

X. APPENDIX A

Table 1: Technologies used at each tier by the CSD platforms / frameworks

	Java EE	.NET	Ruby on Rails
Tier 1	HTML5, CSS, JavaScript (JS Frameworks), XML, JSON		
	XHTML	XHTML	LESS, SCSS
Tier 2	Facelets, JSF, Servlets, Expression Language	IIS, ASP.NET, XAML, XSLT,	Rails Routing, ActionController, ERBs, SASS
Tier 3	EJBs, JAX-RS, Persistence API	.NET Framework, Managed Components	RubyGems, Rails Models, YAML
Tier 4	JDBC, Transaction API, Hibernate	ADO.NET, Fluent Nhibernate	RDBMS: ActiveRecord. NoSQL: Mongoid
Tier 5	RDBMS: PostgreSQL, MySQL, SQLite. NoSQL: Mongo		
	RDBMS: Oracle, DB2	RDBMS: Oracle, DB2	NoSQL: Cassandra, CouchDB
Application Servers (AS)	GlassFish, WildFly (JBoss)	CLR, Mono	Phusion Passenger, Unicorn, Thin

Table 2: Technologies used at each tier by the CSD platforms / frameworks (continued)

	Zend (PHP)	Node.js	Django (Python)
Tier 1	HTML5, CSS, JavaScript (JS Frameworks), XML, JSON		
	-	-	-
Tier 2	Zend Router/Controller, ViewScripts, PHPPrenderer, ZendView	Jade, Ezel	Django URL dispatcher, Django Templates
Tier 3	Zend Framework, Zend Models	Express.js, Spine.js, Socket.io, Backbone.js	Python Modules, Django Models
Tier 4	RDBMS: DataMapper, Doctrine ORM. NoSQL: Shanty-Mongo, Doctrine ODM.	RDBMS: Sequelize. NoSQL: Mongoose	RDBMS: Storm, SQLAlchemy, Django ORM. NoSQL: PyMongo, MongoKit
Tier 5	RDBMS: PostgreSQL, MySQL, SQLite. NoSQL: Mongo		
	RDBMS: SQLServer, Oracle, DB2	RDMBS: DB2. NoSQL: Cassandra, CouchDB	RDBMS: Oracle. NoSQL: Google Datastore
Application Servers (AS)	Zend Server	Node.js	GlassFish, WildFly (JBoss), Google App Engine, Standalone

Table 3: Client tier technologies used by the CSD platforms / frameworks

	Java EE	.NET	Rails	Zend	Node.js	Django
HTML5	✓	✓	✓	✓	✓	✓
XHTML	✓	✓				
CSS	✓	✓	✓	✓	✓	✓
SCSS			✓			
JavaScript (JS Frameworks)	✓	✓	✓	✓	✓	✓
JSON	✓	✓	✓	✓	✓	✓
XML	✓	✓	✓	✓	✓	✓

Table 4: Component technologies of the CSD platforms / frameworks

	Java EE	.NET	Rails	Zend	Node.js	Django
Web Servers	Tomcat Jetty Sun Java System Web Server	IIS	Dev WebBrick Prod Apache nginx	Apache nginx	Standalone Apache nginx	Standalone Apache nginx
Application Servers	GlassFish Wildfly	IIS	Passenger	Zend Server	Node.js	GlassFish WildFly Google App Engine
Routing	Spring MVC	ASP.NET Routing	Rails Routing	Zend Controller	Express.js	URL Dispatcher
Controllers	Servlets	ASP.NET Code-behind	Action Controller	Zend Controller	Ezel	Django Views
Server-side Rendering	JSF	XAML XSLT	ERBs SASS	Zend Views	Jade	Django Templates

Table 5: Data mapping technologies used based on database type

RDBMS	NoSQL	Both
Rails <ul style="list-style-type: none"> ActiveRecord 	Rails <ul style="list-style-type: none"> Mongoid 	Java EE <ul style="list-style-type: none"> JDBC Transaction API Hibernate
Zend <ul style="list-style-type: none"> DataMapper Doctrine ORM 	Zend <ul style="list-style-type: none"> Shanty-Mongo Doctrine ORM 	.NET <ul style="list-style-type: none"> ADO.NET Fluent NHibernate
Node.js <ul style="list-style-type: none"> Sequelize 	Node.js <ul style="list-style-type: none"> Mongoose 	
Django <ul style="list-style-type: none"> Storm SQLAlchemy Django OR 	Django <ul style="list-style-type: none"> PyMongo MongoKit 	

Table 6: Data source technologies for the CSD platforms / frameworks

PostgreSQL, MySQL, SQLite, Mongo	Oracle	DB2	CouchDB, Cassandra	Google Datastore
<ul style="list-style-type: none"> • Java EE • .NET • Rails • Zend • Node.js • Django 	<ul style="list-style-type: none"> • Java EE • .NET • Zend • Django 	<ul style="list-style-type: none"> • Java EE • .NET • Zend • Node.js 	<ul style="list-style-type: none"> • Rails • Node.js 	<ul style="list-style-type: none"> • Django

Table 7: Hit counts for each of the component technologies on major development sites.

	Java EE	.NET	Rails	Zend	Node.js	Django
StackOverflow Questions	24,063	226,262	233,281	19,251	110,065	112,906
GitHub Repositories	270,804	126,677	177,450	8,761	172,160	63,803
Google "Tutorial" Results	2,830,000	8,500,000	6,970,000	472,000	9,410,000	2,700,000