intelligent
mainframe
grid

High Performance Computing

&

Mainframe Integration

Running mainframe Batch Jobs on an Open Distributed System Architecture without business software migration or data format changes

Overview

Over the last years, companies have seen their business needs grow tremendously due to intense competition and sophisticated ways of accessing information. This has created a growing demand of computing power, which in turn increased computer systems investments and maintenance costs, particularly in mainframe environments.

At the same time, technology has improved and more computing power is being made available in the medium and small computer range at a lower cost.

To reduce their computing costs, companies have taken this opportunity to move their business from mainframe to open systems using downsizing techniques. Typically, this decision implies:

- recoding applications and programs
- redesigning systems and interfaces
- creating new software management procedures

Additionally, these downsizing techniques usually require the use of new middleware to exchange data between the different platforms which, as a consequence requires added investments and high risk projects developments.

Another issue is related to batch processing: open systems now support heavy on-line loads as well or even better than mainframe do. However, batch load is still difficult to process on open systems and does not compare well with mainframe batch efficiency and duration.

At the end of the day, when IT managers have analysed the results of the downsizing paradigm, the return investment has not provided the results hoped for. This has slowed down or even stopped the undertaking of new migration projects.

Therefore, the question is:

Is there any solution to reduce mainframe costs without embracing the downsizing path?

IMC believes that a solution exists: The Intelligent Mainframe GRID

What is the Intelligent Mainframe GRID ?

Intelligent **M**ainframe **G**rid is a new solution based on Grid computing technology which enables Open Distributed Systems to run mainframe processes without software modification or data format changes.

IMG solution main components are :

- A Grid platform: provides the hardware and software virtualization services to assign resources to the mainframe processes when they need them.

- Specialized communication and storage hardware: allows high volume data to be shared between the mainframe and the open systems.

- Mainframe integration architecture: Software architecture to synchronize the mainframe and open systems to obtain seamless execution of mainframe batch jobs on the open systems platform.

The results, from a mainframe perspective, are that the batch processes are executed as usual, except that very few mainframe resources are used. (close to 0 MIPS consumed).

This also means that on IMG, it is not necessary to change any procedures, tools or compilers (cobol) during development, maintenance, training and operation to allow batch jobs to be executed.

How does IMG work?

A Mainframe Batch Job (MBJ) is made of a collection of sequential steps, each one usually commands the execution of a program.

IMG provides the necessary tools, architecture and execution platform to be able to execute an MBJ outside the mainframe in three basic steps:

1. Translation of the original JCL instructions of the MBJ into an equivalent version that can runs on the IMG Grid Platform

2. Access to the program source code and compilation of this code on the Grid Platform to create a local executable version of the program on the Grid.

3. Allocate access and resources on the Grid platform for the execution of the job, give access to the input files and allocate resources for the output files on the shared storage platform. The programs are executed locally.

While step 1 and 2 need to be executed only once in the life of an MBJ as long as no modification is done to the JCL or the programs. As before, step 3 has to be repeated each time the MBJ is run.

This means that MBJ's and their programs are catalogued on the mainframe, the same was as they are on IMG. Translated JCL and compiled programs are catalogued on the open systems ready to be executed whenever the need occurs.

When the programs have been recompiled and tested on the open systems, the mainframe is ready to run the MBJ on the IMG platform .

All these steps are completely automated, so that each time a new MBJ is put in production on the mainframe, a set of JCL and programs are catalogued and compiled in the mainframe. As usual, an IMG translated JCL is created along with the compilation of the corresponding programs for the IMG platform at the same time.

Mainframe operation decides then to use the mainframe or the IMG platform version at will. Both can coexist simultaneously and can be used alternatively.

IMG Architecture

Each one of the IMG components is critical to the performance of the system. However, they are decoupled and can be substituted and adapted according to the evolution of technology to give the best possible overall results at any given time.

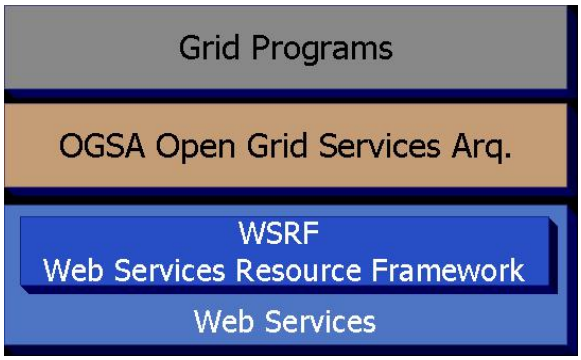
One of the earliest and wisest decisions about the architecture, was to build the execution platform on a Grid of inexpensive nodes to provide the computing power necessary to compete with the mainframe execution efficiency, but without giving up its reputable reliability.

With this in mind, the main objectives the execution platform has been designed to achieve compared to mainframe standards, are:

- Faster executions
- Computing power on–demand
- Scalability
- Improved reliability and fault-tolerance
- Support of heterogeneous systems
- Give solutions to jobs that are heavy to process even for a mainframe by taking advantage of the parallel processing capabilities of the Grid
- Less cost per MIPS

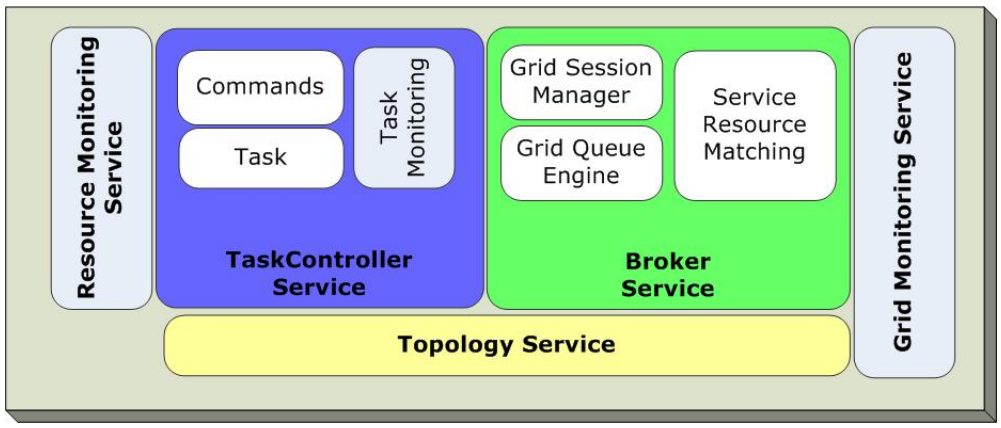
After evaluating the current Grid platforms available on the market, IMC saw that none had enough capabilities to comply with these objectives and the requirements needed. **For instance, none of the current Grids are really fault tolerant as they do have single points of failure, usually in the Master node that distributes the work to the rest of the nodes.** The decision was then taken to develop a new advanced Grid platform to support the solution.

IMG Grid platform is based on open standards (Web services, SOA and virtualisation) to ensure compatibility, flexibility and extensibility with the rest of the IT environment and even other Grid's.



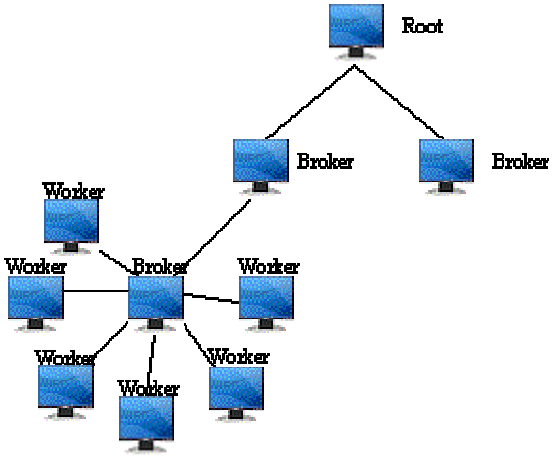
IMG components are at the same time tightly integrated so that they build a unique solution to solve the problem of mainframe batch job execution and decoupled so that they can have their own purpose and independent operation. As such, the IMG Grid platform is a full-fledged Grid platform that can be used on its-own to solve not only intensive batch computational problems but also on-line calculations of nearly any type, written in any language.

IMG grid architecture is built around four main components deployed as Web Services within the IMG Grid Kernel, each one providing a different functionality:



Topology Service

The main function of this component is to manage the grid node structure in a distributed way so that any computer in the Grid can assume and play any role at any time. This maintains the optimal Grid structure and guarantees the execution of the jobs submitted to it. **This means that IMG is really fault tolerant and has no single point of failure by design.**



An IMG Grid node may have three different roles:

1. **Root**: Nodes which manage the Clients jobs
2. **Brokers**: Nodes which manage and process jobs
3. **Workers**: Nodes which are specialized and improve the Broker computing power. It may be a software specialization, a hardware one or both.

Broker Service

This component maintains and computes the information of the grid resources permanently in order to match the "best" resource/s to allocate to a Job.

TaskController Service

The TaskController is the component in charge of executing processes in the grid. The TaskController has a repository of operations that a node is enabled and authorized to process.

Every operation is made of commands which allows the node to re-use functionality. With a same set of allowed operations (and commands), a new operation can be set by the combination of existing commands to provide a new service.

Monitoring Service

IMC grid provides two types of monitoring services and information:

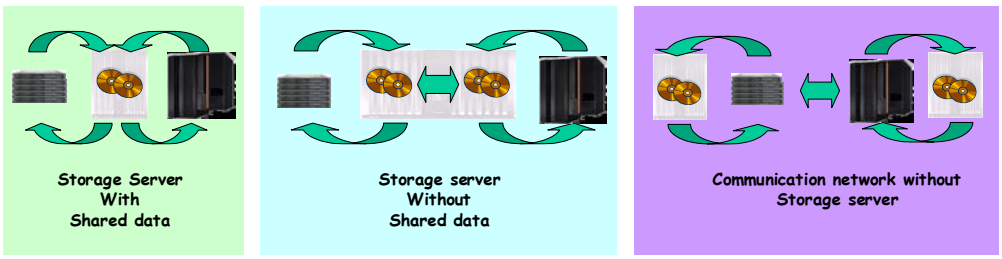
1. Grid Monitoring Service: Internal monitoring service used by the grid platform and the nodes to manage the Grid
2. Resource Monitoring Service: This service provides all the information on the status of tasks running, pending or terminated in each node

Another fundamental component of IMG is the data sharing platform between the mainframe and the Grid.

It has the responsibility to allow high volume mainframe data to be processed by the nodes without interfering with the mainframe. If interference occurs,it uses far less resources than the mainframe would need if it processed the job alone.

Basically, there are three architecture models:

1. Storage server with shared data: the mainframe and the Grid platform can access the data on a shared storage device that allow direct access to the data from both environments without any duplication
2. Storage server without shared data: the mainframe and the Grid share a storage device that allow data to be copied from one environment to the other in both ways but each environment works on a copy of the data individually.
3. Communication Network without Storage Server: the mainframe and the Grid platform share a communication network that provids all the messaging between both environments, and supports the data exchange between them.



IMG supports indistinctly the three models. However, they are not equivalent as the global performance goes down from model 1 to model 3 as well as the corresponding costs.

The last main component of the IMG architecture is the Mainframe Integration Architecture that sits in the mainframe (and part in the Grid nodes). It provides all the necessary tools, commands, monitorization and services needed to allow the seamless operation of the mainframe work independently of the platform on which the jobs are executed: mainframe or Grid.

All the execution remains under the control of the mainframe and integrates with any scheduler the mainframe is running (Control-M, OPC, etc ...).

No change in the planning and scheduling of the jobs is necessary as the Mainframe Integration Architecture sends back the same return codes as if the execution had been executed on the mainframe.

Even in the case of a program error, the same information the mainframe would give is passed to the programmer so that program development is not affected by the platform on which the program has been executed: mainframe or Grid.

About IMC Group

IMC Group is a leading provider of consultancy services and information technology solutions to the financial industry and government institutions on the Spanish market.

IMG is an example of IMC expertise when it comes to understanding our clients needs and building innovative solutions around the high performance computing systems required by the more demanding enterprise environments.

IMC is pleased to provide more information about this product as well as a demo.

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