



# Center for Trustworthy Scientific Cyberinfrastructure Engagement Plan: Final Report for LIGO Engagement

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## About CTSC

The mission of the Center for Trustworthy Scientific Cyberinfrastructure (CTSC, [trustedci.org](http://trustedci.org)) is to improve the cybersecurity of NSF science and engineering projects, while allowing those projects to focus on their science endeavors. This mission is accomplished through one-on-one engagements with projects to solve their specific problems; broad education, outreach and training to raise the practice-of-security across the community; and looking for opportunities for improvement to bring in research to raise the state-of-practice.

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## 1 Introduction

The Center for Trustworthy Scientific Cyberinfrastructure (CTSC) engages with NSF-funded projects to address their cybersecurity challenges. This document presents the results of one such engagement with the Laser Interferometer Gravitational-Wave Observatory (LIGO), a large research project funded by the National Science Foundation. LIGO seeks to make the first direct detection of gravitational waves, use them to explore the fundamental physics of gravity, and develop the emerging field of gravitational wave science as a tool of astronomical discovery.

The primary goal of this engagement was to apply CTSC experience and expertise in leveraging SAML identify federations to support scientific projects to remove barriers for efficient international collaboration between LIGO and other astronomy and astrophysics projects by decreasing the effort required for LIGO to federate with those projects.

## 2 Background

The Laser Interferometer Gravitational-Wave Observatory (LIGO) is a large research project funded by the National Science Foundation. LIGO seeks to make the first direct detection of gravitational waves, use them to explore the fundamental physics of gravity, and develop the emerging field of gravitational wave science as a tool of astronomical discovery.

Through a cooperative agreement with NSF, the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT) jointly operate the LIGO Laboratory and its two observatories, one in Hanford, WA and one in Livingston, LA. The LIGO Scientific Collaboration is the international group of researchers carrying out the science of the LIGO Observatories as well as that of the GEO600 detector in Hannover, Germany. Today LIGO is a worldwide collaboration with more than 1000 members from across five continents.

Over the past few years LIGO invested significantly to develop a SAML-based single sign-on infrastructure. LIGO operates a Shibboleth Identity Provider (IdP) and provisions a LIGO electronic identity (branded as an “albert.einstein@LIGO.ORG” identity) for each collaboration member. The collaboration operates more than 50 Shibboleth service providers (SPs) that host a wide spectrum of services including wikis, document catalogs, event databases, and data investigation tools.

LIGO has planned from the beginning to leverage federated identities to address two primary use cases. First, although LIGO provisions an electronic identity for each collaboration member, many members have a pre-existing federated identity that could in principle be used to access LIGO SPs. By reducing the number and scope of provisioned LIGO identities the collaboration can decrease the burden of having to operate an IdP and the associated help desk services needed to assist users in managing a LIGO electronic identity. Second, the full impact of LIGO science can only be realized with close collaboration between LIGO scientists and astronomers and astrophysicists from other projects. Federated identity helps streamline collaboration between LIGO scientists and other researchers by enabling easier access to resources without the need for provisioning LIGO identities to external collaborators.

To facilitate leveraging federated identity and begin pursuing interoperability LIGO has joined the InCommon identity federation in the United States.

### 3 Report

We report the following summary results for the engagement addressing each of the specific goals in turn:

- *Documentation of the technical and policy challenges faced by LIGO during a peer-to-peer federation exercise to highlight the reasons that a series of peer-to-peer negotiations is not a scalable solution to international federation for LIGO.*

Documentation is provided in the document *A Study of Three Approaches to International Identity Federation for the LIGO Project*, available both in the LIGO Document Control (DCC) <sup>1</sup> and as a CTSC report<sup>2</sup>.

- *LIGO membership in the IDEM federation in anticipation of EGO joining IDEM in late 2014, and a written plan and roadmap for interoperability in late 2014 between the LIGO SAML infrastructure and that supporting Virgo users.*

A detailed discussion of the effort for LIGO to join the IDEM federation is discussed in *A Study of Three Approaches to International Identity Federation for the LIGO Project*.

The roadmap for interoperability in late 2014 between the LIGO SAML infrastructure and that supporting Virgo users is unavailable due to lack of participation and dialogue from the EGO staff charged with supporting identity management infrastructure for the Virgo project. The EGO staff indicated that due to a lack of available people resources and severe time constraints they were unable to participate, but did anticipate being ready to federate with LIGO in 2015.

- *Demonstrated prototype interoperability between the LIGO SAML infrastructure and that from the UK Access Management Federation for Education and Research as mediated by LIGO's membership in InCommon, rather than by LIGO joining the UK federation directly.*

The SAML SP supporting the primary LIGO collaboration wiki served at [wiki.ligo.org](http://wiki.ligo.org) has been federated with an IdP supporting Cardiff University users and LIGO collaboration members at Cardiff have accessed the wiki using their Cardiff identities. The LIGO SP is federated by consuming a prototype metadata feed prepared by InCommon volunteers that includes the Cardiff IdP. The LIGO IdP metadata is consumed by the Cardiff IdP via a prepared metadata aggregate feed that contains the LIGO IdP metadata from the InCommon primary metadata feed and that is prepared by the UK Access Management Federation for Education and Research in support of interfederation efforts in the UK.

LIGO did not join the UK federation nor directly insert metadata into the UK federation but instead leveraged its membership in InCommon to effect the metadata exchange.

- *An investigation and written report into the likelihood and possible timeline for federation with other entities in Europe via interfederation between InCommon and the eduGAIN identity federation in Europe.*

The report is available in InCommon Membership in eduGAIN: the LIGO Perspective, available both in the LIGO Document Control (DCC) <sup>3</sup> and as a CTSC report<sup>4</sup>.

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<sup>1</sup>[https://dcc.ligo.org/DocDB/0105/G1300686/001/CTSC\\_LIGOInterfederationReport.pdf](https://dcc.ligo.org/DocDB/0105/G1300686/001/CTSC_LIGOInterfederationReport.pdf)

<sup>2</sup><http://trustedci.org>

<sup>3</sup><https://dcc.ligo.org/LIGO-G1300767-v1>

<sup>4</sup><http://trustedci.org>

- *Assisting LIGO-India with development of federation use cases in support of the LIGO science mission, to be used as a driver for the continued development of a viable SAML identity federation in India, as well as assisting LIGO with training of LIGO-India staff on issues of federated identity management.*

In February 2013 Scott Koranda from CTSC and LIGO and Stuart Anderson from LIGO traveled to The Inter-University Centre for Astronomy and Astrophysics (IUCAA) in Pune, India for a three day meeting where they presented an introduction to and training on identity management for scientific organizations in general and for LIGO specifically, with an emphasis on SAML identity federations and interfederation. The training material developed by CTSC/LIGO for the visit is available online<sup>5</sup> and may be repurposed for use with other scientific organizations.

During the training event at IUCAA Yatrik Patel from the INFLIBNET Access Management Federation (INFED) presented an introduction to Indian SAML and federation efforts<sup>6</sup>. LIGO discussions on leveraging INFED to support LIGO-India have continued with particular interest in coordination between the Institute for Plasma Research (IPR) and the Raja Ramanna Centre for Advanced Technology (RRCAT) and INFED, since both IPR and RRCAT will take a lead role in the management of the LIGO-India project.

## 4 Conclusion

The CTSC-LIGO collaborative engagement made concrete progress toward enabling international identity federation for collaboration between LIGO and other astronomy and astrophysics projects, blazing a trail for use of identity federation in other international scientific collaborations. The joint CTSC-LIGO effort brought InCommon closer to joining the eduGAIN interfederation service and demonstrated prototype interoperability between a LIGO service and a UK identity provider. The effort also brought LIGO closer to interoperability with federations in India and Italy. Continued effort on interfederation by LIGO and InCommon is expected.

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<sup>5</sup><https://dcc.ligo.org/DocDB/0105/G1300690/001/IAMForScientificOrganizations-IUCCA-Feb2013.pptx>

<sup>6</sup><https://dcc.ligo.org/DocDB/0101/G1300106/001/INFED.pdf>