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Executive Summary

For 20 years, the Internet2 community has developed identity and trust programs and software to make it easier to offer and access services and collaborate. Each component was designed to address a community-identified gap in commonly available tools.

In 2015, the Trust and Identity in Education and Research (TIER) work was initiated to tie these separate components together and form an identity and access management platform that is easy to manage and install, and preconfigured to leverage InCommon and global federation. In short, TIER would add needed functionality while making things easier for operations.

To support this goal, the TIER project team set about to:

- Integrate the existing components to make them easier to connect and use.
- Package the components to reduce the time necessary to install and manage the software.
- Identify and integrate additional components to complete a full-featured identity and access management platform.

This report provides a short history of the TIER initiative, its accomplishments, some metrics and financial information. Accomplishments include:

- Reducing the installation and basic software configuration time from several hours to less than 10 minutes.
- Adding capability to provide access for end-users while also increasing security by removing access when appropriate.
- Providing the capability of managing access for guests, collaborators or third parties as well as students, faculty, and staff.
- Preconfiguring connections with global federations (adhering to community practices).
- Jump-starting a program to help organizations adopt the software and move to production faster, including training, documentation and consulting.
- Building enforcement of community metadata requirements into InCommon federation operations.
Activities and Details

To date there are over 100 TIER component packages actively being run in testing, production or training.

The Trust and Identity in Education and Research (TIER) work began in mid-2015 with extensive community workshops, gathering more than 100 common identity and access management challenges. Community members identified the major gaps and key requirements to be addressed, and formed working groups in four areas:

- Software architecture and integration requirements
- Exploring entity registries for maintaining identities
- Security recommendations
- Software packaging requirements to help streamline adoption

In early 2016, 49 higher education institutions committed to providing funding over three years to support the TIER effort (see Appendix A).

In October 2017 (at about the halfway point for the funding), community architects and developers met at the Internet2 Technology Exchange to evaluate the progress made thus far and to set priorities for the next 18 months.

At this point, 16 campuses had started implementing at least one of the TIER component packages. To increase adoption, the TIER investors agreed to allocate some funding to support a program to provide implementation assistance, training and consulting. Ten campuses joined the Campus Success Program, each with the goal of adopting at least one of the components. Most campuses either successfully adopted at least one component or made substantial progress towards that end. The program also provided valuable feedback on barriers to adoption and community needs for training and assistance.

To date, there are over 100 TIER component packages actively being run in testing, production or training.
Notable Accomplishments

• Packaging of the TIER software components in Docker containers and the development of a continuous development and integration pipeline resulting in:
  o Reduced automated build times to produce new containers from several hours to 15 minutes or less.
  o Improved the installation and basic configuration time for the components from potentially several hours to less than 10 minutes.
• Identifying of midPoint as an additional key software component to act as a registry and powerful provisioning/de-provisioning engine.
• Developing a continuous stream of demonstrations and presentations for key Internet2 and community meetings to share progress and viability with the community.
• Adding telemetry to the TIER packages (status and version installed) to help estimate adoption rates.
• Publishing the Grouper Deployment Guide to assist in the adoption and deployment of the Grouper enterprise access management software.
• Implementing the TIER Campus Success Program, a collaboration of 10 campuses working together to deploy one or more of the TIER components. Each campus also produced a case study to share with the community.
• Developing a graphical user interface for the Shibboleth Identity Provider software to eliminate some manual processes.
• Refactoring and streamlining the Federation Manager software for ease of use by site administrators and allowing for rapid approval of routine federation metadata changes.

Much of this work was accomplished through hours of community design, architecture, and best practices discussion.
2015

Completed three workshops to gather requirements from the 49 investors and other interested parties

- Engaged community architecture steering group called the TIER Ad Hoc Architecture Working Group
- 72 requirements prioritized from over 200 community use cases
- Identified specifications that were needed to drive development of the requirements
- Identified 4 key working groups to do the specification work
Detailed Milestones

2016

- Completed the final TIER Investor memos of understanding and in doing so, secured the 3-year funding for the program
- Chartered and constituted 4 key TIER Working Groups to drive specification work for Entity Registry, standardized Application Programming Interfaces (APIs) and Data Structures, a Security Framework and practices, and the Packaging of the software
- Conducted community survey about how TIER components should be packaged.

- Held the first TIER demonstrations at the Technical Exchange including a preview of the first TIER Production Candidate
- Held the second TIER F2F Developers and Working Group members meeting
- Released a TIER API for the Grouper component

Q1 2016
- Constitution of the TIER Community Investor Council to advise the project on behalf of the 49 investor institutions
- Published a “first-look” TIER release
- First formal TIER Roadmap presentation was held at Global Summit
- Held TIER F2F Developers and Working Group members meeting at Global Summit
- Began contracting consultants/companies to assist with the TIER development

Q2 2016
- Released the first TIER Production Candidate software
- Completed development of the TIER Production/Test Pipeline which is now capable of producing new short-cycle TIER releases with incremental component and feature updates
- Released the Preliminary Draft of the TIER Grouper Deployment Guide
- Launched a collaborative effort with the Big Ten Academic Alliance on Provisioning and De-provisioning
- Began developing requirements for the simplification in installing, configuring, and managing Shibboleth
Detailed Milestones

2017

- Streamlined the packaging of all 3 TIER components including reducing the automated build time to produce a new appliance from several hours or more to less than one hour
- Released the TIER Grouper Deployment Guide (draft version 1.0 release candidate 2017-03-17) for consultation by the Internet2 Trust and Identity community
- Developed the TIER Beacon instrumentation to collect reporting data concerning adoption and deployment
- Began native Docker container work to further streamline development and release efficiency for the TIER components

- Formally announced, reviewed proposals for and announced participants in the TIER Campus Success Program
- Released a formal proposal for a TIER Thin Registry as a baseline for campus adoption.
- Refined TIER container packaging and automated software builds including over 50 development releases

- Conducted a TIER mid-program survey to understand the TIER investor view of the program, with 36 out of 49 investors responding
- TIER Production Release 17040 was announced during the 2017 Global Summit. The most up-to-date versions of Shibboleth, Grouper, and CoManage as well as subsequent continuous updates introduced
- Released the TIER Grouper Deployment Guide Version 1.0
- Developed and tested a stand-alone Shibboleth IdP Docker Container
- Demonstrated an Internet2 IAM prototype using TIER and including TIER Beacon instrumentation to measure adoption
- Held the third TIER F2F Developers and Working Group members meeting at Global Summit

- Launched the TIER Campus Success Program with an informal face to face meeting at TechEx 2017
- Produced a phase one demonstration of a Graphical User Interface (GUI) for Shibboleth to simplify installation and configuration
- Formalized the adoption of a 4th TIER component (midPoint) as a provisioning engine and alternative Entity Registry
- Reviewed and refined the TIER Accomplishments Summary for the remaining project timeline via a fourth TIER F2F Developers and Working Group members meeting at TechEx 2017
2018

- The TIER Campus Success Program (CSP) participants continued regular bi-weekly sessions, began producing blogs and conducted a formal F2F planning meeting in February
- 21 Campus Success school representatives and community members attended a two-week, group-discounted midPoint entity registry training
- Produced Docker container specifications for all TIER component containers based on the CSP and other adopter feedback

Q1 2018

- The TIER Packaging WG produced a standard TIER Container Specification for any future component packaging
- Evolveum was engaged to develop a TIER-midpoint software container

Q2 2018

- 3 packed room Trust & Identity Showcase sessions on TIER were conducted at Global Summit including TIER Campus Success Institutions and TIER WG members working together to demonstrate use of the TIER components in real-world campus implementations
- Demonstrated the emerging TIER Shibboleth IdP Metadata Management User Interface to simplify IdP Operators managing metadata
- TIER software component containers were further refined with build times were reduced to less than 15 minutes

Q3 2018

- The TIER Packaging WG began planning around several fully integrated TIER Reference IAM packages that will include multiple components integrated in common patterns based on community input
- 10 Campus Success Program institutions presented My Year With TIER: Adoption Experiences with the IAM Software Suite at TechEx
- Work began for the transition of TIER to a sustainable roadmap of continued evolving requirements

Q4 2018
Financials

**TIER 2018 FUNDS FLOW SOURCES**

- One-time TIER Investor Funds, $993,600, 38%
- Internet2 Membership Dues earmarked for TIER, $1,650,000, 62%

**TIER 2018 FUNDS FLOW USES**

- 10% Shared Services Support, $239,972, 9%
- Salaries, $1,945,202, ...
- Office Support, $84,816, 3%
- Tech & Equipment, $102,278, 4%
- Professional Services, $176,521, 7%
- Travel, $67,008, 3%

Note that uses for Meetings, External Communications, Legal Fees, Network Operations, Interdepartmental Expenses and Depreciation totaled $27,804 and were less than 2%
Appendix A – Investor Institutions

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<thead>
<tr>
<th>Arizona State University</th>
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<td>Baylor University</td>
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<td>Boston University</td>
<td>University of Florida</td>
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<td>Caltech (California Institute of Technology)</td>
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<td>Carnegie Mellon University</td>
<td>University of Illinois – Urbana-Champaign</td>
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<td>Case Western Reserve University</td>
<td>University of Iowa</td>
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<tr>
<td>Clemson University</td>
<td>University of Maryland – Baltimore County</td>
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<tr>
<td>Cornell University</td>
<td>MIT (Massachusetts Institute of Technology)</td>
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<tr>
<td>Duke University</td>
<td>University of Maryland - College Park</td>
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<td>Harvard University</td>
<td>University of Miami</td>
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<td>Indiana University</td>
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<td>Lafayette College</td>
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<td>MIT (Massachusetts Institute of Technology)</td>
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<td>The Pennsylvania State University</td>
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<td>Purdue University - Main Campus</td>
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<td>Rice University</td>
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<td>Stanford University</td>
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<td>Tulane University</td>
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<td>University of California - Berkeley</td>
<td>Yale University</td>
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The following is a brief summary of many of the activities that occurred as key parts of the TIER work.

Twelve TIER Newsletters and 11 Trust and Identity community newsletters were published including TIER community updates along with 9 TIER quarterly reports.

Fifteen companies, contractors, independent consultants, and partners were engaged to assist with TIER development activities including: Evolveum, West Arete, Alfa Jango, Levevel.IO, Spherical Cow Group (Benn Oshrin, Scott Koranda, Tom Zeller), Unicon (Various), FasurTech (Vivek Sachdeva), Docker Inc., Duke University (Consent Development Team), University of Wisconsin (Keith Hazelton), University of Chicago (Tom Barton), Independent consultants: Chris Hyzer, Bert Bee-Lindgren, Marlena Erdos and David Walker.

Thirty-four external groups engaged with to provide them with knowledge and awareness of the TIER activities, integration with InCommon and the Federation, as well as the different ways to collaborate:

- AACRAO
- Amazon
- American Association of College Registrars and Admissions Officers
- American Association of Medical Colleges
- American Jesuit Colleges and University
- Carbon8
- Cisco
- Common Solutions Group
- Duquesne University
- EDUCAUSE organizational leadership
- Federated Cloud Workshop (OpenResearch Cloud)
- FIM4R
- GÉANT (eduGAIN and REFEDS and related working groups),
- General Services Administration (GSA),
- Global CEO Forum (representing the Shibboleth Board)
- Google
Appendix B - Metrics

- Identity Ecosystem Steering Group
- IMS
- International federation operators
- Internet2 Board
- Kantara
- MCNC
- National Institute of Standards and Technology (NIST)
- RA-21 Project Steering Committee
- Research University CIO Conclave (RUCC)
- Safe BIOPharma
- Shibboleth Consortium
- SIRTFI Working Group
- State of Wisconsin Department of Instruction
- SunCorridor Regional in Arizona
- US Government Agencies (GSA, NSF, NIH)
- The QUILT
- University of Arizona
- US Government Middleware And Grid Interagency Coordination Group (MAGIC)

More than 20 presentations and webinars were given including attending many conferences (excluding Internet2 Global Summit and Internet2 Technology Exchange conferences):

- AACRAO Technology Conference
- Chinese and American Networking Symposium (CANS)
- Conducted two international webinars representing the Shibboleth Board
- Four EDUCAUSE opportunities:
  - TIER Breakfast (115 attendees)
  - Trust and Identity BOF (25 attendees)
  - Trust and Identity poster session
  - and a podcast interview
- Held two IAM Online webinars
- KINBERcon
- MAX
- MCNC Community Day
- Microsoft
- New America
Appendix B - Metrics

- NSF Campus Cyberinfrastructure and InCommon Webinar held in January 2018
- NSF Transition to Practice workshop
- Pacific Northwest GigaPOP
- SC (Supercomputing) conference
- Scientific, Technical and Medical Publishers meeting
- The Quilt Regional Network meeting in February 2018
- Three international webinars (as part of the Shibboleth Consortium)
- TIER midPoint workshop prior to the March RUCC meeting in Denver, CO
- TNC
- Trust and identity breakfast at the EDUCAUSE Annual Conference and presented at track sessions
- US regional network leadership in Tempe, AZ
- Westnet CIO meeting
Appendix C – Internet2 Events

The Internet2 Global Summit and Internet2 Technology Exchange conferences were used as checkpoints to communicate both the progress and building momentum of the TIER work:

Global Summit 2016

- Trust and Identity in Research and Education (TIER) Initiative (Community Collaboration for the Next Decade)

TechEx 2016

- Federated Identity Management For Virtual Organizations
- Base CAMP: The Identity Landscape & Emerging Technologies
- Trust and Identity CAMP: Opening Keynote
- Grouper Provisioning: Locally & Cloud
- What’s New and What’s Next with TIER
- Trust and Identity CAMP: Closing Plenary
- Many ACAMP sessions specific to TIER
- TIER DevOps Environment - First View of New TIER Community Testing and Usability Platform
- A functional IAM infrastructure integrated into the Demo Workbench, including a cross-reference with the TIER Reference Architecture as one of many narrative use cases
- Consent-informed Attribute Release (CAR) service live demo
- IdMatch service and its integration into the Demo Workbench
- Preview of COmanage v1.1.0 including capabilities for loading external source records

Global Summit 2017

- TIER Stories from the Field: Harvesting Early Adopter Experiences
- TIER Roadmap: Working Together to Develop the Path
- (Demonstrations) TIER DevOps Environment - Fresh Presentations from the (Demonstrations) TIER Community Testing and Usability Platform
- Provisioning/De-Provisioning Commercial Apps & TIER
- Instrumentation included in the new TIER Release
Appendix C – Internet2 Events

The new Internet2 TIER Implementation for Community Collaboration (preview)

TechEx 2017

- In-Depth Theme: TIER: Moving the Community to Adoption and Production
- In-Depth Theme: DevOps: Continuous Integration and What it Means for IAM Service Delivery
- Many ACAMP sessions specific to TIER
- (Demonstrations) Enabling TIER Community Adoption using a DevOps Approach and the TIER Workbench
- TIER Provisioning/Deprovisioning Demo
- SOR to midPoint and midPoint to Resources Demo
- Internet2 COmanage Demo

Global Summit 2018

- Trust & Identity Showcase including CSP Institutions and TIER WG members
- T&I Showcase 1
- COmanage / Grouper implementation at Colorado State
- Banner TIER Connector Overview - Colorado School of Mines
- DevOps at the University of Illinois
- T&I Showcase 2
- Shibboleth UI/UX (Unicon)
- SOR to Registry / Identity On-Boarding, Credential management, architecture, and data flows (TIER WG)
- COmanage - midPoint Integration Architectures (SCG)
- T&I Showcase 3
- Provisioning Architecture and data flows (TIER WG)
- Provisioning and De-provisioning (TIER WG)
- TIER Packaging - Container overview and GitHub Repos (TIER WG)
- Trust and Identity at Internet2: Delivering Services and Software for Access and Collaboration
Appendix C – Internet2 Events

TechEx 2018

- midPoint as Entity Registry and Provisioning Engine
- My Year With TIER: Adoption Experiences with the IAM Software Suite: Part 1 (CSP Schools)
- My Year With TIER: Adoption Experiences with the IAM Software Suite: Part 2 (CSP Schools)
- Introducing the TIER ID Match Component
- Many ACAMP sessions specific to TIER