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Statement of Andrew Sullivan
Chair, Internet Architecture Board (IAB)

Before the United States Senate Committee on Commerce, Science,
and Transportation

"Examining the Multistakeholder Plan for Transitioning
the Internet Assigned Number Authority"
24 May 2016

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Chairman Thune, Ranking Member Nelson, and members of the Committee:

I thank you for the opportunity to testify before you on the topic of the transition of key Internet functions to the global Internet community. This is an important issue for the Internet, and I very much appreciate your thoughtful attention to the topic.

1. Introduction

My name is Andrew Sullivan. I am the Chair of the Internet Architecture Board (IAB). The IAB provides long-range technical direction for Internet development, ensuring the Internet continues to grow and evolve as a platform for global communication and innovation. We are chartered as both a committee of the Internet Engineering Task Force (IETF), and an advisory body of the Internet Society. There are 13 members of the IAB, all selected by the IETF community and each donating time in his or her individual capacity: we do not represent our employers or other groups. Because the IETF depends on our donated time, we normally have other employment, too. In my case, I work for Dyn, an Internet Performance Management company with its global headquarters in New Hampshire. Dyn's products and services depend on the global Domain Name System (DNS) and the global routing system: a destabilized Internet Assigned Numbers Authority (IANA) would be extremely bad for Dyn's business. Today, I offer you my personal views, which may not reflect the views of Dyn.

One of the tasks of the IAB is to act as the interface between the IETF and the rest of the world, and in that capacity the IAB oversees certain IANA registries. Because of this, I have been closely involved in the discussions about IANA's future since before the National Telecommunications and Information Administration's (NTIA) announcement of the transition in 2014.

I come to this topic primarily as someone whose daily work relies on dependable IANA functions. In my IETF and IAB work I have had countless interactions with IANA staff and the registries. In my Dyn work, my colleagues and I depend on IANA. I believe the IANA transition is about ensuring the health of the Internet.

In my view, the proposal to move the stewardship of the IANA functions to the Internet community is a good proposal, for three reasons. First, IANA's quite properly limited function works well for the Internet; but IANA is unfortunately less efficient than it could be because of the involvement of NTIA. Second, the transition makes limited changes that provide continuity with the way the system has been working at least since the founding of the Internet Corporation for Assigned Names and Numbers (ICANN). Finally, the proposal to make the transition is complete, and prepared, and has the support of the global Internet community; therefore, it needs to be implemented now.

2. Background on the Transition

In March of 2014, NTIA announced[1] its intention to move the stewardship of IANA to the Internet community. In accordance with NTIA's request, ICANN convened stakeholders with an interest in IANA's operation. The result was the formation of the IANA Stewardship Transition Coordination Group (ICG) in July of 2014. The ICG in turn asked the communities who regularly populate IANA registries – the operational communities – each to prepare a proposal about how to effect the transition for the relevant IANA registries.

Each operational community prepared its proposal, and they were assembled into a whole (and checked for coherence) by the ICG. Each operational community reported its consensus[2] and degree of support to the ICG. The ICG reported its unanimous support of the proposal in March of this year, and the ICANN Board transmitted the proposal to NTIA shortly thereafter. It is that proposal, along with an associated set of proposed accountability changes for ICANN, that NTIA is examining.

Before turning to the substance of the proposal, it is worth pausing and asking why the proposal was developed this way, with so many groups involved. The answer lies in the nature of IANA and the Internet.

One of the important ways that the Internet differs from other telecommunications technologies is in how much it depends on voluntary co-operation. The *Inter*net is a network of networks (of networks, and so on), and each network operates more or less independently. The networks co-operate with one another, without a lot of central co-ordination, because it is in their independent interests to do so. In this way, the Internet is something like a market economy: people trade (goods in the economy, "packets" on the Internet) because they each get something out of it. In my view, it is the very alignment of each operator's interests with the outcomes that has allowed

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[1] https://www.ntia.doc.gov/press-release/2014/ntia-announces-intent-transition-key-internet-domain-name-functions

[2] In the technical world, "consensus" does not have quite the meaning that it usually does in legislative contexts, but it is still very strong. When we say we have reached consensus, we mean that the objections have all been considered and either addressed or found not to override other considerations about the system. See for instance RFC 7282, available from https://www.rfc-editor.org/rfc/rfc7282.txt.

the Internet to grow and flourish, such that it is a dominant communications technology of our time.

In a centrally-organized and centrally-operated system, controls over how people configure systems would be imposed by the center. Centrally-managed systems tend to be expensive or hard to operate (or both) when they get very large. But the Internet is distributed, because in a network of networks there *is* no center. In a distributed environment, it's often easier if one has clues about how to get started interoperating with others. Those clues are the IANA registries. They fall into three broad categories, which I describe below.

To begin with, internetworking means that data (in the form of packets) are shared among independently-operated networks. To allow data packets to get from other networks to yours, it is necessary to be able to tell others what networks you are operating. To make that work, when you say, "I'm running this network," everyone else needs to know what "this network" means. The way we do that is to use a common set of numbers to represent the networks, and to use a common set of numbers it is convenient to maintain a starting-point list – a registry. IANA maintains the top-most of these number registries. IANA uses policies that work in tandem with the Regional Internet Registries (RIRs), who are directly responsible for managing the number resources in various geographic regions. Ultimately, when you connect to the Internet, you get an Internet Protocol address from your Internet Service Provider (ISP), who got their pool of addresses from an RIR, who originally got their share of the global pool from IANA. This distributed way of working ensures that there is not a single large bureaucracy in charge of all Internet addresses.

Second, to make it easy for the various networks to connect to and operate with one another predictably and reliably, they can use common mechanisms configured in a particular way. The mechanisms are called "protocols" — such as those the IETF creates. Protocols do not contain all the instructions for configuration, so, it is necessary to know how to configure a protocol for use on the Internet. For instance, when you go on the Internet and look at cat videos, your computer knows to show you a video as opposed to opening a spreadsheet because the cat video comes with a protocol parameter called "media type". It is convenient to have a single place to look up the configuration settings for these different protocols. Depending on who defines the protocol, the definition of the agreed-upon settings might come from different actors, but everyone writes them down in a shared place. That shared place comprises the protocol parameters registries; publishing them is another IANA job.

Third, names that are assigned on one network won't be any use to those connected to other networks unless the other network users know how to get to those names. It is no use to know that you want to reach "mail-server" without knowing whether it's the Senate's mail server, or your ISP's, or Dyn's. To know that, it is convenient to have a place to start looking for a name on the Internet. Mathematically, a way to do that (and one that is not too hard to implement in

computers) is a tree structure, which by definition starts from a common root. We do this today in the DNS. Maintaining the registry of the common root (also known as the "root zone") is IANA's third job, which it does according to policies established by the multistakeholder processes in ICANN.

Note the emphasis above on how these arrangements are "convenient". We *could* make the Internet in a different way. People have designed and deployed systems that did away with some or all of the IANA registries, in favor of other approaches. But IANA is the system we have now, and the one that got the Internet this far. Note as well that the contents of these registries are specified by someone other than IANA. It is those communities of IANA users – the "operational communities" – who were involved in preparing the different parts of the ICG proposal.

One other point about IANA is critical to keep in mind: just like everything else on the Internet, use of it is voluntary. The Internet has no compliance department and there are no protocol police, because each constituent network that participates in the Internet is independent. On your network, you make your rules. Networks use IANA functions because those functions are useful. Of course, this also means that if they cease to be useful, or if the cost of relying on IANA is greater than the benefit it provides, people will find another way to operate their networks. You can only build the Internet with carrots: sticks do not work.

3. The limited IANA function works well

IANA's tasks are not policy functions; they are important, specialized functions, but they are not a locus of control of the Internet because the Internet by its nature is designed not to have such controls. The decisions about how these registries are to be populated belong with others. This division of responsibility works well, and the ICG proposal only serves to make that division clearer and more explicit.

Each operational community provides the contents of and policies for the registries with which it is concerned. The IETF is responsible for the protocol parameters registries it creates, and it is also the body that creates the protocols that use those registries. The RIRs are closely involved in number resource policy, and they are in turn responsible to their communities of members — the very people who depend on the numbers distributed by the RIRs. And finally, the root zone registry is maintained according to the multistakeholder processes that ICANN uses. Naturally, none of these processes (which are designed and operated by humans) is perfect. But they each have the conspicuous advantage that the technical interest in making the Internet work aligns with participation in ensuring that the registries perform their technical function. The Internet works well when the managers of resources feel the effects of their management decisions.

When requests come to it, IANA makes sure that the requests are well-formed, that requests conform with the policies for the registry, and so on. In this sense, IANA functions are narrow and limited in scope. This is not to suggest they are unimportant, but rather to state that the

technical functions that IANA provides are specialized, and are not a source of control over the Internet.

The processes in question, and the communities involved in operating these processes with IANA, are mature and robust. We have been operating this way for more than 15 years, which is practically an eternity on the Internet. During that period, of course, various improvements and adjustments have happened; but the basic model has not changed very much.

There is one small current problem, and that is the ongoing involvement of the US Department of Commerce through the NTIA. This is not to impugn the NTIA's staff, but instead to admit that its involvement at this stage is incongruous with how the Internet works. The reason it is problematic is that, unlike the operational communities involved in overseeing the different registries, NTIA is not itself primarily an operator of any Internet infrastructure; neither does it have any special expertise about the Internet that cannot be found among the operational communities.

There are two issues that result from the involvement of the NTIA. The first is that there is an extra party involved in all the IANA accountability arrangements, which means that the accountability is not as transparent as it ought to be. Worse, it sets up the US Government as an impediment to the natural evolution of these key Internet functions, because changes to them invoke all the machinery of government bureaucracy before they can take effect. The arrangement forces IANA to work at government speed, not at Internet speed.

The second problem is that the presence of the US government in approving some IANA actions gives other countries the opportunity to blame the US Government for problems that it does not cause. NTIA's approval function sometimes includes changes that directly affect country code top-level domains, and one sometimes hears claims that a response to an emergency on the Internet was held up by NTIA. This perception – even if it is unwarranted – potentially gives other countries an argument that IANA should be controlled by an intergovernmental body, as though a delay introduced by one government could be made shorter by adding all the other governments in the world to the task. The obvious answer, instead, is to let the people who need this service – the operational communities – manage it themselves. They are ready to do it, and have a proposal that has achieved global consensus on how to make that happen; so now is the time to make the transition.

4. The transition proposal brings minimal change

One of the open secrets about the Internet is how little the people who actually operate networks and services like to change things. The first rule of being "on call" is to avoid getting called, so operators do not like to make changes unnecessarily.

Yet successful operators also know that maintenance is critical. In order not to have a large problem later, you must constantly remove unneeded code and functions that are no longer really

necessary, but are there because they were always there. Systems that do not get good, regular maintenance are called "crufty", and they're just as ugly as that word sounds.

The proposal to move the stewardship of IANA to the Internet community is good, conservative maintenance. It eliminates a feature that is no longer really necessary, because the functionality is already provided in another, more efficient way. Also, the whole transition proposal was developed using the same inclusive, bottom-up mechanisms that daily bring us the Internet. The proposal aligns responsibility with accountability, and avoids the use of governmental authority when agreements among affected parties will serve the same purpose. It provides a practicable solution to a practical problem, and only makes changes where necessary to achieve the practical goal.

Consider the parts of the proposal. The IETF came together to develop the part of the proposal related to protocol parameters registries. It did this using the same mechanisms it uses for everything else: it chartered a working group in which anyone could participate (IANAPLAN). The working group proceeded as these groups always do – they work in public to create a document and determine what rough consensus emerges. The IETF achieved rough consensus on the IANAPLAN draft, so it became a part of the final proposal. The protocol parameters portion of the proposal changes so little in the IANA arrangements that the IETF decided to implement the proposal using ordinary supplemental agreements that the IETF and ICANN undertake approximately every year. This is in spite of the fact that the IETF makes far more use of IANA than any of the other operational communities, because there are thousands of protocol parameters registries and hundreds of changes processed every month. The IETF-IANA interaction works well.

To create the numbers portion of the proposal, the RIRs created the Consolidated RIR IANA Stewardship Proposal ("CRISP") Team to create a single proposal approved by all the RIRs. This part of the proposal is little more than a contractual formalization of the arrangements that the RIRs already have with ICANN for operating of the numbers registries. The most significant innovation is the ability of the RIRs to change the IANA operator for numbers registries. But that innovation is hardly ground-breaking: it is just a standard relationship between a service provider and its customer. Accountability that depends on market mechanisms instead of governmental regulatory power has been effective in other parts of the Internet, so there is no reason to suppose it will not be successful in this case too. Indeed, this is the very sort of extremely successful relationship that the IETF has with IANA.

At first glance, it might appear that the names portion of the proposal changes a lot more than the other portions. It creates a number of new bodies, and depends on some fairly significant shifts in ICANN's corporate accountability structures. The changes are, however, less radical than the first glance would suggest. There are three reasons for this.

First, because ICANN to date has contained both the policy function for names and the IANA function, it has not always been clear to people which function of ICANN was involved in any given discussion. So, the names proposal makes the distinction explicit, by creating a Post-Transition IANA (PTI) that will be used to contain the IANA functions. Making clear a line that was blurry is not radical, but is instead a hallmark of good system design. And this clarification is an improvement in the stability of IANA, because it protects IANA from being drawn into the policy discussions that ought properly to go on inside the ICANN multistakeholder community.

Second, while the accountability changes appear large, they actually depend entirely on the already-functioning advisory committees and supporting organizations that ICANN uses for all policy development. Past accountability relied on NTIA's ability to enforce its contract with ICANN to regulate ICANN behavior. Under the new arrangements, that enforcement function lives with the community of people who are most affected. To perform that function they must have the necessary powers, and so the names proposal depends on the newly-empowered community. We already know what that community is like, because it comprises the very same structures that ICANN has relied upon for many years.[3]

Third, the names community proposal mimics the successful relationship between the IETF and IANA, and thereby ensures the operation of all the IANA registries along the same lines.

The overall effect is to provide continuity with the way that things have actually worked for many years, to align IANA stewardship with the way things happen on the Internet more generally, and to make changes only if they are rooted in already-operating structures and bodies.

5. It is time to act

It might be tempting to think that the transition should not happen according to the current timeline, on the grounds that it is happening in a rush. If this is a rush, it is a slow-moving one. Since the original "White Paper" in 1998[4], the plan has always been for the US Government gradually to step out of this function, partly on the grounds that the users of the Internet knew better how to ensure the necessary accountability.

More recently, NTIA's announcement about this stage of IANA's evolution was fully two years ago. In the intervening time people from all over the world have debated and evaluated the various proposals and come to consensus. They have put in countless hours in reading and writing proposals, corresponding with one another, and attending meetings both virtually and in

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[3] The current arrangements have evolved over time, so it would not be correct to claim that the structures have been around for the lifetime of ICANN. Nevertheless, the basics of the current structure were mostly established by the early 2000s, and it is no exaggeration to say that the proposal is primarily relying on structures that are at least as old as Facebook or Twitter — practically geologic age on the Internet.
[4] https://www.ntia.doc.gov/files/ntia/publications/dnsdrft.txt

person. The proposals we have are developed and mature, and they are founded on mechanisms and bodies that have been tested for years.

Under the ICG proposal, IANA will mostly continue to work the way it always has, and the work will continue to be done by the same professionals who have been doing it. The main functional changes are the removal of a formal approval step by the US Department of Commerce, and the elimination of a zero-cost contract let by the United States Government. Because of the process that led to the transition proposal, people all over the Internet have come to expect the final step in completing the work started in the era of the "White Paper" — a time when the World Wide Web was not even ten years old, and before Wikipedia had been established. The Internet has waited long enough. There is a proposal that has found consensus and that is workable. Now is the right time to proceed with this transition.

In an abundance of caution, some have suggested that the transition proceed in phases. It is not clear, however, how that would help anything. A phased deployment would not actually be a test of the eventual IANA arrangements. Instead, it would test a different set of arrangements every time a new phase started, and each phase would introduce a change (which necessarily brings some risk). So, a phased approach will not be a good indicator of how the eventual IANA structure would perform, and would introduce heretofore uncontemplated risks. From a technical point of view, it would be safer and better-advised to proceed with the transition of the IANA all at once. In any case, a phased approach is transparently an attempt to create time to undermine the remarkable global consensus reached on this proposal. A consensus this broad will be frustrated and fragile when faced with delay, and such a delay would represent an attack on the global multistakeholder community.

For businesses that depend on the Internet, such as my employer Dyn, a delay now would send a terrible message. It would introduce uncertainty into the fate of the functions we rely on to make our products, to make our company grow and thrive, and to provide jobs for more than 400 people worldwide. More generally, a delay in the transition outside the process already underway would support the efforts of those aiming to cast doubts on the commitment of US Government to carry through on the plan – first articulated in 1998 – to transition out of its involvement in the IANA function, as well as the more recent request made by the NTIA to the Internet community to come up with a plan. It would signal to governments that want to control the Internet that the US Government does not believe the Internet is resistant to those controls. Finally, it would undermine the multistakeholder processes that have been a foundation of the Internet's success, by telling the global Internet community that its historic, worldwide consensus around this proposal is meaningless.

6. Conclusion

The ICG's "Proposal to Transition the Stewardship of the Internet Assigned Numbers Authority (IANA) Functions from the U.S. Commerce Department's National Telecommunications and

Information Administration (NTIA) to the Global Multistakeholder Community"[5] meets the tests set out by NTIA. The proposal is a practical way to allow the government to step out of a function it does not need to perform, and ensure that IANA continues with business as usual. A limited IANA works for the Internet now, and will continue to do so essentially unchanged in the future. While there are some inevitable changes proposed to enable the transition, they are all based on foundations that are both already working and in line with how the rest of the Internet already functions. The Internet has been waiting a long time for this step to be taken. Delaying brings no benefit and it might itself bring harm.

There remains, of course, careful work to be completed in bringing the proposal to fruition. But execution of a plan that requires months to complete is not improved by the addition of more time. It is, however, improved by the addition of more dedication to see the plan through to its faithful and complete end. Working with others across the Internet community, I believe that we shall together see that end.

Nearly 50 years ago, the United States Government kicked off the project that led to the Internet. It trusted technical people to come up with a new communications medium that offered greater efficiencies, cheaper operation, and a reliable system made out of unreliable parts. The technical community delivered, and today we have an almost magical technology that is a critical engine of the US economy – a technology on which much of the world relies, and which is designed to minimize central points of control and failure. Today, the Internet community is offering to eliminate a needless involvement of the US Government, and to operate this part of the Internet the way everything else on the Internet operates: by private-sector-led co-operation. This is a tremendous chance for the United States to show the world its leadership in understanding that the Internet is robust and designed not to be captured — that even if other governments wish to control it or bend it to their will, the Internet is a system inherently resistant to those wishes. I urge you to lead us that way, and show the world what tremendous ingenuity, harnessed through voluntary co-operation, can give us all.

My colleagues on the IAB and I remain fully engaged to ensure timely completion of this effort. I thank this Committee and its Members for your kind consideration.

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[5]https://www.ianacg.org/icg-files/documents/IANA-transition-proposal-final.pdf