Universal Acceptance Readiness Report FY20

1 September 2020

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UA Readiness in 2020
- At a Glance -

9.7% of email servers are potentially configured to support email addresses in local languages and scripts.

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11% of the top 1000 websites globally support email addresses in Arabic and Chinese.

98.3% of the top 1000 websites globally support email addressses with short top-level domains.

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测试@普遍接受-测试.世界

مشرف@اختبار-سجل.مصر

όνομα@παράδειγμα.ευ

UA Around the World

UA Ambassadors
Benin	Nigeria
Brazil	South Africa
China	Turkey
Egypt	United States
India	

UA Local Initiatives
CIS-Eastern Europe
India

● **Under Development**
China
Thailand
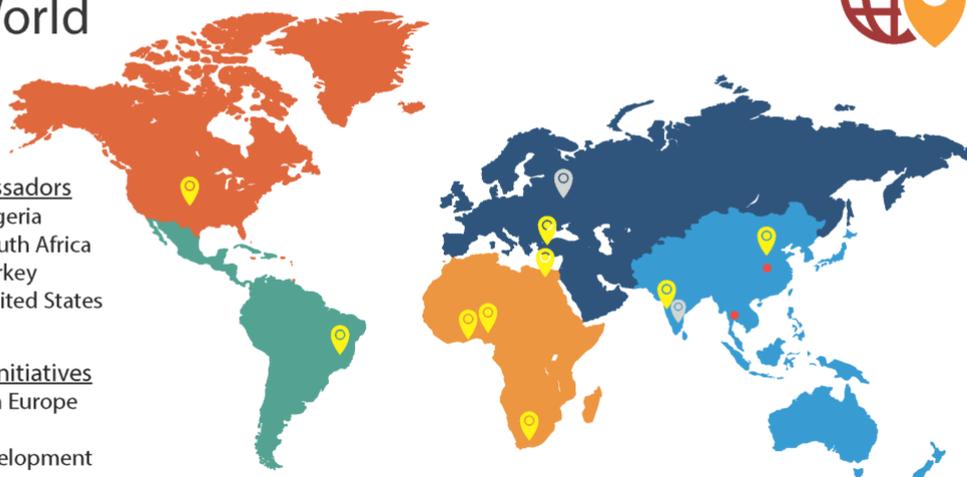
Designed by the UASG, August 2020.

Universal Acceptance: Working Towards an Inclusive, Diverse, and Multilingual Internet

The Internet's Domain Name System (DNS) has expanded to include new and longer top-level domains (TLDs), which provides global consumers with more online identity choices and promotes competition in the domain name industry. Individuals and businesses are able to choose TLDs representing a particular geography, profession, interest, community, and a variety of other factors (e.g., .london, .accountant, .photography, .men, .pizza, .fun, etc.). Further, the world population reads and writes in different languages and scripts (e.g., Arabic, Bangla, Chinese, Cyrillic, Devanagari, Japanese, Korean, and others, including the Latin script.) To make the Internet inclusive, domain names are also available in multiple languages and scripts like: شبكة. (.network in Arabic), .संगठन (.organization in Devanagari), קום. (.com in Hebrew), 我爱你 (.Iloveyou in simplified Chinese), .বাংলা (.bangladesh in Bangla), and .ευ (.eu in Greek).

Even with this expansion of the DNS, users are still excluded from experiencing the full benefits of using a domain name or email address of their choice, including those in their language and/or script due to current limitations of online websites, services, and applications that do not support them. But there is an opportunity for developers and those who manage and/or govern websites, services, and applications to make their systems accept these domain names and email addresses, giving users real choice in the domain name ecosystem.

Universal Acceptance (UA) is the cornerstone to a diverse Internet, aiming to ensure that all domain names and email addresses are supported equally by all Internet-enabled applications on all devices and systems. Achieving UA ensures every person can effectively navigate and communicate on the Internet using a chosen domain name and email address that best aligns with their interests, business, culture, language, and script, and is crucial to enabling consumer choice online and achieving digital inclusivity. Further, there are important economic and social benefits of supporting multilingual Internet users in their ability to access and connect to ecommerce, local communities, and governments, as well as to embrace and proliferate cultural traditions through language as indicated by the OECD 2016 report on the economic and social benefits of Internet diversity and openness.

The Universal Acceptance Steering Group (UASG) is a community-based group dedicated to promoting UA with the support of the ICANN organization. It undertakes gap analysis of standards, technology, services, and applications to determine the state of practice of UA. It also raises awareness, conducts training, and supports remediation of technology applications and services to achieve UA-readiness.

This report captures a summary of scope of UA, documents the current gaps in technology related to UA-readiness to-date, and provides an update on the activities undertaken by the UASG in FY20 (July 2019 – June 2020).

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Our Commitment

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

"The Internet has shaped our world, defined how we work, collaborate, study and communicate with each other's. The evolution of the Internet require that we focus on how the majority of the Internet users whom are non-English speakers can access the Internet using their own identities. By making Universal Acceptance a priority, we can ensure the Internet of tomorrow accepts the languages and technologies of today."

Akinori Maemura
Chair, ICANN Board IDN-UA Working Group

"Universal Acceptance of domain names and email addresses is needed for achieving the truly global reach of the Internet. The ICANN Board has been committed to advance UA readiness for a diverse and inclusive Internet, with the ICANN Board IDN-UA Working Group overseeing the progress of the UA remediation work being conducted by the ICANN org and by UASG under the sponsorship of ICANN org. The Board working group appreciates the progress made by the community in FY20 and would continue to support further work to achieve the UA readiness goal."

Göran Marby
ICANN, President and CEO

"The work of the Universal Acceptance Steering Group and community is critical to achieving a digitally inclusive Internet that allows users to navigate in the language or script of their choice. ICANN org funds the UASG, and is committed to supporting these community-led efforts and to building upon the accomplishments of the past fiscal year. Together, we can help current Internet users – as well as the next billion – experience the full social, economic, and cultural power of the Internet."

UA Work Organization

Universal Acceptance (UA) of domain names and email addresses simply means that all domain names and email addresses, including new and longer TLDs, should work with all software applications on relevant devices. Although this is a reasonably evident expectation, it is not always met.

This lack of support for domain names and email addresses has a negative impact on global Internet users and the domain name industry overall because it hampers consumer choice, competition, and broader access to end users. Therefore, UA is critical to the success of all top-level domains, including new generic top-level domains (gTLDs), Internationalized Domain Names (IDNs), country code top-level domains (ccTLDs), and legacy ASCII TLDs.

UA readiness is achieved through a multi-step process. As a start, the relevant technology needs to be shortlisted and evaluated to determine what the existing gaps are. The technology and issues that need to be addressed have to be prioritized based on multiple factors including the complexity of fixing the problem and the impact on end users.

Based on the priority, effective remediation measures need to be planned to address the UA issues and then ultimately executed. Depending on the stakeholders involved, relevant training may need to be developed to apprise them of the issues and how to fix them. Outreach to fix these issues is needed at multiple levels both globally and locally. Once a high priority list is addressed, the cycle would need to be iterated for the remaining technology. This is captured in the illustration below.

The UASG started organizing itself into working groups in mid-2019 to address the various stages in this UA remediation cycle. The UA Measurement Working Group focuses on identifying relevant technology and undertaking gap analyses to identify the extent and nature of the UA issues in them. The Technology and Email Address Internationalization (EAI) working groups work to prioritize the technology that needs to be updated to determine remediation measures and address any training needs. The Communications Working Group helps to draft messaging that is used in outreach to relevant stakeholders. Both the Local Initiatives and UA Ambassadors work on the ground to train and motivate local stakeholders to update their technology to be UA compliant. This is summarized below.

- **Technology WG** - Plans, coordinates, and oversees remediation work on standards, programming languages, tools, and development platforms.
- **Email Address Internationalization (EAI) WG** - Plans, executes, and oversees engagement with email software and service providers to make them EAI-ready.
- **Measurements WG** – Plans, oversees, and directs work to identify UA readiness gaps in tools and technologies.
- **Communications WG** – Plans and develops a communication strategy and oversees its execution in collaboration with other working groups.
- **Local Initiatives WG** – Plans, develops, and oversees the execution of local initiatives across various geographies.
- **UA Ambassadors WG** – Undertakes training and outreach at national and regional levels.

The work of the UASG has largely been focused on gap analysis from 2019-2020 as the natural first step and prerequisite for the eventual remediation to achieve UA readiness. Work has also been done to develop training materials and train UA trainers to support the subsequent remediation work. More specific messaging for the stakeholders has also been formulated, while the outreach to make communities aware of the UA challenges, solutions, and its advantages has continued. The UASG's FY20 Action Plan provides details on how the UASG has organized and planned the work. The document below presents some details of the work undertaken so far (largely reporting on the UA readiness of technology in mid-2020) based on the most recent data available through the work of the UASG. It also summarizes the UA outreach conducted over the year.

UA Readiness Framework

The Universal Acceptance (UA) of all domain names and email addresses requires that all software is able to accept, validate, process, store, and display them correctly. The report on 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. 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.
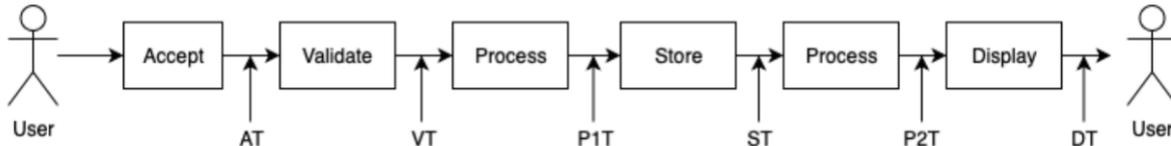
Details of these tests and how these are applicable to the different categories of applications are also provided in the report. Developers can use this framework and test to check the UA readiness of their applications.

UA readiness issues can be faced 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**
   a. **New short** top-level domain names: example.sky
   b. **New long** top-level domain names: example.berlin
   c. Internationalized Domain Names   παράδειγμα.ευ

2. **Email Addresses**
   a. ASCII@ASCII; new short or long TLD   ekrem@misal.istanbul
   b. ASCII@**IDN**   john@société.org
   c. **Unicode**@ASCII   测试@example.com
   d. **Unicode**@**IDN**   ईमेल@उदाहरण.भारत
   e. **Unicode**@**IDN**; right to left scripts   ایمیل@مثال.موقع

A sample set of domain names and email addresses from these categories are presented in UASG004 (TXT) for purposes of technical testing of applications.

Multiple layers of technology may need to be fixed to achieve UA readiness. The figure below shows how such technology may be categorized at a high level with some examples for each layer.

The UA readiness of each layer may have dependency on the UA readiness of the layer below it. This whole technology ecosystem would need to be upgraded, where relevant, to be able to accept, validate, process, store, and display all domain names and email addresses. The figure provides only a limited list that may be extended to include database management systems, authentication services, additional system tools, and more.

Applications and Websites

- Wikipedia.org, ICANN.org, Amazon.com, custom websites globally
- PowerPoint, Google Docs, Safari, Acrobat, custom apps

Social Media and Search Engines

- Chrome, Bing, Safari, Firefox, local (e.g. Chinese) browsers
- Facebook, Instagram, Twitter, Skype, WeChat, WhatsApp, Viber

Programming Languages and Frameworks

- JavaScript, Java, Swift, C#, PHP, Python
- Angular, Spring, .NET core, J2EE, WordPress, SAP, Oracle

Platforms, Operating Systems and Sytem Tools

- iOS, Windows, Linux, Android, App Stores
- Active Directory, OpenLDAP, OpenSSL, Ping, Telnet

Standards and Best Practices

- IETF RFCs, W3C HTML, Unicode CLDR, WHATWG
- Industry-based standards (health, aviation, ...)

Similarly, the email systems would also need to be updated to adopt the recent changes in the standard for EAI. The figure below shows the different email components, all of which need to be upgraded and configured to support EAI. Again, the ecosystem provides a limited view, that may be extended to include spam filtering, calendars, and other relevant tools related to emailing systems.
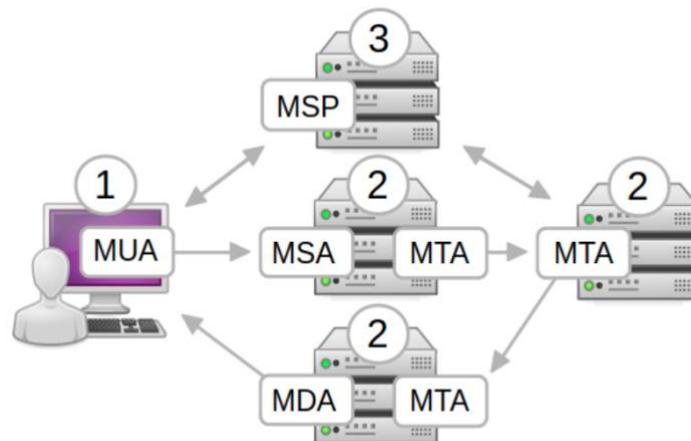
- Component 1: Mail User Agent ("MUA").
- Component 2: Mail Submission Agent ("MSA"), Mail Transfer Agent ("MTA"), and Mail Delivery Agent ("MDA").
- Component 3: Mail Service Provider ("MSP").

UA Readiness Gap Analysis

As discussed earlier in this report, much of the recent work by the UASG has been focused on understanding how big the gaps are in the technology related to UA readiness. The UASG is looking at the following kinds of technology.

1. Technical Resources and Applications
    a. Platforms used to enable and develop applications: Standards, Frameworks, Libraries, and Tools.
        - UA Readiness of Programming Languages and Frameworks
        - UA Readiness of Networking Command Line Tools
    b. Actual deployment: Applications, including websites developed.
        - UA Readiness of Popular Web Browsers
        - Email Acceptance by Websites
2. Email Software and Services
    a. Platforms used to enable and develop applications: Standards, Frameworks, Libraries, and Tools.
        - EAI Support of Major Email Software and Services
    b. Actual deployment: email services and servers deployed.
        - EAI Readiness of Email Servers

UA Readiness of Programming Languages and Frameworks

Software applications that make use of Internet services are built and used in a variety of ways. They exist at all points along a continuum ranging from embedded firmware in a connected device, to desktop/mobile/tablet applications, and to software that runs purely in a web browser environment, the latter often communicating with more software running on remote servers. All of these make use of Internet identifiers which - while historically represented only in characters employed by U.S. English (i.e. A-Z, 0-9 and '-') - can now be fully multilingual. These identifiers are:

- Domain names, e.g. example.com or 普遍接受－测试.世界

- Email addresses, e.g. joe.bloggs@example.com or 测试3@普遍接受－测试.top

It is therefore important for all stakeholders involved in the development of a software application to be aware of what libraries are available for their chosen development environment that can be used for processing Internet identifiers. Additionally, it's important to have a clear basis for assessing those libraries for technical and business suitability with regard to UA readiness and compliance.

In 2019, a study on Reviewing Programming Languages and Frameworks for Compliance with Universal Acceptance Good Practice was undertaken and published. It documented the test cases for evaluating the support of programming languages and frameworks to support UA based on the requirements from different protocols, including those for IDNA2008 and EAI. In addition to development of the test cases, the study also undertook analysis of UA support in different libraries offered by Java, Python, and Rust programming languages across different frameworks. This work is currently being expanded to cover additional programming languages and platforms. The additional work also includes testing of mailer libraries for EAI support in addition to testing for IDNA support. The findings are provided below and will be published in a detailed report.

	UA-ready	UA-ready; use carefully to manage some details	Not UA-ready

Language	Library Name		Language	Library Name
c	libcurl		js	idna-uts46
c	libidn2		js	nodemailer
c#	mailkit		js	validator
c#	microsoft ldnMapping		python3	django_auth
go	idna		python3	email_validator
go	mail		python3	encodings_idna
go	smtp		python3	idna
java	commons-validator		python3	smtplib
java	guava		rust	idna
java	icu		rust	lettre
java	jakartamail			
java	jre			

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 on email addresses. Another study was conducted in 2019, UA Readiness of Command Line Networking Tools, that looked at these tools to see how well they support UA.

The tools generally accept domain names as arguments from the command line and then use them in the tools' operation, which includes looking them up in the DNS. They all return some sort of report to the console, sometimes including the domain name and sometimes not. The report says that a tool can accept and validate a name if it receives a name from

the command line and correctly recognizes it as an ASCII or IDN domain name. It can process the name if it does something useful with it, typically a DNS lookup. Some tools put domain names in their output, so if they do so correctly, they can display names.

The UA-related support for the tools reviewed is summarized in the table below. See the report for further details.

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[1]
ping6	Yes*	No	Yes*(D)	Yes(D)	
traceroute	Yes*	No	Yes*(D)	Yes(D)	
traceroute6	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

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.

UA Readiness of Popular Web Browsers

In 2017, a study was conducted to review the UA of Popular Browsers. A variety of browsers were tested on both desktop and mobile platforms using the set of domain names and email addresses in the test suite provided in UASG004, which spans the categories identified for UA readiness. The results are noted below. This study needs to be performed again to see how UA support has changed since 2017.

After performing individual tests of 17 URLs in eight browsers on six different operating systems (four desktop, two mobile), only Internet Explorer on desktop performed completely as expected, meaning the expected webpage loaded and was displayed properly. Most browsers running on a desktop platform (Windows 10, macOS 10.12, Ubuntu 17.04) performed very well, Vivaldi being the exception of those tested. Of the others, Chrome, Opera, Safari, and Edge failed to correctly render URLs mixing right-to-left scripts with ASCII in the tab title bar. Neither Firefox nor Safari handle the open dot " 。 " as a label delimiter, which is recommended by the UASG (see UASG004, also Appendix A). This leads to search results being displayed instead of the browser loading the expected webpage.

The results were more varied on the two mobile platforms tested (iOS 10.3 and Android 7.0). Firefox and Opera had poor results because the location bar displayed URLs in Punycode

instead of in Unicode in almost all cases. There were no obvious settings in either browser to change this behavior. It is also noted that in several test cases, sites are secured with HTTPS, but the certificate name is displayed only in Punycode. While the certificate is associated with the Punycode domain name, users should reasonably expect to see the name in its expected script.

In summary, the community did notice all browsers – except for Internet Explorer on desktop – showed certain issues resolving searches and displaying results properly. The findings indicate that while browser developers are making progress toward becoming UA-ready, there is still more work to be done. This study needs to be performed again to see how the results have improved since 2017 and also expanded to include local web browsers in different countries.

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 top-level domains (TLDs), including new, long, and IDN TLDs. The study also evaluated non-ASCII mailbox names represented in Unicode. The results showed that there is much work to be done before the websites are UA-ready globally. In 2020, the study was repeated with a slightly different design for choosing the 1,000 websites, but with the same testing strategy.

The recent Country-Based Evaluation of Websites for Accepting Email Addresses did the analysis for 50 popular websites in 20 different countries. The 2020 testing provides the overall acceptance rates of different types of email addresses for the 20 countries and allows a comparison of results between countries. 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.

The table below compares the 2020 results to the earlier 2017 and 2019 testing results. Two important caveats should be remembered in this case: different email addresses were tested (but they were of the same type), and the websites tested in 2020 were different than previous ones as they were the 50 most popular in the 20 countries rather than the 1,000 most popular globally. However, these results may still be used to compare overall trends.

Test Case	2017	2019	2020
ascii@ascii.newshort	91%	97%	98.3%
ascii@ascii.newlong	78%	84%	84.8%
ascii@chinese.ascii	45%	50%	47.9%
chinese@ascii.ascii	14%	13%	18.7%
chinese@chinese.chinese	8%	8%	11.0%
arabic.arabic@arabic	8%	7%	11.3%

The results show some change in acceptance rate across all categories of email addresses since 2017, but marginal change from 2019 to 2020 as the 2020 study was commissioned soon after the 2019 one.

Specific country-based detailed results are available in the report.

The recent study also looked at data in different categories across the countries. The acceptance rates are provided in the table below.

	Overall	Media	E-Commerce	Online Services	Banking	Gov't	Education
ascii@ascii.newshort	98%	98%	96%	98%	99%	99%	100%
ascii@ascii.newlong	85%	83%	84%	85%	82%	83%	85%
ascii@chinese.ascii	48%	51%	47%	46%	42%	46%	45%
chinese@ascii.ascii	19%	21%	15%	20%	24%	22%	17%
chinese@chinese.chinese	11%	12%	7%	10%	15%	15%	12%
arabic.arabic@arabic	11%	13%	7%	10%	16%	16%	12%

The data shows that e-commerce platforms have lower acceptance rates for all types of email addresses than other categories. But all categories still need to be addressed, especially to support internationalized email addresses.

In addition to Chinese and Arabic email addresses, some internationalized email addresses in relevant local scripts were also tested. For example, the Thai script was tested in Thailand, and Hebrew in Israel. The results in the below table below show some variation across countries. For example, Germany (DE) shows much higher acceptance rates for internationalized email addresses in German.

	BH	CN	DE	EG	IL
ascii@local.ascii		24.0%	64.0%		48.0%
local@ascii.ascii		14.0%	34.0%		14.0%
local@local.local	10.0%	14.0%	28.0%	16.0%	8.0%
ascii@local.local			54.0%		26.0%
local@local.ascii					
	IN	KW	RU	SE	TH
ascii@local.ascii					42.3%
local@ascii.ascii	18.0%			16.0%	21.2%
local@local.local	12.0%	16.5%	20.0%	4.0%	9.6%
ascii@local.local	18.0%			20.0%	28.8%
local@local.ascii				6.0%	

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 these requirements to achieve UA. EAI is the protocol that allows email addresses that incorporate IDN or Unicode components to function correctly within the email software ecosystem, illustrated below. A study was conducted to evaluate the existing EAI capabilities of that ecosystem in order to measure its "EAI readiness."

The first phase of this project focused on discovery and analysis, and was completed in 2018 and published on the UASG's website as UASG021A. The first phase analyzed a broad set of components from the email software ecosystem (provided in the table below), defined the test criteria to use when evaluating a particular piece of software, and provided an estimate of the effort required to evaluate a select few representative software and service offerings from that set.

Software	MUA	MSA	MTA	MDA	MSP	Webmail	Region
XgenPlus Email Server	X	X	X	X	X	X	AP
Axigen Mail Server	X	X	X	X		X	EUR
MDaemon Email Server	X	X	X	X		X	NA
Oracle Beehive	X	X	X	X		X	NA
Zimbra	X	X	X	X		X	NA
Apple iCloud	X				X	X	NA
Coremail	X				X	X	AP
FastMail	X				X	X	AP
Gmail	X				X	X	NA
Mail.ru	X				X	X	EUR
Microsoft Outlook.com	X				X	X	NA
NetEase 163.com	X				X	X	AP
Oath Mail	X				X	X	NA
Rediffmail	X				X	X	AP
Sina	X				X	X	AP
Sohu	X				X	X	AP
Tencent QQ	X				X	X	AP
Yandex Mail	X				X	X	EUR
IBM Notes	X					X	NA
Roundcube	X					X	
Apple Mail	X						NA
Microsoft Outlook	X						NA
Microsoft Windows Mail	X						NA
Mozilla Thunderbird	X						NA
Courier		X	X	X			
IBM Domino		X	X	X			NA

Software	MUA	MSA	MTA	MDA	MSP	Webmail	Region
James Enterprise Mail Server		X	X	X			NA
Microsoft Exchange Server		X	X	X			NA
Oracle Communications Messaging Server		X	X	X			NA
Exim		X	X				
Halon		X	X				EUR
OpenSMTPD		X	X				NA
Postfix		X	X				
Sendmail		X	X				NA
Dovecot				X			
Fetchmail				X			
Procmail				X			

In subsequent work carried out in 2019, three email tools and services were tested, and the test criteria was finalized. The details of the testing and review of the three services has been published as UASG021B. The study also undertook an exercise to estimate the effort required to do the detailed testing of email tools and services for subsequent broader gap analysis, which is also published in the report.

Work is continuing on this evaluation in two directions. First, the testing criteria developed is now being used to test popular tools and services used globally. So far, a surprising range of EAI compatibility has been found, from almost perfect in some packages to none at all in others, and everything in between. The following are initial test results, which will be published in an upcoming detailed report:

- **Apple Mail MUA**: cannot send EAI mail, displays EAI mail well.
- **Thunderbird MUA**: cannot send EAI mail, displays EAI mail well.
- **Desktop Outlook MUA**: passes most tests, some challenges in handling RTL scripts.
- **Roundcube webmail**: passes most tests, bugs in handling of unencoded UTF-8 header strings.
- **Coremail webmail**: good EAI support.
- **Yandex webmail**: can send EAI mail but cannot receive it. Good support for EAI in webmail interface.
- **Postfix MSA/MTA**: passes most tests, does not consider A-labels and U-labels on its own domains equivalent but can be configured to treat them the same.
- **Sendmail MTA/MSA**: no EAI support.
- **Fetchmail MDA**: no EAI support.

In addition, work is also in progress to expand the analysis of email ecosystems to document advertised EAI support for various tools and services, and to include additional tools and services from other categories (e.g. address books and spam filters). These studies will be published in 2020 and will help document the current status of EAI support.

EAI Readiness of Email Servers

The use of internationalized email addresses has been slowly growing. To determine how widely such email addresses are accepted, a survey of email servers across domains registered in hundreds of top-level domains (TLDs) was conducted in early 2019, with results published in a report on EAI Readiness in TLDs. The surveyed TLDs ranged from the largest, .COM, to those with low registrations. It tested mail servers under a TLD that was responding with EAI support flag "on" on a request to connect; further EAI support beyond it was not tested. Details of the methodology are presented in the report.

Overall, 9.7% of the domains sampled may be EAI ready. In the largest TLDs (over a million names), 10.5% of the domains sampled indicated EAI support. Microsoft's Outlook.com recently became EAI ready; before that the numbers would have been 7.41% and 7.93%. Interestingly, IDN TLDs were significantly less ready than non-IDN (4.7% rather than 9.8%), but most IDN TLDs are small and none of the ones sampled have many active mail servers. The data is summarized in the illustration below with details in the report.
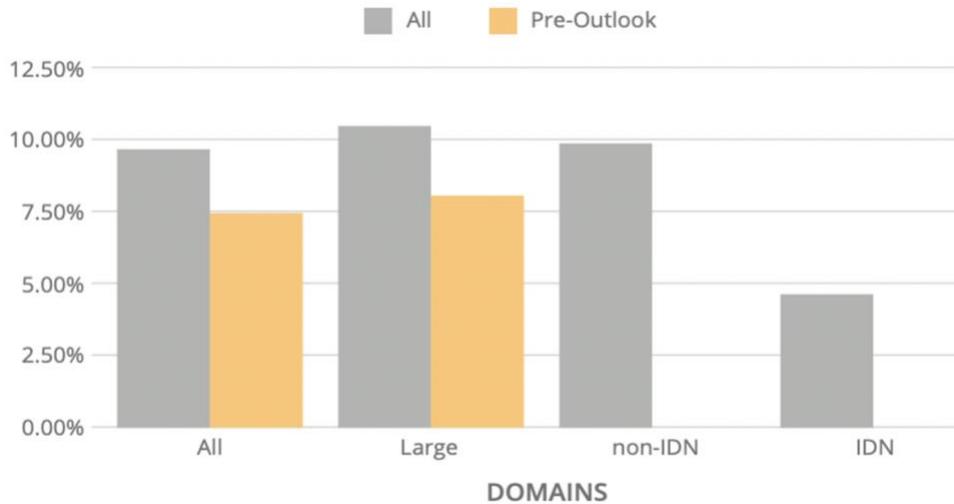
Detailed results based on email servers based on TLDs are presented below.
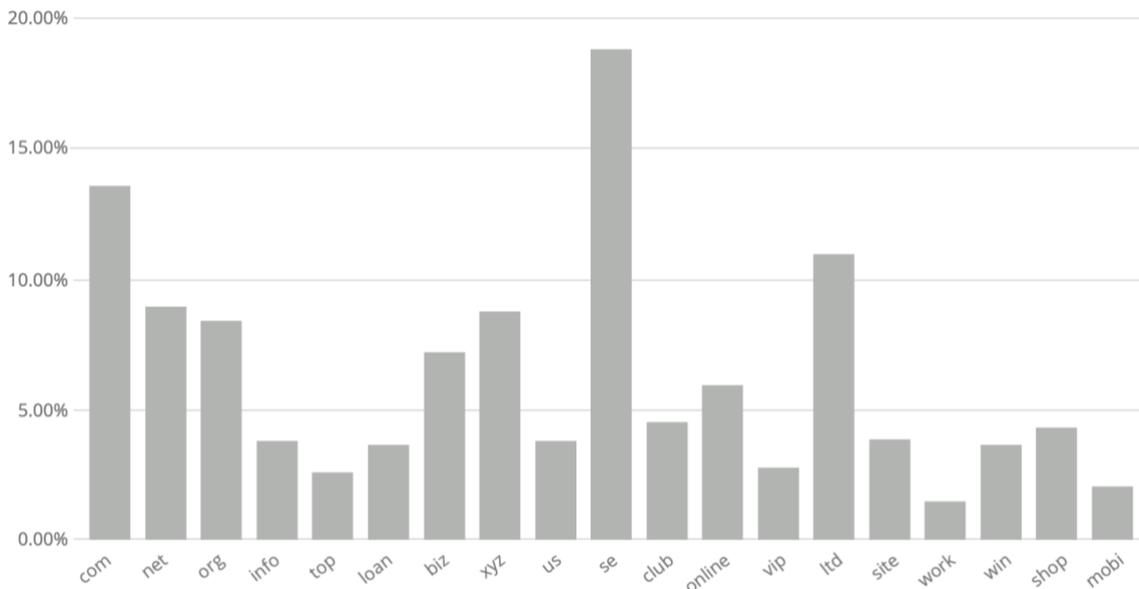
The study found the following details related to the different email tools and software:

- **Sendmail**: the original Unix mail program now largely supplanted by Postfix. Both free and commercial versions now maintained by Proofpoint. It also has EAI support not turned on by default.
- **Exim**: popular open source mail package for Unix and Linux systems from the University of Cambridge (UK). It also has EAI support not turned on by default.
- **MailSite**: commercial Windows mail package. No EAI support.
- **Microsoft**: Exchange servers, different from hosted outlook.com.
- **Haraka**: high performance open source mail package written in Javascript using the node.js framework. Recent versions support EAI.
- **MailEnable**: commercial Windows mail package. No EAI support.
- **MDaemon**: commercial Windows mail package. No EAI support.
- **CommuniGate Pro**: commercial multi-platform messaging package. Optional EAI support.

The study also identified several popular hosted email systems and their level of support:

- **Gsmtp**: Google's mail system. EAI ready.
- **Outlook.com**: Microsoft's mail system also known as Hotmail and Live.com. EAI ready.
- **Nemesis**: Mail system from 1&1/Schlund, the large German-based hosting provider. No EAI support.
- **Amazon SES**: Hosted mail service for Amazon cloud customers. No EAI support.
- **Bizsmtp**: Godaddy's hosted mail service. No EAI support.

It should be noted that the status of support may have changed since the study. More detailed analysis on many of these tools and services is underway.

Outreach for Promoting UA

Outreach to promote Universal Acceptance is taken through multiple mechanisms, major ones include the following:

1. UA Ambassador Program
2. UA Local Initiatives
3. UASG website and social media channels
4. UA-related reports and publications
5. UA awareness and capacity building events

UA Ambassador Program

The UASG has identified several ways to promote UA and EAI issues and solutions, one of which is 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. For 2019, the UA Ambassadors included the following:

1. Harish Chowdhary - India

2. Mark W. Datysgeld - Brazil
3. Abdalmonem Galila - Egypt
4. John Levine - USA
5. Zhijiang Liu - China
6. Xiucheng Wu (Marvin Woo) - China
7. Yangyi Wu (Walter Wu) – China

2019 was a busy and productive year for the UASG, as it worked to spread awareness of digital inclusivity around the world. Driven in a large part by the UA Ambassadors, there has been an increase in activities and interest in how organizations – from technology companies to developers – can address UA challenges and solutions. Throughout the year and throughout the world, the UA Ambassadors have organized awareness sessions, held training workshops, conducted hackathons, met with local technology companies, and attended events to help further the mission of the UASG. This blog presents an overview of efforts that took place in more recent months in China, India, Latin America and the Caribbean, as well as Europe, the Middle East, and Africa.

Figure 1: UA Ambassador events in Egypt, India, Brazil, and China in 2019.

More recently, the UASG welcomed six new UA Ambassadors into the program in 2020 (term from July 2020-June 2021). The newly joined ambassadors have a wide range of expertise and experience in the domain name industry, IT, engineering, software development, and technical research, and will help support UA efforts in Benin, India, Nigeria, South Africa, and Turkey. The UA Ambassador Program now has a total of 13 ambassadors from nine different countries representing the Asia Pacific (APAC), Europe, Middle East and Africa (EMEA), Latin America and the Caribbean (LAC), and North America (NA) regions. The full list of UA Ambassadors and their bios are available here.

UA Local Initiatives

The UA Local Initiatives work in close consultation with UASG leadership, UASG 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 stakeholders to encourage them to become UA-ready.

The Local Initiative program started in 2019 with work starting in two regions: Commonwealth of Independent States and Eastern Europe (CIS-EE) and India. Some details of their work are provided below.

Commonwealth of Independent States and Eastern Europe (CIS-EE) Local Initiative

The CIS-EE Local Initiative was approved by UASG leadership in December 2019. So far, the CIS-EE Local Initiative has gathered local experts and official representatives from 12 IDN ccTLD, new gTLD registries, and IT companies from 7 countries: Armenia, Belarus, Georgia, Latvia, Russia, Serbia, and Ukraine. The members of the CIS-EE Local Initiative are focused on communication and collaboration with different stakeholders within these countries while considering the local community diversity in each country. The work of the CIS-EE Local Initiative covered both technical training and general outreach efforts, some of which are summarized below.

UASG training for trainers on UA engagement was held on 12 October 2019 during the Eastern European DNS Forum in Yerevan, Armenia. It was attended by 15 regional participants from 5 countries.

The first EAI deployment training was held by the Internet Society NGO in December 2019 during the annual REGITON event for local registrars and hosting providers in Yerevan, Armenia. It was attended by 50 participants.

The second training on EAI deployment for system administrators was held on 16 May 2020 in Russia by the Coordination Center for TLD .RU/.РФ. Live streaming of the event was available on an online platform of the biggest Russian Internet conference РИФ.Онлайн (https://2020.rif.ru/online/5709) with additional streaming on its YouTube channel. About 540 unique views were reached by the end of May 2020.

Figure 2: UA events held in CIS-EE in 2019.

The UA case named "Domain.РФ" was presented by the Coordination Center for TLD .RU/.РФ at an online hackathon of the "Digital Breakthrough" competition (https://leadersofdigital.ru/) – the largest hackathon for IT professionals in Russia. The all-Russian competition annually brings together the best IT specialists from all over the country, leading IT-technology companies, and industry experts. 13 teams were shortlisted for the final of the hackathon with UA-supported software decisions. UA Ambassador Abdalmonem Galila took part in the event as a technical expert. More information is available at https://hack2.leadersofdigital.ru/home.html.

The UA-related project Поддерживаю.РФ was launched by the Coordination Center for TLD .RU/.РФ in April 2020 in Russia. So far the project includes the following topics: research popular software for email and web infrastructure (servers, clients) in Russia, including open source; guidelines on development for Cyrillic IDNs and EAI support in open source and commercial software and other UA documentation in Russian; special involvement program for open source contributors to make changes for UA support (in progress); outreach activities for promoting UA and the project within the Russian Internet community.

The local initiative has been working on a series of educational materials on UA readiness for the local community. The first article "IDN domains: why to use and how it works" in the

Russian language was published and promoted by the Coordination Center for TLD .RU/.РФ. It was added into the digital skills training website's knowledge base in June 2020 (https://digitaldictation.ru/know/). The second and third articles for non-technical Russian-speaking audiences are being published this year to complete the series.

The initiative also organized a UA-related public discussion in the region. In 2019-2020, there were several regional events where UA issues were raised and discussed. One of the most relevant discussions focused on the topic of "Cyrillic on the Internet" which was held during the 10th anniversary of .РФ IDN TLD celebrations. Different kinds of interactive events were organized with involvement from the public sector, business, academia, technical community, and other stakeholders on 12 May 2020. More information is available at https://2020.rif.ru/online/5693; https://2020.rif.ru/online/5694.

A special report on the current level of EAI acceptance on Russian websites based on the UASG evaluation (UASG027) and additional testing provided by Coordination Center for TLD .RU/.РФ staff were published in the Russian language and promoted in June 2020.

India

With the support of ICANN org, FICCI-ILIA runs the Local Initiative of India. The prime objective of this initiative is to promote Universal Acceptance in India so that more people can come online and leverage the Internet in their local languages.

The initiative kicked off with the first working group meeting in December 2019, which was attended by several key stakeholders from the community. The India UA Local Initiative started its first activities in April 2020, when FICCI-ILIA organized an icebreaker webinar session on the "Importance of Language Computing Technologies during Global Health Crisis". The session was attended by 80 participants and was well received by the community.

The local initiative organized the second working group meeting on 11 May 2020. The meeting considered how community members can contribute to the initiative and how to reach key target audiences and increase their engagement. The meeting was followed by a UA awareness webinar on UA in the context of India.

Further understanding the importance of technical aspects of UA, the local initiative held the technical workshop on 22 June 2020. Themed "Universal Acceptance Overview," the session was attended by nearly 50 participants with a technical background. Sushanta Sinha, a new UA Ambassador, was the trainer of the session. The technical session was valued by the community and there have been requests to repeat it in the coming months.

The success of any community-based initiative depends on the collaborative efforts of the stakeholders involved. Keeping that in mind, the India UA Local Initiative also supports several other activities organized by the community, including the UA webinar hosted by Harish Chowdhary, another UA Ambassador from India.

The initiative also organized the third working group meeting on 9 July 2020 to synchronize the ideas and to develop a cohesive approach towards the development of UA in India. The meeting was chaired by Ajay Data, chair of the UASG, and other UASG members and ambassadors from India, including Satish Babu, T. Santhosh, Harish Chowdhary, Sushanta Sinha, and Aman Masjide.

| Sushanta Sinha, UA Ambassador, during his address at the UA Technical Webinar. | Ajay Data, UASG Chair, during the UA Awareness Webinar on 11 May 2020. |

UASG Website and Social Media Channels

The UASG continues to bolster its digital footprint. In order to globally showcase UA efforts and highlight events and achievements, the UASG produces and publishes important documents online at UASG.TECH, which are also translated into different languages based on the needs of the community (e.g. Arabic, Chinese, English, French, Hindi, Russian, Spanish, etc.) The UASG is currently in the process of developing its website to be more user-friendly and to make it easier to access UA information and publications online. In 2019, a group was established to assess the structuring of content and pages on the UASG website in order to organize information to create an improved user experience. A new web site development project will be initiated in the financial year 2021.

The UASG also has active social media channels. During the year, the UASG has been generating organic content about UA for followers on Facebook, LinkedIn, and Twitter. This includes promoting community events before and in real-time during events, available UA resources, and UA-related news. At ICANN66, the UASG held a special UA giveaway promotion via Twitter that engaged meeting attendees in-person and on social media.

During 2019, some video materials showcasing UASG members and UA messaging were produced and published on the UASG YouTube channel: Call to Action for UA by Ajay Data, UASG Chair, and UASG and Microsoft Work Towards UA by Mark Svancarek, UASG Vice-Chair.

UA-Related Reports and Publications

The UASG has published several UA and EAI-related reports and articles in different languages in order to reach a global and diverse audience to raise awareness about UA. The table below shows the UA research reports published in 2019 and 2020. Click here for a complete list of publications.

Document Title	Summary	Link	Language
UASG 007 Introduction to UA	An overview of the baseline concepts of Universal Acceptance and an introduction to advanced topics such as	https://uasg.tech/wp-content/uploads/documents/UASG007-en- digital.pdf	Arabic, Chinese, English, French,

	right-to-left scripts, the Bidi algorithm and Normalization.		Russian, Spanish
UASG 021A EAI: Evaluation of Major Email Software and Services	Provides details on the Discovery and Analysis phase of the EAI Evaluation project.	https://uasg.tech/wp-content/uploads/documents/UASG021A-en- digital.pdf	English
UASG 021B EAI: Evaluation of Major Email Software and Services	Provides details on the Discovery and Analysis phase of the EAI Evaluation project.	https://uasg.tech/wp-content/uploads/documents/UASG021B-en- digital.pdf (PDF) https://uasg.tech/wp-content/uploads/documents/UASG021B-en- digital.pptx (PowerPoint)	English
UASG 025 Global Evaluation of Websites for Acceptance of E-mail Addresses in 2019	Evaluate UA compliance of the top 1K websites in the world by sampling the practices & different development approaches to the e- mail field in forms on the Web and testing them in practice.	https://uasg.tech/wp-content/uploads/documents/UASG025-en- digital.pdf (PDF) https://uasg.tech/wp-content/uploads/documents/UASG025-en- digital.pptx (PowerPoint)	Arabic, Chinese, English, French, Russian, Spanish
UASG 026 UA Readiness Framework	Technical guide that provides a framework for scoping UA conformance work on software applications, focusing on the major components of an application to help developers more easily problem solve.	https://uasg.tech/wp-content/uploads/documents/UASG026-en- digital.pdf (PDF)	English, Russian
UASG 027 Country-based Evaluation of Websites for Acceptance of Email Addresses in 2020	A follow up to testing done in 2018 and 2019 (UASG025), this document evaluates the acceptance rates of internationalized email addresses by websites in different countries.	https://uasg.tech/wp-content/uploads/documents/UASG027-en- digital.pdf	English

The UASG worked with a variety of media outlets and trade publications to increase the coverage of UA-related issues, while also promoting the different UA events that were conducted by community subject matter experts. The following media articles were published in 2019 and 2020.

Publication	Title and Link	Date of Publication
TechEconomy.ng	ICANN rallies stakeholders for Universal Acceptance, local initiatives in Africa	5 May 2020
BBC.com	The many languages missing from the internet	14 April 2020
IDN World Report	Task Force on Arabic script IDNs – interview with ICANN's Baher Esmat	28 February 2020
Business Chief	Universal internet access – is it a pipe dream?	26 January 2020

TechCrunch	Universal Acceptance is the first-mover advantage that may be worth billions	19 December 2019
First India	Dr. Ajay Data, UASG Chair editorial: Bug in your website, solve to enable your business for next billion customers	17 October 2019
ABES Software	Como empresas globais lidam e se adaptam ao multilinguismo presente na internet Article in Portuguese "How global companies deal with and adapt to the multilingualism present on the internet"	26 September 2019
TechTarget	What is Universal Acceptance (UA)?	16 September 2019
TechTarget	What is Email Address Internationalization?	24 August 2019

UA Awareness and Capacity Building Events

In 2019 and 2020, the UASG embarked on developing and disseminating technical training related to UA. Three distinct training materials were developed. 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 (i.e. EAI) for email and system administrators. The third training covers the technical details on how to program websites and applications with UA support, currently using examples from Java programming language, aimed at software developers.

Training	Audience	Description	Duration
UA Technical Overview	- CIOs - IT managers - System administrators - Software developers	An overview about UA and EAI readiness issues	1.5 hours
Configuring Email Address Internationalization (EAI)	- Email administrators - System administrators - IT managers	Technical configuration and setup of EAI supported email service	3 hours
UA for Java developers	- Software developers - Software project managers	Develop current best practices for UA compliant Java applications	3 hours

All the UA training materials are available on the UASG's training wiki page.

To develop capacity in conducting this training, a Train-the-Trainer program was launched and 40-plus trainers from more than 15 countries were trained using these trainings.

The UA Ambassadors also conducted many UA training sessions in collaboration with the Local Initiatives and other local events, including the national and regional Internet Governance Forums. See the section on UA Ambassadors and Local Initiatives for more details.

Below is a list of some of the UA-related outreach conducted during 2019-2020.

Date(s)	Event	Location
20, 23 July 2020	UA Train the Trainer Training on UA for Java Developers	Remote
9 July 2020	ICANN LAC Talk on UA	
16-25 June 2020	ICANN68 - UA At large Advisory Committee (ALAC) and Governmental Advisory Committee (GAC)	Remote
22 June 2020	UA technical training by UA Local Initiative - India	Remote
15, 18 June 2020	UA Train the Trainer Training on EAI Configuration	Remote
12 June 2020	UA ISOC Rural Development SIG Seminar	Remote
11 June 2020	Pre-ICANN68 UA Webinar	Remote
18 May 2020	UA Train-the-Trainer Training on UA Technical Overview	Remote
18 May 2020	UA Seminar for Turkey	Remote
11 May 2020	UA India Local Initiative UA Seminar	Remote
10 May 2020	UA CIS-EE Local Initiative EAI training	Remote
30 April 2020	UA Seminar for Africa	Remote
15 April 2020	UA Seminar for Middle East	Remote
7-12 March 2020	ICANN67 UA Sessions	Remote
21-24 Dec. 2019	THNG9	Petchaburi, Thailand
2-7 November 2019	ICANN66 UA Sessions	Montréal, Canada
19-24 October 2019	World Internet Summit	Wuzhen, China
22-25 July	Africa DNS Forum	Botswana

## UA Global Support by ICANN Org

The UASG allows any community member to log an issue through its website as illustrated below.
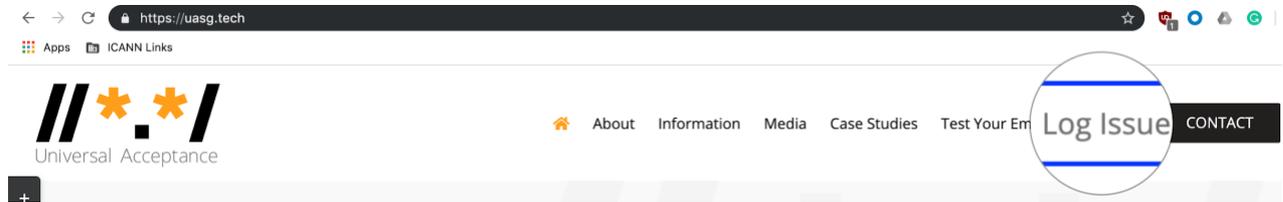

ICANN org has provided support in following up on issues reported from the UASG website through its global support function. The objective of this function is to reach out to the relevant technical team that supports the reported website and inform it about the UA problem. The team also provides relevant information to the technical team to help them address UA issues and tracks these interactions until the issue is resolved. The cases and their tracking are reported to the UASG community.

Here is the current summary of cases for 2019-2020. The resolved status is based on a reply from the point of contact of the reported entity (followed by some basic checking), and detailed testing may be needed for confirmation.
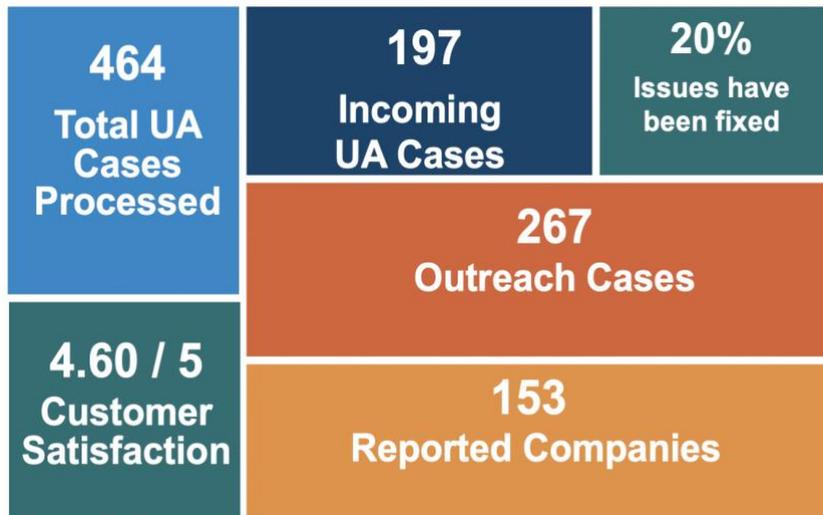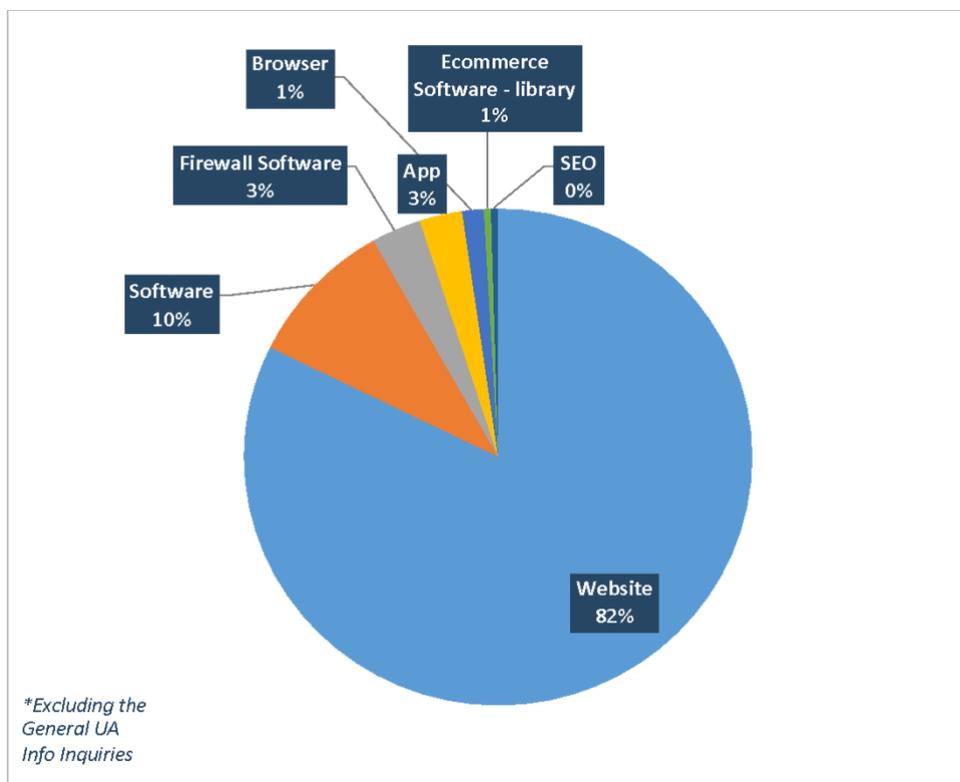
The data shows that the following types of UA issues were reported:
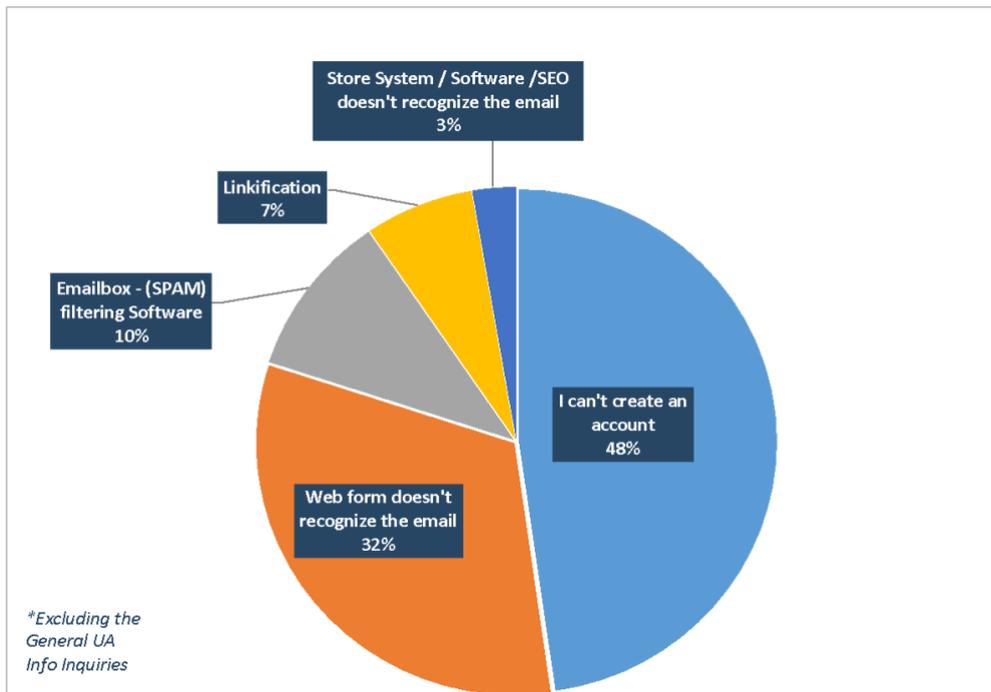
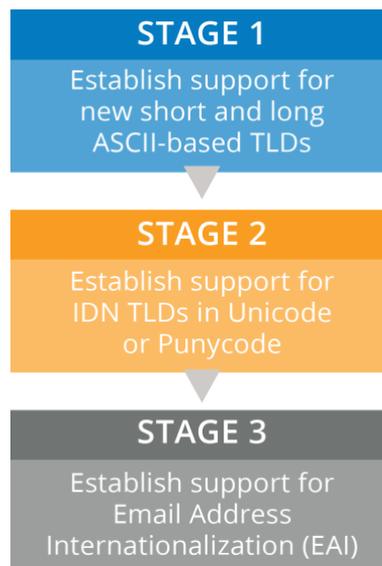The following source of UA issues were reported:

Becoming UA-Ready: ICANN Org Case Study

ICANN org has been assessing and updating its systems since 2017 to ensure all its systems become fully UA-ready in the next couple of years. Currently, many systems created and run by ICANN are UA-ready, and those that rely on plug-ins or software operated by third parties are underway. Examples of ICANN systems that are UA-ready include:

- At-Large system – the website dedicated to individual Internet community users who participate in the policy development work of ICANN.
- ICANN Lookup (previously ICANN WHOIS) – a tool that provides users with the ability to look up publicly available registration data for top-level domain (TLD) names.
- New generic TLD Application Status – the website that provides the current status and details for gTLD applications.

ICANN's journey to UA readiness was divided into three stages:

- Stage 1: Support both new short and long ASCII TLDs – completed.
- Stage 2: Support Internationalized Domain Names (IDNs) – to be completed in 2020.
- Stage 3: Support non-ASCII email addresses – in progress.

STAGE 1
Establish support for new short and long ASCII-based TLDs

STAGE 2
Establish support for IDN TLDs in Unicode or Punycode

STAGE 3
Establish support for Email Address Internationalization (EAI)

ICANN has completed the first stage and is set to complete Stage 2 in 2020. Work has already started for achieving Stage 3 goals, where ICANN org is working with other relevant organizations to make its email system support EAI. Additional details and lessons learned from ICANN org's ongoing effort on becoming UA ready were recently captured in ICANN's case study.

Looking Ahead

The work on UA readiness requires a considerable effort by all of us – it cannot be done in isolation. If *my* email server supports UA but *yours* does not, the email in local languages will not work. It is great to see continued support and contributions from the community aimed at achieving UA readiness. However, we need more people adopting UA in practice. The UASG's efforts so far have shown that there has been a significant demand from the community to learn about how to fix UA issues. The UASG, through its Local Initiatives and Ambassadors, have responded by developing training materials, instructing trainers, and organizing training sessions. UA Ambassadors have been extremely helpful, but more are needed to spread the message actively. The UASG is always looking for more volunteers to adopt and promote UA.

Moving forward, the UASG needs to continue the gap analysis to further document the extent of the problem (i.e. lack of UA readiness). The UA Measurement Working Group will assist with this analysis. The focus also needs to shift towards outreach to stakeholders who can update their technology and systems to be UA-ready. The UA Technology and EAI Working Groups will focus on this remediation effort in 2021. In order to be more effective, messaging needs to target these stakeholders as well beyond just general messaging. The Communications Working Group is working on this and we aim to roll this out soon.

All the UASG working groups have reviewed their work and lessons learned in order to plan for FY21. The UASG has worked to prioritize which FY20 actions are still relevant and have identified additional items that are needed to address UA. The shortlisted items have been prioritized for the FY21 Action Plan, taken up for the period from July 2020 to June 2021.

Resources

- Contact the UASG: https://uasg.tech/contact/

- Meet the people of the UASG: https://uasg.tech/about/people/

- See all UA case studies: https://uasg.tech/case-studies/

- Participate in UASG Discussions: https://uasg.tech/subscribe

- Report UA problems with other applications: https://uasg.tech/global-support-centre/