

## How's your Headroom?

*"We are building out our softs/agriculturals trading capability - will the systems cope with another couple of hundred trades a day?"*

*"There's a lot of investor interest in option structures based around Commodity indices - will adding a few of these trades affect our risk calculation times at all?"*

These are questions which (unfortunately) seldom get asked by business users - because by and large it is assumed that once a Commodities trading system is installed and running, adding more business is just a matter of getting the correct market data and trade templates configured. It's only when the system shows signs of stress that capacity planning becomes a serious matter for discussion.

### Drivers

With the explosive growth in new underlying assets and ever increasing deal volume, it is all too easy for your Commodities trading system to run out of capacity. This article examines best practices for monitoring and managing production system capacity so that business can continue to grow.

What is driving this need for technology to service business expansion? The retail sector as well as investment managers are diversifying their portfolios looking to catch the upswing of commodities in a bullish market.

Constant and growing demand for oil from emerging markets most notably China, coupled with OPEC's reluctance to increase output has led to increased instability and a climb in the price of oil. The market is expecting a 7<sup>th</sup> successive year of price increases. The weakening dollar is not only pushing up oil prices, but is making gold an increasingly safe and attractive option for investors, prices having increased more than 30% in the last year. China is fuelling huge growth in base metals, whilst mergers and continued demand from emerging economies should keep this high. Agriculture is a more recent option for investors, with world wheat stocks hitting a 30 year low driven by Australia's worst drought in 10 years, low inventories, poor harvests and a growing demand from biofuel, the price of soft commodities will continue to climb.

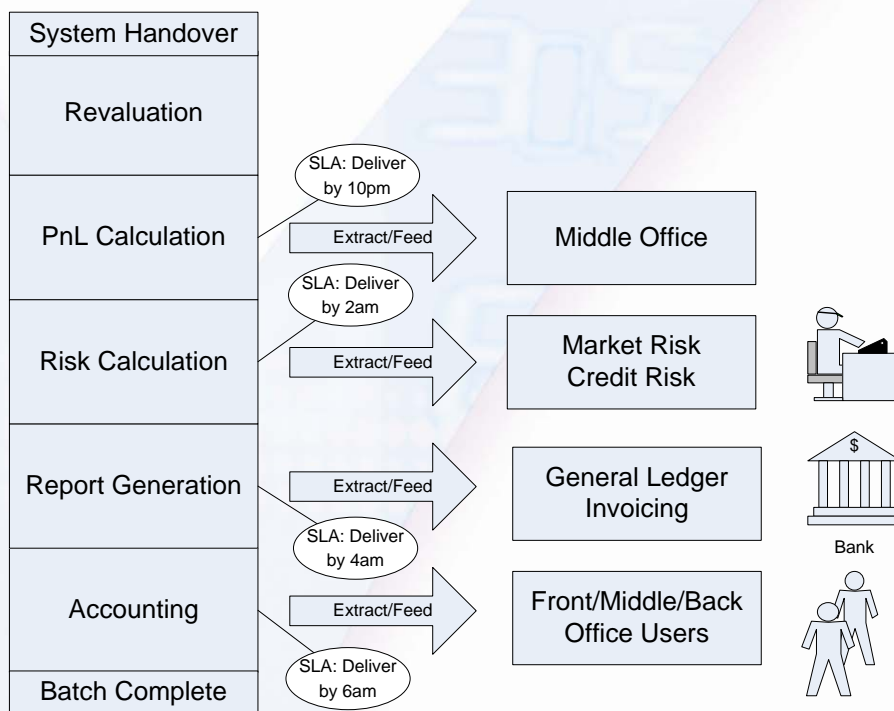
As a result both new and established players are ramping up their involvement in commodities trading. Broad-based commodity indices such as the well-established GSCI and DJ-AIG, along with newer ones such as JPMCCI are attracting large investor interest. Meanwhile the variety of products which fund managers are trading are increasingly structured consisting of exotic products, many carried over from the equity derivatives world, such as baskets, best-of, choosers, rainbows as well as barriers, knock ins and digital options. The increasing move to electronic trading makes even futures trading more problematic, as orders execution becomes fragmented, and a simple order of 100 lots may end up getting booked as 10 or 20 individual fills.

These factors are adding inexorably to a dynamic and sophisticated approach required from technology to meet the needs of the business.

## Existing Processes

As daily trading volumes are increasing and the nature of business transacted becomes more complex there is inevitably an increase in demands on the system. This affects both intraday and end of day performance. Figure 1 illustrates a typical (simplified) overnight batch process, with some indications of Service Level Agreements (SLAs), which will be affected by the increasing demands on the system. Often there is a chain of downstream processing, giving rise to a collection of dependencies and SLAs, each of which must be met to prevent business users from missing their morning data.

Fig 1. Typical overnight batch process



As system stress increases, the effects are felt in a number of ways:

## Potential Issues

### Physical Effects

The trading system may start running out of disk space, may possess inadequate memory for large jobs, or experience exhaustion of CPU capacity for compute intensive calculations such as scenario analysis and VAR. It is possible that limitations are being imposed by an unexpected constraint such as network bandwidth.

### Usability

Higher deal volumes cause issues with the time required to book a trade especially in the case of entirely electronic ones. Delays in trade booking might have follow-on impact as users repeatedly refresh the risk on a position and updating prices from the market might also see slow downs and freezes.

### SLA Deadlines

The trading system is usually one component in a complex chain of other systems, all of which need to have run successfully to support the business, whether that is managing the accounting postings, or delivering market and credit risk reports to the relevant business management. A breach of Service Level Agreements will mean that one or more of the downstream processes is run late, and fails to deliver.

## Approach

### Availability

A stressed system is usually an unreliable one. Reduced uptime, system crashes or frequent reboots required are all signs that the system is approaching failure.

Without planning and preparation for increased deal volume and complexity it is entirely possible that the business will begin to exceed the limits of the system in any of the above ways. If this happens the system will fail and may not be able to trade. How can you best manage a system so as to be prepared for this eventuality?

- It is necessary to understand the performance levels at which your system is currently running. To do this it is necessary to monitor the system and capture metrics (Key Performance Indicators, or KPIs) on many levels, from low-level such as cpu, memory, network and disk utilisation, to higher level concepts such as number of live trades, number of accounting postings, VAR run time, etc. Obviously adherence to SLAs is something that is essential to monitor. The data from these KPIs is extremely valuable - it should be captured in a database for analysis and an individual should be given responsibility for reviewing trends and patterns.
- Decide on sensible limits for each KPI. Some may be driven by external factors such as delivery of a feed to meet a SLA. Others may be constrained by physical limits - for example maximum memory usage. It is necessary to consider the contingency plan available if the system hits its limits. Understand how long it will take to fix the issues if this scenario actually occurs. If your CPU's are running too hot what will you do? Buy a grid? Buy more application servers? How long will this take to install?
- Finally, establish your application's real headroom by "Testing the System to Destruction" to discover how far it can be pushed. Take a copy of the production environment and produce as realistic as possible a run of typical cycles in a development environment. Run batches and feeds of STP trades to test the system. Then, increase the volume of these trades. This can be achieved by duplicating portfolios, or entering dummy trades. Segregate the types of trades and examine the impact by trade type; compare for example 100 futures against 10 exotic Monte Carlo trades.
- All systems will fail at some stage, often in an unexpected manner. For example in one real-life situation a system where the memory usage monitors were showing 'green' was in fact on the brink of failure, because the monitors were calibrated with a maximum limit of 4Gb (the amount of installed memory on the application server). In fact the operating system constrained the maximum process size to 2Gb, so rather than being at 49% capacity the system was in fact at 98%.
- To produce a real calibration of what the system can take, repeat the process until the system does break and you will have a real understanding of how far the system can be pushed. From this position fix the failures and repeat the process until you have sufficient headroom to compensate for planned future growth. (See Fig 2)

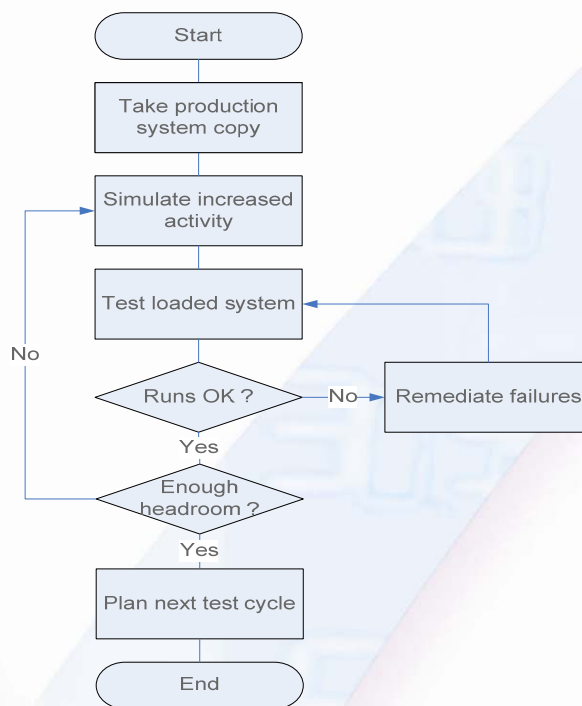


Fig 2.

The final part of the puzzle is determining how to translate business forecasts into required increases in KPIs. It is essential to get predictions from the business on new products planned, their complexity and the volumes that they will trade. The next stage is to project expected growth over the following year. From this it should be possible to devise further system stress tests to prove out the required capacity. Try to ensure that the capacity programme is based on realistic simulations of projected new business, and aim to track estimates against actual traded volumes, so as to make future predictions more accurate.

By following the above steps, the technology team should be able to prove out a system headroom figure that will provide the business sufficient capacity to cope with demands placed on it.

Excelian has proven experience in delivering both the strategy and the implementation expertise when completing significant system health check and upgrade projects for both in house systems and third party commercial products.

## Excelian

Excelian provides integration services across a whole range of trading, risk management and back office systems, and possesses an impressive portfolio of projects where we have provided the client a platform enabling significant growth of the business. Our Grid and High Performance Computing Practice complements the system integration practice in taking our headroom model to the next stage of delivery. If your current infrastructure is unable to meet the growth projected by the model, Excelian's Grid and HPC Team will be able to produce a strategy for building a Grid solution into the solution and implement it. Significantly the Commodities practice has an acute understanding of commodities strategy in today's market place made possible through our staff's extensive experience in providing such solutions for the early adopters, who are now major participants in commodities trading.