

GENI Clearinghouse and Portal

GEC 14

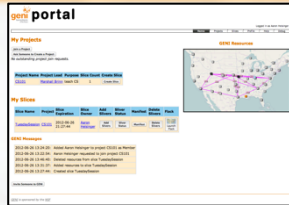
Aaron Helsinger, Tom Mitchell
July 10, 2012
www.geni.net

- Introducing the GENI Portal and Clearinghouse
- GENI Portal Preview
- Portal Architecture and Implementation
- GENI Clearinghouse Vision
- Clearinghouse Architecture and Implementation
- Discussion and Questions

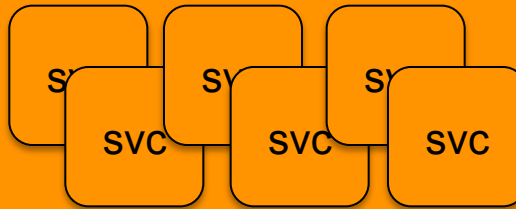
- At GEC13 the GENI Architecture Team adopted the GENI Software Architecture.
- Since then, the GPO has been building the GENI Clearinghouse based on that architecture.
- We have also built the GENI Portal
 - An entry to GENI for experimenters
 - A user interface to the GENI Clearinghouse services
- Our Goals
 - Portal: Make Easy Things Easy, Hard Things Possible
 - Clearinghouse: Enable the GENI Federation

GENI Federation

GENI
Portal



Clearinghouse



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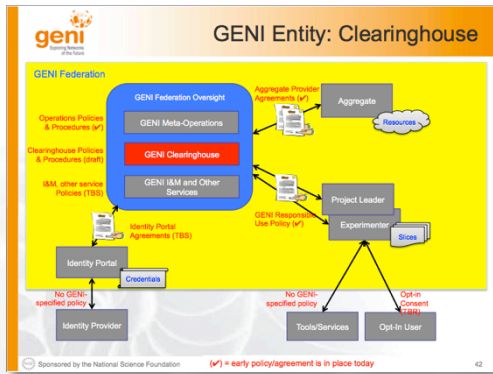
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Clearinghouse and Portal Evolution

Goals for GENI Clearinghouse and Portal:

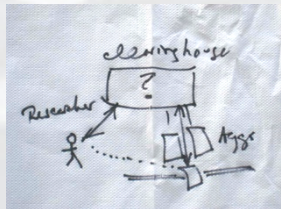
1. Leverage:
 - PG and PL strengths,
 - GENI experience,
 - Falk's GEC11 consensus,
 - The GENI Architecture.
2. Address Experimenter feedback:
 - Keys and certs are confusing, and
 - The GENI learning curve is steep.



GEC11: Federation Session Defined Clearinghouse

GEC14

GEC13: Software Architecture Defined Clearinghouse Services





GENI Federation
Software Architecture Document

Version 1.0 March 2012

GENI Architecture Team
Marshall Brinn and Rob Ricci, co-chairs

- Easy things easy, hard things possible
- The GENI on-ramp
- Leverage InCommon for single sign on authentication
- Integrate existing GENI tools
- Available to early adopters around GEC 15

It should be easy to start using GENI!



Use GENI

My Projects

[Join a Project](#)

[Ask Someone to Create a Project](#)

No outstanding project join requests.

Project Name	Project Lead	Purpose	Slice Count	Create Slice
CS101	Marshall Brinn	teach CS	1	Create Slice

My Slices

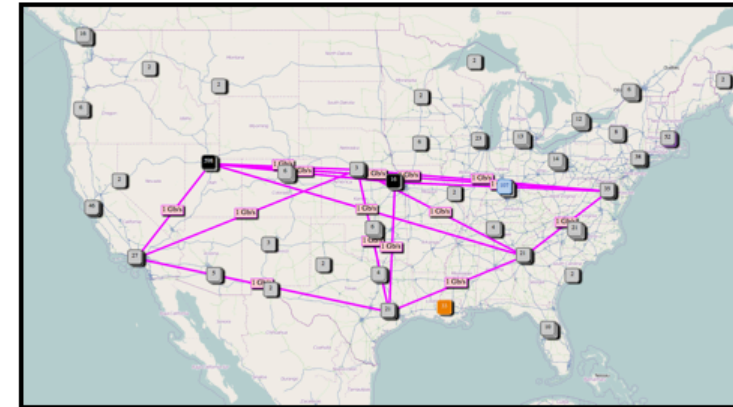
Slice Name	Project	Slice Expiration	Slice Owner	Add Slivers	Sliver Status	Manifest	Delete Slivers	Flack
TuesdaySession	CS101	2012-06-26 21:27:44	Aaron Helsinger	Add Slivers	Sliver Status	Manifest	Delete Slivers	Launch Flack

GENI Messages

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[Invite Someone to GENI](#)

GENI Resources



What you just saw...

- Portal provides a web front end to Clearinghouse services (PHP)
- Uses Shibboleth for single sign on authentication
- Provides key & cert management for experimenters
 - GENI AM API standard x509 certificates, SSH keys, ...
- Supports existing tools if desired (Flack, Omni, ...)
 - But Portal can do many basic operations
- Uses various account types
 - E.g. Project Lead (PI), Experimenter
- Portal is just another client – uses Clearinghouse and AM APIs
 - Recognized and trusted by the Clearinghouse
- Code will be available under standard GENI license

We have an ambitious development agenda...

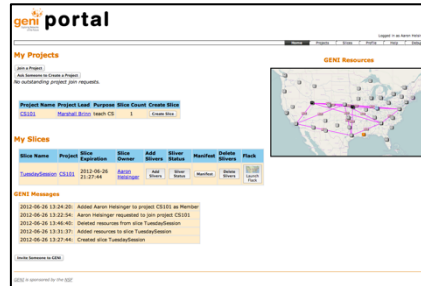
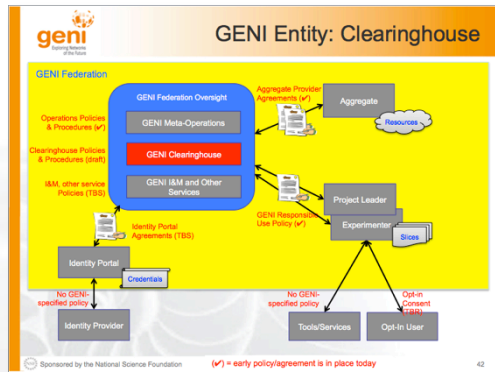
- Expand tool support or improve integration
- Make more things easy or easier
- Add bulk registration for classes/groups
- Improve management of groups (projects, slices, etc.)
- Support RSpec management and searching
- Include 'Lab Book' of slice or experiment logs, notes
- Allow historical slice searching, replication
- Use stitching services as they become available
- UI Design and layout improvements
- Context sensitive help

- Introducing the GENI Portal and Clearinghouse
- GENI Portal Preview
- Portal Architecture and Implementation
- **GENI Clearinghouse Vision**
- Clearinghouse Architecture and Implementation
- Discussion and Questions

What is the GENI Clearinghouse?

- Provides a common trust anchor
- Authorizes experimenters according to policy
- Responsible for creating projects and slices
- Logs transactions to support operations, policy enforcement
- Provides helper services
 - Stitching, resource discovery, etc.

The Clearinghouse we demoed here will become THE GENI Clearinghouse, implementing the GENI Software Architecture and enabling the GENI Federation.

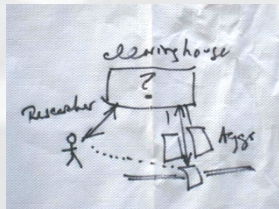


GEC14

GEC15: Portal and Clearinghouse Available to early adopters

GEC11: Federation Session Defined Clearinghouse

GEC13: Software Architecture Defined Clearinghouse Services



For GENI Experimenters

- One stop shopping for GENI resources
 - All resources available in one place
 - One account for all GENI resources
- Help tracking your active experiments and resources
- Historical record of past research
- Trusted listing of aggregates that have agreed to GENI policies
- GENI policies are applied uniformly for all researchers

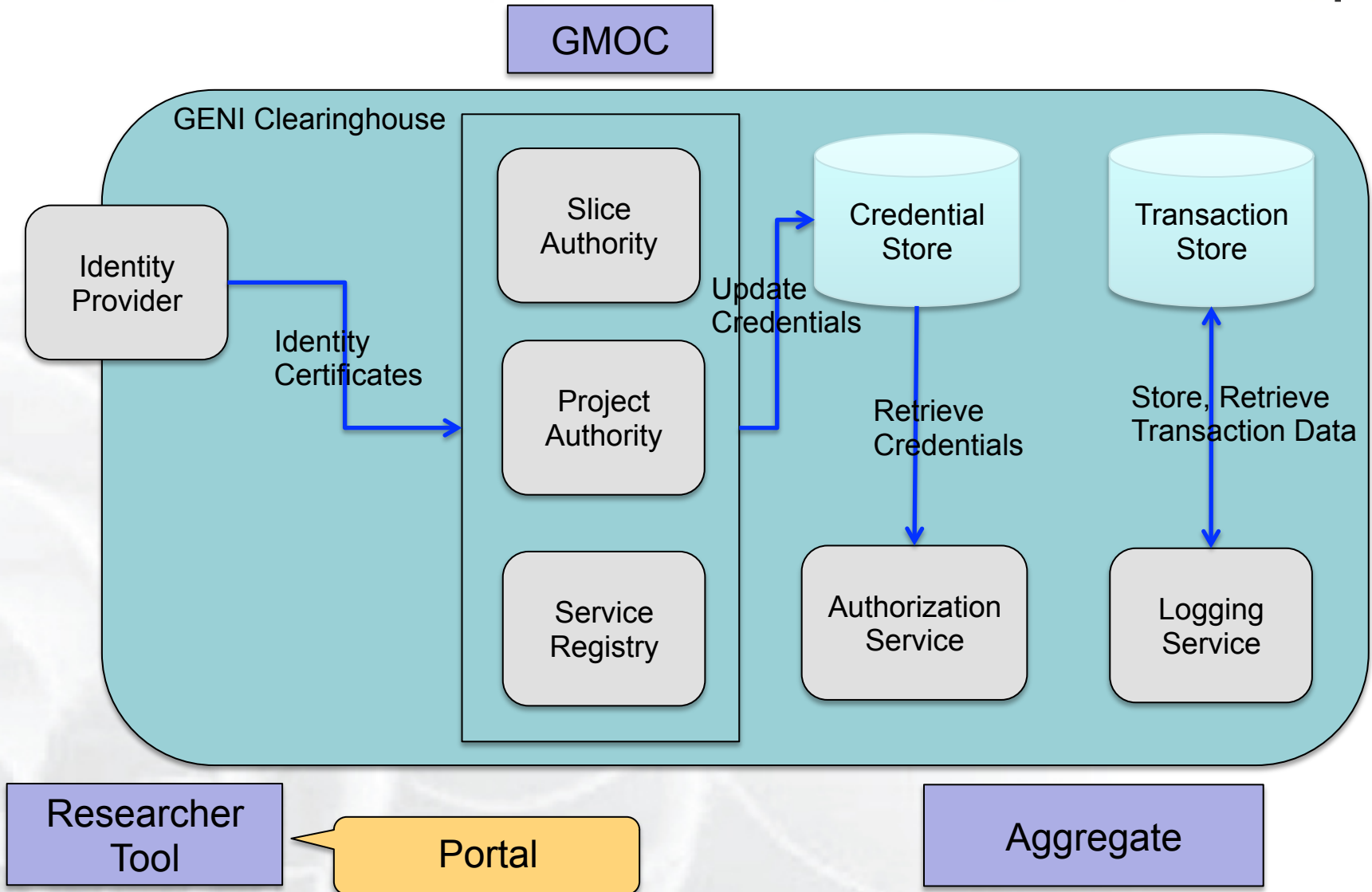
Clearinghouse Benefits continued

For GENI Operators

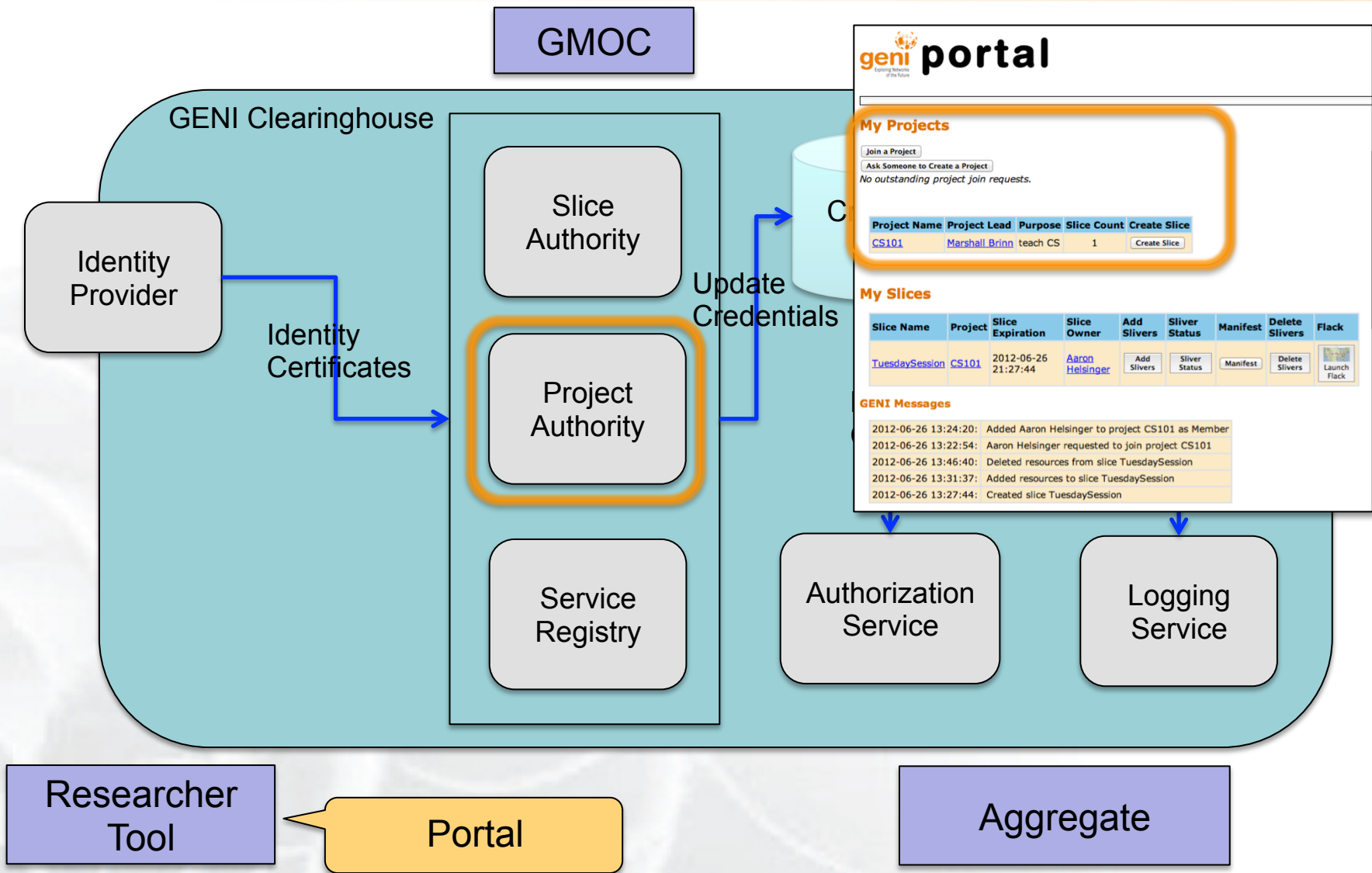
- Definitive source of information on GENI projects, slices, and experimenters
- Trusted experimenter authentication
- Common policies enforced to limit overuse of resources
- Authoritative logging and tracking of GENI resource use

- Clearinghouse stores experimenter/project/slice information
 - Just like PlanetLab and ProtoGENI control frameworks
- GMOC monitors and stores aggregate and resource utilization and live status information
- GMOC will use the Clearinghouse to identify slices and responsible experimenters when something goes wrong
- The Clearinghouse will use GMOC for live availability and status information

GENI Clearinghouse Schematic: Services and Internal Relationships



GENI Clearinghouse Schematic: Portal Calls CH Services



geni portal

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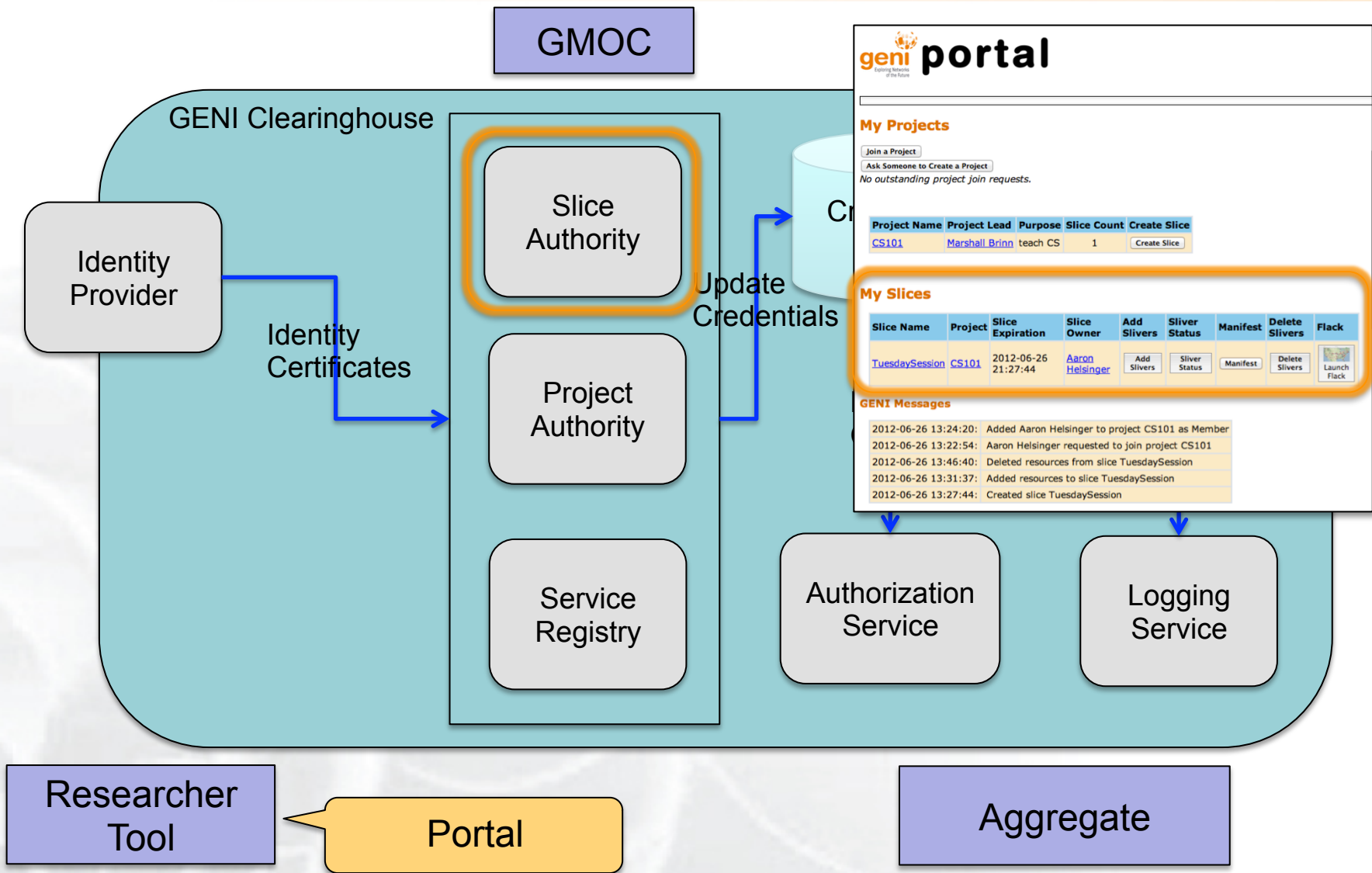
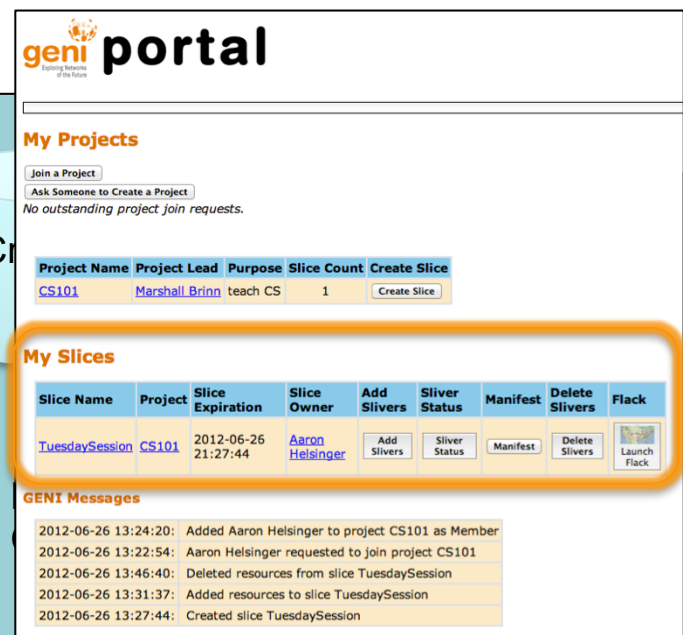
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GENI Clearinghouse Schematic: Portal Calls CH Services

geni portal

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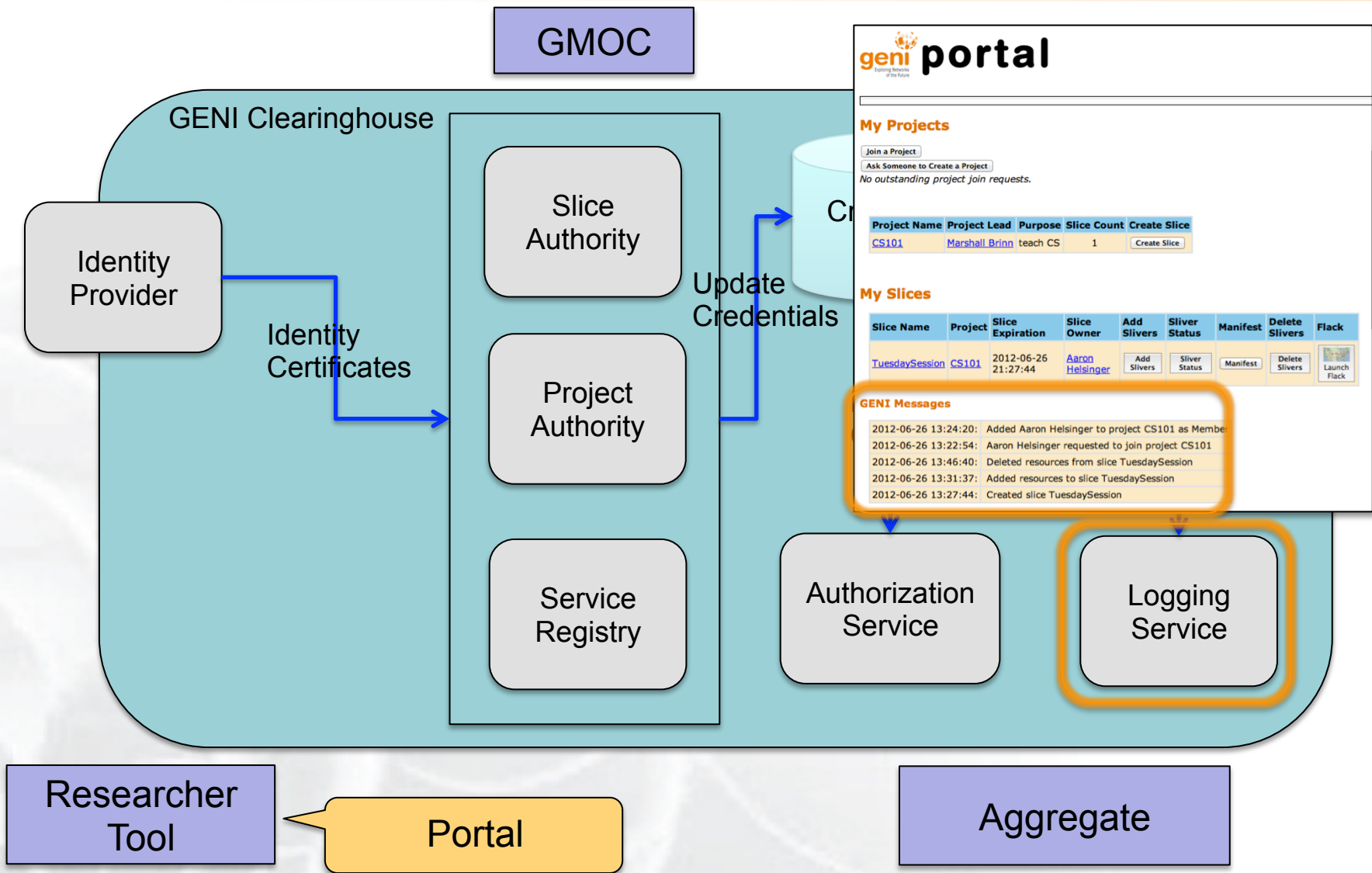
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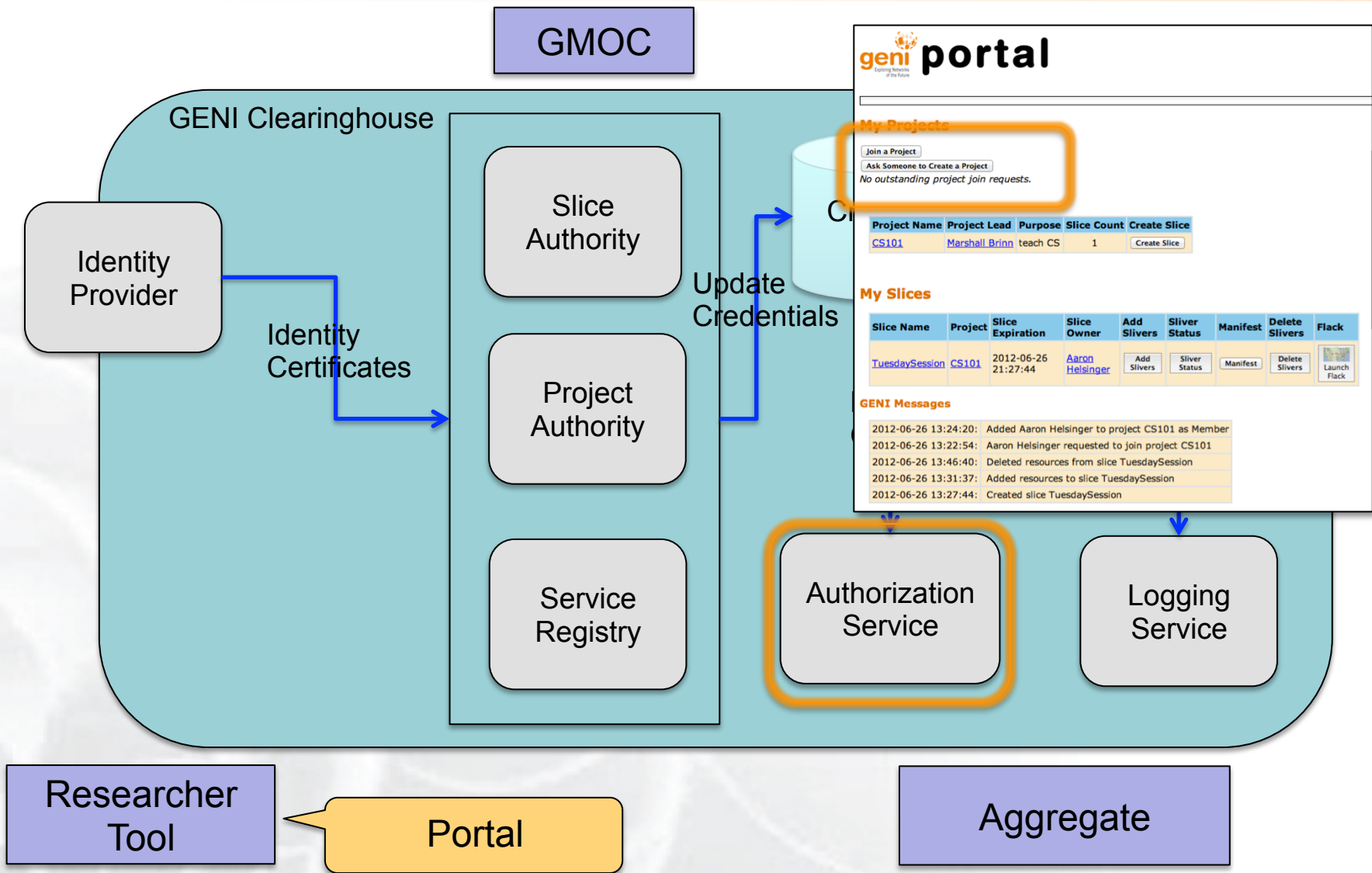
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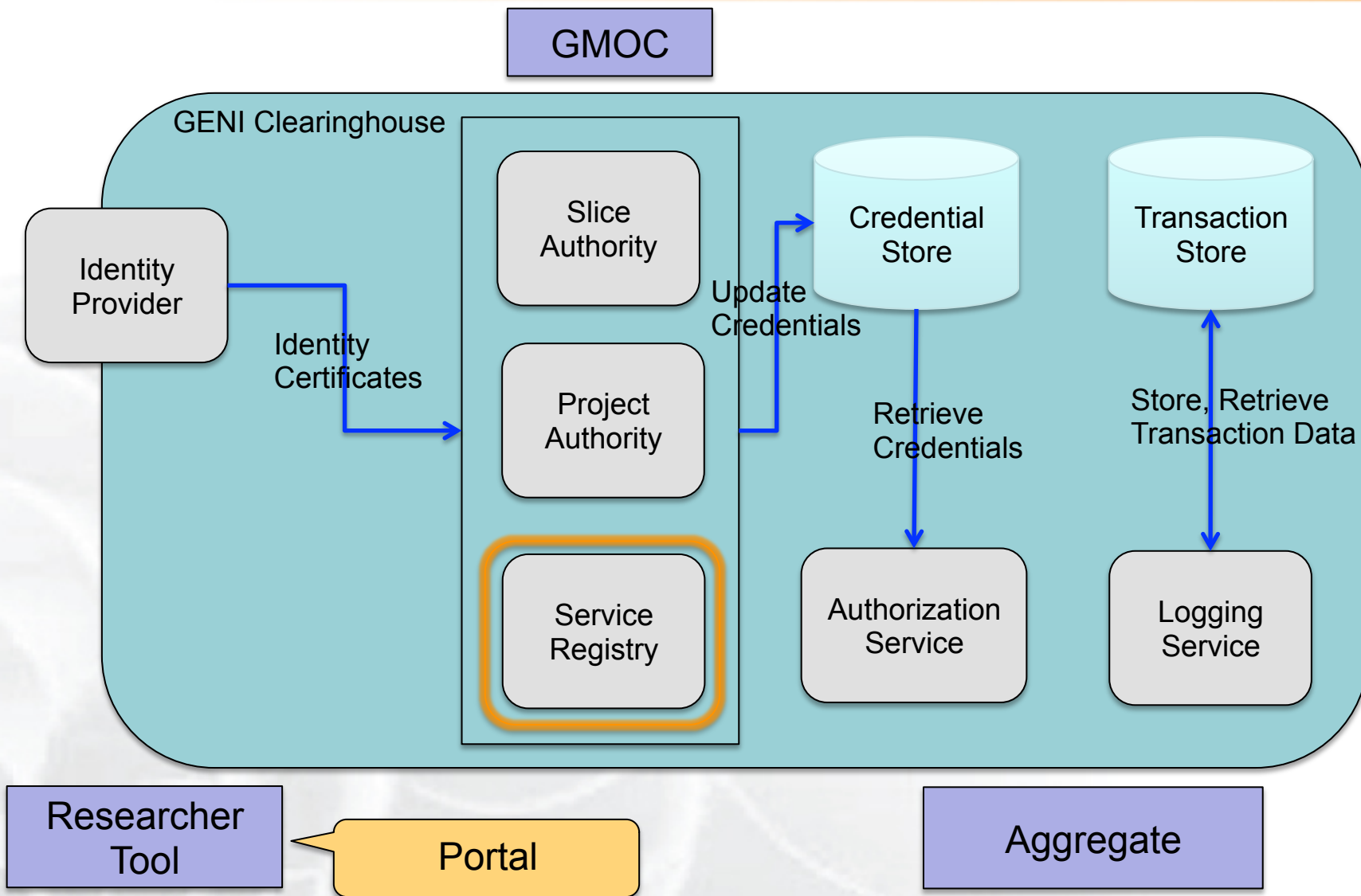
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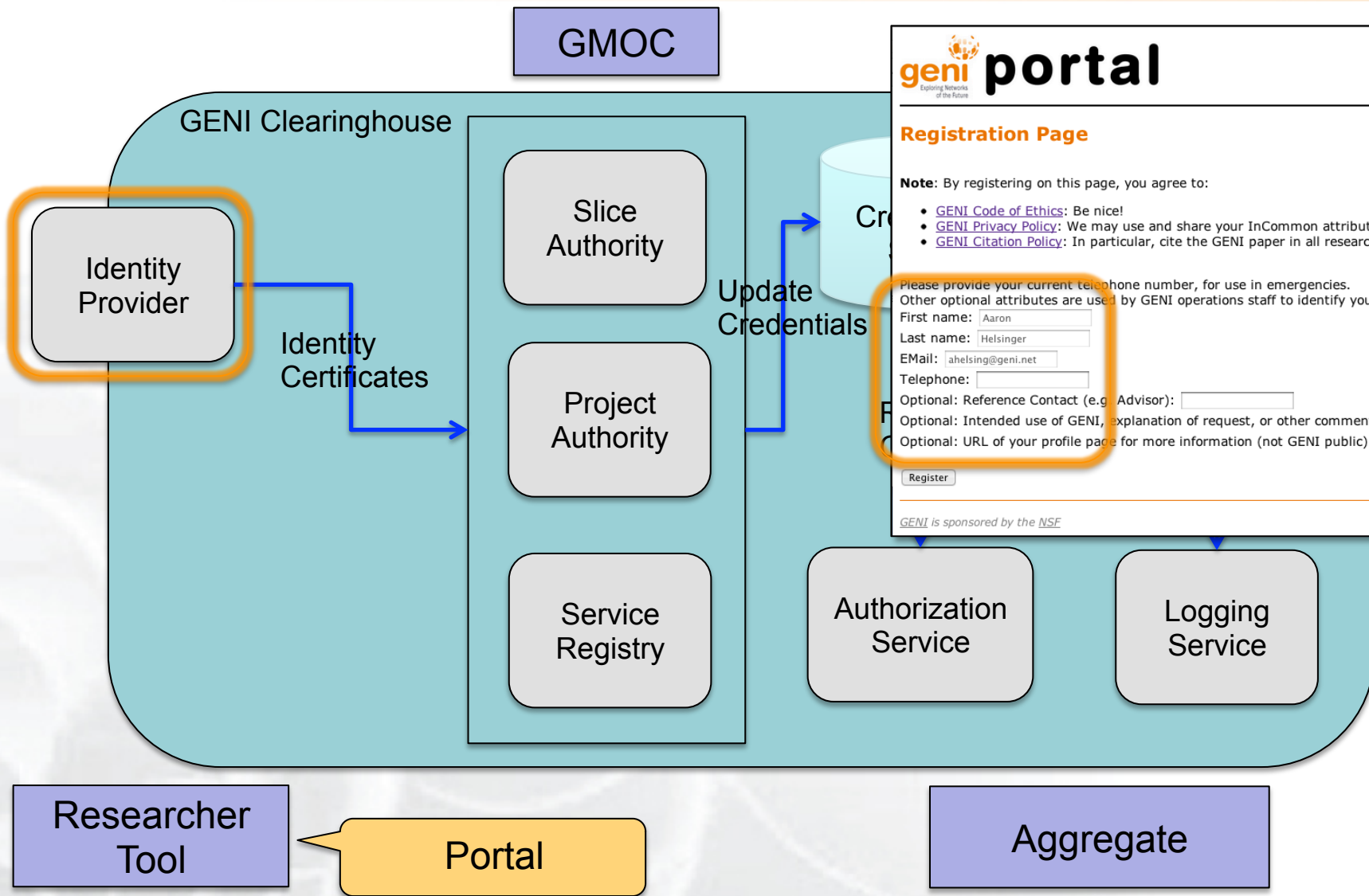
GENI Clearinghouse Schematic: Portal Calls CH Services



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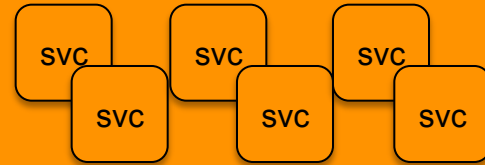


Bridging InCommon and GENI

The GENI Portal is a member of both federations

GENI Federation

Clearinghouse



InCommon Federation



GENI Portal

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The GENI Portal fulfills obligations to each federation

For GENI Developers

- Each Clearinghouse service is a separate web service
 - PHP / Apache, REST-like API, Distributable
- Clearinghouse services use a signed message API
 - S/MIME, Supports proxying, Provides audit trail
- Clearinghouse services are backed by a relational database
 - No internal sharing between services
 - Services use messages to communicate
- Clearinghouse services are singletons right now
 - There are affordances for multiples, but we haven't worked out the details

For GENI Developers

- Clearinghouse services find each other through the Service Registry
 - Dynamic discovery of peer services
- Each API call is authorized through a series of guards
 - Most use the Authorization Service / Credential Store
 - Can use other information as well (eg. resource counting)
- Optional AM proxy supports enforcing resource allocation policy (federation-wide)

Questions? Comments? Track us down, we're eager to talk.

- Active development through GEC 15
 - Still lots to do
 - Focus on *required* features
 - Improved Logging, Authorization, Error handling, etc.
- Support racks, testbed aggregates, etc.
- Roll out features based on demand
- Collaboration and Tools
 - Services use an open API
 - Code will be public under GENI license
 - We expect others will write tools that use this API
 - API documentation expected circa GEC15
- Beyond GEC 15
 - Stitching services? I & M services? Experiment database? RSpec library?

- Around GEC16 the GENI Clearinghouse will replace pgeni.gpolab for experimenter access and slice authority
 - Existing accounts will be migrated if possible
- ProtoGENI and PlanetLab accounts and slices will remain and will remain valid
 - Over time, some GENI aggregates may ONLY recognize GENI Clearinghouse accounts and slices
 - Many GENI aggregates will choose to recognize and trust additional member and slice authorities

- Federation can work in several ways
 - Identity Provider: A peer federation could provide an IdP to allow their experimenters to register for GENI accounts (like InCommon IdPs)
 - Slice Authority: A peer federation could implement a GENI-compatible Slice Authority, producing GENI compatible slice credentials, and/or accepting GENI user accounts and projects (and vice versa)
- There is mutual interest in federation with a variety of partners
 - Existing testbeds
 - International federations

- The Clearinghouse is the trust anchor for endorsing GENI experimenters, projects and slices.
- The Clearinghouse will be the canonical way to access GENI-controlled resources.
- The Clearinghouse will support GENI operations including emergency stop.
- The Clearinghouse enforces federation-wide policies.
- The Clearinghouse implements the GENI Software Architecture.
- The Clearinghouse is a set of services.
- Available to early adopters around GEC 15

Coming Soon!

- The GENI on-ramp
- Easy things easy, hard things possible
- Leverage InCommon for authentication
- Integrate existing GENI tools
- Available to early adopters around GEC 15

Coming Soon!

We're interested in hearing from experimenters willing to be early adopters.

It should be easy to start using GENI!

- Discussion
- Questions?

The End.

Questions and Comments always welcome!
Interested in being an early adopter? Contact us!
{ahelsing, tmitchel, sedwards, mbrinn}@geni.net

- Federation
 - Running an IdP
 - Multiple SAs
- Logging / Proxy
 - Proxy AM logging transactions, RSpecs
 - Resource Allocation Policy
 - Forensics
 - Support Operations

Clearinghouse Services		
CS	Credential Store	Stores authorization tokens and responds to authorization requests
SR	Service Registry	Stores Clearinghouse services and responds to information requests
MA	Member Authority	Manages experimenter and operator accounts and privileges
PA	Project Authority	Manages Projects and associated privileges
SA	Slice Authority	Manages Slices and associated privileges
Log	Logging Service	Stores and retrieves log messages
Other Services		
shibd	Shibboleth Auth	Provides Shibboleth authentication for Apache
PGCH	Flack API adapter	ProtoGENI <-> Clearinghouse adapter for Flack
Proxy AM	Aggregate Proxy	Monitors AM API requests and responses

Clearinghouse as Defined at GEC11

- The GENI Clearinghouse provides:
 - Uniform access to resources, both the ability to control and to view.
 - A set of services to manage a large federation.

The GENI federation is an NxM partnership of experimenters and aggregates that exists to make it easier for all to do research than would otherwise be possible.

The GENI Clearinghouse provides a trust anchor (e.g., CA) and supporting services enabling federation-wide policies and mechanisms to function.

The Clearinghouse (solely) creates projects, issues project leader credentials, and provides GENI endorsement to registered slices

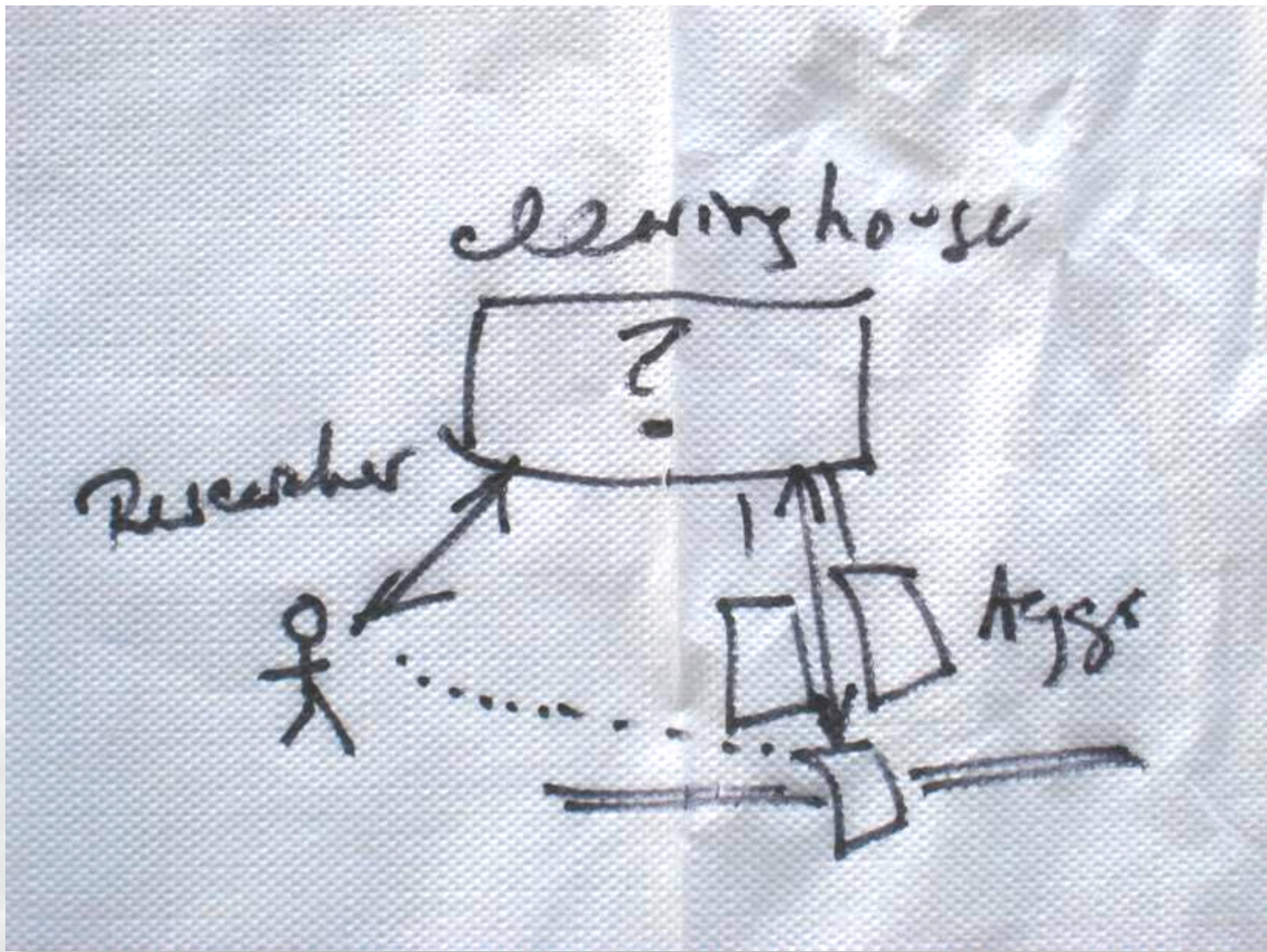
The Clearinghouse provides trustworthy services permitting aggregates to outsource some functions if they choose (e.g., transaction logging)

The Clearinghouse provides some other non-exclusive services which will help GENI function (e.g., stitching, discovery).

Aaron Falk, GEC11

- Leverage the strengths of existing Clearinghouses
 - ProtoGENI
 - PlanetLab
 - For example, projects contain slices
- Aaron Falk's Federation talk at GEC11
 - Defined the components of the GENI federation
 - Projects have a single responsible leader, and many slices.
- GENI Software Architecture as adopted at GEC13
 - Broke up the Clearinghouse into services, defined interfaces
- Experimenter feedback at GEC sessions and via email
 - Keys, certificates, and multiple passwords are confusing.
 - It is hard to get started using GENI; the learning curve is steep.

Original Clearinghouse Architecture



Chip Elliott @ GEC4

GENI Vision: An architecture-specific rendering

GENI is a *deeply programmable infrastructure suite* for performing computer science experimentation *at scale*.

Deeply Programmable: Allows programmatic configuration and control of all aspect of a computation network (computation, storage, communications)

Infrastructure suite: Provides transparent access to a federation of sliceable and shareable resources in custom topologies

At Scale: Allows support for extremely large, distributed experimental topologies, distributed across 100-200 campuses with realistic traffic loads or real traffic from users who 'opt in'

From Marshall Brinn's GEC13 Architecture talk

GENI Entity: Clearinghouse

From Aaron Falk's GEC11 Federation talk

GENI Federation

