This is a summary report for the MDS Investigation project. After spending two weeks with MDS software installation, testing and scripts development, we got a fair good understanding on the interoperability issues of GRIS/GIIS with different schemas and the interoperability of different versions of MDS (MDS 2.2.4, MDS 2.4). The questions raised in the Project Definition are answered. New scripts to update the remote GIIS/GRIS using a secure authentication are developed. The following is a summary on what have been done and answers to the questions raised in the Project Definition, and some suggestions.

II. Phase 1 study

The Phase 1 study mainly focused on the interoperability issues of different MDS schemas and versions. We utilized both Grid3 and LCG-2 schemas and information providers (a subset which report the site info). We also installed and compared the interoperability of MDS version 2.2.4 and version 2.4. Two multi-level GRIS/GIISs were setup to study the schema interoperability issues. And various combinations of MDS clients, servers (GRIS, GIIS), and registrations regarding MDS 2.2.4 and MDS 2.4 were tested.

The detailed study report can be found in the document “MDS Investigation Project Intermediate Document”. Some of the basic findings in this phase are:

1. It seems the schema plays an essential role when publishing the information. The schema should be available in the whole chain of GRIS and GIIS. Otherwise, the information will not be available in the final GIIS. (This answers the question: *What happens when two GRISs with different MDS schema report to the same GIIS?*

2. When two GRISs with different MDS schema report to the same GIIS, the GRISs with different schema don’t interfere with the running of the GIIS. However, if the schema in the GRIS doesn’t show up in the GIIS, the published information in the GIIS will not be searchable when searching the GIIS. (This answers the question: *What happens when two GIIS servers with different schemas report to the same hierarchical GIIS? What information is available for query?*

3. It seems MDS2.2.4 and MDS2.4 are fully interoperable. There is no problem to query a MDS2.4 GRIS/GIIS from a MDS2.2.4 client and vice versa. We can also register a MDS2.2.4 GRIS/GIIS to a MDS 2.4 GIIS, and register a MDS2.4 GRIS/GIIS to a MDS2.2.4 GIIS. (This one is related to the question: *Under what circumstances do MDS2.2.4 and MDS 2.4 GRIS/GIIS servers interoperate?*)
III. Phase 2 study

The Phase 2 study tried to understand whether it is possible to dynamically update MDS schema remotely using secure authentication and without involving local site administrators. We utilized MDS2.2.4, MDS2.4, Globus Gatekeeper (from VDT1.1.12), and Globus GridFTP (from VDT1.1.12) in this study. Two bash scripts have been developed: one is called `schema_update.sh`, which does the update of the MDS GRIS/GIIS schema on a machine with MDS installation; another is called `schema_submit.sh`, which transfers a new schema tarball and `schema_update.sh` script to a remote machine and execute the `schema_update.sh` script on that machine with the help of Globus commands using Globus GSI authentication mechanism.

We also did some tests after finishing the scripts development on both Fermilab machines and machines at other DGT sites. The detailed setup and test results can be found in the document “MDS Investigation Project Phase 2 Document”. Some of the findings are:

1. It is possible to update the MDS schema(s) dynamically using the Globus commands. And this can be done from a remote location using Globus GSI secure authentication. (This answers the question: *Is there a setup that would allow dynamic updating of the schema? Can this be done from a remote location using secure authentication?*)

2. The schema updates can be done by participating grid projects without involving local site administrators. In order to do the update, one of the follow conditions needs to be met:
   (1). The MDS is setup and runs as a regular user and the DN of a remote user can be mapped to this user account;
   (2). The grid-info-slapd.conf file is set to have group/world write permission; (This answers the question: *can participating grid projects be responsible for updating of their MDS schemas without involving the local site administrator?*)

3. Some caution is needed when doing the schema updating remotely. It is observed that MDS server will not be able to start if there is some error in the newly added schema(s). And the MDS startup command doesn’t give any error message, not even an indication on exit status (still showing exiting 0).

IV. Conclusions and suggestions

From the above tests and development, some useful conclusions from my understanding are:

1. MDS schema plays a very important role in MDS information publishing, and GRIS/GIIS information passing. The schema needs to be available in the whole chain of
GRIS and GIIS in order for the related information to be shown up and query-able at the final GIIS/GRIS by users.

2. MDS2.2.4 and MDS2.4 are fully interoperable regarding the client query, GRIS/GIIS registration and information passing. This is very convenient for the current deployment.

3. It is possible to update the MDS schema(s) dynamically using the Globus commands. And this can be done from a remote location using Globus GSI secure authentication and without local site administrators if proper permission is given. However, Some caution is needed when doing the schema updating remotely. If there is some error in the schema, the GRIS/GIIS cannot be started any more. Some local sites may not want this to happen.

4. Both Ian and Ruth have some good suggestions on how to utilize the interoperability Phase I results. Ian thinks it will be good to keep a superset of schemas on the GIIS servers for interoperating. And Ruth thinks it will be good to distribute the document for VDT and Grid3 people.

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