# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMARY OVERVIEW OF FOCUS AREA</td>
<td>2</td>
</tr>
<tr>
<td>FY05 ACCOMPLISHMENTS</td>
<td>2</td>
</tr>
<tr>
<td>IMPACT ON TARGET AUDIENCE</td>
<td>2</td>
</tr>
<tr>
<td>FY06 PLANS</td>
<td>2</td>
</tr>
</tbody>
</table>
SUMMARY OVERVIEW OF FOCUS AREA

The CIP Middleware Project is one component of the overall CIP collaboration between SDSC and NCSA. This project was developed from the observations that middleware systems were difficult to experiment with on production systems. For middleware developers there was no capability in the grid middleware community for software architectural experimentation, software testing, middleware evaluation. Hence the CIP Middleware Testbed was developed to provide a small set of machines of varying configurations to the developers, testers, and evaluators with root-level access and for short durations. The testbed is to include resources both at SDSC and NCSA (see current status below), along with different network connectivity among the machines.

In addition to development of the testbed, a second goal identified was to develop better middleware interoperability of the production systems between SDSC and NCSA in order to help users of both centers to migrate from one set of resources to the other. Initially, this meant better documentation and synchronization between systems at both centers, but in later years, additional capability will be developed such as job migration and co-scheduling, disaster recovery backups, and other more advanced capabilities. Clearly, there is some overlap with work being done by Teragrid on middleware interoperability. However, since not all center resources are Teragrid resources, interoperability with these resources must also occur. Second, since Teragrid has many more partners and issues of interoperability are more complex, the policies developed by the CIP middleware may be more advanced and experimental and if successful can effectively lead the Teragrid efforts.

The funding level for the first year of this project, (Oct 2004-Sept 2005), was 3.75 FTE total across the two centers with 2.0 FTE at SDSC and 1.75 at NCSA. The SDSC funding includes 25% of Karan Bhatia for management and co-ordination of the project, 37.5% of Federico Sacerdoti for managing and developing the testbed, 37.5% of Sandeep Chandra for engineering and maintenance of the testbed, and 1 FTE in the production systems group (managed by Patricia Kovatch) for system administration, configuration and maintenance of the testbed resources. The NCSA resources have included a portion of Doru Marcusiu, and others to be identified.

Staffing has been a major challenge in this project as the 1 FTE in the production systems group has just recently been identified by Kovatch in July 2005. We are proceeding with training of the individuals identified. Federico Sacerdoti, who led the establishment of the testbed, has left SDSC and a search for a replacement is underway. NCSA is working to identify their additional personnel (see table).

CIP Funding

- SDSC- 2.0 FTE
- NCSA- 1.75 FTE

Personnel

- SDSC
  - Karan Bhatia (.25 %)
  - Sandeep Chandra (.37%)
  - Production Group TBN (100%)

- NCSA
  - Doru Marcusiu (25%)
  - John Quinn (50%)
  - TBN (100%)
FY05 ACCOMPLISHMENTS

Despite the staffing challenges, we have been making good progress both on the testbed as well as on the production interoperability issues. At the high level, the accomplishments include the development of the middleware testbed along with allocation policies and procedures, building an active user community that is effectively making use of the testbed resources (including NMI Grid center for build testing, NLADR for system evaluation, and large ITR projects such as GEON, BIRN, Pragma for a variety of uses), and developing a better understanding of the production interoperability issues.

The goals for the first year of the project as specified by the project plan include:

1. Year 1 (Q1)
   a. Deploy website that provides all information regarding CIP middleware project
   b. Production Interoperability
      i. Develop requirements and policy for interoperable security infrastructure (requirements document, policy document)
      ii. Develop requirements and policy for interoperable middleware infrastructure (requirements document, policy document)
      iii. Identify existing middleware services that will be provided and supported at both sites
      iv. Evaluate TeraGrid solution for user management of grid map files
   c. Middleware Testbed
      i. Develop testbed establishment plan (document)
      ii. Evaluate feasibility of using existing testbeds at either SDSC and NCSA
      iii. Identify first set of testbed users (probably the CIP middleware team)

Item 1.a was completed and all information regarding the project can be found at: http://grid-devel.sdsc.edu under projects->cip middleware as well as on the CIP sharepoint website at https://sharepoint.ncsa.uiuc.edu/cip/mi/default.aspx. Items 1.b.i, and 1.b.ii were combined and completed as document available on the sharepoint server1. Item 1.b.iii was completed by Marcusiu and Kovatch; item 1.b.iv is an ongoing interaction between the CIP and the Teragrid projects; and 1.b.v has been completed.

On the testbed side, The testbed establishment plan (1.c.ii), authored by Sacerdoti and Marcusiu can be found on the sharepoint site2. Item 1.c.ii was completed early and no suitable testbeds existed that provided the functionality we envisioned. Machines were purchased and setup at SDSC. Additional machines have been purchased at NCSA and are in the process of being setup. The first set of users was identified (1.c.iii) as NLADR, BIRN and GEON.

---

1 see https://sharepoint.ncsa.uiuc.edu/cip/mi/Shared%20Documents/SDSC-NCSA-middleware%20%28final%29.doc
2. Year 1 (Q2)
   a. Maintain web site that provides all information regarding CIP middleware project
   b. Production Interoperability
      i. Review middleware interoperability plan
      ii. Develop requirements for monitoring middleware APIs (requirements document).
         iii. Evaluate TeraGrid monitoring system, (INCA) for possible deployment on NCSA and SDSC resources
      iv. Develop plan for providing joint startup allocation across centers (policy document)
   c. Middleware Testbed
      i. Gather user requirements for testbed use
      ii. Acquire initial set of CPU resources (x86, itanium, AMD)
         iii. Acquire or identify network resources (switches, teragrid netwOrK, WAN simulator, how can we make this configurable?)
      iv. Identify initial/default set software components (globus, WS, etc)

Item 2.b.i required no changes to the original plan. Item 2.b.ii has not been completed due to the interest in how TG is addressing this area. We are keeping track of TG efforts in monitoring and evaluating their requirements and proposed solutions. Item 2.b.iii is still in the evaluation stage and 2.b.iv was determined to be addressed by the user services project. Finally, 2.b.v has been completed.

The middleware testbed resources were identified and procured (2.c.i, 2.c.ii, 2.c.iii), including 34 dual Pentium 4 Nocona Dell rack mounted servers, 5 itanium nodes (donated by production systems), 3 GigE switches, and 1 WAN simulator. In addition a website for managing the allocation process was developed (http://cylab.rocksclusters.org). Software building blocks (2.c.iv) was donated by various projects (BIRN, GEON,Pragma, and Rocks) and a software repository was setup to house the software. NCSA has procured a SGI alix system and is in the process of adding these resources to the testbed.

3. Year 1 (Q3)
   a. Maintain web site that provides all information regarding CIP middleware project
   b. Production Interoperability
      i. Review middleware interoperability plan
      ii. Support middleware services, investigate and test co-scheduling capabilities.
         iii. Deploy infrastructure for monitoring middleware APIs at each center (software deployment).
      iv. Evaluate TeraGrid automation of grid map file management solution if it exists
   c. Middleware Testbed
      i. Identify software infrastructure components to meet the needs of the first set of users (load testers, network monitors, etc)

For item 3.b.i, no revisions were deemed necessary. All deployed services are being supported in the production environment satisfying item 3.b.ii. Note however that co-scheduling was not investigated as of yet. Item 3.b.iii has not been decided and hence not yet deployed. And regarding item 3.b.iv: the use of the TG grid map file management tool does not meet all the requirements of NCSA and SDSC and will require modifications to be deployed. Therefore, at this time each site still maintains their own grid mapfiles. We will examine in more depth the effort required to make the necessary changes to the gx-map tool and determine the feasibility of pursuing that approach as the correct solution.

On the testbed, the third quarter was spent providing and managing allocations for a diverse set of users including...
- BIRN for software testing of Andrew File System,
- NLADR for system testing of ISILON image processing hardware,
- Pragma for testing and evaluating GAMA middleware software,
- NMI Grid Center for building and testing NMI software components,
- Teragrid for evaluating middleware software
- Rocks for build testing on additional hardware
- UCSD CSE for programming competition (in which they won!)

4. Year 1 (Q4)
   a. Maintain web site that provides all information regarding CIP middleware project
   b. Production Interoperability
      i. Review middleware interoperability plan
      ii. Support middleware services investigate and test co-scheduling capabilities.
      iii. Support middleware API monitoring
      iv. Evaluate (if not completed in Q3) TeraGrid automation of grid map file management solution
      v. Deploy TeraGrid solution for user management of grid map files if found to be acceptable for the SDSC and NCSA infrastructure
   c. Middleware Testbed
      i. Deploy initial set of software components.
      ii. Provide facility to initial set of customers

Again, no changes to the original plan were required (4.b.i) and all deployed services are being supported in the production environment (4.b.ii). Monitoring solution not yet identified (4.b.iii) and 4.b.iv is still under evaluation (4.b.iv and 4.b.v).

For the testbed, additional software components are being packaged (GT4.0) and being made available.

Overall, we are on track and meeting milestones (in fact a bit early) for the middleware testbed portion of this project. It is worth noting that we are receiving 3-4 allocation requests per month and the resources are well utilized. This use is without any marketing of these capabilities and is purely on a word-of-mouth basis. Scaling up past these "friendly users" is going to be a challenge given the staffing problems.
IMPACT ON TARGET AUDIENCE

Overall, the users of the testbed have been very satisfied. Specific things we can do to make the testbed more useable include providing additional software packages, providing a real wide area testbed with the inclusion of the NCSA resources, providing additional networking options, and scaling up the user base.

All interoperability efforts have been aligned with TG efforts. That is, all middleware services will not only interoperate between SDSC and NCSA but also with TG resources. Staff at both NCSa and SDSC are closely tracking and participating in the TG software working group decisions about future upgrades to middleware services to assure we are aware of any changes planned for the TG resources.

We are looking for ways to leverage any solutions used by TG and conversely looking for opportunities to share our solutions with the TG community.
FY06 PLANS

According to the project plan, year 2 of the project with respect to the testbed is centered on scaling up the testbed with additional users, additional hardware as identified by the user community, and with policies to enable management.

On the production interoperability portion of the project, we are somewhat behind and need to understand better the interaction with the Teragrid as many of our initial goals are also goals for them.

Our major challenge for interoperating with TG resources is more a matter of policy and properly setting user expectations than technological. When resources are made available to multiple communities (in this case TG verses non TG users) the use policies and user environments become more complex. While the proper policies and environments can be created for the users it is a manual process that must be done by the users. We are investigating solution to automate this process based on the type (TG vs non TG) user allocation but have not yet implemented any solution. Even with this capability any users having both TG and non TG allocations will still need to determine their preferred working environment. Therefore, we are closely tracking the policies and user environment being used by TG and trying to honor those on NCSA and SDSC resources while at the same time allowing users ultimate control over changing/.setting their preferred environments.

5. Year 2
   a. Production Interoperability
      i. Enable and showcase initial interoperation: co-scheduling capability, joint allocation
      ii. Develop requirements for deeper interoperation between centers (requirements document, i.e. what is needed)
      iii. Disaster recovery mechanism (Patricia's idea of doing online backups of datasets or metadata)
      iv. Develop requirements for true account fungability
      v. GPFS over wide-area
   b. Middleware Testbed
      i. Based on initial set of users, determine further requirements for middleware testbed
      ii. End of year 2 hardware refresh
      iii. Additional users
      iv. Develop allocation policy and mechanism for facility