

# Visualizing Big Data with Eclipse BIRT

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# **Today's Agenda and Goals**



- Introduction to Big Data
- Compare with 'Regular' Data
- Survey results
- Big Data connections in BIRT
- Live demo
- Deploying BIRT applications
- Questions





Providing effective business analytics tools and technologies to the enterprise is a top priority of CIOs and for good reason.

Effective business analytics – from basic reporting to advanced data mining and predictive analytics — allows data analysts and business users alike to **extract insights** from **corporate data** that, when translated into action, deliver higher levels of efficiency and **profitability** to the enterprise.

Underlying every business analytics practice is data....



Big data is a collection of data sets <u>so large and complex</u> that it becomes <u>difficult to process</u> using on-hand database management tools or traditional data processing applications

Web Logs	RFID	Sensors	Social Networks
Internet Text	Searches	Call Detail Records	Astronomy
Atmospheric Info	Genomics	Biogeochemical	Biological
Military Surveillance	Medical Records	E-Commerce	Photo/Video

Source: Wikipedia



Traditional Data	Big Data
Gigabytes to Terabytes	Petabytes to Exabytes
Centralized	Distributed
Structured	Semi-structured to Unstructured
Stable Data Model	Flat Schemas
Known Complex Interrelationships	Few Complex Interrelationships



#### Is Big Data a replacement for Relational Data?

	Big Data	Relational
Analysis Type	Exploratory analysis to uncover value in the data	Operational analysis of what was discovered
Data Granularity	Store HUGE amounts of highly granular data	Store transform (sometimes) aggregated data
Timeframe	Data flows in BIG Data → "real-time" monitoring	Long term trending analysis



#### Traditional tools and technologies are straining

- New approaches to data processing
  - Commodity hardware to scale
  - Parallel processing techniques
  - Non-relational data storage capabilities
  - Unstructured, semi-structured data



#### New Approaches To Big Data Processing And Analytics 🤿



- Hadoop Approach
  - Data broken into "parts"
  - Loaded into file system
  - Multiple nodes
  - MapReduce
  - Batch-style historical analysis
- NoSQL
  - Cassandra, MongoDB, CouchDB, HBase\*
  - Discrete data stored among large volumes
  - Higher performance than relational data sources
  - Categorized as Columnar, Document, Key-Value, Graph
- Massively Parallel Analytic Databases
  - Quickly ingest mostly structured data
  - Minimal data modeling
  - Scale to petabytes of data
  - Near real-time results to complex SQL

# **Big Data Growth Drivers**



- Increased awareness of the Big Data benefits
  - Not just web, financial services, pharmaceuticals, retail
- Increased maturity of Big Data software
  - Data stores, analytical engines
- Increased availability of professional services
  - Supporting business use cases
- Increased investment in infrastructure
  - Google, Facebook, Amazon

# **IDC 2013 Big Data Predictions**



- The "Digital Universe" will expand to over 4 zettabytes... Over 50% growth from 2012
- The Big Data focus will shift "up the stack", toward analytics and discovery, and analytic applications
- Spending will reach \$10 billion in 2013, over \$20 billion by 2016

Source: IDC, IDC Predictions 2013 presentation



Big Data or Little Data - How Do You Display Yours? The Eclipse Foundation would like to better understand how developers are using Eclipse with big data and reporting projects.

- We ran this survey to get the pulse of what technologies where in demand related to Eclipse/BIRT technologies.
- Eclipse Promoted the Survey.
- 60% of 518 responders claimed to be big data users



#### What Big Data technologies are you using with Eclipse?



Note: Responders could choose more than one option

# **Eclipse BIRT Survey - Data Visualization**



How important is Data Visualisation/Reporting to your project?



# **Eclipse BIRT Survey - Data Visualization**





#### How do you create/use data display tools in development?

#### Note: Responders could choose more than one option



Goals:

- How many large firms (>\$1B) are conducting Big Data projects
- What are such companies doing with their Big Data projects
- What are the expected benefits for those Big Data initiatives
- What are the inhibitors
- King Research received 516 surveys
  - 316 completed and 200 partially completed surveys
- Completed surveys were the primary source of analysis
- 32% of those who completed survey (98 respondents) work at companies with revenue of \$1B or more

# **Independent Big Data Survey – Key Findings**





"Not enough staff with expertise" and "Expected cost of Big Data initiatives" are the major inhibitors



# **Big Data Initiatives**

#### Major Benefits *Expected*

Make better decisions, faster

Gain competitive advantage

Improve efficiency

Improve customer targeting

Major Benefits *Realized* 

Gain competitive advantage

Improve customer targeting

Make better decisions, faster

Improve efficiency

#### **Independent Big Data Survey – Big Data Technologies**





#### What Big Data technologies do you plan to use? (eval/planning)

- We asked about their planned use of 15 technologies, and the top 5, in descending order of frequency of mention are displayed above
- Other technologies planned for use at \$1B+ organizations include: Apache Cassandra, 12%; Hortonworks Hadoop, 12%; Amazon DynamoDB, 9%; Apache CouchDB, 9%; VoltDB, 9%; HyperTable, 6%; MongoDB, 3%; Datastax Cassandra, 3%



#### What are likely to be your Big Data applications? (responses from those



who are evaluating or planning Big Data implementations)

- Our survey listed 23 frequently reported Big Data applications and when asked which of these they have evaluated or planned to use, they indicated an average 4.5 apps each.
- The most important application types are about customer analysis

# **Top Big Data Challenges**



- Data integration
  - Top challenge
  - Integrating disparate data, different sources, different formats is difficult
- Getting started with the right project
  - Building the right team
  - Determine the top business problem

#### Architecting a big data system.

- High volume, high frequency data
- Build unified information architecture
- Lack of skills or staff
  - Some hire externally / university hires.
  - Others try to re-train from within.
  - Cross pollinate skills from another part of the organization
  - Build centers of excellence that help with the training

Source:TDWI

#### **Actuate Launches the BIRT Project**



# Actuate proposed and started **BIRT**

... a top-level Eclipse project

#### Professional open source Primary development resources funded by Actuate

Contributions from many sources *IBM, Innovent Solutions and community* 

Actuate Joins Eclipse Foundation as Strategic Developer and Board Member

Adds BI and Reporting as Open Source Project

AUGUST 2004

#### What is BIRT?



#### A New Generation of Data Visualization Technology

- Makes all data-driven content development easy
- Modern, web-page design metaphor
- Open and standards-based
- Flexible with rich programmatic control
- Full support for libraries and reuse
- Foundation for a range of solutions





# **BIRT Release History supports Big Data**



S	September 2004		BIRT Project proposal accepted, and project launched
J	lune 2005	1.0	Eclipse Report Designer, Report Engine, Chart Engine
٢	December 2005	2.0	Support for a wide variety of common layouts
J	June 2006	2.1	Advanced parameters, ability to join data sets,
J	lune 2007	2.2	Dynamic crosstab support, web services data source,
J	June 2008	2.3	JavaScript Debugger, BiDi Support, Charts in Crosstabs,
J	lune 2009	2.5	Page aggregates, Multiple drill-downs in Charts,
J	June 2010	2.6	New charts, more chart control, developer productivity,
J	lune 2011	3.7	POJO Runtime, Hive/Hadoop, Open Office emitters
J	June 2012	4.2	Maven Support, Excel Data Source, Relative Time Periods
J	lune 2013	4.3	POJO Data Source, MongoDB/Cassandra support, client JS

#### **BIRT Data Access**



#### BIRT Offers many ways to get data

- Standard Data Sources
  - Flat File (CSV, TSV, SSV, PSV)
  - Hive Data Source (Hadoop)
  - Cassandra Scripted Data Source
  - MongoDB Data Source
  - JDBC Textual or Graphical
  - Web Service XPath syntax
  - XML XPath syntax
  - XLS/XLSX
- Scripted Data Source Written in Java or JavaScript
- Open Data Access (ODA) DTP Project

Community Contributions
GoogleDocs
XML/A
Casandra
REST
MongoDB
Multi-Flat File
GitHub
Twitter JSON Search
Dropbox usage
YQL
Google Analytics
LinkedIn
Facebook FQL

# **BIRT Formatting Capabilities**

- Listings, cross-tab, dashboard, pixel-perfect, charts
- Grouping, advanced aggregations, subtotals, calculations
- Multi-section and sub-reports
- Conditional sections and logic
- Full programmatic control and scripting
- Embedded images
- Dynamic hyperlinking
- And much more!





# **BIRT Productivity Aids**



- Graphical layout and design
- Query and metadata editors
- Customizable cheat sheets and templates
- Formatting builder
- Grouping builder



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# **BIRT Re-use and Productivity**

- Library support for publishing and sharing components
- Leverages common standards
  - SQL
  - Java
  - JavaScript
  - XML
- Cascading Style Sheets
- Integrated debugger





# **BIRT Expressions and Scripting**



- Expressions are everywhere
  - Data Source\Set, Parameters
  - Report Items
    - Data, Crosstab, Images
  - Chart Elements
  - Visibility, TOC, Bookmarks
  - Events
- Helper Object References

Layout Master Page Script XML Source

Preview

- Data Sets\Table Bindings
- Native JavaScript Func's
- BIRT Functions
- Operators



# **BIRT Output Formats**



- HTML, PDF, MS Office, Open Office
- Custom emitters : CSV, Text, ...
- Internationalization of labels and text
- Localization of date and numeric fields
- Support for Asian character sets and right-to-left display

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#### Live Demo – Connecting to Big Data



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#### **Connecting to Hadoop** *Hortonworks Sandbox Tutorial*





#### http://hortonworks.com/hadoop-tutorial/birt\_reporting\_tutorial/

### **Connecting to Hadoop**



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#### **Hive JDBC – HQL Sub Query Example**



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#### Hive JDBC – get\_json\_object UDF



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#### **Hive JDBC – RegExP Example**



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#### **Hive JDBC – HQL Hints example**







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#### **Cassandra** – Scripted Data Set Example



```
Script: open
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                        ▼
  1 importPackage(Packages.java.util);
  2 importPackage(Packages.me.prettyprint.cassandra.serializers);
  3 importPackage(Packages.me.prettyprint.cassandra.service);
  4 importPackage(Packages.me.prettyprint.hector.api);
  5 importPackage(Packages.me.prettyprint.hector.api.beans);
  6 importPackage(Packages.me.prettyprint.hector.api.factory);
  7 importPackage(Packages.me.prettyprint.hector.api.query);
  8 importPackage(Packages.me.prettyprint.cassandra.model);
  9
 10 var cluster = HFactory.getOrCreateCluster("Test Cluster", new CassandraHostConfigurator("localhost:9160"));
    var keyspace = HFactory.createKeyspace("users", cluster);
 11
 12
 13
 14
 15 var cqlQuery = new CqlQuery(keyspace, StringSerializer.get(), StringSerializer.get(), StringSerializer.get());
 16 cqlQuery.setQuery("select * from User");
 17 var resultCQL = cqlQuery.execute();
18 rowsIterator = resultCQL.get().iterator();
                                                     Script: fetch
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                                                                                                       R 🕐
                                                                                                               open
 19
                                                       1 if (rowsIterator.hasNext()) {
 20
                                                               var myrow = rowsIterator.next();
                                                       2
 21
                                                       3
                                                               var cols = myrow.getColumnSlice().getColumns();
                                                       4
                                                               for( ii=0; ii < cols.size(); ii++ ){</pre>
                                                       5
                                                                  row[cols.get(ii).getName()] = cols.get(ii).getValue();
                                                       6
                                                               }
                                                       7
                                                               return true;
                                                       8 }else{
                                                       9 return false;
                                                      10 }
```

# **High-Level BIRT Architecture**





# **High Level BIRT Architecture – APIs**





#### **Multiple Deployment Options**





# **Report Engine API (REAPI)**



- Report Engine can be used in different ways
  - 3 tasks related to report execution and rendering
    - RunTask
    - RenderTask
    - RunAndRenderTask
  - Using RunTask and then RenderTask means multiple processes to generate and view a report.
  - RunAndRenderTask happens in single process so event firing order is different

# **Report Engine API (REAPI)**



```
static void executeReport() throws EngineException
```

```
{
```

```
IReportEngine engine=null;
```

```
EngineConfig config = null;
```

```
try{
```

```
config = new EngineConfig( );
```

```
config.setLogConfig("C:\\BIRT_422\\logs", java.util.logging.Level.FINEST);
```

```
Platform.startup( config );
```

IReportEngineFactory **factory** = (IReportEngineFactory) Platform

```
createFactoryObject( IReportEngineFactory.EXTENSION_REPORT_ENGINE_FACTORY );
```

```
engine = factory.createReportEngine( config );
```

```
IReportRunnable design = null;
```

```
design = engine.openReportDesign("C:\\BIRT_43\\designs\\param.rptdesign");
```

```
IRunAndRenderTask task = engine.createRunAndRenderTask(design);
```

```
task.setParameterValue("ordParam", (new Integer(10101)));
```

```
task.validateParameters();
```

...

# **Report Engine API (REAPI)**



- 0 X

**PDFRenderOption** options = new PDFRenderOption();

```
options.setOutputFileName("my report.pdf");
options.setOutputFormat("pdf");
task.setRenderOption(options);
```

task.run();

task.close(); engine.destroy(); }catch( Exception ex){ ex.printStackTrace();

finally

Platform.shutdown();



CustomerReport-Complete[2].pdf - Adobe Reader

= ا - 🖾 

<u>File Edit View Document Tools Window Help</u>

# **BIRT AJAX Based WebViewer Example**





#### Top 25% Customers (sorted by name)

Top Classic Models Inc. Customers by F

Customer Name	Customer Number	Customer Total
AV Stores, Co.	187	\$148,410.09
Anna's Decorations, Ltd	276	\$137,034.22
Australian Collectors, Co.	114	\$180,585.07
Corporate Gift Ideas Co.	321	\$132,340.78
Corrida Auto Replicas, Ltd	458	\$112,440.09
Danish Wholesale Imports	145	\$129,085.12

# WebViewerExample in BIRT Runtime



- • ×

Copy WebViewerExample from the runtime download to the application server and rename it "birt"



# **BIRT Web Viewer URLs**



As a straight HTML output:

http://localhost:8080/birt/run? report=reportName.rptdesign

With viewer toolbar, pagination, etc.:

http://localhost:8080/birt/frameset? report=reportName.rptdesign

Other servlet mappings:

preview, document, output, extract

URL parameters include:

id	title	showtitle	toolbar	navigationbar	locale
format	report	document	parameterpage	pagerange	fittopage
svg	isnull	islocale	masterpage	resourceFolder	bookmark
rtl	page	overwrite			

# **BIRT Web Viewer URLs**



Output to PDF:

http://localhost:8080/birt/frameset? report=reportName.rptdesign& format=pdf

To display a single report item as a reportlet:

http://localhost:8080/birt/run? report=SD.rptdesign& bookmark=myTable&\_\_isr eportlet=true

# **BIRT Viewer Toolkit (BVT)**

#### New product for use with open-source BIRT.

#### **Key Features:**

- It's FREE!
- It uses the Actuate commercial-grade Viewer (Built on OS Viewer)
  - More modern look and feel
  - More seamless parameter entry screen
  - Calendar date-picker
  - Progressive Viewing
- It's built on the latest BIRT version
- Includes JavaScript API (JSAPI) AJAX library for easier integration into applications of all types.





# **BIRT Viewer Toolkit WAR and EAR Deployment**



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#### http://localhost:8080/ActuateBVT

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The URL's used with the OS viewer can still be used with BVT.

With viewer toolbar, pagination, etc.:

As a straight HTML output: <u>http://localhost:8080/ActuateBVT/run?</u> report=CustomerReport.rptdesign

Output to PDF:

http://localhost:8080/ActuateBVT/frameset? report=SD.rptdesign& format=pdf

To display a single report item as a reportlet: <u>http://localhost:8080/ActuateBVT/run? report=SD.rptdesign& bookmark=myTable</u>

Parameterized report with date picker:

http://localhost:8080/ActuateBVT/frameset? report=DynamicParameter.rptdesign

# **BVT and JavaScript (JSAPI)**



```
<html><head>
           <script type="text/javascript" language="JavaScript"
                                                   src="http://localhost:8080/BIRTViewerToolkit/jsapi"></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script></script>
</head>
<body onload="init();">
           <div id="myDivContainer" style="border-width: 1px; border-style: solid;"></div>
           <script type="text/javascript" language="JavaScript">
                     var myViewer;
                    function init() {
                                actuate.load("viewer");
                                actuate.initialize( "http://localhost:8080/ActuateBVT/", null, "administrator", "", createViewer );
                      }
                    function createViewer() {
                                myViewer = new actuate.Viewer( "myDivContainer" );
                                myViewer.setReportName("/reports/TableReport.rptdesign");
                                myViewer.submit();
                      }
           </script>
</body></html>
Live Example: http://localhost:8080/ActuateBVT/SimpleReport.jsp
```

#### Sign up for SF Bay Area BIRT Meetups Next Meeting in January



Aeeive Find	a Meetup Group
Harris Marshare, Dhahaa	SF Bay BIRT Developers
Home Members Photos	Discussions More Join us!
San Francisco, CA Founded Sep 26, 2013 Developers 25	Calling BIRT developers in the San Francisco Bay area! This meetup will focus on helping you learn and make the most out of BIRT in your reporting and data visualization projects – as well as providing opportunities to network with other local developers and to have some fun.
Organizers: Ray Gans, Graham Gallivan, Utpal Bhatt	<ul> <li>What you can expect:</li> <li>Presentations by BIRT Experts on best practices for BIRT design, deployment and application development</li> <li>Discussions exploring techniques for using BIRT with the latest new technologies such as analytics and big data</li> </ul>
We're about: Open Source · BIRT · Open Source Analytics · Data Visualization · Software Developers · Business	• Examples of real-life BIRT usage in industry, finance and government New users, project managers and experienced developers are all welcome.

# **BIRT Developer Center**



#### The place for all things BIRT

- Access demos, tutorials, tips and techniques, documentation...
- Enables developers to be more productive and build applications faster



# http://developer.actuate.com

#### Explore

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#### Contribute

- BIRT designs, code
- Technical tips
- Applications