



Dassault Systèmes 3DEXPERIENCE

Migrating to TomEE and Java EE: A Success Story

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Our Company



a Scientific company

Combining Science,
Technology and Art
for a sustainable society



13,300 passionate people

- 117 nationalities / 178 sites
- One global R&D / 54 labs
- Game changing 3DEXPERIENCE solutions



190,000 enterprise customers

- 12 industries in 140 countries
- 18 million users



10,000 partners

- Software, Technology & Architecture
- Content & Online Services
- Sales
- Consulting & System Integrators
- Education
- Research



Long-term driven

- Majority shareholder control
- Revenue: \$3.2 Bn*
- Operating margin: 29.8%*

* Figures as of FY 2014 / Non-IFRS

An Innovation Leader

Forbes The World's Most Innovative Companies

27	 DIAGEO	Diageo	United Kingdom	5.2	16.0	37.5
28	 HERSHEY	Hershey	United States	7.8	22.4	36.2
29	 DANONE	Danone	France	3.3		
30	 P&G	Procter & Gamble	United States	0.6		
31	 DASSAULT SYSTEMES	Dassault Systems	France	4.7		
32	 COLGATE	Colgate-Palmolive	United States	1.5		
33	 ECOLAB	Ecolab	United States	31.3		
34	 MONSANTO	Monsanto	United States	8.2		
35	 RECKITT BENCKISER	Reckitt Benckiser Group	United Kingdom	2.8		
36	 KEYENCE	Keyence	Japan	2.8		

BROWSE THE LIST

Values calculated August 2013

Rank ▲	Company	Country	12-Month Sales Growth (%)	5-Year Annualized Total Return (%)	Innovation Premium* (%)
1	 Salesforce.com	United States	32.1	21.6	72.8
3	 VMware	United States	16.3	19.0	63.7
31	 Dassault Systems	France	4.7	16.7	35.5
50	 CITRIX	United States	16.5	19.6	30.7
56	 Intuit	United States	9.1	17.3	27.9
72	 SAP	Germany	6.1	7.0	22.7

 DASSAULT SYSTEMES | The 3DEXPERIENCE® Company

Our Customers... from shampoo bottles to airplanes

	TRANSPORTATION & MOBILITY	RENAULT TOYOTA BMW HONDA VOLKSWAGEN Valeo
	AEROSPACE & DEFENSE	BOEING DASSAULT AVIATION EADS SAFRAN AEROSPACE DEFENCE SECURITY Bell Helicopter
	MARINE & OFFSHORE	DELTAMARIN MEYER WERFT ISO NAVAL S.L. DSME
	INDUSTRIAL EQUIPMENT	BOBST GROUP CLAAS metso ABB 三洋機工株式会社 SANYO MACHINE WORKS, LTD.
	HIGH-TECH	NOKIA Nikon Panasonic ideas for life ST LG PEGATRON
	CONSUMER GOODS - RETAIL	GUESS? UNITED COLORS OF BENETTON GAP PATEK PHILIPPE GENÈVE s.Oliver VF
	CONSUMER PACKAGED GOODS - RETAIL	P&G Barilla Coca-Cola amcor Tetra Pak
	LIFE SCIENCES	OLYMPUS Medtronic GE Healthcare SANOFI J&J
	ENERGY, PROCESS & UTILITIES	BASF The Chemical Company ALSTOM Power AEG SAMSUNG HEAVY INDUSTRIES
	ARCHITECTURE, ENGINEERING & CONSTRUCTION	SIMEC SAINT-GOBAIN KAJIMA SKANSKA ARUP
	FINANCIAL & BUSINESS SERVICES	BNP PARIBAS LA POSTE pwc IBM
	NATURAL RESOURCES	RioTinto Cerrejón Technip ExxonMobil

Our Purpose



“

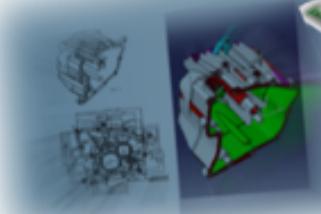
Dassault Systèmes provides business & people with **3DEXPERIENCE** universes to imagine sustainable innovations capable of harmonizing product, nature and life.

”

Bernard Charlès, CEO Dassault Systèmes

Our Legacy

3D
Design



3D DMU
Digital Mock-up



3D PLM
Product Lifecycle
Management



3DEXPERIENCE

What is the 3DEXPERIENCE Platform?

It's a **Business Experience Platform**
available on premise and
in public or private cloud



To enable our clients to create
delightful **EXPERIENCES**
for their ultimate
customers or consumers

A Groundbreaking Navigational User Experience

The screenshot displays the IFWE Compass | My Dashboard interface. At the top left is the 3DCompass icon. The main dashboard area includes:

- 3DDashboard**: Shows three photo thumbnails: "test pictures", "Interesting photos - 20 ...", and "Interesting photo".
- 3DSwym**: Shows a 3D model of a motorcycle.
- 3DPlay**: Shows a 3D model of a motorcycle.
- 3DSearch**: A search bar with dropdown menus for "All" and "Search".
- 6WTag**: A panel showing tags and their counts: who (50), when (9), what (283), category (50), language (29), comments (19), activity (4), interest (50), skill (50), answers (12), status (6), tags (50), type (13), where (135), community (35), city (50), country (50), why (0), and how (0).
- Profile**: Options for My Profile, My Status, Notifications, Messages, and Sign Out.
- Add**: Options for Post, Media, iQuestion, Idea, Wiki Page, Message, and Community.
- Share**: Options for Chat, Share on Facebook, Share on Twitter, Share on Google+, and a link to a news article about Adidas.

On the right side, there are news feeds for "Adidas : une innovation enracinée à Herzogenaurach" and "BPA delivery now available". Below the news feeds is the **3DMessaging** section, which includes a search bar for contacts and a list of contacts: Pascal Motte, Nicolas Cerisier, Frederic Van Batten, and David Cousin.

Out of the Box 3DEXPERIENCE Platform Capabilities



3DEXPERIENCE Available on Cloud, on Premise, and on Mobile



3DEXPERIENCE Powers our Brand Applications for 12 Industries



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Why did we need a 3DEXPERIENCE platform

- ▶ Success of CATIA made growth by acquisition possible
 - ▷ However, these acquisition targets had diverse technological investments
- ▶ The portfolio had both standalone native apps and integrated enterprise server-based apps
- ▶ Our primary needs were
 - ▷ To provide a common platform to best optimize collaboration and data sharing among the technologies we acquired
 - ▷ To unify the user experience for all the different disciplines working concurrently on the platform
 - ▷ To increase supportability of the entire portfolio of solutions

And then there was TomEE

- ▶ In 2013, we started to adopt TomEE:
 - ▷ Closer to full stack of Java EE specifications
 - ▷ Has everything that we currently need
 - ▷ All the benefits of Tomcat plus less need to add packages
 - ▷ Easy transition for development, QE, and support
 - ▷ High confidence due to the maturity of the underlying pieces
 - ▷ The majority of customers are open source friendly
 - ▷ It conforms to our strategy of adopting standards



Use of Java EE and TomEE in 3DEXPERIENCE platform

- Selective use of Java EE Standard Features throughout the platform
 - Heavy usage of Servlets and JSP
→ migrating towards HTML5/CSS3
 - Usage of JMX and JMS
 - Usage of JAX-RS (TomEE+) and JAX-WS
 - Limited use of JSF, CDI, EJBs, JPA, and JavaMail
 - Exploring use of JAAS and JTA



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SIMULIA Brand: When we started...

- ▶ Large enterprise customers: needed a scalable enterprise system using Java EE servers and infrastructure
- ▶ Small customers: app server costs too high to pass on
- ▶ So, we split the portfolio into
 - ▷ a native desktop app, and
 - ▷ a enterprise app based on commercial Java EE app servers
 - ▶ Both developed separately with some redundant features



3DOrchestrate (3DO) for High Performance Computing

Requirements for a world-class HPC platform

- ▶ ***One Execution Engine***

Drive all simulation tools through a common execution engine, including integration with common DRM solutions, reducing maintenance costs and promoting more efficient distribution

- ▶ ***Orchestrate the Execution***

Streamline the complexity of hierarchical, parallel process distribution including the interface with PLM-based data

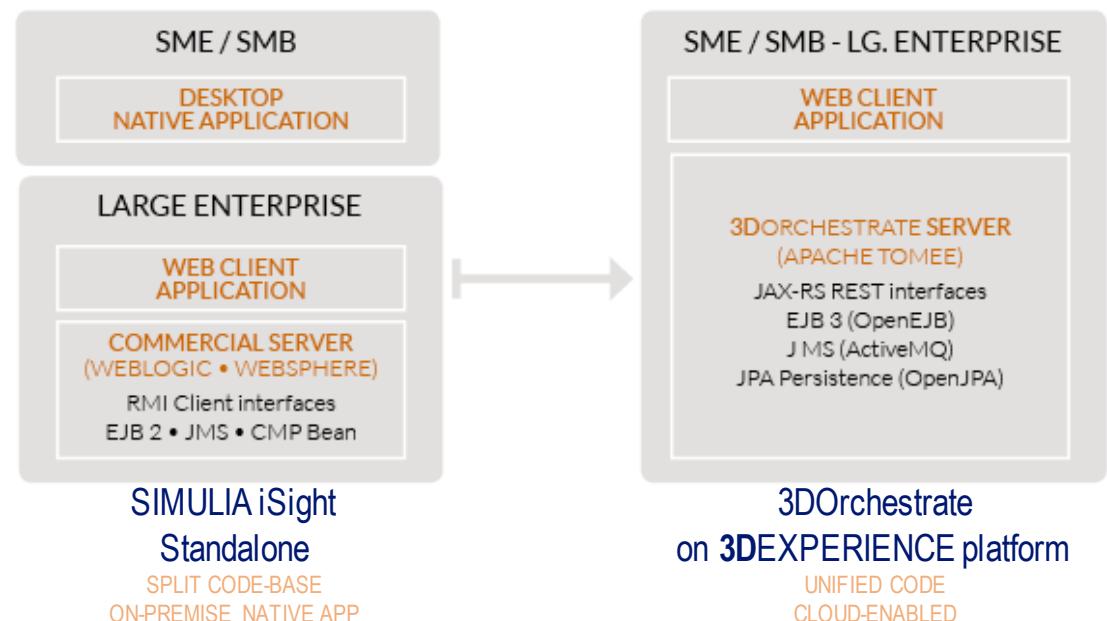
- ▶ ***Cloud Support for Burst Computing***

Reduce capital expenditures for infrastructure and licenses necessary to support peak resource needs and leverage flexible cloud-based execution



The Cloud: Our Path to a Scalable Solution

- Previous to our adoption of cloud, we had **two customer profiles** differentiated by target market: SME/SMB and large enterprise
- **3DEXPERIENCE** on the cloud has enabled **consistent, powerful solutions** that scale from **small customers to the largest enterprises in the world**



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Merging Acquisitions into a Common Platform

- ▶ Dassault Systèmes acquired Enginuity in 2011 and integrated it into the ENOVIA portfolio
- ▶ The code was based on Glassfish and is being ported over to TomEE+
- ▶ Having one common platform will ultimately save recurrent costs

Technical Considerations when Switching Containers

- ▶ Java EE implementation differences
 - ▷ Mojarra versus Apache MyFaces
- ▶ Changes in extended features
 - ▷ EclipseLink versus OpenJPA
- ▶ Non-standard implementations
 - ▷ Custom realms – no standard classes
- ▶ Configuration challenge files change

Configuration UI for GlassFish

- ▶ GlassFish, WebLogic and WebSphere all have mature UIs for administration
- ▶ Extensive tool integration

The screenshot shows the GlassFish Server Open Source Edition Administration Console. The title bar reads "localhost" and "GlassFish™ Server Open Source Edition". The left sidebar, titled "Tree", shows a hierarchy of resources: Common Tasks, Domain, Clusters, Standalone Instances, Nodes (localhost-domain1), Applications, Lifecycle Modules, Monitoring Data, Resources (Concurrent Resources, Connectors, JDBC), and JDBC Resources. The "JDBC Resources" section is currently selected. The main content area is titled "JDBC Resources" and contains the sub-section "Resources (7)". A table lists seven JDBC resources:

Select	JNDI Name	Logical JNDI Name	Enabled	Connection Pool	Description
<input type="checkbox"/>	jdbc/__TimerPool		✓	__TimerPool	
<input type="checkbox"/>	jdbc/_default	java:comp/DefaultDataSource	✓	DerbyPool	
<input type="checkbox"/>	jdbc/cjava		✓	cjava	
<input type="checkbox"/>	jdbc/ctjava1		✓	ctjava	
<input type="checkbox"/>	jdbc/n34		✓	n34	
<input type="checkbox"/>	jdbc/sample		✓	SamplePool	
<input type="checkbox"/>	jdbc/test		✓	test	

Configuration of TomEE

- ▶ No UI for configuration or admin (yet)
- ▶ Need to find the various XML files for manual command-line modification of behaviors, etc.
- ▶ Hard to debug because there is no integrated debugging (yet)

```
<tomee>
  <!-- see http://tomee.apache.org/containers-and-resources.html -->
  <!-- activate next line to be able to deploy applications in apps -->
  <!-- <Deployments dir="apps" /> -->
</tomee>
```

TomEE Distribution

- ▶ Web Profile – Servlets, JSP/JSF, JTA, JPA, CDI, Bean Validation, EJB Lite
- ▶ JAX-RS – Web Profile + JAX-RS
- ▶ Plus – JAX-RS + EJB Full, JCA, JMS, JAX-WS
- ▶ Plume – Plus + Mojarra , EclipseLink

EJB Lite vs. Full

Feature	EJB Lite	EJB Full
Session Beans	✓	✓
Message Beans	✗	✓
Entity Beans	✗	✓
JPA	✓	✓
No-Interface	✗	✓
Remote Interface	✗	✓
Timer Service	✗	✓
Async Beans	✗	✓
Interceptors	✓	✓
RMI-IIOP	✗	✓
Security	✓	✓
JAX-WS/RS	✗	✓
JAX-RPC	✗	✓

ActiveMQ

- ▶ Not included by default:
 - ▷ ActiveMQ web console
 - ▷ activemq.xml – configuration file
- ▶ Additional steps required to use activemq.xml:
 - ▷ Create file in conf
 - ▷ Add Spring dependencies to tomee/lib:
Spring-beans, spring-context, spring-core, spring-web, xbean-spring.

Configuration Challenges

- ▶ JNDI names are difference between:
 - ▷ GlassFish: jdbc/ds
 - ▷ TomEE: openejb:Resource/jdbc/ds
- ▶ JNDI differences require code changes.

GlassFish Custom Realm

Generic code sample

```
import com.sun.appserv.security.AppservPasswordLoginModule;
import javax.security.auth.login.LoginException;

public class PassportLoginModule extends AppservPasswordLoginModule {

    @Override
    protected void authenticateUser() throws LoginException {
        // authenticated the user
    }

    @Override
    public boolean commit() throws LoginException {
        // using inherited variables
        return true;
    }

}
```

GlassFish Custom Login Module

Generic code sample

```
public class PassportRealm extends AppservRealm {

    @Override
    public void init (Properties props) throws BadRealmException,
        NoSuchRealmException {
        super.init(props);
        String jaasCtx = props.getProperty(IASRealm.JAAS_CONTEXT_PARAM);
        this.setProperty(IASRealm.JAAS_CONTEXT_PARAM, jaasCtx);
    }

    @Override
    public String getAuthType() {
        return "PassportRealm";
    }

    public String[] authenticateUser(String username, String password) {
        throw new UnsupportedOperationException("Not SUPPORTED!");
    }

    @Override
    public Enumeration getGroupNames(String string) throws
        InvalidOperationException, NoSuchUserException {
        Vector groups = new Vector();
        groups.add("sa-admin");
        return groups.elements();
    }
}
```

Tomcat/TomEE Custom Realm

Generic code sample

```
public class PassportRealm extends RealmBase {

    private String name;

    private String password;

    @Override
    protected String getName() {
        return name;
    }

    @Override
    protected String getPassword(String string) {
        return password;
    }

    @Override
    protected Principal getPrincipal(String string) {
```

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Benefits of Java EE and TomEE adoption

- Permitted to unify the underpinning architecture of our portfolio
 - Customers benefit by having a more powerful, collaborative platform at lower cost
- Create cloud-enabled apps that scale from small customers to enterprise customers
- Eliminate redundant, legacy native apps
- Consolidate development and testing costs by unifying app server platform strategy

Technical Lessons Learned

- ▶ Buy support and training!
 - ▷ Fast turn around and rapid integration of bug fixes
 - ▷ Some developers needed to learn the EJB 3 and JPA 2.0.
- ▶ Dump the legacy interfaces (EJB 2, CMP, etc)
 - ▷ Less code
 - ▷ Better support
 - ▷ Easier to use
- ▶ Be careful with persistence
 - ▷ Migrating from CMP to JPA 2.0 is time-consuming but necessary
 - ▷ Debugging JPA with a heavily threaded system is challenging



