**Brazil-US Cybersecurity Research: An NSF Perspective**

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If you’re a researcher in a science or engineering discipline, it’s likely that the researchers with interests most closely aligned with yours aren’t in the office next door, in your university, or even in your country. Increasingly, scientific research has become international, with the best and brightest minds in a research area being found around the world.

According to the *Science and Engineering Indicators 2016* report1, the percentage of publications with authors from multiple countries rose from 13.2 percent to 19.2 percent between 2000 and 2013. At the US National Science Foundation (NSF), and specifically in the Directorate for Computer and Information Science and Engineering (CISE), we have invested in a number opportunities to support international research collaborations. Most recently, we issued the *Dear Colleague Letter: Enabling US-Brazil Collaboration on Cybersecurity Research*2  – a collaboration between NSF/CISE and the Research and Development Center on Digital Technologies for Information and Communication (CTIC) of the Brazilian National Research and Educational Network (RNP), with support from the Brazilian Ministry of Science, Technology, Innovations and Communications (MCTIC).

**A Recipe for Success**

In the various international research collaborations that we in NSF/CISE have engaged in, we’ve noticed a few common ingredients to developing and launching a successful collaborative international research program:

* **People and people-connections.** The researchers themselves are at the heart of any collaboration, and in the end, researchers want to work with the best minds in the world3. In some cases completely new collaborations may arise from a collaborative research funding opportunity; in other cases, they build on informal or formal past collaborations. The foundations for such past collaborations may have been laid by programs supporting research visits by students and faculty in either direction. For example, as a networking researcher, I’ve worked with Brazilian students and faculty who have traveled with funding from Brazil’s National Council for Scientific and Technological Development (CNPq).
* **Topic area.** For a collaborative research program focused on a specific area (as in the US-Brazil Collaboration on Cybersecurity Research), the research area must be important to both countries’ research communities, and aligned with national (funding agency) priorities. There must also be a critical mass of world-class researchers in that area – researchers who are excited about international collaboration and what that entails (e.g., travel, researcher exchanges). And each side must bring unique perspectives, strengths, and opportunities to the table. Will the collaboration advance important research not otherwise possible; will it accelerate the pace of research; or will it provide access to unique resources?
* **Agency-to-agency leadership and collaboration.** Just as there must be excitement among researchers, so too must there be excitement in funding agencies. A “champion” within each agency provides vision, does the hard work needed to make a collaborative research opportunity happen, and help smooth out the inevitable “bumps in the road” along the way. In the case of the US-Brazil Collaboration on Cybersecurity Research,numerous agency leaders in CTIC, RNP, and MCTIC in Brazil and in NSF in the US have been critical in providing the vision, hard work, and leadership to make it a reality. This funding opportunity would not have happened without their tremendous efforts.
* **Research community leadership.** Leaders from within the research communities play a crucial role in organizing and catalyzing international research opportunities. They have a vision of the excitement, the potential, and the value proposition of international research collaboration, and they can articulate that vision. They often organize workshops that bring together the research community to identify topic areas for possible collaboration and to build the research-to-researcher connections. Two researcher-led workshops4 set the foundation for the US-Brazil Collaboration on Cybersecurity Research. Similar workshops helped launch an Indo-US collaboration in pervasive computing,as well as other US collaborations in networking with Japan. The fact that these workshops are researcher-led reflects the research-community-driven, bottom-up emphasis of many NSF/CISE programs.

**Looking Forward**

We in NSF/CISE are excited about the breadth of the international research collaborations that we support and about the US-Brazil Collaboration on Cybersecurity Research. The recipe for success requires the commitment of many individuals and organizations, which I would like to acknowledge: the workshop co-leads: Priscila Solis Barreto (U. Brasília) and Daniela Oliveira (U. Florida) for organizing our research communities; the day-to-day champions within funding organizations: Ciro Eduardo Ferreira (MCTIC), Wanderson Paim (RNP), and Wenjing Lou (NSF); and the leadership who supported these champions: Jose Henrique De Lima and Laura Brasil De Araujo (MCTIC), Lisandro Zambenedetti Granville (RNP), and Ralph Wachter, Jeremy Epstein, Nina Amla, Charles Estabrook, Ken Calvert,Peter Arzberger and Erwin Gianchandani (NSF).

This opportunity has generated tremendous excitement in the US and Brazilian cybersecurity research communities alike. Bi-lateral collaboration in a focused area such as cybersecurity is but one form of international research collaboration; models for more broadly-based and longer term collaborations include the United States-Israel Collaboration in Computer Science (USICCS)6 and the program for Collaborative Research in Computational Neuroscience (CRCNS)7. We look forward to the exciting and impactful research supported by bringing together the world’s best and brightest through the US-Brazil Collaboration on Cybersecurity Research!

1 National Science Board, *Science and Engineering Indicators 2016*. <https://www.nsf.gov/statistics/2016/nsb20161/#/>.

2 <https://nsf.gov/pubs/2017/nsf17024/nsf17024.jsp?org=NSF>.

3 Paraphrasing from *Knowledge, Networks and Nations*. The Royal Society, March 2011. <https://royalsociety.org/topics-policy/projects/knowledge-networks-nations/report/>

4 [http://www.usbrazilsec.org](https://www.nsf.gov/cgi-bin/good-bye?http://www.usbrazilsec.org)

5 J. Kurose, H. Saran. "International Collaboration in Pervasive Computing," *International Innovation*, *May*, *2013*, p. 112. http://gaia.cs.umass.edu/Kurose\_Saran\_2013.pdf

6 https://nsf.gov/pubs/2017/nsf17020/nsf17020.jsp

7 https://www.nsf.gov/pubs/2016/nsf16607/nsf16607.htm