Grouper Product Roadmap

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This roadmap sketches substantial and signal functional enhancements to Grouper, and to align at least some of them with future releases. It is (always!) a work in progress, subject to the considerations and requirements of participants in the Grouper Working Group. It is also a proposition: it represents the default plan that the Grouper core developers will attempt to implement.
Items that have fallen off of the roadmap appear further below with some explanation as to why.

See Grouper Versioning info here.

Release	Tentative date or time frame	Support	Notes
v1.6	Released June 2010	None	
v2.0	Released September 2011	None	
v2.1	Released March 2012	None	
v2.2	Released July 2014	None	
v2.3	Released April 2016	None	
v2.4	Released August 2018	None	
v2.5	Released April 2020	None	
v2.6	Released September 2021	None	Has both new provisioning and subject sources as well as old
v4	Released March 2023	Stable release	Is same as v2.6, but using semantic versioning
v5	Estimated October 2023	Stable release	Will only have new provisioners and subject sources (data fields) **These will go away in v5** Subject source adapters (unsure about future) Non-provisioning-framework provisioners googleapps-google-provisioner grouperAtlassianConnector grouper-aws-changelog grouper-azure grouper-box grouper-duo grouperKimConnector grouper-pspng grouper-remedy grouper-remedyDigitalMarketplace grouperScim grouper-shib grouper-tierApiAuthz grouper-tier-scim **These will still be in Grouper going forward** All provisioning framework connectors Custom change log consumers Messaging connectors grouper-messaging-activemq grouper-messaging-aws grouper-messaging-rabbitmq
6.0	Estimated Q1 2024	Not released	Stable version of v5
v7	Estimated Q1 2025	Not released	Will redo how data is stored in the database in order to make things faster and use fewer resources

So while the Grouper developers are coding v7 (fall 2022 to fall 2023) and supporting v2.6 and v5, the community can work on reconfiguring and upgrading to the new provisioners and subject sources.

Release	Item	Description

v5	Rules UI	Add a rules UI
v5	External system usage	Report on external systems to see where they are used
v5	Consolidate utils classes, make a translation utility on UI	JEXL translations have different utils classes in scope. These should be harmonized. Make a translation utility on UI to test various things... use GSH for this
v5	Grouper WS OpenAPI	Document the WS API with Swagger JSON. WS will host a "dynamic" and customizable WS API page. Explore client generation.
v5	Add more JEXL scripted group features	Add natural language, real time updates, friendly reference group names, visualization, self-documentation, diagnostics, attribute resolver, secure editing, renames, etc
v5	Implement centralized SQL batch sizes	See what the batch size is for each DB vendor and set a default which can be overridden. Adjust hardcoded batch sizes with these defaults
v5	External system documentation in wizard	For each external system document the specifics in the wizard
v5	Normalize UUIDs, add idIndexes	For core objects which do not have idIndex, add. Normalize UUIDs so they are lower case without dash.
v5	Upgrade libraries	JS libraries
v5	Remove unneeded externalized text	Remove admin and lite UI externalized text
v5	Remove legacy subject source configs	Only new subject source available
v7	Add bulk operations	Make bulk operations faster, e.g. creating or deleting a list of groups, adding or removing a list of memberships. Add bulk hooks
v7	Redesign Grouper DDL	Reduce size, improve efficiency, move to single purpose tables/structure. Simple integer foreign keys (sequence or auto increment). Simple integer enums. Compact core tables with external auxiliary tables.
v7	Performance diagnostics	Administrative function to measure and diagnose the performance of a deployment
v7	Cache redesign	Analyze and improve how Grouper caches objects in and out of Hibernate. Simply the subject API
v7	Rewrite Grouper wiki	Remove old docs and make sure missing docs are added

v9	Revisit Grouper service registry	Identify services in grouper. Make them easy to see, join, manage, document, attest, etc. https://docs.google.com/document/d/1zV2kuAKOwoBFIf4GIpiQt6-NFsVkdbYdagDjGcJ7efQ/edit
v9	Re-write Grouper WS	Either use SCIM or more targeted REST/JSON to streamline operations. Proxy from old to new so legacy clients are supported. New operations will not have SOAP or XML. SOAP jars will no longer be in Grouper (proxy to another shim project)
?	Selenium in UI to sanity test Grouper	Add selenium in UI so Grouper can be sanity tested on upgrade (or whenever)
?	Migrate Grouper git	For consistency, reporting, licensing reasons, Internet2 would like the Grouper git repo to be in its enterprise account instead of public git
?	Simplify UI	Make UI task oriented and easy to use for various types of users
?	Integrate connid	midpoint uses connid for provisioning. This is a standard. We would like Grouper to be able to load from and provision to connid connectors. We would also like to migrate our (non-pspng) connectors (e.g. duo, box, etc) to connid (if not there already) and share with midpoint.
?	Improve notifications	support people, groups, and email lists. Individual email addresses are problematic. Add ability to batch emails. Log emails (temporarily). User can control preferences. Notify configure on groups. Grouper email notifications
?	Curated groups	Add features to support Duke presentation https://meetings.internet2.edu/media/medialibrary/2019/12/05/20191211-mckee-paranoidiam_1.pdf
?	Membership constraints	Allow memberships to be able to be constrained for certain reasons, when those conditions are met, enable the membership, else disable. And keep the existing enabled/disabled dates if applicable
?	Installer in UI container	Move or allow parts of the "install container" to be in the UI container. This should allow servlets to load without any config, and walk through the setting up of the database and other things
?	GraphQL WS interface	Implement graphQL on web services
?	Custom Grouper types	Allow institution specific types to be added. Get requirements from community.
?	Daily report refactor	Refactor the Grouper "daily" report. make it a dashboard on UI. Keep calculations in attributes if they arent already there with instrumentation. See what features we can use from Michael Gettes dashboard. See what features from Chad Redman email on April 9, 2019 with his daily report features
?	Add group graph	Add group membership graph similar to "paranoid IAM" on group screen. See trends in membership via PIT
?	Changelog improvements	Allow change log consumers or message publishers to process messages before the single threaded "change log temp" processor completes. Or, not that change log temp is quicker, allow change log consumers to keep track of which messages they have processed so messages can be processed out of order
?	Register for notifications	Add ability for users to register to be notified of changes to specified objects. Note, there are rules to email users about changes to memberships
?	Provision lifecycle events	Events (such as admission, enrollment, new hire, etc.) must trigger lifecycle stage transitions, role changes, affiliation changes, etc. Those can then cause other events such as service eligibility. Lifecycle changes or affiliations all precipitate a need for provisioning wherein roles are mapped to services / entitlements.
?	Workflow state groups	The solution must support high level workflows between states. Group memberships transitioning among workflow state groups

?	Separation of duties	The solution must anticipate the possibility of conflicting roles in the case of multiple personae. Also allow overrides of separation of duties
?	Conflicting roles	The solutions must take into consideration that conflicting grants of authority, eg, one source indicating a grant of access and another a denial of access, must be resolvable according to the needs of each application or service context
?	Handle multiple roles	The solutions must enable individuals to have multiple roles/affiliations/relationships/whatever with the institution, each with its own lifecycle and overlapping set of access privileges needed to undertake each role. Statefulness (persistence and preservation of state) must permeate the design goals of all solution components in order to correctly and efficiently manage their access over the course of these multiple lifecycles
?	Min group membership size	In loader jobs and just on groups have min group sizes https://todos.internet2.edu/browse/GRP-2388
?	Rules on individual membership	An individual membership could have a rule that it is dependent on memberships in another group for example
?	Add remaining attribute/permission operations to WS	Add permission hierarchy services for roles, actions. Limits? Any other attribute permission services?
?	Add dropbox endpoint to provisioning	
?	UI warn, restrict, or schedule large operations	If adding a group to another group, maybe warn, restrict, notify user that the operation will take a while to provision. Or schedule this for later?
?	Copy entitlements to another user	Copy entitlements to another user. Optionally include start and end dates
?	Automatically clean various things	If a group is marked as a composite ad hoc list (and/or maybe includes / excludes), then if the membership is no longer relevant, then set an end date for some time in the future. Optionally notify. This applies to individual permissions as well. Automatically or manually clean up redundant privs (if assigned to group and individual). Automatically or manually clean up redundant memberships (group and individual)
?	Add high level help or how tos	For admins or users etc
?		Direct/indirect should show on policy group
?		Security model - documentation and UI opportunities - wizard?
?		Can application owners see reference group? via attributes
On-going	Update third party libraries	Update third party libraries to the latest version
On-going	Update training videos	Go through training videos and either keep, re-record, annotate, or delete. Identify new training videos to make

On-going	Grouper Core enhancement	Continue adding capabilities to meet requirements from the field.
On-going	Community contributions	Solicit and publicize community contributions of extensions and complements to Grouper.
Not yet assigned	More provisioning connectors	Add further connectors to reflect specified group, membership, role, and permission information into external systems and services. Include Google provisioning (from the Unicon contribution to the PSPNG)
Not yet assigned	Scaling REST webservice	A page in the Administration guide, Grouper always available web services and client, demonstrates one way to provide always available services using a specialized client. The CIFER REST web service will need the server-side capability to provide that always-available functionality. In addition the REST API should be able to access multiple, read-only caches so it can efficiently handle any increase in query requests, most of which will not need to directly access the primary database. PSPNG should be able to provision to a database table, and WS should be able to read from that table (or tables) for simple operations.

Whatever happened to ... ?

A brief explanation of why some things seem to have disappeared from earlier versions of this roadmap.

What Happened?	Item	Description
v4 (DONE)	Improve grouper startup time	Grouper takes a while to startup in webapp or gsh command line. Reduced (batched) number of queries
v5 (DONE)	Upgrade libraries	Upgrade java (17), jars,
v4 (DONE)	Remove jsonlib	Migrate to jackson
v5 (DONE)	Add Grouper data field system	Manage user attributes and identifiers differently than the legacy subject source system
v5 (DONE)	Single process container	Only run Tomcat in container, not TomEE, Apache, ShibSP
v5 (DONE)	Remove pspng and legacy provisioners	Only new provisioning framework, change log consumers, ESB consumers (including messaging) available
v5 (DONE)	Evaluate which upstream linux container should be used	Rocky linux
v4 (DONE)	GSH loader	Allow a loader to be a GSH script to load groups and memberships (like SQL)
v4 (DONE)	Unicon authn	Add Unicon authn in container which implements SAML in java (and other things, CAS, etc)
v2.6 (DONE)	Add remedy provisioners	
v2.6 (DONE)	Box provisioner	
v2.6 (DONE)	Rewrite Grouper SCIM server	Replace the current J2EE SCIM server to only need tomcat
v2.6 (DONE)	Support JSON in grouper client	grouper client currently does XML but should do JSON (by default with option to switch back)

v2.6 (DONE)	Add OIDC UI authn	OIDC UI
v2.6 (DONE)	Streamline provisioning configuration	Make it easier to configure before more people start using it (v2.6 change). There would be an upgrade instruction to run a script to help you transition (including script configs). e.g. CRUD and validation. Change docs/tests.
v2.6 (DONE)	Add provisioning loaders for non generic provisioners	Add loader for provisioners (not SQL or LDAP) like Duo or Zoom
v2.6 (DONE)	Group attributes on edit screen	Have some configured group attributes on the group edit screen
v2.6 (DONE)	Add provisioning config scaffolding	Add scaffolding for provisioning configs to generate a starting point
v2.6 (DONE)	Add OSGI to Grouper	Add strategy to have plugins on their own classpath
v2.6 (DONE)	Entity global attribute resolver	Define a SQL or LDAP generic entity resolver which can be used in Grouper features like ABAC or provisioning
v2.6 (DONE)	ABAC JEXL scripted groups	JEXL based access policies based on memberships or attributes
v2.6 (DONE)	Improve folder security performance	Might need an extra table to hold part of the folder security decision
v2.6 (DONE)	Finalize LDAP provisioner	
v2.6 (DONE)	Add Google provisioner	
v2.6 (DONE)	Finish provisioning diagnostics	
v2.6 (DONE)	Finalize Azure provisoiner	
v2.6 (DONE)	Add SQL provisioner	
v2.6 (DONE)	Add box provisioner	
v2.6 (DONE)	Add Duo role provisioner	Admin roles
v2.6 (DONE)	Add WS authn options	Trusted JWT WS, self-service JWT WS, OIDC WS
v2.5 (DONE)	Add database columns	Add database columns for group expiry (membership expiry already exists), and membership notes (maybe an attribute instead). Anything else for point-in-time? "visible" flag for UI for groups. password table for revamped WS authn. Service account subject source table? provisioning status. provisioning group status? log table? email batching? config PIT table

v2.5 (DONE)	Revise build environment and dependency retrieval	Revising code environment to get rid of dependencies and the hybrid builds (Maven and ant builds, hard to keep everything in sync) Possible options: 1. Ivy: keep existing ant scripts and use Ivy for dependency retrieval 2. Maven: Remove ant build script and let maven drive both the build and dependency retrieval. (create various profiles for each env) 3. Gradle: Remove ant/maven build scripts. Use groovy scripts to retrieve dependencies and drive the build Need to figure out versions for each dependency.
v2.5 (DONE)	Real time message based provisioning	Allow messaging to take events to provision new netIds (pspng)
v2.5 (DONE)	Add unicon azure integration to grouper	Add the unicon azure integration to grouper. https://github.com/Unicon/office365-and-azure-ad-grouper-provisioner
v2.5 (DONE)	GSH templates	Look at how the community uses GSH and move those needs into the UI
v2.5 (DONE)	Subject source adapter configuration wizard	Have grouper subject source adaptor configuration in the UI like the loader config. Explore including Midpoint and Comanage if useful
v2.5 (DONE)	LDAP provisioning	Improve PSPNG so it is more performant and accurate.
v2.5 (DONE)	Provisioning in UI	Add UI elements to troubleshoot and monitor provisioning.
v2.5 (DONE)	Daemon configuration	UI elements to add/edit/remove Grouper daemons including configuration specific to each type of daemon
v2.5 (DONE)	External systems wizards	Wizards to guide administrators through configuring, managing, testing external systems. External systems and things Grouper connects to and generally have endpoints, credentials, and settings.
v2.5 (DONE)	Provisioning configuration wizard	UI screens to configure a provisioner and assign provisioning to folders and groups
v2.5 (DONE)	Provisioning controls on grouper objects	Screens on folders, groups, memberships, and subject to view, troubleshoot, and fix provisioning. Reports of activity, errors, etc.
v2.5 (DONE)	Gantt chart for jobs	See when jobs have executed, job overlap, how long jobs take, success or error
v2.5 (DONE)	Update WS /UI authn	Basic authn in database. Passwordless WS authn in future
v2.5 (DONE)	Grouper installer installs container	REMOVED
v2.5 (DONE)	Container redesign	One servlet container, easier mounts, one directory structure, fewer processes, maven build, patchless
v2.4 patch (DONE)	attributes on memberships	allow direct and indirect attributes on memberships in UI
v2.5 (DONE)	Require container	Grouper requires a container to run. No tarballs will be distributed. The grouper installer will install the container easily
v2.5 (DONE)	Expire dates on groups	GRP-849: add enable/disable dates on groups like memberships and permisisons
v2.4 patch (DONE)	Custom join /leave /analyze UI	Simple custom join/leave UI, also analyze access

v2.5 (DONE)	Improve pagination in WS	Cursor based paging
v2.5 (DONE)	Add some web services	Add GRP-2153: Add audit log functions to the Web Service Add point in time options for WS get members, get groups, group save, get memberships
v2.4 patch (DONE)	Screens to show attribute assignments from attribute def (name)	GRP-2302: create screen to show attribute assignments from an attribute def GRP-2303: create screen to show attribute assignments from an attribute def name
v2.4 patch (DONE)	Allow configuration to be stored in database	Allow configuration to be stored in the database so common configuration is shared among all JVMs. Of course some configuration wouldnt be eligible for this (e.g. database connection information, passwords, etc)
v2.4 patch (DONE)	Templates	Templates can create multiple folders / groups / privileges / etc at once based on a wizard UI. Built in template for a service/application, and TIER Grouper Deployment Guide structure
v2.4 patch (DONE)	Real time message based loading LDAP by person	Allow messaging to take events to update a user in loader jobs (ldap)
v2.4 patch (DONE)	Disable loader jobs	Add ability to disable loader jobs
v2.4 patch (DONE)	Provisioning in UI	Manage and which folders and groups get provisioned in the UI
v2.4 patch (DONE)	Improve performance	Look at recent Grouper performance issues and make improvements
v2.4 patch (DONE)	Tag Grouper Types	Add ability to tag Reference / Basis / Authorization groups. Show this information to describe access policy
v2.4 patch (DONE)	Visualizing Grouper	Allow the ability to show a visual graph representation of group, privilege, and permission relationships
v2.4 patch (DONE)	Membership reports	See which users in a group or a folder of groups are not active. Add other attributes. Download reports. Schedule reports.
v2.4 patch (DONE)	Membership approvals	Add simple workflow (approval) for an OPTIN or UPDATE operation on a group
v2.4 patch (DONE)	Show disabled memberships	Show disabled memberships and privileges on demand and allow the user to configure enabled/disabled dates in more flexible way
v2.4 patch (DONE)	USDU expiration dates	Allow USDU to clean up unresolvable subjects that have been unresolvable for X days
Completed in v2.3	Provision to BMC Remedy	Provision memberships into remedy and digital marketplace
Completed in v2.3 patch	Deprovisioning	User interface to manage deprovisioning of subjects https://spaces.at.internet2.edu/x/ZQlhBg
Completed in v2.4	Finish the new UI, replace admin and lite UI	Add features into the new Grouper v2.2 UI so that everything from the admin UI and the lite UI can be performed in the new UI. Remove the admin and lite UIs (redirect outdated links). Add user based auditing and overall auditing. Add new features like the ability to easily configure "rules" in the UI
Completed in v2.3	Require Java8, Tomcat8	Standardize and require java8
Completed in v2.3	Add new messaging strategies	Add new messaging strategies in the Grouper Messaging system for ActiveMQ, AMQP (e.g. RabbitMQ), AWS
Completed in v2.3	Attestation	Groups and folders can be marked to require periodic membership review. Reminders will be emailed to group owners

Completed in v2.3	TIER API in installer	The TIER API Tomee service is installed with the grouper installer
Completed in v2.3	Grouper loader in UI	User interface to show loader configuration, diagnostics, logs, wizard editor
Completed in v2.3	Subject source diagnostics in UI	User interface to analyze, diagnose, and recommend improvements for subject source configuration
Completed in v2.3	Harmonize configuration	Convert sources.xml and ehcache.xml to be cascaded properties files
Completed in v2.3	Grouper loader real time updates	Allow a change log table (SQL triggers) or messages to trigger loader updates for a partial population or single user
Completed in v2.3	Grouper instrumentation	Improve and standardize Grouper logging to provide centralized metrics at an institution and the ability to upload stats to a central Internet2 server • Around Dec 2016, make the patch default to on • Add features: Number of loader jobs, Hourly stats of number of users (UI/WS) [rate information not just count], Collect configuration (non sensitive), Performance (e.g. threadcount of loader jobs, heap size), Operations per time period for pspng / ldap server, how many messages, Subject source type • UI so administrators can see local stats
Completed in v2.3	TIER packaging for v2.4	In the TIER packaging for Grouper, create Grouper docker container, integrate Grouper with Shibboleth, configure PSPNG, configure user registration with COmanage
Completed in v2.3	UI accessibility	Incorporate recommendations from Colorado UI accessibility review
Completed in v2.3	Improve GSH	Improve gsh by adding readline like capabilities (line editing, tab completions, history, etc). Use groovysh instead of beanshell.
Completed in v2.3	Inbound messages	Allow Grouper to read a message queue and act on messages (e.g. membership changes etc)
Completed in v2.3	Update third party dependencies	Update third party dependncies and have strategy to easily do this on each release. Document which libraries are used and licenses.
Completed in v2.3	upgrade vt-ldap	to ldaptive (PSPNG to use ldaptive). Use adaptor
Completed in v2.2	Unix GID management	Built-in support for managing unix GIDs by assigning a numeric ID to each group and folder.
Completed in v2.2	Legacy attribute migration	Migrate from legacy attributes to the new attribute framework in a transparent way. The old API and WS and UI should still work correctly. Plan to migrate lists and hooks as well.
Completed in v2.2	COmanage integration	Work cooperatively with the COmanage project to integrate Grouper within COmanage. Integer group ID's, WS operation tweaks
Completed in v2.2	Subject security realms	Differently users might have different privacy requirements for the Subject API. Security by realm is implemented in the JDBC2 source adapter. Callers pass in which "realm" the search should take place in, and the source can adjust how the search takes place, what attributes look like, etc.
Completed in v2.2	Grouper user data	Store information about a user in grouper in a generic way. e.g. recently used objects. favorites, etc.
Completed in v2.1	GrouperWS high availability	In-built load-balancing to enable highly available read-only access to the Groups Registry via web services.
Completed in v1.6-v2.1	PSP, formerly Ldappc NG	Complete work on the new provisioning connector, built from the Shibboleth Attribute Resolver and SPML components. Integrate with Grouper notifications for asynchronous, incremental updating in addition to periodic batch style updating. Includes specific support for Active Directory. Package a Shibboleth DataConnector for Grouper. Real-time and incremental provisioning will be added in v2.1. Consider adding an SPML input to grouper capability.

Completed in v2.1	Dynamic group membership	Dynamically maintain groups and memberships based on LDAP-resident attributes.
Completed in v2.0	Point in Time Audit	Query the state of the groups registry at a prior point in time.
Completed in v2.0	Rules	Declarative triggers that perform changes to the Grouper Registry.
Completed in v2.0	Federated group membership and privileges	Built-in support for memberships and Grouper privileges to be assigned to federated identities.
Completed in v2.0	Federated group management	Enable groups from autonomous Grouper instances to be referenced by and incorporated into another Grouper instance.
Completed in v2.0	PDP	The Grouper permissions web service takes into account allow/disallow and limits to give the decision of access back to the requestor
Completed in v2.0	Lite UI enhancement	Support easier to use end-user UI components in addition to the existing administrative UI. Initial component, for managing membership of a single group, is in v1.5. In v2.0, add simple management of attributes, roles, and permissions.
Completed in v2.0	Integrate with VOOT	Integrate Grouper with VOOT (group protocol for cloud webapps), experimental...
Completed in v1.6-v2.1+	Notification of changes	In v1.6, build on the initial implementation of incremental group, membership, and folder (or namespace) change notifications in v1.5 to provide notification based on flattened group membership to more efficiently enable relying parties to maintain membership lists. Also in v1.6, partner with a deployment using an asynchronous messaging infrastructure (perhaps an ESB) to drive enhancement of the toolkit for that style of data integration. For v2.0, add flattened membership notification. Somewhere along the line, add ability for users to register to be notified of changes to specified objects.
Completed in v1.6	Attribute framework	Complement the existing ad hoc attribute on groups with the ability to define and associate attributes of various types to groups, memberships, and folders. Initial release was in v1.5, comprising marker attributes. Additional attribute types in v1.6. Expose attribute framework suitably through web services interfaces in v1.6.
Completed in v1.6	Kuali Identity Management integration	A connector that enables Kuali Rice to delegate group management to Grouper.
Completed in v 1.6	Subject Web Service	Expose Subject API methods suitably via Grouper Web Services so that clients don't have to build their own way to reference Subjects.
Completed in v 1.6	External workflow integration	Integrate Grouper with Kuali Enterprise Workflow (v1.6), and maybe other implementations.
Completed in v1.5	Namespace Transition Support	The hierarchy of folders (or naming stems) in a deployment will change over time. This supports the ability to logically move or copy a group, a selection of groups, or a folder from one folder to another. This complements the capability of the XML Import/Export tool for prune & graft operations for large scale changes.
Completed in v1.5	User Audit	Report on who took which administrative action when.
Completed in v1.4	Extension hooks	Implement infrastructure within the Grouper API to enable independent extension of key internal events. Pre- and post-processing hooks will be provided for each "primitive API operation". This would make certain other tasks more feasible, notably "Notification of changes" in this roadmap and incorporation of a site's business rules.
Completed in v1.4	Enhance Web Services	Solidify the experimental Web Services support released in 1.3.0 based on field experience.
The issue has been resolved with improved Grouper configuration and the cessation of the Signet project.	Configuration and binding framework for I2MI	Identify and implement a framework in which combinations of I2MI components (currently Grouper API, Grouper UI, Grouper Web Services, Signet API, Signet UI, Ldappc, and Subject source adapters) can be easily integrated (not just in a single JVM). This is largely an issue of managing configuration and 3rd party libraries. The Spring application framework is an example of what might be used to address this need.
This was overtaken by the "Enhance Web Services" item in the roadmap.	Web service interface facades	Determine which subsets of native API capabilities should be exposed through more focused end points to facilitate access by applications to Grouper- and Signet-provided access management capabilities. Also investigate how facades may be used to manage access to underlying group and privilege management and query capabilities.

Not yet assigned	Further KIM-Grouper integration	Refine the Kuali KIM services interfaces and extend existing integration beyond group-level into roles & permissions.
Not yet assigned	Further uPortal-Grouper integration	Complete Phase II deliverables. Time frame for Phase III deliverables still to be determined in concert with uPortal team.
Not yet assigned	Security plugins	Spring security, Shiro, .NET plugins for Grouper WS that might be able to be distributed with the plugin itself. Initial proof-of-concept code available: https://spaces.at.internet2.edu/display/Grouper/Unicon+Grouper+Contributions.