Nordic Domain Days presentation on UA</a>
29 April 2022	<a href="#">OSIANE 2022</a> Universal Acceptance Workshop



28 April 2022	<a href="#">LAC Domain Name Week</a> : Universal Acceptance and LAC region: Why it matters?
30 March 2022	<a href="#">APAC DNS Forum</a> : What's Next for Internationalized Domain Name (IDN) Variants?
21 March 2022	<a href="#">UA Technical Training Series in LAC Region EAI training</a>
24 February 2022	<a href="#">APTLD81 UA panel</a>
15 February 2022	<a href="#">UA Workshop for African ccTLDs: UA and Its Impact and Next Steps</a>
20 December 2021	<a href="#">Arab IGF- Digital Cooperation and Development Forum- Making the Internet More Acceptable Universally</a>
10 December 2021	<a href="#">IGF 2021 - Universal Acceptance for Wider Access through Collaboration</a>
5 November 2021	<a href="#">Tanzania IGF UA session</a>
30 September 2021	<a href="#">Demystifying Universal Acceptance: What does a multilingual Internet look like?</a>
1 September 2021	<a href="#">SEA-IGF UA session</a>
29 July 2021	<a href="#">Uganda: Understanding UA Webinar</a>
29 July 2021	<a href="#">West Africa IGF: Technical Overview of UA and EAI</a>

## 9 LOOKING AHEAD

The UASG recently finalized and published its [FY23 Action Plan](#). Though the studies to analyze gaps in UA support in the technology continue, focus of UASG work is now shifting towards fixing or remediating these gaps. The remediation work will focus both on the technical community developing underlying tools and frameworks as well as those programmers and system administrators involved in developing and deploying end-user software applications and email services. For the former, the focus will be to submit bug reports and engage with them to help prioritize the fixes. For the latter, outreach and training would be the focus as it is a much broader set of stakeholders.

The COVID-19 pandemic continued to present outreach challenges in FY22 as well, but the UASG has been able to make progress on a local level through its UA Local Initiatives and UA Ambassadors. The UA Local Initiatives provide the right connection to the community to raise awareness and train stakeholders. Therefore, the UASG aims to expand the program and looks forward to supporting additional initiatives while continuing to support those already established in China, CIS-EE, India, and Thailand. Similarly, the UASG will continue to conduct outreach through its UA Ambassador Program virtually until conditions allow for in-person meetings.

The UASG Measurement WG has launched gap analysis of webhosting tools and identity platforms in addition to work already completed and published. The WG will continue to prioritize other technologies for measurement-related work which could include a second and more comprehensive phase on CMS. The WG also aims to study the HTML5 standard



and its use to see the extent of its impact on UA. The WG is also planning an outreach to academia by trying to develop IT related curricula to include IDN and UA-related topics.

The UASG Technology WG will be focusing on technology remediation. The WG is currently working to develop, test, and publish functional minimal running prototypes to demonstrate UA-readiness on the Java, Python, and JavaScript technology stacks. The purpose is to demonstrate UA-readiness to developers so that they can be persuaded to adopt the practice. It will continue to include more stacks and will develop training materials for these technology stacks as well as for other technologies being investigated by UASG such as CMS, webhosting tools, etc. The WG has been working on designing a survey to determine technical challenges in adopting UA and plans to conduct the survey this year. The WG will continue its remediation effort for the top 2,000 websites which are surveyed in UASG039. Finally, the WG will also contribute to the academic curriculum development to include IDNs and UA.

The UASG EAI WG is currently finishing work on an EAI self-certification guide. Once finalized, it is aiming to develop a tool to assist with this self-assessment. It will focus on developing success stories on EAI implementation to create greater enthusiasm and showcase working solutions. The WG also aims to create user-centric documentation on how to find a service provider and use/test that provider's services, and provide system administrators with working EAI setups, configurations, and tests for self-hosting. The EAI WG also wants to reach out to global technology leaders like Facebook, eBay, and others to encourage them to support EAI.

The UASG Communications WG plans to coordinate with other WGs to make sure their output is effectively disseminated to the right audiences by publishing blogs, case studies, and videos, while also actively engaging with the community through its social media channels. The WG also aims to engage at a global level with a cohesive strategy for outreach at national, regional, and global Internet Global Forums (IGFs). The WG also continues to maintain and improve the [uasg.tech](https://uasg.tech) website experience. The WG is also finalizing scope to develop short videos for explaining different aspects of UA to technical community.

The UASG leadership team, UA Local Initiatives and UA Ambassadors will also be coordinating to plan and implement a UA Day in early 2023. The aim is to organize multiple events at local, regional, and global levels to amplify the UA adoption message. This will be a new effort by the UASG, for which it also aims to collaborate with other organizations globally.

Achieving UA is a collective responsibility, and it will only be fully achieved if we make all of our own systems UA-ready. With an abundance of literature, materials, training, and code examples now available through the UASG, we hope that the community will also engage and help implement UA adoption.

## 10 CONTACT THE UASG

- For further information about the UASG visit <https://uasg.tech/>
- Contact the UASG at <https://uasg.tech/contact/> or email [info@uasg.tech](mailto:info@uasg.tech)
- Meet the people of the UASG: <https://uasg.tech/about/people/>
- Join UASG working groups: <https://uasg.tech/join/>
- Participate in UA general discussions: <https://uasg.tech/subscribe>
- Report UA problems with other applications: <https://uasg.tech/global-support-centre/>
- Follow the UASG on its social channels: [Twitter](#) | [Facebook](#) | [LinkedIn](#)