Google TLDs, Their New Registar and Their Army of Developers

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http://www.domainsherpa.com/google-io-2014/

0:04 BEN FRIED: Good afternoon.
0:06 Who cares about new domain names?
0:08 The short answer is we think you should.
0:12 And we certainly do, too And actually, this
0:15 is the most important, and I think
0:18 an exciting change, in the internet in a long, long time,
0:21 maybe since the beginning of the modern internet
0:23 as we knew it, at least as users will experience it.
0:26 And we are incredibly excited about this.
0:28 And if that is not enough, if our excitement and the changes
0:31 in the internet aren't enough to get you excited,
0:33 we're going to give each and every one of you
0:35 a free domain name registration to use soon,
0:41 as part of our new domain registrar business.
0:43 So hang on till the end to learn more about that.
0:44 I hope that that helps excite you
0:45 about the topic a little bit.
0:50 Yay!
0:51 Free!
0:51 Free is good!
0:53 Domain names actually cost more than t-shirts, even in bulk.
0:56 So you're getting a good deal.
0:58 [AUDIENCE LAUGHTER]
1:00 I'm Ben.
1:00 Ben Fried.
1:01 I'm Google's chief information officer.
1:03 I'll be joined on stage later by Kripa, and during the Q&A,
1:06 Corey's going to come and join us as well.
1:08 So just out of curiosity, how many of you manage a domain,
1:12 have a domain under management?
1:14 Oh, all right, awesome.
1:16 How many manage more than 10 domains?

1:20 How many of you manage more than 50?
1:22 You're an impressive bunch.
1:24 You certainly out-domain manage me.
1:26 OK.
1:26 And so you're clearly experts.
1:28 So this is material that you didn't need to hear,
1:30 but just to set expectations for the broader audience, what's
1:34 in a name.
1:35 Obviously, names are locations.
1:37 They're how we find things on the internet.
1:38 They're what make the web nameable and usable.
1:40 They're incredibly important.
1:42 The key components that we're going
1:43 to be talking about in names are that stuff
1:45 to the right of the last dot is called the top-level domain.
1:48 .com is an example of what's called a generic top-level
1:51 domain.
1:52 There are also country code top-level domains, like .us,
1:55 for example.
1:56 Google is the second level domain here.
1:58 Obviously in the site name, google.com.
2:00 Keep those terms in mind if you didn't already know them.
2:03 It's very important.
2:05 So why are we talking about domain names?
2:07 Why do we care about them?
2:08 What makes them important in our lives?
2:10 And the answer is that domain names
2:12 are the key to making the internet work for us.
2:14 What's important about names is that they need to be readable.
2:17 You need to understand the location, address of the place
2:19 that you want to go.
2:20 Domain names also need to be memorable.
2:23 It does you no good to have a location or a place
2:25 that you want to go if you can't remember it in the future.
2:29 And finally, names, as in all things in life,
2:31 names work best when they're meaningful to us and actually
2:34 kind of convey something that's important to us.

2:37 But it's no secret to this group of experts
2:40 that as the internet has matured,
2:42 something has happened to names.
2:45 Finding meaningful names has become a lot harder.
2:47 And when I try to explain this to friends and family,
2:50 I go to that oracle of the internet, Jack Donaghy,
2:52 the character played by Alec Baldwin in "30 Rock."
2:56 And here's a quote from the television show "30 Rock."
2:59 "I just registered the domain name for my campaign website.
3:02 Jackdonaghyisrunningformayor2013newyorkthisisthewebsite.com.
3:08 That's as close as I could get.
3:09 Everything else was already pornography."
3:11 [AUDIENCE LAUGHTER]
3:13 So how did we get here?
3:15 How did we get to the point where a broadcast prime time
3:19 comedy can actually be telling us
3:20 something we all relate to about the exhaustion of names
3:23 on the internet?
3:24 You actually have to go back and put this in context.
3:27 In 1985, when the modern internet naming was created,
3:30 there were seven top-level domains.
3:32 And in fact, the very first name registered, which was in .com,
3:35 was symbolics.com, which was owned by the Symbolics Computer
3:39 Corporation.
3:41 But over the next, I guess 29 years,
3:43 we've seen over 240 million domain names registered
3:47 in the second-level domain space.
3:49 And the result is the situation that Jack described.
3:51 To give you more color on it, and I
3:53 think this is probably obvious to all of you.
3:55 Of the almost 460,000 four letter .com domain names that
4:01 are possible, there are none that are available.
4:04 So we're out.
4:05 Is it any secret to any of us that we're out of names?
4:08 Finding names is awfully hard.
4:11 Anyway, I guess the good thing to know
4:12 is that we've known this problem was important for a long time.

4:16 There's an organization called ICANN, the internet Corporation
4:18 for Assigned Names and Numbers, whose mandate it
4:21 is in part to worry about naming on the internet.
4:24 And they've been worried about this problem since 2000.
4:28 And in fact, in 2000 and then in 2004,
4:31 ICANN created a handful, a total of 15,
4:34 new generic top-level domains.
4:36 But whether, considered as experiments,
4:38 those worked or didn't, I don't think they really changed
4:41 the naming crisis that we have on the internet.
4:43 I'd imagine all of you would agree.
4:45 So in 2011, as you can see here in this picture,
4:48 ICANN voted to open up the top-level domain name space
4:52 and allow any applicant to suggest and apply
4:54 for a new top-level domain.
4:58 And that has actually happened.
4:59 So over 1,400 new top-level domain names have been approved
5:03 and are working their way into the name space.
5:05 In fact, there have been over a million registrations
5:09 in the new top-level domains since ICANN
5:11 opened this program.
5:13 So the other important thing to understand
5:15 is unlike those prior 15 new top-level domains,
5:18 there are tons of important interests
5:19 that are invested in making these new top-level domains
5:22 successful.
5:23 Companies, not just Google, but lots of companies
5:25 that you've all heard about, for whom top-level domains are
5:28 an incredibly important part of their strategy.
5:30 And even cities, like New York, London, and Berlin,
5:34 are getting into the top-level domain business.
5:37 So it's really, really likely that we're going to see,
5:39 incredibly likely, it's a given, I think,
5:41 that we're going to see new names on the internet.
5:43 And I think we'll be talking to our children or our friends
5:47 children one day and laughing about the days when there were
5:49 only seven top-level domains and when finding a meaningful name

5:54 in .com was incredibly hard.
5:57 So anyway, when ICANN created this program,
5:59 we, Google, decided to get involved.
6:01 We care deeply about the internet.
6:03 The web is incredibly important to us.
6:04 And naming and location and finding things on the web
6:07 is at the heart of what we think our mission is.
6:11 So that was why we created a new business, Google Registry.
6:16 Now let me tell you a little bit about how this business works.
6:19 In the world of naming there are three participants
6:22 in the naming business.
6:23 The first is a registry.
6:24 You can think of it as a factory that creates and manages
6:26 top-level domains, but they're kind of the top-level domain
6:29 factory.
6:30 Then there are registrars.
6:31 These are the storefronts, the businesses
6:34 that sell second-level domains from n-tuple domains made
6:38 by registries to the public.
6:40 And we call the public registrants, in this case.
6:42 So registries create top-level domains,
6:45 registrars sell names in those top-level domains,
6:48 and registrants purchase those top-level domains.
6:51 And as I said, Google last year launched a new business,
6:54 Google Registry, which is built on App Engine, by the way.
6:59 We run on the Google Cloud Platform.
7:01 And it provides the infrastructure
7:02 for powering our top-level domains.
7:05 And in fact, as part of that ICANN process,
7:07 we applied for about 100 new top-level domains.
7:12 And these top-level domains, as you
7:14 can see if you look at the list on the screen,
7:16 reflect a variety of potential business models
7:19 that we think are going to emerge
7:21 in the world of this new top-level domain name space.
7:24 So we have a bunch of cases of things
7:26 that are Google brands or Google products,

7:28 and you can clearly understand what their relationship is
7:30 to us and why we might do them.
7:32 And then all the way on the other extreme,
7:34 from things like Android, and Chrome,
7:35 and .google as top-level domains,
7:38 all the way on the other extreme,
7:41 we have things like .dad or .lol or .meme.
7:44 More whimsical things where we're
7:47 looking at other ways of using domain names to light up
7:50 entirely new ways of interacting with the internet.
7:53 Now as it turns out, other applicants,
7:55 there are other parties who are interested in some
7:57 of these top-level domains.
7:58 Google may not end up in possession of all of these,
8:01 but this was our intent.
8:02 And this is where we started.
8:05 So not only did we think it was important
8:10 as the DNS name space, as the top-level domain name space was
8:12 expanding, did we think it was important to create
8:14 a registry in new top-level domains,
8:16 but it made us think hard about the experience of getting
8:19 online.
8:20 What it's always been like, what it will be like,
8:22 what we would like it to be like.
8:25 And we realized that that moment of bringing your business
8:28 online, bringing yourself online, acquiring a domain
8:31 name, managing a domain, these are
8:33 incredibly important experiences in the lives of our customers.
8:37 And we wanted Google to be a part of that.
8:39 Not only that, we wanted to make sure
8:41 that Google could provide an experience to people buying
8:44 domain names that was a Google experience, that was one where
8:47 we thought we could set the bar for what the user
8:49 experience and the quality of that experience would be.
8:52 And that was why we've launched a new business, Google Domains,
8:56 which is a registrar which will sell domains to the public,
9:01 to registrants.

9:02 And these are not just new top-level domains
9:04 that we'll sell, not just Google top-level domains, but as
9:06 many as possible.
9:08 The historic top-level domains that we all know about,
9:10 and as many of the 1,400 new top-level domains that
9:13 are coming online as we can sell.
9:18 So we think that this registrar is
9:19 going to do a lot to help us make the new names more
9:22 meaningful.
9:24 But let me tell you a little bit about the other features that
9:26 are coming in the registrar in Google Domains.
9:31 And I should point out that we've
9:32 announced this as a new business,
9:34 but we're not feature complete yet.
9:35 We're in a limited access beta period.
9:40 Soon I'll tell you how to get a free code so you
9:42 can register a domain name, or transfer an existing domain
9:45 name to Google domains.
9:47 But we're not feature complete.
9:48 We're still in beta.
9:52 It's invite only beta, as I mentioned.
9:53 But here are some of the things that we
9:55 think are important about what our registrar does.
9:57 First of all, as I said, it's a Google experience.
9:59 And I think it's one that you'll recognize
10:01 the signposts of with relation to other Google products.
10:04 Secondly, we want to make things simple and transparent.
10:10 So for example, we're not going to charge.
10:12 We're going to build in the pricing
10:14 for private registration, for example.
10:17 We're going to build in all the features
10:19 that you expect in one price for the domains
10:21 that you want to register.
10:25 We want to make it incredibly easy to find a name that's
10:29 meaningful to you, and we're using technology
10:31 from Google's Knowledge Graph to help
10:32 you find domain names in the top-level domains

10:35 that you care about, that are meaningful to what
10:37 you're trying to search for.
10:38 So we're going to help you find names
10:42 that you want to acquire, help you acquire those names,
10:44 help you transfer names in, help you manage them.
10:47 And if you want to, we'll make it easy
10:48 for you to transfer the names away
10:50 from us if you decide you don't like us as a registrar.
10:52 We're going to give you a live customer support.
10:55 During the beta period, that support is 9:00 AM to 9:00 PM,
10:58 but you'll be able to actually talk to a person to get answers
11:01 to any problems you have with your registration.
11:05 And another thing that's important to mention
11:07 is this is the same infrastructure
11:09 that we use for our own services.
11:11 So we think it sets an incredibly high bar
11:13 for reliability, security, and performance.
11:23 So we've also decided it was really important to launch
11:28 with partners who can make it really, really easy
11:30 for you to create a great website.
11:32 And so many people want to get on the web in the first place,
11:35 to create a website.
11:37 So we've done very, very deep integration
11:40 with four partners, Shopify, Squarespace, weebly, and Wix,
11:46 to give Google Domain's customers
11:49 the option of easily working with and using these companies'
11:53 products for the sites that they're creating
11:56 through the domains they purchase through Google
11:59 Domains, the registrar.
12:02 We worked really hard to make the integration
12:04 of the registration experience and the experience working
12:07 with the site builder incredibly simple.
12:09 It's a really deep integration.
12:10 it's going to make it really, really easy to use.
12:15 Of course, I should mention that use of these companies'
12:18 products is available at an additional cost
12:20 beyond that of acquiring your domain name.

12:23 But, as I said, this is a beta.
12:25 It's an early invite only beta and we've gone about
12:29 as far as we can go by just testing
12:32 the registrar on our colleagues and ourselves.
12:35 And this is why we're moving to an invite
12:38 only beta period because we want data.
12:40 Apologies to Brent Spiner.
12:42 I doubt he's in the audience or watching us
12:44 on YouTube, but Brent, apologies.
12:48 We want data.
12:48 We want your feedback about the registrar.
12:52 I'll remind you once more, we're still not feature complete,
12:56 but we really want to hear what you think of this experience.
13:02 So, as I said, to help you get started,
13:05 and feedback is so important to us,
13:07 every Google I/O attendee will get one free domain name
13:10 to acquire or to transfer in into Google Domains.
13:15 You'll get an email soon with more information about that.
13:19 I'll tell you more about the email sign-up process
13:21 flow soon.
13:23 So we're really excited to get your feedback
13:25 to help us make this a great product.
13:29 Now kind of as a transition, 1,400 new top-level domains
13:33 are being created in the world right now.
13:35 And although we're really excited about what this means
13:38 for solving the problems of domain name exhaustion,
13:40 or domain name space exhaustion, unfortunately
13:43 there's an awful lot of code out there
13:45 that is about to break as a result of going
13:47 from a very small number of top-level domains
13:49 to a very, very large number of top-level domains.
13:52 And the person at Google who's responsible for making sure
13:54 that we fix all the code that breaks is Kripa Krishnan, who's
13:58 here to tell you about what you need
14 to do to fix your code that's going
14:02 to break as a result of this.
14:04 Kripa, over to you.

14:06 KRIPA KRISHNAN: Hi, everyone.
14:08 My name is Kripa.
14:08 I'm a technical program manager at Google.
14:11 And I'm here to tell you about-- to worry about the concerns
14:16 that we have to face and the issues that we have to face,
14:18 as hundreds of new TLDs enter our internet ecosystem.
14:22 So let's just dive in very quickly
14:23 and start looking through a series of examples,
14:25 and we can see how this is actually going to play out.
14:29 Taking a look at this slide, there are three TLDs.
14:31 .foo, .photography, and .minna in Japanese.
14:35 Nothing special about them, except they're all new strings.
14:40 And hundreds more, if I recall correctly,
14:42 close to 1,500 new TLDs are going
14:44 to be entering our ecosystem.
14:46 They are much longer than some of our old strings.
14:49 We had a limited set of TLDs in the past.
14:52 And if you look at the new TLDs, the lengths of them
14:54 are quite unpredictable.
14:55 And they now come in a host a brand new characters.
14:58 In the past, we had a very, very ASCII, Roman character set,
15:03 very dominantly on the internet.
15:04 Now we have new character sets from various languages
15:06 and scripts.
15:08 So just the fact that you have new strings,
15:10 new lengths of strings, and new characters,
15:14 lends itself to a host of different issues
15:15 that we need to worry about.
15:17 So we're going to talk about a few of these issues.
15:19 There's several more to consider.
15:20 The point of my talk here is not to just tell you
15:22 all the various problems that we have.
15:24 I'd like to offer a few fixes, but something
15:26 so you can take home with you, and sort of consider
15:28 as you start designing your applications if they're working
15:31 with URLs or email addresses in general.
15:33 So let's start talking about validation of new TLDs,

15:36 or TLDs in general.
15:38 Just a show of hands in the audience, how many of you
15:41 have written any code to validate
15:43 a URL or an email address?
15:46 How many of you believe you got it right?
15:49 Wow.
15:51 That was a significant drop of hands.
15:54 But the reason is, it's complicated.
15:55 It's hard.
15:56 It's not a straightforward problem.
15:57 And nobody builds a consistent set of rules around this.
16 A lot of rules for validation are hard-coded.
16:03 So it's very hard for two applications
16:04 to actually do the same thing on the internet.
16:06 So in our research, when we were trying to find issues
16:10 with the way we validate code, we found several such issues.
16:13 And I'll walk you through a handful of them.
16:16 One of the issues that we found was
16:18 validating based on the length of a TLD.
16:20 For a very long time, when we had a few dozen TLDs,
16:24 .museum was one of our longest TLDs and it had just six
16:27 characters.
16:28 So a lot of validation scripts around,
16:30 hey, if the TLD is longer than six characters, reject it.
16:33 It's no longer valid.
16:34 So that obviously doesn't work in the new world
16:37 because there are several new TLDs coming about.
16:39 And we don't know if this is the final wave of TLDs
16:41 coming about.
16:42 We don't know if ICANN will come out and say, have a bunch more.
16:44 So this is not a usable solution any more.
16:47 Another approach people often use
16:49 is they create a white list in their code.
16:51 And the white list has a list of TLDs.
16:54 So if your application is using TLDs
16:57 that are part of that hard-coded white list, then great.
17 It all works.

17:01 Else it's rejected.
17:02 Well, this kind of might have worked for a while
17:05 because the number of TLDs we had was somewhat static.
17:08 Had a few dozen, so you could hard-code a white list.
17:11 For a little while, it was OK.
17:12 But right now we're looking at crazy refresh rates, right?
17:15 They're talking 1,500 new TLDs.
17:17 And so doing this sort of white list creation thing
17:20 is impractical, completely not feasible.
17:22 Probably time for us to throw this technique out.
17:24 So this is not a great idea.
17:26 And finally, another type of example
17:29 we've seen in hard-coding validation rules,
17:32 is one where you check for whether the TLD is
17:35 in ASCII characters.
17:36 It doesn't work anymore because we
17:38 have 100 of the 1,500 new top-level domains are all
17:42 going to be in various languages and various scripts.
17:44 And this validation method rejects several applications
17:49 that should be working.
17:50 So these are minor-ish in terms of the problem space
17:54 I'm stating.
17:55 Why does this even matter?
17:56 Why is this even important?
17:57 Well, there's one reason.
18 On the internet, your email address
18:02 is your primary identifier.
18:04 You can sign up for a bank account
18:06 if you'd like, probably with a user name and a password.
18:08 But if your account is getting hijacked,
18:10 the bank needs to validate your email letters correctly
18:12 and send you a note and not a note to dev/null.
18:15 You need to know something's going on with your account.
18:17 The Internet communicates with you via email,
18:19 and if different applications on the internet
18:21 are validating different email addresses in different ways,
18:24 failing silently in some cases, not

18:26 a great experience for the user.
18:28 So now what?
18:30 We get from what do we do with respect to validation.
18:33 So do you actually need to validate TLDs at all?
18:36 You might want to consider if it's worthwhile
18:38 just not validating TLDs at all.
18:40 Treat them like SLDs, allow any sort of values
18:42 to go through, unless there is a solid reason for your product
18:45 to actually validate a TLD.
18:47 And these reasons do exist.
18:48 For example, if you take the Chrome address bar,
18:52 Chrome actually likes to pre-determine
18:54 whether a string that someone puts into the address bar
18:57 is a URL or a search term, so it can treat it accordingly.
19 So in this manner, yes, validation is important.
19:03 And if you do have to validate in such a case,
19:06 then use something more authoritative
19:07 than a hard-coded list or a hard-coded set of rules.
19:10 Authoritative sources could be things like Mozilla Public
19:13 Suffix List, or you could check against DNS, for example.
19:16 These are just ideas for what you
19:17 could do with respect to validation,
19:19 but it is worthwhile considering whether or not
19:21 you actually need to validate a TLD.
19:23 So we talked a little bit of validation.
19:28 Validation pretty much tells you whether or not
19:30 an end user can work with your application or not.
19:33 So now I want to show you a set of issues that confuse the end
19:37 user because you're surfacing the problems with these TLDs
19:40 to an end user.
19:41 So we talk about a handful of display issues.
19:44 So let me ask you guys a question.
19:45 If you know the answer, just raise your hands.
19:47 So if I were to type www.example.com
19:51 in the body of something, in the body of my Gmail message,
19:54 or if I type www.example.com, press Space in a document,
19:59 what is the expected result?

20 Do you guys know what is supposed to happen?
20:03 It's supposed to link, yeah?
20:04 Ideally, it's supposed to link.
20:05 In our own products, this is what we found at Google.
20:08 Different products, all of these URLs
20:10 in, I guess my left, or right, whatever,
20:13 one of them, set of URLs is absolutely correct.
20:16 And they're all valid, but each application actually
20:19 figures out whether they are TLD and auto-linkifies
20:22 in their own way.
20:23 So there's no consistency even within our own products.
20:25 We found this to be a very big issue.
20:28 It sounds pretty silly right now,
20:29 but if you really think about it,
20:31 a user copying and pasting a URL from app to app
20:33 will have completely different behaviors from app to app.
20:35 Seems small, but we are working very
20:36 hard on trying to standardize these sorts of things
20:38 and fixing this within our products.
20:40 Let's take a slightly more complicated example.
20:43 So in the case where your top-level domains are
20:46 made of internationalized characters,
20:48 we refer to them for the purpose of this presentation
20:50 as internationalized domain names.
20:52 Internationalized domain names are domain names
20:54 where any part of the domain name
20:56 has something of a different script that
20:58 is not a Roman character.
21 I would like to dive into a tiny bit of detail
21:02 as to how this actually works, so we can talk to you
21:05 about the kinds of problems this actually
21:06 surfaces to an end user.
21:08 In this example, in the blue box you've
21:10 got a Russian domain name.
21:12 The Russian domain name is human readable
21:14 and is encoded by an encoding called Unicode.
21:16 However, the internet at large, DNS specifically,

21:19 doesn't understand Unicode.
21:21 And it needs to translate this Unicode into ASCII characters
21:24 for us to be able to move this data through our DNS service.
21:27 So for this to happen, we use encoding called Punycode
21:31 to translate between the Unicode domain name and the ASCII
21:34 version.
21:34 What I'm really saying is that the stuff in the blue box that
21:36 says Unicode and the stuff in the yellow box that's says
21:39 ASCII both point to the exact same location.
21:42 And the only reason the ASCII version,
21:44 the xn dash dash version exists, is
21:46 so that you can talk to the rest of the internet
21:48 in the back end.
21:49 So what's the problem?
21:50 Here's an example.
21:52 Let's say I have a friend.
21:53 My friend's name is Testing IDNs,
21:54 and my friend has a Russian email address.
21:56 I put this person's address in my address book in Contacts.
22 Looks great.
22 Everything's good.
22:01 Now I want to send my friend an email.
22:03 So I say to Testing IDNs in the To field, and if you notice,
22:07 the auto-complete over there gives me the correct email
22:10 address for Testing IDNs, except it translates it back
22:13 to the Punycode version.
22:14 So you'd see that it's the exact same email address,
22:16 but now it has the xn dash dash version.
22:19 So to most users, these two are not the same.
22:21 This is a very confusing experience.
22:23 Most people don't know if they're doing a safe thing
22:24 or not.
22:25 This actually is quite sad.
22:27 And if you were noticing, this is Google's Gmail
22:30 and Google's Contacts, and we thought
22:32 this was highly embarrassing.
22:33 So we just went ahead and we fixed it.

22:35 In the next few weeks, you will actually
22:37 find this rolling out to all of your inboxes eventually.
22:41 Anyway, so what actually happened here?
22:43 Why are we surfacing this?
22:45 This is what we did.
22:47 We take this system that we use to transcribe and move
22:50 stuff along the internet, and present this ASCII
22:52 version directly to the users.
22:54 Simple fix.
22:55 Just make sure you translate everything back to Unicode
22:57 at client level.
22:58 Every client upgrades to Unicode when presenting information
23:01 to the end user, unless there is an actual reason not to.
23:07 Yeah, just translate everything to Unicode.
23:10 If you are paying very close attention,
23:12 you might notice that this actually
23:14 comes with it a problem.
23:16 And this is a problem in security.
23:18 If I were to just show Unicode characters to my end users,
23:22 we could end up with, just for the purposes of an example,
23:25 something like this.
23:29 Do you see a difference between www.google.com
23:31 and www.google.com?
23:34 These are actually quite different,
23:37 even though they are virtually indistinguishable
23:39 in certain fonts.
23:41 In a different font, you could actually
23:43 see that the google.com in the second row
23:45 actually has Greek characters in place of other O's that we're
23:48 using in the first google.com.
23:50 So it is that easy to dupe a user into using a site
23:53 that they believe they are on when they're not.
23:55 This is not a new problem.
23:56 It exists today.
23:57 However, the scope of it is much, much larger
24:00 with the large number of new TLDs
24:01 and the large number of IDNs we have.

24:04 Some products tend to solve this by exposing
24:08 the Punycode version of that, especially for IDNs.
24:11 They surface the Punycode version to the user
24:14 because Punycode is a fingerprint for every URL.
24:16 But to an end user, if you show them a www.xn dash dash
24:20 sort of domain, they are actually
24:22 feeling even more insecure than they were a minute ago.
24:24 So this is not a great experience either.
24:26 Unfortunately, we don't have a great, simple one line
24:29 solution for this just yet.
24:31 We are experimenting with a few things.
24:32 We are definitely experimenting with things
24:34 like warning messages to educate the user
24:36 if they are using character sets or mixed character
24:38 sets that they may not be aware of.
24:40 So at the moment we're playing around with this,
24:42 but we don't have a straightforward solution.
24:43 The point of this is there are several others.
24:45 If you keep looking under the hood,
24:46 there's several other issues.
24:47 How do you normalize TLDs?
24:48 How do you store TLDs?
24:49 How do you index them as the environment changes?
24:52 And the point of this is we really
24:53 need to take this into consideration as you start
24:56 developing code where you are using URLs or email
24:58 addresses primarily.
25:00 Now we also really want to help.
25:03 So in whatever way we can, we'd like to help.
25:06 And to this end, we have launched a new tool
25:09 in the last week or two.
25:13 We've been working very hard towards this tool.
25:16 We've worked on a tool that will help developers
25:18 use their applications and validate TLDs
25:20 against their applications to make sure that there's nothing
25:22 in their stack, maybe UTF-8 issues,
25:24 if you're using a hard-coded white list, whatever,

25:26 to surface these issues and tell you how the TLD actually
25:29 interacts with your application.
25:32 This is not particularly new.
25:34 There are other such examples that do exist.
25:37 However, the two big differences between this
25:38 are we would like to launch this tool on
25:41 pretty much every new TLD if we can,
25:43 on as many new TLDs as possible, and we would also
25:46 give you the ability to test email with this same tool.
25:49 So let's just dive into it.
25:50 It's a simplistic thing.
25:51 So let's just walk through it and see how this works.
25:53 The tool's called Domain Test, and you
25:55 would find it on several new TLDs.
25:56 For example, domaintest.foo, domaintest.photography,
26:00 domaintest.minna.
26:01 The canonical source for this is domaintest.foo.
26:03 We'll see a few more examples in a little bit.
26:05 Let me walk you through an example.
26:07 And for example, let's use domaintest.minna.
26:11 So what I'm going to do is go to the site domaintest.minna,
26:14 and Domain Test, as a tool, supports
26:16 a whole host of HTTP commands.
26:18 If you look at this, you will actually
26:19 notice that we support a whole bunch of Echo and Stash
26:21 commands, so you can use this for an example.
26:23 So in my Chrome browser, I'm going to go ahead
26:26 and type domaintest.minna.
26:27 And I'm going to ask my tool to echo back to me a string,
26:31 and the string over here is, hello world.
26:33 So it's a browser, it should technically work.
26:36 And if it works, everything is good.
26:37 So here's what I get.
26:38 I get hello world back from this URL.
26:41 Great.
26:41 Everything is dandy.
26:42 Now we need to see if this would actually

26:44 work on a different Google product.
26:46 So let's try something with Google+.
26:51 So if I were to, by accident, sign in to Ben's Google+
26:56 account and then try to post as him.
26:59 And I want to see if URLs actually
27:00 work in the link field in this share box.
27:03 So what I would do is I would take the exact same URL,
27:06 domaintest.minna, and I'm trying to echo
27:08 the same thing, hello world, back to me.
27:10 So what you'd notice is that it would echo hello world back
27:13 to me, but you'd also notice that it displays
27:16 the Punycode version of domaintest.minna.
27:19 So you know there's a bug.
27:20 You go file it, and you've got to try to get it fixed.
27:22 So this is sort of how this would
27:23 work with your application.
27:25 The second thing that we tried to do over here
27:28 is that this tool also has a feature for email testing.
27:31 So this is something that's a little new.
27:33 And here's how are we're going to try
27:35 to test an email application to see if this tool works.
27:39 Send an email to any mailbox at domaintest.minna.
27:43 Again Domain Test exists on several TLDs,
27:45 so I'm using domaintest.minna for our example.
27:47 And I'm sending a note in Gmail to say, test everything.
27:51 And if you notice, many of you might
27:53 have complained about this before,
27:55 but Gmail actually does not work with internationalized domains.
27:58 So this was also equally embarrassing.
28:00 So geez, we just went ahead and fixed that, too.
28:02 So we'll show you an example of what happens in a dev instance,
28:06 but in a few weeks, you will see this roll out to all inboxes
28:09 where you will be able to send and receive email
28:11 to all internationalized domain names
28:13 and pretty much any TLD there is.
28:15 In our dev instance, this is how this works.
28:18 We would be sending a note to a mailbox at domaintest.minna.

28:22 You will see that the message got sent.
28:24 So you have validation that the message got sent.
28:26 And you will also receive a confirmation email in return
28:30 to show you that both your incoming and outgoing email
28:33 have actually worked.
28:34 So this actually works on Gmail today.
28:39 And that's pretty much it.
28:40 The great thing about this is as soon as we launched this tool,
28:42 we tried to ask a few registries if they would like
28:46 to host Domain Test in TLDs that they were responsible for.
28:53 And here's what we got.
28:55 Within the last couple of weeks actually, over 126,
28:58 or I think roughly 126 new TLDs now
29:01 have Domain Test running on them.
29:02 Domaintest.foo is still your canonical source,
29:04 thanks to Donuts, Uniregistry, and AusRegistry,
29:07 and there are several more on the way.
29:08 They're ready to actually host Domain Test.
29:09 So you can go play with this now.
29:11 It's live.
29:12 And if you have any questions, there
29:14 are ways to get to us from there.
29:15 And that's pretty much it.
29:17 From this point on, I'm going to hand it back to Ben
29:19 to talk through the potential that we
29:21 have the new TLDs going forward.
29:24 BEN FRIED: Thank you.
29:24 [AUDIENCE APPLAUSE]
29:30 So I wanted to talk just for, so we kind of gave you
29:33 the big picture about lots of new top-level domains.
29:36 Names on the internet are never going to be the same.
29:39 We talked a bit about creating a new registrar business and what
29:43 we think that means for the experience of coming online.
29:46 Kripa talked about the bugs this may introduce in your code
29:49 and what to do about it.
29:50 I wanted to end on hopefully the high note of talking about what
29:53 we think our vision for what the internet may be like with some

29:56 of these top-level domains.
29:57 And I'm going to do that by talking about our plans
30:00 and tell you a bit about what we're
30:01 planning to do with some of those almost
30:04 100 top-level domains that I put up
30:06 on a slide a few minutes ago.
30:09 So the very first top-level domain that we launched,
30:11 and this actually went live in December of last year,
30:13 is .minna.
30:15 Kripa mentioned it earlier.
30:16 Minna is the Japanese word for everyone.
30:19 And what was important for us about this
30:21 is that the top-level domain is in hiragana, a Japanese script.
30:26 This was actually the first top-level domain,
30:28 the first generic top-level domain, in a Japanese script.
30:32 So it always struck me as kind of strange
30:34 how Anglo-centric the internet was,
30:36 that you have to understand these strange abbreviations
30:38 of English language words in order
30:40 to find sites meaningful to you, even though you might not
30:43 speak English, or even use a Roman alphabet.
30:46 And minna was important to us because we
30:48 thought we could do an enormous amount for the readability
30:51 of names on the internet with it.
30:54 And this was obviously just a starter.
30:56 As Kripa mentioned earlier, there's going to be,
30:58 and if you looked at the TLD list that I put up,
31:01 you'll see that there are going to be domain names in Russian,
31:05 in Chinese, in Japanese, in Hebrew,
31:07 in many languages coming very soon.
31:09 So the internet is going to be a lot more friendly to people
31:12 who don't use Roman scripts.
31:14 So thinking about what we do next at Google with new
31:19 top-level domains, one of the next top-level domains that
31:21 we're going to launch, we haven't launched it yet,
31:23 is .soy.
31:25 And in this case, we're using it to mean the Spanish word

31:30 for I am.
31:31 And what we want is to make .soy be a top-level domain
31:35 for Latinos.
31:37 In America, Hispanics are one of the fastest growing
31:40 groups in the country, and our goal
31:42 is to make this top-level domain be
31:44 known as a place where there is content
31:47 particularly meaningful to Latinos.
31:50 So we're going to work with site creators and businesses,
31:53 content consumers, content producers,
31:55 to create content in .soy for Latinos.
32:02 But there are more things you can do with top-level domains
32:04 than create meaningfulness through readability.
32:08 And there are examples of this that you're all already
32:11 familiar with.
32:11 If you think of .gov or .edu, these are examples of top-level
32:16 domains where there are restrictions to who can
32:19 register in those top-level domains.
32:21 And those restrictions actually provide a service
32:24 to the registrants in those top-level domains
32:26 and provide a lot of value to the users, people
32:29 visiting URLs and using sites and interacting
32:32 with sites in these top-level domains.
32:33 Obviously, if you go to a .edu site,
32:35 you know it's an institute of education.
32:37 If you go to a .gov site, you know it must be a United States
32:40 based government agency of some sort.
32:43 And with that same kind of motivation in mind,
32:46 we are planning on launching .esq.
32:49 Imagine a top-level domain where every registrant
32:52 has been verified to be a lawyer.
32:55 Imagine Jack Donaghy.esq, for example,
32:58 would mean Jack Donaghy the lawyer,
33:00 and not Jack Donaghy the NBC executive,
33:02 if you want to go back to my "30 Rock" example earlier.
33:06 We think this is going to be really, really
33:08 helpful to people, to lawyers, and helping them provide names

33:12 that provide more meaning, but also obviously
33:14 to people who are using these domains because
33:16 of the association that the top-level domain will provide.
33:21 So we've talked about using the top-level domain
33:25 to provide more meaning in language, in script,
33:29 in restriction.
33:30 One of the other things that we're planning on doing
33:33 is creating actual features within the top-level domain
33:37 that provide special meaning to the community of users.
33:41 One of the places we're going to do this,
33:43 the first place we're going to do this, is in .foo.
33:46 .foo is going to be a top-level domain for people like you,
33:49 developers, people who care about code.
33:53 We're planning on launching features like requiring that
33:57 every site in .foo, there be a well-known address that gets
34:01 you to the source code repository for that site.
34:05 We're thinking about doing things like making .foo provide
34:07 very, very simple Click to Publish to a cloud hosting,
34:10 to a cloud hoster features, for example.
34:13 These are things that we can do by actually building features
34:15 into the top-level level domain that didn't exist before,
34:18 and we think that we can actually then create
34:20 new kinds of meaning for important communities
34:22 with the top-level domain in this way.
34:28 So that's just a hint of what we're planning.
34:32 If I would go back to the very beginning of the talk,
34:35 the thing that I think I'd like you all to walk away with
34:37 is that we're actually at the start
34:40 of a new phase in the internet.
34:42 Names on the internet are never going to be the same.
34:45 They've only just begun these new names,
34:46 so we don't really know how it's all going to play out.
34:50 But we are going to be there absolutely.
34:53 And I know that we're going to look back in 10 years
34:56 and think about how different the internet was in an era
34:58 when there were only a handful of top-level domains.
35:02 So thanks for listening.

35:05 Oh, right!
35:06 Free domain registration.
35:08 I promised you all free domain registration or a free domain
35:11 transfer.
35:12 On July 9th, expect an email with an invitation code, which
35:16 you can use to get your free domain registration
35:19 or transfer.
35:22 I should mention that Google Domains, our registrar,
35:24 is only available in the US.
35:26 We're working on adding other countries as quickly as we can.
35:31 There you have it.
35:32 And thank you very much.
35:34 We'll take Q&A.
35:35 [AUDIENCE APPLAUSE]
35:43 Are there questions?
35:49 AUDIENCE: Yes, I have a question.
35:50 Is Google Domains going to also do the DNS part or?
35:54 BEN FRIED: Yes.
35:55 So Google Domains hosts, yeah, can host your DNS service.
35:59 Yes.
35:59 AUDIENCE: Is it just going to be a simple one or something
36:01 that's fully capable of handling sub-domains and all that?
36:05 BEN FRIED: Yes.
36:06 It will be capable of handling sub-domains.
36:08 We'll give you something like 100 sub-domains
36:10 for free bundled in.
36:12 We'll also give you domain redirects,
36:14 a whole bunch of other features like that.
36:16 Yes.
36:17 AUDIENCE: Folks were really excited or disappointed
36:19 with GoDaddy's response to SOPA and all that good stuff,
36:22 and it's getting really political
36:24 as domain ownership expands, and now there's many more TLDs.
36:28 Has Google taken a position how they're
36:30 going to deal with the political environment for domains,
36:32 and censorship, and stuff like that?
36:34 BEN FRIED: We don't have any positions

36:35 we're ready to talk about on those matters now.
36:40 AUDIENCE: I just saw on your site
36:41 that you're providing domain aliases, email aliases,
36:45 and forwarding it to Gmail.
36:46 So how does it work when I want to mail with that alias?
36:49 There was no details on that.
36:53 Like say if I have my, say, sandip@google.com-- that's
36:57 my name-- and you're forwarding that mail to,
37:00 I think your personal Gmail address.
37:03 BEN FRIED: Right.
37:04 And your question is-- yes, that's
37:05 the intent of the feature.
37:06 AUDIENCE: How do I reply from that alias domain name itself?
37:09 KRIPA KRISHNAN: I might be answering this wrong.
37:11 If I am, please let me know.
37:13 I think you are looking to send an email to any mailbox
37:16 for example, test@domaintest dot whatever TLD you might want,
37:19 right?
37:20 AUDIENCE: No.
37:20 [INAUDIBLE] the description says if I have sandip@google.com,
37:24 it gets forwarded to your personal Gmail
37:26 address, whatever it is.
37:27 And then if I want to mail back with sandip@google.com itself,
37:31 how do I do that?
37:32 COREY GOLDFEDER: In general, you can set up domain email aliases
37:35 from Gmail.
37:35 As long as you can receive email at the alias, it gets--
37:38 BEN FRIED: And yes.
37:39 And we're not restricting that to just be Gmail, right?
37:42 But work with your mail agent or your mail provider
37:45 to change the settings to allow you to send
37:46 mail to come from that domain, but each mail product generally
37:51 has ways of doing that.
37:52 It's specific to the product.
37:53 AUDIENCE: Maybe just a feedback.
37:55 Like if you can give at least one Google

37:57 Apps ID with that, that would have
37:59 been a much more better way than making an alias
38:03 and making it complicated.
38:04 Thank you.
38:06 AUDIENCE: You seem to be painting
38:08 a very rosy picture about the domain names.
38:14 Do you have any concerns about cybersquatting,
38:15 about people who were going to be reserving
38:18 the exact same name across 150, 200, 300 TLDs?
38:23 Because we're seeing that now.
38:25 It's not helping the name exhaustion problem.
38:28 It's increasing the confusion, and the common perception
38:32 is that the only people that are benefiting from the new TLDs
38:36 are the registrars.
38:38 And you're a registrar.
38:42 BEN FRIED: Right.
38:43 So our registrar and our registry
38:46 are separate business entities.
38:48 We're not doing this to enrich one or the other.
38:54 I think we see a bunch of the same problems that you see
38:56 and that you've pointed out.
38:58 And one of the things that we think
39:00 is a great opportunity with new top-level domains
39:02 is to create rules that prevent a bunch
39:06 of the negative attributes that have taken place
39:08 around top-level domains.
39:10 The specifics I think will vary based on the top-level domain
39:13 and what we try to do, but it's our hope
39:17 that there's an opportunity to get a clean start here and try
39:19 to prevent some of the things in the new top-level domains
39:22 that are accepted practices in the old ones.
39:27 Since I didn't even see that there's a line back there,
39:29 I'll take another question from the back mic,
39:31 and then I'll move to the group in front.
39:32 AUDIENCE: Hi, I'm wondering about search engine
39:34 optimization.
39:35 So if I have a website and it's website.com,

39:39 and I have resources for programmers on that website,
39:41 website.com/programmers, that programmers part of the site is
39:45 benefiting from website.com being in existence for 10 years
39:50 in the search engine.
39:52 So if I follow the practice you proposed
39:55 and make website.foo and move my resources for programmers
39:59 there, how can I guarantee that I'm still
40:01 going to get good search engine rankings?
40:06 BEN FRIED: So gosh, I'm not a search engine optimization
40:10 expert.
40:12 But I think at Google we pride ourselves
40:16 on helping people find things on the internet
40:19 and making search work.
40:20 And we're really committed to making sure
40:22 that Google Search works fantastically well
40:25 across the whole 1,400 new top-level domains that
40:27 are going to be coming out.
40:28 Beyond that, I can't kind of offer you any more specifics.
40:31 I think we're all going to see how this plays out
40:33 as these domains get adopted and used.
40:36 But Google Search isn't about favoring
40:38 one top-level domain over the other.
40:40 It's about allowing people to find things on the internet.
40:42 We hope that the new top-level domains
40:44 makes those things more memorable,
40:45 makes them more meaningful, gives people
40:47 better naming choices.
40:52 We don't intend to have that have
40:54 a negative effect on searchabiity.
40:55 AUDIENCE: Thank you.
40:56 COREY GOLDFEDER: Let me chime in here for a second.
40:58 Also one thing we've heard from other operators
41:00 of new top-level domains, is that they're
41:02 recommending people in your exact situation
41:04 to use the new domain as a redirect.
41:06 So you get the name space advantages,
41:08 but you still have your canonical source.

41:10 BEN FRIED: I mean, if you're working
41:12 getting in new top-level domains now, you're a bit of a pioneer.
41:15 And I think in a matter of years,
41:18 we'll all look back and realize, oh, that was a great practice,
41:20 and that was something that maybe didn't work out
41:22 so well, and so on.
41:23 These are early days for these new top-level domains.
41:26 In 1985, and some of us I don't think were even alive in 1985,
41:30 but in 1985, who could have predicted that .com would be
41:33 essentially all used up, right?
41:36 Sir?
41:38 AUDIENCE: So are you guys predicting
41:42 there's going to be a huge adoption
41:43 rate with the new top-level domains?
41:47 Because I notice even in the existing market,
41:49 well, let's leave out the 1,500 for now,
41:52 people will often consider having
41:54 a name, foo.com, foo.net, and they'll
41:58 think about food.biz, foo.org.
42:01 But anything besides that, they're just,
42:03 I'm going to think of a new name.
42:05 Do you think this is something that's
42:06 going to change within the next five years,
42:08 or are we looking at adoption hopefully within 20?
42:16 BEN FRIED: I'm not a guy who's good at predicting the future.
42:19 I wouldn't.
42:20 Don't ask me for stock market tips or things like that.
42:25 I want to turn the question around a little bit
42:27 and say that what happens with these new top-level domains
42:30 is dependent on people like you, who create sites, who
42:33 build apps, who through the work that you do guide
42:38 how people use the internet.
42:39 No one actually knows what, or when, or how this will take up.
42:42 I think there's a huge qualitative difference
42:44 between the 1,400, 1,500 new top-level domains and the 15
42:48 that were added to the gTLD pool in 2000, 2004.
42:52 You can't even compare them as being similar, right?

42:55 So I wouldn't want to make any kind of predictions about time
42:58 frames, but I do think that people like you and people
43:02 like us will be doing an awful lot to try to figure out
43:05 how to make these as meaningful as possible.
43:06 AUDIENCE: OK.
43:07 Could you ask another question on to that?
43:10 Is Google Domains, or Google as itself,
43:13 going to do anything to accelerate every country having
43:16 a ccTLD?
43:20 BEN FRIED: We have no specific plans
43:22 around that as an objective now.
43:24 Google Domains is still in beta.
43:26 We're really focused now on completing our feature set
43:31 and going to GA as we get feedback from you
43:33 all over the next several months.
43:35 AUDIENCE: OK.
43:36 Thank you very much.
43:38 AUDIENCE: Hi there.
43:38 Question about privacy service.
43:40 Do you provide that only in the US or for everybody outside?
43:43 And if somebody comes from, say Utopia,
43:46 and is going to abuse a domain that has privacy from you
43:51 on it, what will you do with such a domain?
43:58 COREY GOLDFEDER: So privacy is at the WHOIS level,
44:00 so that's definitely any privacy [INAUDIBLE].
44:04 That's a question for Google Domains.
44:05 I'm not from the registry team.
44:07 But I can tell you that at the registry,
44:08 privacy is global at the WHOIS level.
44:12 Generally, abuse is also a registry issue.
44:16 There are abuse stopping ways of going to a registry
44:19 and saying that a domain is abusive.
44:21 And we support, for our TLDs, the standard ones.
44:24 And if you had an abusive domain on any other TLD,
44:28 you would go to the registry for that TLD for that purpose.
44:31 AUDIENCE: So that means that Google Domains
44:33 is going to other registries to ask

44:35 to take these domain names down?
44:37 BEN FRIED: It's a great question.
44:38 It's one that we're not prepared to fully answer right now.
44:42 Brent, do you have any-- so Brent,
44:44 who manages the team that built Google Domains, is here.
44:47 Do you have something to add?
44:49 I have a mic here for you if you--
44:55 BRENT: So thank you all for coming.
44:57 So on a WHOIS, it will work for all countries.
44:59 It's provided by a partner that does it
45:02 actually out of New Zealand.
45:03 So it's not a service that's going to be US only.
45:07 And then about abuse.
45:09 Abuse is handled for every domain.
45:12 It's a requirement with ICANN that we verify email address.
45:15 We do know that there's a way to contact the owner of the site.
45:20 And that has to be checked every single year,
45:22 so that we make sure that that's always up to date.
45:24 If there's an abusive situation, we
45:26 can always use then the email to contact them.
45:31 You can inform us of abuse.
45:32 Every registrar has its own abuse contact, either phone
45:38 number or email.
45:39 You can get that off the WHOIS.
45:41 You can also contact the registries,
45:42 or you can contact ICANN.
45:44 Abuse is a big problem, and we try
45:46 to make sure that that doesn't happen.
45:47 So there's multiple ways to handle that.
45:49 AUDIENCE: OK.
45:50 Final question is, which ccTLDs do you add on Google Domains?
45:54 Is there any?
45:56 BEN FRIED: No, why don't you take it?
45:57 BRENT: OK.
45:59 So we're working to get a number of ccTLDs out.
46:02 We currently only have two.
46:05 But we're working on increasing that pretty significantly.

46:09 So I don't know which ones we're actually
46:10 going to launch the GA with.
46:12 BEN FRIED: It's our goal to support as many as possible.
46:14 There's only a few that we've got right now,
46:16 but there's a lot of leg work to sign up with more ccTLDs.
46:19 We're doing it.
46:20 AUDIENCE: Thanks.
46:24 BEN FRIED: All right.
46:25 This it the last question and then we have to move on.
46:28 AUDIENCE: You'd mentioned that you're not good at forecasting,
46:31 but just one more question around that line.
46:34 You see that right now, everybody
46:37 understands any web address to be just an address.
46:41 If it is a edu, you just understand
46:43 that it is a university, but it's still just a link
46:49 to go to a place to look at content.
46:50 Obviously, with the stuff that you're bringing
46:52 in, you're saying .foo will be for developers and on top
46:55 of that, there is some added features that's going to go
46:58 with it.
47:02 So it's kind of like you're choosing your horses
47:04 in the game that might pan out in the future.
47:07 So do you see that to be kind of a fragmented version of what
47:11 things might be than compared to right now, which
47:13 is just an address right now?
47:16 BEN FRIED: So I think the goal is
47:18 to create new kinds of meaning for a broad set
47:21 of constituencies.
47:22 Meaning specific to those constituencies for them
47:25 in ways that the internet never was able to do before.
47:28 You know what I'd like to see happen with .foo, for example,
47:31 is I'm imagining a top-level domain where people post
47:34 their hobby projects, for example.
47:35 Or are companies that are all open source in their software
47:38 development practices, use those.
47:40 And you immediately know, oh, .foo.
47:42 if I'm curious about how that website works,

47:44 there's a well known URL that I could
47:46 go to to find their source code repository.
47:49 And there are things like this that exist today.
47:51 People think about how they use existing source code
47:55 repositories, for example.
47:57 Or how important it is for some classes of developers
48:00 to post links to their source code.
48:02 I think that in the case of .foo,
48:03 I think we can do all sorts of things where we accelerate that
48:06 and we create kind of new features and new meaning
48:08 and new value for people in the top-level domain name itself
48:12 that they were only able to achieve otherwise.
48:14 And I think it kind of all will come together for them
48:17 through those top-level domains.
48:18 So maybe, hopefully in a few years, you say, oh, a .foo URL.
48:23 I know that's posted by someone who cares about code
48:26 and who cares that other people be
48:27 able to see how they built their website,
48:29 or how they built their app, and how the code works.
48:32 I think that there will probably, hopefully
48:34 be a lot more of that on the internet in several years.
48:36 That's certainly our hope.
48:38 I don't know if that-- that's the best
48:39 I can do to answer your question.
48:41 We have to end now.
48:41 The next team is coming in for their talk.
48:43 So thank you all very much.
48:44 [AUDIENCE APPLAUSE]

Watch the full video at:
http://www.domainsherpa.com/google-io-2014/