SIF Systems Interoperability Framework
Association AU

ENTERPRISE SCALE TESTING

SOLVING REAL WORLD PROBLEMS THROUGH INTEROPERABILITY, THIS CASE STUDY 4 OF 7 IN THE SIF AU PILOT PROGRAM, FUNDED BY THE FEDERAL GOVENMENT AND SUPPORTED BY THE VICTORIAN DEPARTMENT OF EDUCATION AND EARLY CHILDHOOD DEVELOPMENT.

→ INTRODUCTION AND BACKGROUND

The Digital Education Revolution envisages "technology enriched learning environments" for all young Australians. Key to its success is the capacity to put the right information at the right time into the hands of learners, teachers, parents and policy makers.

Since 2007 Chief Information Officers from Australia's state and territory education systems, together with colleagues from the Catholic and Independent school sectors and with support from the Commonwealth Department of Education, Employment and Workplace Relations, have been working towards the establishment of an open standard for systems interoperability for Australian schools to enable information to be used when and where it is needed.

This joint initiative, known as "Towards SIF AU", has enabled the development of a draft SIF Implementation Specification for schools in Australia (further referred to as the SIF AU Spec.) and a business case identifying the costs and benefits of adopting SIF across the Australian Schools Sector. The business case assessed evidence gathered from interviews and surveys with key stakeholders, and through a program of pilot projects aimed at solving practical interoperability challenges making use of SIF. The pilot program was conducted in such a way as maximise the sharing of knowledge and solutions across projects and produce a knowledge base of enduring value to the schools sector.

This is a summary case study of one of these pilots.

→ OVERVIEW: ENTERPRISE-SCALE TESTING

One of the questions often asked of SIF is "Does it provide enterprise scalability and reliability?"After an extensive consultative process to discover how enterprise-readiness could be demonstrated in the context of the Australian K12 education systems, the tests that make up this pilot were chosen as the most appropraite and robust examples.

This pilot was commissioned to create and run tests to determine whether SIF infrastructure could provide solid reliability at the peak data loads experienced by Australia's large jurisdictions. The pilot included Victoria and Western Australia as the example models of large Australian jurisdictions. The tests were designed to answer these questions:

1. **Scalability and load handling:** Could a SIF implementation accommodate a large transaction load or volume, and handle the projected transaction loads of the Victorian and Western Australian Departments of Education?
2. **Availability:** Could a SIF implementation remain fully functional even if one or more of its servers should fail?
3. **Recoverability:** Can a SIF implementation 'store and forward' messages if an agent is unable to process them? When the agent recovers, can these messages be forwarded as expected without loss?

A CLEAR DEMONSTRATION OF THE ENTERPRISE QUALITY OF A SIF IMPLEMENTATIONS UNDER THE CONDITIONS OF A LARGE AUSTRALIAN JURISDICTION

→ THE PARTICIPANTS

The project was co-approved by the Education Departments of Victoria and Western Australia, with funding from the Federal Government's Digital Education Revolution Fund provided through the SIF-AU program. All participants made in-kind contributions around a real world problem being solved with a new collaborative approach.

Visual Software conducted the testing for this pilot, with the Towards SIF AU team providing support and groupsite access and management.

→ KEY FINDINGS

The pilot demostrated that a SIF implementation could:

- handle enterprise-level transaction loads equivalent to that of a large Australian jurisdiction with ease and furthermore do this with modest hardware and software.
- remain highly functional should one or more of its servers fail.
- store and forward a very high volume of messages at need without loss or error.

→ PARTICIPANT EXPERIENCE OF THE PILOT

All tests were run in-house by Visual Software, using their own data constructs, server farms and test-beds, although remote access to the servers was made available to interested parties. As Visual Software were experienced in the implementation of SIF and were working with a clear aim the pilot proceeded smoothly.

Testers found that SIF was robust and required modest hardware even for a jurisdiction level of traffic:

"As shown through these tests, a SIF infrastructure should be able to support the required load levels of an enterprise deployment in WA or Victoria in a reliable and robust environment. The Zone Integration Server software that we tested, installed on modest hardware, was able to handle the estimated load requirements for these Australian states with minimal to average machine utilization....even in failover mode the tested software on the tested platform was capable of sustaining a load that exceeds the estimated normal load for an Australian state such as Victoria or Western Australia." [RH]

→ SOLUTION

The test rig was designed to simulate interoperability traffic in Victoria or WA, including base and peak loads. It originally included five servers, four dedicated for the ZIS (two database and two web servers) and one to the SIF agents. To generate sufficient traffic, a more powerful agent pool of seven servers was ultimately configured. The ZIS was configured with MS Windows Server 2008 R2 Network Load Balancing (NLB), multicast mode, with no affinity and no hardware acceleration. Database servers used SQL Server Enterprise Edition, and test agents were built using ZIAgent (Visual Software's admin-configurable agent).

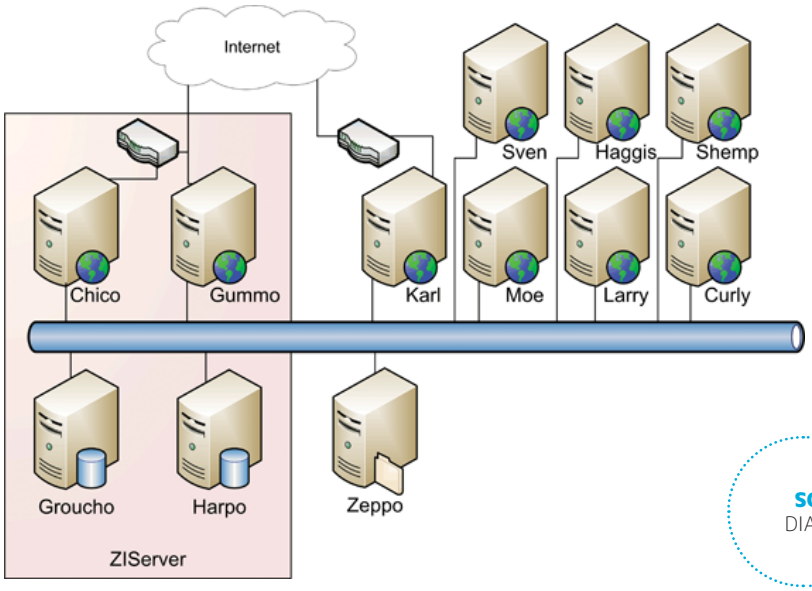
To test scalability and load balancing, agents passed messages of various sizes containing events, requests and responses. Messages were passed at sustained rate of 40 per second, with peaks of up to 75 per second. Servers handled this easily as shown by the server utilisation below, with less than 25% CPU and memory consumption and negligible disk usage:

Some incidental tests were done on optimal message size, which was found to be not critical but most efficient between 64K and 128K.

It was also found that disk mirroring and the high-availabilty, high-safety server setup cost little in either overhead and hardware. A recommended typical minimum installation for an Australian jurisdiction was found to include four physical servers, two each for database and web services, each with modest hardware and software requirements.

AVAILABLILTY - KEEP OPERATING WHEN SERVERS FAIL

The availbility test was done by simulating a random catastrophic event where a single server was shutdown in the middle of serving requests. A request/reponse pair was used as this presents a "worst case" scenario becuase of the complexities of identifing the transactions underway at the failure time. Extensive capture of testing data revealed that elements of the SIF system functioned correctly as expected. A combination test followed which pushed a high load as well as a progressive failover to a single server. With a single server handling the entire load, the normal message load remained within reasonable limits.

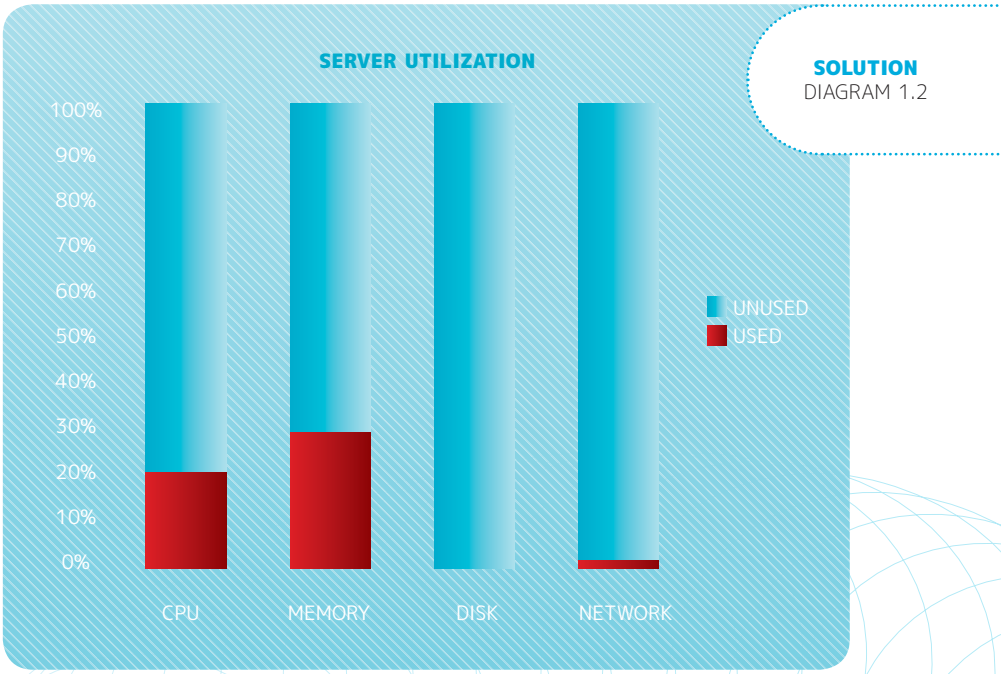


SOLUTION
DIAGRAM 1.1

RECOVERABILITY - SELF-CORRECTION AFTER FAILURE

The recoverability test requested enough objects to generate 400,000 messages. After sending the request, the requesting agent was removed from service until all message were queued, simulating a system failure. The agent was then reintroduced (simulating an system coming back online) and the queue of messages automatically sent without human intervention. When the queue emptied, a check was made to see if all messages were been correctly delivered. The ZIS cluster provided the expected the 'store and forward' functionality when the agents were unable to process messages. When the agents were reawakened, they received all the messages correctly.

See Visual Software's own detailed case study of this pilot: **_http://www.sifsupport.com/wordpress/index.php/sif-au-pilot/pilot-2-case-study/_**



SOLUTION
DIAGRAM 1.2

CAPTURE OF TESTING DATA REVEALED THAT ELEMENTS OF THE SIF SYSTEM FUNCTIONED CORRECTLY AS EXPECTED.

→ BENEFITS

The benefits of this study include:

- a clear demonstration of the enterprise quality of a SIF implementation under the conditions of a large Australian jurisdiction.
- a valuable set of tested configuration options for such a system which could save or provide a standard for jurisdiction research into such solutions

→ NEXT STEPS

It is recommended that the findings of this pilot be used in presentations on "Designing SIF for use in a jurisdiction". These presentations would be made to an audience of solution architects and other interested parties from jurisdictions to illustrate the enterprise scalability and reliability of SIF.

→ ABOUT THE SYSTEMS INTEROPERABILITY FRAMEWORK

The Systems Interoperability Framework (SIF) is a simple but powerful tool for effectively integrating information from diverse computer systems. SIF manages both the "what" and the "how" of information sharing. Its core components are: a specification of what is to be transferred (the SIF Implementation Specification Australia); a software agent that maps the information in a computer system to that Specification; and a traffic cop directing the flow of information between systems called the Zone Intergration Server (ZIS).

The SIF Implementation Specification (Australia) is administered in Australian jurisdictions by the interim SIF AU Board, and internationally certified by the SIF Association.

→ MORE INFORMATION

For more detailed information, see the SIF AU Phase One Pilot Program Case Study. This study also forms one of seven summary case studies on pilots from Tasmania, Western Australia, South Australia, Catholic Education Office Melbourne, Enterprise Scale SIF, National Systems Interoperability Service and the SIF AU Specification.

You can find case studies and other useful information on the SIF AU website: **http://au.sifassociation.org/**

You can contact SIF AU by email: **info-au@sifassociation.org**

→ ACKNOWLEDGEMENTS

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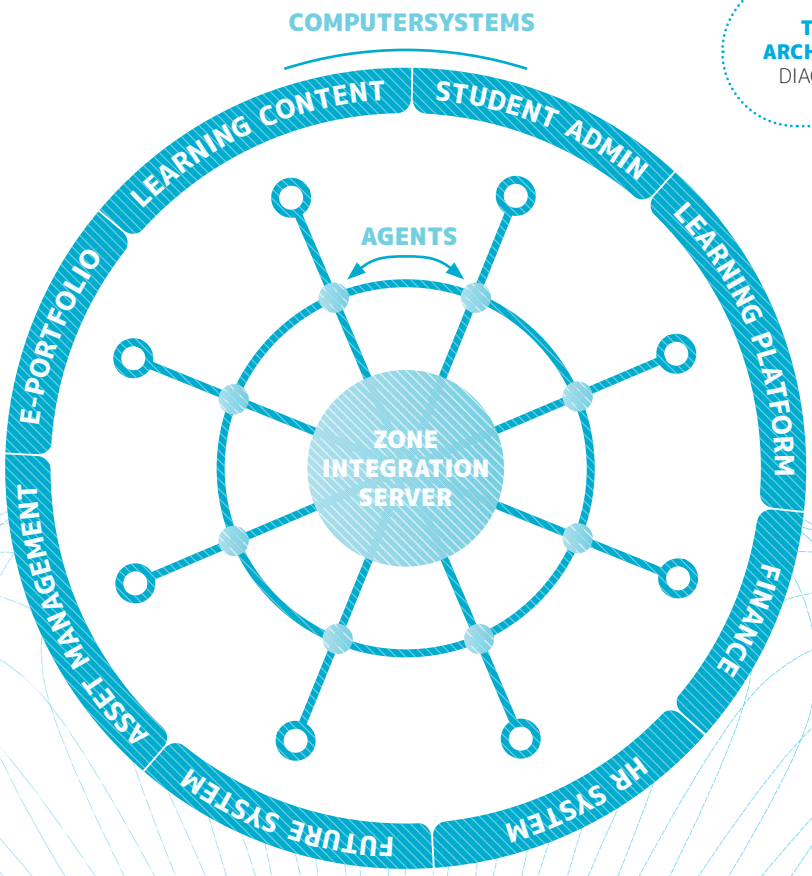
THE SIF ARCHITECTURE
DIAGRAM 1.1



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