Platform as a Service: The WSO2 Way

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2011
Agenda

- What is a PaaS?
- What are the differentiations?
- How is the market evolving?
- What to look for?
- What is Stratos?
- Stratos demo
What is a middleware Platform?

Software

OS

Hardware
What is a middleware Platform?

End user software

Middleware

OS

Hardware
What is Platform as a Service?

SaaS

PaaS

IaaS
Stratos Overview

• A full middleware platform available as a service, with self-service
  • Fast provisioning
• Based on OSGi
  • Modular, componentized, standard
• Multi-tenant, Elastic, Metered and Billed
  • Effective and powerful
• Available under the Apache License
  • Open Source, Open License, Open Development
Enterprise IT in 2011
Enterprise IT in 2015+
Cloud Native Attributes

• Core Attributes
  • Self-service
  • Multi-tenant
  • Distributed / Scalable
  • Elastically / Dynamically Scaled
  • Metered

• Extended attributes
  • Incrementally deployable and testable
  • Billed
  • Dynamically wired

What kind of PaaS is it?

Software as a Service: Applications
For end-users

Platform as a Service: Middleware
For developers, integrators, architects

Infrastructure as a Service: Servers, Storage
For infrastructure specialists
Cloud Middleware Platform and PaaS

• A PaaS requires an underlying software base
  • Cloud Middleware Platform (CMP), or
  • Cloud Enabled Application Platform (CEAP – Gartner)
• Not all PaaS have redistributable CMPs
• The benefit of having a CMP is choice:
  • Run your own PaaS in a private cloud
  • More than one PaaS provider
• Open PaaS / Open CMP fights lock-in
• WSO2’s CMP = Stratos
• WSO2’s PaaS = StratosLive
StratosLive

http://stratoslive.wso2.com
Gartner is forecasting that it will be 2015 before vendors have true, integrated, complete PaaS frameworks.

We believe Stratos is that today!
What to look for in a PaaS

• Lean
  • All the same benefits are magnified in a cloud
  • Efficiency that is valuable in fixed deployments is *invaluable* in large dynamic deployments!

• Available on private, public, on-premise
  • Getting locked into a specific public PaaS will have long term repercussions
  • Open Source is a huge protection against this

• The correct set of core “services”
  • Not just App Server, but Identity, Registry, Data, Cache, ESB, BPMS, Billing, Logging, etc

• Open Standard interfaces to common services
  • Enables modular usage
  • Self-service, multi-tenancy, elasticity, metering, incremental deployment and testing

• Offers a basis for both single-tenant and multi-tenant models
  • Lots of tenants each with their own stuff, and/or
  • One application that is offered to all or many tenants
Services available in Stratoslive

### Activate your Cloud Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Deactivate</th>
<th>Powered by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enterprise Service Bus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application Server</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Services Server</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Governance Registry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Identity Server</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Business Activity Monitor</strong></td>
<td></td>
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<tr>
<td><strong>Business Process Server</strong></td>
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<tr>
<td><strong>Business Rules Server</strong></td>
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<tr>
<td><strong>Mashup Server</strong></td>
<td></td>
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<tr>
<td><strong>Gadget Server</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complex Event Processing Server</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Message Broker</strong></td>
<td></td>
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</tr>
</tbody>
</table>
One Enterprise Platform wherever you need it:

<table>
<thead>
<tr>
<th>WSO2 Carbon</th>
<th>→</th>
<th>WSO2 Stratos</th>
<th>→</th>
<th>WSO2 StratosLive</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Premise:</td>
<td></td>
<td>In Private Cloud:</td>
<td></td>
<td>As a Service in the Public Cloud:</td>
</tr>
<tr>
<td>• In Production at Fortune 1000 companies</td>
<td>• A single managed platform</td>
<td>• We manage, run and maintain your application platform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Handling 1bn transactions/day</td>
<td>• Elastic, Self-Service, Multi-tenant</td>
<td>• Complete Pay as you Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The only modular open source middleware stack</td>
<td>• Accelerates your private cloud beyond virtual machines to provide real Enterprise Cloud Services</td>
<td>• ESB-as-a-Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Everything you need to build Enterprise Applications</td>
<td>• Use only what you need</td>
<td>• Governance-as-a-Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• From Core Logic to Mobile Apps</td>
<td></td>
<td>• Identity-as-a-Service</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• A single code continuum
• Completely modular based on OSGi
• Complete Enterprise SOA Architecture:
  • AppServer, ESB, Governance, Portal, BPMS, BAM, Identity and more
• Supported 24x7 with phone, web and full SLAs
WSO2 Carbon & Stratos

On-Premise

- WSO2 Enterprise Service Bus
- WSO2 Application Server
- WSO2 Data Services Server
- WSO2 Governance Registry
- WSO2 Identity Server
- WSO2 Business Activity Monitor
- WSO2 Business Process Server
- WSO2 Business Rules Server
- WSO2 Mashup Server
- WSO2 Gadget Server

PaaS: Private, Hybrid, Public Clouds

- WSO2 Enterprise Service Bus as a Service
- WSO2 Application Server as a Service
- WSO2 Data as a Service
- WSO2 Governance as a Service
- WSO2 Identity as a Service
- WSO2 Business Activity Monitoring as a Service
- WSO2 Business Processes as a Service
- WSO2 Business Rules as a Service
- WSO2 Mashups as a Service
- WSO2 Gadgets as a Service
Cloud Native Middleware

Customer Applications | Private SaaS

Industry Standard Programming Model
(BPEL, ESB, Java webapp/services, XML, etc)

Cloud Native Middleware

WSO2 Stratos

Multi-tenant | Monitored and Metered | Elastic | Dynamically Discoverable | Incrementally Testable

Amazon Web Services | Joyent | VMware | Eucalyptus
User Experience of Stratos

Tenant Application

Tenant Application

Super Tenant Application (SaaS)

WSO2 Stratos

Presentation Services
Reusable Portlets

Business Processes
System-centric Processes
Human-centric Processes

Business Services
Orchestration
Enrichment
Custom Business Services
Rationalization

Data Services
Data Access
Data Aggregation
Data Synchronization
JDBC
file://

Connectivity Services
Messaging
Adapters
Custom APIs
JDBC
file://

Service Bus
Service Registry
Security Services
Common Services
Services Repository

Infrastructure as a Service (Eucalyptus, UEC)
Multi-tenancy
Multi-tenancy

- Three possible ways
  - Machine per tenant
  - VM per tenant
  - Share machine/VM across tenants

- Challenges
  - Data isolation
  - Logic isolation
  - Security
Achieving Tenant Isolation

- Each Tenant is given a Security Domain
- Each domain may have its own User Store and Permissions, thus have a set of users and permissions enabling users to access resources
- Each domain is isolated and do not have access to other domains
Achieving Execution Isolation

- Axis2 have stateless executions and keep all state in a Context.
- Different contexts are created for each tenant
Security

- Tenants cannot write code with privilege operations
  - Otherwise tenants can write malicious code
  - Tenants can't write to file system, can't open port
  - Java Security Manager can be used to prevent it
  - Sandbox environment, similar to applets

- Only allow privilege operations to codes signed by a particular key
Identity
Every tenant has access to an Identity Service
Identity Server / Service

• Each tenant is identified by the @tenant-domain

• Each tenant admin can choose to manage their tenants user store either within the Stratos-internal LDAP store or using an external LDAP

• Bulk import

• Each tenant user has a OpenId/Infocard as well as SAML2 tokens
  • Single-signon
  • Single-Signoff is also supported

• SAML2 is used across the Stratos deployment to ensure a smooth transition (single sign-on) between Stratos services

• SAML2 is also available as sign-on for webapps, gadgets and other user-deployed content
web.xml – Integrating Identity into WebApps

```xml
<login-config>
  <auth-method>BASIC</auth-method>
  <realm-name>Basic Auth</realm-name>
</login-config>

Automatically ties into Stratos Identity
Google Authentication

- Enable sign into Stratos using Google Apps username/password.
- For successful sign in using Google Apps,
  - If a tenant does not exist, it will be created with the same name as Google Apps domain. The IdP of this domain is Google Apps
Login with Google Apps Domain
Direct Access From Gmail

- Google Apps administrator can add Stratos to your domain. Direct access to Stratos.
Cloud Data Solutions
WSO2 Cloud Data Solutions

- WSO2 Data Server
  - Carbonized Cassandra Cluster
  - Database cluster
  - Carbonized HDFS Cluster
- <Data> PaaS Offerings
  - Apache Cassandra as a Service
  - Relational Database as a Service
  - HDFS as a Service
- We are also planning MapReduce as a Service as Future work.
Polyglot Data Architecture
Users can log in to the Stratos data page and create a Database and receive a JDBC URL.

A Database will be allocated from a Amazon RDS cluster, and they are isolated from other Stratos tenants and it is integrated with WSO2 Security model.
New Database

- **Database Server Instance Name**: WSO2_RSS
- **Database Name**: db1

[Create] [Cancel]
## Databases

<table>
<thead>
<tr>
<th>Database Name</th>
<th>Database Server Instance Name</th>
<th>Tenant Domain</th>
<th>Database URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>tempaudb1_temp au</td>
<td>WSO2 RSS</td>
<td>SUPER_TENANT</td>
<td>jdbc:mysql://rss3.crik244zrfxc.us-east-1.rds.amazonaws.com/tempaudb1_temp au</td>
</tr>
<tr>
<td>finalrssdb_temp au</td>
<td>WSO2 RSS</td>
<td>SUPER_TENANT</td>
<td>jdbc:mysql://rss3.crik244zrfxc.us-east-1.rds.amazonaws.com/finalrssdb_temp au</td>
</tr>
<tr>
<td>tempdb_temp au</td>
<td>RDS1</td>
<td>temp.au</td>
<td>jdbc:mysql://wso2-rnd-db1.cd3cwezibdu8.us-east-1.rds.amazonaws/tempdb_temp au</td>
</tr>
</tbody>
</table>

**Signed-in as:** admin@temp
Database Console

[Image of a database console interface with options for auto commit, max rows, and auto complete.]

Important Commands
- Displays this Help Page
- Shows the Command History
- Executes the current SQL statement
- Disconnects from the database

Sample SQL Script
Users can log in to the Web Console (both in Stratos and in WSO2 Data Server) and create Cassandra key key spaces.
Column Family Storage (Contd.)

- Key spaces
  - will be allocated from a Cassandra clusters
  - they are isolated from other tenants in Stratos
  - it is integrated with WSO2 Security model.
- Users can manage and share his key spaces through Stratos Web Console and use those key spaces through Hector Client (Java Client for Cassandra)
- In essence we provide
  - Cassandra as a part of Stratos as a Service
  - Multi-tenancy support
  - Security integration with WSO2 security model
HDFS as a Service

- Users can log in to the Stratos data page and create a HDFS volume (File system volume for user).
HDFS as a Service

- The volume
  - will be allocated from a HDFS cluster
  - they are isolated from other tenants in Stratos
  - it is integrated with WSO2 Security model.
- Users can manage and share his File system through Stratos Web Console and use the file system like any other file system.
Users can come to a Stratos Web page and submit a MapReduce job. May be several Jobs linked together as a workflow for future versions.
Map Reduce as a Service (Contd.)

• The Job is executed in subset of nodes places in a Hadoop Cluster and users are billed per CPU hours used.

• Jobs can use data from any of the data storage in Stratos
Cloud Services Gateway

- Service Client
- EC2 Security Layer
- CSG
- Secure Channel
- Datacenter
- Internal Firewall
- CSG Carbon Component
- Backend Services
- WSO2 Web Services Application Server
Elasticity
Elasticity

- Fault tolerance, High availability and scalability
- Traditional solution: Buying safety-net capacity
- Better Solution: Scale up and down
- Pay for the actual use
- Elastic, Service & tenant aware load balancer
Metering & Billing
Metering

• Each services collects
  • Number of service calls
  • Request/response bandwidth
  • Registry bandwidth (upload, download)
  • Total registry space usage

• Send above to BAM publishers, which sends the data to the BAM Service

• BAM summarizes periodically

• Summarized data will be accessible by Stratos Manager
Throttling

- Restrict tenants from using more than the allocated resources, depending on the usage plan:
  - Number of users per tenant
  - Storage space
  - Number of requests to webapps, services etc
Usage Data Metering/Throttling

Usage Metering

- Registry Resource Volume
- Number of users
- Appserver Service Bandwidths/Request Response count
- ESB Mediation Data (Bandwidths Data)

Throttling

- Number of users
- Registry Resource Volume
- Number of Request and Response counts
- Service incoming and outgoing bandwidths
Stratos Billing

- Scheduled invoice generation
- Ability to view past invoices and the current (interim) invoice
- Securely pay the invoice via Paypal
- Notifies the customer via email on received payments
- Notifies the super-admin on customers exceeding the credit limit
- Presents a summary view to the super-admin
**INVOICE**

**JUN 2011**

**INVOICE NO: 18**

800 West El Camino Real Suite 180, Mountain View, CA 94040
Invoice Date: 2011/06/20
Invoice period start date: 2011/06/07
Invoice period end Date: 2011/06/20

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Value (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Charges for subscriptions</strong></td>
<td></td>
</tr>
<tr>
<td>Subscription Type: Medium</td>
<td></td>
</tr>
<tr>
<td>Active since: 2011/06/06</td>
<td></td>
</tr>
<tr>
<td>Active until: This is your current active subscription</td>
<td></td>
</tr>
<tr>
<td>Subscription for package</td>
<td>$20.00</td>
</tr>
<tr>
<td><strong>Payment details</strong></td>
<td></td>
</tr>
<tr>
<td>You don't have any payment details for this period.</td>
<td></td>
</tr>
<tr>
<td><strong>Invoice Summary</strong></td>
<td></td>
</tr>
<tr>
<td>Brought forward</td>
<td>$1.50</td>
</tr>
<tr>
<td>Total cost</td>
<td>$20.00</td>
</tr>
<tr>
<td>Total payments</td>
<td>$0.00</td>
</tr>
<tr>
<td>Carried forward</td>
<td>$21.50</td>
</tr>
</tbody>
</table>

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**Padmika Dissanayke,**
Director - Finance

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**WSO2**

Federal Tax ID 87-0750575

800 West El Camino Real Suite 180, Mountain View, CA 94040
Tel: (408) 754 7388
Fax: (408) 689 4328
Email: billing@wso2.com

---

**Log in to my PayPal account**

- Email: amila_1298269926_per@gml
- PayPal password: ********

---

**Payment Details**

- Payee ID: 8558N8TAE4Y
- First name: Test
- Last Name: User
- Amount: 21.50 USD

---

Please click Confirm to confirm your payment or Cancel to go back to the invoice page.

---

**WSO2**

Federal Tax ID 87-0750575
800 West El Camino Real Suite 180, Mountain View, CA 94040
Tel: (408) 754 7388
Fax: (408) 689 4328
Email: billing@wso2.com

---

Thank you. Your payment was completed successfully.

- Transaction ID: 43Y09851SC864051K
- Invoice ID: 18
- Amount: 21.50 USD

---

Pay the invoice securely online.

---

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Logging
Distributed Logging

- Every service and custom applications logs are captured by the log4j/commons loggings settings
- Logs are partitioned & stored by tenant
- Logs are sent to the Manager service via syslog
- Logs are then viewable / downloadable by tenant admins
Log Viewer – Stratos Manager {Super-Tenant}

System Logs

Logs are taken from the remote log hosted server.

<table>
<thead>
<tr>
<th>Tenant Domain</th>
<th>Get Tenant Logs</th>
<th>Service Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>hasiniY.com</td>
<td></td>
<td>WSO2 Stratos Data Services Server</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>File Name</th>
<th>Date</th>
<th>File Size</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSO2 Stratos Data Services Server.log</td>
<td>09-Jun-2011 09:13</td>
<td>74K</td>
<td>View, Download</td>
</tr>
<tr>
<td>WSO2 Stratos Data Services Server.log.1.gz</td>
<td>08-Jun-2011 12:05</td>
<td>2.7K</td>
<td>Download</td>
</tr>
<tr>
<td>WSO2 Stratos Data Services Server.log.2.gz</td>
<td>06-Jun-2011 05:23</td>
<td>1.2K</td>
<td>Download</td>
</tr>
</tbody>
</table>
Log Viewer – Stratos Data Services Server {Tenant User}

System Logs

Logs are taken from the remote log hosted server.

<table>
<thead>
<tr>
<th>File Name</th>
<th>Date</th>
<th>File Size</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSO2 Stratos Data Services Server.log</td>
<td>16-Jun-2011 05:09</td>
<td>94K</td>
<td>View, Download</td>
</tr>
<tr>
<td>WSO2 Stratos Data Services Server.log.1.gz</td>
<td>06-Jun-2011 05:54</td>
<td>1.4K</td>
<td>Download</td>
</tr>
</tbody>
</table>
Messaging

• A full AMQP message broker
  • Pub/Sub and Queuing
  • Queues and Topics are partitioned by tenant
    • Authorized against the tenant identity store
• JMS
  • Backed by a multi-tenant JNDI implementation based on our Registry
• Amazon SQS API
• WS-Eventing
Stratos Demo
The Scenario

- Shopper
- Operator
- Business Admin

Shopping Cart
- User Portal
- Administrative Gadgets
- Admin Portal

External Services
- Supplier
- Payment Gateway

Partner Services
- Amazon.com
- eBay
Solution Architecture

- WSO2 Governance Registry
- WSO2 Data Services Server
- WSO2 Business Process Server
- WSO2 Application Server
- WSO2 Gadget Server
- WSO2 Mashup Server
- WSO2 Identity Server
- WSO2 Carbon Studio
- RDBMS
- External Services
  - Supplier
  - Financial
- Partner Services
Questions
Contacts

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- http://wso2.org/
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