

Secure Business Intelligence (secBI)

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FISHER COLLEGE

About Author

- 25 years in Industry Developing N-Tier Business Solutions
- Program Director and Professor at Fisher College in Boston
- Acting Program Director for New York University Cyber Fellows Program
- Research is in N-Tier and Cloud Application Correctness



Project Goals

- **Ensure Confidentiality, Integrity and Availability of reports, dashboards and other data that an organization uses for critical decision making**

Use Case for Experimentation

- **Major US Musuem**
- **Over 120 custom BI Reports & Dashboards**
- **Email Marketing to 600,000 patrons per week**
- **Visitors**
- **Group Sales**
- **Members**
- **Donors**

Two Components

- **Client-Side Testing Engine – Specify business intelligence reports, dashboards and data to execute and record testing data**
- **Server-Side Reporting Engine – Specify output formats for business intelligence reports**

XML Tag Based Language

Tag	Type	Parent	Language
Credential	Statement		Both
Report	Statement	Credential	Both
Execution	Statement	Report	secBIML
Parameter	Statement	Report	Both
Outputtable	Statement	Report	secBrpts
Outputcolumn	Statement	Outputtable	secBrpts
Alert	Statement	Comparison or Outputtable	Both
Dataconnection	Statement	Outputtable	secBrpts
Datajoin	Statement	Outputtable	secBrpts
Datasource	Statement	Dataconnection	secBrpts
Datacolumn	Statement	Datasource	secBrpts
RestAction	Statement	Alert	Both
DBAction	Statement	Alert	Both
LogAction	Statement	Alert	Both
Reference	Expression	OutputColumn or Comparison	Both
Comparison	Expression	Datasource	Both
Literal	Expression	Comparison or OutputColumn	Both
ActionValue	Expression	RESTAction, DBAction or LogAction	Both

Example Client-Side Code

```
<report name="eventbyhour"  
server=https://logireports.fi.edu?rdName=Repo  
rts.Admissions.Event_ByHour  
credential="bilogin"/>
```

```
<execution name="eventbyhourjuly"  
report="eventbyhour"/>
```

```
<parameter execution="eventbyhourjuly"  
name="BeginDate" value="07/01/2019"/>
```

```
<parameter execution="eventbyhourjuly"  
name="EndDate" value="07/31/2019"/>
```

Example Server-Side Code

```
<report>
  <outputtable>
    <dataconnection id="dc1" type="mysql"
      schema="nonprofits.xsd" credentials="npdb1"/>
    <datasource id="ds1" connection="dc1" type="sql"
      source="select * from events"/>
    <outputcolumn datasource="ds1" datacolumn="name"/>
    <outputcolumn datasource="ds1" datacolumn="date"
      format="MM/DD/YYYY"/>
  </outputtable>
</report>
```

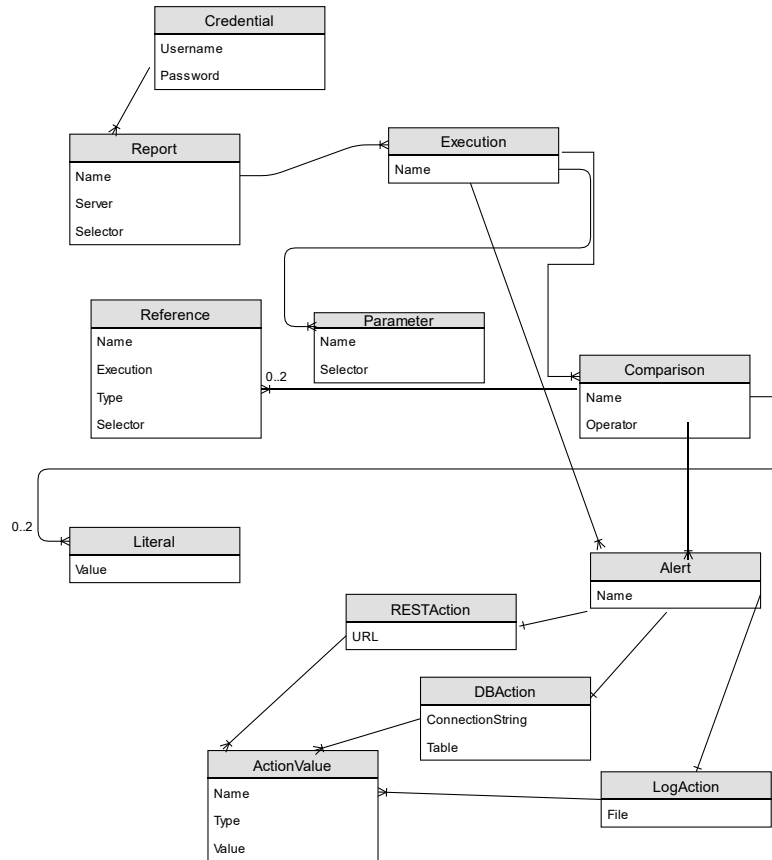

Nested Tags or attributes

```
<execution name="eventbyhourjuly"  
report="eventbyhour"/>
```

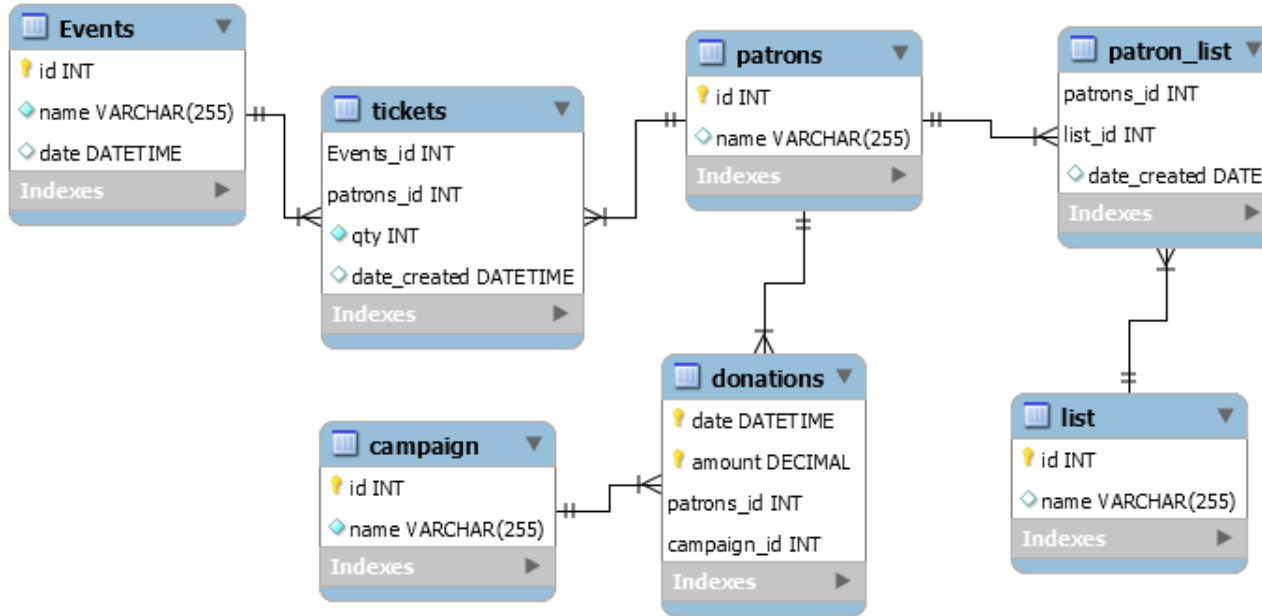
Or

```
<report name="eventbyhour"  
server=https://logireports.fi.edu?rdName=Reports.  
Admissions.Event_ByHour credential="bilogin">  
  <execution name="eventbyhourjuly"  
report="eventbyhour">  
  </report
```

secBISQL



Experiment ER Diagram



MAC Expressed in XSD

```
<xs:element name="authorization_context_amount">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="amount">
        <xs:simpleType>
          <xs:restriction base="xs:decimal">
            <xs:totalDigits value="10"/>
            <xs:fractionDigits value="0"/>
            <xs:minExclusive value="-10000000000"/>
            <xs:maxExclusive value="10000000000"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="FundDevelopmentAccessLevels">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="TelemarketingStaff" >
              <xs:simpleType>
                <xs:restriction base="xs:decimal">
                  <xs:maxExclusive value="100"/>
                </xs:restriction>
              </xs:simpleType>
            </xs:element>
            <xs:element name="FundDevelopmentStaff" >
              <xs:simpleType>
                <xs:restriction base="xs:decimal">
                  <xs:maxExclusive value="10000"/>
                </xs:restriction>
              </xs:simpleType>
            </xs:element>
            <xs:element name="FundDevelopmentManagement" >
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:element>
```

Availability Testing

Data Point	Original Timing	Post Timing	Executions
Cache-miss sequential	17652	14808	120
Cache-hit sequential	1464	1452	120
Cache-miss 4 thread	20556	18324	120
Cache-hit 4 thread	1824	1812	120
Cache-miss 8 thread	22380	20556	120
Cache-hit 8 thread	2016	2016	120
Cache-hit production	145873	139647	910
Cache-miss production	4864	4393	320

Integrity Testing

Document Type	Count	Internal	External	Initial Integrity	Continuous Integrity
Word Documents	102	24	82	82%	94%
PowerPoint Documents	55	2	53	86%	92%
Excel Documents	1	0	1	100%	100%

Conclusion & Questions

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