

.eu Insights

# World report on Internationalised Domain Names 2015

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United Nations  
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# World report on Internationalised Domain Names 2015

.eu Insights

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The EURid Insights series aims to analyse specific aspects of the domain name environment. The reports are based on surveys, studies and research conducted by EURid in cooperation with industry experts and sector leaders.

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## Foreword

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by Roberto Viola, Director General of DG Connect  
at the European Commission

The role of the Internet is particularly important to the European economy and that is why we have launched this year our Digital Single Market strategy.

At the same time, the Internet is a wonderful tool for communications, exchange of information, knowledge and contacts for people even in remote and underserved areas all around the world. This year sees the overall review of ten years of progress after the World Summit on the Information Society (WSIS) highlighted – as never before – the role of the Internet as a driver of innovation, economic growth, information and communication as well as social change for the whole world. Access to the Internet has become an important factor in facilitating the development of peoples, helping some of them to achieve basic living standards and making them part of the global society. We have also seen the recent adoption of the Sustainable Development Agenda and the Sustainable Development Goals which emphasise the use and application of information and communication technologies in reaching those goals to help reduce poverty, increase access to education and healthcare, improve environmental conditions, and provide a voice to and from individuals and communities.

In Europe we have some experience with ensuring that different cultures and languages can interact and grow together to build an even stronger community based on common goals and principles. We want to see diversity and multilingualism flourishing in our common European environment. This is even more so the case at the global level where efforts are being made to bring the next 4 billion Internet users online and where the ability to access the Internet in one's own language will be an essential factor in ensuring success of that goal.

The European Commission has been working for many years to ensure that the Internet remains a single, open, free, unfragmented network of networks. Encouraging and helping to reinforce linguistic and cultural diversity is not just a nice goal to have – it is in our European DNA. Indeed in Europe we are lucky to have our own European Top Level Domain (TLD), .eu, which has been providing an excellent service to the European

citizens over the past nine years. The .eu TLD has been supporting all the official European Union languages at the second level since late 2009 and therefore, providing a very good example of putting Internationalised Domain Names into practice. It is clear that Internationalised Domain Names (IDN) are essential for a multilingual and inclusive Internet. That is why the European Commission and EURid, the registry manager of the .eu TLD, have been working hard to introduce the .eu in Greek and Cyrillic at the top level within the arcane processes set by ICANN to request IDN at the top level.

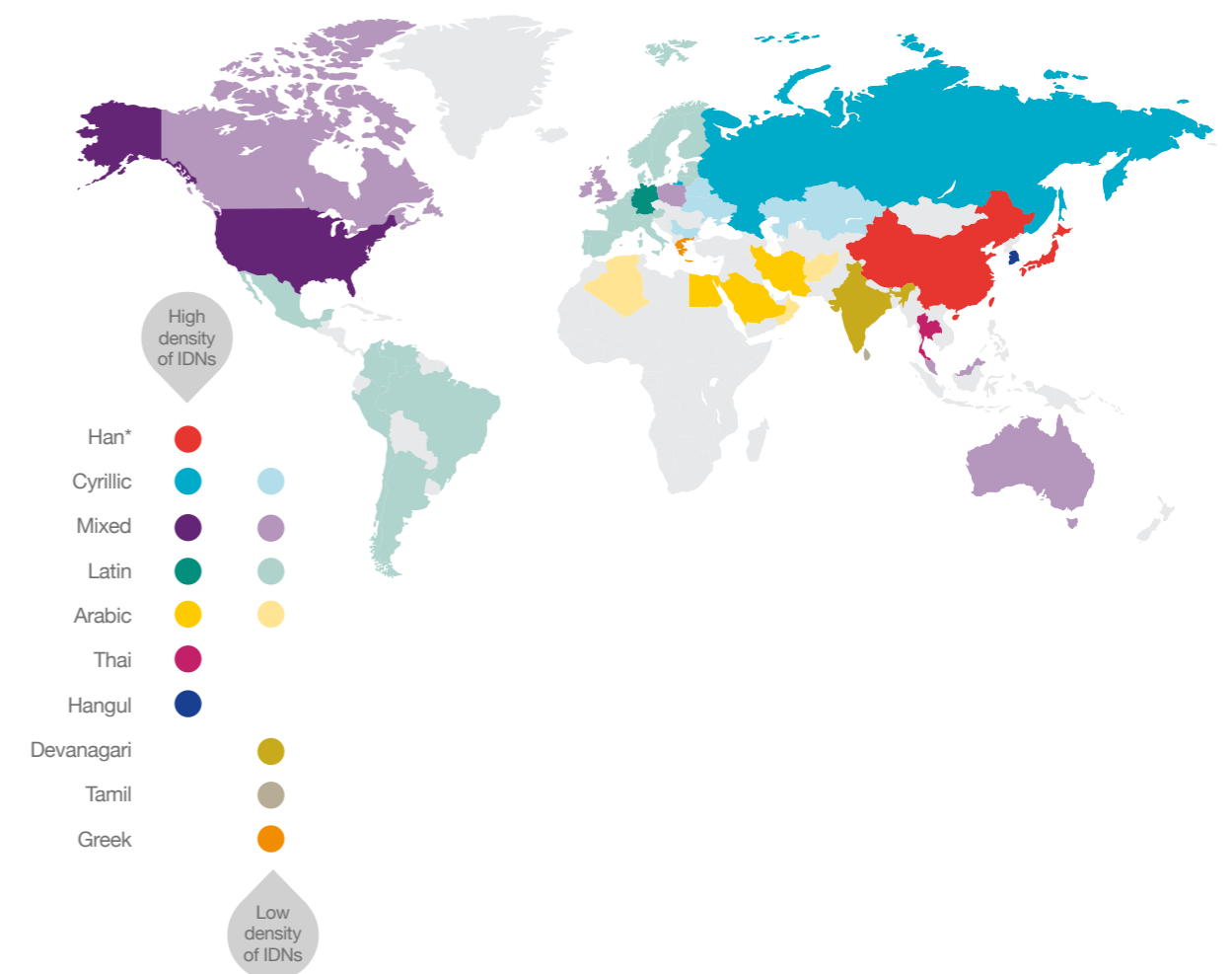
Only by pursuing a policy of multilingualism in Internet access we can give effect to our policy of an Internet that is truly global, and truly accessible to all. This report demonstrates quite clearly that the use of IDNs can lead to better Internet uptake by different language groups. While much of the information available on the Internet in the past has been dominated by one or a few languages, that will change dramatically in the future making the Internet a true Babel for the world's different communities and language groups. Evidence from the World Report on Internationalised Domain Names indicates that IDNs are closely coupled to multilingual content - supporting the availability of Internet in different languages and scripts, in making it more accessible to more people. After all, the goal of getting the rest of the world online cannot be achieved without their precious support, and this makes it essential that all actors work together to ensure that IDNs function in email, web and other environments to the same standard as traditional domain names.

Therefore, at this time of reviewing the progress made over the last ten years throughout the world in achieving the Information Society goals of the WSIS, and of assessing the role of Internet and the information and communication technologies to achieve the goals of the Sustainable Development Agenda over the next years, it is clear that the actions outlined in our Digital Single Market strategy will be of paramount importance to create the most appropriate digital environment for improving access and driving ever increasing and better growth in Europe with positive repercussions for all the world.

# 1 Executive Summary

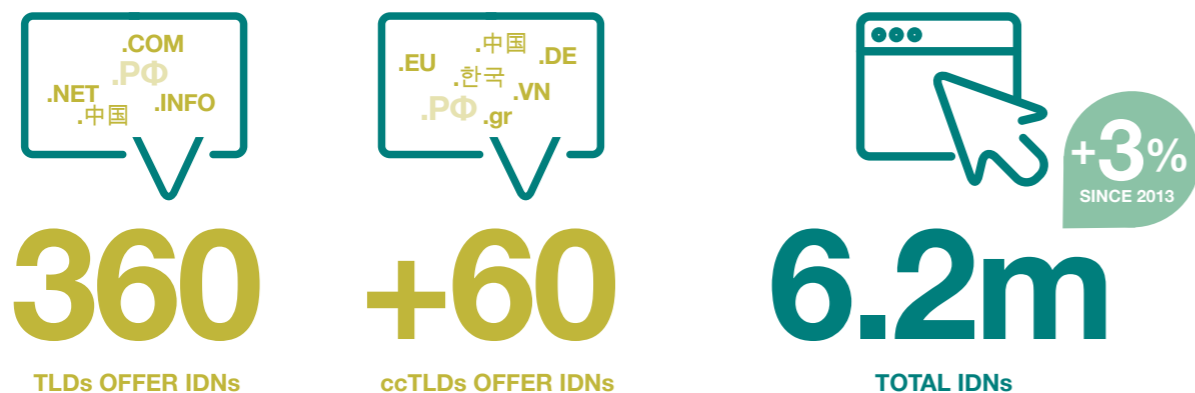
## The IDN World Map, 2014

IDN scripts reflect the languages spoken in countries

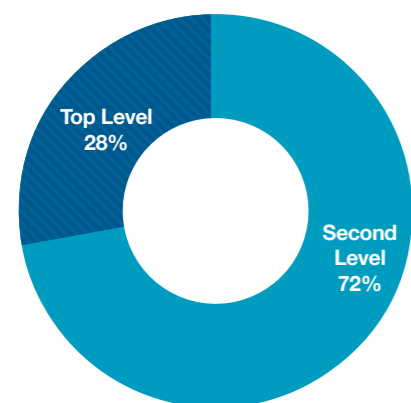


\* includes Han, Katakana and Hiragana (associated with Japanese language)

## IDNs in numbers (top and second level)

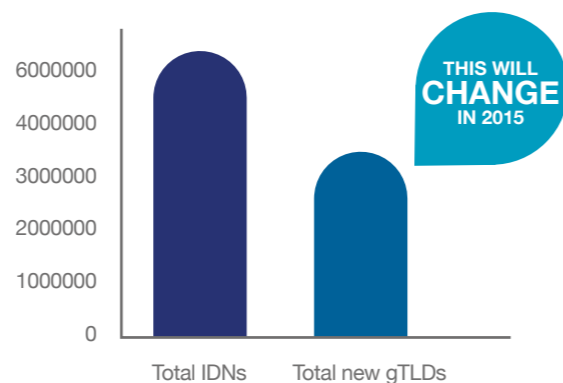


## Top level vs second level IDN registrations

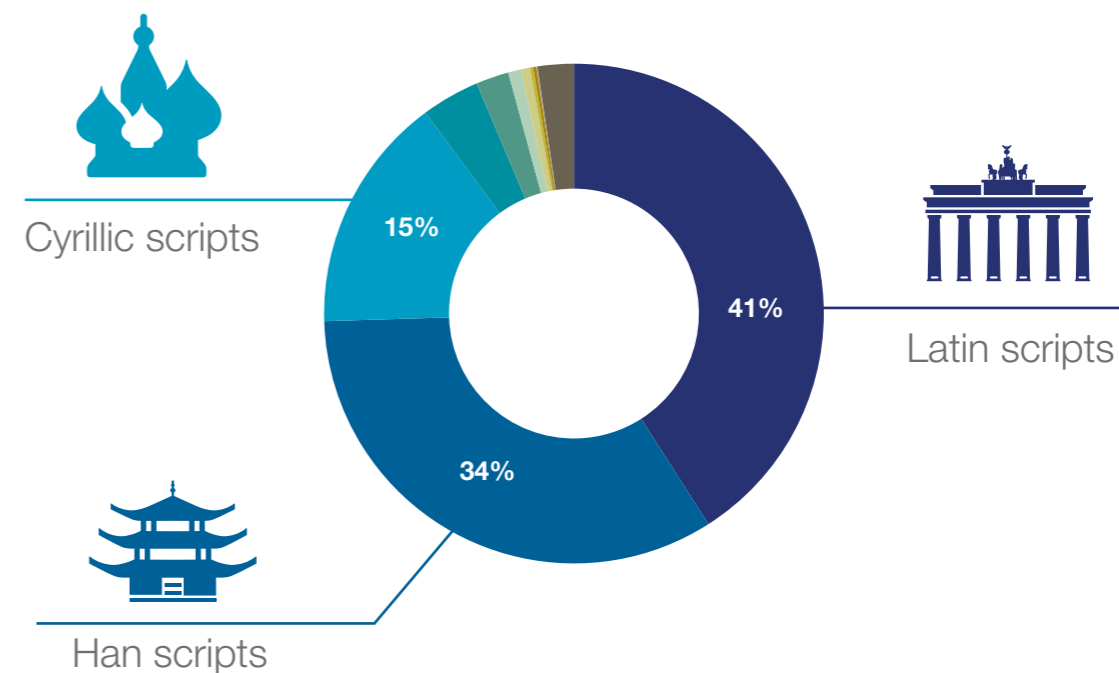


## Total IDNs vs new generic TLDs registrations

In 2014, there were more IDNs than new generic TLD registrations



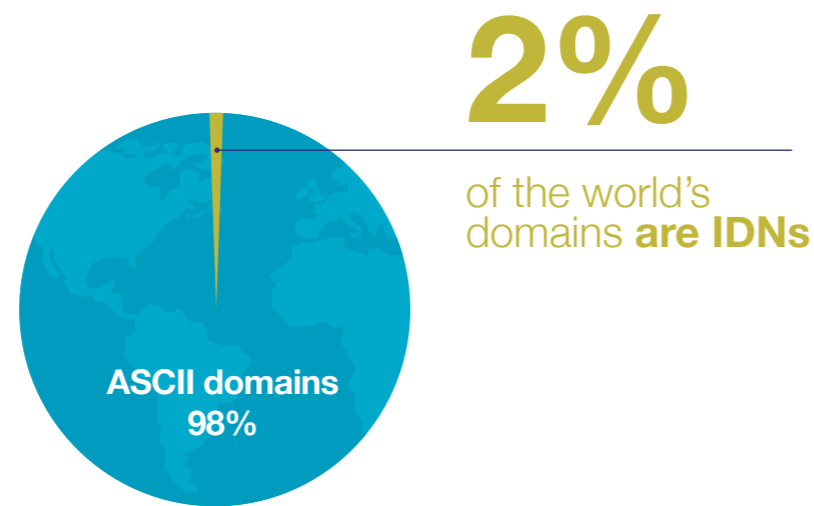
## Three scripts (Latin, Han and Cyrillic) make up 90% of the world's IDNs (2014 – top & second level)



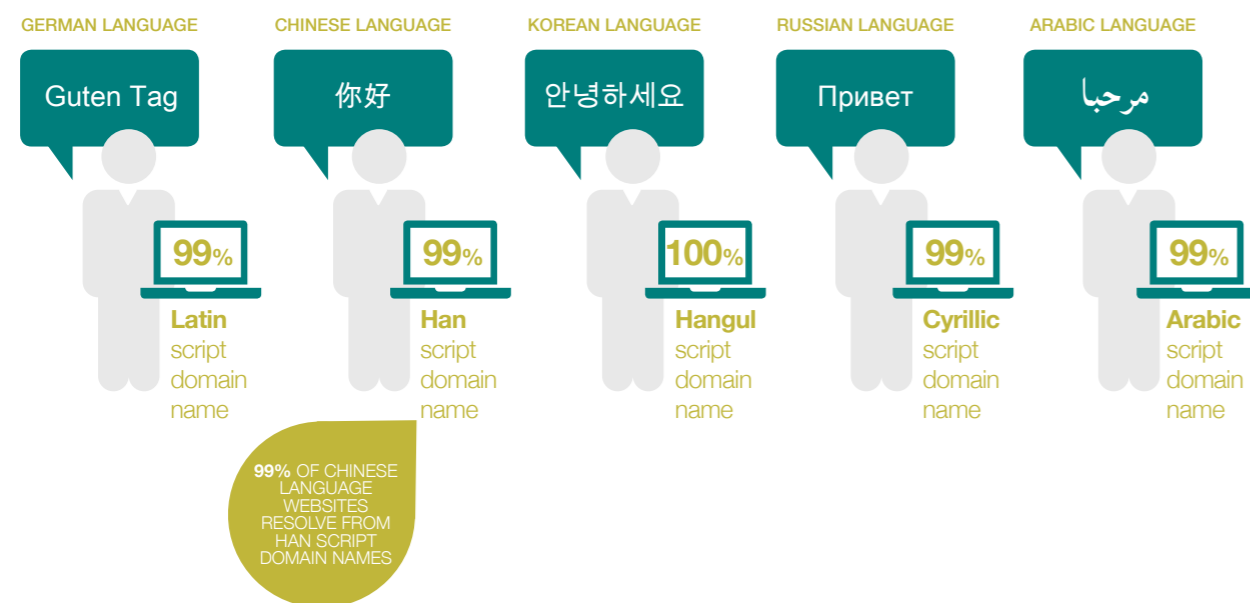
Latin	41%
Han	35%
Cyrillic	15%
Hangul	4%
Han, Katakana, Hiragana	2%
Thai	1%
Arabic	1%
Hebrew	0%
Greek	0%
Devanagari	0%
Other	2%

**90%**  
of the world's IDNs use **these three scripts**

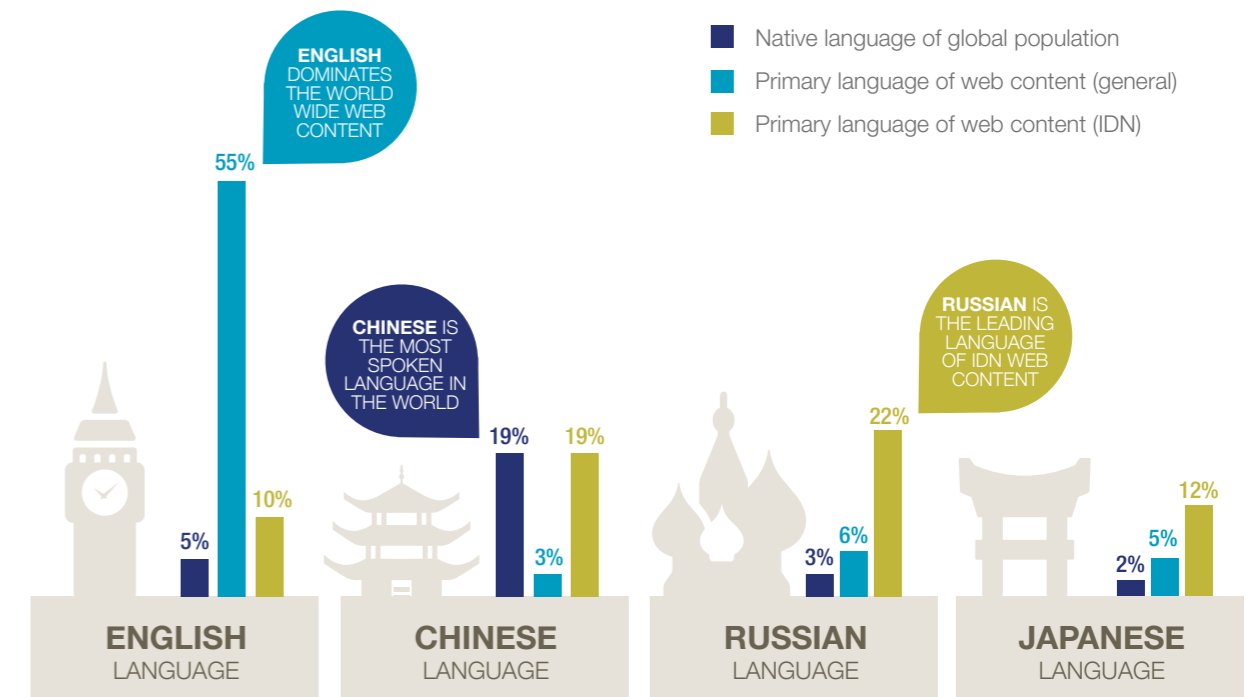
## IDNs as a percentage of all domains



## Web content language & domain name script are nearly perfectly correlated

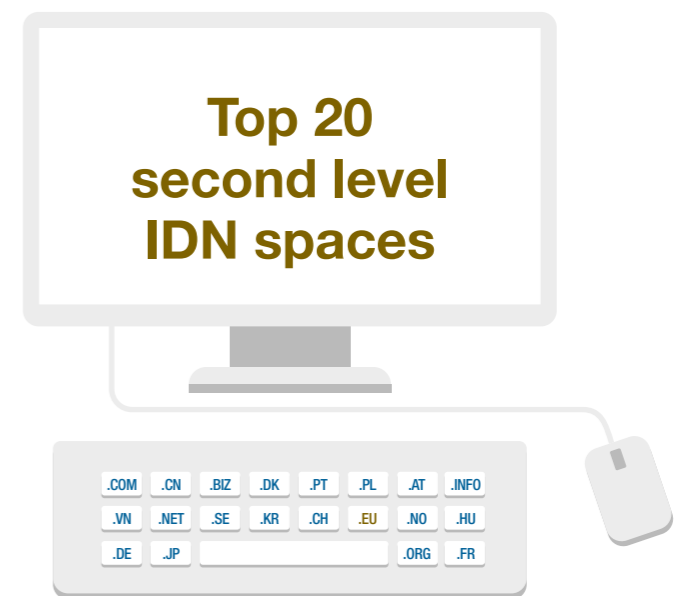


## Web content is more linguistically diverse with IDNs

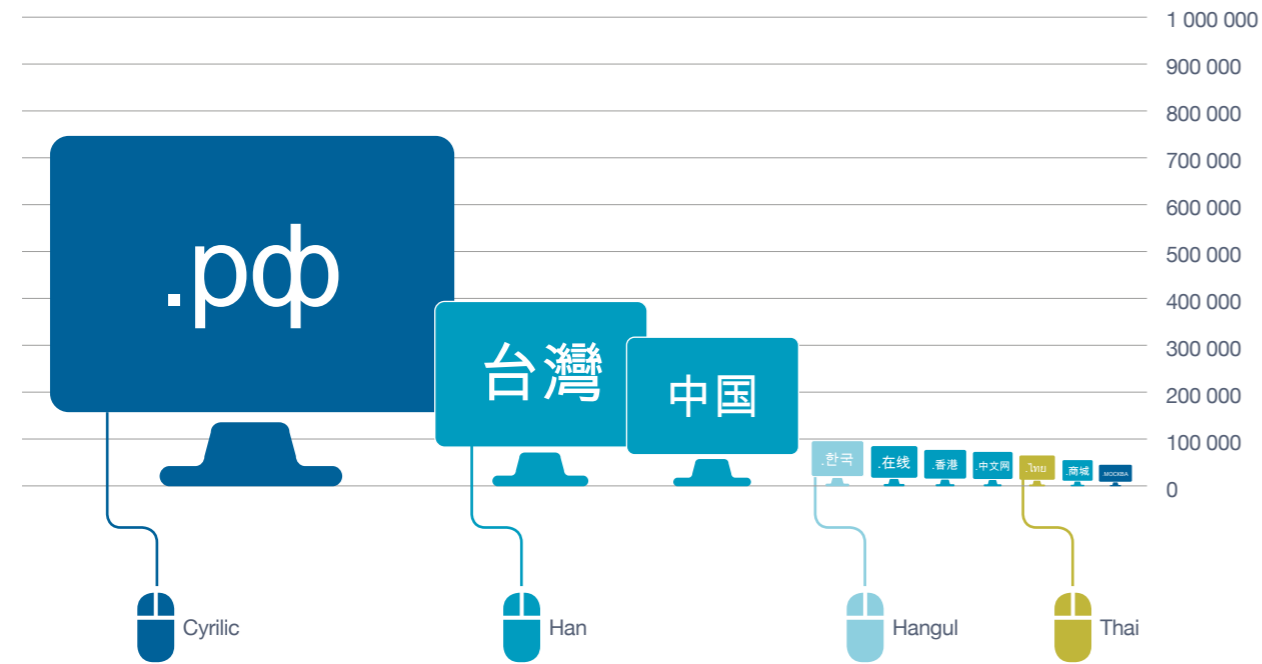


## Top 20 second level IDN spaces

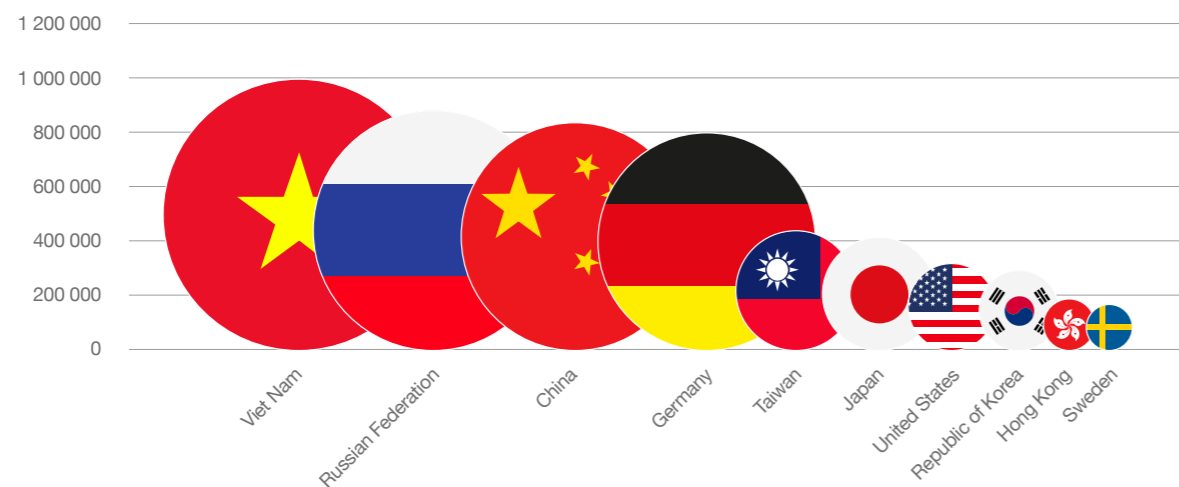
OUT OF 360 IDN NAMESPACES, EU IS IN THE TOP 20



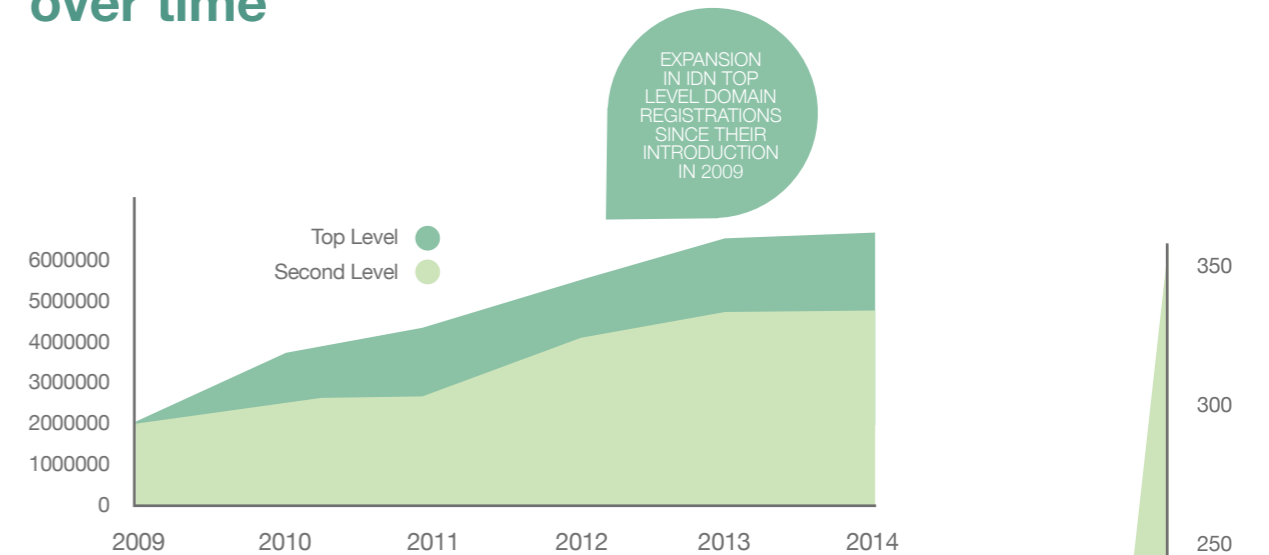
## Top 10 top level IDN registries 2014



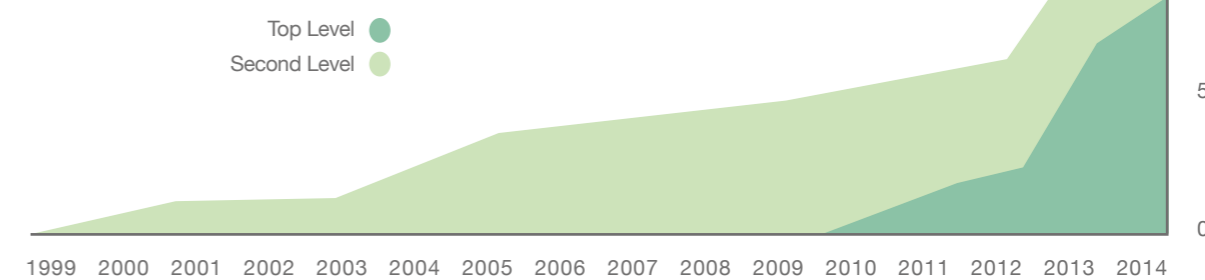
## IDNs (both first and second level) are strongly associated with Emerging Economies



## Growth of IDNs over time



## Cumulative IDN launches 1999-2014





## 2 Introduction

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This year's World Report on internationalised domain names (IDNs) begins with an analysis of why IDNs are drivers of multilingualism (Focus A). It looks at the ways in which IDNs enhance linguistic diversity in cyberspace. It tracks the usage rates of IDNs (both at second level and full IDNs), and the strong correlation between language of web content and script of IDN. For the first time, we then model the language of web content for all IDNs (ccTLDs as well as gTLDs), which demonstrates greater linguistic diversity than web content associated with ASCII domains.

Focus B considers universal acceptance of IDNs, in a chapter by Mark McFadden, following on from previous reports. The section concludes that little progress has been made in the last 12 months, apart from a growing effort to raise awareness of the issue within the ICANN community.

Focus C provides analysis of IDN facts and figures, including the overall number of IDNs, growth rate since last year, second level vs top level registrations and growth, and anticipates that IDN growth is likely to pick up (at least in new gTLDs) in the coming years.

Focus D looks at the most popular scripts in worldwide IDNs, and finds that while Latin script is most popular in second level IDNs, the same is not true of full (top level IDNs), where Cyrillic and Han scripts account for 95% of registrations.

Focus E revisits our annual review of industry opinions on IDNs. As last year, the general trend is downward – with registries tending to be more pessimistic about IDN uptake, support by registrars and end user awareness than they have been in previous years. Universal acceptance, again, is highlighted as the major obstacle to mass IDN uptake.

Focus F and G turn to the European Union. First, there is an indepth focus on .eu IDNs, considering growth over time, usage and language of web content (which correlates closely with languages spoken in the region and IDN script), country of hosting and registrar market share. Finally, there is an analysis of IDNs in the European Union. This begins with a background on the region, and the strength of its domain name industry. Having reported on IDN launches over time, and Europe's share of the worldwide IDN market, the report concludes with four case studies on IDNs in Germany, Spain, Bulgaria and Greece.

The report has an appendix which explains what IDNs are, and presents a timeline of IDN launches at second and top level to 2014.

### FOCUS A

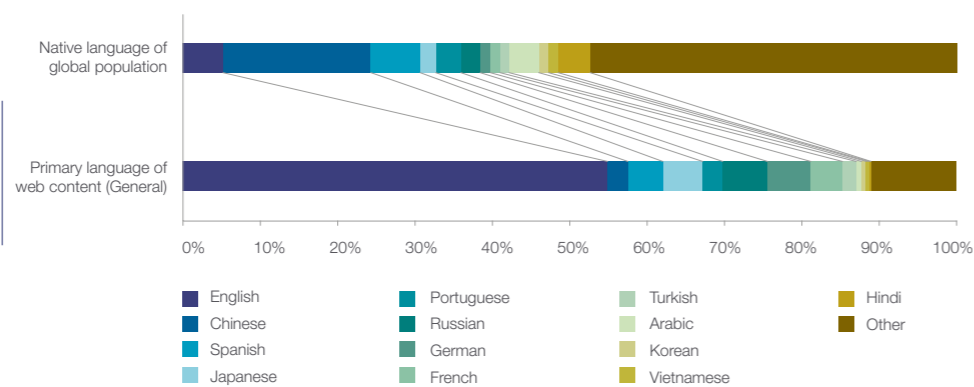
## IDNs as drivers of multilingualism

### 3 IDNs as drivers of multilingualism

There is international consensus on the need to promote linguistic diversity, in cyberspace as well as offline. This is reflected in the World Summit on the Information Society (WSIS) action line C8 (Cultural diversity and identity, linguistic diversity and local content) and UNESCO’s Recommendation concerning the Promotion and Use of Multilingualism and Universal Access to Cyberspace (2003).

In last year’s report (2014), we explored the status of multilingual content online, and noted the gap between the rich diversity of languages spoken in the offline world, and the languages of cyberspace – English is the language of more than half of web content.

Figure 1 – Language of web content compared with native language of offline population



English is the primary language of 55% of web content

Last year’s report also noted the gap between the drive for increased linguistic diversity in popular web applications, and the continuing challenge of ensuring universal acceptance of internationalised domain names. Facebook supports more than 70 languages, Google Translate 80, Twitter more than 35.

Nevertheless, where IDNs are in use, the language of web content is more diverse and a better reflection of offline languages than traditional ASCII domains. As a result of our analysis of the language of content associated with 1.6 million IDNs last year (in the gTLD space plus 51 000 .eu IDNs) we concluded that:

- IDNs help to enhance linguistic diversity in cyberspace
- The IDN market is more balanced in favour of emerging economies
- IDNs are accurate predictors of the language of web content.

This year, we have extended the analysis to include content of ccTLD IDNs, which form the majority of IDN registrations.

#### 3.1 Methodology

As ccTLDs do not have open zone files, we built a model to help us infer the language of web content associated with ccTLD IDNs, based on two broad factors:

- Usage rates of IDNs, and variations according to script.
- Correlation between language of content, script of IDN and locality, observed in previous studies.

##### 3.1.1 Usage rates

What is meant by “usage”? At the most basic level, a domain name needs to have active nameservers in order to work. So, a domain without active nameservers is not capable of carrying any web content.

From our access to gTLD zone files and collaboration with Verisign we can determine the number of IDNs with active nameservers and the language of web content.

As figure 2 indicates, usage levels of IDNs varies immensely by TLD, with an overall rate of 64% with active nameservers.

So, it seems that the TLD itself may be relevant in inferring rates of usage. Is there any variation in usage rates by IDN level (ie second level or top level), or by script?

Our sample of 1.7 million domains comprised IDNs in gTLDs (both top and second level), and .eu (second level).

We found that on average, 30% of IDNs (regardless of level) were both “in use” (ie had active name servers) and had sufficient web content to identify the language. In other words, more than half of IDNs with active name servers do not have web content, so measuring active nameservers alone would overstate the numbers for language of web content.



**Inferring usage rates**

The table below summarises the active website rates for IDNs.

To understand the likely percentage of ccTLD IDNs with active web content, it is not sufficient to measure instances of active nameservers alone. Many more domains have active nameservers than active web content with a sufficient number of characters to measure the language.

**Table 1 – active website rates for IDNs**

Type of registry	Second or top level	Percentage with active website
.com and .net	Second level	30%
.eu	Second level	48%
.es	Second level	68%
.vn (ccTLD)	Second level	13%
gTLD	Second level	47%
New gTLD	Second level	16%
New gTLD	Top level	18%
.pф (ccTLD)	Top level	57%

The rate of active web content associated with IDNs at the second level ranges from 13% (.vn) to 68% (.es), and at the top level from 18% (IDN new gTLDs) to 57% (PФ). The script of IDN seems to affect usage rates – with Han and Arabic showing lower levels of active web content than the combined Han, Katakana and Hiragana (associated with Japanese language) and Latin.

Therefore, when inferring usage rates for ccTLD IDNs, we applied the following rules:

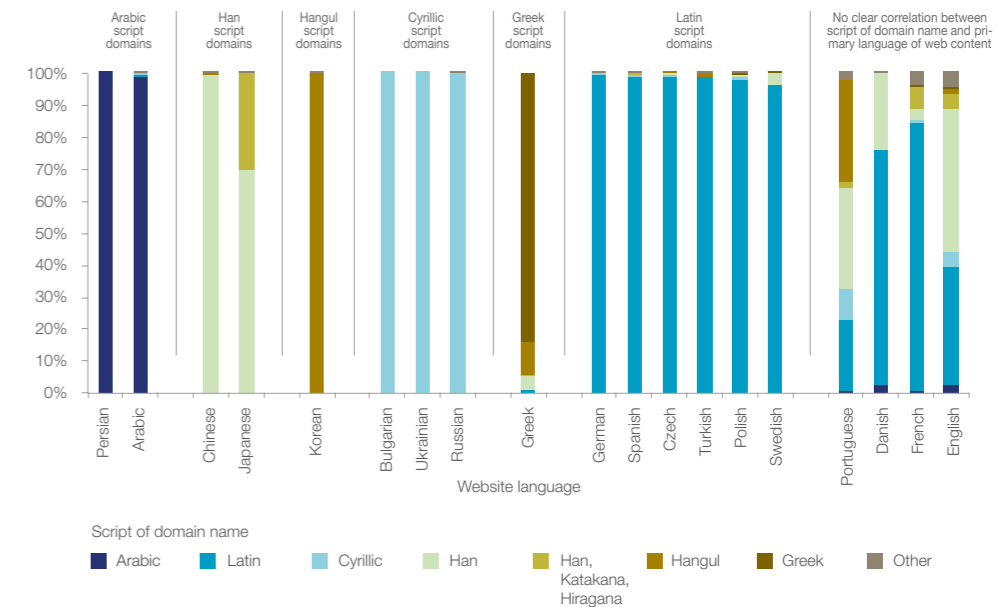
- Use actual data where available (.eu, .es, .vn, .pф). This accounts for 1.9 million IDNs, or 42% of the IDNs in ccTLDs (both at second and top level).
- Assume an active website rate of 40% for IDNs (where top or second level)
  - Discount by 20% for Han script, and right to left scripts (Arabic, Hebrew)
  - Discount by 25% for new offerings, or giveaway policies.

**3.1.2 Language of web content**

In the 2013 and 2014 reports we reviewed the language of web content associated with IDNs, to see whether there was any correlation with the script of domain name. It's plausible that we might have observed a random pattern in the evidence, ie no strong correlation between domain name script and the language of web content. But with a strong correlation, we might expect that a Cyrillic script domain would lead to web content in Russian, Bulgarian or Ukrainian, or that an Arabic script domain would lead to web content in Arabic or Persian, Han script to Chinese, and so on.

*Language of web content and script of domain name are near perfectly correlated*

**Figure 4 – Correlation between website language and domain name script**



As in previous years, our analysis of the web content of 500 000 IDNs (top and second level gTLDs, plus second level .eu) found that the relationship between language of web content and IDN script is not random. There is near-perfect correlation between language of web content and the script of IDN associated with it (figure 4). In other words, IDNs are in practice (see below) accurate predictors of the language in which their web content appears. Only English and French – commonly spoken as second languages around the world – are associated with a large number of scripts (Latin, Arabic, Cyrillic, Han, Katakana, Hiragana, Hangul, Greek, and others), and display the more random pattern predicted in the “no connection” hypothesis. The results for Greek, Portuguese and Danish are overstated – as the automated translation tools wrongly identified Portuguese for Japanese, and Greek for Korean. Manual re-checking of the Hangul script IDNs in the data sample found no instances of Greek language websites.

Of course, the analysis shown in figure 4 works from the language of web content up to the IDN script, and it does not necessarily follow that the reverse is true, ie that IDN script will accurately predict the language of associated web content. However, the strength of the correlation between language of web content and script of IDN can help us infer the language of web content of IDNs in ccTLDs for which we do not have access to the zone files.

In previous studies, we have found that in ccTLDs, IDN deployment (in almost every case) closely matches the requirements of languages spoken in the ccTLD's country or territory. We can predict that the languages of active web content of IDNs will reflect the

languages associated with the ccTLD country or territory. One exception is the English language, which represents approximately 10% of the language of web content in the IDNs we have analysed.

### 3.2 Populating the model

We now apply our model (see above) to the 4.5 million ccTLDs, which make up 72% of the world's registered IDNs (both at top and second level).

Whereas in last year's report we included website language data from all gTLDs plus .eu, this year we have expanded the analysis to include language data for all 4.5 million ccTLDs as well. We have actual data for 3.4 million IDNs (all gTLDs, plus 1.9 million ccTLDs: .eu, .es, .vn, and .pф), and have inferred usage and language data for 2.6 million ccTLDs.

Figure 5 provides a full view of the language of web content associated with all 6.2 million IDNs (both at top and second level).

Incorporating the data of ccTLD IDNs (both top and second level) had the effect of increasing the proportion of Chinese, German, Russian and Korean language sites, and decreasing the relative proportion of Japanese sites compared with the analysis of gTLD and .eu IDNs last year. This year, we found 78 languages associated with IDNs – more than the number supported by Twitter or Facebook on their platforms.

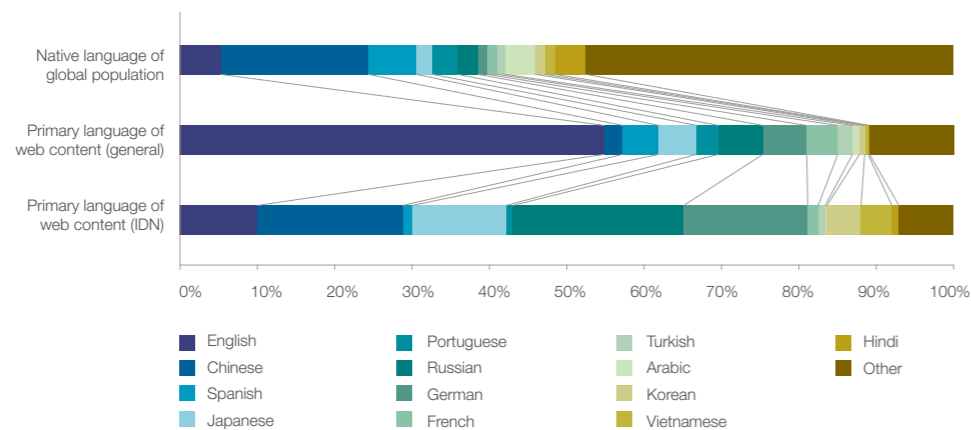
As last year, we find that English language content of IDNs is more in line with the proportion of global (offline) users who speak English as a primary language.

## FOCUS B

# Universal Acceptance

by Mark McFadden

**Figure 5 – Primary language of web content associated with IDNs, compared with primary language of general web content, and native language of global population**



*Web content is more linguistically diverse with IDNs*

## 4 Universal Acceptance

by Mark McFadden

### 4.1 Summary

In this section we will examine what universal acceptance is, how key software and services are impacted by IDNs and what progress is being made supporting IDNs in applications and services on the Internet. In previous years we have found that progress toward universal acceptance of IDN has been slow. This year is no different.

While browsers are capable of correctly displaying and using IDNs, almost no progress has been made in supporting IDNs as account identifiers, in email or in popular applications. The one bright spot this year is a growing effort to raise awareness of universal acceptance issues and new initiatives that test, document, and report on problems with IDNs on the public Internet.

### 4.2 What is universal acceptance, and is it possible?

For IDNs to be successful, there are requirements beyond the infrastructure of domain name delegation and registration. In addition, IDNs must be “usable” – or, more precisely, accepted. It is a goal of IDNs that they be universally accepted – that is, usable anywhere a traditional ASCII domain name is used.

However, in previous reports we have seen that the landscape for universal acceptance for IDNs is problematic. Modern and traditional browsers cope with and display IDNs successfully in many ways, but IDNs are not just for use in browsers – and herein lies an essential dilemma: people associate domain names with many things other than URIs. If universal acceptance is a realistic goal, IDNs must be usable in email clients, in other software, in mobile apps, in modern web-based applications and even in forms on paper or in PDFs.

As we will see, the pace of progress towards meeting the goal of universal acceptance continues to be slow. Successful efforts are just starting in measurement and monitoring of universal acceptance, in outreach to software and network designers to build awareness of universal acceptance issues, and in working with consumers to build confidence in IDNs. It is worth noting that, in 2015, the most difficult barrier to universal acceptance continues to be the enormous infrastructure of the legacy Internet – which needs to be changed for IDN acceptance. Despite notable successes this year, this work is still in its infancy and remains the fundamental impediment to universal acceptance of IDNs. Another success this year is the work on label generation rules that will aim to standardize the way particular scripts are

used in domain names. An example of this success is the Task Force on Arabic IDNs which, in 2015, published its label generation rules for Arabic<sup>2</sup>.

### 4.3 IDNs, universal acceptance and the Internet of the future

In the recent past, to “be connected” usually meant having a computer connected to a Local Area Network that shared an Internet connection. Two trends have changed that definition. First, mobility makes it possible for users to dispense with a shared connection (for instance, a mobile broadband connection). Devices can connect to the Internet from nearly anywhere. Second, the types of devices connected to the Internet are evolving quickly. It’s hard, for example, to find a modern television that can’t be connected to the Internet.

Along with these two trends comes the emergence of an Internet of Things where many devices are connected to the Internet without the intervention or involvement of humans. Smart Cities, eHealth, Intelligent Transportation Systems – these are all examples of strategies to automate huge networks of sensors, controls and devices.

The evolution of the Internet – both the emergence of mobility and the evolution of the things that are connected – has implications for universal acceptance. If devices use the Domain Name System to connect to servers or other devices, then being able to use IDNs will be important. Just as IDNs should be supported by browsers, so too should devices, machines and sensors that make up the future of the Internet. This means that the need for advocacy on universal acceptance issues is expanding into new areas such as consumer electronics, automobiles, home automation, and other applications of the Internet of Things.

*The emerging Internet of Things has implications for universal acceptance*

### 4.4 IDNs and browsers

Browsers are everywhere. In cars, on computers, on phones and even in photocopiers. Since browsers work in so many settings it is natural to survey how well browsers work with IDNs. There are two main issues: display and retrieval.

Browsers must decide what to display to the user. Often the decision of what to display is based on the circumstances the browser finds itself in, rather than a hard-coded set of rules. For instance, the browser must decide whether to display the Unicode or the Punycode version of the IDN. Displaying the Punycode version can create confusion for consumers, because what is typed into the browser (or, clicked on) is not reflected in the address bar. The user has a natural expectation that the IDN representation of the domain name – the non-ASCII version – would be preserved by the display in the browser. Changing it to the Punycode version does not meet that expectation.

Our research this year finds that all major desktop browsers are built with APIs (software libraries) that support parsing of IDNs in URLs as well as doing conversions between Unicode and Punycode to support requests for DNS resolution. While this is encouraging progress, unfortunately there is no standardization in the display of IDNs across different browsers. As a result, each desktop browser's handling of Unicode is inconsistent. This has been the situation since our early report in 2012 and is a result of each browser developer taking a different approach to security issues related to IDN display in the browser's address bar.

This year's survey records a slow, measured improvement in the ability of browsers to display IDNs. In the latest mobile operating systems, browsers support the display of the IDN properly in the presence of a Unicode character set. For example, iOS is able to work with and display the URL in Unicode. Android's native browser works as well, but displays the Punycode equivalent in the address bar. These steps toward universal acceptance are particularly encouraging in view of the fact that – just three years ago – there was no support for IDNs in mobile browsers at all.

*Custom built browsers in cars are not supporting IDNs*

For this year's survey, we tested browsers built into a variety of settings, including cars and other embedded systems. The general conclusion is that there are two types of browser being embedded into devices like cars: browsers built on or adapted from existing browsers, and browsers that are custom-built for their setting. In almost every case (90%), browsers built on existing browser technology reflect the IDN characteristics and support of the underlying browser. Remarkably, we found no support (0%) for IDNs in any embedded browser where the software was custom-built.

Today, approximately 10% of new vehicles have built-in Internet connectivity<sup>3</sup>. That number is expected to climb to 90% by the end of the decade. One of the reasons for the increase is that, in some jurisdictions, there is a requirement that the car be able to make an automatic emergency call in the case of an accident. Next to customer demand, this requirement is one of the key drivers of Internet connectivity for cars. Of the cars being produced today with Internet connectivity, 22% have a browser as one of their features.

## 4.5 IDNs and measurement

The EURid UNESCO World Report on IDNs provides annual snapshots of universal acceptance for IDNs. Recently, there have been other attempts to collect routine and systematic information about the acceptance of IDNs (and other TLDs in ICANN's new TLD programme).

In August 2015, APNIC Labs published a report on universal acceptance of all gTLDs in the new gTLD programme<sup>4</sup>. IDNs were a part of that research. The study did not request the IDNs as part of its survey, but instead concentrated on ten Punycode-encoded equivalents. The results are as follows:

1. Web success rate of 80%
2. No DNS rate of 0.5%
3. No Web rate of 1.5%
4. Blocked Web rate of 17%
5. Late Web rate of 0.5%

"Web success" indicates situations where the DNS worked as expected. "No DNS" is a situation where the DNS server did not see any queries for the requested domain name. "No Web" is where the DNS appeared to work properly, but no web content was returned. "Late Web" is the unusual condition wherein the web server records that it has returned content to the browser, but the browser is not reporting that the content was received.

The remarkable statistic here is the 17% rate for "Blocked Web." This means that the web server has delivered the content to the browser, but the browser has not displayed it. A rate of 17% is enormous compared to the traditional Web where the "Blocked Web" numbers would typically be less than 0.01%. The cause of this has yet to be determined, but, if it is consistent across many Punycode web responses, it means a further difficulty for acceptance of IDNs.

The study was published recently but already two conclusions have been drawn by the community interested in universal acceptance: first, there are concerns about the methodology (especially on the part of some browser vendors, who feel that their browsers are under-represented in the survey), and second, there seems to be a commitment on the part of ICANN, who commissioned the study, to conduct further analysis along these lines in the future.

## 4.6 Universal acceptance Initiative

Along with supporting studies of IDNs and new gTLDs, ICANN is also supporting an industry-led project on universal acceptance. This work has four crucial areas of emphasis: Measurement and Monitoring of universal acceptance, Outreach, Top Line Issues for universal acceptance, and internationalisation.

While funding support for the project is being provided by ICANN, the actual work is being done by volunteers in the registry, registrar, software and ISP industry. In 2015, the emphasis has been on solving the issues surrounding internationalised email. The group recognizes that it is crucial to involve the biggest vendors and providers of email software and services. At the most recent ICANN meeting in Dublin, Ireland (October, 2015), Google and Microsoft used the universal acceptance sessions to commit to work together on internationalised email, and reported that they are making efforts to reach out to Apple and Yahoo.

Having the major vendors working together on universal acceptance is a positive development. The initiative is also working on reaching out to software and application developers. In the last two workshops held by the Steering Group more than 75 people have participated and have represented every region except Africa. There is also a good mix of software developers, registries, registrars and service providers participating. Perhaps the one area under-represented in this volunteer effort is the user community.

This work is just under way, but there is a clear desire for a multi-year, industry-led approach to universal acceptance. That should make a difference, in the long term, for universal acceptance of IDNs.

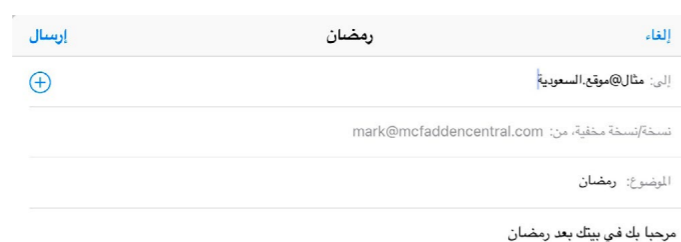
#### 4.7 Internationalised email

Previous surveys have noted that using IDNs in email is problematic at best and impossible at worst. As our report went to press last year, Google announced support for IDNs in email<sup>5</sup>. At the time it wasn't obvious what the announcement might mean for IDNs. A year on, the impact is clearer.

There are two major developments in the internationalised email ecosystem. First, other commercial companies have taken the lead from ISPs and network providers, and now provide proprietary, closed systems of internationalised email. Energized by the potential scale of the client base, several vendors have moved to provide dedicated internationalised email solutions for customers using their networks. Such a solution does not constitute a generalised approach to internationalised email, but it does provide those customers who sign up for the service with the ability to seamlessly exchange internationalised email with other customers of the same service<sup>6</sup>. It is possible to overcome the challenges of IDNs in email on small browsers. In figure 6 Arabic email is demonstrated on a recent release of iOS for an iPhone. The success is that the iPhone correctly renders right-to-left text and fully supports the internationalised email address.

*iPhone now supports internationalised email addresses*

Figure 6



*Google's servers now support the sending and receiving of internationalised email*

The second major development is the emergence of transport for internationalised email. Some companies, most notably Google, have made it possible for users to send and receive internationalised email using their servers. This is an important development because mail servers, like mail clients, need to be standards compliant. The implication of Google's announcement is that internationalised email can be passed through and delivered using Google's servers. The email clients sending and receiving the mail must comply with the Internet standards for internationalised email. However, there is no guarantee that internationalised email passing through other servers will be forwarded correctly. Indeed, the Google announcement provides transport for international email but Google does not yet allow users to use an internationalised email address for a Gmail account.

The result is continued growth for internationalised email but a patchwork of capabilities. The hoped-for effect of Google announcing support for internationalised email has not emerged: there are still very few cases where users can experience end-to-end delivery of internationalised email and universal acceptance seems a long way off. In fact, despite the publicity for Google's support of internationalised email, you still need an ASCII email address to get into your Google account.

#### 4.8 Universal acceptance and applications

For IDNs to be universally accepted, they must be usable anywhere a traditional domain name is used. One of the places where domain names are very often used is in web-based or mobile applications. Unfortunately, this year sees very little improvement in the area of IDN support within applications.

In previous years, our survey has identified two key success factors for web-based applications and IDNs: first, the service should support IDNs as they would any other URL; and second, it should be possible to create user accounts with IDN email addresses.

To illustrate the first instance, IDNs featured in comments and requests in a web forum or in comments in a review on Amazon or iTunes should be supported in the same way as traditional domain names. In a social network, an IDN should be able to appear and be used in the same way as any URL created from a traditional domain name.

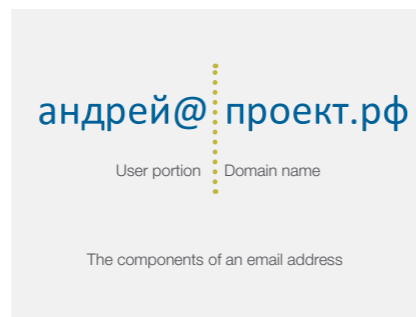
One of the few bright spots for IDN universal acceptance is in the use of IDNs as content. If an application or service displays a URL, it should recognize that it is a link to an external resource and perform the expected action when the text is clicked. When IDNs appear as part of a web page, they should display and function in the way any URL would display and function. Also, web pages that have IDNs as "content" should handle the URL appropriately.

*There has been a marked improvement in the handling of IDNs in content*

This improvement in universal acceptance is significant. Two years ago, 92.3% of the sites we tested did not recognize IDNs in the same way as ASCII URLs. Last year's survey showed a marked improvement: the number was down to 54.6%. This year, the



Figure 7 – The components of an email address



number of sites we tested that did not handle IDNs correctly in “content” was down to 45.0%. This is the area of greatest improvement in universal acceptance for IDNs.

The second success factor involves user identifiers on the Internet. If an application requires an email address as a component of the user identifier, the service should support email addresses built from IDNs as well as traditional ASCII email addresses. In fact, both the userpart of the address and the domain name part of the address should support internationalised characters. When you sign into a service such as Facebook or Google you are often asked for your email address as your “user name.” One of the motivations for using an email address is that it is likely to be unique and specific to an individual, unlike a string of characters such as “Jane Smith.”

*It is still impossible to create a user account using an IDN email address on the world’s most popular web services*

In the last two years, we attempted to create accounts on eleven of the most popular services on the Internet using an email address that included an IDN. In all eleven cases, in each of the last two years, the account creation failed.

Despite broader understanding of the universal acceptance issue, there continues to be little success in using IDNs in user account creation. This year shows no change in all eleven of the top web sites visited by users who require a logon or security credential. It is not possible to use an IDN as part of a user account except in cases where the service or website is completely targeted at a very local, discrete and regional set of users (for instance, VK in Russia). For global services and applications, the attempt to use an IDN as part of a username nearly universally fails.

## 4.9 New domain names

ICANN’s new gTLD program has resulted in a large number of new strings in the root zone. Current practice shows that universal acceptance is a big problem for all new gTLDs, with or without IDNs.

We’ve seen that ICANN and the domain name industry is sponsoring outreach, education and awareness-building for universal acceptance<sup>7</sup>. Their remit includes IDNs. However, recent results indicate that the new gTLDs – including IDNs – are being

*New domains (including IDNs) are actively being blocked for security reasons by some systems administrators*

actively blocked by security and mail administrators who associate them with sources of spam. A mailing list dealing with security and server-administration issues features the following typical concerns:

- “Personally I do not trust anything hosted on the new top-level domains.”
- “My spam filters are regularly catching spam with URLs in TLDs like .faith, .win, .review, .space, .date, etc. I’m pretty close to treating 100% of all these new gTLDs as spam identifiers at this point.”
- “I blocked all of them in our email servers. Reason? 100% spam. Not a single valid email coming from the new domains so far. Not one.”

The implications for IDNs, if this were to become a common approach, are significant. At the time this report was compiled, 795 new gTLDs are available for use in the root zone of the DNS. Of those 62 are IDNs<sup>8</sup>. If a bulk blocking approach for email or firewalls came into effect among many mail system administrators, the impact on universal acceptance would be lasting and pronounced.

## 4.10 Universal acceptance progress

This year’s review of universal acceptance for IDNs finds that there is a single bright spot: browsers and web designers are doing even better at handling IDNs as content in web pages. However,

- Electronic mail represents a significant challenge for IDNs, especially in the context of being able to use full, internationalised email addresses outside of limited, closed networks;
- Applications, and software tools for building applications, are the biggest challenge for universal acceptance of IDNs. Most applications, and nearly all services that use email addresses as identifiers, fail to support IDNs natively; and,
- Universal acceptance means more than just browsers and apps – the danger that IDNs are seen to be part of a larger problem related to ICANN’s new gTLD program represents a significant ongoing risk for universal acceptance.
- The evolution of the Internet and the expansion of the types of devices connected to the Internet both mean that advocacy for universal acceptance will expand into new areas beyond the browser, email and mobile apps.

## FOCUS C

# IDN Facts and Figures

*After years of strong performance, IDN growth slowed in 2014*

## 5 IDN Facts and Figures

There are an estimated 6.2 million IDNs (as at December 2014). 4.5 million are ccTLDs, and 1.7 million are gTLDs. 28% of the world's IDNs (ie 1.7 million) are at the top level, and 72% (ie 4.5 million) are at the second level. The growth rate of IDNs was less than 1% in the twelve months from December 2013.

Figure 8 – Total IDNs 2009-2014

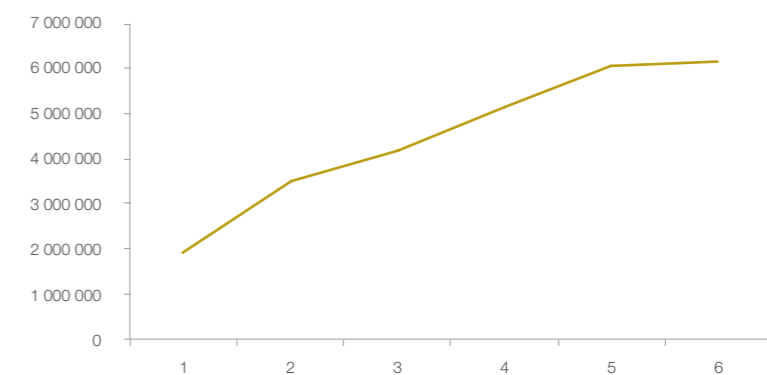
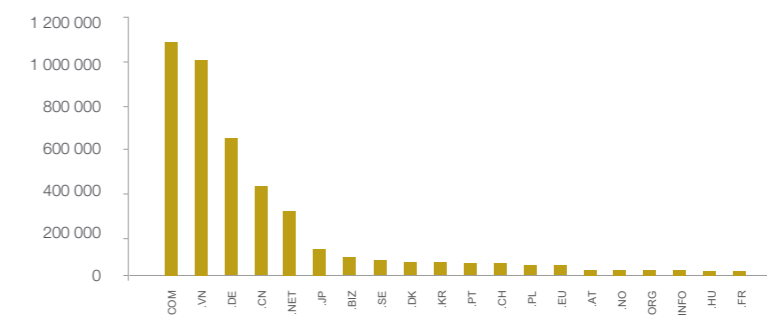
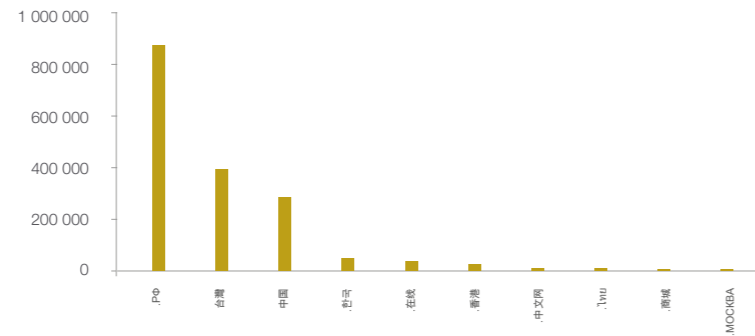


Figure 9 – Top 20 second level IDN spaces 2014



The largest IDN space is .com with 1.1 million registrations (second level), followed by .vn (second level, Viet Nam, 1 million) which operates a giveaway policy for its IDNs. The largest full IDN zone remains the Russian Federation's .рф. The top 20 IDN spaces include one new gTLD zone, .在线 (Chinese, "Online"), and we anticipate that more new gTLD IDN registries will reach the top 20 by 2016. The European registry, .eu, is the 14<sup>th</sup> largest second level IDN space.

Figure 10 – Top 10 top level IDN registries 2014



## 5.1 ccTLDs vs gTLDs

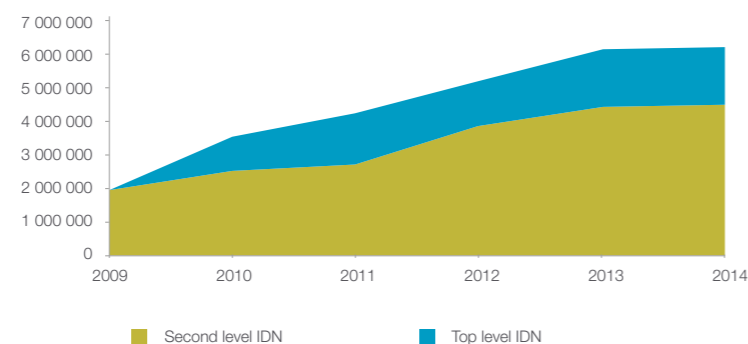
### 5.1.1 Second level vs Top Level IDNs

There are two types of IDN. Full (or Top Level) IDNs have the same script at both the TLD level and the domain label, eg `пример.рф`, `例如.中国`. Second level IDNs (also called hybrid IDN) have a non-ASCII label under an ASCII TLD, eg `例如.com`, `dæmi.eu`.

Second level IDNs have been available for 15 years (since 2000). It was not possible to register full ccTLD IDNs until 2009, when IDN strings were allowed into the root IANA database through the ccTLD IDN Fast Track process. At the gTLD level, gTLD operators had to wait for ICANN to open the call for a new gTLD round to be empowered to submit applications for IDN TLDs, which happened only three years ago.

In December 2014, 70% of registered IDNs were at the second level, and 30% were full IDNs. However, as figure 11 shows, there has been an expansion in IDN top level domain registrations since their introduction in 2009. There are now Please correct to 1.7 million and 4.5 million second level IDNs.

Figure 11 – IDNs over time



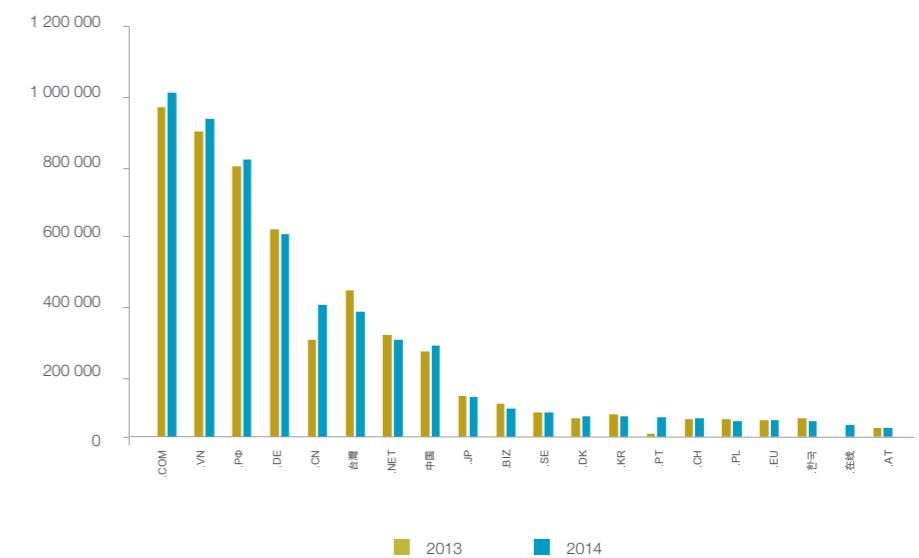
The majority of IDN registrations are at the second level

### 5.1.2 Growth rates

Between December 2013 and December 2014 the growth rate of IDNs was less than 1% per year. Growth rates in second level IDNs (0.8%) were marginally higher than growth in full IDNs (0.6%). This compares with 19% growth in 2012-2013.

The small net growth is partly attributable to new gTLD IDN registrations (91 000 full IDNs; 35 000 second level IDNs). Within the top 5 IDN spaces, IDNs at the second level under .cn have grown by 36% (2013-2014), while second level IDNs under .de reduced slightly (-2%). Within the top 20, .pt had the strongest growth (560%) due to a change in policy. Growth in the full IDN registries has been lower. While .pp and .中国 had positive growth (2.6% and 7% respectively), other large IDN zones such as .台灣 (Taiwan of China) and .한국 (Korea) have had negative net growth (-14% and -18% respectively).

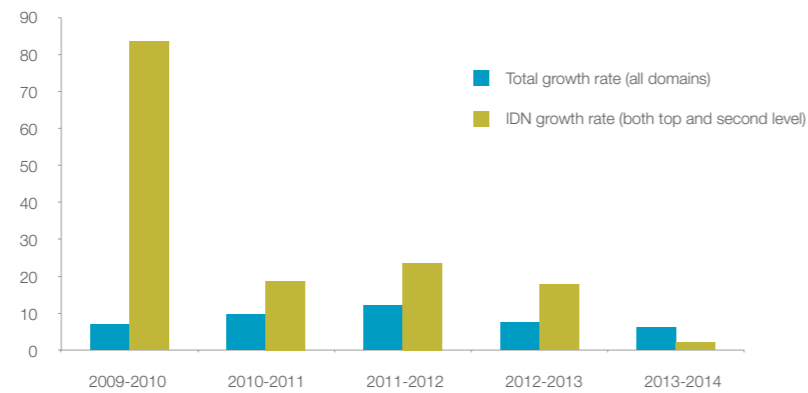
Figure 12 – Top 20 IDN spaces: growth 2013-2014



The majority of leading IDN spaces experienced negative or flat growth in 2014

The growth rate of IDNs to December 2014 is lower than in previous years, and is also lower than the growth rate of all domain name registrations for the first time since we began our study. Global domain name growth rates are tending to flatten, and this is likely to have impacted IDN registrations, too, probably because they are a niche product that needs a lot of promotional support from the registry and high end-user awareness.

Figure 13 – IDN and total domain annual growth rate compared 2009-2014  
(source: Verisign Domain Name Industry Brief, and EURid UNESCO)



*For the first time since 2009, IDN percentage growth was lower than total domain growth in 2013-2014*

FOCUS D

IDNs by script

5.1.3 Calm before the storm? New gTLD growth in 2015

Four Han-script new gTLDs have enjoyed high growth during 2015, namely .网址 (“website”), .公司 (“company”), .在线 (“online”), and .网络 (“Internet”). In total, these account for nearly 500 000 registrations at the time of writing (November 2015). Despite strong early registrations, the percentage of parked domains in these IDN TLDs is high (from 65% to 94%). We have observed that, where domain names are not in use (including parked domains), they are less likely to be renewed. We are already seeing a slight drop in domains across these four IDNs, despite only one of them having reached its first-year renewal period.

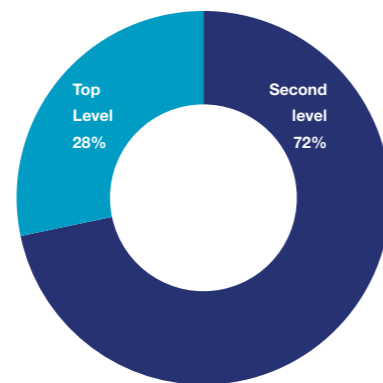
New gTLDs have been a key contributor to the growth in IDN numbers from December 2013 to December 2014, as many of the more established domains saw a slight decline in their IDN numbers.

We captured the new gTLD zones in late April 2015, and found a total of 4.85 million domain names, of which 130 000 are IDNs (94 000 full IDNs, and 36 000 IDNs at the second level under ASCII top level domains). By September 2015, there were 500 000 full IDN registrations in new gTLDs. Although we expect a drop on renewal, this augurs well for future years.

## 6 IDNs by script

In total, we have found 6.2 million IDNs at December 2014, of which 72% are at the second level, and 28% at the top level.

Figure 14 – IDNs by level, 2014



The majority of IDN registrations are at the second level

This year, we have analysed the script of our sample of 6.2 million IDNs. We present our results by three views: script of all IDNs, script of second level IDNs; and script of top level IDNs. The results show that use of Latin script for IDNs is lowest in full IDNs. This is not a surprising result, given that Latin script IDNs fit well within an ASCII TLD (eg .eu, .vn or .com), whereas the top level IDNs that have been created tend to be in non-Latin scripts, and tend to have homogenous scripts at the second level, that fit with the script of the IDN TLD.

Another general observation across the three comparisons is that whereas Latin is the most popular script for IDNs across the whole data set, Han, Cyrillic and Hangul script are each strongly represented in all three views.

On the script analysis for all 6.2 million IDNs, Latin script is the most popular with 41% of IDN registrations, followed by Han (34%) and Cyrillic (15%). All other scripts comprise only 10% of all IDN registrations, of which Hangul has 4%, and combined Han, Katakana and Hiragana (associated with Japanese language) 2%.

Are there any differences between the popularity of scripts in IDNs at the second and top levels?

Three scripts account for 90% of IDNs: Latin, Han and Cyrillic

Figure 15 – IDNs by script, 2014 (all - includes top and second level)

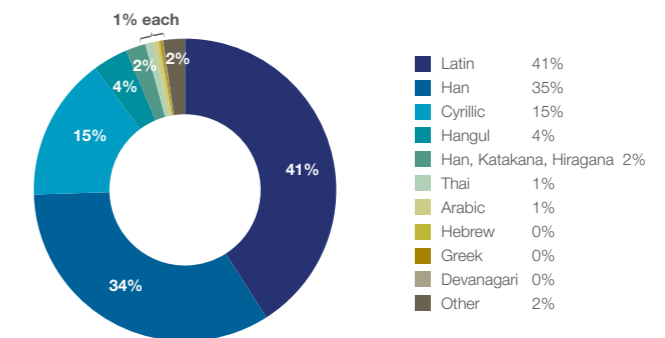
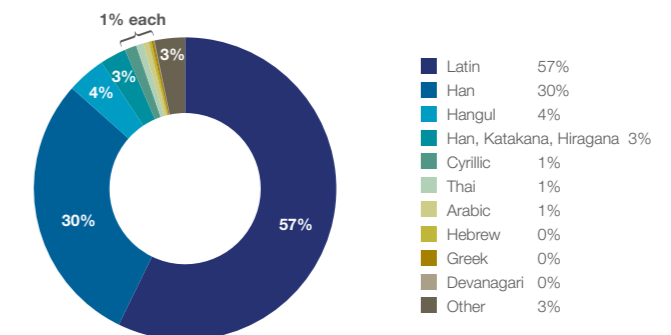


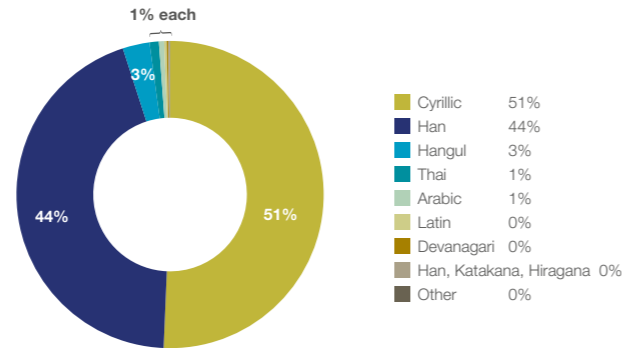
Figure 16 – Second level IDNs by script 2014 (total in sample, 4.5 million)



In second level IDNs, Latin script dominates, with 57% of registration

Second level IDNs were introduced to the market nearly a decade earlier than top level IDNs. Therefore, it is not surprising that they comprise approximately three quarters of all IDN registrations. At the second level, Latin script dominates, with 57% of second level IDN registrations; then comes Han (30%), Hangul (4%), Han, Katakana and Hiragana (3%). All other scripts, including Cyrillic, Arabic, Devanagari (with hundreds of millions of speakers offline) represent less than 6% of second level IDNs. The dominance of Latin script in second level IDNs can be explained by the good fit between a Latin script IDN (usually with accents or diacritics) and an ASCII TLD, where ASCII is a subset of Latin script. For example, for Viet Nam, Germany, France, or Turkey, whose languages are based on Latin script, it makes sense to deploy IDNs at the second level under established ccTLDs (.vn, .de, .fr and .tr).

Figure 17 – Top Level IDNs by script 2014 (total in sample 1.7 million)



Cyrillic and Han scripts represent 95% of top level IDNs

Meanwhile, a different pattern is seen across the 1.7 million top level IDNs. Two scripts dominate: Cyrillic (51%) and Han (44%); Hangul has 3%. Historic factors are also relevant in this comparison: only in 2009 were ccTLDs given the opportunity to apply for their IDN equivalents, and the Russian top level IDN, рф, was one of the first IDN ccTLDs to be launched that year. It has sustained high volumes ever since. Overall, there is slightly greater script diversity to be found in second level IDNs, mainly because of the presence of Latin script.

Arabic is poorly represented in every category, with less than 1% of IDN registrations.

We have discussed in previous reports the complexities inherent in using IDNs which mix scripts (for example Han script at the second level, with a top level ASCII/Latin script). Those complexities are most acute where IDNs are bi-directional, combining right-to-left labels with left-to-right TLD endings. The resulting names are “barely usable”, as the strict hierarchy necessary for domain names to work becomes confused.

For example, compare:

Latin script IDN (second level) with ASCII TLD	Hybrid IDN (second level) with ASCII TLD	Top level IDN
thidv.vn	例如.com	例如.中国
dæmi.eu	например.eu	пример.рф
	مثال.com	مثال.مصر

Given the popularity of traditional, ASCII domain names, it is to be expected that Latin script IDNs will be popular at the second level (under ASCII TLDs such as .com and .eu).

As problems with user acceptance issues start to diminish, we can expect to see further uptake of top level IDNs.

## FOCUS E

# Industry opinions

## 7 Industry opinions

### 7.1 A reminder of the domain name supply chain

The different actors within the domain name supply chain all have similar names.

The **registry** is the operator of the Top Level Domain, and is responsible for maintaining the database of all domain name registrations and their associated IP addresses (equivalent to a wholesaler). The registry is the authoritative entity for that Top Level domain, and is included in the “root” directory, the Internet Assigned Numbers Authority (IANA) database. Most of the larger registries included in this study do not have direct interaction with end users at the domain name registration phase.

**Registrars** sell domain name registrations to end users (retailer). They typically also provide a number of other services, and many offer a range of different TLDs to their customers. Registrars are usually accredited or otherwise authorised by a registry to sell individual TLDs.

**Registrants** are the people or organisations who register domain names for their own use (customer).

Figure 18 – The domain name supply chain



## 7.2 Methodology – registry survey

Since 2011 we have sent out an annual questionnaire to the registries who are members of the regional ccTLD organisations CENTR (Europe), APTLD (Asia and Pacific) and LACTLD (Latin America and Caribbean).

The survey asks for opinions on four questions:

1. *How does uptake of IDN registrations relate to your expectations?*
2. *How well are IDNs supported by your registrars?*
3. *How would you rate end-user awareness of IDNs?*
4. *What single change would improve IDN uptake?*

Each question was scored on a Likert scale<sup>9</sup> from 0 (far below expectations) to 5 (exceeds expectations).

The first question aims at identifying any gaps between the level of IDN registrations and the registry operators' expectations. A low uptake may be completely in line with expectations, for example, when there is a low population of people using the relevant character set in the target market.

The second and third questions are aimed at the two primary methods of sales: in marketing jargon, one is supplier "push" and the other is end user "pull". If registrars (the channel to market) are not able to support IDNs, then a marketing push (eg through advertising, price promotions or other push strategies) will not be effective. Likewise, if customers are not aware of IDNs, then there will be little or no consumer pull (eg proactive requests by customers).

The fourth question is aimed at identifying the perceived barriers to greater uptake of IDNs. This year, 56 registries responded to the qualitative questions, consistent with last year's response rate of 58. The registries represented a geographically diverse sample including Europe and North America, Latin America, Arab States, and Asia and Pacific. Not every registry answered every question, and the identity of the individual registries within the data set varies year on year.

The low numbers in the data set can lead to potential distortions in percentage differences, especially when looking at subsets. However, the participants are expert in the field and manage a large portion of the world's domain names. So, while the results are not conclusive, they give an interesting picture of industry impressions of IDN uptake, from a geographically diverse base, and a variety of registry business models.

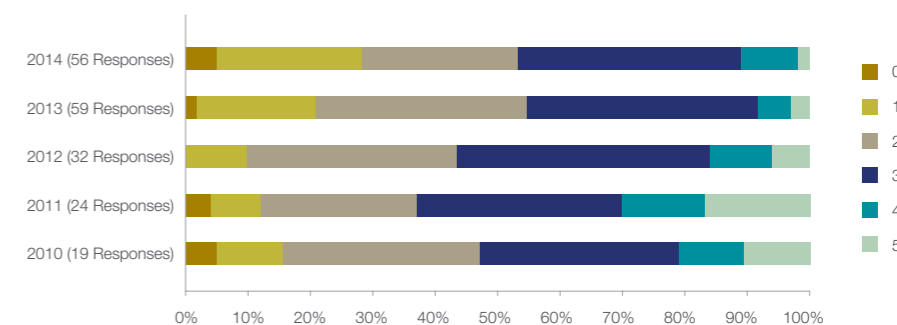
## 7.3 Results of 2015 industry opinions survey

### 7.3.1 How does the uptake of IDN registrations relate to your expectations?

Registry confidence in IDNs as a product is essential if IDNs are to thrive in the marketplace. Confidence in a product drives investment, likelihood of product promotions and can contribute to the long-term viability of a product.

This year, we had 56 responses to the question "How does the uptake of IDN registrations relate to your expectations?". The number of responses is broadly consistent with last year's survey (59).

**Figure 19 – How does the uptake of IDN registrations relate to your expectations? (0-5) 0 = below expectations, 5 = exceeds expectations**



*Only 11% of registries think that IDN uptake is very good or exceeds expectation*

Over time, there has been a decline in registries' opinions about the level of uptake of IDNs in relation to expectations from a high point of 2.9 (2011) (figure 19). This year, the average has steadied at 2.3, the same as 2013. The overall average score, 2.3 (out of a potential maximum of 5), indicates that registrations of IDNs continue to underperform relative to registries' expectations.

Only 11% of registries who responded to the survey told us that uptake of IDNs was very good or exceeded their expectations, 3% higher than the equivalent responses for 2013 (8%). However, this is still a long way below the high point of 30% for 2011, suggesting that confidence in IDN uptake is relatively lower than it was three years ago.

At the other end of the scale, 28% of registries indicated that uptake of IDNs was below or far below expectations (compared with 21% for 2013). This is the strongest negative score in the five-year survey, suggesting that confidence may be declining. In all, the negative scores are increasing and the positive scores are declining.



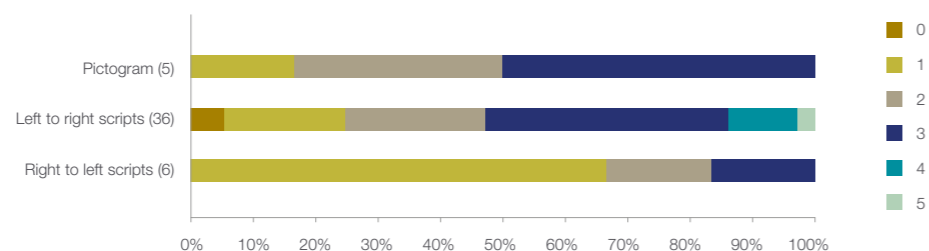
We reviewed whether there were any correlations between the types of script offered or the geographic region and registry opinions<sup>10</sup>. The responses were from registries offering IDNs both at the top level and second level.

Scripts were grouped by direction (left-to-right eg Latin, Greek, Cyrillic, and right-to-left eg Arabic and Hebrew), and South and East Asian scripts were grouped together under the label "pictogram". "Pictogram" is not a precise term here, as the grouping includes scripts such as Hangul, Devanagari, Thai which are not strictly speaking pictogram. Even Han script (used in Chinese language) includes many symbols equating to sounds rather than images.

Geographical grouping was determined according to the UNESCO regions<sup>11</sup>.

There is some evidence of correlation between levels of confidence and the scripts offered. Registries offering right-to-left scripts (Arabic and Hebrew) have the lowest confidence levels (1.5 average vs overall average of 2.3). Registries offering pictogram script IDNs – with a similar size data sample (5 pictogram vs 6 right to left) – conform to the average for the entire data set (2.3), with the left-to-right scripts (comprising the majority of the data set) just above the average at 2.4 (average is 2.3). However, the relative size of the data sets is too diverse to draw firm conclusions.

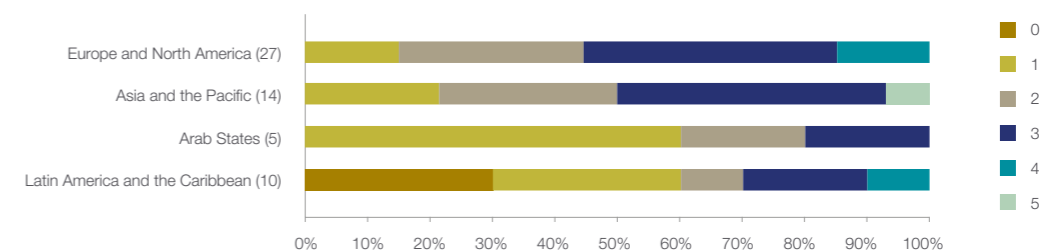
**Figure 20 – How does the uptake of IDN registrations relate to your expectations? 2014 responses by script**



We categorised responses according to the UNESCO world regions. For 2014, there were 14 responses from Asia and the Pacific, 5 from Arab States, 27 from Europe and North America and 10 from Latin America and the Caribbean. Responses from Europe and North America and from Asia and the Pacific were a little higher than the overall average score of 2.3 (2.6 and 2.4, respectively). Views from Arab States and Latin America and the Caribbean indicate that uptake is well below expectations in those regions (averages of 1.6 and 1.5). The view by region gives an additional insight into the differing experiences of registries offering left-to-right scripts. Opinions from Latin America

and the Caribbean are strikingly lower than those from Europe and North America. One possibility is that geographical factors – such as economic development, levels of Internet uptake – may influence opinions as much as, if not more than, script. Another possible reason is that the registries in those regions are not heavily promoting IDNs.

**Figure 21 – How does the uptake of IDN registrations relate to your expectations? 2014 responses by UNESCO region**



Individual registry opinions also affect the overall trends. Some individual ratings from registries declined in 2014, particularly for those who have responded with higher scores in previous years. Answers to this question closely map to a registry's actual IDN registration volumes during the year of each survey. So, if a registry has had a successful launch in the previous twelve months, its confidence will be high. A year later, if renewal rates have reduced the number of registrations, its confidence tends to fall.

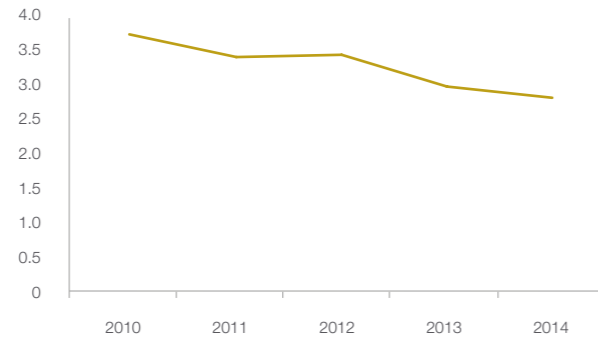
Overall, geographic factors seem to affect opinions more than script. The domain name supply chain is relatively more mature in Europe, North America and Asia and the Pacific than in the Arab States and Latin America and the Caribbean. The increasing geographic diversity of our data set in recent years may in part explain apparently falling levels of confidence over the years.

### 7.3.2 How well are IDNs supported by your registrars?

Support by registrars is essential to getting IDNs into the marketplace, thereby driving user uptake.

In previous years, registries have generally been upbeat about registrar support for IDNs, with average scores comfortably above 3.4 from 2010 to 2012. For 2014, the average score has fallen to 2.8, down on last year's 2.9, indicating that registries are slightly less satisfied with levels of support for IDNs by registrars than in previous years (figure 22). Since 2010, when our annual surveys began, the average ratings for this question have steadily decreased (figure 22).

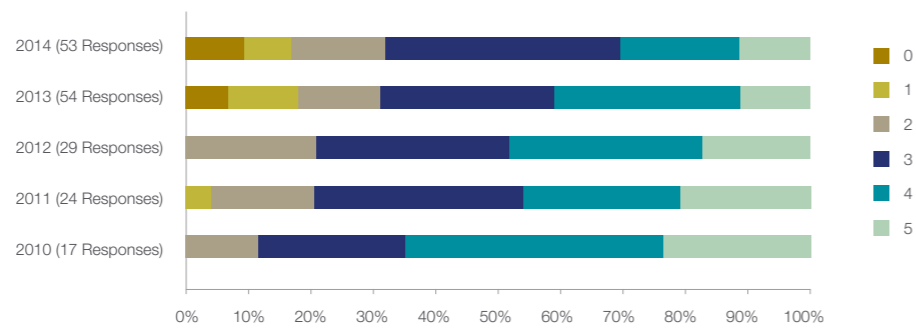
Figure 22 – How well are IDNs supported by your registrars (average score)



30% of registries who responded to the survey told us that registrar support for IDNs was very good or exceeded their expectations. This represents an 11% decrease since last year's survey, when 41% of registries who responded to the survey rated registrar support as very good or exceeding expectations (48% in 2012, 46% in 2011, and 65% in 2010).

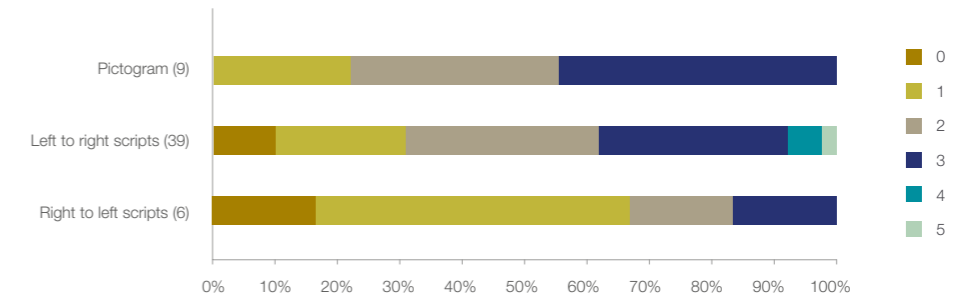
Figure 23 – How well are IDNs supported by your registrars? (0-5) 0 = below expectations, 5 = exceeds expectations

30% of registries rated registrar support for IDNs as very good or excellent, an 11% decrease since last year



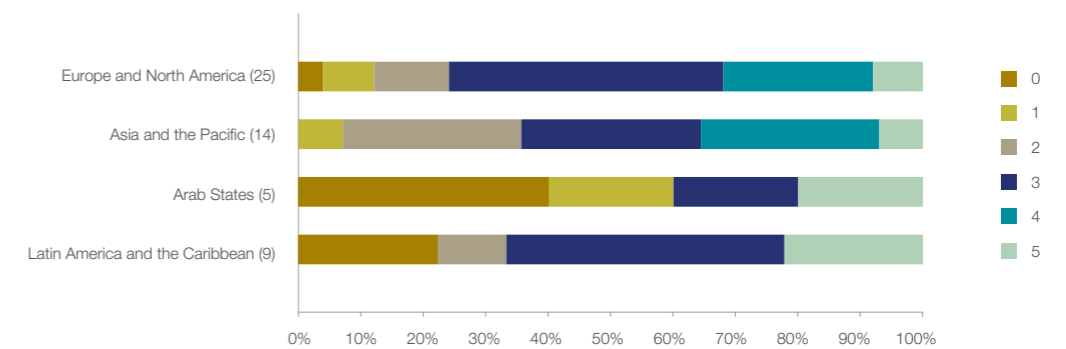
This year, 17% of registries who responded used the two lowest ratings, comparable with last year's 18%.

Figure 24 – How well are IDNs supported by your registrars? 2014 responses by script



There is some evidence of correlation between levels of registrars' support and the scripts offered. Registries offering right-to-left scripts (Arabic and Hebrew) have the lowest confidence levels (1.3 average vs overall average of 2.8) in registrar support. Registries offering pictogram script IDNs – with a similar size data sample (9 pictogram vs 6 right to left) – are well above the average for the entire data set (3.3 vs 2.8). However, the relative sizes of the data sets are too diverse to draw firm conclusions.

Figure 25 – How well are IDNs supported by your registrars? 2014 responses by UNESCO region



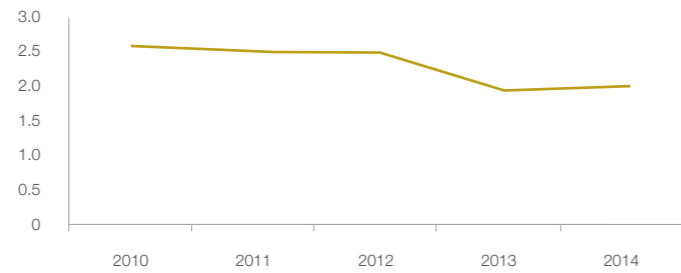
Viewed by geographical region, higher levels of confidence in registrar support for IDNs again correlate with regions where the domain name industry is relatively more mature (Europe, North America and Asia and the Pacific average 3.0 vs the overall average of 2.8). In contrast, registrar support for IDNs is felt to be less satisfactory in

the Arab States (1.8), where the domain name supply chain is relatively less mature. The increasing geographic diversity of our data set in recent years may in part explain apparently falling levels of confidence over the years.

### 7.3.3 How would you rate end-user awareness of IDNs?

User awareness is a key driver of demand for a product. In the context of domains (and IDNs), awareness can relate to the size of a Top Level Domain and to its use in business advertising in a particular country or region.

Figure 26 – How would you rate end-user awareness of IDNs?

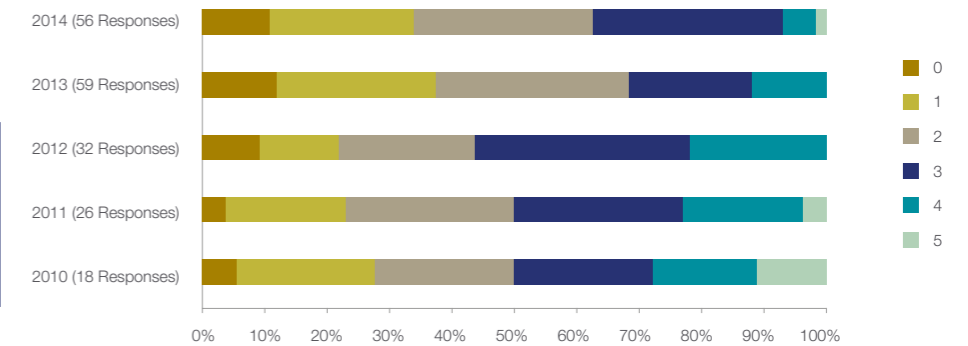


Since we started our survey, registries' rating of end-user awareness has been the poorest performer in the group of three questions. While the average continues to be lower than that of the other two questions, there has been a slight recovery since 2013. The average is now 2.0 compared with 1.9 last year. While the average scores have been consistently low, there is less change in responses to this question over time (compared with a steady decline in scores for the other two questions).

7% who responded to the survey told us that user awareness of IDNs was very good or exceeded their expectations, compared with 12% last year (a decline of 5%). While there is a decrease in the most positive scores since 2013, the top score reappears for the first time since 2011.

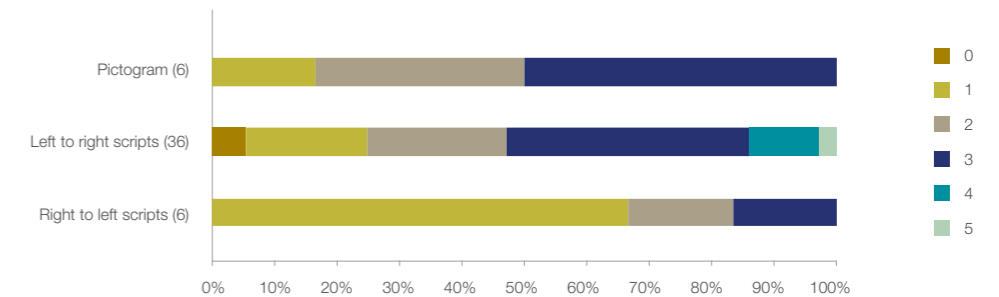
*Registries say end user awareness of IDNs has slightly improved since last year*

Figure 27 – How would you rate end-user awareness of IDNs? (0-5) 0 = non existent, 5 = excellent



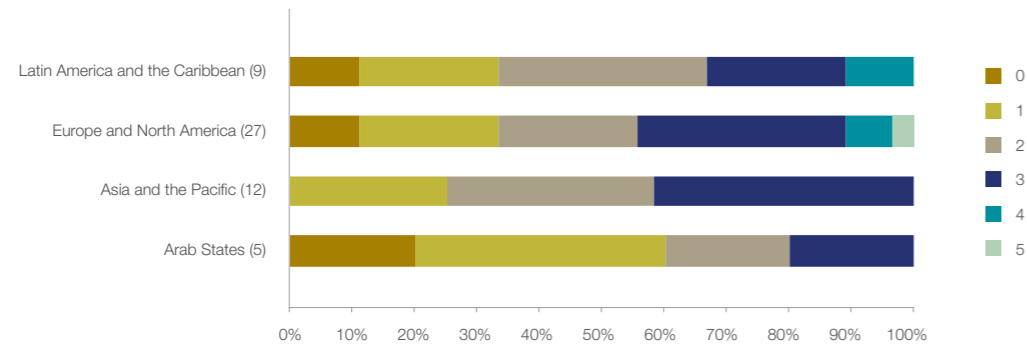
At the other end of the scale, 34% of registries indicated that end-user awareness was below or far below expectations, a slight improvement on last year's 38%.

Figure 28 – How do you rate end-user awareness of IDNs? 2014 responses by script



As with the other questions, registries responding to this question offer IDNs at both top level and second levels. Those offering right-to-left scripts (Arabic and Hebrew) and "hybrid" IDNs (where IDNs are offered at the second level under an ASCII domain ending) have the lowest confidence levels (1.5 average vs overall average of 2.0). Averages for the "pictogram" and left-to-right registries were 2.3 and 2.4 respectively, well above the average for the entire data set (2.0). Again, this suggests that registries believe users to be less aware of right-to-left script IDNs than other script IDNs. This also reflects the relatively low uptake of Arabic script IDNs, and recent drops in the numbers of Hebrew script (hybrid second level) IDNs.

**Figure 29 – How do you rate end-user awareness of IDNs?  
2014 responses by UNESCO region**



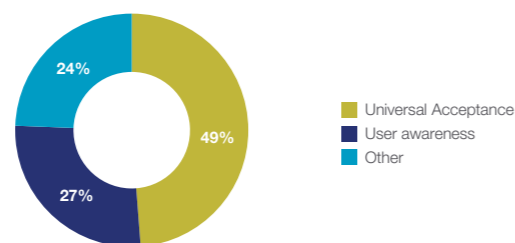
Compared to the overall average score for this question (2.0), registries in Asia and the Pacific, and Europe and North America, were slightly more optimistic (averaging 2.2 and 2.1 respectively). Latin American registries' responses were the same as the average. Registries from Arab States were again significantly below the average for this question at 1.4, repeating the pattern observed in other answers for the region and for right-to-left scripts.

#### 7.4 What single change would increase uptake of IDNs?

Every year, our registry survey participants are asked what single change would improve uptake of IDNs. The responses are free-text, and no suggestions are given. This year, we had 41 responses to this question, similar to the response rate last year.

As in previous years, two broad themes come through from the responses (figure 30): the need to improve universal acceptance, ie support for IDNs across browsers, email, and Internet applications (49%), and the need for an increase in user awareness through marketing or price promotions (27%).

**Figure 30 – What single change would you make to increase uptake of IDNs?  
2014, 41 Responses**



*Universal acceptance remains the key challenge to overcome if IDNs are to achieve mass uptake*

Other comments (24%) highlighted the need for all stakeholders to participate in the relevant policy processes at ICANN and APTLD, paying specific attention to renewals, while some highlighted the limited potential for IDNs in their country or region, given the limited usage of particular languages.

#### 7.5 Conclusions

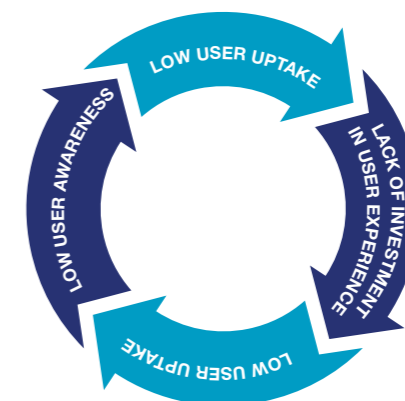
Our 2014 registry survey response rate was consistent with that of 2013, thanks to the cooperation of regional ccTLD organisations. The survey now has a reasonable geographical balance of experts in ccTLD domain name management.

We have suggested in previous reports that IDNs may be suffering from a negative cycle (see figure 31). Without universal acceptance across applications and email, the user experience of IDNs remains poor. Users lack incentives to use IDNs, and therefore registrations are not yet achieving their potential. The knock-on effect is that many Internet users are simply unaware of IDNs, even those in countries and territories where one might expect a high uptake. Confidence in a product or service within the supply chain is essential for success, and it is hoped that advances in universal acceptance will improve confidence levels.

Analysis of differences by script and geographic region highlight low scores from Arab States (and Arabic script), indicating that special attention may be required for IDNs to achieve their potential in this region.

IDN perception and penetration in the various regions are likely to be influenced by multiple factors, including the way IDNs were introduced at the second and/or top-level, the way new and old end-users decide to be present online and whether local registries and registrars offer proactive marketing initiatives. These factors combined serve to raise awareness and DNS literacy in a country or region. At the most basic level, users don't always understand that it is possible to register domain names in local language scripts.

**Figure 31 – IDN negative cycle**



## FOCUS F

# .eu IDNs

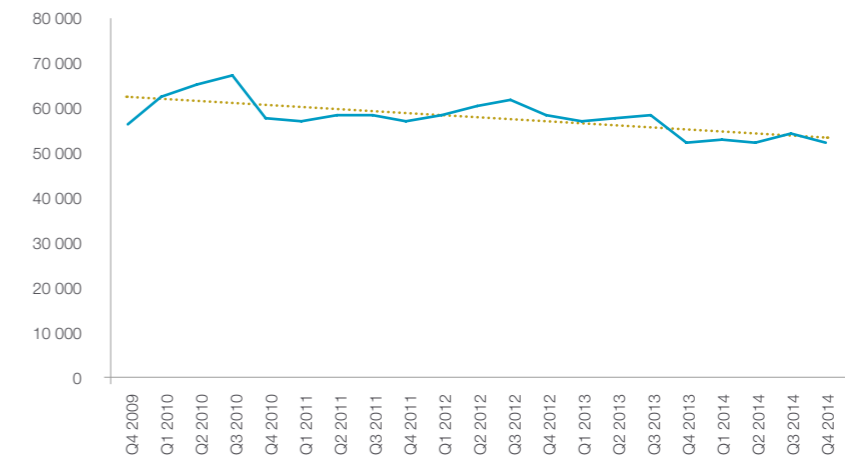
## 8 .eu IDNs

### 8.1 Background

EURid launched IDNs at the second level under .eu in 2009. The scripts supported are Latin, Greek and Cyrillic, reflecting the scripts of the current 24 official languages of the European Union.

In December 2014, there were 52 499 .eu IDNs. The number of IDNs has remained roughly consistent since 2009, with a peak at 67 000 in 2010, and a slightly downward trendline from 2009 to 2014.

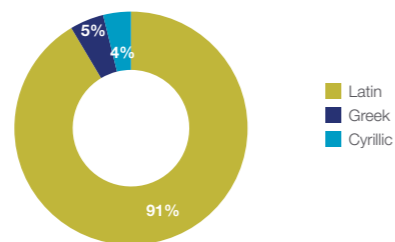
Figure 32 – .eu IDNs over time



Analysis of the .eu IDN zone (captured in January 2015, and comprising 50 000 IDNs) reveals that the majority of IDNs under .eu are in Latin script (91%). This reflects the widespread use of Latin script in many European languages, with accents and diacritics forming the IDN element of the Latin script domains. Some European languages, such as German, Swedish, French, Czech and Polish, use many diacritics. Others (such as English and Dutch) use relatively few. Two EU languages – Bulgarian and Greek – rely on non-Latin scripts (Cyrillic and Greek, respectively).

More than 90% of .eu IDNs are Latin script

Figure 33 – .eu IDNs by script (2015)



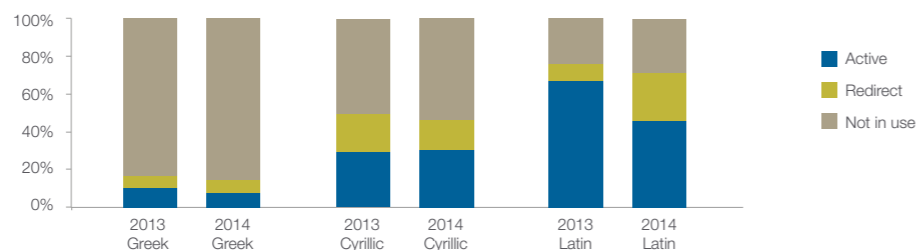
Aware that mixed-script IDNs pose challenges for users, EURid since 2009 has been exploring with ICANN the possibility of introducing the equivalents to .eu in both Greek and Cyrillic script. These would give .eu registrants the opportunity to register domain names in an entirely Greek script or Cyrillic script environment, thus affording them a truly multilingual experience, and avoiding the well-documented difficulties of mixed-script (or hybrid) IDNs. So far, the Cyrillic script application has passed ICANN’s evaluations, and the Greek script application has stalled. At the time of writing (November 2015), it is likely that the Cyrillic string will be delegated and therefore made available in 2016.

## 8.2 Usage of .eu IDNs

As with the larger data set (see Focus A), we analysed the percentage of .eu IDNs with active name servers or redirects, with the following results:

- Highest active usage for Latin script IDNs (72%)
- Lowest active usage for Greek script IDNs (14%)
- Increase in redirects in Latin script in 2014 (to 26%, an increase of 16% since 2013)
- Slight decline in usage rates across all scripts compared with 2013

Figure 34 – .eu IDNs - usage rates by script 2013-2014



Latin script .eu IDNs have the highest active usage rates, with redirects increasing since last year

The well-known difficulties of hybrid IDNs help to explain the disparities in usage rates, and emphasise the importance of having fully internationalised domain names.

## 8.3 Analysis of .eu IDNs – language of web content

This year, as in 2013, we undertook an analysis of the language of web content associated with .eu IDNs. The data set was 50 000. Of these, 26 000 had too little content to analyse, leaving a working data set of 24 000 names with active web content. And of these, 23 000 were Latin script, 660 Cyrillic script and 240 Greek script. Therefore the percentage by script with active web content was 50% for Latin script, 34% for Cyrillic script and 10% for Greek script. Note that the number of sites with active web content is lower than the percentage with active name servers and redirects in 8.2 above.

If we are correct in thinking that IDNs link strongly with associated languages, we would expect to see a high correlation between script and language (eg Greek content with Greek script domain names) and to see web content in languages for which IDNs are particularly relevant (eg German, French, Swedish). Because the .eu domain is associated with the European Union and three countries of the European Economic Area (Iceland, Liechtenstein and Norway), and has a residency requirement, we would not expect to see many non-European languages (eg Chinese, Korean) featuring in the language analysis.

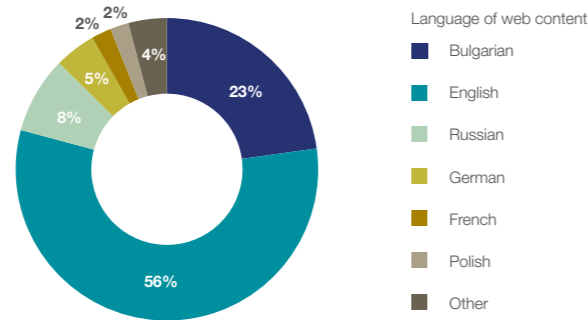
### 8.3.1 Languages cluster around relevant scripts

As with the larger data set (see Focus A), clear patterns emerge within the .eu data.

Bulgarian and Russian language websites are associated with Cyrillic script domains (figure 35) and not with Greek or Latin script domains (apart from a single Russian language website associated with a Latin script IDN); Greek language websites are only associated with Greek script domains (figure 36). An array of European languages are associated with Latin script IDNs, with German language making up 46% of websites (57% in 2013) (figure 37).

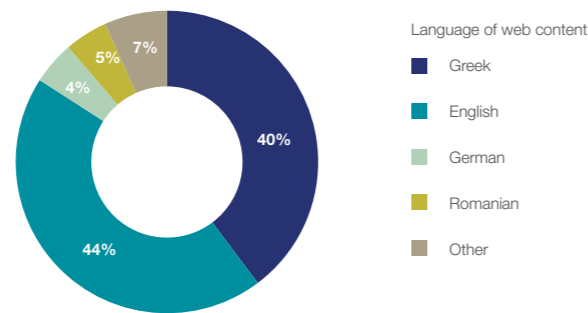
The small sample sizes for Cyrillic and Greek mean that relatively small differences in numbers can result in large percentages. For example, of the 7% of “other” languages in the Greek script IDNs (see figure 36), none has more than 9 websites. As with the larger data set, English performs strongly across all three scripts reflecting its popularity as a second language among Internet users. French and German also appear in web content associated with a small number of Cyrillic and Greek script IDNs (fewer than 30).

Figure 35 – Language of websites associated with Cyrillic script .eu IDNs (number in sample 660)



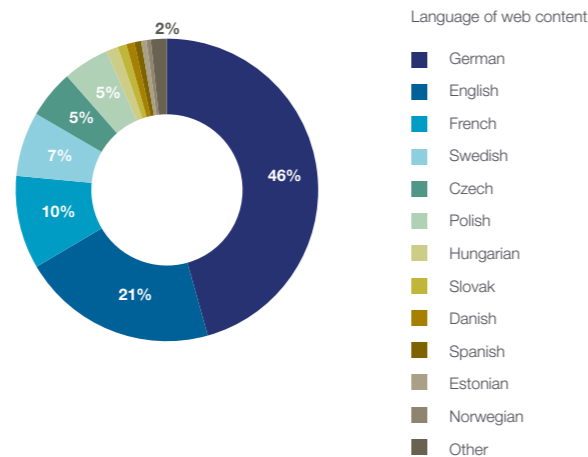
Bulgarian and Russian language websites are associated with Cyrillic script .eu IDNs

Figure 36 – Language of websites associated with Greek script .eu IDNs (number in sample 240)



Greek language websites make up 40% of websites associated with Greek script .eu IDNs

Figure 37 – Language of websites associated with Latin script .eu IDNs (number in sample 23 000)



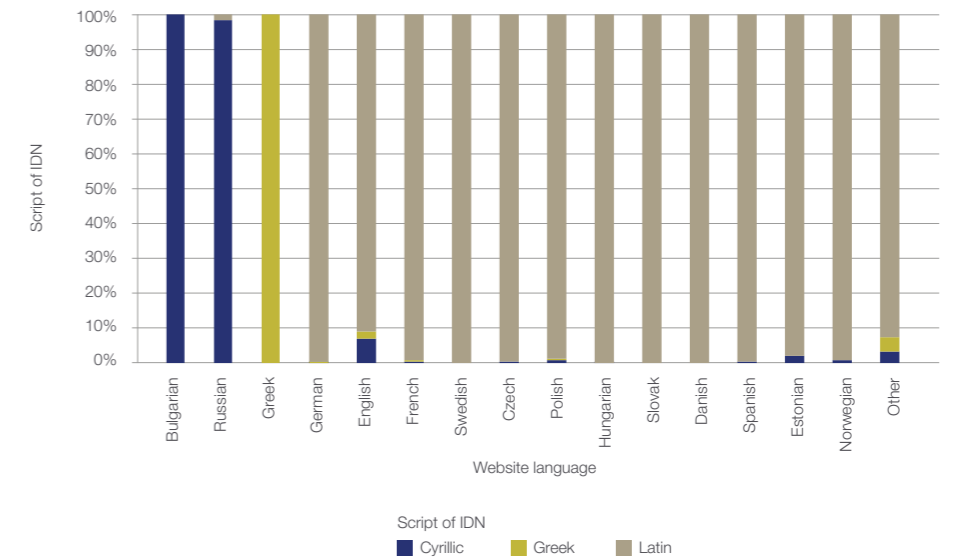
An array of Latin script European languages are associated with Latin script .eu IDNs

### 8.3.2 .eu IDNs show strong correlation with website language

Another perspective is gained by starting with the language of web content and analysing the script of the IDNs pointing to it.

As before (see Focus A), there is an almost perfect correlation between the language of web content and the script of IDNs – it is almost always the script one would expect for the individual language. The clearest examples (see figure 38) are Greek language websites which are only associated with Greek script IDNs; and Bulgarian and Russian language websites, which are only associated with Cyrillic script .eu IDNs (apart from a single Russian language/Latin script IDN example). Only with English does the correlation dip below 90%, for reasons we have explored above.

Figure 38 – .eu IDNs: correlation between script of domain name and language of web content



There is a near perfect correlation between the language of web content and script of IDNs under .eu

#### Comparison with last year's results

The results are consistent with last year's analysis of 51 000 .eu IDNs. The instance of English language websites is higher than last year, but the relationship between languages and IDN scripts remains strong.

## 8.4 Hosting of .eu IDNs

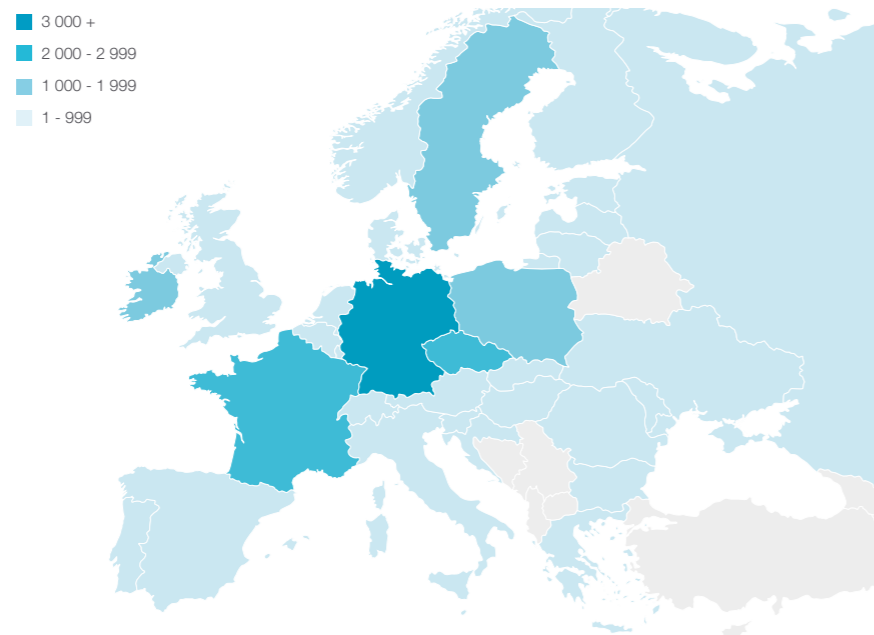
In December 2014, EURid had 747 accredited registrars, representing a geographically diverse registrar-base, across the EU and overseas. This slight drop since December 2013 (752 registrars) reflects continued industry consolidation.

34% of the total 3.9 million .eu domain names are managed by German registrars<sup>12</sup>, compared with 35% last year. The top 100 .eu registrars manage 85% of the .eu namespace, compared with 84% last year.

Last year, we speculated that if the correlation between local language content and local servers was borne out, we would expect to see clusters of hosting for .eu IDNs in countries associated with particular scripts (eg Greece for Greek script; Bulgaria for Cyrillic), and to see different patterns associated with IDN .eu domain hosting, compared with total .eu registrations. Overall, the picture may be a little blurred, as many registrars operate through networks of resellers who may be located in any country.

From our data sample of 50 000 .eu IDNs, we were able to identify the hosting country for 39 000. The remaining 11 000 domains had no IP addresses (indicating no active services, and therefore no hosting).

Figure 39 – Hosting of .eu IDNs



*Hosting country correlates with script of IDN. All .eu IDNs hosted in Bulgaria are Cyrillic script; all hosted in Greece are Greek script*

A comparison of ASCII and IDN .eu registrations by country of hosting (figures 40 and 41) emphasises links between script and local language. Germany's relative share increases from 33% (all .eu domains) to 49% (IDNs), perhaps reflecting that German language uses diacritics and special characters. Of the IDNs hosted in Germany, 99% are Latin script. Of the .eu IDNs hosted in Bulgaria, 100% are Cyrillic script; of the IDNs hosted in Greece, 100% are Greek script.

Figure 40 – .eu domains by country of registrar (all)

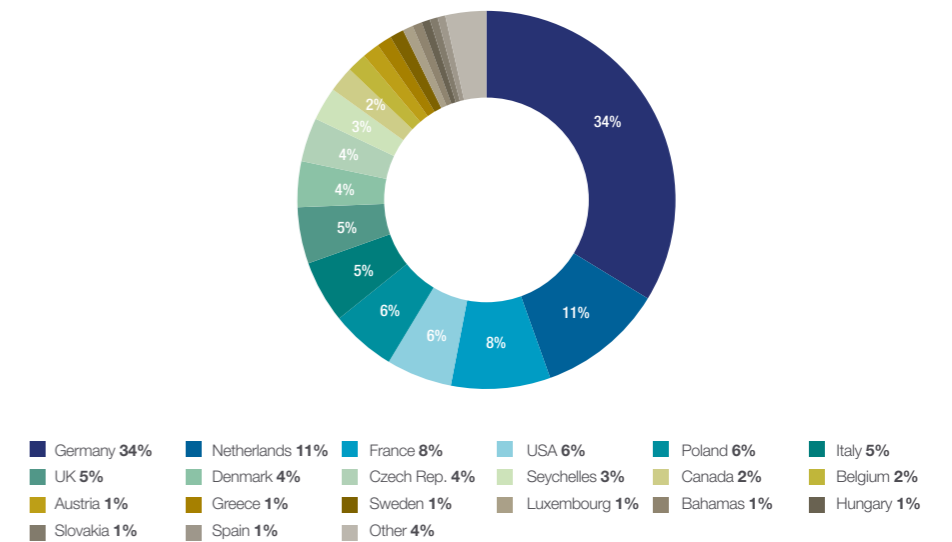
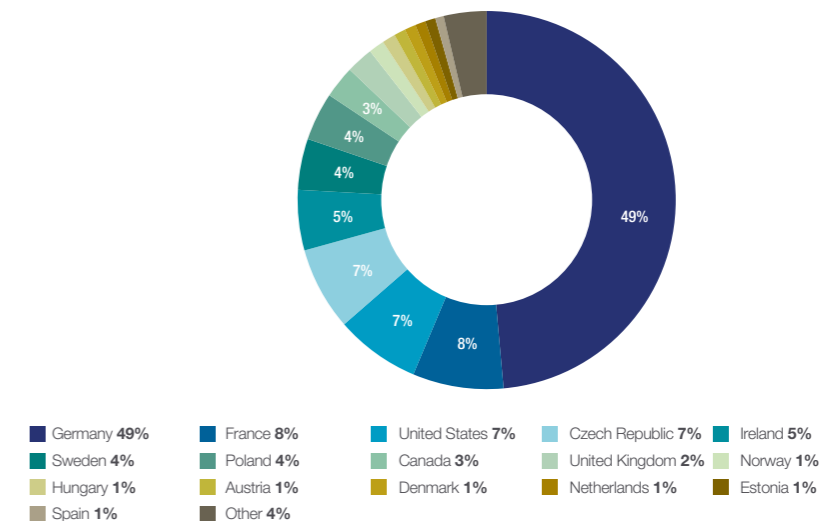


Figure 41 – .eu IDNs by country of registrar



*IDNs under .eu are hosted throughout Europe, with the majority found in Germany*



As in 2013, Germany continues to dominate .eu IDN hosting with more than 18 000 .eu IDNs, but its share has decreased by 10% to 49% (59% in 2013). United States has increased its share from 3% (2013) to 7% (2014), and Ireland from less than 1% (2013) to 5% (2014), with the addition of 1300 .eu IDNs. But in both cases the change in number of domains is comparatively small. It is worth emphasising that both German and US registrars are among those with the largest networks of resellers and the most effective penetration in multiple markets through local branches.

The results of the analysis of .eu IDN hosting support the findings of third-party research which correlates local servers with local content, and emphasises the link we have drawn in previous IDN studies between the script of domain names, and the language of web content.

## FOCUS G

# IDNs in the European Union

## 9 IDNs in the European Union

### 9.1 Background

The signatories to the Treaty of Rome – France, Belgium, Italy, Luxembourg, the Netherlands and West Germany – formed the European Economic Community (EEC) in 1957. The community enlarged in the second half of the twentieth century to create a single market founded on the “four freedoms” of movement of goods, services, people and money, and the broad dimensions of the present European Union (EU) were defined by the Maastricht Treaty in 1993<sup>13</sup>.

The EU now comprises 28 countries and is the biggest regional economy<sup>14</sup> and trading bloc in the world, with a combined gross domestic product (GDP) of \$18.46 trillion (2014), a population of 500 million, and Gross National Income per capita of more than \$35 000. The annual value of both imports and exports between EU and non-EU countries is €1.7 trillion<sup>15</sup>.

Life expectancy at birth is 80 years, and 97% of EU individuals complete primary education<sup>16</sup>.

Internet penetration in the EU is high, with 82% of individuals using the Internet. On average, 65% of individuals use the Internet every day (compared with 31% in 2006)<sup>17</sup>. There are regional differences: 80% or more of individuals in Northern Europe, including Nordic countries, use the Internet daily, as opposed to fewer than 50% of individuals in Romania, Bulgaria and Greece.

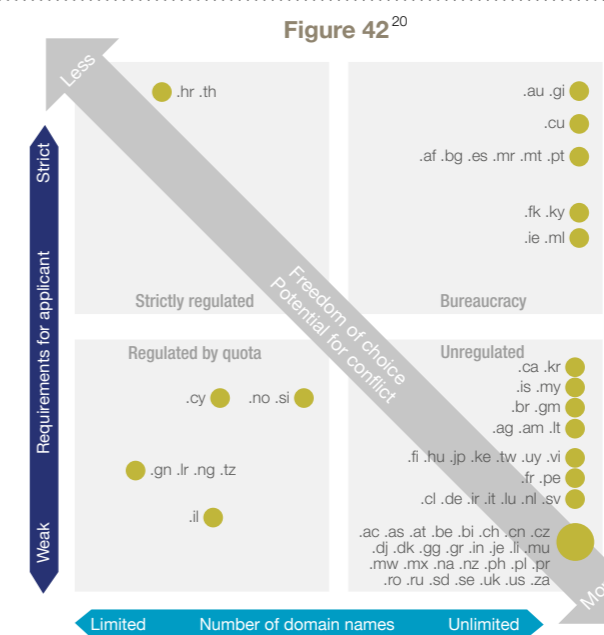
The EU is characterized by linguistic and cultural diversity. There are 24 official languages and, according to UNESCO estimates, more than 100 endangered languages across the region<sup>18</sup>. Most of the official languages are Latin script, with the exception of Greek (Greek script) and Bulgarian (Cyrillic script).

For speakers of Latin script languages, the ASCII character set, used in traditional domain names, does not present an essential barrier to understanding. Even though the character set for traditional ASCII domains is more limited – having no accents, diacritics or special characters – work-arounds have emerged in some languages, for example the convention of representing the “ü” with “ue”, so Müller becomes Mueller. The affinity with Latin script has led most ccTLDs in the region to deploy IDNs at the second level under ASCII TLDs.

### 9.2 Domain names in the EU

The European Union is home to some of the most successful ccTLD registries in the world. Five of the top ten ccTLDs in the world are in the European Union (.de, .uk, .nl, .eu, and .fr)<sup>19</sup>. Penetration of ccTLDs per 1 000 of population ranges from 20 (Croatia) to 330 (Netherlands).

The ccTLD market in the EU (and the continent of Europe) has been strong since the late 1990s. The regional ccTLD organization, CENTR, has been a focal point for exchange of good practices, which has accelerated development. For example, the trend since the year 2000 has been for European registries to move towards open systems of registration (first come, first served). In 2005, NORID (the registry for Norway, .no) developed a matrix to reflect registry policies, and mapped the position of CENTR members (and associate members) at the time.

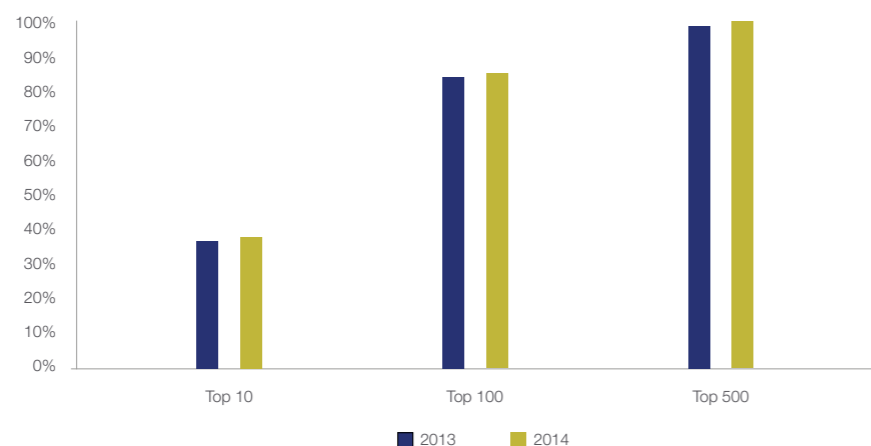


Since 2005, the tendency for European ccTLDs has been to move towards the bottom-right quadrant (“unregulated”), the most recent examples being .fr (France), .pt (Portugal), .es (Spain), .it (Italy), .lv (Latvia) and .bg (Bulgaria). Following liberalisation of registry policies, these ccTLDs have enjoyed high growth<sup>21</sup>.

European ccTLDs have played an important role in developing local Internet ecosystems since the late 1990s. The majority use locally accredited registrars as their primary channel to market. Typically, there will be a handful of large, international registrars (which may also be ICANN accredited) in most ccTLDs. The familiar “long-tail” of market share by registrar indicates that only a minority of any ccTLD’s registrars will earn their

primary income through domains. To survive in business, smaller local registrars develop related added-value services such as hosting, web design, and certification, often in local languages. These stimulate growth in Internet services at the local level, as well as providing an incubation for future international players and ICANN accredited registrars. As an illustration, of EURid's 761 registrars (December 2014), the top ten managed nearly 38% of the register (an average of nearly 150 000 .eu domains per top ten registrar). At the bottom end, by inference, 261 .eu registrars manage a total of 0.5% of the register (an average of 75 .eu domains per registrar). Similar patterns are observed in other large ccTLDs.

Figure 43 – Market share of top 10, top 100 and top 500 .eu registrars (source: EURid)



European ccTLDs have also been at the forefront of technical developments in the domain name system, including implementation of automated registration systems (EPP and national equivalents), security extensions (DNSSEC) and involvement in IDNs, both at the technical and policy levels.

In summary, domain names have been an established part of the European Internet landscape since the early days of mass Internet deployment. Consumers are accustomed to seeing local ccTLD domains in advertising and mass marketing materials. European ccTLD registries themselves have played a pivotal role in the development of thriving, competitive local markets for domains and related added-value services.

### 9.3 IDN Readiness in the EU

The prospect for IDNs in a European environment should be promising, and this is reflected in our "IDN Readiness Matrix", which takes into account country and language factors on the one hand, and ccTLD factors on the other.

Figure 44 – IDN readiness in the EU



Within "country and language factors" are measures of economic strength, key skills such as literacy, Internet penetration, costs, and presence of Internet exchange points, as well as language and cultural factors.

Economic factors are favourable (eg Germany, Spain and Greece are classified as high income countries by the World Bank), essential skills are strong (literacy levels 97% and above), Internet Exchange Points are plentiful (19 in Germany, Amsterdam is a regional hub), and mobile broadband prices are low as a percentage of income (with the exception of Bulgaria).

Although there is high linguistic diversity across the region as a whole, linguistic and cultural homogeneity tend to be high within member states (for example, according to the World Values survey 2010–2014<sup>22</sup>, more than 90% of people in Germany speak German at home, 83% in Spain speak Spanish at home). There is a comparatively high level of local language applications<sup>23</sup>.

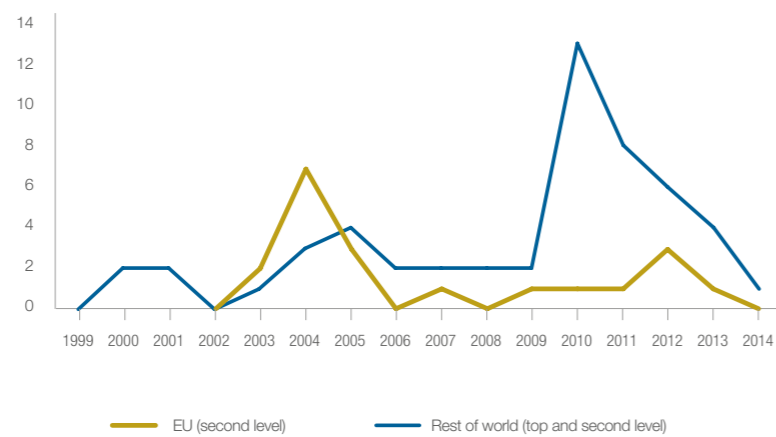
The ccTLD registries are strong, with liberalised policies, low prices and sophisticated channels to market. Downstream, at the retail level, domain name and related services are thriving with strong competition and wide consumer choice.

According to the IDN readiness matrix, we would expect to see high levels of IDN registrations in Germany, fairly high levels in Spain, and a moderate number in Greece and Bulgaria.

### 9.4 IDNs in the EU

Internationalised Domain Names began to be launched at the second level from 2000, with the gTLDs .com and .net. Countries and territories from Asia and the Pacific were among the first ccTLDs to launch, including Japan, China and Taiwan of China (2000–2002).

Figure 45 – IDN launches in ccTLDs over time



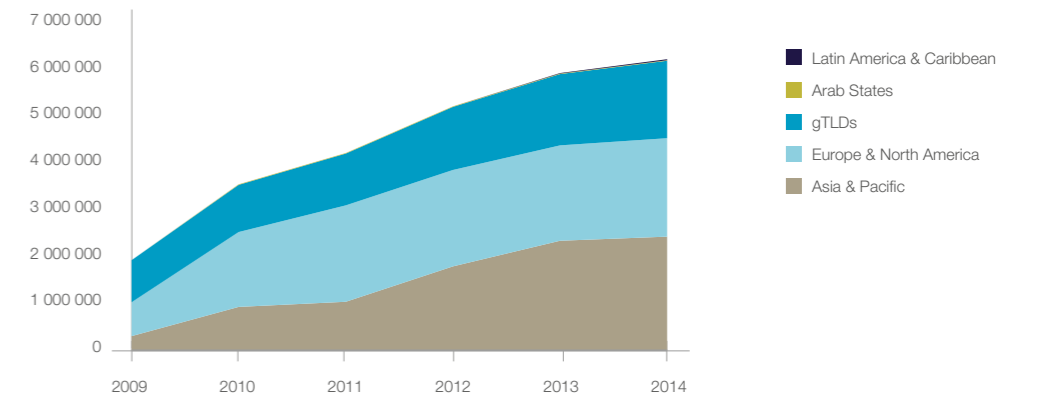
The first EU countries to launch IDNs (at the second level) were Poland (.pl) and Sweden (.se) in 2003, followed by a wave of launches in 2004 and 2005 that included Austria, Germany, Denmark, Hungary, Lithuania, Latvia, Finland, Greece and Portugal along with several others from the European Economic Area.

A second wave of IDN launches (again, at the second level) occurred between 2009 and 2013: Bulgaria, .eu, Luxembourg, Slovenia, Estonia, and Belgium.

The EU has more than a decade’s experience of managing IDN. Because the majority of EU languages use Latin script, it is natural that the majority of ccTLDs have opted to implement IDNs at the second level rather than IDN ccTLDs. The exceptions are Bulgaria and Greece, which use Cyrillic and Greek script respectively, and have applied for бг and ελ via the IDN ccTLD Fast Track Process (see below).

The dominance of Latin script languages in the region could potentially depress uptake for IDNs, as the majority of EU Internet users would be able to decipher traditional ASCII domain names, which are not subject to universal acceptance issues. In practice, though, there is relatively high uptake of IDNs compared with other world regions.

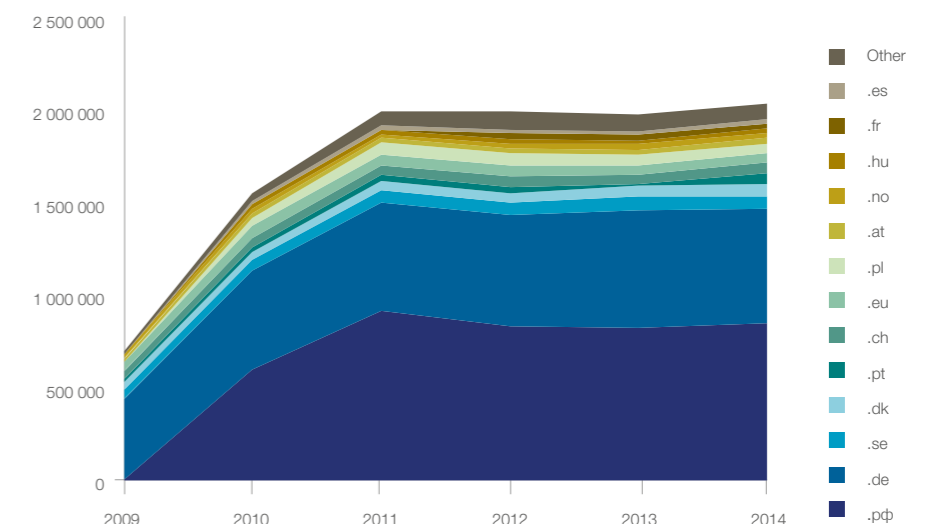
Figure 46 – IDNs by geographical region (both top and second level) 2009-2014



Europe has 34% of the world’s IDNs

In 2014, 34%, (or 2 million) of the world’s IDNs were in ccTLDs in Europe and North America, second only to Asia and the Pacific (2.4 million). Whereas the relative market share of Asia and the Pacific has increased over time, the proportion of IDNs from Europe has remained fairly constant since 2011.

Figure 47 – Europe and North America, market share for IDNs (top and second level), 2009-2014



.pф (top level) and .de (second level) comprise two thirds of European IDNs

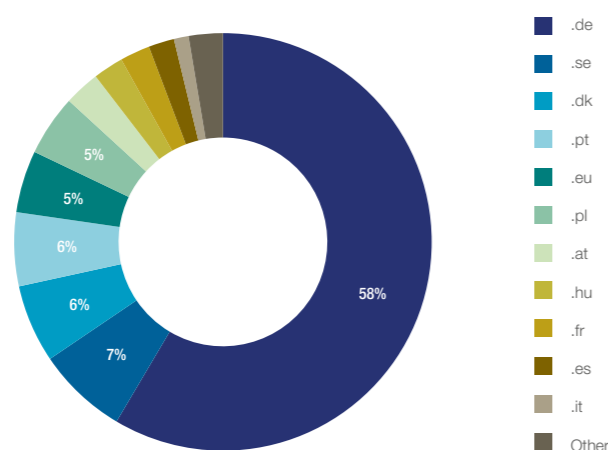
Factors from the IDN Readiness Matrix may help to explain this – the maturity of domain name markets in the EU, high Internet adoption, low prices, and the strength of languages spoken within member states. Many of the ccTLDs in the EU launched IDNs more than a decade ago, giving time for the market to become accustomed to the domains.

Within the UNESCO region of Europe and North America, the relative market shares have remained fairly stable over time, with the two largest IDN spaces (the Russian Federation, .рф – 840 000 – at the top level, and Germany, .de – 630 000 – at the second level) roughly equal to all the others put together.

Over the past 12 months, the only major shift in market share is under .pt (Portugal), where IDNs have increased by 560% from 9 000 to 62 000. The registry has launched an initiative called “On the Spot Firm” whereby the registry automatically creates a domain name on the day a company in Portugal is constituted. The domain name reflects the registered name of the company, and that is why so many of the new domains are IDNs, because the underlying company names have characters associated with Portuguese language.

Of the IDNs in Europe and North America, approximately half relate to EU countries. These are all at the second level. Germany (.de) has nearly 60% of EU market share for IDNs, and .eu has 5%.

Figure 48 – Market share, IDNs in the EU (second level)



## 9.5 IDN experiences in Germany, Spain, Bulgaria and Greece

We interviewed the registry managers of ccTLDs for Germany, Spain, Bulgaria and Greece. Germany and Spain offer Latin script IDN registrations at the second level, Bulgaria has been offering Cyrillic script at the second level under .bg and is in the process (since 2009) of applying for .бг. The Greek registry, FORTH-ICS, has been offering Greek script IDNs at the second level since 2005, and has applied for the IDN ccTLD ελ. Both .бг and ελ are expected to complete the delegation process and be launched in the next 12 months.

### 9.5.1 Germany

DENIC, a private non-profit organisation established in 1996 and headquartered in Frankfurt, is one of the largest ccTLDs in the world (and by some way the largest of the EU registries), with more than 15 million registrations.

DENIC operates as a cooperative. It has 320 members who are domain name registrars. According to the organisation’s bylaws, a certain percentage of profits are retained for investment, and any surplus is returned to the members. The majority of members are based in Germany. DENIC’s operations are focused principally on domain name registration.

In 2004, DENIC began offering IDNs (Latin script only) at the second level under .de. At their peak, there were 648 000 IDNs under .de; as at December 2014, there were 630 000. The fall in numbers is partly in line with overall trends, and may also have been affected by a giveaway or price promotion. For a few months in 2013, IDN numbers were increasing at a higher than usual rate, and one year later the same number were deleted. For example, in August 2013 there were 12 000 new registrations, and in July 2014 there were 11 000 deletions. This is consistent with poor renewal rates on giveaways or aggressive price promotions.

DENIC notes that universal acceptance issues are likely to affect uptake. Web browsers do not support the sharp “s” (ß). DENIC has tried to get the big web browsers interested in supporting this character but without success. “They don’t answer”, according to DENIC. It means that the percentage of IDNs is steadily declining compared to overall registrations under .de, because ß is one of the most commonly used characters in German language. The registry’s perception is that there are no drivers in the wider market to improve IDNs.

At the user level, DENIC believes that Germans are now accustomed to normal domains, and used to seeing words like “straße” written as “strasse”. “They no longer perceive any error”, according to DENIC, “You even see advertisements in Germany now using the double ‘ss’ rather than the ‘ß’.”

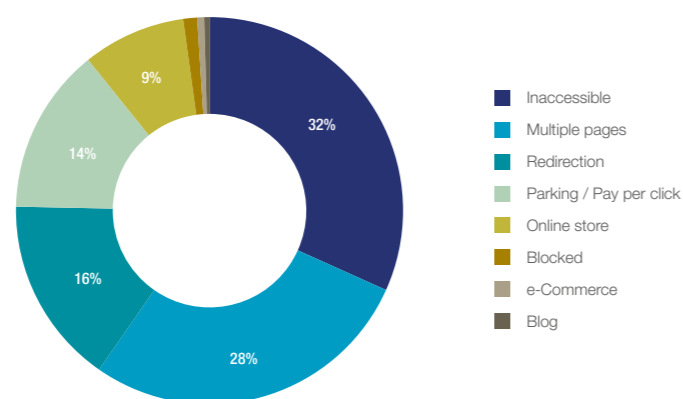
### 9.5.2 Spain

Red.es is a public sector (government agency) registry. There are 1.7 million .es domains (December 2014). There are just over 100 accredited registrars, of which 57% are from Spain. Red.es' registrar accreditation process is tough compared with other registries. As well as meeting documentation requirements, registrars need to carry insurance cover and lodge a financial bond with the registry. Registrars also need to demonstrate technical proficiency to interact with Red.es' systems. Under .es there is a ban on the warehousing of domain names (a practice associated with the secondary market). Registrars also need to keep a signed document on behalf of the registrant to prove their identity. The registry is beginning to enforce data quality requirements.

IDNs are offered in Latin script at the second level to support Spanish – one of the most widely-spoken languages in the world. IDNs were launched in 2007, with a high-profile event at the Royal Spanish Academy in Madrid, with the Spanish Prime Minister and other Ministers in attendance. The IDN launch was reported widely in the press, with a focus on how it would allow people to represent the word “España” properly, with the tilde on “ñ”. The registry reports that at the time there was a great deal of optimism: “We felt we’d invented the ñ.”

Optimism has given way to frustration, as a result of universal acceptance issues. The registry reflects on the problems with usage: “It’s getting better for websites, but email is not so good. Overall, registrations are quite marginal. Registrars don’t see it as a priority, and demand is not high.” Red.es’ IDN numbers have remained stable at 20 000 since 2009. The renewal rate is comparatively high, at 83%, but the number of new registrations is low (approximately 4 000 per year), and therefore the net growth is negligible as deletes offset new registrations.

Figure 49 – Use of IDNs under .es (second level)



“We’re glad to have IDNs, but are not making a huge effort to promote them, because we fear we would be blamed if they don’t work. We’ll be glad when we can do a big push. It is very good to have the ñ. It’s there, available.” Red.es echoes DENIC, the German registry, in saying that users have become accustomed to seeing and using ASCII domains.

Red.es is not involved in universal acceptance programmes. It has a small staff dedicated to the registry operation, and is not in a position to lead this work.

Red.es reports that there is very low use of IDNs in advertising. This contrasts with the position in, say, the Russian Federation, where IDNs often appear in advertising.

The usage rates of .es domains are in line with other European IDNs. Over 50% of IDNs under .es have active web content associated with them, with a range of sites, including multiple page sites, parking, stores and ecommerce and blog sites. An additional 16% are redirected to other active websites.

### 9.5.3 Bulgaria

Register.BG is a private company, operational since 1991. There are approximately 42 500 domains in .bg (as at December 2014). The Bulgarian registry has fewer than 10 locally accredited registrars.

Register.BG operates a first-come, first-served policy for registration of .bg domains, so long as the administrative contact for each domain is in the EU or has a proxy in the EU.

IDNs have been offered at the second level under .bg since 2009, in Cyrillic script to support the Bulgarian language. There are fewer than 1 000 IDN registrations in .bg (less than 2% of overall registrations in .bg). To some extent, this reflects the poor user experience of mixed script IDNs, which has been documented in earlier reports. The Bulgarian registry has applied through the ICANN ccTLD Fast Track process for .bŕ, which when granted will enable the Register.BG to offer IDNs entirely in Cyrillic script. It is hoped that the .bŕ domains will be available from the Spring of 2016.

To coincide with the launch of .bŕ, a new multistakeholder organization, set up by Register.BG, will take on marketing of both .bg and .bŕ.

### 9.5.4 Greece

FORTH-ICS is a public sector (government agency) registry, a department of the Institute of Computer Science of the Foundation for Research and Technology, Hellas. The registry has been operational since 1989. There are between 400 000 and 450 000 .gr domains.

There are approximately 450 locally accredited registrars for .gr, of which approximately 20 are international registrars and the remainder Greek.

Since 2005, FORTH-ICS has been offering IDNs in Greek script at the second level under .gr, to support Greek language. Fewer than 2% of domain names in .gr are IDNs – approximately the same proportion as in .bg. The Greek registry has also applied for the IDN ccTLD ελ, which this is now reaching the final stages of the ICANN IDN ccTLD Fast Track Process and is expected to be launched in 2016.

According to the registry, while uptake of IDNs and support by registrars are more or less in line with expectations, user awareness is low. It is hoped that the fully Greek script IDN ελ will prove a more attractive market offering.

## 9.6 Conclusions

The European Union, the world's biggest economy, has high levels of Internet penetration and is home to many of the world's leading ccTLDs. A linguistically diverse region, the majority of languages use Latin script, making it a natural decision for states to deploy IDNs at the second level (with the exception of Bulgaria and Greece). The region's strength in economic factors, Internet development and linguistic diversity raise an expectation that IDNs deployment will be strong. This expectation is borne out, as 34% of the world's IDNs (2 million) are found in the region. Half of these relate to the EU. European ccTLDs have tended to deploy IDN scripts that closely match the requirements of local languages spoken in the country or territory. Some registry managers observe that (perhaps as a result of the high penetration of traditional ASCII domains in the region) users have become accustomed to seeing and using workarounds for special characters (eg "ue" instead of "ü" in German, or "n" instead of "ñ" in Spanish). This observation highlights the impact of poor universal acceptance: users will work around IDNs if they have a choice, by adopting ASCII domains instead – because they work.

## Conclusions

## 10 Conclusions

Ethnologue publishes a list of languages with at least 50 million speakers<sup>24</sup>. Of the 23 languages listed, only eight are Latin script. The other 15 languages, totalling more than 2.7 billion speakers, use different scripts. For those nearly 3 billion people, the ASCII domain name system may be neither intelligible nor intuitive. Yet, only 2% (6.2 million) of the world's registered domains are so-called internationalised domain names.

Recent years have seen a burgeoning in alternative ways to locate online resources: 'apps', search, QR codes. Yet, the domain name system continues to underpin much of the Internet's functioning: from email and web browsing, to certificates and unique user identifiers. Research has found that global Internet users<sup>25</sup>, and those in the Middle East and Adjoining Countries<sup>26</sup> rely on domain names for direct navigation (typing a web address straight into the browser bar), and when deciding on which search result to click. People who can't read the Latin alphabet are at a disadvantage when interacting with the Internet. Even so, progress on guaranteeing universal acceptance of IDNs is slow – little changes year on year.

Fifteen years after the first IDNs (at the second level) came to market, and more than 6 years since the launch of the first full IDNs, it is still difficult to send and receive an IDN email across different platforms. It is still not possible to log in to popular services using an IDN email address.

Figure 50 – IDN negative cycle

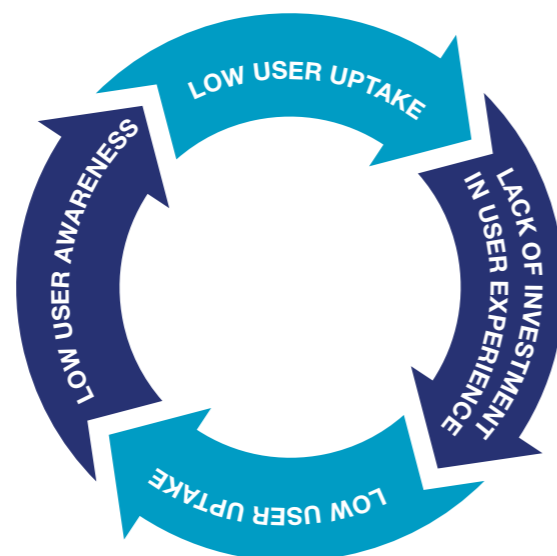
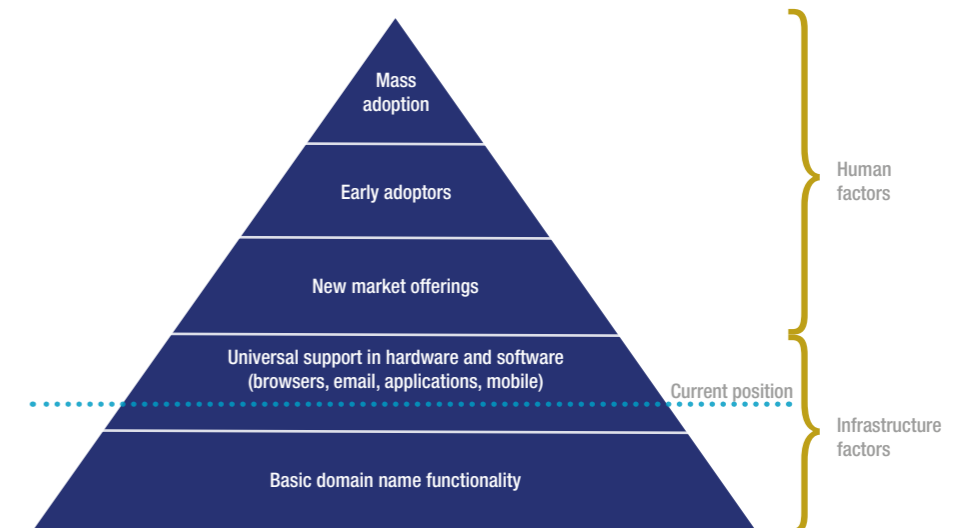


Figure 51 – IDNs - Hierarchy of needs



We have observed in previous reports that a negative cycle of poor functionality, low uptake and low user awareness is at play. Until IDNs work seamlessly in every context in which an ASCII domain is used, mass adoption will remain elusive (as predicted in the IDN hierarchy of needs). Industry opinions – about uptake of IDNs, support by registrars and end user awareness – are unfortunately showing declining confidence across every category. Investment in IDNs by registries or other industry actors is less likely if confidence levels in the product are low.

Where IDNs are in use both at the top and second levels, there is evidence of a strong linkage with online linguistic diversity. Whereas more than half of web content is in English language, content associated with IDNs is more evenly distributed across major world languages, including Chinese, Japanese, German, Russian and Korean. The script of IDNs, both at the top and second level, accurately signals the language that will be found on associated web content, and hosting patterns for IDNs also follow the languages spoken in countries.

Three scripts dominate the 6.2 million registered IDNs: Latin, Han and Cyrillic. The majority of IDNs are registered at the second level (eg 例.com). Whereas Latin script dominates second level IDNs (eg españa.eu) with 57% of registrations, the picture is different with full IDNs, where 95% are either Cyrillic or Han script (eg 例.中国 or пример.рф).

Europe has been a leading region for the domain name industry, and more than one third of the world's IDNs are registered in Europe. Under .eu, IDNs are offered at the second level in Latin, Greek and Cyrillic scripts to support the 24 official languages of the European Union. IDNs in .eu show a strong correlation between language of web



content and IDN script, and hosting location tends to reflect language and script: so, of the .eu IDNs hosted in Bulgaria, 100% are Cyrillic script, and of the .eu IDNs hosted in Greece, 100% are Greek script.

The experiences of Bulgaria and Greece reflect the difficulties of mixed-script domains. Second level IDNs under .bg and .gr have struggled for uptake, and the registries are expected to launch top level IDNs .бг and ελ during 2016. Meanwhile, although actual registration levels of Latin script IDNs at the second level under .de (Germany) and .es (Spain) are comparatively higher, growth rates are fairly static. Of greater concern, the registry managers from Germany and Spain both mentioned that users are now accustomed to seeing German or Spanish words represented without accents in domain names.

Looking ahead, there are signs of hope.

Large platform providers, such as Google and Microsoft, are working with other actors to overcome universal acceptance challenges, particularly in relation to email address internationalisation.

During the year 2015, IDNs within the new gTLDs experienced high growth, particularly at the top level. At the time of writing (November 2015), one of the top 10 new gTLDs is the Han script .网址 with more than 350 000 registrations. There are a further three full IDNs (also Han script) in the top 50 new gTLDs. Against the backdrop of generally low uptake of new gTLDs, IDNs are performing reasonably well, and this may attract investment and market interest.

## APPENDIX

# What are Internationalised Domain Names, and why are they important?

Domain names, the Internet's addressing system, work because they are interoperable and resolve uniquely. This means that any user connected to the Internet, anywhere in the world, can get to the same destination by typing in a domain name (as part of a web- or email address). The plan to internationalise the character sets supported within the Domain Name System is almost as old as the Internet itself. However, technical constraints and the overriding priority of interoperability resulted in a restricted character set within the Domain Name System: ASCII<sup>1</sup> a to z, 0 to 9 and the hyphen<sup>2</sup>.

Technical standards to internationalise domain names were developed from the mid-1990s. The solution retains the domain name system's restricted character set, and transliterates every other character into it. Each series of non-ASCII characters is transliterated into a string of ASCII characters prefixed with xn-- , called Punycode. Punycode domain names are meaningless to humans, but meaningful to machines that resolve domain names – name servers. Thus, humans see the meaningful, transliterated characters when they navigate the Internet, whilst the underlying technical resolution of domain names remains unchanged.

Figure 1 – Internationalised Domain Names explained

	IDN second level	ASCII top-level domain (TLD)
human readable (UTF8):	παράδειγμα.eu	Greek script domain name (hybrid)
machine readable (punycode):	xn--hxajbheg2az3al.eu	The same domain name in punycode
	IDN second level	IDN top-level domain (IDN ccTLD)
human readable (UTF8):	образец.рф	Cyrillic script domain name (full IDN)
machine readable (punycode):	xn--80abnh6an9b.xn--p1ai	The same domain name in punycode

Implementation of IDNs began in 2000 at the second level (under .com and .net) and 2001 (.jp). In the ten years that followed, several ccTLDs deployed IDNs, primarily supporting local language character sets. Some experimented with other strategies for internationalising domain names, but the IDN technology proved the most successful. Following pressure from the ccTLD community, ICANN introduced a fast-track process to create IDN ccTLDs in 2007–2008. From 2010, IDNs became available at the top level having completed the specific process set by ICANN (for example, السعودية for Saudi Arabia, рф for the Russian Federation)<sup>3</sup>.

IDNs are technically complex to implement. Many challenges remain, including (at a technical level) how to handle variant characters<sup>4</sup>, which are prevalent in Arabic and Chinese scripts. Another challenge is the user experience, eg consistent representation in browsers and emails.

Despite the technical challenges, IDNs are viewed by many as a catalyst and a necessary first step to achieving a multilingual Internet. According to UNESCO, in 2008 only 12 languages accounted for 98% of Internet web pages; English, with 72% of web pages, was the dominant language online<sup>5</sup>. Recent reports indicate that other languages are growing rapidly online. For example, by 2010, only 20% of Wikipedia articles were in English<sup>6</sup> and according to W3Techs, by 2014 the percentage of websites with English as primary language had diminished to 55%<sup>7</sup>. Supporters of IDN believe that enabling users to navigate the Internet in their native language is bound to enhance the linguistic diversity of the online population, and that IDNs are strongly linked to local content.

While this study focuses on the web, it should be noted that other applications also require internationalisation, eg email, file transfer protocol, etc.

## 1 IDN timeline

For more than a decade, hybrid internationalised domain names have been available at the second level with ASCII top level domains (for example, παράδειγμα.eu in figure 1). This situation was only satisfactory for Latin-based scripts used by most European languages, where the IDN element would commonly reflect accents, or other diacritical marks on Latin characters. For speakers of languages not based on Latin scripts (for example, Chinese, Arabic), the hybrid IDN/ASCII domains were unsatisfactory. Right-to-left scripts, such as Arabic and Hebrew created bi-directional domain names. When combined with left-to-right TLD extensions, bi-directional domains require users to have a familiarity with both their own language and Latin script in order to navigate the Internet. As explained in the report IDNs State of Play 2011, bi-directional domain names not only require Internet users to change script when typing in a single web address, but also potentially confuse the strict hierarchy of the Domain Name System. Industry experts describe bi-directional domains as “barely usable”<sup>8</sup>.

Internet governance discussions from 2006 onwards highlighted the lack of IDNs in the root domain zone (which would enable full IDN domain names including at the top level)

Figure 2 – examples of hybrid and bi-directional IDN domain names (Japanese, Arabic, Hebrew).



as a key building block towards the goal of a multilingual Internet<sup>9</sup>. From 2005, there was increasing pressure on ICANN, the global coordinator of Internet domain names, to implement IDNs in the root zone.

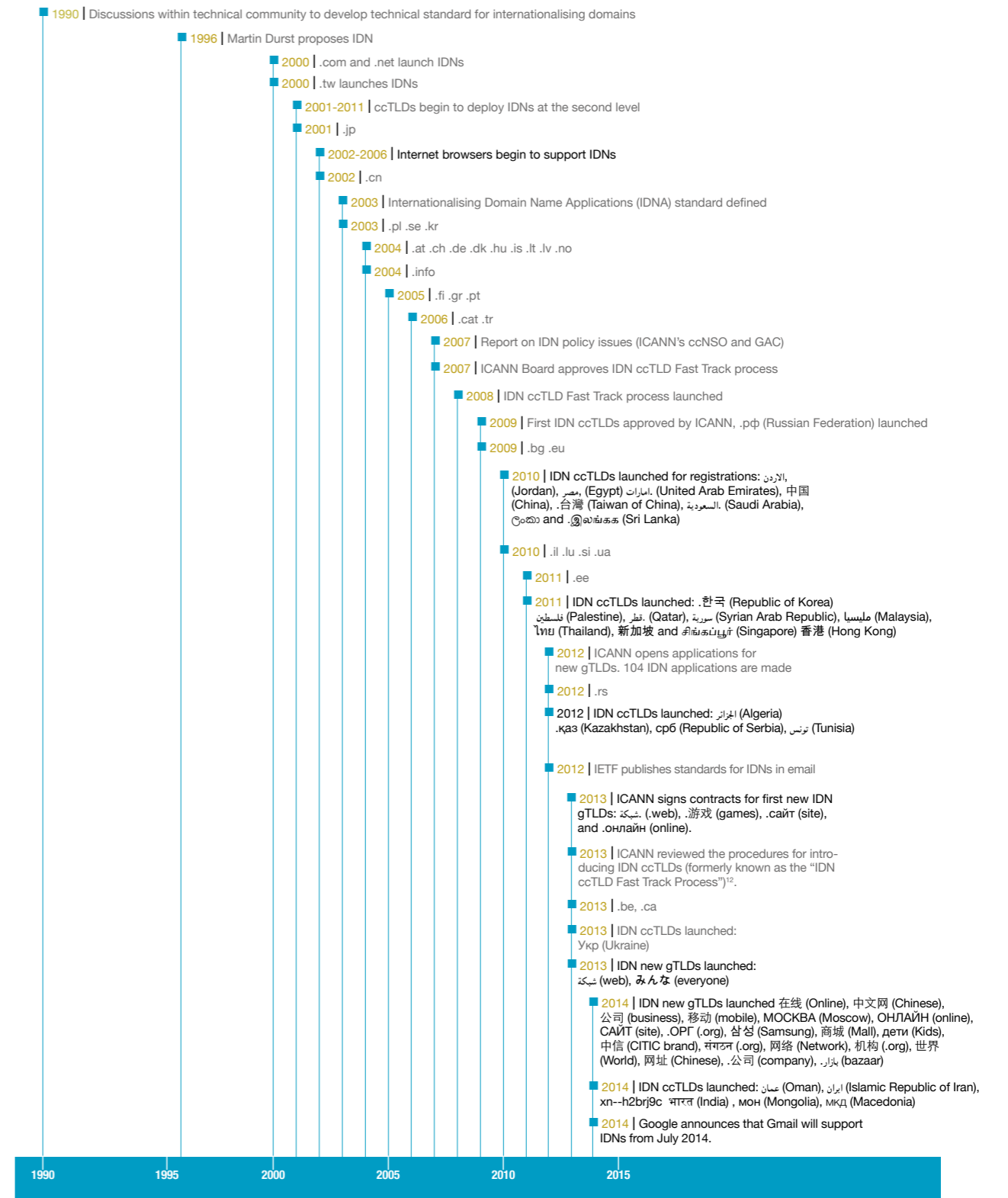
In the meantime, some countries created their own work-arounds. For example, China and the Republic of Korea developed keyword searches at the domain name servers for .cn and .kr. For those searching for domains within the country, the keyword system resolves the domain without the user having to type the Latin-script domain ending (TLD). In China and Egypt, browser add-ons were developed to translate a domain into another name that would be looked up on national servers, to enable Internet users to enter local character strings into browsers. However, this solution relied on users downloading a plug-in, which was not compatible with every browser. These efforts indicate the importance that policy makers and technologists have placed on internationalising domain names, and that IDNs emerged as the superior technology amongst a number of alternatives.

In 2009, the ICANN Board approved a fast track process for IDN ccTLDs, describing the programme as a “top priority”<sup>10</sup>. By April 2011, 17 IDN ccTLDs had been launched. Since then, there has been a steady expansion of the number of IDN.IDN registries launched, including .한국 (Republic of Korea), .قطر (Qatar), فلسطين (Palestine), الجزائر (Algeria), .香港 (Hong Kong), سورية (Syrian Arab Republic), .қаз (Kazakhstan), срб (Serbia), 新加坡 and சிங்கப்பூர் (Singapore).

In mid 2013, ICANN signed its first contracts for new gTLDs: شبكة (.web), 游戏 (games), .сайт (site), and .онлайн (online). The new gTLDs started to launch from the end of 2013 through 2014, and by 31 Dec 2014 292 new gTLDs were available for general registrations, including 14 IDN new gTLDs<sup>11</sup>.

According to our research, as at 31 Dec 2014, IDNs are offered at the second level under 297 ASCII TLDs, comprising ccTLDs and gTLDs, and 71 IDN TLDs.

Figure 3 – IDN Timeline



## Endnotes

1. VNNIC, *Report on Viet Nam Internet Resources 2014*, p48 <http://www.vnnic.vn/sites/default/files/whitebook/ReportOnVietNamInternetResources2014.pdf>
2. <https://community.icann.org/display/MES/Task+Force+on+Arabic+Script+IDNs>
3. <http://www.everis.com/global/WCRepositoryFiles/everis%20connected%20car%20report.pdf>
4. <http://www.potaroo.net/reports/Universal-Acceptance-UA-Report.pdf>
5. [http://www.eurid.eu/files/publ/IDNWorldReport2014\\_Interactive.pdf](http://www.eurid.eu/files/publ/IDNWorldReport2014_Interactive.pdf) p55
6. For example, gmail.
7. Examples of this include the universal acceptance Steering Group and the research efforts discussed in the section on IDNs and Measurement.
8. As at November 2015
9. Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 140, 1–55
10. NB The totals by script do not equal the total number answering this question, as some registries offer multiple scripts.
11. <http://www.unesco.org/new/en/social-and-human-sciences/unesco-regions/>
12. EURid Quarterly report 2014, Q4
13. For a brief history of the European Union, see [http://europa.eu/about-eu/eu-history/index\\_en.htm](http://europa.eu/about-eu/eu-history/index_en.htm)
14. See EU position in the world, <http://ec.europa.eu/trade/policy/eu-position-in-world-trade/>
15. Source: European Commission, *Trade Flows in goods between EU and non-EU countries* [http://madb.europa.eu/madb/statistical\\_form.htm](http://madb.europa.eu/madb/statistical_form.htm) 2014.
16. Source: World Bank 2014 <http://data.worldbank.org/region/EUU>
17. Source: Eurostat 16 December 2014 "Internet usage by individuals in 2014" <http://ec.europa.eu/eurostat/documents/2995521/6343581/4-16122014-BP-EN.pdf/4f07b2a-5aee-4b91-b017-65bcb6d95daa>
18. Source: UNESCO Atlas of the World's Languages in Danger, 2015 <http://www.unesco.org/languages-atlas/en/atlasmap.html>
19. See Verisign, *Domain Name Industry Brief, Q4 2014* <http://www.verisign.com/assets/infographic-dnib-Q42014.pdf>
20. Source: NORID, 2005
21. Source: ICANN Middle East DNS Study (EURid et al), 2015
22. *World Values Survey wave 6 (2010–2014)* <http://www.worldvaluessurvey.org/WVSDocumentationWV6.jsp>
23. Measured by percentage of local sites in Alexa.com top 20 by country.
24. <http://www.ethnologue.com/statistics/size>
25. Global Domain Name Preferences survey (Domain Name Association), February 2015. 5,000 responses <http://www.thedna.org/wp-content/uploads/2015/07/DNA-Global-Domain-Name-Preferences-Survey-Feb-2015.pdf>
26. ICANN Middle East and Adjoining Countries DNS Study, 2015 <https://www.icann.org/en/system/files/files/eurid-middle-east-dns-study-initial-13oct15-en.pdf>

## Appendix

1. For an explanation of ASCII, see <http://en.wikipedia.org/wiki/ASCII>
2. See *Internationalisation of Domain Names: A history of technology development*, Klensin, J and Fältström, P.
3. See <http://www.icann.org/en/topics/idn/idn-activities-seoul-28oct09-en.pdf>
4. IDN variants have been a focus for working groups within ICANN recently. See <http://www.icann.org/en/news/public-comment/idn-variant-tld-revised-program-plan-04may12-en.htm>
5. See address of Janis Karklins, Assistant Director General, Communications and Information Sector, UNESCO, at the Opening Ceremony of the IGF Vilnius 2010.
6. See "The relationship between local content, Internet development and access prices", *Internet Society, OECD and UNESCO*, 2011.
7. See W3Techs, *Most popular content language*, [http://w3techs.com/technologies/overview/content\\_language/all](http://w3techs.com/technologies/overview/content_language/all)
8. Lipsicas, B. and Shikmoni, D., "Internationalised Domain Names: the long and winding road", *CENTR Domain Wire*, Issue 1, 2007.
9. See *Internet Governance Forum 2006, Diversity main session*, <http://www.intgovforum.org/cms/IGF-SummingUp-011106.txt>
10. See <http://www.icann.org/topics/idn/idn-activities-seoul-28oct09-en.pdf>
11. At the time of writing (Nov 2015), 760 new gTLDs are available, including 66 IDN new gTLDs
12. <http://www.icann.org/en/resources/idn/fast-track>

## Glossary of terms

- **ASCII**  
The American Standard Code for Information Interchange, representing text in computers, communications equipment and other devices. In the context of the domain name system ASCII means the letters "a-z" inclusive, the numerals "0-9" inclusive and the hyphen "-". Until the year 2000, no other characters were allowed in domain names, and in 2009, the first IDN ccTLDs were introduced
- **ccTLD**  
Country code Top Level Domain, which represents a country or territory found in the ISO 3166 list, for example .eu (European Union), .de (Germany), .uk (United Kingdom), .fr (France).
- **CENTR**  
The European country code Top Level Domain organisation, a not-for-profit organisation which supports the interests of ccTLD managers. [www.centri.org](http://www.centri.org)
- **EURid**  
The European Registry of Internet Domain Names, EURid, manages the .eu top level domain under contract to the European Commission. The .eu TLD was launched for general registration in 2006, and has over 3.9 million domain names.
- **gTLD**  
Generic Top Level Domain, which does not represent a particular country or territory. Examples include .com, .net, .org, .info, and .biz.
- **Hybrid IDN, hybrid domain**  
An internationalised domain name in which the constituent elements are in different scripts. Examples of hybrid IDNs are shown in Appendix, figure 2.
- **ICANN**  
The Internet Corporation for Assigned Names and Numbers. A non-profit company responsible for management of the domain name root operation (the IANA), policy coordination for generic Top Level Domains (gTLDs), and for Internet numbering. In 2012, ICANN launched a process to create an unlimited number of new gTLDs, over 1 900 applications were received. ICANN's policy development is guided by a number of support organisations and advisory committees representing various stakeholder groups including governments, the domain name industry, business, ccTLD registries, and civil society. [www.icann.org](http://www.icann.org)
- **IDN**  
Internationalised Domain Name. A domain name written in non-Latin scripts such as Chinese, Arabic, Hangul, or Cyrillic. For an explanation of IDNs, see Appendix.

■ **IDN ccTLD**

A country code domain written in non-Latin scripts. Examples include 한국 (Republic of Korea), قطر (Qatar), 中国 (China), .рф (Russian Federation).

■ **IDN ccTLD Fast Track**

A process developed within ICANN by the ccTLD registries to implement IDN ccTLDs. The first IDN ccTLDs were approved by ICANN in 2009. The IDN ccTLD Fast Track process continues.

■ **IETF**

Internet Engineering Task Force. Develops Internet standards. Its members are volunteers from the international technical community, and it is open to any interested individual. IETF standards are published as Requests for Comment (RFC). [www.ietf.org](http://www.ietf.org)

■ **ISOC**

The Internet Society. Formed in 1992, it promotes the open development, evolution and use of the Internet for all. [www.isoc.org](http://www.isoc.org)

■ **ISP**

Internet Service Provider. An organisation that provides access to the Internet, and a variety of related services including web hosting, or email services.

■ **IXP**

Internet Exchange Point. Internet Service Providers (ISPs) can exchange Internet traffic between their networks, thereby reducing costs and increasing speed in resolving Internet queries (eg web pages).

■ **Landrush**

When a new TLD is first launched, there is a period of time when trademark holders and others who have rights in particular names or brands have the opportunity to pre-register domain names (Sunrise Period). Following the Sunrise period, the registry opens to general registrations – this is called the landrush.

■ **New gTLD**

A new generic Top Level Domain. In 2012, ICANN opened applications for new gTLDs, and received more than 1 900 applications. Approximately 100 of the new gTLD applications were for IDN TLDs. Examples of new gTLDs include .xyz, .top, .wang, .win, .club and .网址.

■ **OECD**

Office for Economic Co-operation and Development. [www.oecd.org](http://www.oecd.org)

■ **Punycode**

The syntax by which a string of Unicode characters is transliterated uniquely and reversibly into the ASCII character set used by the Domain Name System. Punycode is the underlying technology which makes IDNs possible. See Appendix for further explanation.

■ **Register**

The domain name database managed by a registry.

■ **Registrant**

A domain name registrant is the person or organisation in whose name or on whose behalf a domain name is registered. For example, the British Broadcasting Corporation (BBC) is the registrant of the domain name [bbc.co.uk](http://bbc.co.uk).

■ **Registrar**

A domain name registrar. An organisation that is allowed to register domain names in one or more TLDs on behalf of its customers. To register in gTLDs, registrars must be accredited by ICANN; some ccTLDs operate their own systems of registrar accreditation. Examples of well-known registrars are Go Daddy, Inc, Tucows, and 101Domains.com.

■ **Registry**

A domain name registry is a Top Level Domain provider, for example EURid is the registry for .eu, Verisign for .com.

■ **Second level domain**

Domain names have a hierarchical structure, starting (in left to right scripts) to the right of the dot, with the Top Level Domain. Most domain names are registered at the second level, eg under .eu, or .com. In a domain name example.com, "example" is a second level domain. Some domains, eg .jp only register domain names at the third level, eg under .co.jp.

■ **TLD**

Top Level Domain. The domain name system is hierarchical, and is organised into various Top Level Domains (TLDs), eg .com, .eu, .рф under which domain names can be registered.

■ **UNESCO**

United Nations Educational, Scientific, and Cultural Organisation, whose mission is building peace in the minds of men and women. UNESCO is organised into four sectors, including Communication and Information Sector whose mission is Building inclusive knowledge societies through information and communication. [www.unesco.org](http://www.unesco.org)

■ **Unicode**

A technical standard used for consistent encoding of text from ASCII into other scripts.

■ **WSIS**

The World Summit on the Information Society, a UN process which took place in two phases 2003 and 2005, and resulted in the Geneva Declaration of Principles, Geneva Plan of Action, the Tunis Commitment and the Tunis Agenda. A number of UN organisations, including UNESCO, have been tasked with fulfilling action lines resulting from the WSIS.

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**EURid vzw/asbl (headquarters)**  
Woluwelaan 150, 1831 Diegem, Belgium  
T: +32(0)2 401 27 50  
F: +32(0)2 401 27 51

