

GridOneD: Peer to Peer visualization using Triana: A Galaxy formation Test Case

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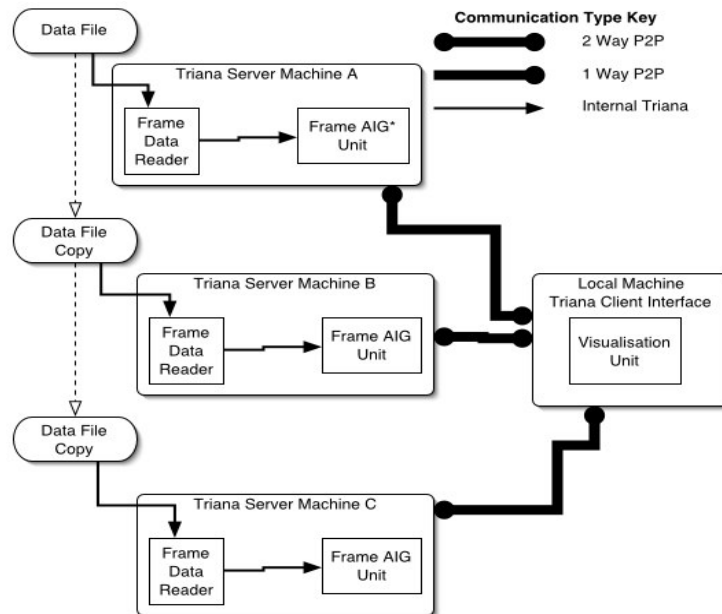
Key words to describe the work: P2P, JXTA, Triana, Consumer Grid, Java

Key Objectives: This demonstration demonstrates the use of the JXTA implementation of Triana as a Peer-to-Peer platform for Grid computing.

Motivation for the work (problems addressed): This work attempts to address inherent latency problems in the visualization of galaxy formations by distributing individual data frames to multiple Triana Services running in a “Grid like” environment as a series of collaborating computational peers. Although our solution is for this specific problem area it can be easily adapted to suit any similar class of “High Throughput” problem.

Abstract

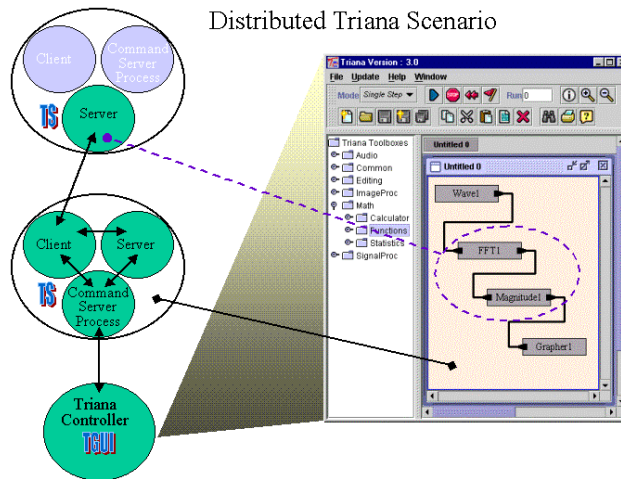
Galaxy and star formation using smooth particle hydrodynamics generates large data files containing snapshots of an evolving system stored in 16 dimensions. After calculation, each snapshot is entirely independent of the others allowing the distribution over the Grid for independent data processing and graphic generation. Processing may involve simple view port reorientation or more complex line of sight mass density calculations. A simple small graphic can then be returned to the client for real time chronological reassembly of the graphics for animation. The adjustment of the view port sends a signal to all processing units within a 16 dimensional data frame to recalculate the viewpoint of the data to be analysed and visualized. The processing units then return a graphic to a unit for temporal reassembly and smooth animated display. A schematic is given below for the distribution mapped onto a Consumer Grid [1]. Note that the data files are distributed at the start of the session and then remain on each node for the remaining period of the interactive session.



*AIG - Analysis and Image Generator

Triana [2] provides a visual programming interface with functionality represented by units connected by data flow pipes. Conceptually, Triana is split into three components that provide the GUI (controller), then local and distributed remote services. The Triana controller provides the interface to the command server process that acts as a client service to locally and distributed server services. Groups of Triana units may be distributed across the Grid. Here, on the left, we show a simple spectral analysis network with a schematic of the relationship between the user view within the Triana controller and its distribution amongst the Triana services.

Distributed Triana Scenario



JXTA Implementation

We can look at JXTA [3] P2P networking with respect to Triana and distributing Triana task graphs at varying levels of granularity. At the lowest level, each Triana Unit (or Group Unit) is itself a peer communicating with other Units/peers via some mechanism, using JXTA as an implementation this would be a JXTA pipe. The units or peers would organise in peer groups with communication to the Triana client peer and collaboration and communication with other peer groups of units being controlled by a Triana Server peer. However, this model has implementation overheads due to the level of granularity, each unit communicates via the underlying P2P communication mechanism which could be implemented on top of many different underlying layers. Our approach therefore is based around a Triana Server peer. This peer is capable of running a Triana task graph or sub-section of a task graph. This peer would also act as a rendezvous or relay peer able to forward messages, other sub-sections of a task graph or control instructions onto other Triana Server peers. Communication is more coarse grained than the previous model, communication between units within a server are internal to that server. Triana services discover each other via advertisements and communicate via JXTA pipes.

References

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2. Triana Software Environment: <http://www.triana.co.uk/>
3. Project JXTA : <http://www.jxta.org/>