School of Public Policy
Internet Governance Project

Reconsidering the definition of the field.

Laura DeNardis, Georgetown University

Virtual presentation, IGP's 7th Annual Conference,
"From Internet Governance to Digital Political Economy
The Hague, October 18, 2022

Laura DeNardis:

Hello, everyone. Good afternoon, and good morning to anyone who's in my time zone. I am Laura DeNardis, a professor and endowed chair in technology, ethics, and society at Georgetown, and I'm coming to you from Washington DC.

I really wanted to come to the conference. I couldn't, and it was very generous of you to allow me to zoom in from DC to weigh in. I do feel, let me first say, that I think the very existence of this conference has been a great provocation, and an important conversation. The premise of it comports well with a book that I wrote not too long ago: *The Internet in Everything: Freedom and Security in a World with No Off Switch*. And let me explain why it comports.

The book is about the IoT and the cyber physical world. But I challenge everything in my own work about what the Internet is and what Internet governance is in that book. It was really a provocation to myself, and the long body of my work. The digital world and the physical world are no longer separate. They are completely enmeshed in every way, and the category 'Internet user' collapses. There's no such thing as an Internet user anymore, right? Some people who have never been online are profoundly affected by what happens online. Let's say with the data breach, or, caught up in surveillance, cameras, etc. Some people online are not actually people, they're bots, they're objects. So that category has completely collapsed.

What else has collapsed? Tech companies. All firms are now technology companies. They all collect massive amounts of data. They all require strong cybersecurity to function, and they all provide products and services that are enmeshed with embedded components. So it's no longer possible to separate the digital and physical world. The Internet is in everything, including the flesh and the physical objects all around us.

Now I came to understand viscerally the shift when I went to a farm. My community of scholars is studying mostly content-related issues, speech, intellectual property, privacy, and I was standing in a dairy farm in Culpepper County, County Virginia not too far from where I live, and I watched robots milking cows. The cow is voluntarily entered into stanchions. They were milked by these robotic arms. They fed while they were being milked, and they were connected to a

system that was proprietary digital technology. But it connected to a back-end system which then connected to an app which transmitted over the public Internet to the farmer's smartphone. He showed me all the data that he was collecting about the cows. But it just dawned on me at that point that cybersecurity attacks are no longer just about taking away my ability to email, text or access health care data - things that are very important – it's about the ability to disrupt our food supply. So this is the Internet in everything.

In the same way that the Internet has leapt from 2D to 3D into the physical world, Internet governance needs to leap from 2D display screens like the ones we're communicating through right now into this cyber physical world all around us. I have a few things here that remind me of how quickly technology changes. Here is a telegraph key that I keep on my desk. It's very recent in human history. I have here a slide rule, which I like to use. I have a book on my shelf with a complete list of all websites on the Internet, from 1992. A list of all websites on the Internet that fit in a small book. What else do I have here? I have a very large collection of vacuum tubes, and I'm not in the center for analog ethics. I'm in the center for digital ethics. Milton is in the Internet governance project, not the analog governance project, but I raise that because in the same way that analog is going away, so is digital.

I just recently presented a paper on quantum Internet protocols at the transatlantic quantum forum, and something that I said gained a lot of traction: the word digital will go away. Yeah, that seems funny, because I always use that word. But in the same way that we don't have the Analog Governance Project, maybe we won't have the Digital Governance Project either. These are all provocations. It's about terminology.

I am an STS scholar. That's my field, science and technology studies. And I understand how technologies become invisible once they're widely entrenched and people stop talking about them as technologies. The best example of this is probably the kitchen sink. If you've been to one of the Disney parks there is a ride called the Carousel of Progress. It takes a family through human history and the evolution of technology, and there's one scene there where they bring the water pump into the kitchen. You now have a water pump, which is the kitchen sink. It was considered the height of technology, and then at some point, humans stopped viewing a sink in a faucet as technology. And now it's technology again, as it's part of the IoT. So this issue of how things become invisible is very, very interesting, but there still is to me a thing called the Internet.

The coordination of the many functions that keep the Internet operational is an epistemic community. I don't call it a field. I call it an epistemic community. And I want to share with you my origin story about how I came to that, and then challenge a few of the things in my own work. I will share 3 quick stories.

One speaks to the moment in my life when I realized how important these topics are. I was an engineering graduate student at Cornell University in the fall of 1988 when the Internet had its first major outage. A lot of you in this room probably don't know what I'm talking about. You probably weren't a user at that time. So in 1988 the Internet had a massive outage, and we were all affected. It got traced back to a computer at MIT, and from there it got traced back to a computer at Cornell University in my building, Upson Hall. A fellow graduate student named Robert Morris had unleashed this. What was interesting to me is that the Feds came around.

They were very concerned about this. The media was talking about this, and the Internet came into the public sphere for the first time. They were all talking about it in a way that was completely wrong, technically. I found that interesting. It led to the formation of the first computer emergency response team at Carnegie Mellon. So now we have CERTs all over the world. Also, it was the first time that anyone was prosecuted under the Computer Fraud and Abuse Act. I was hooked. I saw immediately the politics of cybersecurity, and the connection with communication and media systems with political structures, with engineering communities. I thought, this is incredibly important and interesting.

The second story of why I identify, and have identified, as someone who studies Internet governance is that I took a course with Janet Abbate. The course was on Internet history and politics. If you don't know who she is, you should Google her. She wrote the book, *Inventing the Internet* in 1999. A great historian of technology. She was my dissertation advisor. But on the syllabus was a book by Milton Mueller, called *Ruling the Root: Internet Governance, and the Taming of Cyberspace*. I had started my doctoral dissertation on a protocol called IPv6. Until I read that book, I didn't realize that I was doing Internet governance work. I was an STS Scholar. But I realized that the object of my work really was Internet governance, and for me that meant not traditional governments alone, but design communities, coordination communities, and beyond. So, Morris Worm that's my interest. The Janet Abbate course, that's how I started framing my work as Internet governance.

The third origin story was when I was at Yale Law School. I was working on my book *Protocol Politics*, and I attended the very first Internet Governance Forum and the Inaugural meeting of the Global Internet Governance Academic Network (GigaNet) in Athens. I enjoyed going to Athens, but I really enjoyed meeting an epistemic community of people: Derrick Cogburn, Nanette Levinson, Hans Klein. Lots of people who were asking similar questions and doing the same thing. So that's why I call it an epistemic community. And this gave me an Internet governance community.

This is directly connected to an introduction I wrote to the book, *Researching Internet Governance: Methods, Frameworks, Futures* that I co-edited with Francesca Musiani, Nanette S. Levinson, and Derrick Cogburn. I decided to call my opening chapter, "Internet governance as an object of research inquiry" – an object of study, not a field in and of itself. Technology is always changing. What has happened since that Athens meeting in Internet governance? Around the time of that Giganet meeting, I believe Facebook had just been launched at Harvard. Am I correct about that? It was right after the domain name YouTube was activated. It was around the same time as the United Nations First Internet Governance Forum, and since then we have had the rise of social media, Twitter, Reddit, drones, the iPhone and mobile Internet access big time, the so-called Arab spring, Netflix streaming video.

The Internet has grown tremendously, and the Internet is in the physical world now so that is a huge change. There is nothing fixed about Internet architecture; it is always changing. So, there cannot be anything fixed about Internet Governance, it is constantly evolving also. And again, if you want to call that cyber governance or digital governance or Internet governance, it's important to address that nomenclature, and I'm sure we'll get into that discussion. But since that Athens meeting, the governance of the Internet has become high politics, involving the

highest level of policy making. There are many scholars involved. Advocacy groups have formed around this. Policymakers now speak about governance of technology in the same breath as other kinds of global collective action problems, like climate change, refugee crises, and terrorism. This is not surprising to me. In the same way that the Internet evolves, in the same way that Internet governance has evolved, my own work has evolved. But I've always looked at emerging technologies and I always use a similar conceptual framework. So I want to say a little bit about some of those conceptual themes and ask: do they still apply regardless of what you want to call this thing?

The first theme, which comes directly from STS, is that arrangements of technical architecture are arrangements of power. You certainly see that in battles over control points of the Internet. You see it in supply chain issues. You see it around crypto-currency, and many different things.

The second theme is that technical infrastructure is routinely co-opted as a proxy for political power, for social control. Whether it's using cloud computing networks to shut down sites to stop people from accessing networks of resistance during social unrest, or even the turn to the domain name system for content regulation. A book I co-edited called *The Turn to Infrastructure in Internet Governance* called attention to that, and this co-opting of infrastructures is still relevant.

The third theme is the privatization of governance. Cyber governance, digital governance, Internet governance, whatever you want to call it, is as much about private ordering and industry as it is about traditional governance structures. That doesn't mean that you leave the geopolitical, nation states out of that, but it's a recognition that infrastructure is owned and operated by the private sector, and it's very difficult for governments or other powerful forces to do anything without some kind of connection with the private sector.

The fourth theme is that values are always in conflict around technical architecture. There are so many examples of this I wouldn't know where to begin. There are tensions between law enforcement and privacy, tensions between speech and the economy, tensions between human security and interoperability (you don't want a toaster connected to a nuclear reactor in the world of IoT; you want interoperability but also need security.) The values are always in tension, and I think that holds up.

Finally, the fifth theme Is that what happens locally affects us globally, and what happens globally affects us locally. A shutdown in one part of the world, using, let's say, border gateway protocol can have cascading effects around the world. This holds at the legal or policy levels as well: the GDPR in one part of the world can raise the common denominator in other parts of the world around privacy.

So where are we? There is digital mediation of the public sphere, but there is also digital mediation of everything, including cow milking machines. There is the privatization of much of the policy around this. The stakes are rising in every way; cybersecurity is not just about data outages but is a great human rights issue, because it's about human safety. Governments and the private sector alike recognize that infrastructure control is now a proxy for political power. So, this is what I study.

From Internet Governance to Digital Political Economy

I like the term Internet governance a lot. I also recognize that I use other terminology. I could get into in our discussion of any taxonomies or boundaries around this and I'm looking forward to that. But I want to close with two things. One is that there are a lot of challenges to what we study. How do you make the invisible visible? There are institutions that are not visible. People have heard of RIPE-NCC now that the Ukrainian Government asked them to shut down Russia. There are also technologies that are not visible. It is a challenge to make that visible, it requires understanding complex technologies. I have an engineering background, but you don't need that to be an expert in the technology. I think it's very important to understand technology, and I tell my students anyone can learn it. When I was studying engineering. I didn't learn about TCP/IP or the domain name system, or the quantum protocols that I'm studying now. I taught myself that, and so can you. It's also very difficult to study the private sector because of trade secrecy and other forms of proprietary enclosure. This is a challenge to us because we tend to over-study open institutions. The IETF and ICANN have been fairly open to participant observation. But there are some institutions that are not open at all.

A significant challenge to all of this is that technology is always changing. Governance is not fixed anymore; technology is not fixed. How do you apply different conceptual frameworks to this? I think I was smart to say that *Internet governance is an object of research inquiry* because it requires different kinds of methodological lenses. I myself come at it from the standpoint of science and technology studies but also law. It's vital to bring political economy into the discussion. We amassed a number of people from different fields into this and there are still a lot missing. So how do you apply different conceptual frameworks, whether you call it the digital world, the cyber world, or the internet world?

I continue to believe that there is an Internet, and therefore there is Internet governance. It's important not to sideline STS; people who study the technology must be included in the conversation – you want to make technology visible. In the beginning of Internet governance there weren't enough people who studied the technology. There were more people who studied the institutions, and then finally the world of “War”. I took a lot of heat because I titled my book about how the Internet is governed *The Global War for Internet Governance* and that was considered too provocative. People asked, 'why are you calling it war?’ The opening paragraph of this, I think, foreshadows what has happened around the digital iron curtain unfolding around Russia. I'll just read one or sentences from it:

> “Internet Governance conflicts are the new spaces where political and economic power is unfolding in the 21st century. Technologies of Internet governance increasingly mediate civil liberties such as freedom of expression, and individual privacy. They are entangled with the preservation of national security and the arbitration of digital commerce in innovation. The diffuse nature of Internet governance technologies is shifting historic control over these public interest areas from traditional nation-state bureaucracy, to private ordering and new global institutions. Many of these governance functions are technically and institutionally complicated, and therefore out of public view. Yet how conflicts over Internet governance are settled will determine some of the most important public interest issues of our time.”

So why the word war? If you know me, you know that I have a secret word in every book. In *The Internet and Everything*, the secret word my family asked me to include was *Giraffe*. It's on the opening page. *War* was not the secret word in *The Global War for Internet Governance*. But when I was struggling with the title, one of my friends said, “well, people say in a title, you should use violence, food, or sex.” I thought it was safer to use violence. I think that that has turned out to be a word that is not entirely inappropriate, I think it holds up.

So those are my thoughts. I'm sorry that I can't be with you in person, because I feel like I've missed a lot of really, interesting discussion. I hope that there were a few provocations out of my remarks, and I very much look forward to reactions and hearing from the closing panel. Thank you very much.

Milton Mueller:

Laura, thank you very much, that was great. We had a very rich discussion yesterday about the political economy perspective vis-a-vis Internet governance with Jan Aart Scholte, Tatiana Tropina, Michel van Eeten, and Louise Hurel. I think you know all of them. It's great that you are stalwartly defending the word Internet governance. And I don't know if you saw my tweet, but I also like the way you one-upped me by saying that the word “digital” might have to go very soon too, due to quantum computing. So to heck with digital political economy, it'll be some other kind of thing.

Nobody here is challenging the idea that there is an Internet. There was, however, a consensus that there is a wider digital ecosystem which internetworking basically helped to create, and that you have interdependent technical, economic and political relations between networking, data, software, and devices. Those all are getting embraced into a digital political economy with things like chip sanctions, and the rise of operating systems that are globally concentrated due to compatibility relations. I think that was the point. And it was very hard to talk about internet governance without reference to this broader digital ecosystem.

Laura DeNardis:

Yeah, I think that's very, very valid. And is something like cryptocurrency part of Internet governance? Are proprietary technologies part of Internet governance? I think, in a way they are because they connect in many ways to the public Internet because in some cases, they truly are proprietary. But I think that expansion is very important. What I would ask, though, is, why use the word political economy? To many, the word political economy seems to be around a certain field in a discipline or a collection of theories. So what I would be concerned about is whether that then takes away other branches of political science, or issues of culture, or fields like science and technology studies, or even straight up black letter law. So how do you define political economy if not as a field? That's something that I would have been listening to very carefully had I been there in person.

Milton Mueller:

Yeah, I think that was the core of the debate that we had. It wasn't like people were saying you shouldn't do political science, or you shouldn't do STS, or you shouldn't do cultural or anthropological studies. The point was, if you want to shape and participate in governance then

you must talk about political economy, because this gives you a systemic perspective on the governance problems. There are people who isolate politics and ignore economics and industrial organization, for example, and there are people who do economics without talking about the institutions, the governance processes and geopolitical power struggles that shape those markets. I am always surprised at how little STS people talk about things like markets, capital investment and relative costs and how they affect the social shaping of technology. They are missing the boat; we need to add to this picture a hardcore political economy perspective.

Laura DeNardis:

I think that's an incredibly important perspective to add, I also would be concerned, and I'm not suggesting that you're saying this, Milton. I would be concerned about things that suddenly don't get inside the black box of technology. And look at that like there's that's a very institutionally based set of theories, and that's why it's so important to have diverse conceptual lenses that look at this. I mean I myself am interdisciplinary but identify as a STS scholar. But I think in the beginning of discussions of Internet governance when they originally came from law, there was a lot of institutional-bound lenses. And I was really criticized by the engineering communities, when I suggested, in my first book Protocol Politics, for suggesting that protocols are not neutral. I drew that from Janette Abbatte's work as well, I wasn't the first person to say that by any means. But that took a lot of heat because opening up the black box of technology and saying that there's politics in the actual design, that was a limitation of early Internet governance work that came primarily from law. And I think it's very important to keep the diverse set of conceptual lenses so that we don't miss that aspect, even while adding these other lenses that acknowledge the diffusion of technology that goes beyond the bound of internet as we've often thought of it.

Milton Mueller:

Alright we have a question from the floor.

Wout DeNatris:

I am not an academic but a very practical person. However, looking at Internet governance now is not the right moment to have a discussion on changing the name, and I'll explain why. Because the Internet Governance Forum and the other more formal Internet governance Institutions are about the only place in the world left where we can discuss the Internet. We're together, and if you change the concept now you take away the power that it has accumulated in the past years. If you start debating the fundamentals of the name, … my theory is that if the IGF is going to Moscow or somewhere in Russia, if we ever get there, they have selected that day because it's the final date of the mandate. They selected that date to bury the whole Internet governance structure. We should be trying to convince everybody who is in the room to continue this word because we need this space for all stakeholders to meet on an equal level. Shouldn't that be the debate at least for the coming years? What we should really be pushing is an argument to continue with governance as we know it. Thank you.

From Internet Governance to Digital Political Economy

Laura DeNardis

I think that Russia would love for us to not use the term Internet governance anymore. And I think that China would love for us to not use the word Internet governance anymore. And they would love for the organized epistemic communities who have come together with different disciplinary lenses, to unpack the politics and the importance of this to disband. And I think they would love the multi-stakeholder community to disband, which has been private sector, new institutions, governments, advocacy. I think they'd love all of that to be disbanded.

And why would we disband an epistemic community that has been a space. Again, we have to always question the nomenclature. It's not perfect, but none of the other terms are either. Why would the experts that have been involved in policy engaged advocacy, actual black letter law and scholarship? Why would they disband and allow other kinds of forces to come in that may not have the same expertise that may have very authoritarian views and government-centric views on digital governance or cyber governance. I think that that would be an opening for honestly more authoritarian views of what the Internet is, what the governance is, and making a huge role for the State rather than for a multi stakeholder policy engaged involvement in this. Call it what you will, I'm going to keep calling it Internet governance even while I'm in a Center for Digital Ethics, even while I'm studying quantum and even while I'm a STS scholar. I think it is important not to disband the communities that we have. We have all critiqued the Internet Governance Forum in various ways, and it's very important to self-reflexively critique our scholarly communities as well, and challenge our own nomenclature, to expand our lenses. But I think in a world where more disciplines and more people, where even those who are not experts in Internet governance are now getting involved in Internet governance, it's important not to just disband the actual communities that have dialogues, networks and expertise.

Milton Mueller:

I'm really glad that you made such a passionate statement, Wout. We want to be careful that we do not undermine the community that has been organized around this label. I'm much more sensitive to that than I was. I was initially approaching it more from an academic standpoint than an activist standpoint.

But Laura's intervention made a bit of an overstatement, in my opinion. Nobody is talking about "disbanding" any governance communities. I mean, I'm as involved as anyone can be, and the IGP is involved in numerous multi-stakeholder communities. We are trying to expand it, in fact, getting into new areas like content moderation and PKI trust stores for global software. But we are trying to bring a new framing or angle to it based on a deeper understanding.

This was a major concern that came up in our initial discussion. Are we undermining the community formed around this label? It is a very defensive view. I do not share the fear many of the people in the community have about this. I know that there are threats of greater state intervention and authoritarianism. We have been studying these threats carefully. That is why I prefer the term digital political economy, because those threats are fundamentally geopolitical and political economic. They come from the nature of states as opposed to the transnational communities that have been active in these institutions such as ICANN and Web PKI and the Regional Internet Registries.

If you do not understand the nature of these threats, if you look at them as just people who are anti-multistakeholder, if you do not understand the political economy of it, you're creating more risk to the IG community. Just to give you an example, people are having the fragmentation debate over and over and over again. In the book I published five years ago, *Will the Internet Fragment?*, I explained how the source of the fragmentation problem is the conflict between the territorial authority of states and the globalized connectivity and management of the Internet. But people in the Internet governance community repeatedly refuse to confront that head on. They keep talking about fragmentation as if it were somehow a technical issue, or about the digital divide, or about private sector walled gardens. It's not. It is fundamentally about who is exerting authority over the digital ecosystem. Are you in a sovereign system or are you in a non-sovereign system? I very much uphold the multi-stakeholder, non-sovereign system of governance where it is appropriate. By reframing, we are trying to focus more on what those actual threats are, and how they might be countered.

Milton Mueller:

Let's entertain some of the questions that have come in about quantum computing. **Rita Zajacz** asks, if you think about the development of the Internet, what stage are we at with the development of quantum computing? **Johannes Bauer** asks, given what we currently know about quantum will it alter some fundamental characteristics of the Internet, such as end-to-end architecture, or will it simply add another family of technologies to the physical layers?

I want to burrow into that a bit. One of the things I discovered while developing my course on digital political economy is how time-bound the digital revolution is. You really go back to the 1940s, information theory, von Neumann's computing architecture and the cybernetics of Norbert Wiener and you just see everything rolling out from there. Of course, there are precursors from the thirties, and you could even go back to Babbage, but really, what we now think of as the digital revolution started in the mid-1940s, and we could very well be near the end of it, just as we're now making it the centerpiece of governance. We are studying PKI as one of the many infrastructures and of course, one of the big concerns there is that quantum computing will eliminate present methods of encryption. So do you think quantum is a continuation of digital technology? Is it going to take us in a completely new direction?

Laura DeNardis:

Quantum computing is still incredibly nascent, but it also is a real thing. If you look at the results of quantum computing experimentation, it is very promising and powerful, but it's one thing to demonstrate something in a lab and it's quite another to take that and put it out in the world and implement it in a way that can actually be used. So, for example, a lot of the scientists that are trying to move from quantum computing into quantum communication. They are saying, let's design a repeater, a quantum repeater. Well, anyone who understands digital systems knows that it's not just about reproducing a signal, you also need metadata or overhead information in it. You need to resolve names into numbers. You need to connect to different kinds of governance structures, like certificate authorities. I think it's still far away.

However, even if you have a quantum computer that's sitting in a room not connected to anything. If you have a huge data repository, let's say I am a Let's pretend I'm a government, and

I'm amassing encrypted information, and I'm storing it even though I can't currently read it. In the same way, you have a painting and you don't know there's a Picasso underneath it. Years later, when you have the kind of technology that can look underneath the paint, there's all this information lying dormant and not currently accessible, but it's being stored because it could be accessible in some way. There's a lot of potential there. But moving from the theoretical work into the implementation of this is still pretty far away

Milton Mueller:

So to directly answer Rita's question, I'd say quantum computing is in the 1940s or 1950s.

Laura DeNardis:

To respond to Bauer, I wrote a very long piece called Quantum Internet Protocols that I put the draft of it of it up on SSRN if anyone is interested in. My opinion is that quantum is not one thing, it's many different things. There's quantum computing, there's quantum sensing and metrology. There's quantum communications. But what most people are concerned about is how vast increases potentially in quantum computing could crack certain kinds of encryption, and I think that this is a very real question, and something that we should all be concerned about. But ontologically, is it something completely different? I think yes, it is. The very premise of quantum computing involves things like superposition and probabilistic models, models from theoretical physics. It is quite different from the digital world of zeros and ones. Something can take on either a zero and a one in any moment, and that is quite different than the discrete world of digital technologies, just as digital is quite different from analog.

But it will have to coexist with digital. Historians of technology like Thomas Hughes talk about the conservative momentum of technologies. There's such an entrenched digital structure in our society that it is gonna be here for a very, very long time and the two will have to coexist.

Now, Milton, the word cyber. People put that out there, too. I don't think that's the perfect terminology, either, for a variety of reasons. But one thing that is so interesting is even in a room of like-minded experts when you talk about cyber, people suddenly switch to national security. When they use digital, they are talking about speech and the digital economy. There is a code-switching going on. Around digital and the Internet, the terminologies are very, very messy, and they are always changing. I mean, maybe the word technology has more of an enduring nature. But that's not good, either, because genomic medicine is a technology. Information and communication technologies, maybe that's the term? I still believe there is an Internet, and appreciate that there is an Internet, and that there are common standards, common interconnection, and institutions that coordinate and manage that, but I also code-switch all the time between digital technology, information and communication technologies and the Internet. So I think the nomenclature is very squishy. Now throwing quantum into the mix just makes this even worse.

My paper has a section on lessons from the Internet standards world for the quantum world. The biggest challenge is around cybersecurity. Quantum computing can challenge encryption. I think everyone in the technical community agrees with this, every standard setting community is working on this, including the IETF, which is trying to figure out how to shore up public key cryptography, which is based on certain kinds of algorithms threatened by the powerful

quantum computing potential. Now when you listen to the theoretical physicists discuss this, they think the threat is to personal privacy. In fact, the whole way that the Internet works is threatened. Public key cryptography is the foundation upon which so much works, like domain name system security (DNSSEC), virtual private networks, and access to crypto wallets. Public key cryptography is the engine upon which the entire Internet runs. So I would say that that is the number one principle in the area of principles.

Milton Mueller:

All right. I'm gonna have to cut it off there, Laura. Thank you very much for your appearance. It's been great to hear from you, and if we do another IG2DPE conference next year, I hope that we can do it where you can attend. And it has been a really good conference. So thank you all for attending, good night.