HPC in the Cloud: Gompute Support for LS-Dyna Simulations

Iago Fernandez[1], Ramon Díaz[1]

[1]Gompute (Gridcore GmbH), Stuttgart (Germany)

Abstract

Gompute delivers comprehensive solutions for High Performance Computing, in-house, in the cloud or both. With over 10 years' of experience providing solutions and services to the Engineering communities, Gompute delivers a collaborative and productive infrastructure to either manage your HPC environment or burst out into the Gompute data center , ranging from 1 > 1000's of cores..

Keywords: Cloud Computing, LS-Dyna on demand, HPC simulations, flexible capacity.

1 Introduction

During the last decades, companies have been introducing CAE simulations as part of their product development with the main objective of improving reliability and reducing the costs of prototyping. It is nowadays demonstrated that introducing simulations during an early step of the product design process reduces the risk of failure as well as the associated costs, when the prototypes need to be redesigned.

Tradicionally, enterprises have invested in geographical independent local workstations or clusters that nowadays resulted in non-connected computational units. Besides, CAE Software used for analyzing problems like crash tests or impacts resulted in an essential tool for any Engineer, forcing the growth and development of faster and more powerful computing stations. In order to make the hardware investment more efficient, enterprises are considering new solutions like consolidation of internal resources with Private Enterprise Cloud Environments or External HPC Cloud Services. New challenges arise with this technology such large data transfers and 3D remote visualization over medium to high latency links.
Gompute has been developing HPC solutions since 2002 to cover these needs both for enterprises and small consultants, offering a complete portfolio that allow users to fulfill all his needs from a unique HPC partner.

2 Gompute Solutions

2.1 Overview of the Gompute HPC Cloud Platform.

Gompute provides solutions for HPC users running internally, in the cloud or both. Figure 1 shows an overview of the different packages available for enterprises using heterogeneous types of hardware such Visualization Nodes for pre or post-processing, GPUs or CPUs and users that want to run on a cloud service and just get the specific hardware required for a project with the possibility to expand it when there are peaks of workload.

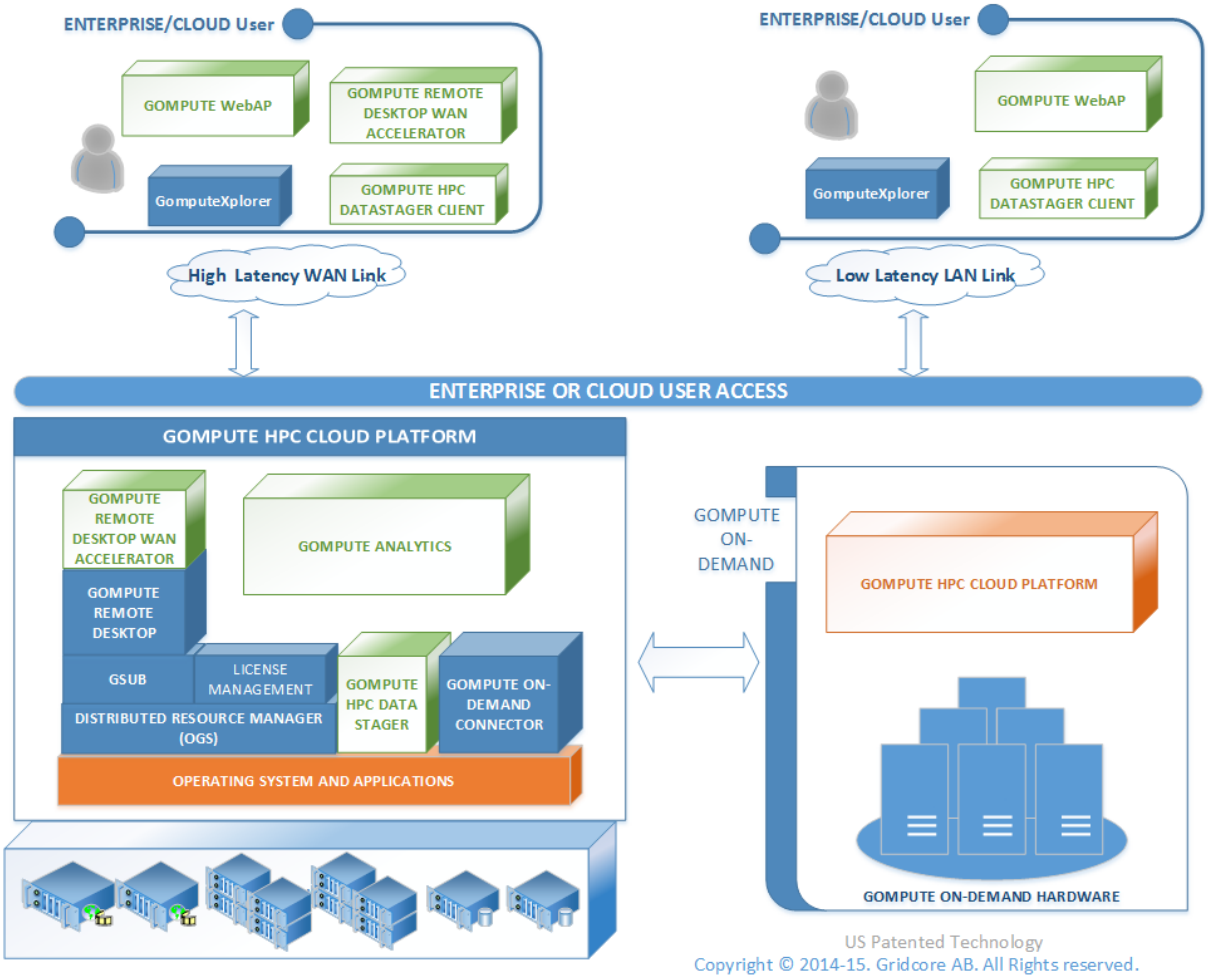

Fig.1: Summary of the Gompute Portfolio.

2.2 Gompute Xplorer

The Gompute Xplorer platform allows users to connect to both, their internal cloud and the Gompute On-Demand service with a common interface. Some features included in this platform are:

2.2.1 Remote 3D Workstation

Any CAE user can work interactively, with graphic remote pre- and post- processing. The entire workflow, from CAD or Mesh to the Postprocessing can be performed in the same environment, minimizing file transferring. The desktop is automatically resized to be adapted to the size of the screen in use. As an example, Figure 2 shows a snapshot of a remote desktop with the ball-plate test case loaded in LS-PrePost.

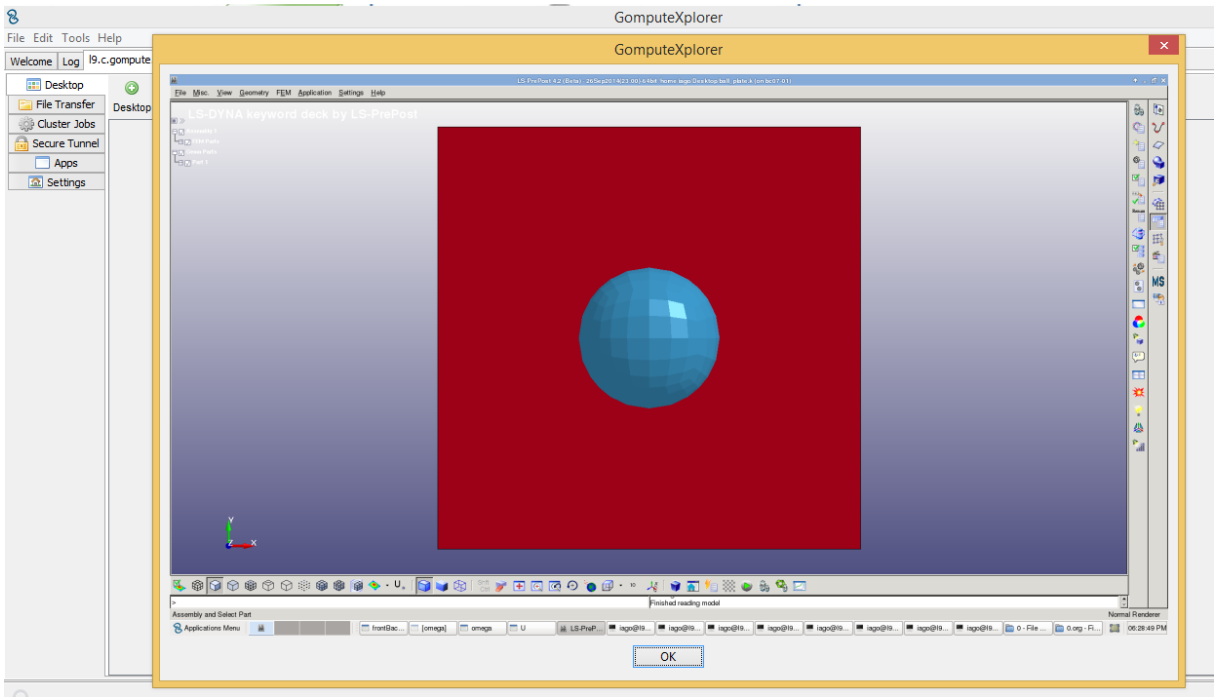

Fig.2: Remote Desktop in Gompute Xplorer.

2.2.2 File transfer:

The file transfer tool allows to transfer files to and from the cluster, as well as administrate the different files available in the users account.

2.2.3 Queue System

The GomputeXplorer queue system allows to control running jobs or jobs in the queue and offers statistics as start time, job status, job ID and number of slots used or requested by the job.

2.2.4 Application launcher

Via the menu the user can select, step by step, the different options like application, release, job name, extra options etc. and submit the job to the queue. For those users that prefer to control it through the terminal, the option to connect to a remote desktop is also included.

2.3 Gompute WAN Desktop Accelerator

The two main restrictions that can affect the user experience are low bandwidth and high latency. High latency makes an impact to those users pre- and post-processing in graphical mode. In order to avoid this, Gompute has developed the Remote Desktop Accelerator that has been tested up to 230 ms (network conditions apply).

This is very useful for those users located in a different site, especially on large distances. As an example, some Gompute users use this technology to connect from India to Sweden or from Germany to USA.

2.4 Gompute Analytics

Especially targeted for group managers, the Gompute Analytics provide the user with full information and statistics of the use and status of the cluster over time, with intuitive plots representing the history

and usage of the different resources, resulting many times as an essential tool to analyze expenditure on different projects.

2.5 Gompute Data transfer

Market trendfor users is to make larger and more number of cases resulting in larger amounts of data. Gompute has developed several products to manage this:

2.5.1 Data Stager

Move large amounts of data along the globe. Optimized for high latency WAN networks

2.5.2 Data Sync

Data can be synced across multiple sites.

2.5.3 Data Exchange

Secure large scale data exchange between global users in distributed teams.

3 Running LS-Dyna Simulations in the cloud: Gompute On-Demand

Gompute on Demand delivers HPC as a service. It provides customers with a turnkey environment backed by specialized support to solve computationally intensive workloads.

As a HPC Service for CAE workloads, different versions of LS-Dyna are available as well as other applications, allowing users to get a complete ready-to-use solution with flexible amount of resources to be adapted to the immediate needs.

LS-Dyna is a finite element program for solving complex problems, and these problems require different hardware fitted to the workflow needs. Gompute's solves this letting the user to book in advance the amount of cores needed selecting specific hardware if required, like nodes with large amount of memory for FEM or graphic nodes for pre and post processing purposes.

Companies can have one or several users, and share desktops in order to avoid data transfer out of the cluster. As the software is pre-installed, Gompute On Demand reduces the provisioning time compared to buying internal capacity, allowing users to start a project in a short time frame.

3.1 Purchasing computing power

Gompute on Demand offers a subscription to a private cluster with an HPC environment compatible with the chosen security policy. Users and departments can be organized as needed and seamlessly combined with the application environment tailored to the customer's needs.

Computing resources are added to this private cluster as reserved nodes and extra storage. Nodes are Infiniband interconnected for a correct scalability.

3.2 Remote Visualization & Collaboration

Gompute on Demand is powered by Gompute's cutting edge technology for remote visualization, letting users access their applications with its original GUI.

Gompute on Demand's remote visualization improves productivity by providing effective collaboration between geographically distributed teams in different continents. Team members or third party support can share desktops helping in quick decision making and cutting costs.

3.3 Supported Applications

Gompute supports both commercial and open source software. Users have the possibility to run both batch jobs and launch their favorite applications using its native Graphical User Interface. A large number of commercial and open-source applications are pre-installed and ready to go.

Gompute's solution can help you integrate any application, including custom applications.

LSTC portfolio is available in Gompute On Demand, allowing the user to perform workflows in a single environment, with option to install exclusive or own-developed applications.

3.4 Dyna licenses

Gompute, as a ready to use solution, offers several options to handle Dyna licensing:

- Host licenses on the Gompute On Demand cluster.
- Fetch the licenses from their own license server.
- Flexible usage of Dyna licenses based on hourly use.

In any case, LSTC license rules are applied and might vary depending on the region.

3.5 Gompute on Demand facilities

All computing resources are hosted in Gompute's own data center located in Sweden.

This center is designed primarily for high security and large power density with redundant internet connections, fire safety, as well as state of the art cooling and power system.

Fig.3: Gompute Data Center, Gothenburg (Sweden)

3.6 Gompute Support

Gompute On Demand provides personalized support for the users, letting them focus on their cases while they get a ready-to-use platform developed and maintained by experts in HPC and CAE. Support can also be provided for special development of codes and installation of user developed applications.

3.7 Security of the solution

Gompute on Demand is provided in the form of a private Linux cluster with a private internal network and file system.

The service is capable of complying with most security requirements in terms of user identification, data security and system access by using various techniques, e.g. data encryption, VPN based communication etc.

Gompute owns and operates its own infrastructure and datacenter making it capable of delivering secure solutions to global organizations or institutions.

4 More Information

For more information or testing of the service, please contact info@gompute.com or visit our website www.gompute.com