

Towards Real Time Valuation

This presentation will give practical experience of an insurer's efforts in reducing reporting times for Solvency II. This has been achieved through the development of an automated valuation process system which allows the entire valuation process to be mapped and run from raw mainframe data and market feeds right through to actionable board risk dashboards. The presentation will cover how the system addressed auditability, version control and grid computing issues along the way.



Towards Real Time Valuation

The Scottish Friendly Experience

Keith Jennings
Head of Actuarial
Scottish Friendly

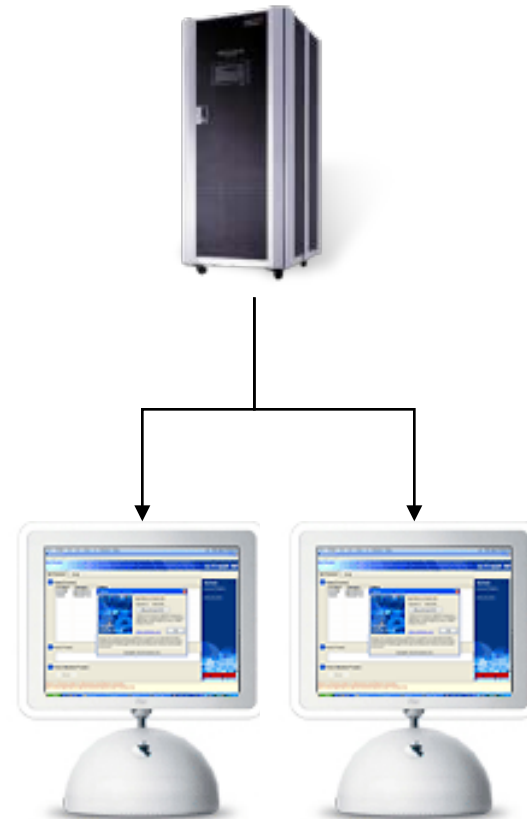


The Real Time Valuation Challenge

80%

:

20%

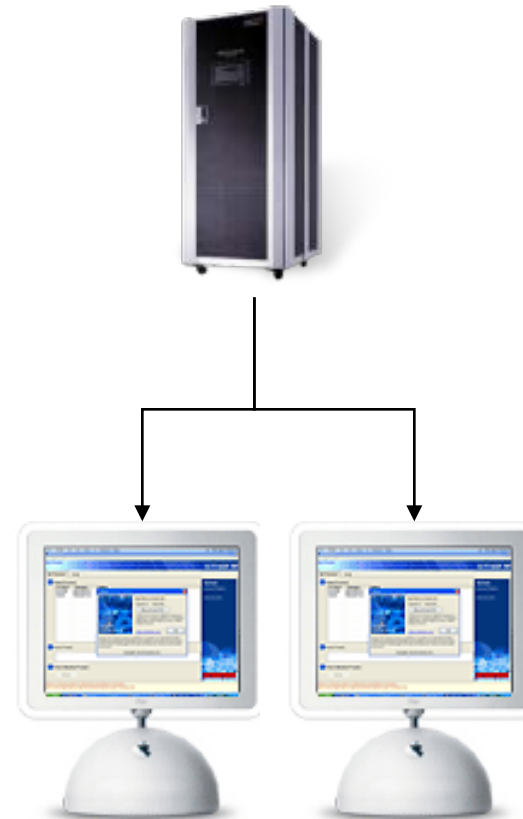
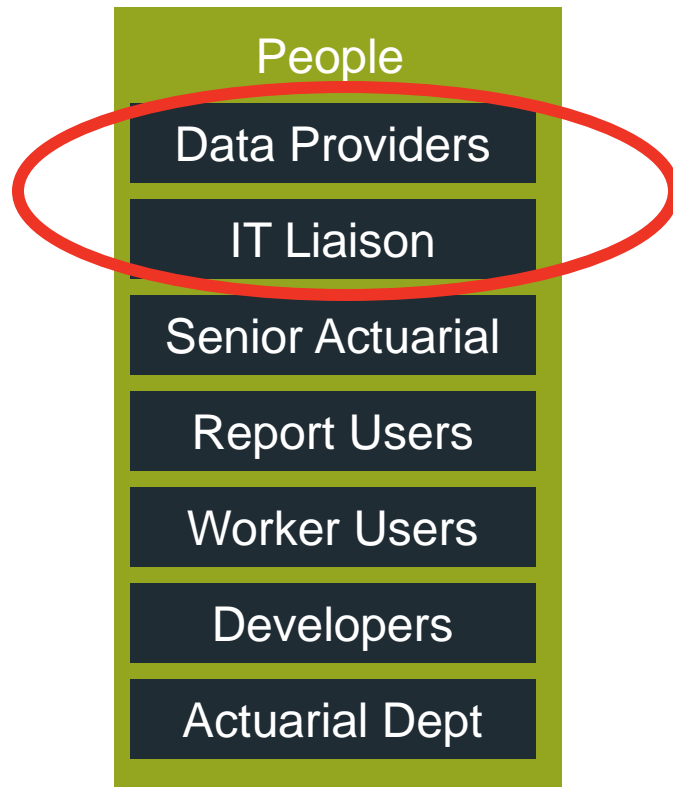


The Real Time Valuation Challenge

80%

:

20%



Prerequisites: Data Challenges

- Accounts / Investments – Daily Asset Data
- IT – Weekly Liability Data
- Technology can help: SQL Services Integration Services manages data into single aggregate feeds
- However, cross-departmental buy in key: dated or poor quality data makes exercise pointless
- Benefits of additional department work need to be highlighted
- If the data process cannot be automated, ongoing drain on resource will be difficult to justify

Achieving IT Buy In

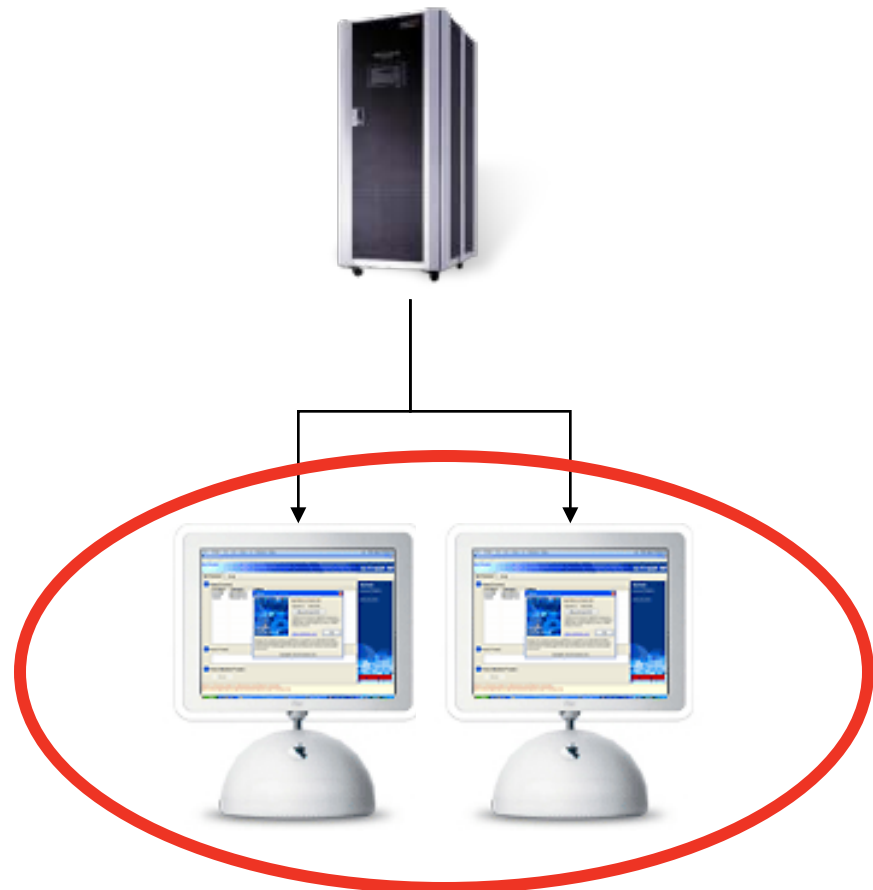
- A key approach to limiting IT costs and risk is to limit user rights
- Real Time Valuation as a client-server based solution involves significant rights across a number of PCs
- IT policies need to be adapted to permit the solution – the cost of reviewing these policies (and ultimately making a change) needs to be justified

The Real Time Valuation Challenge

80%

:

20%



What is the worker automation problem

- Need to run an executable against the worker PC processor and memory
- Executable may use a number of .dll files (some of which will be user compiled model code)
- Executable parameters passed via command line
- Model support files: parameter text files, parameter XML files
- Assumptions and Data

Worked Example: Excel Automation

- Generic Control Spreadsheet
- Generic Module to add to new spreadsheets
- Minor code changes to customise the new spreadsheet

Automating the Process

- Control spreadsheet is executed using a command line from command prompt on the worker PC:

```
"c:\Program Files\Microsoft Office\Office\excel.exe"  
"c:\actuarial\Excel\AssetsReport\model\control.xls"  
/e/c:\actuarial\Excel\AssetsReport\model\worker3\product.xml//
```

- First part – Excel exe location
- Second part – Spreadsheet to open
- Third part – location of xml parameter file and optionally any command line parameters

Spreadsheet Startup

- When spreadsheet launches it will automatically run the macro `Workbook_Open` stored in `ThisWorkbook` on startup
- Normally, Excel is set to ask whether macros are enabled. You will need to change your settings to automatically enable macros

Obtaining Input Parameters

- The following code will read the input parameters on the command prompt:

```
CmdRaw = GetCommandLine
CmdLine = CmdToStr(CmdRaw)
product_loc = Mid(CmdLine, 1, fwd_slash_pos1 - 1)
```

```
Function CmdToStr(Cmd As Long) As String
    If Cmd Then
        StrLen = IstrlenW(Cmd) * 2
        If StrLen Then
            ReDim Buffer(0 To (StrLen - 1)) As Byte
            CopyMemory Buffer(0), ByVal Cmd, StrLen
            CmdToStr = Buffer
        End If
    End If
End Function
```

Declarations

```
Declare Function GetCommandLine Lib "kernel32" Alias "GetCommandLineW" () As Long
Declare Function IstrlenW Lib "kernel32" (ByVal lpString As Long) As Long
Declare Sub CopyMemory Lib "kernel32" Alias "RtlMoveMemory" _
    (MyDest As Any, MySource As Any, ByVal MySize As Long)
```

Reading XML file parameters

- The following code will obtain the XML parameters:

```
Dim xDoc As New XmlDocument60  
xDoc.Load product_loc  
output = xDoc.SelectSingleNode("//output").Text
```

Worker Progress Logging

- The following code (in an additional module in the new spreadsheet) will manage logging:

```
Public LogFileName As String
Sub LogInformation(LogMessage As String)
Dim FileNum As Integer
    FileNum = FreeFile ' next file number
    Open LogFileName For Append As #FileNum ' creates the file if it doesn't exist
    Print #FileNum, Str(Now()) + "," + LogMessage ' write information at the end of the text file
    Close #FileNum ' close the file
End Sub
```

- This is called within the new spreadsheet using for example:

```
Module1.LogFileName = xDoc.SelectSingleNode("//logfile").Text
LogInformation "Updated log file location"
```

Run the Spreadsheet

- The desired spreadsheet can now be opened and its work performed:

```
On Error GoTo ErrHandler1
```

```
Application.Workbooks.Open ThisWorkbook.Path + "\daily_transactions.xls",  
    updatelinks:=False
```

```
Application.Run "daily_transactions.xls!transactions"
```

```
ErrHandler1:
```

```
    LogInformation Err.Source + " " + Err.Description + " " + Str(Err.Number)
```

```
    For Each workbk In Workbooks
```

```
        workbk.Saved = True
```

```
    Next
```

```
Application.Quit
```

Example Summary

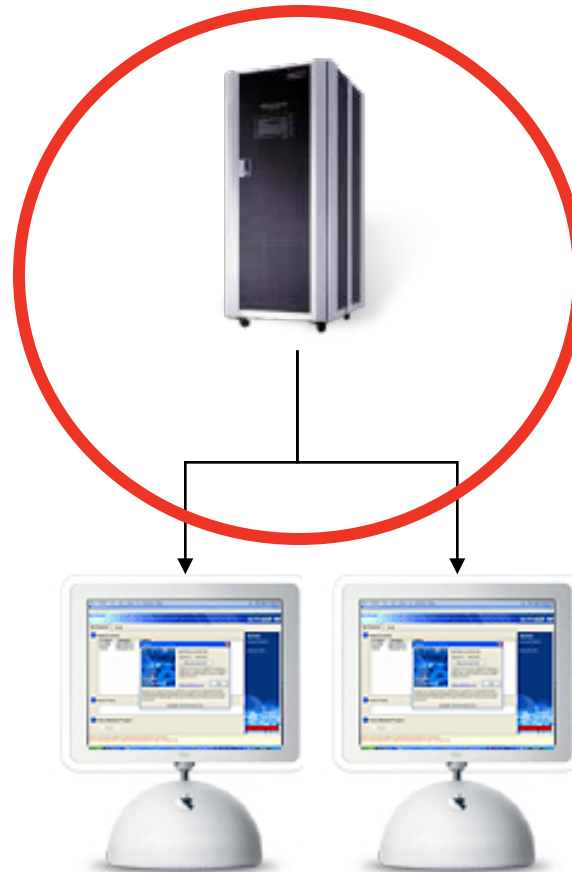
- All runs have:
 - A parameter set & XML file to customise the run
 - A logging system to quickly identify issues
 - An identifiable output which can be used in later runs

The Real Time Valuation Challenge

80%

:

20%



Master Automation Approaches

- Need to run code (a .exe file) against the CPU of a worker PC. This needs to be initiated by the master PC
- Solution A: install a service on the worker PC which can communicate via a port with the master PC
- Solution B: use Windows Management Instrumentation (WMI) to monitor and remotely control the worker PCs

Service Approach

- + Can have access to network locations
- + Service can run without admin rights
- + Master PC doesn't need rights on admin PC
- - Needs to be installed on worker PCs (admin rights to install); risk that affect users
- - Need to keep a port open across the network
- - Service running in background uses up PC resource

WMI Approach

- + Minimal installation – not reliant on worker software; no impact on user; system upgrades don't require further install
- + No port issues
- - No access to network, so file access needs to be initiated from server
- - Need admin rights on worker PCs
- - WMI monitoring uses worker PC resource

WMI versus Service

- Adopted a WMI approach for security reasons
- Having admin rights (via an IT controlled account) on worker PCs not an issue, since already a number of IT admin accounts to roll out user updates
- User PCs don't hold important data
- WMI assures that the user PC cannot access the network
- Service approach creates risk of user issues due to installation
- Master passing files to worker (rather than worker reading files via network from Master) is preferred, since it controls current hard disk reads. Copies of files on worker minimise future reads. Optimum speed solution, if workers have adequate hard disk space.

Hardware & Software Decisions

- Server with 16 processors / 24GB ram
 - Windows Server 2008 Standard (not High Performance Computing)
 - Microsoft SQL Server database system
 - Microsoft SSIS data management system
 - Customisation within SSIS using C# programming language
- Well supported & developed (global) products
 - not locked in to specific company for support; widely supported by contractors, books, training & internet forums
- Total cost: £8,000

Worker Hardware Solutions

- Dedicated PCs
- Cloud Computing – PCs on demand from outside organisation
- CPU Scavenging – PCs on demand from within organisation

Cloud Computing

- If writing 1GB of results / hour need sufficient network connection
- Program will need to be loaded onto the cloud computers and appropriately monitored
- Master on cloud? If so permanent and hence minimum cost?
- Computer configuration – windows / Linux?
- Quick extension of resource easy?

CPU Scavenging

- Monitoring for screen saver
- Scheduled availability (night time)
- Set process priority flag

Master Control

- Tabulated details of run:
 - Record of version of assumptions, data, ESG, model used
 - Location of zipped up results along with hash code
- Ensures results can be reproduced and quickly verified
- Automated version control & sign off: allows later runs to pick up output from earlier runs
- Audit drones randomly pick historic runs and notify if they cannot reproduce hash code
- Separate Log table of Master actions and behaviour

Managing Complexity

- Event driven system to manage complexity
- Runs added, but required to wait for other runs to arrive
- Runs added based on
 - user activity (accounts investment system updated)
 - e-mail (market volatility e-mail arriving)
 - Other runs being completed
 - IT processes (data run being performed)
- Investigation programs can spawn review runs based on investigation results

Run dependency

- Run dependency is defined in tables
- Runs which are not waiting on other runs to complete are marked as ready to start
- Based on the outcome of a run, further (investigation) runs may be added
- Different batches of runs can be performed in parallel (defined by run batch identifiers)

Hard Disk Management & Recovery

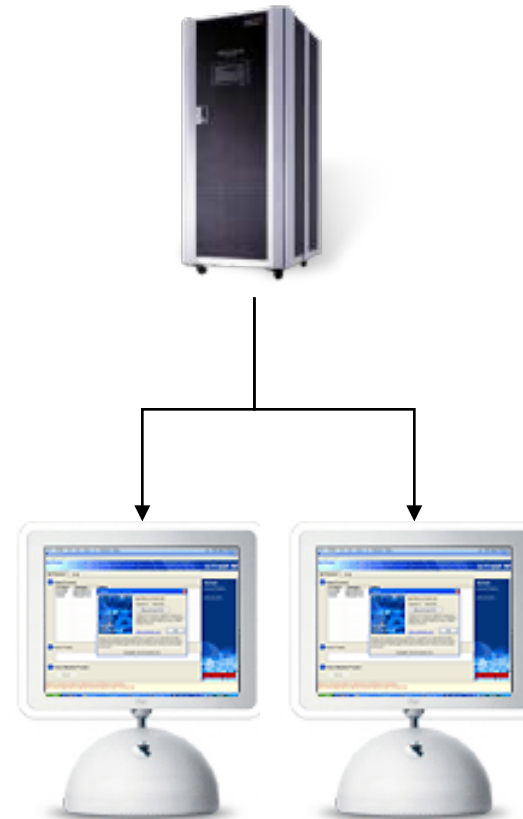
- Typically using 30GB / 24 hours
- Process to free space; define space requirements and assure that hard disk is backed up
- Manage space usage on worker PCs – leaving files means they don't need to be copied for next run, but increases disk space usage

The Real Time Valuation Challenge

80%

:

20%



Obtaining Internal Actuarial Buy In

- Current processes: senior actuaries / committees approve assumptions over period of months, sometimes applying them retrospectively
- This undermines results as assumptions are not yet out. Final results might give different picture.
- Revised Approach: ongoing assumption updates, not applied retrospectively (so no assumption changes following key valuation dates)
- Assumptions reviewed throughout year (rather than at or for valuation dates) and changes apply immediately on day review approved
- This requires appropriate buy in and changes at a senior level

Board/Exec Reporting Challenges

- Need to be able to explain all movements since previous day
- Don't have "ran out of time" clause
- Expectation management – future developments
- Awareness that results today are based on previous week's / month's results
- Diverting resource to developments means slow "restart" time

Development Versus Reporting

- Difficult ongoing trade off between
 - Developing & improving current results
 - Moving to and using next set of results
- Even though production is automated, results review and usage takes time
- It doesn't take long to automate results, but promoting new uses for results takes longer: cannot afford poor quality figures

Results Review & Monitoring

- More results means more monitoring
- Need to understand and interpret results and new changes
- Offering a hypothesis for a movement or attributing the movement to a cause no longer sufficient – needs to be proven in a spreadsheet calculation
- Managing cumulative results movements in a high noise environment

Worker Monitoring – User Support

- Getting user buy in – why should managers agree to letting their team's PCs be used?
- “Bad news spreads fast” – little room for mistakes; success goes unnoticed
- Managing PCs being powered down
- Developing confidence in system
- Managing IT relationship – is a problem IT or related to worker system?

Obtaining Developer Support

- Having a production and development system
- Approach to replicating changes across systems (sql procedures, table changes, code changes)
- Need to have process for developing in a “sand box”, ensuring that the production system is unaffected
- Gradual move from development to “go-live” at which point developments are pre-tested on the development system

Impact on Actuarial Roles

- Valuation Role -> more IT focused – reviewing run logs. Significantly reduced
- Results Ambassador Role -> promoting results usage and confidence. Significantly increased
- Developer Role – more resource available for higher value added development work
- Investigation Role – since investigations become automated, role is more of an investigation “architect” rather than investigation “performer”

The Real Time Valuation Challenge

80%

:

20%

People

Data Providers

IT Liaison

Senior Actuarial

Report Users

Worker Users

Developers

Actuarial Dept

