



DR. CRAIG A. LEE

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Objective: Focus on the development, adoption, and standardization of federation technologies for government, industry and academia worldwide.

Relevant Accomplishments:

- Lead author, NIST Cloud Federation Reference Architecture (CFRA)
 - Culmination of two years effort as chair of the NIST Cloud Federation Working Group
 - CFRA organizes the federation design space and illustrates concrete implementation approaches
 - Coordinating outreach efforts across NIST, USGov agencies, InCommon, Internet2, ORCA, etc.
- Support for federation efforts in the Open Geospatial Consortium (OGC)
 - Liaison between OGC and NIST, on-going
 - Author of Testbed-14 Federated Clouds Engineering Report, 2018
 - Advisor on Testbed-15 federation tasks, 2019
- KeyVOMS and federation demo suite built
 - KeyVOMS is a Keystone-based Virtual Organization Management System
 - Accomplished by re-purposing the OpenStack Keystone Authorization Service
 - Built using NGA and internal R&D funding 2012-2014
 - Demo suite illustrated secure data sharing between two clouds, AWS and PDNS, 2014-2016
- President, Open Grid Forum (OGF), 2007-2010
 - The Virtual Organization (VO) concept developed to manage "big science" collaborations
 - The VO concept developed in OGF is a direct forerunner of the notion of general federation

Bio: Dr. Craig A. Lee has had a 31-year career at the Aerospace Corporation culminating as a Senior Scientist in the Engineering and Technology Group. He has worked in high-performance parallel and distributed computing this entire time. This led to Dr. Lee's involvement in the Open Grid Forum (OGF) where he served as President from 2007 to 2010. Dr. Lee served as the main liaison between OGF and the DMTF, SNIA, TMF, the Open Cloud Consortium, Cloud Security Alliance, OMG, and OASIS. Dr. Lee is now on the OGF Board of Directors and heavily involved with NIST, having contributed significantly to the NIST Cloud Standards Roadmap and supporting the NIST Cloud Technology Roadmap. He is currently serving as the chair of the NIST Cloud Federation Working Group. He has served on the program committee for many conferences and workshops, as a panelist for the NSF, NASA, DOE, and as an international evaluator for INRIA. He was on the editorial boards of Future Generation Computing Systems (Elsevier, 2004-2019) and the International Journal of Cloud Computing (Inderscience). Dr. Lee has published over 85 technical works, including four book chapters and seven edited volumes and issues. He holds a Ph.D. in Computer Science from the University of California, Irvine (1988).

Complete vitae available on request.

Selected Relevant Publications and Presentations:

- Lee, C., Robert Bohn and Martial Michel, *The NIST Cloud Federation Reference Architecture*, NIST SP 500-332, <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.500-332.pdf>, <https://doi.org/10.6028/NIST.SP.500-332>, February 2020.
- Lee, C.A., Federated Clouds Engineering Report, Open Geospatial Consortium, OGC 18-090r2, <http://docs.opengeospatial.org/per/18-090r2.html>, second revision, September, 2019.
- Lee, C.A., Z. Zhang, Y. Tu, A. Afanasyev and L. Zhang, Supporting Virtual Organizations Using Attribute-Based Encryption in Named Data Networking, Invited paper, *4th IEEE Conference on Collaboration and Internet Computing*, October 19, 2018.
- Lee, C., Marcio ASSIS, Luiz F. BITTENCOURT, Stefano NATIVI and Rafael TOLOSANA-CALASANZ, Big Iron, Big Data and Big Identity, Chapter in *New Frontiers in High Performance Computing and Big Data*, G. Fox, V. Getov, L. Grandinetti, G. Joubert, T. Sterling, eds., *Advances in Parallel Computing*, Vol. 30, pp. 139-160, IOS Press, Nov. 2017.
- Luiz F. Bittencourt, Rodrigo Calheiros, and Craig Lee, Guest Editors' Column: Middleware for Multicloud, *IEEE Cloud Computing*, July-August 2017.
- Lee, C., The Cloud Federation Session: Introduction, the Federation Management Design Space, the Current Federation Landscape, and KeyVOMS, *Intl. Adv. Research Workshop on High Performance Computing*, Cetraro, Italy, June 29, 2016.
- Lee, C. A., E. Dimpfl and S. Cathers, A Keystone-based General Federation Agent, *Fifth IEEE International Workshop on Cloud Computing Interclouds, Multiclouds, Federations, and Interoperability (Intercloud 2016)*, pp. 160-165, Berlin, Germany, April 4, 2016.
- Assis, M., Luiz F. Bittencourt, Rafael Tolosana-Calasan, and Craig Lee, Cloud Federations: requirements, taxonomy, and architectures, chapter in *Developing Interoperable and Federated Cloud Architecture*, Kecskemeti, Kertesz, Nemeth, eds., IGI-Global, pp. 1--42, April 2016, DOI10.4018/978-1-5225-0153-4.ch001.
- Lee, C., Virtual Organizations: A User-facing Abstraction for Managing Federation, Trust and Collaboration on a Global Scale, *IEEE/NSF/Internet2 Workshop on End-to-End Security and Trust in the Internet of Things*, Washington DC, Feb 4, 2016.
- Lee, C. A., Cloud Federation Management and Beyond: Requirements, Relevant Standards, and Gaps, *IEEE Cloud Computing*, v3n1, pp. 42--49, Jan-Feb 2016, doi:10.1109/ MCC.2016.15.
- Lee, C., Turn OpenStack into the Global Intercloud -- Now!, *OpenStack Design Summit*, <https://www.youtube.com/watch?v=KdQYwc0sUHo&feature=youtu.be>, Tokyo, Oct. 29, 2015.
- Lee, C., N. Desai and A. Brethorst, A Keystone-based Virtual Organization Management System, *6th IEEE CloudCom*, December 15-18, 2014.
- Lee, C., A Design Space Review for General Federation Management Using Keystone, *First IEEE Cloud Federation Management Workshop*, 7th IEEE Utility and Cloud Computing, December 8-11, 2014.
- Lee, C.A. and N. Desai, Approaches for Virtual Organization Support in OpenStack, *IEEE Third International Workshop on Cloud Computing Interclouds, Multiclouds, Federations, and Interoperability (Intercloud 2014)*, March 11, 2014.
- Chadwick, D.W., K. Siu, C. Lee, Y. Fouillat, D. Germonville, Adding Federated Identity Management to OpenStack, *Journal of Grid Computing*, V12n1, pp. 3-27, March 2014.
- Lee, C. A. and D. W. Chadwick. The Virtual Organization Concept for Authorization Management in Federated Clouds, The OpenStack Design Summit, Hong Kong, Nov. 8. 2013.