A Study on New Computing Infrastructure for MEG Using Grid Technology

Brain is one of the most complex system in this world. Understanding the structure, function and development of the brain is a key to understand human beings and improve its quality of life. To the end, the approach from the integrated view of medicine, biology and informatics is indispensable.

We are currently targeting on MEG (Magnetencephalography) as an experimental device. MEG is a device that has the ability to detect the change in minute magnetic fields generated from the brain activity. Furthermore, MEG has an excellent temporal resolution. However, in spite of its promising capability, few MEG devices available exist over the world due to their costs for purchase and maintenance.

Against this background, our research aims at sharing of MEG devices among researchers and development of new computing infrastracture for MEG analyses with Grid computing technology.

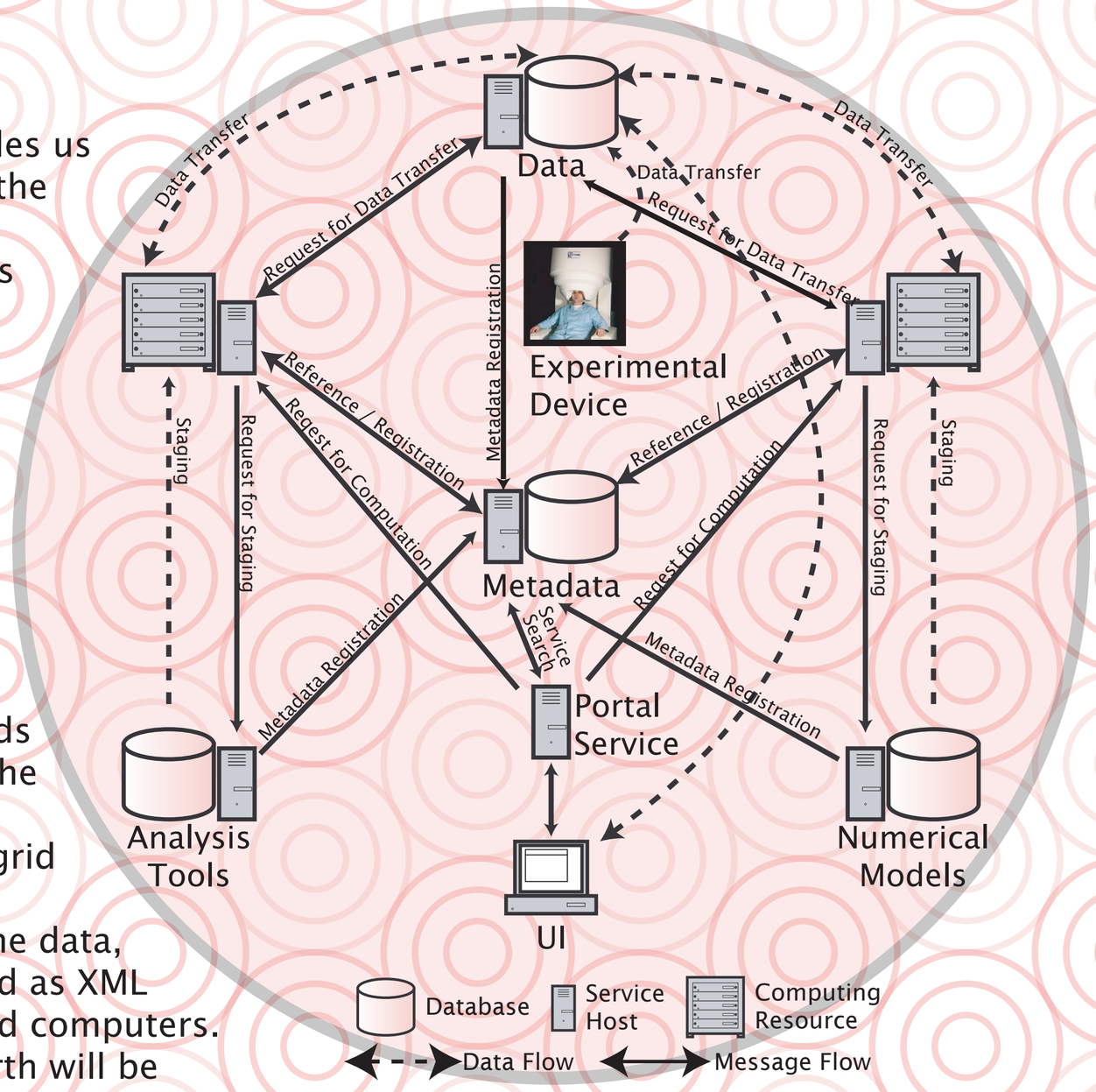
Grid Computing

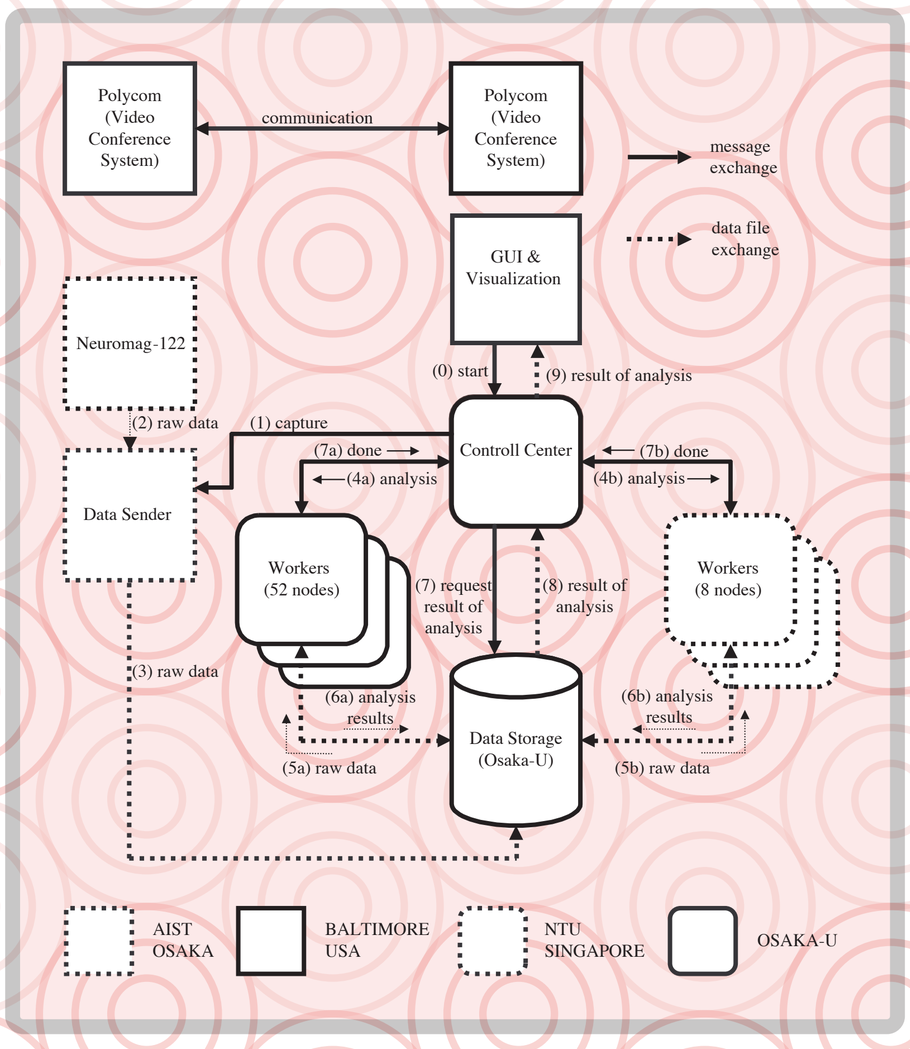
Grid Computing is an emerging technology that enables us to utilize thousands of computational resources on the Internet and networked instruments. This requires an uniformed middleware for integration of heterogeneous computing resources and instruments. One of such middlewares is the Globus Toolkit, a de facto standard tool for constructing Grid environment.

Design Strategy

The essentiality of our research is development of new computing infrastructure for sharing of neuroscience databases, tools and numerical models. For the purpose, we recognize that fundamental methods are data description, accumulation and distribution as the basis of data sharing. Our design strategies for these bases are metadata-driven access and service-oriented grid environment.

Metadata takes a central role in our framework. All the data, tools and models are described with metadata formatted as XML document that can be understood by both of human and computers. Users' request for computation, data transfer and so forth will be processed by portal service, which retrieves information about appropriate resources exposed as grid services.





SC2002 Demonstration

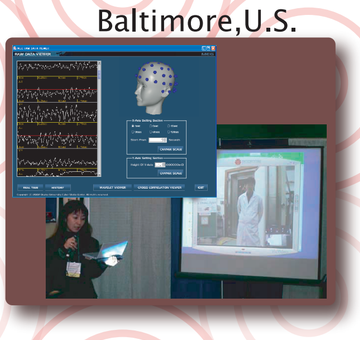
As a prototyping system for MEG data sharing and analyses, we developed an experimental grid environment and its applications including MEG data transfer, wavelet cross-correlation analysis and ICA.

We demonstrated this system in SC2002 at Baltimore, U.S. This demonstration system consisted of a PC cluster in Osaka university, MEG in Life Electronics Laboratory at AIST-Kansai, a PC cluster in Nanyang Technological University in Singapore and a client machine in Boltimore, U.S.

In this demonstration, we performed real-time MEG data transfer and wavelet cross-correlation analysis that was parallelized using 60 computers in total.

Osaka, Japan (AIST-Kansai)

Baltimore,U.S.



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