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BUILDING BLOCKCHAINS: EXPLORING WEB 3 AND OTHER APPLICATIONS FOR DISTRIBUTED LEDGER TECHNOLOGIES

WEDNESDAY, JUNE 8, 2023

House of Representatives,

Subcommittee on Innovation, Data, and Commerce,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:00 a.m., in Room 2123, Rayburn House Office Building or via Webex, Hon. Gus Bilirakis, [chairman of the subcommittee] presiding.

Present: Representatives Bilirakis, Bucshon, Walberg, Duncan, Lesko, Allen, Fulcher, Harshbarger, Rodgers (ex officio); Schakowsky, Castor, Dingell, Kelly, Soto, Trahan,

and Clarke.

Staff Present: Michael Cameron, Deputy Staff Director; Jessica Herron, Clerk; Tara Hupman, Chief Counsel; Peter Kielty, General Counsel; Emily King, Member Services Director; Tim Kurth, Chief Counsel; Brannon Rains, Professional Staff Member; Teddy Tanzer, Senior Counsel; Zane Mandle, Intern; Hannah Anton, Minority Policy Analyst, Ian Barlow, Minority FTC Detailee; Daniel Greene, Minority Professional Staff Member; Lisa Hone, Minority Chief Counsel, Innovation, Data, and Commerce; Joe Orlando, Minority Junior Professional Staff Member; Anthony Choi, Minority Intern; and Camden Burk, Minority Intern.

*Mr. Bilirakis. The subcommittee will come to order.

The chair recognizes himself for an opening statement.

Good morning, and welcome to today's subcommittee hearing.

Cryptocurrencies and certain financial aspects of blockchains have hijacked the public's attention when it comes to this emerging technology. Today's hearing will highlight that blockchains are not just impacting Wall Street but are also changing Silicon Valley and the Internet as a whole.

It is essential that Congress accurately understand what it is regulating before it does so. That would be nice. This is a complicated topic, which is why I am looking forward to the superb panel of experts educating us here today and welcome.

The core issue is about how data is organized, preserved, and protected, which is the jurisdiction of this subcommittee.

As I understand it, a blockchain is a linked list or ledger of transactions stored on a network of computers. Blockchains are composed of building blocks of data chained together cryptographically.

We will walk through these technical components today and discuss what it means for blockchains to be decentralized, immutable, and open.

But to step back from these terms, what we are really discussing here is a new foundational technology that can provide individuals and businesses new ways to access, record, and validate digital activity online.

Web 1.0, the original World Wide Web, and I remember it well, lasted from roughly 1993 to 2004 and was characterized by dial-up and AOL. I remember those days well because I am old enough.

It was replaced by Web 2, which is the current Internet we know well and has been characterized by smart phones and Big Tech platforms.

Web 3, which encompasses the nonfungible tokens, the NFTs, and other use cases, is the emerging Internet built on top of blockchains and is characterized by increased user control, decentralization, and transparency.

Using these technologies, developers are building new decentralized social media, new messaging apps, new ways to stream music, and new privacy enhancing technologies, just to name a few.

Blockchains are not a crypto casino. In fact, according to one report, despite crypto prices falling roughly $2 trillion, a 70 percent decline, blockchain developers have only declined ten percent.

There are respected developers who are not trying to make a fast buck, but rather, they are building a new evolution of the Internet.

But this technology goes beyond just Silicon Valley. Blockchains, Web 3, and other distributed ledger technologies are just tools. Like the Internet, blockchains will impact many areas of our jurisdiction and can help address challenges with our current Internet ecosystem, bolster supply chains, verify information, and increase efficiencies for businesses.

However, we should not treat this technology as a cure-all. There are still technical challenges, such as scaling, data availability, and cybersecurity.

There are also human challenges, such as fraudsters and compliance with law enforcement. As with any new technologies, scams do exist in a blockchain ecosystem unfortunately.

As this committee knows well, the number one Federal

regulator of scams and fraud is the Federal Trade Commission, and that is where we want its focus, okay, on scams and fraud.

Instead of diverting resource to fight legal battles over possible competition theories, the FTC should focus on protecting Americans from fraudsters as these bad actors migrate from older technologies to these new technologies, unfortunately, again. We see it all the time.

Last Congress, my bill, the Ransom Act, was signed into law. This legislation requires the FTC to increase cooperation with foreign law enforcement and report on ransomware and other cybersecurity-related attacks.

When international hackers target Americans using blockchains, the FTC should take a lead role in ensuring they are made whole.

Blockchains present an incredible opportunity but also come with unique challenges. Regardless, the United States must lead on the international stage so our adversaries do not have an opportunity to set the rules of the road. That is why we are having this hearing to educate all of us.

We must lead with our values for freedom, human rights, and human dignity.

I look forward to working with members on both sides of the aisle to ensure these technologies are anchored here in the United States and we are central to that discussion.

[The prepared statement of Mr. Bilirakis follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. I now recognize the gentlelady from Illinois, Ms. Schakowsky, the ranking member, for five minutes for her opening statement.

*Ms. Schakowsky. Thank you, Mr. Chairman.

You know, I have had the privilege of being on the Energy and Commerce Committee, which has the absolute broadest jurisdiction of any committee, and the subcommittee which I think of all the subcommittees has the largest jurisdiction as well.

*Mr. Bilirakis. I agree with that.

*Ms. Schakowsky. But today we are exploring some new territory. So here is the title of this hearing, "Building Blockchains: Exploring Web 3 and Other Applications for Directed Ledger Technology,'' pretty wonky I would say, but good for us that we are heading into this territory.

So we are here today to discuss blockchain, which is a relatively new technology. The blockchains are being used to solve problems like supply chain management or creating digital contracts and even wills.

However, this technology has some significant shortfalls. Some blockchains have large energy and environmental implications that we need to be concerned of.

But the biggest downfall, I think, is the use of this technology by scammers and fraudsters and extortionists. Real people are actually being hurt right now. Some have lost even their life savings because of the problems they have encountered.

Just this week, the SEC alleges that two of the largest cryptocurrency exchanges were absolutely scamming consumers, and criminals often are demanding -- and you were talking about your legislation -- that ransom be paid and sometimes that even has affected hospitals in a really negative kind of way.

Between 2017 and 2022, Illinois residents -- that is the State that I am from -- allege that they have lost $45 million to the currency scams. So we have the tools. That is the good news. We do have the tools. We have the Federal Trade Commission.

And like the chairman has said, we want to make sure that the Federal Trade Commission has the resources that it needs to make sure that in this new developing technology, that they are going to -- they have the tools, but now are they going to have the resources?

And so I look forward to hearing from our witnesses, the

people who really know what they are talking about, and I hope that you will educate us to the extent that we need to do our part as members of Congress to make sure that we can partner with you and the information that you give us to make sure that this is a safe environment for consumers and for our economy.

So I want to thank you very much for being here. I look forward to learning a lot from you today.

Thank you, and I yield back.

[The prepared statement of Ms. Schakowsky follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. The gentlelady yields back, and I appreciate that.

And now I will recognize the chair of the full committee. She gave me the opportunity to chair the subcommittee with the broadest jurisdiction, and I appreciate that very much.

So I recognize Mrs. Rodgers for five minutes for an opening statement.

STATEMENT OF CATHY McMORRIS RODGERS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

*The Chair. Good morning. Good morning, everyone. Welcome to today's hearing.

This committee and this subcommittee, in particular, play a vital role in advancing American competitiveness and global technological leadership with our values, as you stated, Mr. Chairman, freedom, human rights, and human dignity.

What changed? Web 3 and other applications of distributed ledger technologies represent a new technological shift, comparable to the breakthrough of the Internet, and we need to ensure that America, not China or Europe, is charting our path to lead in the deployment and standard setting of these technologies.

Our mission on Energy and Commerce is to help foster and to promote innovation and American technological leadership. We led on passing the Telecommunications Act of 1996, which was foundational to the evolution of the Internet.

The innovation and entrepreneurship that followed represented some of the greatest accomplishments in American

history and the world.

We must ensure that we can lead the next era of American innovation and entrepreneurship with a regulatory environment that keeps pace with the constantly evolving tech sector. That is especially true with blockchains.

For this reason, in 2016, the Energy and Commerce Committee held one of the first congressional hearings on blockchains. In the years since, the technology has continued to advance as entrepreneurs have found new and exciting applications.

Additionally, at the end of 2020, my legislation with the help of the then chair of the subcommittee, Chair Schakowsky, the American Compete Act was signed into law, which required the Department of Commerce to study ways the U.S. can advance several emerging technologies.

Part of the legislation in the package, led by Representatives Guthrie and Soto, requires a study on blockchains and ways for the Federal Government to promote American leadership and adoption.

We continue to wait for this forthcoming report from the Biden Administration to provide the committee with pro innovation recommendations. Unfortunately, the report is now

far beyond the statutory deadline, as well as the requested extension we allowed.

As with any new technology, we must move quickly. While the U.S. led in the creation of the Internet, we could easily fall behind with Web 3, the next generation of the Internet. According to public filing data, less than 40 percent of blockchain companies are headquartered in the United States and that number continues to decline.

As we saw with Huawei and 5G, when we do not lead, our adversaries fill the void. It is critical that America leads, especially given the implications of these new technologies.

Big Tech has developed tools that interact to track Americans both online and offline. Technologies like distributed ledgers can align with the goals of comprehensive data privacy legislation -- I am excited about that -- by enabling people to reclaim control of their personal online data and by limiting any one company's ability to control and collect the information that we share online.

As these technologies are deployed, the U.S. develops standards to regulate them, and we have a responsibility to ensure entrepreneurs and small businesses can continue to

thrive.

We have often celebrated they are the engine of our economy. While larger companies can navigate complicated regulations like GDPR in Europe or a patchwork of State laws, smaller businesses cannot afford the high compliance cost.

Embracing innovation, entrepreneurship and free markets is what has made America a global technological leader, not overly prescriptive regulation.

While securities and commodities are just one of the many uses of blockchain technologies, there is reason that the Gramm-Leach-Bliley Act does not regulate nor should it the use of Americans' personal information outside of the financial sector.

Congress needs to have a conversation about what blockchains are and are not to ensure that the heavy hand of government regulation does not force blockchain startups to reevaluate if America is the best place to begin their business.

When this committee worked on the Telecom Act, we never could have predicted the power of the Internet. Now, as then, we do not know how powerful blockchain technologies will be.

But we do know America should lead the way. So I look forward to an informative discussion today.

And I yield back.

[The prepared statement of the Chair follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. I thank the Chair.

And I now recognize the gentleman from Florida, my good friend, Mr. Soto, the designee for Ranking Member Pallone, for five minutes for his opening statement.

STATEMENT OF DARREN SOTO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF FLORIDA

*Mr. Soto. Thank you, Chairman.

I know issues like blockchain can be so dizzying for so many Americans, and at its essence it is a fixed electronic ledger. Once you add information to it, you cannot take it away.

And why is that important? Because it adds integrity to technology and to the Internet. We add transactions in the form of cryptocurrency, which was discussed already. Information, think of the most complex data that we have added together like for health care or for climate change.

Even Chinese dissidents have added protesting language to blockchains to protest maltreatment in China.

And then what is Web 3? It is basically a decentralized version of the Internet where you utilize blockchain technology rather than the centralized version that we have right now.

This is much discussed about cryptocurrency, and I want to focus on the information part to it.

As the co-chair of the Congressional Blockchain Caucus,

along with Congressman Emmer, we are pleased to work on a lot of these issues, and in Central Florida, for instance, in my district, looking down the line we see blockchain technology to help local producers and retailers track produce shipments and quickly trace contamination of foodborne illnesses.

Digital assets can be used for remittances, especially a lot of immigrants in our community that send money back to their families abroad, perhaps in countries where the economy and the currency is destabilized.

Travel agents in Orlando can work with tourists from around the world and have less transitional costs.

I agree with my colleagues that we need to remain a digital leader here in the United States, and so it is important that this committee continues to promote innovation and research into applications of blockchain technology and protect consumers from this very complex yet critical technology.

That is why we pushed for the Blockchain Center of Excellence within the Department of Commerce to coordinate Federal use of blockchain technology.

Here is just a sample of some blockchain initiatives that we have gotten into both the budget and the National

Defense Authorization Act over the last few years.

Remembrance, making data secure because you cannot change it afterwards.

So veterans' electronic health records, we secured amendments in the NDA for data management to study blockchain technology to help secure our veterans' health records.

Department of Defense, it is helpful in communications so that whether it is through computer to computer or even on use in warfare with encoded messages using the blockchain.

Department of Energy, using blockchain in the energy sector to help out with communications between computers and to assess complex sets of data, such as the nuclear or other uses.

And funding the blockchain for grid modernization.

So there are a lot of ways that we could utilize blockchain beyond cryptocurrency, which gets a lot of the conversation going, like our chair and ranking member mentioned.

Lastly, one that has started working really well is food traceability through blockchain. By utilizing the blockchain to trace food and if there are issues like contamination or others. The FDA is already starting to use effective

controls to track all of this.

So there is a lot to do and I look forward to working with the committee on these complex but critical issues to the future of American innovation.

And I yield back.

[The prepared statement of Mr. Soto follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. I thank the gentleman.

And I now will call our first witness, who is Carla Reyes, Associate Professor of Law at SMU, Southern Methodist University.

You are recognized for your five minutes.

Thank you.

STATEMENT OF CARLA L. REYES, ASSOCIATE PROFESSOR OF LAW, SMU DEDMAN SCHOOL OF LAW

*Ms. Reyes. Chairman, Chairwoman, Ranking Members, and members of the Subcommittee on Innovation, Data, and Commerce, thank you for inviting me to testify regarding blockchain technology and its nonfinancial use cases.

It is an honor to be here, and I applaud this committee's persistent and consistent efforts to demystify this technology for your colleagues, for your constituents, and for the public and, indeed, to thereby encourage thoughtful policy making in the arena.

My name, as you said, is Carla Reyes. I am an Associate Professor at SMU Dedman School of Law, but I am not I should make clear at the outset testifying on behalf of SMU Dedman School of Law or for Southern Methodist University, but rather I am testifying in my personal capacity, and the views that I express here are entirely my own.

In this initial statement I intend to keep my remarks at a pretty high level to anticipate the discussion that we will have the rest of the hearing and because of the short time.

But to begin with, it is worth a note perhaps, perhaps a

footnote in my line of work, as to what a blockchain protocol is. At the absolute highest level of generality, and I cannot emphasize that enough, but at the absolute highest level of generality, a blockchain protocol is one type of distributed database known broadly as distributed ledger technology.

A blockchain protocol uses a specific type of data structure, namely, a blocked group of data linked together by one-way cryptographic pointers to thwart malicious efforts to manipulate the network.

Ultimately though blockchains track changes in data, what we call transitions in state, in order to allow participants in the network to reach agreement about the existence and evolution of shared facts between them without relying on a third-party intermediary.

As discussed more fully in my written testimony, a blockchain protocol is often referred to as Layer 1 of the blockchain technology stack.

Another computer program can be layered on top of the protocol, often referred to as Layer 2 programs.

In my research, I focus specifically on the uses of smart contracts to build applications and decentralized,

autonomous organizations layered on blockchain protocols.

In that regard, smart contracts can be used to build regulatory technology tools, or RegTech tools, to help make regulatory compliance more efficient and transparent, and to experiment with innovative methods of economically productive activity.

In particular, decentralized autonomous organizations are building productive organizations in communities with flatter governance than what is typically found in, say, corporations.

This has the democratizing potential of returning control over business activity and entity conduct to the owners rather than requiring trust in the corporate machine.

To ensure the ability of U.S. entrepreneurs to harness the democratizing, transparency enhancing power of blockchain protocols, policy, I think, should embrace three important principles.

First, the principle of technology neutrality should predominate. Law and policy should target specific activity and actions irrespective of the technology used to undertake those activities or actions.

Second, in the case of blockchain protocols and,

frankly, in the case of any emerging technology, the only way to understand what activity is being undertaken is to understand how the technology itself works.

For someone who has just said this law should be technology neutral, perhaps that is counterintuitive at first. However, understanding how blockchain protocols function, including their limits, is the only way to identify how people are using it and whether that use requires legal or policy attention, in the first instance.

As a result, when it comes to policy, technical precision is required in the way we talk about what blockchains do, in the way we understand what they accomplish, and when crafting law to effectuate that policy, technology neutrality should prevail.

Third, blockchain protocols are not monolithic. The technical details of blockchain protocols and the applications that are built on top of them vary widely, and those differences matter for law and policy making in this arena.

Precision in how we talk about what a particular blockchain protocol does or the features of a particular cryptocurrency or token prevents the creation of "one size

fits all'' policy in legal frameworks that leave industry confused and clamoring for deeper clarity.

Finally, it is my view that if we keep these principles in mind, the law itself stands to learn from blockchain technology and its use cases. Blockchain technology, like other emerging technology, acts as a mirror for law.

Yes, we ask how does the law apply to the technology and its use cases, but the technology itself can reflect back to us places where there are gaps in our law, not just as it applies to the technology but more broadly as it applies to the thing it was originally intended to regulate or govern.

And with that, I will end my remarks. Thank you very much.

[The prepared statement of Ms. Reyes follows:]

**********COMMITTEE INSERT**********

Mr. Bilirakis. Okay. Very well done and right on time.

Our next witness is Hasshi Sudler, Professor at Villanova University and CEO of Internet Think Tank, Inc.

You are recognized, sir, for five minutes.

Thank you.

STATEMENT OF HASSHI SUDLER, PROFESSOR AND CHIEF EXECUTIVE OFFICER OF VILLANOVA UNIVERSITY COLLEGE OF ENGINEERING AND INTERNET THINK TANK, INC.

*Mr. Sudler. Thank you very much.

*Mr. Bilirakis. Thanks for being here.

*Mr. Sudler. And good morning. Thank you, Chair Bilirakis and Ranking Member Schakowsky.

And I would like to also thank all members of the subcommittee and staff for inviting all of us to discuss this rather important topic about blockchain technology.

My name is Hasshi Sudler. I am the chairman and CEO of Internet Think Tank, a technology and science research institute based in L.A. with research offices in Philadelphia.

I am also the Adjunct Professor at Villanova University, teaching in both cybersecurity and blockchain technology.

I am a contributing author to two books in cybersecurity and blockchain. In cybersecurity, "The Handbook of Research on Counterfeiting and Illicit Trade,'' and in blockchain, the book, "Blockchain Impact,'' which outlines a variety of use cases for blockchain technology.

Over the course of my research at the university and both in my company, we have looked at a variety of use cases for blockchain, particularly non-financial applications of the technology, to really explore its potentials.

Two of those technologies lie in health care and in space sciences, both of which I would like to share with the committee today.

In April 2020, I presented to this very same committee an innovative technology using blockchain for contact tracing to address the pandemic led by COVID-19. We used blockchain technology in cooperation with cell phone devices, where the cell phones would detect proximity between two individuals and would push that contact information to a blockchain which can be global in nature. Its very architecture is very global.

Also it is anonymous. So it masks the actual individual who may be infected with COVID, but it delivers the critical information of who has come in contact with someone with an infection.

This was particularly beneficial when we look at the fact that COVID not only spread in individual countries, but you had individuals moving between countries. So infections

were being spread between countries, yet the technologies that countries were using typically were very local.

Japan had its own contact tracing application. The U.K. had its own, and the U.S. actually had State-based contract tracing applications. So we were even further subdivided in the United States.

So even if a person moved from one State to another, it was very difficult to trace how that person may be taking COVID to a different region in this country, let alone different regions of the world.

The blockchain had a very important benefit to contact tracing because it could be global. Therefore, if individuals had the same application on their cell phones and practically everyone in most regions have cell phones, we would be able to detect contact between individuals who came within close proximity.

And if one of those individuals later were found to be COVID-19 positive, regardless of whether they were in the world, others who came in contact with that individual would be notified that they may have been infected themselves.

The work itself was very well received. We did some case studies and reviewed the technology with Presbyterian

Senior Living in Philadelphia.

That is an assisted living facility with aged individuals, obviously a very critical population that we wanted to protect.

So the technology certainly was very useful, and for that particular age group, individuals did not like using cell phone devices. They were rather hard to see.

The other usefulness of blockchain technology is that you can have different types of devices hanging off of it, whether it be laptop computers with broader views or mobile devices. The blockchain itself is device-agnostic, and therefore, we can have various input devices, whether it is thermometers or other camera scanners, looking at large populations coming together, and you can read it off the blockchain in a variety of other devices as well.

The challenges that we found is that there was no global technology strategy for COVID, and obviously, we were all figuring out ways and solutions to address the pandemic, but I feel that given that the virus has no respect for borders, we need a technology that is also able to work across borders as well.

So I would encourage for future regulation that we look

at ways in which we can ensure that a technology goes across our borders between States, but also encourage the government to cooperate with other governments and collaborate on perhaps a standard where we can address such a critical issue such as COVID in a unified way.

I want to talk a little bit about a second technology that we are working on and since we are a little short on time, I will be brief, and that is the application of blockchains on space satellites.

My company, in particular, is working on building technologies that will put blockchain on space satellites extending it beyond the earth's surface.

And the benefit there is that now we can have satellites communicating directly with other satellites and be able to transfer useful information or the unique information to each other, enrich the data of other satellites, and to be able to solve problems based on what those satellites were able to see and deliver that to individuals on earth in need of that data.

In combination with technologies like zero trust technologies, we can encrypt the information on those satellites and ensure that even the nodes that they are

passed across, the very satellites they move across, it is private until it reaches the individual it is designated for.

Just to close, the blockchain, yes, is a young technology, and we would like to ensure that over the coming years that we have more legislation that helps to encourage the non-financial uses of blockchain technology, and to also clear the way in certain industries that may be a little hesitant to accept blockchain.

So I look forward to working with the committee on ways in which we can do that.

Thank you very much.

[The prepared statement of Mr. Sudler follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. Thank you.

Our next witness is Ryan Wyatt, President of Polygon Labs.

Sir, you are recognized for five minutes.

STATEMENT OF RYAN WYATT, PRESIDENT, POLYGON LABS

*Mr. Wyatt. Good morning, Chair Bilirakis, Ranking Member Schakowsky, and members of the subcommittee. Thank you for the opportunity to testify here today.

My name is Ryan Wyatt. I am the President of Polygon Labs, which is an international software development company that builds blockchain infrastructure.

Prior to joining Polygon Labs a year and a half ago, I was an executive at YouTube as a global head of gaming for almost eight years.

I am here to speak to you today about the evolution of the Internet, one that is based on blockchain technology. I will discuss how this enhanced Internet, what we call Web 3, can benefit users and consumers and why it is important for this technology to be built here in the United States.

Over the past four decades, the Internet had been built primarily by large, centralized corporations. The companies have been true innovators creating technology far beyond what the inventors of the Internet could have ever imagined.

That being said, 95 percent of traffic goes to the top one percent of sites, and 85 percent of mobile app usage goes

to the top one percent of publishers.

This means that large corporations who control these sites and apps accrue the value of our time, our data, and our money, and it leaves the average user at a disadvantage. The growth and innovation from Web 2 have come at a steep cost to the consumer and everyday user.

This is not only in the form of fees, but also in the form of companies extracting all forms of user data. For example, maps applications record user's location. Social media requires the user to give up personally identifying information.

And your browser is collecting and sharing searches with other applications to provide you targeted advertisements for products and services.

Today online identities are stored in silos within company databases. This is how these companies create value for themselves, by wielding the data for their own benefit and only sharing the least amount of value to users to ensure continued use.

For this reason, user privacy is inherently compromised in Web 2, and we have become totally accustomed to it. A blockchain based Internet corrects this issue.

Blockchains inherently democratize the Internet. They are not run by large corporations but a group of people or entities running individual computers who receive incentives for verifying information transmitted to the blockchain and for securing the network.

Web 3 applications are developed by third parties and built on top of these networks separate and apart from the original developers of the blockchains themselves.

Due to the way blockchains work, without intermediaries, users can connect to Web 3 applications through their own personal software and decide when, how and whether to share any information about themselves, their own data, their content, their works of art, and their assets.

Users never have to provide any personal information to use these Web 3 applications. For that reason instead of extracting value from users and consumers, Web 3 creates a value layer of the Internet where users are able to control all of the aspects of their interactions on the Web.

The new Web 3 applications being built on Polygon Network are not only created by startup software developers, but also by a number of other actors who are familiar to us, such as large American brands like Nike, Starbucks, Coca-

Cola, the National Football League, and even UNICEF for making its various forms of aid relief more efficient, expedient, and transparent, and that is just to name a few.

Blockchains are powerful tools that can help us reclaim control of our online lives. That is why I am so excited about it, and it is one of the reasons why I believe it is critical for this technology to be built here in the United States.

This country has long been a leader in technological innovation, and we should not lose out now. The U.S. is ceding space to countries like China who are promoting all aspects of the technology, but without any of the privacy and data security that would be afforded to users here.

A great number of companies and the strong accompanying jobs are already being lost to countries that have created or are creating strong regulatory framework, such as the EU.

What we do now is critically important in determining whether the U.S. users and consumers will have benefits of Web 3 accompanied by a robust and comprehensive consumer protection framework.

Thank you again for the opportunity to testify before the subcommittee, and I look forward to your questions.

[The prepared statement of Mr. Wyatt follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. Thank you very much.

Our final witness is Ross Schulman, Senior Fellow for Decentralization, Electronic Frontier Foundation.

So, sir, you are recognized for five minutes.

STATEMENT OF ROSS SCHULMAN, SENIOR FELLOW, DECENTRALIZATION, ELECTRONIC FRONTIER FOUNDATION

*Mr. Schulman. Good morning. Senior Fellow for Decentralization at the Electronic Frontier Foundation.

I thank Chairmen Rodgers and Bilirakis, Ranking Members Pallone and Schakowsky, and members of the subcommittee for the opportunity to share EFS' views on blockchain today.

One of the first classes that an aspiring computer scientist takes at the beginning of their undergraduate studies is usually called something like data structures and algorithms. These are the fundamental building blocks of every computer program.

And blockchains are at their core simply a relatively new data structure. Like most technologies, they are not inherently good or evil. They are simply tools that provide particular features and have particular drawbacks.

They do not require much in the form of targeted regulation beyond the standard consumer protections, although I will note that our country still desperately needs a consumer-driven, enforceable, general privacy law.

Nor do they need particular nudging or assistance in

order to be innovative. They are also not the only route to decentralization.

Many barrels of ink have been spilled in the quest to sort of explain how blockchains work. So a full description here, I think, would be repetitive, but it is nevertheless worth delving into what exactly they are meant to accomplish.

The biggest problems that blockchains solve is providing a means for two or more parties to agree on the value of a piece of data when they do not trust one another or, for whatever reason, cannot trust a third party to keep track of it for them.

In a non-blockchain system, those parties might rely on a bank, a legal contract in the courts or even just a handshake and a belief in one's fellow human.

Blockchains instead distribute the necessary trust across a network of peers in such a way that as long as 51 percent of the network acts honestly, the result can be relied upon.

In the context of a currency, this is often referred to as solving the double spending problem. This feature is useful in more circumstances than blockchain detractors claim it is, but in fewer situations than the past few years of

hype may have led one to believe.

In addition to solving the double spending problem, blockchains have a few other strengths that might suggest them as solutions to particular problems. For one, blockchains make it easier to provide transparency and auditability of their contents, which could lend itself to government recordkeeping, tracking business documents for auditing purposes or in legal proceedings where chain of custody is of the essence.

Another area where blockchains provide value is where they are tied into a system where they provide compensation for a service provided by the network itself. For example, the file claim blockchain uses a unique validation system called proof of storage in which nodes in the network are compensated, providing hard drive space to the network.

They also have a few limitations that we should keep in mind. First of all, they are not inherently good for people's privacy. In fact, in their most basic form, such as with Bitcoin or Ethereum, they are affirmatively bad for privacy. Every transaction must be publicly posted so that the whole network can analyze them for their correctness.

And while it is true that identities on these networks

are not tied to real names, researchers as well as law enforcement, including the FBI, have shown that transaction analysis can easily pierce that privacy.

Indeed, to the extent that there is privacy, it is because it has been bolted on after the fact by projects such as Zcash. We have to be very careful in assessing the use of blockchains where personal data is involved.

The second limitation is relative inefficiency. As many probably already know, some blockchains require every node in the network to expend large amounts of resources in an effort to solve meaningless mathematical equations just to validate the next group of entries to be included in the ledger.

This proof of work system is used in the Bitcoin network as well as a number of other networks and leads to waste or energy and also absurdly high transaction costs, sometimes up to $60 to conduct a single transaction.

This purposeful inefficiency also leads to recentralization. The research group Trail of Bits reported in a paper commissioned by DARPA last year that many of the largest blockchains are susceptible to attacks based on the fact that only a handful of entities comprise the majority of the deciding power in many of the largest blockchains.

There have been efforts to solve these problems, most notably the move to proof of stake by the Ethereum blockchain in September of 2022, which eliminates those large efficiencies and it is claimed lowers the barrier of entry for validators by eliminating the large capital costs.

In light of all this, what should Congress be doing? You should rely on the regulations that already exist to protect people. Much, if not most, of the harms that may arise from use of blockchain are going to be well covered by existing protections, such as the FTC's unfair and deceptive practices prohibition.

Congress should also focus on two things to protect Americans from blockchain-related harms. First, as I mentioned earlier, pass consumer-driven, comprehensive privacy legislation, and second, adequately fund the FTC so that it can hire technical and legal experts it needs to properly investigate and prosecute these harms.

Since the subcommittee is focused on innovation, it is also worth noting that regulation which targets people who write code in an open-source system is going to cause more harm than it is going to cause good. It will stifle innovation and further development would grind to an

immediate halt.

There can be no doubt that blockchain is a clever solution to the problem it was originally developed for, preventing the double spending problem. But the overwhelming hype that this advancement has generated over the past years has blinded many to the fact that its usefulness extends to one or two other cases, but not much further.

And that is okay. Hammers will not help you tighten a bolt, but there are great when you need to drive a nail. And just as with other tools, regulating blockchain because it is blockchain would largely be counterproductive.

It is nearly always more appropriate to regulate harmful actions than the tools used.

Thank you again for the opportunity to provide this testimony, and I look forward to answering your questions.

[The prepared statement of Mr. Schulman follows:]

**********COMMITTEE INSERT**********

*Mr. Bilirakis. Thank you very much. I appreciate it.

I really appreciate all of your testimonies. It is very informative.

So what I will do is I will begin the questioning. I recognize myself for five minutes.

The first question is for Ms. Reyes. The blockchain echo system is incredibly complex, obviously. A few minutes researching the topic quickly leads to an alphabet soup that the public will not understand in some case, probably in most cases.

Help us boil this down. At its most basic form is this a new protocol database?

Or in other words, we are really talking about a new way to send, organize, and preserve, verify, and protect data. Is that a fair characterization?

We would appreciate a response there.

*Ms. Reyes. Thank you so much for the question.

So I entirely agree that if you were to Google it, you would get an alphabet soup of words that is difficult to understand.

Indeed, I have a series of papers looking at how different constituents in the ecosystem talk about the

technology themselves and noting that they often talk past each other.

The technical experts use different words. The lawyers use different words, et cetera.

But so you are absolutely not wrong. But as to the characterization of it being a new way to store, send, organize, preserve, verify, and protect data, kind of.

So I think honestly it depends on the blockchain and the purpose to which it is put. Many blockchains are not general purpose databases, right?

So take the Bitcoin blockchain, for example. The Bitcoin blockchain is very good at tracking which UTXOs have been spent and which have not, and that is what it does. It tracks which UTXOs have been spent and which have not been spent and who controls the UTXO.

I should say a UTXO being one of those alphabet soups. It is an unspent transaction output. It is essentially what people refer to as the Bitcoin, right?

Other batches can, however, enable decentralized file storage. I think Filecoin was already referenced, and another example might be IPFS.

But generally, I would say the extent to which you can

view a blockchain as a data storage service, it in and of itself depends a little bit on the architecture of the blockchain protocol, the purposes to which it was intended to be put, and a lot of it about understanding the technology stack that a blockchain operates on.

So the blockchain protocol itself is just the base layer, right? It is the mechanism by which the nodes communicate with each other about a specific thing. In the Bitcoin blockchain context, the transmission of UTXOs, the spending of unspent transaction output.

On top of that, you can layer other things, but often when you have to actually host the data, unless you are using something like Filecoin or IPFS, you may be hosting the data on centralized servers and simply anchoring that data or connecting that data to the blockchain protocol, right? So you can track changes to the data rather than tracking the data itself, if that makes sense.

So it is often --

*Mr. Bilirakis. Let me go ahead. I know it is hard to explain in a couple of minutes, but you have done a great job, and maybe we can get together and talk one-on-one on this particular subject because it is so very important and

913 complicated.

914 *Ms. Reyes. I would be very happy to submit written

915 answers for the record if that would be helpful.

916 *Mr. Bilirakis. Thank you.

917 So let me get to Mr. Sudler, if you do not mind.

918 As you know, I am from the State of Florida, the home of

919 space exploration. It gives me an opportunity to elaborate

920 on what you were saying.

921 So I was specifically intrigued by your discussion on

922 satellites in your testimony. In addition to chairing the

923 subcommittee dealing with innovation and data, I also sit on

924 the sister subcommittee on telecommunications where we focus

925 on broadband Internet development.

926 Can you explain how blockchains applied in this space or

927 how it will protect security and resiliency?

928 If you can, elaborate.

929 *Mr. Sudler. Absolutely.

930 *Mr. Bilirakis. How will it further, again, innovation

931 above our atmosphere as well?

932 *Mr. Sudler. Yes, absolutely. So carrying the

933 blockchains into space is essentially taking it into a new

934 region of computing. We are simply taking it higher.

It is the same blockchain, but we have to think of a few differences in terms of how blockchains exist on earth and how they would exist in space.

One major difference that you would see is that servers on earth are sitting still in data centers. Blockchains in space are basically sitting on satellites that are moving very quickly. They do not see each other for very long. So they have to synchronize with one another in very short spaces of time.

And you also have this latency issue. The distance between the satellites may be quite far, and if we kind of think a little further to how we might use blockchains for the Artemis Project in sending them as far as lunar orbit, now we are talking significant distances that might increase latency even further.

But to the point of why this would be important for our security is that movement of satellites, in general, is moving from having individual satellites performing a mission or some operation to having constellations of satellites that are able to talk to one another.

This creates greater resiliency, particularly in the light of any type of cyberattack that may happen by our

adversaries against any of our satellites. In a blockchain network if one of our satellites is lost, that is not a problem because the other satellites are aware of the transaction history. They understand what that one particular satellite was tasked to do, and they can take over the activities of that lost satellite or disabled satellite.

So we see certain resiliency in having blockchain structures, and we also see immutability, the ability to store this information and assure that it is not tampered with. It becomes more tamper-proof.

So if someone wanted to cyberattack, in particular, a satellite and change information, the information on the satellites are quite resilient to change because of the mutability of blockchain.

So we see some very unique cases where blockchain plays a very nice role in helping to secure the security of the satellite itself, but also national security because a lot of our satellites can be tasked for national security purposes.

*Mr. Bilirakis. Okay. Thank you very much. I appreciate.

My time has expired. I yield back.

And I am going to recognize the ranking member for her

five minutes of testimony or so. If you want to go over a little bit that is fine because I did. So we have got to be fair.

Thank you. We recognize you.

*Ms. Schakowsky. Thank you, Mr. Chairman.

So I see myself as someone who really wants to protect consumers against scams. So, Mr. Schulman, I wanted to ask you if you could describe what blockchain scams look like, what tactics are used, and if you have any advice, aside from what we can do as Congress to protect consumers but are things that consumers ought to be watching out for.

*Mr. Schulman. Certainly. Thank you, Congresswoman.

In many ways the scams that we see in the blockchain space are as old as time itself, right? They have a new sheen on them. They involve oftentimes paying the scammer in a new way, using a Bitcoin or some other cryptocurrency, but fundamentally, you know, they rely on the same human failings that people have had forever, the fear of missing out, the ability to see only the upside of risk instead of the downside and, you know, the promise of great riches.

And scammers that are operating today are using those same human failings, but they are using, you know, a better,

perhaps faster method of getting the money out of their target than perhaps you could have done in an older time frame.

People today should keep their head on their shoulders in the same way that they did ten years, 15 years ago before blockchain. I think, you know, the FTC has some great resources that people should absolutely look to in terms of ongoing scams, the things that they are seeing on a regular basis, and people should definitely check those out.

I think generally speaking unless you are really expecting it, I think the number one piece of advice would be if someone tells you to send them cryptocurrency in a way that you were not anticipating, just do not. That is a good sign that it is probably a scam unless you really already know what you are doing, I think.

*Ms. Schakowsky. You know, even though we have seen some dramatic failures, I think that the promises that you can make a lot of money or that there is zero risk is really a lure, still continues to be a lure. And I appreciate your warnings.

Now, the FTC has issued reports on crypto, and the report was that consumers report of $1 billion in losses in

2021 and 2022, and we know. We all read about it, and this is really, I think, the tip of the iceberg.

But, Mr. Schulman, in your testimony, you mentioned the importance of the FTC consumer protection work. How would you elaborate?

If you were on the FTC, what do you think that we need to do?

*Mr. Schulman. Well, I want to first take a moment to laud the FTC. They do amazing, incredible work, and I would hesitate to tell them their business. I think honestly the biggest issue --

*Ms. Schakowsky. Well, tell us our business to tell them. Okay?

*Mr. Schulman. I also hesitate to tell Congress their -- no, that is not true.

You know, I think the biggest issue for the FTC is not necessarily that they do not know what to do, but they just do not have the resources to do it. I think more of the same is probably what is necessary.

I know a few years ago the then Chairman of the FTC, Simons, sent a letter actually to you, ma'am, talking about the resources that the FTC had available to it, said at the

time that they had about 40 full-time employees or full-time equivalents devoted to privacy and data protection, and then compared that to some of the other nations around the world.

For example, in the UK the Information Commissioners Office, which is their equivalent of the FTC, had about 500 employees dedicated to that.

*Ms. Schakowsky. So we need more technologists. We need to hire more people who really know what they are doing and what they are looking for.

*Mr. Schulman. Yes, ma'am.

*Ms. Schakowsky. Okay. Thank you so much. I appreciate it.

And I yield back.

*Mr. Bilirakis. I thank the gentlelady.

And now I recognize the gentleman from South Carolina, Mr. Duncan.

Before I do, Mr. Duncan, I want to clarify. These are not Clemson colors.

*Mr. Duncan. It is Clemson orange.

*Mr. Bilirakis. These are Gator colors.

*Mr. Duncan. Clemson orange.

Thank you, Mr. Chairman. I want to thank you for your

leadership on both blockchains and on name, image, and likeness, and I especially want to thank you for releasing your NIL discussion draft which I am sure we both hope will ultimately lead to certainty in this space.

My question centers on the overlap between NIL and blockchain. Student athletes have a unique platform to create business opportunities for themselves, and we could potentially see a case where a student athlete uses their NIL to create a digital sports collectable through NFTs.

So, Mr. Wyatt, how are you seeing NFTs being used by athletes in the digital sports collectables space?

*Mr. Wyatt. Thank you for the question.

Yes, I mean, even Nike has participation in the space. So I think it is good for athletes that are moving forward.

One way, it is a way for them to uniquely offer opportunities through their community events. And so what we are seeing right now is people using almost NFTs like a membership pass.

So people can come in. They understand that there is a finite amount of them. It is access, and then the athletes can use them to do whatever they want, whether it is meet-and-greets, if they want to do autograph signings. There are

a lot of different opportunities for them.

But it really clarifies when somebody buys this NFT membership what they are getting from that athlete, and now it has opened up a whole new monetization stream for them because these blockchains are open protocols and public goods for everyone. Anybody can deploy.

So it is great for athletes to be able to really start to think about it and a unique opportunity with NIL as well.

*Mr. Duncan. Thank you for that.

Professor Reyes, how could blockchains be used to track am athlete's engagements with an agent in NIL deals?

Microphone.

*Ms. Reyes. I think this is an excellent question.

I am not sure I would want to speculate entirely, but I think the first question to ask is whether the athletes, the agent, and if there is anybody overseeing the whole thing, whether they trust each other and whether they can trust the information being passed back and forth.

Otherwise I am not certain a blockchain is necessarily needed.

A blockchain, right, is generally, I think, as other folks have mentioned already this morning, generally used

when folks in an arena do not know each other necessarily and do not trust each other and do not trust a third party to handle the information for them. So they use the technology to do the thing they are not sure of.

*Mr. Duncan. Would it not also help the people that oversee the activities and help them track and monitor the deals, whether it is the conferences, the universities themselves, or some other governing authority?

*Ms. Reyes. Maybe. Again, if there is an information gap or a difficulty in getting the information from the participants in an NIL activity, but otherwise a centralized agency can always use a just distributive database.

And maybe it is the distributive ledger rather than a blockchain, right of permission distributed ledger that is not necessarily energy intensive linking blocks of data in cryptographically linked chain.

It could just be as much of a use case for a distributive ledger like a permissioned one where you cordon off who can participate and what kinds of entries they can make into the system.

*Mr. Duncan. Thank you for that.

I want to shift gears. How can blockchain technology

combat fraud, corruption, intellectual property infringement, and I will go to Mr. Wyatt for that.

*Mr. Wyatt. Yes. The one thing that is really beautiful about blockchains is the inherent transparency for it, and so I believe because it is a transparent protocol, unlike these kind of wall gardens that we see databases sitting in today, it allows us an access that we did not have before.

On the privacy side, you are now moving away from all of that sitting inside of corporations where you have to rely on them, big and small corporations, to now taking your own data and being the controller of that privacy.

So this is now a shift where you have to rely on others, where you can now rely on yourself, and I think that allows for a whole other level of privacy and data that we have never had before.

*Mr. Duncan. That is great.

So, Mr. Sudler, in your written testimony, you state that the U.S. Air Force is using blockchain-based supply chain called Base Camp.

You also noted that the Department of Defense has commissioned a project, Almeda, to support DOD logistics.

This seems like something we would want to be kept highly classified. Yet the DOD is using blockchain to keep track of everything.

Are there different types of blockchains that can serve different purposes?

*Mr. Sudler. Yes. Different blockchains are created for different reasons. There are essentially three parameters that blockchains try to work with.

First is security and how long it takes to secure new transactions on the blockchain.

The other is speed. How fast can it actually commit those new transactions to the edge of the blockchain?

And the other is fees, in terms of how large the transaction is. That can translate into larger fees.

So different blockchains are driven by their consensus model. The Bitcoin blockchain which is driven by proof of work uses energy to ensure that transaction --

*Mr. Duncan. Is the military using a different blockchain technology?

*Mr. Sudler. They are most likely not using proof of work. They are perhaps using proof of authority or proof of stake, but for the military they would be using some form of

a permissioned ledger because this is not something that is open to the public. It is something that only classified individuals should be able to have the access to, and therefore, their consensus model would drive that purpose.

*Mr. Duncan. Thank you.

My time has expired. Mr. Chairman, I yield back.

Thank you.

*Mr. Bilirakis. Thank you very much. I appreciate it.

Now, I will yield five minutes to the gentlelady from New York, Ms. Clarke.

*Ms. Clarke. Thank you very much, Mr. Chairman.

*Mr. Bilirakis. My pleasure.

*Ms. Clarke. And to our ranking member for convening this hearing.

And to our panelists for joining us today.

The jurisdiction of this subcommittee often requires us to attempt to address the challenges of tomorrow with only the information available today. While our collective understanding of blockchain, distributive ledger technology, and cryptocurrency has come a long way since this committee first held a hearing on these issues in 2016, it is apparent that we have a long way to go to enhance our knowledge as we

consider legislation in this space.

That is why this hearing and others like it are so important. We as policy makers need to ensure that we have a deep understanding of this technology in order to be create a regulatory environment that protects consumers, while fostering American innovation and leadership.

With all that in mind, I will be keeping my remarks and questions brief and to the point. My first question is to Mr. Wyatt. I am interested in cybersecurity implications of distributive ledger technology as we transition to Web 3.

Can you speak to what impact, if any, this technology may have on future cybersecurity both from a defensive and offensive perspective?

*Mr. Wyatt. Yes. Thank you for the question.

I believe right now we do have a lot at the application layer that we can continue to protect consumers with, both on the protection and privacy side. I believe with the transparency that there are a lot more things that we can be doing as far as just overall making sure that the networks are secure.

I also think we can do things like standardized code auditing so that we have a baseline that we adhere to for

these protocols to ensure that these continue to be very secure, very private.

Obviously, in addition to that, users do own their own data. So there inherently is more privacy because of that, but I think these are critical steps that we need to take because I actually do believe we are behind relative to other countries on these matters.

*Ms. Clarke. Are there any other witnesses that have anything to add in this regard?

[No response.]

*Ms. Clarke. Okay. Thank you.

Mr. Schulman, you mentioned in your testimony that blockchain could have some exciting potential use cases but should be treated as just another tool in a software developer's toolkit.

Could you elaborate on that?

Are there limitations of this technology we should be aware of?

And how should members of this committee think about what blockchain is and is not?

*Mr. Schulman. Absolutely. Thank you. It is a good question.

I think the biggest thing to keep in mind whenever we are thinking about whether blockchain suits a purpose is, as Professor Reyes sort of alluded to earlier, is that you need to look for what you might call a trust gap. Blockchains are useful where two parties or more than one party are trying to get together to agree on something but cannot trust one another for some reason and cannot trust a third party to sort of serve as a middle person and you know, in a way that, you know, banks or escrows often do, for example.

In those circumstances, blockchain can be quite handy. It can be quite useful.

It has drawbacks that we have talked about as well that makes them unsuitable to other situations where you need, for example, speed. Blockchains are not the fastest way to figure out an answer to a question, for example.

They are not great, although they can be messaged to make privacy useful, but they are not great at privacy because of the inherent transparency that is necessary in a blockchain situation, and so those are situations where you would want to reach for a different tool.

But, yeah, I think that is more or less --

*Ms. Clarke. And to the entire panel, there has been a

lot of discussion about energy use with respect to blockchain technology. Would you opine on that?

You know, we are in the midst of a real struggle around, you know, how we will transition in energy, and clearly, as we expand and Web 3 becomes sort of the dominant use of the technology, what would you say to those who are concerned about energy consumption?

*Mr. Wyatt. Congresswoman, I would like to weigh in here.

You know, Polygon Labs is a blockchain software company. We are incredibly passionate about this topic. It is worth noting that 19 of the top 20 protocols are proof of stake and not proof of work, which means they are not as energy intensive.

And, in fact, Polygon Labs ensures that we remain carbon neutral. It is a big part of our mission. We report third party audits with maintaining that integrity, and I think this is something that a lot of people that are building in this space are quite passionate and care deeply about.

And so I just want to say that we share that importance, and I think it is an integral part of kind of growing and scaling this technology.

*Mr. Sudler. I would like just to add to that.

We all started with a Bitcoin blockchain which used proof of work, very energy intensive, and in some countries, the largest amount of spend is actually on energy due to Bitcoin mining.

So obviously that is unacceptable and unsustainable.

But as a global society, we are evolving from that. We are moving to proof of stake. We are moving to proof of authority, other consensus models that do not use that type of energy.

And certainly as we are applying blockchains into space, it would be impractical to have proof of work that is so energy intensive weighing down satellites. It would drain the batteries of those satellites very quickly.

So we are quickly realizing that there are other alternatives to how we are doing these consensus models with blockchain that do not use as much energy. So I am pretty confident going forward we will all see the future of blockchains using less energy consumption.

*Ms. Reyes. I know the time has expired, but I hope I might be permitted to comment briefly.

I would say that it is important to note that protocols

that use proof of work versus protocols that use proof of stake have different technological architecture value propositions.

So Bitcoin blockchain is very focused on the security and integrity of the blockchain itself, and proof of work is viewed to maximize the security of the protocol versus proof of stake values throughput and scalability.

And so it is not only about energy consumption, but it is also a technical architecture choice that is made given the value and proposition of that particular protocol.

Secondly, I would say I think that --

*Mr. Bilirakis. We have got to move on. Thank you very much, and we can have further discussions.

I appreciate the gentlelady yields back.

And I will recognize the chair of the full committee for her five minutes of questioning.

*Ms. Clarke. Thank you, Mr. Chairman. I yield back.

*Mr. Bilirakis. Thank you.

*The Chair. Thank you.

Mr. Wyatt, I appreciate you being here today to tell your blockchain story, and you captured well in your testimony how Big Tech companies silo our data and create

value for themselves.

Can you explain to us how your company or other similar services can provide an alternative solution to the concentration of this data that has led to abuses and breaches?

*Mr. Wyatt. Yes. Look. I think largely when you look at corporations, they may have not had other solutions on where some of this data can be held, and really if you look at what blockchains have been doing on the past decade, they finally have gotten to a point where this technology can meaningfully scale to really support hundreds of millions, if not billions of individuals building on top of it.

And so I think the big thing about it as I see the movement moving over into this space is that people now owning their privacy and owning their data is really critical, whereas corporations were owning that. We trusted them to own that, and they monetize it, right? It is how a lot of these businesses make money that are in the space.

And so just because of that shows that there is an inherent value of having data, right, or having someone's individual information.

And so we should be bringing that back to the

individuals where they should be making those decisions on what they own, how it is used, and what they want to do with it. And that is what I think the beauty of blockchains do.

*The Chair. Thank you.

Enacting a Federal data privacy standard is a top priority for me, and in some ways it is counterintuitive that decentralized data could be private because one would think that one's information is available to everyone.

I know that you referenced zero knowledge proof in your testimony. Would you explain the concepts of that and how it can coexist?

*Mr. Wyatt. Yes. Without getting too highly technical on the concept, you are right. One of the things that we tout often here is the transparency of the blockchain. That is true. There is a lot that you can do with it, and that is in the beauty of it.

But I think without having the ability to have more ownership of your privacy, that can, you know, have its own shortcomings.

And so what zero knowledge does is effectively let you have the best of both worlds. You can have the transparency of the blockchain, but you can self-select as an individual

what you want to share with any of these applications that you are interacting with.

And zero knowledge allows that ability to happen through cryptography in a trusted way.

*The Chair. Thank you, thank you.

Ms. Reyes, you provided a lot of information on smart contracts in your testimony, as well as the fact that it does not require mining or more information to complete a transaction. This has clearly not been the approach Big Tech has taken historically.

You noted an example of mortgage alerts, which you see this as being applied to a compliance mechanism when a company changes its privacy policies to alert users.

Would you speak more about smart contracts?

*Ms. Reyes. Sure. So briefly, a smart contract simply, just by what folks may have said about it being an artificially intelligent, legally enforceable contract, but that is not what it is, right?

It is just a computer program that says effect happens, then why, execute.

And in the context of privacy policies, for example, I think your question, Chairwoman, speaks to whether it could

be used as an alert system to indicate to the SEC that a company has changed their privacy policy.

I do think that that could be an aera looking back to like when is the good use case for blockchain technology, where the SEC does not necessarily trust privacy policy compliance of the corporations. The users do not always know when the privacy policies have been updated or even when they push "I agree,'' they did not really realize what they did, right? They did not read it.

Certainly this could be used to alert folks that it has happened.

I think it could go farther. I am working on research to think about using smart contracts as the basis for privacy policies so that you could have granular permissions over how your data is used in a specific context.

At the moment, I am thinking about that in the context of K through 12 education actually.

*The Chair. Great. And you mentioned the alerts, the alerts to the FTC, but it also could be the alerts to the individual when the privacy contract is being changed because right now, I think we all recognize that these people do not really know what they are agreeing to.

*Ms. Reyes. Absolutely.

*The Chair. Mr. Sudler, thank you for providing your insight again today as you have previously done during COVID.

How important is it for the United States to lead on this technology?

*Mr. Schulman. I think it is incredibly important because essentially when you have the world facing a huge crisis, that is when leadership is shown. And if the United States is going to lead in blockchain technology, then it really should demonstrate that during a point where the world needs it the most.

So I think what this does is when we are facing situations like COVID, if the United States shows its power economically, militarily, and through technology, we demonstrate to the world that we are not here to just say we are leaders. We are here to show it.

So when we can demonstrate technological innovation to solve very serious problems that affect the world, then the world sees us as leaders for that very act alone.

So I think it is very important for us to continue leadership in technology, and I think blockchain is a big part of that story.

*The Chair. Thank you.

And in closing, again, I am looking forward to receiving the emerging technology reports that were enacted in our legislation back in 2020.

Thank you, Mr. Chairman. I yield back.

*Mr. Bilirakis. The Chair yields back.

And now I recognize Ms. Kelly for her five minutes of questioning.

*Ms. Kelly. Thank you so much, Mr. Chair.

And thank you to the witnesses for your testimony to help us better understand these emerging technologies.

It is clear from witness testimonies that blockchain technology has and can continue to add value, but this must be done, as you know, responsibly. As the chair of the Congressional Black Caucus Health Brain Trust, my priorities include protecting health equity and reducing health disparities in all communities.

So I am interested in the benefits of blockchain technology in the health care sector, but I think it is important that we understand any potential drawbacks.

Patient health care records are very private, and we know there are bad actors looking to steal the data. And,

similarly, we know health care services are disrupted when hospital systems fall victim to cyberattacks.

So I wonder if data privacy and security can be negatively impacted should health care systems broadly adopt and use blockchain technology.

But I am also pleased to learn more about the potential applications in the agriculture sector. My district is urban, suburban, and rural with recent outbreaks of foodborne illness and investigations of fraud in the organic food sector.

There are weaknesses in information about agricultural supply chains. Blockchain technology can have an impact on the tracking of goods throughout a supply chain system and even applications for reducing foodborne illnesses by tracking the prominence of items.

So, Professor Reyes, as a preliminary matter, can you discuss the differences between permissioned and permission-less blockchains?

*Ms. Reyes. Absolutely. Thank you for the question.

So in permission-less blockchains, to some like the Bitcoin blockchain or the Ethereum protocol, the idea is that anyone can download the software and participate as a node in

the protocol, and anyone thereby can initiate transactions in the network.

In a permissioned system, it is typically not the case that anyone can simply participate as a node in the system and that they can simply whenever they want commit transactions to the network.

But rather, it is more -- it is often, I should say, and they are not all the same, but it is often a consortium or group of companies or like-minded organizations that come together to build the network, and there is usually some kind of application process or screening process to determine whether you are an appropriate entity to host a node and to have access to initiate transactions.

*Ms. Kelly. Thank you.

What are some of the benefits of blockchain technologies as they relate to supply chain and logistics?

And are there any potential drawbacks, Professor Reyes?

*Ms. Reyes. Thank you.

Yes, certainly in the area of supply chain management, there is a lot of interest, and the interest stems largely from the capacity for increased efficiencies, increased transparency, and audibility of the steps in the supply

chain.

The drawback I would say is that at any point in the supply chain you are still relying on someone to connect whoever initiates the entry into the supply leger. You are relying on them to provide reliable data, and they may not always be incentivized to provide the reliable data.

And so a supply chain management system based on blockchain will suffer from the same garbage in/garbage out problem that all computer software has. The data that the supply chain management system keeps an audible record of is only as good as it was when it was first entered.

*Ms. Kelly. In agricultural applications, does zero data in a blockchain represent events associated with a physical product?

These events must be recorded by manually recording data or through manual or automated scanning of digital markers on the product or its packaging.

However, manual data entry could introduce errors into the blockchain, and I would ask all of you what blockchain protocols could be used to address such errors when it comes to manual data entry.

Whoever wants to answer.

*Mr. Sudler. Yes. I think when you have data entered into the blockchain, and there will be errors, the blockchain certainly will record those errors quite permanently. So at least it can be viewed and there is some accountability as to how those errors got in there.

But you could use things like smart contracts. If there is some range of data that is unreasonable, then the smart contract itself in seeing that condition can, you know, reply and alert that this data is out of range.

And so that can be a way in which we can capture, you know, certain types of errors being put into the blockchain.

*Ms. Kelly. Thank you.

I do not know if either one of you want to answer.

*Mr. Schulman. I think I would add one small note, and it is something that once you say it out loud it sort of sounds incredibly obvious, but I think it is important to sort of note anyway, and that is that particularly when blockchains are representing real world goods, such as in a supply chain, a change in the blockchain does not actually mean anything necessarily.

Nothing happens in the real world just because something changed on a blockchain, if that makes sense, right?

And this is sort of analogous to the same problem we have been discussing about data going in, and particularly if you are using a blockchain, again, it is because you are worried about a trust gap somewhere.

And if you have a trust gap, blockchain is not going to necessarily fix that in the situation because if you do not trust the counterparty, you do not trust them necessarily to put the right data into the blockchain in the first place.

*Ms. Kelly. Thank you.

Any other comments?

*Ms. Reyes. I would just say I think this is where I get nervous when people call the blockchain the record of uncensored truth or something similar because that is not actually what it is a record of. It does not speak to the truth of the data that is being recorded in the chain.

*Mr. Wyatt. I will just add I think health care has been, you know, a tough one to actually digitalize over the years and companies, you know, like MyChart trying to bring health care together have made tremendous progress.

But I do believe these ideas of permissioned blockchains where you can actually get the United States health care system on it could actually streamline it in a really, really

efficient way.

So I think there is more to come there.

*Ms. Kelly. Thank you so much.

And I yield back.

*Mr. Bilirakis. Thank you very much. I thank the gentlelady.

Now I will yield five minutes to the vice chairman of the subcommittee, my good friend Mr. Walberg from the great State of Michigan.

*Mr. Walberg. Thank you, Mr. Chair.

And thanks to the panel for being here.

I am encouraged that we are discussing this new and transformative technology. That is what this subcommittee is especially about, and in fact, my staff today informed me that they used AI to look up some information for me for the background on blockchain, and so far I think they got it right, at least what I have heard from you.

America needs to stay ahead in all that goes on here. The leadership is important.

So, Professor Sudler, as someone who has seen blockchains used in a variety of contexts, how would you categorize the primary uses of blockchain technology?

*Mr. Sudler. Sure. Thank you for the question.

You know, in my course work, I have developed a framework that helps my students and other practitioners of blockchain understand the categories of use cases for blockchain technology, and it is called the APPS Framework, A-P-P-S. It is fairly easy to remember, APPS, and what it stands for is asset management, payments, public records, and supply chain management.

The A for asset management is essentially representing something physical or digital with a token. We more commonly know that as NFTs.

For payments, it all started with payments with Bitcoins. So we are very familiar with that use case.

With public records, it is essentially committing data to a blockchain which could be public in nature, such as birth certificates, and so forth, but doing so mutably so no one can tamper with it.

And finally, supply chain management we have discussed here at length, looking at an asset going from start to finish and tracking its status along the way.

*Mr. Walberg. Thanks for allowing me to be a student then. APPS, okay.

Blockchain proponents argue that the security of a blockchain can be trusted more than we can trust other intermediaries, like Big Tech.

Professor Sudler, I would like to dig into that a bit more. Are blockchains really secure is the first question.

And can we really trust this computer code more than we can trust some of the other intermediaries in our lives?

*Mr. Sudler. I think we have to address that in two different ways. First, we have to look at the network architecture, and then we have to look at the software. So there are two components.

If you look at the network, networks' blockchains basically need to be highly distributed, which basically means they need to be distributed geographically as well as by ownership.

And it is important that they be distributed in both ways. If you have a huge concentration of blockchain nodes or servers sitting in one country, then it is very possible that if that country is authoritarian, they can declare imminent domain and simply take control of all of these servers. That destabilized the security of the blockchain itself.

So it is important that we do have highly distributed blockchain servers across the world.

The other is the software itself. Now, the software for blockchains should be open, should be visible by other programmers to inspect it, and if you are presented with a blockchain that is not open, that should send off alarm bells in a lot of ways, to make sure that people can see it and evaluate what it is doing.

*Mr. Walberg. Okay. Mr. Wyatt, staying on the same theme of security, there are a lot of different blockchains out there, and transferring data between them is not simple. For example, in 2022, a bridge between two chains was hacked for $325 million.

What steps are being taken that you are aware of both in industry and in government to prevent these attacks from happening in the future?

*Mr. Wyatt. Yes. First, you know, when networks are launched, you know, companies are looking at the code itself, and there are trusting third-party audits as well, but I think it is particularly important that we standardize and streamline code auditing.

We should have a bar, an expectation that we are holding

people to to ensure that these things never happen, and I do think formally legislating code auditing would be really important to mitigate these issues.

*Mr. Walberg. Okay. Professor Reyes, I appreciated the way you described the blockchain as protocol. As you noted, a protocol is a set of instructions for the compilation and interaction of objects.

For blockchain technology, this protocol is a set of rules that allows network computers to track transitions globally in the network without a centralized third-party intermediary.

Could you explain on other ways you think smart contract blockchains are similar to the Internet?

*Ms. Reyes. I absolutely thank you for the question.

I think, first, it is important to note that the blockchain protocols do not work without the Internet, right? You cannot access the protocol unless you are connected to the Internet.

So it is all part of a technology stack, and as part of that technology stack, the parallel to the Internet is that you can continue to build additional applications on top of the blockchain protocol.

And those additional applications may or may not be decentralized. Some are more centralized in their components than others, just like the additional applications that can be built on the Internet, and it is really an asset application layer that consumers tend to interact with blockchain technology.

Few consumers transact with Bitcoin directly through Bitcoin Corp. software, for example. They tend to use intermediaries because the user interface at the Layer 1 level is difficult and a little clunky.

And just like the Internet, most of the time we interact with the Internet through Google, right? Through Web browsers, not to name Google specifically, but through Web browsers and through other applications. That is similar in blockchain space as well.

*Mr. Walberg. Okay. Thank you.

My time has expired. I yield back, Mr. Chairman.

*Mr. Bilirakis. Thank you. Thank you very much. I appreciate that.

The gentleman yields back. Now, I will recognize Mrs. Trahan for her five minutes of questioning.

*Mrs. Trajan. Well, thank you, Chair Bilirakis and

Ranking Member Schakowsky, for calling this hearing.

I am glad that the committee is bringing awareness to the potential that blockchain technologies have to offer and the promising applications of Web 3.

However, as we discuss the path forward for this tool, we must also acknowledge its shortcomings so we can ensure it is applied correctly and safely.

I share the ranking member's concern that we need to fully understand how this technology can be used for the wrong reasons. In particular, the immutability of a blockchain or the impossibility of changing the past makes cryptocurrencies an attractive financial avenue for scammers to fleece unsuspecting consumers.

The FTC has repeatedly warned consumers that cryptocurrency scams are dramatically on the rise and billions of dollars being lost. In fact, the losses of crypto scams did not just double or triple between 2019 and 2022. They increased over 25 times, reaching more than two and a half billion dollars lost last year, according to the FBI.

Professor Reyes, in your opinion, would you agree that blockchain technologies offer some advantages to scammers?

And why do you think that scammers are making so much use of this technology?

*Ms. Reyes. Thank you for the question.

I would say in my view I do not know necessarily that blockchain technology offers particular advantages to scammers. I think, as we discussed at length already, many of the scams that take place in the blockchain industry are simply echoes of traditional scams, promising money that does not exist, taking your money to use it for one thing and using it for something else entirely.

I think what makes it so attractive at the moment to scammers is the same kind of thing that got people in trouble in the early days of the Internet, unfamiliarity with the technology on a wide scale and what the risks are.

It is much less likely nowadays to fall for a phishing scam. We have internal processes to learn how to avoid phishing scams in emails, for example, and it will take time until that same kind of education happens around blockchain technology.

I know I am taking up a lot of time, but one note I would like to make because I am dying every time it is said out loud is the term "immutability,'' to be precise, does not

actually mean that the records in the blockchain can never be changed.

In fact, the term "immutable'' never appears in the Bitcoin white paper. It is actually reference to being computationally improbable. That is very difficult to change the records in the blockchain protocol.

And I think as was referenced by Professor Sudler, what that means is the blockchain protocol is tamper resistant, tamper proof. You can tell when it has been tampered with, but not necessarily that it is impossible to do so.

*Mrs. Trajan. Well, I appreciate the clarification.

And also, you know, the recognition that consumers need to be careful. Do you believe that consumers, especially vulnerable consumers like children and seniors, have the information that they need to detect and avoid scams relating to blockchain and Web 3 or other types of online fraud?

*Ms. Reyes. I think a lot more education should be directed toward seniors. I think that same kinds of scams that target like going to the go get me Target gift cards and send me the code, the same kind of thing that they are falling for in the cryptocurrency realm.

I fascinatingly tend to think that children often know

more about cryptocurrency and blockchain ecosystems than we might expect. They are more sophisticated in it, I think, increasingly than other populations, but certainly, of course, they always need extra protection.

*Mrs. Trajan. It is a great point about children versus seniors and our job and our objective is to safeguard all of them.

But to follow up, we know that some actors in this space have made promises they could not keep, be it a stable coin unable to stick to the promised value or a poorly designed blockchain platform that is vulnerable to a cyberattack. It is not surprising for a new industry based on new technology, but it is also extremely difficult for consumers to accurately evaluate some claims that blockchain companies make.

And I want to be sure that our regulators are ready and able to address that.

And, Mr. Schulman, you mentioned in one of your answers that these types of scams that are happening are as old as time, and you suggested that in order to prevent, understand, and remediate scams involving blockchain and Web 3 technologies, that the FTC requires specific technical

expertise and resources.

What makes enforcement against these scams so difficult?

*Mr. Schulman. That is a good question. I think there are probably a couple of different factors.

I think a fundamental one is certainly technical understanding. As I think we have talked about many times here today, there is a reason you all invited us here, and it is because this is hard, right?

It is not that a lot of people are really stupid. It is that these are really complicated technologies. They are hard to understand. They are hard to explain. They are very different from how things that we already know tend to work.

And so when you are an enforcer at, say, the FTC, just understanding how the technology works and where the fraud actually happened and who perpetrated it is difficult.

And so hiring the people that can do that is important.

*Mrs. Trajan. Great. Thank you for indulging me a little bit longer than my time, Mr. Chair.

I yield back.

*Mr. Bilirakis. The gentlelady yields back. Thank you.

And next we will recognize Mr. Allen from the great State of Georgia for your five minutes of questioning.

*Mr. Allen. Thank you, Mr. Chairman, and thank you to our witnesses for being here today.

For 40 years I have worked at building a construction company in Augusta, Georgia, and when we think about blockchains, I would like to know how this will help small businesses like construction companies and Mom and Pop grocery stores and stores, for example.

Mr. Sudler, from a supply chain perspective, are there increased efficiencies that small businesses can see from the adoption of blockchains?

*Mr. Sudler. You know, in some of the research that we have looked at that involve supply chains, and they very much impact small and medium sized businesses, we look at the effects of how, you know, these supply chains can be very difficult to track.

At MIT, we look at supply chains a lot using a tool called the Beer Project. It is a beer game. It has nothing to do with drinking beer, but it tracks a beer supply chain.

And what you find out over the simulation is that if you change the demand at the consumer level just once, all of the other players in the supply chain will become very confused. They will oversupply. They will under request, and this is

simply because information is not openly shared.

Now, this is something blockchain could alleviate very easily by simply having everyone in the supply chain tied to this common ledger, and they can see for themselves what the demands are and what everyone is requesting against that demand.

So I think that would tremendously help small businesses to really make sure their margins are good, make sure they are ordering properly.

*Mr. Allen. Thank you, Mr. Sudler.

Mr. Wyatt, you know, the small business community created almost 70 percent of all the new jobs in the greatest economy in my lifetime, which is 2017 and 2018. In your testimony, you highlight that some of America's largest brands are using your platform.

How can small businesses like my business benefit from using Polygon?

*Mr. Wyatt. I appreciate the question. You know, any blockchain, Polygon protocol or otherwise, it is an open public good for anybody to build on, and it is actually really easy to deploy and start to get up.

So I think when a lot of these companies are having to

go through a very cumbersome process of all the work that needs to be done to launch in a Web 2 environment, whether it is thinking about cloud infrastructure and some of the other things, Web 3 and blockchains make it much easier for anybody to get on and the cost being very low.

You know, when we talk about a smart contract being deployed on the Polygon protocol, it can sometimes cost pennies to do, and so I think the cost efficiencies are a really big deal for small developers and small companies in keeping costs down.

*Mr. Allen. Right, and the cost benefit could be enormous.

*Mr. Wyatt. Absolutely.

*Mr. Allen. Okay. You know, it is becoming increasingly clear that blockchain technology is set to play a critical role in strengthening our supply chains. In fact, the ag. industry is already using distributed ledger technology to trace and protect their food supply chains, and obviously food supply is a big, big issue in our country.

I think this is a great example for why we should not limit the conversation around this technology solely to securities and commodities. For example, Walmart has already

established a blockchain partnership with Kroger, Nestle, IBM, and Dole to bolster their food traceability. Sweetgreen or Salad Restaurant has used blockchains to trace and trace the origins of the produce that it buys.

In an era where consumers are increasingly concerned about the origins and safety of their food, blockchains can offer an unprecedented level of transparency and resiliency for agriculture-based supply chains.

Mr. Sudler, what lessons can we take from use cases in agriculture blockchains technology that can be adopted on the State and Federal level to a regulatory type framework?

*Mr. Sudler. I think what we have learned from agriculture applications is how effective supply chains can be managed using blockchains. Now, we can learn from that and apply that to other forms of projects.

What we have looked at is how do we apply some of these lessons from agriculture to other projects or even mega projects that essentially face the same type of supply chain issue.

Mega projects certainly at the State and Federal level are projects that are $1 billion or more. They are very complicated. They have, you know, many contractors and

subcontractors, and they do not necessarily trust one another.

So we can certainly learn from the gains we are seeing in agriculture and say what are the smart contracts that they use.

Who is allowed to view certain types of information in these blockchains, and how do we keep a good flow of the supply chain in these large projects that the agriculture group is able to do very well?

*Mr. Allen. Mr. Wyatt, I have got about 15 seconds, but we have seen Big Tech from inside. As an executive, you saw it at YouTube. Why did you choose to leave and how will blockchain impact the way Big Tech extracts and uses our data?

*Mr. Wyatt. I love to go into YouTube because I felt that, you know, it was democratizing education and content. Anybody around the world could access YouTube, could upload content to YouTube, and I felt that that was really important.

In a lot of ways, blockchains do the same thing of democratizing this, and so I felt that this was very aligned with my personal mission and excited that it is a place where

I can do this.

*Mr. Allen. Okay. Well, thank you so much.

And I yield back, Mr. Chairman.

*Mr. Bilirakis. Thank you.

The gentleman yields back.

And now I recognize Mr. Soto for his five minutes of questioning.

*Mr. Soto. Thank you so much, Chairman.

In the beginning in my opening remarks, I talked about a lot of the areas we already were able to pass amendments into both the National Defense Authorization Act and to the Appropriations Act.

We got actually a lot of the blockchain advanced under Federal law so far, whether it was as mentioned by our colleague, Mr. Allen, the food tracing with the FDA to help with public safety; whether it was helping with encrypted communications through our military; whether it is protecting veterans' records, among other areas that are going forward.

So we here at the Congress want to make sure we are good partners in advancing this critical technology, whether it is for economic reasons, security for advancing critical research.

So I will start with Mr. Wyatt, but I am going to ask all of you the same question.

Mr. Wyatt, if there could be one particular partnership the Federal Government could help advance in some of these areas, what do you think it should be that we should work on and why?

*Mr. Wyatt. Look. I think the best thing that we could do is have clear regulatory clarity on how to operate with the nuanced understanding that there are protocols. There are wallets. There are exchanges, and there is a lot of nuance there.

So my ask would be to continue to push forward very clear regulatory guidance on how to operate this new tech, and that would ensure that, you know, tech innovation would stay here in the U.S. and that we would continue to foster some of the best talent in the world.

*Mr. Soto. But if there is a particular subject matter, what would that be?

I get you all want regulatory reform, and that is cool.

*Mr. Wyatt. I think, in general, decentralization is such at the heart of this where we are removing intermediaries, and so I think the subject of

decentralization is of the most important topic.

*Mr. Soto. Mr. Schulman, what would be a great partnership with the Federal Government to help advance blockchain technology?

*Mr. Schulman. That is an interesting question. I am not 100 percent sure that the Federal Government needs to partner. I guess I will put it this way. I think --

*Mr. Soto. Let me define it more. In the most broadest of terms, like funding or laws or encouraging research, not like ownership, right, in the strictest sense.

*Mr. Schulman. Sure.

*Mr. Soto. Partnership in the facilitating sense.

*Mr. Schulman. Sure. Okay. I think I will offer two then. The first, which I have sort of mentioned before already, is the Federal Trade Commission has a huge role to play in protecting consumers. I think it needs more funding and more people.

And then I think the other has to do with how the government approaches jurisdiction over blockchain entities. I think there is clarity that definitely needs to come about what exactly an autonomous organization is, a GAO, how it is subject to law, how it is not subject to the law.

I think those questions are just starting to percolate in the courts, and it is going to be very interesting watching that and figuring out what the answers are.

*Mr. Soto. Thank you, Mr. Schulman.

Obviously, neither of you have identified a particular subject but regulatory, and I get that. But I know Professor Sudler had mentioned space already.

I represent a district right next to the space coast. So how can we partner with you all in advancing technology to use blockchain in space?

*Mr. Sudler. Yes. I think one of the biggest relationships that we would look at is with the Department of Defense. You know, space is open for business. There are more satellites going into space, and it makes it a target certainly for cyber criminals, for bad actors, and for nation-states who do not share our interests to attack either individual satellites or constellations.

So we are very open to really looking at this type of new problem because it is in a new area that needs a lot of solutions, and we would love to certainly look at some of those national security issues.

*Mr. Soto. Thank you.

And, Professor Reyes, where do you think through funding and incentivizing we would advance blockchain in America?

*Ms. Reyes. I think it would be excellent to have a funded education program for law makers and regulators because the nuance really does matter, and all of the regulatory clarity we all have been asking for depends on understanding the difference between the financial use cases and the non-financial use cases.

I would also really love to see the Federal law makers take a cue from some of their State counterparts where States have done an excellent job of pushing private law reform around decentralized autonomous organizations, around the property rules, for example.

And it would be excellent to see Federal law to the extent that it is inconsistent in any way or somehow getting in the way of those reforms being effective. It would be really excellent to see those changes take shape as well.

*Mr. Soto. Thank you so much.

My time has expired.

*Mr. Bilirakis. I thank the gentleman.

Now I will recognize Mrs. Harshbarger from the State of Tennessee, East Tennessee, and I want to tell you how much I

appreciate your patience. You have been here the entire time.

*Mrs. Harshbarger. Yes, I want to learn.

*Mr. Bilirakis. So I will give you five minutes for questioning.

Thank you.

*Mrs. Harshbarger. Thank you, Mr. Chairman.

Thank you all for being here today.

I have been a licensed pharmacist and business owner for over 30 years, and I guess one of the most challenging aspects facing the pharmaceutical industry is the ability to track drug components, and the drug supply chain is incredibly complex and difficult to trace exactly where everything is coming from and where it is going.

And we as pharmacists have to abide by chain of custody, and under the FDA is the Drug Supply Chain Security Act. We have to know if the manufacturers are registered, if the wholesalers are licensed, if the pharmacies are licensed.

So, Professor Sudler, you discussed in your testimony a blockchain-based contract tracing solution to mitigate the spread of COVID-19. In your example you stated that blockchain technologies can report infectious contacts

instantly and anonymously without revealing who is infected.

And I am interested in how this technology could improve the pharmacy sector.

And how would this blockchain technology help address supply chain challenges in the pharmaceutical sector, first of all?

*Mr. Sudler. Well, thank you for that question, and I think it is very powerful to look at how we can do better at applying blockchain to the medical industry and the pharmaceuticals because that affects our human health and our human lives.

*Mrs. Harshbarger. Yes.

*Mr. Sudler. I have done research with colleagues of Villanova University, Dr. Peggy Chaudhry, which I partnered with quite a bit on the counterfeiting of pharmaceuticals.

*Mrs. Harshbarger. Yes.

*Mr. Sudler. Which is very dangerous, obviously providing medicine that actually is not the proper medicine, and we looked very closely at how do we encounter some of that. Blockchain has played a part in that conversation.

I think what we can do is look at applying blockchain to the supply chain, understanding who these manufacturers are

and even the actual medications themselves, tracking them along the supply chain, making sure they get to the proper, you know, end user who should be taking that as a patient.

So, you know, I am very eager to continue this research with my colleagues and certainly working, you know, with folks here to see how we can apply that.

*Mrs. Harshbarger. That is very good. I will be in touch with you.

*Mr. Sudler. Thank you.

*Mrs. Harshbarger. Okay. Would these blockchains be able to help address challenges like prescribing medication from various health care providers and verifying identity?

And if you think so, how so?

*Mr. Sudler. I think this gets into this whole area of electronic health records.

*Mrs. Harshbarger. Yes.

*Mr. Sudler. And how do we, you know, do a better job of having hospitals, you know, be able to participate in the prescription process electronically and making sure they are getting to the right individuals.

The electronic health records have been very slow. It is maturing to some degree. We have been working with Common

Health, which is a new technology and organization really dedicated to trying to get electronic health records fed into by hospitals and health practitioners.

And we are looking at writing to the API of, you know, these databases so that blockchains can play a role in helping facilitate those prescriptions getting to the right individuals.

*Mrs. Harshbarger. That is huge because we have got 400,000 companies in China that do the APIs versus 3,000 here. So that is a big deal.

*Mr. Sudler. Yes.

*Mrs. Harshbarger. From a consumer and cybersecurity standpoint, do you believe that the blockchain is a more secure option for securing health and pharmaceutical related data than our current methods? Yes or no?

*Mr. Sudler. I think the way we are currently looking at the technology, there is basic security. I cannot say it is necessarily bad. We are where we are with the current technology.

But when you start adding blockchain, that adds another layer of technology and another layer of security. So, yes, we are doing okay cybersecurity-wise with what we have, but

now adding some of that immutability or the ability to keep it from --

*Mrs. Harshbarger. Yes. Professor Sudler or Mr. Wyatt, where is China with CCP in their line of development of blockchain? Do you have any idea?

It is okay to talk.

*Mr. Wyatt. No, I appreciate the question.

I think, look, at the end of the day, if China continues to be the first mover in this space and innovating, they are going to do it in the wrong way and a way that is not conducive for our --

*Mrs. Harshbarger. Kind of like AI.

*Mr. Wyatt. Exactly. And so I think they are going to do it in a way that does not respect the spirit of blockchains of being open and transparent and decentralized.

*Mrs. Harshbarger. Yes.

*Mr. Wyatt. So I cannot stress enough how critical it is that I think this will be the most important year for us from an innovation standpoint to make sure that we do not cede it to Russia or China.

*Mrs. Harshbarger. We have a lot of work to do.

*Mr. Wyatt. I would agree.

*Mrs. Harshbarger. The satellite was very interesting. Professor Sudler -- and I will hurry up -- have you talked to Elon Musk and Starlink?

You know, we went over and looked at the facilities. It is very interesting to know how those satellites will communicate if something happens.

Have you looked at that?

*Mr. Sudler. I have not personally spoken to Elon Musk, but I am going up on his Falcon 9 rocket this October.

*Mrs. Harshbarger. Cool.

*Mr. Sudler. So we indirectly do work with each other. He obviously is using Starlink satellites. They communicate with each other through optical communications. So they are looking at the same types of problems in terms of constellations.

Constellations is the buzzword right now in space. So every company that is interested in putting up satellites is really considering the network approach to it, which means they are looking at how to get satellites to talk to other satellites.

We are really one of four or five companies that are introducing blockchain networks in space. So we are

certainly of the new era of companies that will bring this technology to test.

*Mrs. Harshbarger. Well, best of luck. When you go up, let us know how it works out.

*Mr. Sudler. Thank you.

*Mrs. Harshbarger. Thank you.

With that I yield back, sir.

*Mr. Bilirakis. Thank you.

The gentlelady yields back.

Now I will recognize Mr. Fulcher from the great State of Idaho.

*Mr. Fulcher. Thank you.

*Mr. Bilirakis. You are recognized for five minutes for questioning, sir.

*Mr. Fulcher. Thank you, Mr. Chairman.

*Mr. Bilirakis. Thank you.

*Mr. Fulcher. Mr. Schulman, one of the topics we have talked about a lot in this committee has to do with artificial intelligence, and just listening to the joint comments of the panel today, we have talked about the helpful side of artificial intelligence. There are some incredible opportunities with predicting analytics, things like

optimizing energy generation through increased dispatch efficiency.

There are some really positive employments for artificial intelligence, but frankly, there are some components to that that scare me. The potential algorithms that are focused on shaping, that type of thing.

But it all has to draw from a database, and so I am wondering with blockchain employing a decentralized data storage, is there a role for blockchain when it comes to potentially neutralizing some of the what could be the negative impacts of artificial intelligence?

*Mr. Schulman. So it is a good question. I think the thing to remember about blockchain is -- and particularly when you are talking about it with regard to AI -- is that blockchain is not fast. In most of its forms, it cannot move a lot of data very quickly.

And one of the things that AI fundamentally needs, as it is sort of used or implemented today, is a lot of data, and so you might be able to envision some sort of blockchain as a control mechanism perhaps where the amount of data you needed to throughput is not big. It is a relatively minor sort of turn on/turn off or some sort of control mechanisms.

But I would say that I think integrating blockchain with AI is always going to be kind of problematic because of the inherent throttling that blockchain has in terms of data throughput.

*Mr. Fulcher. Thank you.

Mr. Wyatt, do you care to weigh in on that?

*Mr. Wyatt. I think there are three things. One, I want to acknowledge that AI and blockchain are powerful tools and that can go either way, and we need to be very thoughtful about how we talk about them and regulate them. But they can be enhancements.

There are three things I think that are really important with AI: transparent machine learning models so that we can understand if there are inherent biases in any of these artificial intelligent models. Blockchains can help do that for us.

Verifying source materials so we see people producing fake images that can move markets or change people's minds. I think it will be really important for us to be able to look and say, "Is that a verifiable image that is from the New York Times or not, or is it manipulated?''

And I think lastly, it could be incredibly helpful for a

phishing code auditing.

So I think these worlds will continue to unit and blockchain will be a very powerful part of ensuring the integrity of AI.

*Mr. Fulcher. Thank you.

Mr. Sudler, since we are on the topic, AI, blockchain, that connection.

*Mr. Sudler. Absolutely, it is a powerful connection, and it is one that we are going to have to take a close look at.

AI can contribute to blockchain in the sense that we can understand how we can make smart contracts smarter so we can actually give a little more intelligence to blockchain networks and how it evaluates conditions that smart contracts can respond to.

On the other side, blockchains can help AI to give it more explainability. Oftentimes we see, you know, AI algorithms produce results. We are not exactly sure how it came to its conclusion. So blockchain can actually keep track and trace immutably in its records where those contacts came from such that they came to a decision.

And so that explainability is very important,

particularly when you talk about AI applied to very human sensitive, you know, circumstances like, you know, self-driving cars and so forth, where accountability is very important.

*Mr. Fulcher. Thank you.

Ms. Reyes, just as a reminder, I would like to get your take on this, and I am concerned about potentially some of the negative impacts of AI, and I am wondering if the decentralized nature of the data storage for blockchain might insulate that.

Your take on that issue?

*Ms. Reyes. Thank you for the question.

I think that my thoughts are more along the line of Mr. Schulman insofar as I do not see a blockchain obviously being a source of data input for AI.

That is not to say it could not happen, I suppose, but at the moment, the state of technology, I do not see that as being how it would be used.

*Mr. Fulcher. Okay. Very quickly, as we have seen in China, they have got a creation of a social credit system and a central bank. I am also concerned about the potential of a Federal Government type blockchain, and I am going to ask

this of Mr. Wyatt.

With the Federal Government-generated blockchain, could that be controlled?

I will just leave it at that and ask is that a benefit or a drawback if there is a federally created blockchain database when it comes to a social credit system type system.

*Mr. Wyatt. It depends on what you are looking for. I do think you have the optionality of some of the topics we have touched on today of permission for public blockchains, and there are things that you could do in a permission environment.

But there are other use cases that I would find, you know, that are more beneficial and meaningful right now using blockchains outside of our current system.

*Mr. Fulcher. Thank you.

And I am over my time. Mr. Chairman, I yield back.

*Mrs. Lesko. [Presiding.] Thank you.

And there are no Democrats to speak so I recognize myself for five minutes of questioning.

Mr. Wyatt, I am delighted to hear about how blockchains can improve everyday processes and empower consumers with new technology, but new technology often comes with new risks,

and some of which being made clear only after widespread deployment.

What potential problems could you see arising from increased use of blockchain technology?

And then a follow-up: what steps could this committee take to minimize those problems?

*Mr. Wyatt. I think the biggest risk that we have here in our country is not doing anything, and I am not implying that we are. This committee is a great example of the work that we are doing here.

But I would say with a sense of urgency so that we can make sure that we are leading and we are the pioneers and we are placing kind of the consumer protections that we need to put in place.

So my concern largely would stem around us continuing to not do anything or act swiftly enough and what implications that could have.

*Mrs. Lesko. Okay. And then I guess, Mr. Wyatt, a follow-up question. It is related to this, quite frankly.

In addition to me being a member of this subcommittee, I am also the vice chair of the Subcommittee for Energy and Commerce on Oversight and Investigations.

In your opinion what balance should exist between encouraging innovation by technology start-ups and government oversight and regulation?

Meaning what role do you see government playing in shaping the future of blockchain technology, if any?

*Mr. Wyatt. Yes. I do not know that necessarily I would say that the government is responsible for shaping it, but I think it is really important that we establish guidelines, regulations and rules of the road so that there is clarity so that people feel comfortable that they are capable and enabled to innovate in this country.

*Mrs. Lesko. And then, Professor Sudler and Professor Reyes, when trying to anticipate the potential risks of blockchain technology and how we can mitigate them, I think it is also important to discuss regulatory authority.

As we have heard from all of you today, blockchains are a multiuse technology. So we must make sure that regulatory authority is clear.

What is the best way to prevent unfair or deceptive acts or practices, ensure data security, and regulate a new technology or is it too early to regulate?

*Mr. Sudler. That is a very bundled question.

*Mrs. Lesko. It is.

*Mr. Sudler. But if you take a look at how we treated the Internet in its early days, we were fairly hands off to allow it to innovate, and I think that is very important for the blockchain to continue to do that.

Let's keep in mind that the blockchain is only about 15 years old. It is a teenager. Let it be a teenager, and let it come to some degree of maturity before we talk about huge regulations.

Having said that though, there are industry's specific standards that we have to take a look at, things like health care where, you know, HIPPA laws are in place, and the privacy of our data is very critical.

So we need to look at this on an industry-by-industry basis to see how blockchains are being used and whether or not from an industry perspective we need to put some guardrails on how blockchains could potentially threaten our information, our lives.

*Mrs. Lesko. Ms. Reyes.

*Ms. Reyes. Thank you.

So I do want to make sure it is clear for the record that this is not an unregulated industry. It is actually

quite heavily regulated. I have been a blockchain lawyer since around 2011, and most of my counseling was on regulatory matters, right?

So it is quite heavily regulated. The problem is often that the regulations that apply are not entirely clearly at least as applied to the specific subset that folks are interested in.

I think we see this largely in the securities industry at the moment in securities regulation.

I think the key to making sure that such clarity is provided in the regulatory framework is to go through the rulemaking process, an open process whereby rulemaking is issued, people get a chance to comment on it, and then clear rules of the road are provided because many of the existing laws and regulations that we have do apply to the activity undertaken using the technology.

What I think would be a detriment to the United States legal system is if laws targeted the technology or the software itself and said the blockchain must look like this and you may only build a protocol with these features. That would not be helpful.

I also concur with Mr. Schulman's earlier remarks that

targeting the developers themselves, particularly open-source developers, is not particularly helpful, particularly recognizing that blockchain protocols are not the only open-source software that we rely upon on a daily basis.

If you used a computer today, it is likely that you used some piece of open-source software while you did so.

So those are my comments on your question.

*Mrs. Lesko. Well, thank you.

And I thank all of you for coming here today.

Now I call on my colleague, Mrs. Cammack, for five minutes of questioning.

*Mrs. Cammack. All right. Well, thank you, Madam Chairwoman.

Thank you to our witnesses for appearing before us today.

As you can tell by the attendance in the room, we are all here. [Laughter.] Kidding.

This is something that I find incredibly fascinating, being kind of a token millennial, right, in the room. So I am going to go in reverse and start with you, Mr. Wyatt, talking about the gaming industry.

So 2019 we were looking at the gaming industry doing

about $260 billion in total economic output, right? They are anticipating $560 billion by 2030. So it is not just the old school Tetris and Mario that so many people think of, right? The gaming industry is huge.

How do you envision blockchain changing the game, not to put a pun on it, but how do you envision blockchain changing the future of gaming and even going so far as like, say, the metaverse?

*Mr. Wyatt. Yes, I appreciate the question, and I am empathetic to it, especially, you know, having kids and my wife not being particularly keen with video tames too much.

But I think one thing that a lot of folks do not realize is the way that we think about videogames, Mario, Tetris, it is evolved. They are digital worlds. People are learning. They are interacting. They are socializing. They are wanting to spend their time inside of these environments, whatever it is that they are doing, right? And there is obviously a variety of things.

So with this is people want to spend money where they are spending time. It is a very natural behavior for anyone to do.

And so whether you are a kid or an adult that are, you

know, interacting in these digital worlds, that is important. So, therefore, you see a lot of digital goods being purchased inside of these games whether it is a cosmetic item for you to have some representation in game or whatever the case may be.

As you pointed out, that is generating hundreds of billions of dollars. YouTube is one of the largest verticals in the business.

I think what this allows people to do is instead of just licensing this from the publisher, they can now own it. If you spend money on something, you deserve to own it. You do not just license the sweatshirt from Nike. You buy it. It is yours. You can give it to me. You can trade it to me. You can sell it to me. I think that is really important.

And so these digital goods deserve more rights. People are spending a lot of money on it. They deserve more autonomy on how these things can be used. There is no better way to solve for that than putting these on open blockchain protocols.

*Mrs. Cammack. I appreciate that. Thank you.

Mr. Sudler, did I say that correctly?

*Mr. Sudler. Yes, that is correct.

*Mrs. Cammack. So I want to shift gears a little bit, and thank you, Mr. Wyatt, for that on the gaming response.

We have talked a little bit here today about the uses that can be applicable to Federal Government, and I want to just expand that a little bit.

How do you foresee -- and I am running out of time -- but blockchain technology? How could that be used for, say, foreign aid, particularly in countries where we do not have the most sophisticated financial systems; we do not have necessarily the means?

How can we utilize the technology today to utilize foreign aid for effectively utilizing blockchain?

*Mr. Sudler. I think there are a couple of ways in which you can do that, and some of my students have explored that very same topic. If foreign aid is being sent to a country, how do we make sure it is getting into the right hands, it is not getting to, you know, adversaries or people who are wasting that money?

So the blockchain can keep track to some degree of where that individual is on the receiving side and whether they are receiving that payment or not. There are some complexities in terms of, you know, the receiving end and what actually do

they do with it. You know, that obviously gets into tracking. You know, who is actually spending that money at the end of the day?

The other way is helping communities really create their own community coin. So if you go into that country and say, you know, we are going to help set up some infrastructure where maybe there is a community coin, allows for self-organization, allows for some particular region to have an internal economic system based on a coin that is well structured, has some rules in terms of how it is used. That could be a way of aiding some group outside of this country without necessarily just sending money but actually building, helping build an economy.

*Mrs. Cammack. And to take that one step forward or further, how do you foresee us using blockchain to prevent waste, fraud, and abuse and cut down cost with Federal programs, things like SNAP, EBT, et cetera?

*Mr. Sudler. Yes. If you have something like SNAP on a blockchain, now you are starting to track, you know, whether an individual is using, you know, those particular services appropriately.

And this does get into identity itself, really tracking,

you know, the individual who is using all those particular programs and income of their activities on the blockchain.

That does get into a new area of technology of identifying a person on the blockchain itself and some unique identifier that would track their identity on the blockchain and then how they are using some of the Federal programs that they are allowed to use.

So we are looking very closely at identity. Obviously, that gets into a lot of privacy and how do we do that correctly, but there certainly is that type of use case that has some potential.

*Mrs. Cammack. Certainly I have concerns about the privacy issues surrounding blockchain and how the technology is going to evolve around the sense that we need our constitutional rights to be protected. We have a right to privacy, and so kind of threading that needle is something that I am very interested in.

But I know my time has expired. Mr. Chairman, I will follow up with the remainder of my questions for the record.

And thank you to our witnesses again, and I yield.

*Mr. Allen. [Presiding.] I thank the gentlelady for yielding.

And this concludes our hearing today. I want to thank our witnesses for your expertise and your knowledge around this technology. It is important for us to understand what you are dealing with so that your Congress can deal with this issue appropriately.

I ask unanimous consent to insert into the record the documents included on the staff hearing documents list.

Without objection?

*Mrs. Cammack. No objection.

*Mr. Allen. So that will be the order.

[The information follows:]

**********COMMITTEE INSERT**********

*Mr. Allen. I remind members that they have ten business days to submit questions for the record, and I ask the witnesses to respond to the questions as promptly as you can.

Members should submit their questions by the close of business on June 21st.

And then without objection, the subcommittee is adjourned.

[Whereupon, at 12:07 p.m., the subcommittee was adjourned.]