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RPPR Final Report

as of 16-Apr-2018

Agency Code:

Proposal Number: 68094LSMRI

Agreement Number: W911NF-15-1-0595

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Final Report for Period Beginning 03-Sep-2015 and Ending 31-Dec-2017

Title: Minerva E-ID Assessment Framework (MEIA) Pilot Project

Begin Performance Period: 03-Sep-2015

End Performance Period: 31-Dec-2017

Report Term: 0-Other

Submitted By: Eric Burger

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 1

STEM Participants: 1

Major Goals: The goal of this project is to determine the US national and international security implications of the Estonian e-Residency initiative and subsequently to develop a cross-discipline assessment tool, the Minerva E-ID Assessment (MEIA) framework. This framework includes a set of standards and tools to assess the security implications of these types of programs in Estonia and in other nations that are following Estonia's lead. This will advance the basic objectives of the project, which are to enhance scientific understanding of international cyber security threats and vulnerabilities, and to develop strategies for effectively addressing them. As a multidisciplinary endeavor, this project contributes to the social sciences by examining the impact and issues of a government-backed digital identity on the populace and governments of other countries. The project also contributes at the intersection of law and computer science by creating a framework for estimating the impact of similar programs on the ability of malevolent actors to leverage government-backed digital identities to create adverse outcomes.

Accomplishments: We have published a journal article, made two scholarly conference presentations, made two workshop presentations, and briefed the Estonian Ambassador in Washington D.C. three times (twice in person and once by email) and have produced a report on our findings. The report and the published article have been provided to the Minerva project manager, the Estonian Ambassador, the Deputy Secretary General for Communications and State Information Systems, Ministry of Economic Affairs and Communications in Estonia, and the Team Leader and Managing Director of e-Residency in Estonia. The team was also recently honored to be invited by the Estonian Embassy to a reception on July 12, 2017 at the E.U. Delegation in Washington D.C. to mark Estonia having the new E.U. Presidency.

Training Opportunities: Robert Ramierez, a graduate student at MIT was employed as a Research Assistant for this project in 2016. Robert has not yet graduated, but his work on this project has added to his interest in obtaining employment with the federal government in Washington DC in the policy field and has increased his interest in adding to his IT qualifications by studying law. This summer Robert is MIT Japan Program Intern at Secom Trust Systems Co., Ltd, working on two projects related to his work on the Minerva project - cyber security research ethics and blockchain technologies.

We developed a post-graduate research program for a Masters of National Security Law student, Calvin Liepold, at the Law Center, Georgetown University in 2016-2017. This is Cal's final course to complete the Masters Degree and graduate in 2017. Cal examined the privacy implications of Estonian e-Residency, under the supervision of the project co-PI, Professor Clare Sullivan. He completed the research paper in February 2017, was awarded the grade of A+, and graduated in May 2017. Cal has been appointed an assistant United States attorney in Baton Rouge LA. We expect to develop this paper further for publication in 2018.

RPPR Final Report

as of 16-Apr-2018

Results Dissemination: Academic Publications

- Clare Sullivan and Eric Burger, "Minerva Project on the Estonian E-Residency Initiative: Impact of Estonia's Start-Up Culture on Decisions Related to Prudence & Good Governance", abstract accepted and published for the AHFE Affiliated Conference on Cross-Cultural Decision-Making, Orlando July 29. 2016. The abstract was published in the conference materials.
- Clare Sullivan and Eric Burger, "E-Residency and Blockchain" abstract accepted for presentation at the Research Conference on Communications, Information and Internet Policy (TPRC) September 30-October 1, 2016. The abstract was published on SSRN and the paper was presented by Professor Burger at the conference in 2016.
- Clare Sullivan and Eric Burger, "E-Residency and Blockchain," Computer Law and Security Review, Vol 33m pp 470-48. A copy of the paper has been provided to the Minerva project manager.

External briefings:

- Meeting with Estonian Ambassador Marme and Marki Tihonova-Kreek, Deputy Chief of Mission, and other Embassy Staff at Estonian Embassy, Washington DC on February 4, 2016 to discuss and plan project meetings and interviews in Tallinn, Estonia and Helsinki, Finland in September 2016. The Embassy provided the Minerva team with contacts in Helsinki. The Embassy helped coordinate the meetings and interviews with government officials, e-Residency program director and his staff, the head of the Estonian Border Guard and her staff and key individuals involved in the e-Residency program in Estonia.
- Meeting with Ambassador Marme at the Estonian Embassy in Washington D.C on December 4, 2016 to thank the Ambassador and his staff for arranging the visits by Professor Sullivan to Tallinn and Helsinki in September 2016. The Minerva team informed the Ambassador that the visits were very productive and outlined the major findings from this phase of the research for the pilot project. The Minerva team discussed the team's wish to address these areas in the next phase of the research, particularly in working with the Estonians to develop the cross-discipline Minerva E-ID Assessment Framework to provide a technical and legal benchmark for these types of programs internationally. The Ambassador asked to be provided with a copy of the written report on the September 2016 visits to Tallinn and Helsinki when available, and informed the Minerva team of his willingness to facilitate follow-up meetings for further research. The Summary Findings report was sent to the Ambassador on April 25, 2017 with a copy of the team's article on Estonian e- Residency and Blockchain which was then in press.
- Presentation, "Estonian e-Residency and Blockchain," Clare Sullivan, at CyberSEED conference at the University of Connecticut; October 19, 2017.

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI

Participant: Eric Burger

Person Months Worked: 5.00

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

Participant Type: Co PD/PI

Participant: Clare Sullivan

RPPR Final Report
as of 16-Apr-2018

Person Months Worked: 11.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: Robert Ramírez

Person Months Worked: 1.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

CONFERENCE PAPERS:

Publication Type: Conference Paper or Presentation

Publication Status: 1-Published

Conference Name: 7th International Conference on Applied Human Factors and Ergonomics

Date Received: 01-Aug-2016 Conference Date: 27-Jul-2016 Date Published: 01-Aug-2016

Conference Location: Orlando, FL, USA

Paper Title: Minerva project on the Estonian e-residency initiative: Impact of Estonia's start - up culture on decisions related to prudence & good governance

Authors: E. Burger and C. Sullivan

Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation

Publication Status: 1-Published

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Date Received: 14-Aug-2017 Conference Date: 01-Oct-2016 Date Published: 01-Oct-2016

Conference Location: Arlington, VA, USA

Paper Title: E-Residency and Blockchain

Authors: Clare Sullivan, Eric Burger

Acknowledged Federal Support: **Y**

Final Report on Minerva E-ID Assessment (MEIA) Pilot Project

Proposal Number: 68094-LS-MRI, **Agreement Number:** W911NF-15-1-0595

PI Name, Institution: Professor Eric Burger, Department of Computer Science, Georgetown University

Co-PI Name(s) and Institution(s): Professor Clare Sullivan, Law Center, Georgetown University

Project Point of Contact: Professor Eric Burger: ewb25@georgetown.edu

Project URL: The project does not have a URL

Government Program Officer: Lisa Troyer, Social & Behavioral Sciences Program
Life Sciences Division, Army Research Office

Summary

Starting at the end of 2015, the Minerva E-ID Assessment (MEIA) Pilot Project began with the goal of developing an outline of a framework to evaluate electronic identity systems, with a focus on the Estonian E-Residency program as a first case study. The E-Residency program offers certified digital identities for non-Estonians, issued by the Estonian government. Countries other than Estonia have announced similar programs. For a number of reasons outlined below, we believed and have subsequently preliminarily determined a number of issues these schemes raise that affect United States national security interests. Conversely, Estonia's program offers a number of valuable lessons for the United States.

Mid-2106, the MEIA Pilot was expanded to examine new developments added to the e-Residency initiative including the impact and implications of the use of blockchain technologies for certified digital identities.

To date, we have published a journal article, made two scholarly conference presentations, made two workshop presentations, and briefed the Estonian Ambassador in Washington D.C. three times (twice in person and once by email) and have produced a report on our findings. The report and the published article have been provided to the Minerva project manager, the Estonian Ambassador, the Deputy Secretary General for Communications and State Information Systems, Ministry of Economic Affairs and Communications in Estonia, and the Team Leader and Managing Director of e-Residency in Estonia. The team was also recently honored to be invited by the Estonian Embassy to a reception on July 12, 2017 at the E.U. Delegation in Washington D.C. to mark Estonia having the new E.U. Presidency.

Background

The pilot project examined Estonian e-Residency as a major new cyber development and its international security implications. This is the first independent examination of the e-Residency program.

The cross-discipline expertise of the Minerva team provides new perspective in examining and assessing both the technical features of the program and non-technical aspects including program procedures and governance. The research is founded on the premise that e-residency is a fundamental shift. The stance is that e-Residency is an exciting new cyber development which is here to stay and that other countries are highly likely to follow Estonia's lead.

Estonia is the most advanced e-society in the world and consistently leads the way in the development of e-initiatives. The research stance is that the Estonian e-Residency program, like all the e-Estonia initiatives to date, heralds the near future for other countries and the world generally. The findings from this research therefore have both immediate impact in relation to the Estonian e-residency program; and predictive value and lessons for other countries like Finland, Azerbaijan, and Singapore; and regions like the E.U., implementing similar international e-ID initiatives and future evolutions such as digital citizenship.

Pilot Project

The present research, which commenced in late 2015, is a pilot program to examine the major features of the Estonian e-Residency initiative and its impact on U.S. and international security, to determine the need for, and focus of, a cross-discipline assessment tool, the Minerva E-ID Assessment (MEIA) Framework. The MEIA Framework is a set of standards and tools to assess the security implications of these types of programs in Estonia and in other nations following Estonia's lead. The goal of this project is to determine the US national and international security implications of the Estonian e-Residency initiative and subsequently to develop a cross-discipline assessment tool, the Minerva E-ID Assessment (MEIA) framework. This will advance the basic objectives of the project, which are to enhance scientific understanding of international cyber security threats and vulnerabilities, and to develop strategies for effectively addressing them. As a multidisciplinary endeavor, this project contributes to the social sciences by examining the impact and issues of a government-backed digital identity on the populace and governments of other countries. The project also contributes at the intersection of law and computer science by creating a framework for estimating the impact of similar programs on the ability of malevolent actors to leverage government-backed digital identities to create adverse outcomes.

In 2016, the pilot program expanded to examine new developments added to, and planned for, the Estonian e-Residency program through 2016/7. These developments include:

1. New applications of blockchain technology to identity authentication, document authentication and management, securities trading, and new virtual payment systems
2. The features and operation of eResNetwork, the new business networking platform for e-Residents
3. Development and expanded use of X-Road as an international joint data exchange platform, being developed between Estonia and Finland

Assessment of the benefits, impact and implications of these developments and any present and future security risks they present to US and international security were incorporated into the pilot program in 2016.

The pilot research project is the first step towards the longer-term research aim as outlined in the 2015 Minerva proposal which is to work with Estonian and other interested nations following Estonia's lead including Finland, Azerbaijan and Singapore, as well as the E.U., to collaboratively develop the MEIA framework.

Research Aim:

Given the stance that e-residency is a fundamental change which is likely to extend to other countries and regions, the primary objective of the pilot project, is to determine the nature and extent of the security impact (if any) and as a follow-up, to work collaboratively with the Estonians on technical and procedural aspects to address any security concerns. The long-term goal is to develop the MIEA Framework initially for test-application to the Estonian e-Residency program and to a similar initiative being developed in Finland; and then for assessment of other e-ID programs internationally.

The immediate aim of the current pilot project is therefore to determine the US national and international security implications of the Estonian e-Residency initiative and to establish a benchmark for future development of the MEIA Framework. The long-term goal is for the Minerva team to work collaboratively with the Estonians on technical and procedural aspects to address any identified security concerns, and to develop and refine the MIEA framework, initially for application in Estonia and Finland and subsequently, in Azerbaijan and Singapore.

Research Problem:

The pilot project focuses on the procedures in place to authenticate an applicant's identity for Estonian e-Residency and their adequacy to address the potential to create a false identity and use it for money laundering, terrorism financing, and other illicit activities. Closely aligned to this enquiry are issues relating to security of identity information particularly when data is stored outside national geographical borders.

Approach:

Professor Burger is responsible for research and evaluation of technical aspects. Professor Sullivan is responsible for research and evaluation of non-technical aspects, specifically applicable procedures, governance, and legal compliance. The research for the pilot project is qualitative in nature and is a combination of interview and archival research. The research methodology encompasses face-to-face interviews in English with the government officials and personnel associated with the e-Residency initiative in Tallinn, Estonia and with government officials and personnel involved in mutual e-ID recognition and data exchange in Helsinki, Finland. The archival component involves review and analysis of e-Residency program manuals, policies and procedures and legislation relevant to the establishment and operation of the program including relevant E.U. Directives and Regulations, particularly the new General Data Protection Regulation which was passed in 2016 and will be in full effect in the E.U. in 2018. The Minerva team will use the results of this pilot program to assess the security risk posed by the Estonian e-residency program, and the issues to be addressed, to establish a baseline for development of the MEIA Framework.

Countries examined via fieldwork for the pilot research:

- Estonia
- Finland because of mutual e-ID recognition between Estonia and Finland; and because Estonia's X-Road which is also used for the Estonian e-Residency program, is being developed as an international joint data exchange platform between Estonia and Finland

Other countries specifically considered in the pilot research:

- The E.U. because Estonia is a full member of the E.U. so national law must comply with EU law.

Scientific Progress of the Pilot Project:

The pilot research project commenced in November 2015 with archival research which has been updated throughout the pilot to take account of latest developments. The Minerva team reviewed applicable national law and relevant EU Directives and Regulations as well as available procedural and technical information as part of assessing the procedural, governance, and legal compliance and associated security aspects of the Estonian e-Residency program, from US national and international security perspectives.

The next stage of the pilot research comprised face-to-face interviews by Professor Sullivan with Government officials, the e-Residency team and associated program personnel in Tallinn, Estonia and with corresponding officials and personnel in Helsinki, Finland, were conducted on schedule, in September 2016.

Ambassador Marme of the Estonian Embassy in Washington D.C facilitated the interviews in Estonia and Finland. The Ambassador's staff arranged the interview schedule, ensuring that Professor Sullivan was able to meet with all the key people in Tallinn and Helsinki, including high level government officials and all key personnel. The information obtained during the interviews has significantly added to the value of the research for the pilot program.

As reported in February 2017, Professor Sullivan interviewed senior members the Estonian government responsible for the e-Residency concept, its design, and its implementation since inception in late 2014 to the present time. The individuals interviewed included those from the Government Office of Estonia, Estonian Police and Border Guard, Estonian Tax and Customs Board, Estonian Information System Authority, the Government CIO, Centre of Registers and Information Systems and members of the e-Residency program team. In view of the close cooperation between Estonia and Finland in relation to X road and mutual recognition of e-IDs, and on the advice of the Estonian Embassy in Washington D.C., Professor Sullivan travelled to Finland to interview government officials in Helsinki particularly in relation to cooperation between Estonia and Finland for mutual recognition of e-IDs and data exchange. All required research protocols were followed and all the interviews were recorded with the consent of each interviewee. The audio files and written transcriptions are on file ready for the next stage of the research.

Pilot Project Key Findings

It is clear that there is much to be learned from what the Estonians are doing with the e-Residency initiative. In summary, the research for pilot project reveals that there is recognition amongst those involved in the e-Residency program in Estonia that it is being operated as a start-up, with a typical start-up culture. The Estonians interviewed reported that the primary initial objective is getting the e-Residency initiative underway and in making services accessible to e-Residents. The emphasis at present is on encouraging and facilitating e-Residency to expand Estonia's commercial base. There is general acceptance amongst the people interviewed in Estonia that as a result, the full consequences and risks of the e-Residency program and its procedures may have not been fully realized nor considered and addressed. They therefore welcome the Minerva research as an independent review of the e-Residency initiative. Without exception, all the interviewees are very interested in the research findings, and in working with the Minerva team to address any issues identified.

Stage 2 of the current research which was added to the pilot project in 2016, examines the significant new developments added to the Estonian e-Residency program through 2016/7; to assess their impact, particularly the present and future security risks they present to US and international security and implications for other identity programs. The research on these new developments to date has consisted of archival and interview research, particularly the interviews conducted by Professor Sullivan in Tallinn and Helsinki in September 2016.

The interviews reveal contradictory understanding and reporting of the present use of new applications of blockchain technology to identity authentication and identity document authentication and management for the e-Residency program. It is clear at this time, however, that the Estonians are cooperating with Bitnation to expand the services available to Estonian e-Residents. This of itself is a major development because the stated objective of Bitnation is to "establish a new virtual jurisdiction with its own rules". This raises the potential to create and use an identity outside traditional national and international legal channels, a development which has potential security implications because it can enable creation and use of new and false identities and their use for a range of transactions outside the regulated economy and established national and international legal systems.

As to the other new developments added in 2016, the eResNetwork, the new business networking platform for e-Residents, and the use of X-Road as an international joint data exchange platform between Estonia and Finland are currently in the planning and further development stages. Whilst all their features and the full nature of their operation are not yet certain, it is clear that both these developments present major advances in the ability of individuals who are not citizens of Estonia to do business not only in Estonia but in other nations. As such there is potential impact on US and international security. The further development and implementation of eResNetwork, X-Road, and of blockchain technology to identity authentication will be monitored and assessed by the Minerva team during 2017. As they currently stand these developments directly impact on U.S. national and international security.

In summary, therefore, overall the research by the Minerva team for stages 1 and 2 of the pilot project has uncovered issues which impact U.S. national and international security. The issues fall into two buckets.

The first bucket of security issues relates to the issue, and use, of an Estonian e-Resident ID. The primary concerns relate to identity authentication procedures to obtain e-Residency and the use of that government-authenticated e-ID for transactions. The commercial imperative of providing e-Residents with a quick, seamless experience for obtaining an Estonian e-ID and doing banking and business remotely is tending to overtake established international identity authentication and verification standards including the Know Your Customer procedures in place in most countries, including Estonia. These established procedures are slower and more time consuming and at present require in-person attendance, but they are in place to address concerns about the creation of new identities and identity fraud, particularly that involving money laundering and terrorist financing and other terrorist activities. In requiring only one identity credential, e.g. passport or national identity card, the current identity authentication required for e-Resident applicants does not meet the international standard set by the AML/CTF requirements. The Estonian e-Residency application process currently departs from that standard in three respects: by no longer conducting a face to face in-person interview with the applicant, by not requiring production of a range of original documents¹ to substantiate identity, and lastly by only requiring a photo or scan (and not sighting the original) of the identity document used for the application. The plans for requiring this process for opening a bank account also breaches this international standard, Estonian law, and commonly accepted banking standards. As a consequence, the e-Residency program clearly raises concerns about identity crime and fraud, with the most significant risk being the use of e-Residency and its services for money laundering. Trade-based money laundering by organized crime and terrorist organizations is a major concern.

The second bucket of security issues relate to data storage outside Estonia, particularly using the Estonian State Cloud and Estonian Data Embassies located in NATO countries. The reason for this out-of-country storage is to provide data backup and enable recover in the event of natural disaster or attack by other nation especially Russia. These initiatives raise unprecedented national and international security implications and major new international legal issues, particularly in relation to data security and defense. At the heart of these issues is whether a new definition of sovereignty is required. Traditionally sovereignty has been tied to geography but technology and initiatives like e-Residency are rapidly making that approach redundant. Closely tied to this issue are issues fundamental to US national and international security, particularly the obligations of an allied nation to protect and defend a data embassy located within its territory or a State cloud which traverses its geography. There are significant implications for the US and its allies under mutual defense obligations under the ANZUS and NATO alliances and both have expressed the wish to be informed of the progress of the proposed full Minerva project to develop the MEIA Framework and the ramifications for the alliances.

While these issues are highlighted by the Estonian e-Residency initiative, they are of broader relevance to government - authenticated e-IDs and to security of identity information and identity databases generally. The Estonian e-Residency initiative is attracting international interest from individuals seeking to become e-Residents, and from other nations seeking to offer similar programs to expand their economic base including countries as diverse as Finland, Azerbaijan and Singapore which have technology infrastructure of differing stages of development. The synergies between Estonian e-Residency initiative and mutual recognition of an individual's digital identity as part of implementing the Single Digital Market in the E.U. in 2017 are also striking. Former Estonian Prime Minister Andrus Ansip, now the European Commissioner for the Digital Single Market and Vice President of the E.U., recently informed the team that he is "very much interested in following the progress and the outcomes" of the proposed, full MEIA, project.

¹ As required for the KYC check, formal known as the 100-point identity check.

The Estonian e-Residency program presents a timely opportunity to address the necessary rigor and effectiveness needed for identity authentication and verification and for data storage, particularly from US national and international security perspectives. Further research on these issues and development of the MEIA Framework will position the US to for the future at an ideal time.

Future Work Necessary to Conclude Research

The pilot project has confirmed the hypothesis that the Estonian e-Residency program raises security implications for the U.S. and that the MEIA framework is necessary to assess the security impact of these types of e-ID initiatives. The next stage is for the Minerva team to work collaboratively with the Estonians on both technical and procedural aspects to address the security concerns, and to develop and refine the MIEA framework using the information gathered in the pilot project as the benchmark.

Given the international interest in the Estonian e-Residency program, it is proposed that the MEIA framework developed by the Minerva team in collaboration with the Estonians also be tested and refined as necessary, for the more mature legacy systems in place in Finland, for a wholly mobile platform such as exists in Azerbaijan, and a hybrid system such as exists in Singapore. Considering the close similarities of e-Residency with the more extensive Single Digital Market in the E.U. as the E.U., there are clear advantages in the Minerva team also coordinating with the E.U. in developing the MEIA Framework. Considering the timing of these international developments and the relative maturity of the Estonian e-Residency program, the timing of for next stage of the research to develop and test the MEIA Framework, is optimal.

Potential Impact on DoD Capabilities and Broader Implications for National Defense:

The research stance is that the Estonian e-Residency program, like all the e-Estonia initiatives to date, heralds the near future for other countries and the world generally. As anticipated, the pilot research shows that the e-Residency program has considerable potential advantages in facilitating international interoperability but also concomitant potential risks in enabling creation and use of new false identities, illegal use of legitimate identities, and in enabling trade-based money laundering and other illicit activity. The Estonian e-Residency initiative also raises unprecedented international security implications in relation to the use, and protection, of data embassies and the proposed use of the Estonian State Cloud.

The findings from the pilot project stage therefore have immediate impact in relation to the security implications of the Estonian e-residency program for the U.S and its allies. However, the real value will come from the next phase of the research during which the Minerva team will work with the Estonians and other nations undertaking similar e-residency initiatives, to develop the MEIA Framework. The next phase of the research will have predictive value and lessons for the U.S. from a security perspective, as other countries and regions move to implement similar e-residency initiatives and future evolutions, such as digital citizenship programs which transgress geographical boundaries. The MEIA Framework will provide DoD with an international benchmark to assess the impact and implications of these types of initiatives on U.S. national security and on international security.

Outreach Activities though the Pilot Project

Sharable data resources generated

- N/A yet, though the proposed full MEIA research project will encompass development of the MIEA Framework, which will include data on technical and policy aspects which will be in shareable form.

Academic Publications

- Clare Sullivan and Eric Burger, “Minerva Project on the Estonian E-Residency Initiative: Impact of Estonia’s Start-Up Culture on Decisions Related to Prudence & Good Governance”, abstract accepted and published for the AHFE Affiliated Conference on Cross-Cultural Decision-Making, Orlando July 29, 2016. The abstract was published in the conference materials.
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- Clare Sullivan and Eric Burger, “E-Residency and Blockchain,” Computer Law and Security Review, Vol 33m pp 470-481. A copy of the paper has been provided to the Minerva project manager.

Policy Publications:

- N/A

External briefings: (excluding academic conferences) *Include briefer name, topic, event name (if applicable), host/organizer, notable attendees, and date.*

- Meeting with Estonian Ambassador Marmei and Marki Tihhonova-Kreek, Deputy Chief of Mission, and other Embassy Staff at Estonian Embassy, Washington DC on February 4, 2016 to discuss and plan project meetings and interviews in Tallinn, Estonia and Helsinki, Finland in September 2016. The Embassy provided the Minerva team with contacts in Helsinki. The Embassy helped coordinate the meetings and interviews with government officials, e-Residency program director and his staff, the head of the Estonian Border Guard and her staff and key individuals involved in the e-Residency program in Estonia.
- Meeting with Ambassador Marmei at the Estonian Embassy in Washington D.C on December 4, 2016 to thank the Ambassador and his staff for arranging the visits by Professor Sullivan to Tallinn and Helsinki in September 2016. The Minerva team informed the Ambassador that the visits were very productive and outlined the major findings from this phase of the research for the pilot project. The Minerva team discussed the team’s wish to address these areas in the next phase of the research, particularly in working with the Estonians to develop the cross-discipline Minerva E-ID Assessment Framework to provide a technical and legal benchmark for these types of programs internationally. The Ambassador asked to be provided with a copy of the written report on the September 2016 visits to Tallinn and Helsinki when available, and informed the Minerva team of his willingness to facilitate follow-up meetings for further research. The Summary Findings report was sent to the Ambassador on April 25, 2017 with a copy of the team’s article on Estonian e- Residency and Blockchain which was then in press.
- Presentation, "Estonian e-Residency and Blockchain," Clare Sullivan, at CyberSEED conference at the University of Connecticut; October 19, 2017.

Training and Development:

- Robert Ramirez, a graduate student at MIT was employed as a Research Assistant for this Minerva project. Robert has not yet graduated, but his work on this project has added to his interest in obtaining employment with the federal government in Washington DC in the policy field and has increased his interest in adding to his IT qualifications by studying law. This summer Robert is MIT Japan Program

Intern at Secom Trust Systems Co., Ltd, working on two projects related to his work on the Minerva project - cyber security research ethics and blockchain technologies.

- Post graduate research program developed for Masters of National Security Law student Calvin Liepold at the Law Center, Georgetown University in 2016-2017. This is Cal's final course to complete the Master's Degree and graduate in 2017. Cal examined the privacy implications of Estonian e-Residency, under the supervision of co-PI, Professor Clare Sullivan. He completed the research paper in February 2017 and was awarded the grade of A+. Cal has been appointed an assistant United States attorney in Baton Rouge LA. It is expected that this paper will be developed for publication in 2018.