

**betfair.com** **JBoss World 2005**

**Betfair takes a punt on JBoss**

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Application Architect  
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**Speaker**

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Matt Youill

- Application Architect at Betfair.
- Designed and implemented Betfair's new core systems (The post 2002 stuff).
- Now responsible for strategic architecture (The post 2004 stuff).
- 10 years experience writing Internet and Enterprise software.

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**Industry Background**

What is a Betting Exchange, and who are Betfair?

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**Industry Background: Traditional Bookmaking**

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- Offers only back betting. Customers cannot bet against the outcome of an event.
- Bookmaker sets prices and factors in a heavy margin.
- Winning customers often penalised and may have their accounts closed.
- Bets are only made between the customer and the Bookmaker.

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**Industry Background: The Betting Exchange**

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- Customers can both bet for (back) and bet against (lay) the outcome of an event.
- Customers set the prices.
- Customers never penalised for success.
- Customers bet directly against each other.

*Betfair simply provides the technology enabling customers to match each others bets.*

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Industry Background: The Betting Exchange

Betting on New England to win at odds of 1.4. (-250 in American Odds)

Betting \$100.

If New England lose, I'll lose \$100. ☺

If New England win, I'll win \$40. ☺

Of course, I would first need to deposit funds into my account.

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Industry Background: Betfair

Pioneered the concept of the "Betting Exchange".

- Betfair launched June 2000.
- Initially an ASP/Oracle application based on a prototype developed on Microsoft Access.
- April 2001, matched £1,000,000 in 7 days for the first time.
- Achieved first £1,000,000 market in February 2002 on Premiership Soccer.
- Received the Queen's Award for Enterprise April 2003.

In 2004:

- Matching over £30,000,000 per day.
- Over 2 million bet transactions per day.

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Betfair Architecture: 2002

What was it, what was wrong with it, and why was it "re-architected"?

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Betfair Architecture: 2002

- By 2002, Betfair reached a point where it was a victim of its own success.
- Business had grown very quickly.
- Technology couldn't support further growth.
- Repairing the platform considered impractical.
- Only realistic course of action was to...start all over again. ☺

▪ But, what was the architecture in 2002...

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Betfair Architecture: 2002

Initially the application was simple, but as the ASP/VB/Oracle application grew, so did the Primary Web Application.

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Betfair Architecture: 2002

- ✓ Fast, but...
- ✗ Unmaintainable
- ✗ Unreliable
- ✗ Non-scalable
- ✗ Insecure
- ✗ Poor manufacturer support
- ✗ Poor supportability
- ✗ Limited functionality

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**Re-architecture Project: "Betex"**

How was it done, what was done?

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**Betfair Architecture: 2002**

Most importantly, change the data tier.  
But to do that, first needed to...

- Introduce a business tier.
- Change the platform.
- Change the presentation tier.
- Change the client applications.

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**Re-architecture Project: Betex**  
Selecting JBoss

ASP/COM not a viable server platform to continue on.  
Lots of choice for a short list of replacement technologies.  
J2EE and .NET clearly the most appropriate.  
2 years of hands-on experience supporting Windows.  
Partners could advise on J2EE vs .NET.  
500 in-house performance tests and 50 prototypes.  
Server platform not the same as client platform.

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**Re-architecture Project: Betex**  
Selecting JBoss

Metrics

Metric	
Security	
Reliability	
Scalability	
Manufacturer Support	
Maintainability	
Supportability of Platform	
Development Time	
Functionality	
Cost	
Learning/Training	
Staffing	

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**Re-architecture Project: Betex**  
Selecting JBoss

Metric Weights

Metric	Weight
Security	10
Reliability	9
Scalability	7
Manufacturer Support	7
Maintainability	6
Supportability of Platform	5
Development Time	5
Functionality	5
Cost	4
Learning/Training	4
Staffing	2

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**Re-architecture Project: Betex**  
Selecting JBoss

Metric Scores

Metric	J2EE Commercial	J2EE Open Source	.NET
Security	8	8	2
Reliability	9	9	6
Scalability	8	8	6
Manufacturer Support	7	6	4
Maintainability	7	7	7
Supportability of Platform	9	9	2
Development Time	4	5	7
Functionality	6	5	8
Cost	1	6	7
Learning/Training	5	6	7
Staffing	7	5	2

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Re-architecture Project: Betex  
Selecting JBoss

**Weighted Metric Scores**

Metric	J2EE Commercial	J2EE Open Source	.NET
Security	80	80	20
Reliability	81	81	54
Scalability	56	56	42
Manufacturer Support	49	42	28
Maintainability	42	42	42
Supportability of Platform	45	45	10
Development Time	20	25	35
Functionality	30	25	40
Cost	4	24	28
Learning/Training	20	24	28
Staffing	14	10	4
<b>Total</b>	<b>441</b>	<b>454</b>	<b>331</b>

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Re-architecture Project: Betex  
Selecting JBoss

- Success of J2EE over .NET largely due to flaws in the Windows O/S as opposed to the .NET platform itself.
- Main Commercial/Open-Source J2EE differentiator:
  - Proprietary value-adds.
  - Price/performance.
- JBoss chosen as preferred open source J2EE platform.
  - Features.
  - Maturity.
  - Community.

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Re-architecture Project: Betex  
Selecting JBoss

However...

- .NET chosen as the preferred client platform technology. Because of:
  - Responsiveness
  - Features
- Betfair's (thick client) management applications are .NET applications.
- Betex is a heterogeneous system.

**.NET**

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Re-architecture Project: Betex  
Presentation Toolkit

- Localization frameworks & content management systems understand locale only.
- Betex required locale plus region, skin and brand.

Betfair, British Region, Standard Skin, Chinese

The Ritz, British Region, Standard Skin, Greek

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Re-architecture Project: Betex  
Presentation Toolkit

- Content structured hierarchically.
- Supports fallback across all items string, file and database based.
- Fallback dramatically improves ability to manage content.
- Highly optimised and cached cluster wide using Tangosol Coherence.

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Re-architecture Project: Betex  
Presentation Toolkit

Importance of fallback

- Consider the "Home page link".
- Without fallback, need to maintain 420 copies of the text "Home".
  - 4 brands x
  - 7 regions x
  - 1 skin x
  - 15 locales
  - = 420.
- With fallback, only need to maintain 15 copies. That is, one for each language.

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Re-architecture Project: Betex  
Presentation Toolkit

At HTTP session initialisation, "presentation information" must be negotiated.  
"Presentation information" is the persons locale, region, skin, brand, currency, and time zone.

```
<xml version="1.0" encoding="UTF-8">
<resource-config>
<brands>
  <default>betfair</default>
  <brand>
    <name>betfair</name>
    <names>racingsite</names>
    <negotiation-urls>
      <url-pattern>.*.racingsite.*</url-pattern>
    </negotiation-urls>
    <negotiation-locale-patterns>
      <locale-pattern>.*.AU.*</locale-pattern>
      <locale-pattern>.*.DE.*</locale-pattern>
    </negotiation-locale-patterns>
    <negotiation-country-patterns>
      <country-pattern>NZ</country-pattern>
      <country-pattern>GB</country-pattern>
    </negotiation-country-patterns>
    <negotiation-currency-patterns>
      <currency-pattern>NZD</currency-pattern>
    </negotiation-currency-patterns>
  </brand>
</brands>
<brands>
  <name>betfair</name>
  <names>racingsite</names>
  <negotiation-urls>
    <url-pattern>.*.betfair.com.*</url-pattern>
  </negotiation-urls>
</brands>
```

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Re-architecture Project: Betex  
Caching

Betex runs on a moderate sized cluster of 45 JBoss 3.x application servers.  
30 application servers.  
15 caching servers.  
Uses Tangosol Coherence clustered caching product.

**TANGOSOL**

Caching dramatically reduces load on the database.  
Clustered caching allows sending data directly to application servers instead of via the database.

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Re-architecture Project: Betex  
Caching

With no caching, transaction rate is slow and database is overloaded.

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Re-architecture Project: Betex  
Caching

With caching not every request results in a database hit. Transaction rate is still slow and database load is unacceptable.

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Re-architecture Project: Betex  
Caching

With clustered caching only 1 node need request data from database. Efficiency improves.

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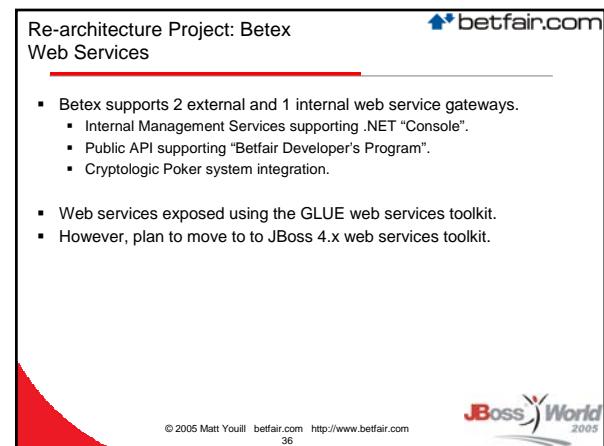
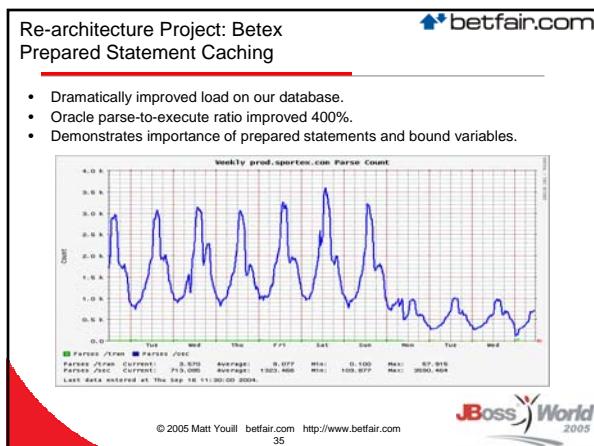
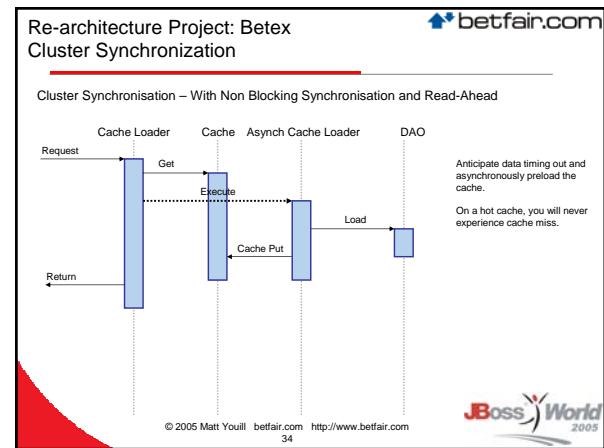
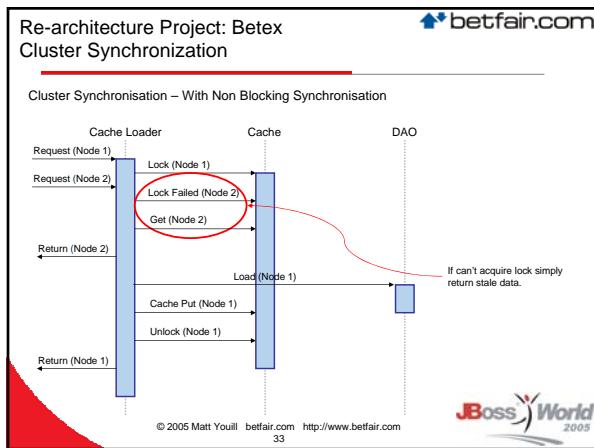
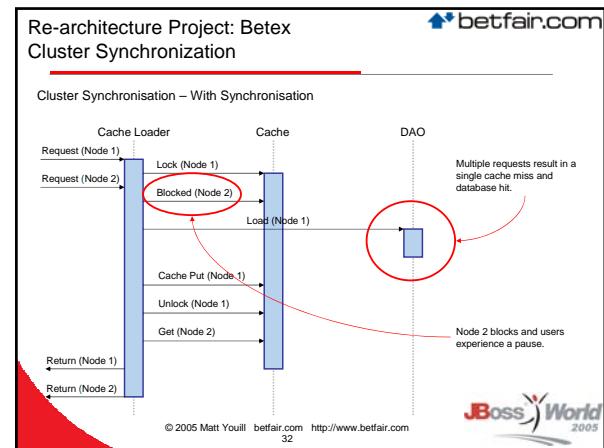
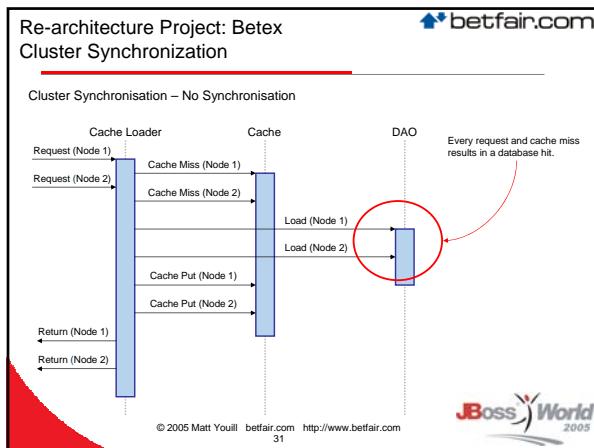
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Re-architecture Project: Betex  
Caching

More importantly, with clustered caching database no longer holds the only copy of data. Often the database need not be hit at all. Transaction rate and database load improves dramatically.

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**Re-architecture Project: Betex Web Services**

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Internal Management Services supporting .NET "Console".

- All system management via this application.
- Communicates with web services running on JBoss.



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**Re-architecture Project: Betex Web Services**

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Public API: "Betfair Developer's Program".

- Allows third parties to write applications to access core Betfair betting technology.
- All applications communicate with web services running on JBoss.



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**Re-architecture Project: Betex Web Services**

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Cryptologic Poker Integration.

- Allows sharing of account details and funds between Betfair and Cryptologic.



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**Re-architecture Project: Betex Monitoring**

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- Betex codebase instrumented with MBeans exposing various performance counters.
- Standard and custom counters collected periodically by Orca using twiddle.sh.



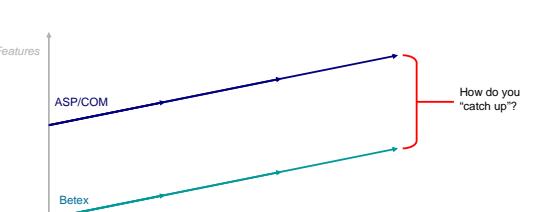
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**Re-architecture Project: Betex Managing Continuous Evolution**

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- Betex project completed over two years in parallel with continued operation and maintenance of the existing system.
- Every month spent developing Betex saw a month spent developing the ASP/COM site.



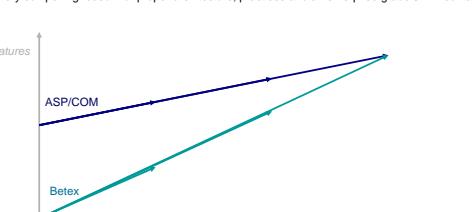
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**Re-architecture Project: Betex Managing Continuous Evolution**

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- How do you "catch up"? Don't know ☺
- Fortunately (for the Betex developers) ASP/COM system was so un-maintainable that 6 months of ASP/COM work could be completed in 2 weeks on Betex.
- Very compelling reason for proper architecture, practices and an enterprise grade J2EE container.



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**Next Steps: "System<sup>2</sup>"**

What to do next?

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**Next Steps: "System<sup>2</sup>"**

Currently in planning stage.  
Presentation and business tiers largely complete. Focus now on data tier, partition data, distribute system.  
Aim to dramatically increase capacity and scalability.

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**Next Steps: "System<sup>2</sup>"**

Ambitious target set of 50,000 transactions per second. Current peak transaction rate of 500 transactions per second.  
Few off-the-shelf products can support this performance. Current 48 CPU Sun 6900 Oracle database will not support much more than current transaction rates.  
Research into custom betting engine software.  
Research into more exotic technologies such as hardware based betting engines - "Betting engine on a chip" and fast in-memory database clusters.

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**Next Steps: "System<sup>2</sup>"**

The role of JBoss in the next phase...  
Likely that JBoss will provide the system infrastructure or "plumbing":  
Management and monitoring.  
Messaging.  
Transaction management.  
Etc.

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**Questions?**

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