Activities of the IVOA Theory Interest Group
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Foundation
It had been realized for a while that the inclusion of theory data and services in the IVO process presents some new challenges (see for example the whitepaper "Theory in the VO" by Lemson & Colberg, http://ivoa.net/pub/papers/TheoryInTheVO.pdf).
To address these a special interest group for theory was created during the IVOA executive meeting of Jan 2004 in Garching, Germany. Gerard Lemson from GAVO is its current chairman.

Charter
A charter was proposed on the group's TWiki page at
http://www.ivoa.net/twiki/bin/view/IVOA/IvoaTheory. The main points are:
- Provide a forum for discussing theory specific issues in a VO context.
- Contribute to other IVOA working groups to ensure that theory specific requirements are included.
- Incorporate standard approaches defined in these groups when designing and implementing services on theoretical archives.
- Define standard services relevant for theoretical archives.
- Promote development of services for comparing theoretical results to observations and vice versa.
- Define relevant milestones and assign specific tasks to interested parties.

Theory at interoperability meeting, Cambridge, MA, 2004-05-25
The interoperability meeting in Cambridge, MA devoted one session to the theory interest group (TIG). Contributions were made by representatives from the various IVOA working groups and from members of different national VOs. Slides from these contributions can be found on the TWiki page, here is a summary of the main points.
Theory has as yet little explicit support in the IVOA standardization efforts. The registry resource model allows the assignment of "resource type = simulation", the UCD framework allows the addition of a "meta.model" suffix and the data modeling group has defined a special effort for modeling of simulations. It was noted that use cases are needed to derive requirements for the working groups and that there the interaction between observation and theory deserves special attention. It was furthermore agreed that attention should not be restricted to "large models", such as cosmological simulations, but also to "small models" such as libraries of stellar evolution tracks.
There is quite some theory VO-like activity outside the IVOA. Various groups have made theoretical data collections and services available online. Examples and links can be found in the different contributions on the TWiki pages.
During discussions it was agreed that we need to actively engage the theoretical community in the efforts of the TIG. As this community is relatively small this can be done directly and on an individual basis by representatives of national VOs. It was thought at least as important to engage the observational community. This should be done by implementing and demonstrating science cases where theoretical data products and services are used to assist in the interpretation of observations. An important tool here

will be the so called "virtual telescope", software that brings simulated results into the "observational plane" for analysis by standard tools. For giving input to the working groups it was agreed that scientifically motivated use cases must be defined from which requirements to the standardization process should be derived.

Roadmap:
As a result of the discussions in Cambridge we propose the following roadmap.

- National VO leads will be asked to assign representative to TIG (by end of June).
- These representatives are expected to contact the theory community in their "constituency". The goal is to notify the community of the existence of the TIG, to gather feedback on possible science use cases and to make an inventory of existing TVO-like services and data collections that are available online. These are to be registered via the national VO's websites and the TIG's TWiki pages. (Results reported in Pune)
- Define science use cases/scenarios from which functional requirements can be extracted for the various IVOA WGs. (Discussion to be started in Pune, or earlier on forum)
- Define and implement some "non-standard" demo applications showing theory specific functionality. Non-standard indicates that we do not think we can embed theory functionality in the IVOA demos that are planned already and that are supposed to show case the efforts of the registry and data modeling working groups. But experience of the NVO theory demos of Jan 2004 has shown that interesting applications can be created within rather short timescales, especially since there are already quite some efforts underway in the different national VOs. (by Jan 2005 demos)
- For targeting the observational community define and implement demonstrations targeting the theory/observational interface. Particular attention will be given to the development of "virtual telescopes". Such IVOA compatible demonstrations should be prepared for the AAS and EAS in 2005 and there should be theory VO demonstration at the IAU 2006.