

# XSEDE Campus Bridging Use Cases

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## A. Document History

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<b>Entire Document</b>	1.4	5/09/2012	Formatted	Stewart, Knepper, Grimshaw, et al.
<b>Entire Document</b>	1.5	5/14/2012	Hopefully penultimate version before public release	Stewart
<b>Addition to preface, additional variant to use case 2</b>	1.6	5/16/2012	Reflects input from presentation at TEOS- ALL meeting	Stewart

## B. Document Scope

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This document is both a user-facing document (publically accessible) and an internal working document intended to define user needs and use cases that fall under the general umbrella of Campus Bridging within the overall activities of XSEDE. The definition of use cases is based on a template from Malan and Bredemeyer<sup>1</sup>. In general it is in keeping with the approaches and philosophy outlined in “Software architecture in practice.”<sup>2</sup>

This document is one component of a process that generates at least the following documents, some of which are user-facing, some are as of now intended to be internal working documents:

- ***This document*** - A description of use cases [User facing].
- A binary mapping of use cases to Requirements in DOORS (a binary mapping means that for each use case a “yes” or “no” flag indicating whether a particular requirement within the full list of requirements is or is not required to enable a particular use case).
- A set of level 3 decomposition documents, which include:
  - Quality Attributes descriptions
  - Connections diagram in UML
- A paper to be submitted to XSEDE12 entitled “What is campus bridging, why should you care, and what is XSEDE doing about it?” that will be based in part on this document. That manuscript will include a restatement of use cases in the form of a set of seven five-year goals for XSEDE related to campus bridging.
- A guide for researchers, campus IT staff, and campus leaders, ancillary to the XSEDE campus bridging documentation that results from the implementation of the technology required to support the use cases presented here. This guide will serve as a guide for those interested in adopting campus bridging technology and services. It will be structured as a roadmap that enables incremental implementation of campus bridging technologies and services and will explain the relative degree of difficulty and potential benefits of each step in such an implementation.

The use cases are presented here using the following format, derived from the Malan and Bredemeyer white paper<sup>1</sup> as follows:

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<sup>1</sup> Malan, R. and D. Bredemeyer. *Functional Requirements and Use Cases*. Architecture Resources for Enterprise Advantage. 2001. Available from: [http://www.bredemeyer.com/pdf\\_files/functreq.pdf](http://www.bredemeyer.com/pdf_files/functreq.pdf)

<sup>2</sup> Bass, L., P. Clements and R. Kazman. *Software Architecture in Practice*. Addison-Wesley, 2003. Available from: <http://books.google.com/books?id=mdilu8Kk1WMC>

Use Case	Use case identifier and reference number and modification history
<i>Description</i>	Goal to be achieved by use case and sources for requirement
<i>References</i>	References and citations relevant to use case
<i>Actors</i>	List of actors involved in use case
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	Conditions that must be true for use case to be possible Conditions that must be true for use case to terminate successfully
<i>Steps</i>	Interactions between actors and system that are necessary to achieve goal
<i>Variations (optional)</i>	Any variations in the steps of a use case
<i>Quality Attributes</i>	
<i>Non-functional (optional)</i>	List of non-functional requirements that the use case must meet
<i>Issues</i>	List of issues that remain to be resolved

## C. Campus Bridging Use Cases

Following are seven use cases related to campus bridging. After that is one use case that is general to XSEDE, but which is foundational (a prerequisite) to a use case in the list below.

UCCB 1.0	InCommon-based authentication
<i>Consistent use of community-accepted authentication mechanisms</i>	Simplify the authentication process for XSEDE and NSF cyberinfrastructure generally by adopting InCommon-based authentication mechanisms as a way to authenticate to XSEDE for access to Level 1 and 2 resources (required) and Level 3 resources (optional but recommended).
<i>References</i>	<p>Recommendation (in its most recent form):</p> <ul style="list-style-type: none"> <li>NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging. Final Report. March 2011. <a href="http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf">http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3597300">https://www.createpace.com/3597300</a></li> </ul> <p>Implementation Guides:</p> <ul style="list-style-type: none"> <li>Barnett, W., V. Welch, A. Walsh and C.A. Stewart. A Roadmap for Using NSF Cyberinfrastructure with InCommon. 2011. <a href="http://hdl.handle.net/2022/13024">http://hdl.handle.net/2022/13024</a> or <a href="http://www.incommon.org/nsfroadmap.html">http://www.incommon.org/nsfroadmap.html</a>. Available as print-on-demand book from <a href="https://www.createpace.com/3630011">https://www.createpace.com/3630011</a></li> <li>Barnett, W., V. Welch, A. Walsh and C.A. Stewart. A Roadmap for Using NSF Cyberinfrastructure with InCommon: Abbreviated Version. 2011. <a href="http://hdl.handle.net/2022/13025">http://hdl.handle.net/2022/13025</a> or <a href="http://www.incommon.org/nsfroadmap.html">http://www.incommon.org/nsfroadmap.html</a></li> </ul> <p>Prior Implementation Experience:</p> <ul style="list-style-type: none"> <li>Jim Basney, Terry Fleury, and Von Welch, "Federated Login to TeraGrid," 9th Symposium on Identity and Trust on the Internet (<a href="http://dx.doi.org/10.1145/1750389.1750391">IDtrust 2010</a>), Gaithersburg, MD, April 2010. <a href="http://dx.doi.org/10.1145/1750389.1750391">http://dx.doi.org/10.1145/1750389.1750391</a></li> </ul>
<i>Actors</i>	<ul style="list-style-type: none"> <li>XSEDE: Senior Leadership and SP Forum</li> <li>XSEDE: administrators of all Level 1 and 2 resources</li> <li>XSEDE: accounting staff</li> <li>XSEDE: security / financial / SD&amp;I / A&amp;D</li> <li>XSEDE: documentation and support teams</li> <li>XSEDE: campus bridging</li> </ul>

UCCB 1.0 InCommon-based authentication	
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	<ul style="list-style-type: none"> <li>• XSEDE establishes a relationship with a 3<sup>rd</sup> party provider of InCommon credentials for individuals at institutions that are not members of InCommon.</li> <li>• XSEDE has created an authorization and accounting system that allows separation of authentication from authorization and accounting.</li> <li>• XSEDE has created and operates a tool to provide mapping from Local ID (as authenticated via InCommon) and XSEDE authorization, group management, and accounting functions.</li> <li>• XSEDE “nice to have” – XSEDE distributes a tool for creating login screens locally, that is similar in form and structure to the XSEDE login screen. In this way if there is a campus that is an InCommon member but does not have a nice, local GUI to their authentication system, it will be possible for local campus-based admins to put in place an authentication interface to local authentication system that is similar to the XSEDE login screens, for ease of training and use.</li> </ul>
<i>Steps</i>	<ul style="list-style-type: none"> <li>• A&amp;D and SD&amp;I recommend one InCommon-compatible login tool (e.g, CILogon or GridShib) and tests, packages, and distributes a ‘kit’ for this functionality (called here “InCommon authentication kit” for lack of better term).</li> <li>• Use of the “InCommon authentication kit” is required by XSEDE management for Level 1 and 2 SPs, and recommended for Level 3 SPs. This implies that being a member of InCommon is a prerequisite for being a Level 1 or 2 SP.</li> <li>• All XSEDE Level 1 and 2 SP administration install the “InCommon authentication kit”.</li> <li>• XSEDE documentation and training team develop appropriate documentation and training materials.</li> <li>• InCommon-based authentication put into production use, with the capability of moving from a web based interface to a shell window within the web-based session.</li> </ul>
<i>Variations (optional)</i>	<p>Variation (B): InCommon-based authentication for access to Science Gateways</p> <ul style="list-style-type: none"> <li>• User authenticates to a Science Gateway, using InCommon-based tools as above, and jobs are “translated” to ownership by a group account used for jobs launched on XSEDE resources by that Science Gateway (e.g. JimmyNeutrino or MRLEAD) that runs on XSEDE resources.</li> <li>• InCommon is by definition a US-based entity supporting US institutions. It seems reasonable that XSEDE would pay for a relationship with ProtectNetwork to enable users of XSEDE who are at institutions that are not InCommon members</li> </ul>
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <p>Once authentication is completed at the InCommon Identity Provider, activities that take place in XSEDE systems that allow access to resources will be completed in at most 5 seconds.</p>
<i>Non-functional (optional)</i>	

UCCB 1.0 InCommon-based authentication	
<i>Issues</i>	<ul style="list-style-type: none"> <li>• Almost none of the prerequisites and assumptions are presently the case.</li> <li>• Authentication is the responsibility of InCommon Identity Providers; the burden on XSEDE is to ensure validity and maintain the level of trust of the InCommon credentials, and to provide authorization information that determines a user's level of access on XSEDE resources.</li> <li>• In order to provide access to individuals not at InCommon federation members, a person not at an InCommon member institution must be able to obtain credentials from ProtectNetwork in 48 hours or less. ProtectNet provides identity access almost immediately. Docufide and Apple Computer are the only two Identity Providers listed by InCommon that are not educational institutions. The suggested catch-all is therefore ProtectNet.</li> <li>• Need to understand level of trust and ID/discuss with security team.</li> </ul>

UCCB 2.0 Enable economies of scale in usability and training for XSEDE and campus resources through dissemination of information and tools	
<i>Description</i>	Make it easier for “on campus users” to use XSEDE resources, and make it easier for all to create high quality and reusable training materials, by taking steps that make it possible for campus clusters and other resources to be more like XSEDE resources and thus easier to document, learn, understand, and use.
<i>References</i>	<a href="http://creativecommons.org/licenses/by/3.0/">http://creativecommons.org/licenses/by/3.0/</a> Attribution 3.0 Unported license (CC BY 3.0)
<i>Actors</i>	<ul style="list-style-type: none"> <li>• XSEDE: Senior Leadership and SP Forum</li> <li>• XSEDE: administrators of all Level 1 and 2 resources</li> <li>• XSEDE: SD&amp;I / A&amp;D</li> <li>• XSEDE: documentation and support teams</li> <li>• XSEDE: campus bridging</li> <li>• Campus: campus systems administration staff</li> <li>• Campus: instructors and learners</li> </ul>
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	XSEDE A&D, SD&I, Senior Leadership, and SP Forum have an agreement on basic aspects of system implementation – directory hierarchy, locations of standard software ‘kits’ and optional locally-installed or user-contributed software – and that compliance with this set of standards is uniform across at least all Level 1 and 2 SPs.



UCCB 2.0 Enable economies of scale in usability and training for XSEDE and campus resources through dissemination of information and tools	
<i>Steps</i>	<ul style="list-style-type: none"> <li>• XSEDE must create a standard way to document system characteristics and software configurations. A document template, in an editable format, must be released with a license that allows re-use and modification, such as the CC BY 3.0 license.</li> <li>• XSEDE must create and disseminate training materials in ways that allow them to be minimally altered and used by “on campus” users. All materials must be released with a license that allows reuse and modification, such CC BY 3.0 license.</li> <li>• XSEDE should create a “ROCKS Roll” distribution that allows a campus-based sysadmin to install a cluster that includes the open source elements of a basic XSEDE cluster configuration using ROCKS.</li> <li>• As part of the creation of a “ROCKS Roll” distribution, documentation should be prepared that defines how a “generic XSEDE-like cluster” would be configured. This documentation will enable systems administrators who do not wish to use the ROCKS approach to still configure systems to be as similar as possible to the least specialized of the major XSEDE Level 1 resources. This should be presented as a “guide to current practice” and NOT a standards document. The former is what we can realistically aspire to; the latter is not obviously beneficial and standards development processes often take so long and are so much work that they are not effective use of time UNLESS one really is describing some sort of fundamental standard (which is not the case here).</li> </ul>
<i>Variations (optional)</i>	OSG is moving to an RPM-based distribution mechanism for OSG software. An RPM-based mechanism for distribution should be considered as a supplement to or alternate for a ROCKS-based distribution

<b>UCCB 2.0 Enable economies of scale in usability and training for XSEDE and campus resources through dissemination of information and tools</b>	
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <ul style="list-style-type: none"> <li>• All materials are distributed in editable and commonly used formats by default.</li> <li>• The documentation and training materials we distribute should be of the highest standards – suitable for use in any university or college. These materials should include high quality, well-tested hands-on exercises and “answer keys” and debugging tip sheets.</li> <li>• A cluster administrator on a campus can install a modest (up to 10 TFLOPS) cluster based on a “generic XSEDE cluster” with cluster build tools packaged by XSEDE in less than 2 days assuming hardware is correctly installed and functioning.</li> <li>• An instructor can learn how to deliver a 90-minute lecture, and customize materials to local resources (assuming they are using the “generic XSEDE-like open source cluster build”), in less than 4 hours.</li> <li>• “Nice to have” – a good quality video of an expert instructor delivering the class materials, and video of someone completing the exercises, posted online to aid instructors learn the training material and learn how to present the material.</li> <li>• “Nice to have” – a well-implemented web form that allowed a person to enter data for a system description template and have a high quality template created as output.</li> </ul>
<i>Non-functional (optional)</i>	
<i>Issues</i>	<ul style="list-style-type: none"> <li>• Campus Bridging and TACC-based documentation team are iterating on a system description template.</li> <li>• Essentially nothing else on this list is completed.</li> </ul>

<b>UCCB 3.0 Operation of a long-term remote interactive graphic session</b>	
<i>Description</i>	User wants to open and maintain an interactive graphical session (e.g., an NX remote desktop or X-Windows session) on a remote resource – perhaps for a long period of time such as several days.
<i>References</i>	<a href="http://nomachine.com/">http://nomachine.com/</a> , <a href="http://en.wikipedia.org/wiki/X_Window_System">http://en.wikipedia.org/wiki/X_Window_System</a>
<i>Actors</i>	Users, systems administrators
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	<p>The most popular tool currently is Nomachine NX client; a prerequisite is the server software be purchased and operated on behalf of XSEDE as a critical, 7 x 24 resource.</p> <p>In the case of X-Windows session, if X clients are available on compute resources, sysadmins must ensure that X forwarding via ssh is allowed.</p>

UCCB 3.0 Operation of a long-term remote interactive graphic session	
<i>Steps</i>	<p>Basic Case (A):</p> <ul style="list-style-type: none"> <li>• Systems administrators install necessary software.</li> <li>• User initiates an NX session.</li> <li>• Session stays active as long as user specifies – perhaps as long as multiple days.</li> </ul>
<i>Variations (optional)</i>	<p>Variant (B):</p> <p>Use of an open source tool rather than NX client.</p>
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <ul style="list-style-type: none"> <li>• Very high degree of reliability of maintenance of open sessions – 99.99% success for hitting specified duration is a possible reasonable minimum level of success.</li> </ul>
<i>Non-functional (optional)</i>	List of non-functional requirements that the use case must meet.
<i>Issues</i>	<ul style="list-style-type: none"> <li>• Purchase, installation, and management of needed software.</li> <li>• Agreements to maintain sessions for long periods of time by systems administrators.</li> <li>• Important to make clear to the user that X Sessions are highly network-dependent on the path to the user.</li> <li>• Multiple long sessions with a given GUI may be better run as scripted jobs when software is capable of such, users should be directed to help in this direction when it's possible and viable.</li> </ul>

UCCB 4.0 Use of data resources from campus on XSEDE, or from XSEDE at a campus	
<i>Description</i>	Support analysis of data integrated across campus-based and XSEDE-based resources
<i>References</i>	<p>Description of issues and recommendations in:</p> <ul style="list-style-type: none"> <li>• NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging. Final Report. March 2011. <a href="http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf">http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3597300">https://www.createpace.com/3597300</a></li> <li>• Almes, G.T.; Jent, D.; Stewart, C.A. 2011. Campus Bridging: Data and Networking Issues Workshop Report. <a href="http://hdl.handle.net/2022/13200">http://hdl.handle.net/2022/13200</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3592681">https://www.createpace.com/3592681</a></li> <li>• Dreher, P., S.C. Ahalt, G. Almes, M. Mundrane, J. Pepin and C.A. Stewart, (eds.), 2011. Campus Bridging: Campus Leadership Engagement in Building a Coherent Campus Cyberinfrastructure Workshop Report. 2011. <a href="http://hdl.handle.net/2022/13194">http://hdl.handle.net/2022/13194</a></li> <li>• McGee, J.; V. Welch; G.T. Almes. 2011. Campus Bridging: Software &amp; Software Service Issues Workshop Report. <a href="http://hdl.handle.net/2022/13070">http://hdl.handle.net/2022/13070</a></li> </ul> <p>Definition of community and reference data collections:</p> <ul style="list-style-type: none"> <li>• <a href="http://www.nsf.gov/pubs/2005/nsb0540/nsb0540.pdf">www.nsf.gov/pubs/2005/nsb0540/nsb0540.pdf</a></li> </ul> <p>Open Data Commons license:</p> <ul style="list-style-type: none"> <li>• Open Data Commons. ODC Public Domain Dedication and License (PDDL). <a href="http://www.opendatacommons.org/licenses/pddl/1-0/">http://www.opendatacommons.org/licenses/pddl/1-0/</a></li> </ul>
<i>Actors</i>	<ul style="list-style-type: none"> <li>• XSEDE: Senior Leadership and SP Forum</li> <li>• XSEDE: administrators of all Level 1 and 2 resources</li> <li>• XSEDE: SD&amp;I / A&amp;D</li> <li>• XSEDE: documentation and support teams</li> <li>• XSEDE: data storage and movement teams</li> <li>• XSEDE: campus bridging</li> <li>• Campus: campus systems administration staff</li> <li>• User</li> </ul>
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	XSEDE supports one or more tools for transfer of data between campus and XSEDE.

UCCB 4.0	Use of data resources from campus on XSEDE, or from XSEDE at a campus
<i>Steps</i>	<p>Basic case (A): Movement of data from campus resource to XSEDE, and back to campus</p> <ul style="list-style-type: none"> <li>• User has data resource(s) on a campus resource they wish to access from or at an XSEDE Level 1 or 2 resource for analysis and/or visualization. Access may be accomplished by either direct remote access or by transferring file to local storage with local access. Examples of data resources include a flat file, tar ball, database to be moved wholesale, an extract from a database, or a file looked up via a metadata database.</li> <li>• User reads data located on a campus resource from an XSEDE resource.</li> <li>• User analyzes and/or visualizes data on XSEDE resource.</li> <li>• User writes/updates/deletes data back to campus resource.</li> </ul>
<i>Variations (optional)</i>	<p>Variant (B): User has generated data resource(s) on an XSEDE resource and wishes to transfer them to campus</p> <ul style="list-style-type: none"> <li>• User analyzes and/or visualizes data on XSEDE resource.</li> <li>• User writes/updates/deletes data back to campus resource.</li> </ul> <p>Variant (C): XSEDE-maintained community and reference collections: For efficiency, support of Virtual Organizations, and support of XSEDE users, XSEDE maintains copies of community and reference data collections</p> <ul style="list-style-type: none"> <li>• XSEDE determines a list of community and reference data collections it will maintain.</li> <li>• XSEDE creates a GUI for interactive selection of data to be moved from XSEDE to campus resource.</li> <li>• Access is initiated and completed successfully.</li> </ul> <p>Variant (D): Synchronization of copies of data between campus and XSEDE resource</p> <ul style="list-style-type: none"> <li>• User identifies a data set that s/he wishes to maintain, in a synchronized fashion, on one campus resource and one or more XSEDE resources.</li> <li>• User makes a change to one version of the file, and the other copies are automatically updated.</li> </ul> <p>Variant (E): XSEDE-managed archival storage service</p> <ul style="list-style-type: none"> <li>• User provides appropriate metadata associated with data to be stored.</li> <li>• Possible requirement for users: User provides data under a reasonable public domain license – such as Open Data Commons Public Domain Dedication and License, perhaps with a time delay (at latest: data become public domain upon death of submitter).</li> <li>• Note: NSF policies may obviate this use case.</li> </ul>

*Quality Attributes*

Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):

For transient failures, the system should be able to restart transfers and notify the user once the transfer has completed successfully.

Stimulus: a properly authenticated user accesses file or directory.

Environment: an error condition occurs that prevents immediate access.

Response: system recovers.

Availability requirement: 98% successful.

Intuitively usable GUI for interactive initiation and management of file transfer (should be at least as good as the GUI in Box.net or the Dilbert file transfer tool).

Stimulus: user installs or requests installation of an access layer interface.

Environment: user has an XSEDE account and allocation, and a campus account with an associated storage resource. User knows to look to the XSEDE portal/web site for assistance when necessary. Necessary software is installed and operational on the XSEDE Level 1 & 2 Service Providers resources.

Response: access layer interface is successfully installed.

Usability: Takes < 1 working day for a user with proper permissions to install the necessary software on the user side.

Stimulus: user accesses file or directory via an access layer interface.

Environment: user has an XSEDE account and allocation, and a campus account with an associated storage resource. User knows to look to the XSEDE portal/web site for assistance when necessary. User has basic understanding of files and directories. Necessary software is installed and operational on the XSEDE Level 1 & 2 Service Providers resources.

Response: user is able to access file or directory via an access later interface.

Usability: Takes a person <=15 minutes to do a file copy without user support or documentation the first time, and <5 minutes for all subsequent copies.

The combination of transfer efficiency and impact of failures and restarts provides efficiency that is at least as good as 50% of peak theoretically possible throughput of optimal network path and storage systems.

Stimulus: user accesses files.

Environment: Total size of all files must be >1 GB and average file size > 1 MB. Disk performance on both ends of the copy must have adequate performance specifications. Files accessed within continental US. Achievable performance is measured on an idle network and storage systems on each end.

Performance: 50% of end-to-end theoretical peak throughput of optimal network path and storage system performance.

UCCB 4.0 Use of data resources from campus on XSEDE, or from XSEDE at a campus	
<i>Non-functional (optional)</i>	
<i>Issues</i>	Some pieces of the required steps and services are in place, but overall very few.

UCCB 5.0 Support for distributed workflows spanning XSEDE and campus-based data, computational, and/or visualization resources	
<i>Description</i>	Enable distributed workflows – interactively or in batch mode – possibly spanning XSEDE and campus cyberinfrastructure resources, without user intervention after workflow is initiated
<i>References</i>	Example use cases: <a href="http://dl.acm.org/citation.cfm?id=1838587">http://dl.acm.org/citation.cfm?id=1838587</a> .
<i>Actors</i>	<ul style="list-style-type: none"> <li>• XSEDE: Senior Leadership and SP Forum</li> <li>• XSEDE: administrators of all Level 1 and 2 resources</li> <li>• XSEDE: SD&amp;I / A&amp;D</li> <li>• XSEDE: documentation and support teams</li> <li>• XSEDE: data storage and movement teams</li> <li>• XSEDE: campus bridging</li> <li>• Campus: campus systems administration staff</li> <li>• User</li> <li>• Providers and supporters of 3<sup>rd</sup>-party workflow tools</li> </ul>
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	<ul style="list-style-type: none"> <li>• XSEDE arrives at a list of distributed workflow tools it supports by default. Possible tools to support include Pegasus, Taverna, Kepler, DAGMAN, OGCE, and provenance tools like XMCCAT and Kharma.</li> <li>• System administrators at all Level 1 resources install the software and configurations required locally to support the distributed workflow tools specified by XSEDE leadership.</li> <li>• Campus administrators install software and configurations required to support the distributed workflow tools used by their local users on local resources</li> <li>• Some workflows may require advance scheduling, coscheduling, or metascheduling facilities.</li> </ul>

UCCB 5.0	Support for distributed workflows spanning XSEDE and campus-based data, computational, and/or visualization resources
<i>Steps</i>	<p>Variant (A): Interactive management of workflows</p> <ul style="list-style-type: none"> <li>• User wants to perform an analysis with a distributed workflow and has a workflow (directed acyclic graph) where vertices will execute on different resources at different locations. Vertices consist of jobs that may involve stage in/stage out and "direct access" (CRUD) to remote (remote to the locus of execution) data resources.</li> <li>• User starts an interactive session with a workflow tool, and it accesses data sources, computational tools, visualization resources, and data transfer tools on a variety of resources. Some of those resources are XSEDE resources, and some are local campus-based resources that the user accesses with local credentials. File I/O is sometimes limited to only a single process accessing a file any given time. Ability for simultaneous I/O by multiple processes to a single file is a (relatively rare) requirement, and in this case the user/program is responsible for file integrity. This implies ability for multiple sources to read/write data simultaneously (user responsible for housekeeping).</li> <li>• Job completes, user initiates new workflow interactively or stops.</li> </ul>
<i>Variations (optional)</i>	<p>Variant (B): Distributed workflows in batch mode</p> <ul style="list-style-type: none"> <li>• As above, but in batch mode, with notification to user when workflow has successfully completed or failed.</li> </ul> <p>Variant (C): Support for distributed workflows initiated via Science Gateways</p> <ul style="list-style-type: none"> <li>• As above, but mediated by a Science Gateway that accesses XSEDE and campus based resources. Access to campus resources is handled with user credentials (e.g. not as part of a sharing arrangement, as described in UCCB 6.0). XSEDE must document the types of credentials that science gateways must support for campus access. Since the access is mediated through the science gateway, the credentials must support delegation from the user to the science gateway. OAuth provides a standard protocol for delegation (see: <a href="http://www.sciencegatewaysecurity.org">www.sciencegatewaysecurity.org</a>).</li> </ul>
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <p>Workflow restarts automatically a user-configurable number of times, and then fails if the number of restarts configured by the user is exceeded.</p> <p>If the number of restarts is exceeded, the user is notified.</p> <p>The process of requesting that an additional workflow tool be installed should take no more than 1 month for a decision and no more than 1 additional month for implementation.</p>
<i>Non-functional (optional)</i>	



<b>UCCB 5.0</b>	<b>Support for distributed workflows spanning XSEDE and campus-based data, computational, and/or visualization resources</b>
<i>Issues</i>	Very few, if any, of the required elements are in place as a matter of XSEDE architecture and policy.

<b>UCCB 6.0</b>	<b>Shared use of computational facilities mediated or facilitated by XSEDE</b>
<i>Description</i>	XSEDE can provide tools and mediate relationships that enable the US to make better use of its aggregate cyberinfrastructure resources.
<i>References</i>	<p>Description of issues and recommendations in:</p> <ul style="list-style-type: none"> <li>• NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging. Final Report. March 2011. <a href="http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf">http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3597300">https://www.createpace.com/3597300</a></li> <li>• Almes, G.T.; Jent, D.; Stewart, C.A. 2011. Campus Bridging: Data and Networking Issues Workshop Report. <a href="http://hdl.handle.net/2022/13200">http://hdl.handle.net/2022/13200</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3592681">https://www.createpace.com/3592681</a></li> <li>• Dreher, P., S.C. Ahalt, G. Almes, M. Mundrane, J. Pepin and C.A. Stewart, (eds.), 2011. Campus Bridging: Campus Leadership Engagement in Building a Coherent Campus Cyberinfrastructure Workshop Report. 2011. <a href="http://hdl.handle.net/2022/13194">http://hdl.handle.net/2022/13194</a></li> <li>• McGee, J.; V. Welch; G.T. Almes. 2011. Campus Bridging: Software &amp; Software Service Issues Workshop Report. <a href="http://hdl.handle.net/2022/13070">http://hdl.handle.net/2022/13070</a></li> </ul>
<i>Actors</i>	<ul style="list-style-type: none"> <li>• XSEDE: Senior Leadership and SP Forum</li> <li>• XSEDE: administrators of all Level 1 and 2 resources</li> <li>• XSEDE: SD&amp;I / A&amp;D</li> <li>• XSEDE: documentation and support teams</li> <li>• XSEDE: data storage and movement teams</li> <li>• XSEDE: campus bridging</li> <li>• Campus: campus systems administration staff</li> <li>• User</li> <li>• Programmatically: XSEDEDB</li> </ul>

UCCB 6.0 Shared use of computational facilities mediated or facilitated by XSEDE	
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	<p>Prerequisites:</p> <ul style="list-style-type: none"> <li>• UCCB.1.0 implemented and supported.</li> <li>• For Variant B: Unified/integrated XSEDE trouble ticket system.</li> <li>• XSEDE creates and distributes a “capability kit” for implementation of InCommon-based authentication in ways that maintain the basic functionality, look, and feel as “XSEDE-like” authentication. Note – this requires participants to be InCommon members. This has two sub-cases: <ul style="list-style-type: none"> <li>○ Users are not necessarily represented in XSEDEDB, and users are authenticated via InCommon mechanisms without reference to XSEDEDB.</li> <li>○ Users are represented in XSEDEDB, and authorization and accounting are done with reference to XSEDEDB.</li> </ul> </li> </ul>
<i>Steps</i>	<p>Variant (A): Creation and use of a Shared Virtual Compute Facility (SVCF) – Multiple researchers or groups have campus-based compute resources they are willing to “expose” (subject to access control) to each other, and this group manages the internal economics of the exchanges.</p> <ul style="list-style-type: none"> <li>• Participants create virtual clusters, virtual high throughput computing facilities (e.g. condor flocks), virtual clouds, and/or other sort of virtual resources based on campus compute resources at one or more campuses.</li> <li>• Participants install on their resources the “capability kit” described above that implements InCommon-based authentication in ways that maintain the basic functionality, look, and feel as “XSEDE-like” authentication, but without reference to XSEDEDB for authorization or accounting.</li> <li>• Participants manage accounting, “value exchanges,” policy compliance, and security response.</li> <li>• Participants must have the ability to, on their own, create groups and set access control to resources based on groups.</li> <li>• Note: The entity operating a Shared Virtual Compute Facility would not need to be (and may not want to be) an XSEDE Level 3 Service Provider as defined in the Service Provider Forum charter (<a href="https://www.xsede.org/documents/10157/281380/SPF_Definition_v10.1_120228.pdf">https://www.xsede.org/documents/10157/281380/SPF_Definition_v10.1_120228.pdf</a>)</li> </ul>

UCCB 6.0	Shared use of computational facilities mediated or facilitated by XSEDE
<i>Variations (optional)</i>	<p>Variant (B): An organization (virtual or otherwise) becomes a Level 3 Service Provider and contributes access to campus-based resources via a Shared Virtual Compute Facility (SVCF) in return for in-kind use of XSEDE resources later.</p> <ul style="list-style-type: none"> <li>• An organization (virtual or otherwise) operates an SVCF and is willing to allow usage of that SVCF by users with XSEDE credentials and allocations (that is, outside the group operating the SVCF) in return for later ability for contributor of resources to obtain cycles via XSEDE in kind.</li> <li>• The organization (virtual or otherwise) providing resources is willing to become an XSEDE Level 3 Service Provider, and has a particular resource, or creates virtual clusters, condor flocks, virtual clouds, and other sort of virtual resources.</li> <li>• XSEDE creates and distributes a “capability kit” for implementation of InCommon-based authentication in ways that maintain the basic functionality, look, and feel as “XSEDE-like” authentication, with authorization and accounting are done with reference to XSEDEDB.</li> <li>• SVCFs have this “capability kit” installed and in operation.</li> <li>• XSEDE provides security notification responsibilities in case there is a security breach related to accounts or services that use campus-based authentication mechanisms.</li> <li>• XSEDE has ability to manage exchange rates between campus-contributed resources and resources campuses might AND ability for XSEDE to provide cycles per some Service Level Agreement back to the contributors.</li> <li>• Integrated ticket management – expanded to include local trouble ticket system of campuses that are providing resources.</li> </ul>
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <p>Variant (A): Shared Virtual Compute Facility (SVCF)</p> <ul style="list-style-type: none"> <li>• Ability to set up a Private Gated VO facility in no more than one calendar day.</li> <li>• Ability to install authentication / authorization “capability kit” in no more than 2 days (1 day to do the work, one day for propagation of attributes).</li> </ul> <p>Variant (B): Organization (virtual or otherwise) becomes a Level 3 Service Provider</p> <ul style="list-style-type: none"> <li>• Ability to install authentication / authorization “capability kit” in no more than 2 days (1 day to do the work, one day for propagation of attributes).</li> </ul> <p>Both:</p> <ul style="list-style-type: none"> <li>• Tickets passed to local trouble ticket system within 1 business day of submission to XSEDE help system</li> </ul>
<i>Non-functional (optional)</i>	

UCCB 6.0 Shared use of computational facilities mediated or facilitated by XSEDE	
<i>Issues</i>	Variant (B) requires the establishment and publication of exchange rates for service that allows prospective cooperative members to see the current rate of exchange for campus-contributed resources.

UCCB 7.0 Access to private cyberinfrastructure resources on a service-for-funds basis (___ on demand).	
<i>Description</i>	Provide the ability for a privately operated resource to be delivered in a way consistent with the expectations of users of XSEDE resources.
<i>References</i>	Description of issues and recommendations in: <ul style="list-style-type: none"> <li>NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging. Final Report. March 2011. <a href="http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf">http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf</a>. Available as print-on-demand book from: <a href="https://www.createpace.com/3597300">https://www.createpace.com/3597300</a></li> </ul>
<i>Actors</i>	<ul style="list-style-type: none"> <li>XSEDE: SD&amp;I / A&amp;D</li> <li>XSEDE: documentation and support teams</li> <li>XSEDE: data storage and movement teams</li> <li>XSEDE: campus bridging</li> <li>Campus: campus systems administration staff</li> <li>User</li> <li>Private “_____on demand” provider</li> </ul>
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	Prerequisites: <ul style="list-style-type: none"> <li>Private resource contributor has a particular resource, or creates virtual clusters, condor flocks, virtual clouds, and other sorts of virtual resources.</li> <li>XSEDE creates and distributes a “capability kit” for implementation of InCommon-based authentication in ways that maintain the basic functionality, look, and feel as “XSEDE-like” authentication, with authorization and accounting are done with reference to XSEDEDB.</li> <li>Private resource provider has this “capability kit” installed and in operation.</li> <li>Private provider has the ability to provide essential security information to XSEDE as appropriate.</li> </ul>
<i>Steps</i>	<ul style="list-style-type: none"> <li>Private resource provider publishes mechanism by which to contract for time (credit card or Purchase Order).</li> <li>Individual or group user sets up account with private provider.</li> <li>User uses private resource, in ways that are convenient because they leverage system similarity with XSEDE resources and user familiarity with same, company gets money.</li> </ul>
<i>Variations (optional)</i>	

UCCB 7.0 Access to private cyberinfrastructure resources on a service-for-funds basis (___ on demand).	
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <p>Stimulus: Private resource owner makes a resource available on demand.</p> <p>Environment: Capability kit is available to resource owner. Installation documentation and information is available to resource owner. Resource owner provides payment mechanism for cycles on demand.</p> <p>Usability: Capability kit can be installed in &lt;= 1 day.</p> <p>Stimulus: Security incident on private resource.</p> <p>Environment: Resource owner has information on how to contact XSEDE incident response.</p> <p>Usability: XSEDE incident response evaluates and takes effective action if necessary within 24 hours of contact.</p>
<i>Non-functional (optional)</i>	
<i>Issues</i>	Issues are with the private provider making use of the capability kit that allows the local private installation to appear similar to XSEDE installations.

#### D. Foundational (general XSEDE) use case that is a prerequisite for one of the use cases above

CB Prerequisite	XSEDE-wide unified trouble ticket handling
<i>Description</i>	Unified and integrated trouble ticket handling within XSEDE
<i>References</i>	Example: <a href="http://iopscience.iop.org/1742-6596/331/8/082013/">http://iopscience.iop.org/1742-6596/331/8/082013/</a>
<i>Actors</i>	<ul style="list-style-type: none"> <li>• XSEDE: Senior Leadership and SP Forum</li> <li>• XSEDE: administrators of all Level 1 and 2 resources</li> <li>• XSEDE: accounting staff</li> <li>• XSEDE: security / financial / SD&amp;I / A&amp;D</li> <li>• Helpdesk staff at all Level 1 SPs (minimally)</li> </ul>

CB Prerequisite XSEDE-wide unified trouble ticket handling	
<i>Prerequisites (Dependencies) &amp; Assumptions</i>	<ul style="list-style-type: none"> <li>• Ability to record but also differentiate within the trouble ticket system a “trouble ticket” – a ticket about something that really is a consultation on a “problem” of some sort, and a “long term consultation” – a record of an ongoing interaction that is more project-focused than problem-focused. This is essential so that problem tracking and reporting can be done properly.</li> <li>• Ability to enter a ticket into a local trouble ticket system and have it propagated to the central XSEDE trouble ticket system, and vice versa.</li> <li>• Have updates to any ticket from any system (including closing the ticket) propagated to all systems where the ticket is represented.</li> <li>• Likely requirement: ability to have tickets either appear in a special queue within all local ticket systems at all Level 1 SPs, or the ability to have them appear within (programmatically selected) relevant local ticket systems.</li> <li>• Ability to run reports for trouble ticket handling and extended consultations from XSEDE trouble ticket system and have that represent accurately the full and total activity of all trouble ticket handling by XSEDE as an organization.</li> </ul>
<i>Steps</i>	<ul style="list-style-type: none"> <li>• Help desk staff enter a ticket in local campus ticket system or XSEDE ticket system.</li> <li>• Ticket is propagated throughout XSEDE as appropriate, including propagation to XSEDE ticket system.</li> <li>• Ticket is updated in one place and updates are propagated (including ticket being closed).</li> </ul>
<i>Variations (optional)</i>	
<i>Quality Attributes</i>	<p>Initial quality goals set at time of use case description (which are superseded by the more detailed information in the Campus Bridging Use Cases Quality Attributes document):</p> <ul style="list-style-type: none"> <li>• Propagation of updates to all relevant ticket systems happens in no more than 5 minutes.</li> </ul>
<i>Non-functional (optional)</i>	
<i>Issues</i>	