Integrating data mining and data access in China-VO

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Goals

- Integrate data mining and data access
- Interactive & Automatic mode
- Distributed computing
- Individual object vs. Mass data set
- Extensibility

VO Data Mining Application

- To meet the targets we design a VO data mining application
- A VO services integrator (a platform)
- Based on Web Service
- Support multiple tasks
- User defined workflows as well as interactive operations
- Working language is Job Description Language (JDL)

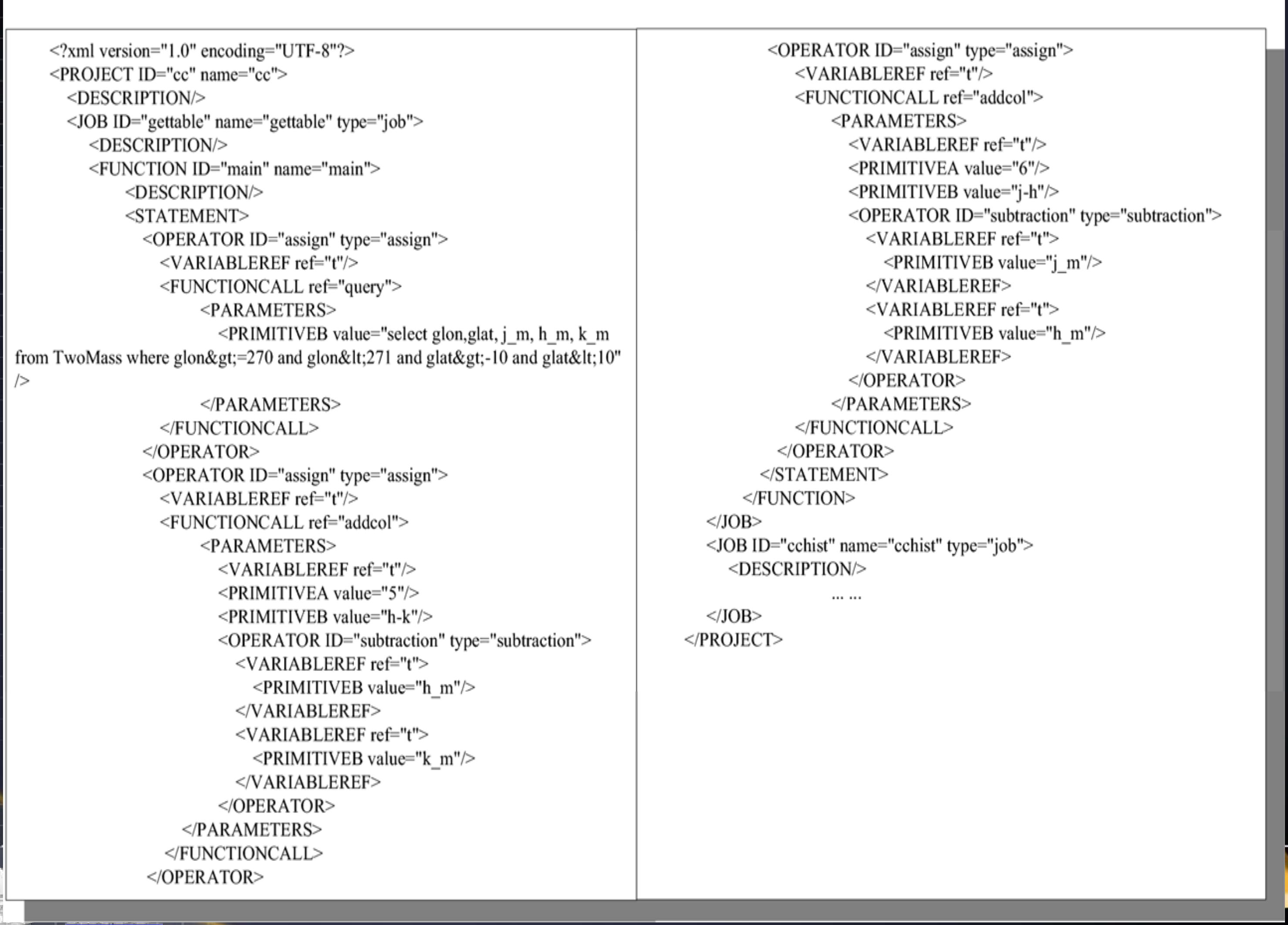
Job Description Language

- An interpreted programming language
  - Computing-oriented
  - Simple syntax
  - Easily learn
  - Distributed execution
  - Extensible
- Describe both automatic workflow and interactive actions
  - Multiple jobs contains in a JDL program
  - Data exchange between jobs
- Two equivalent form: JDL/s and JDL/x

Job Description Language (Sample)

```
project cc
    job gettable
        function t=main()
            t=query("select glon,glat, j_m, h_m, k_m from TwoMass where glon>=270 and glon<271 and glat>-10 and glat<10");
            t=addcol(t, 5, "h-k", t("h_m")-t("k_m"));
            t=addcol(t, 6, "j-h", t("j_m")-t("h_m"));
        end
    end
    job cchist
        function m=main()
            t=jobresult("gettable");
            m=hist(t, "h-k", "j-h");
        end
    end
end
```

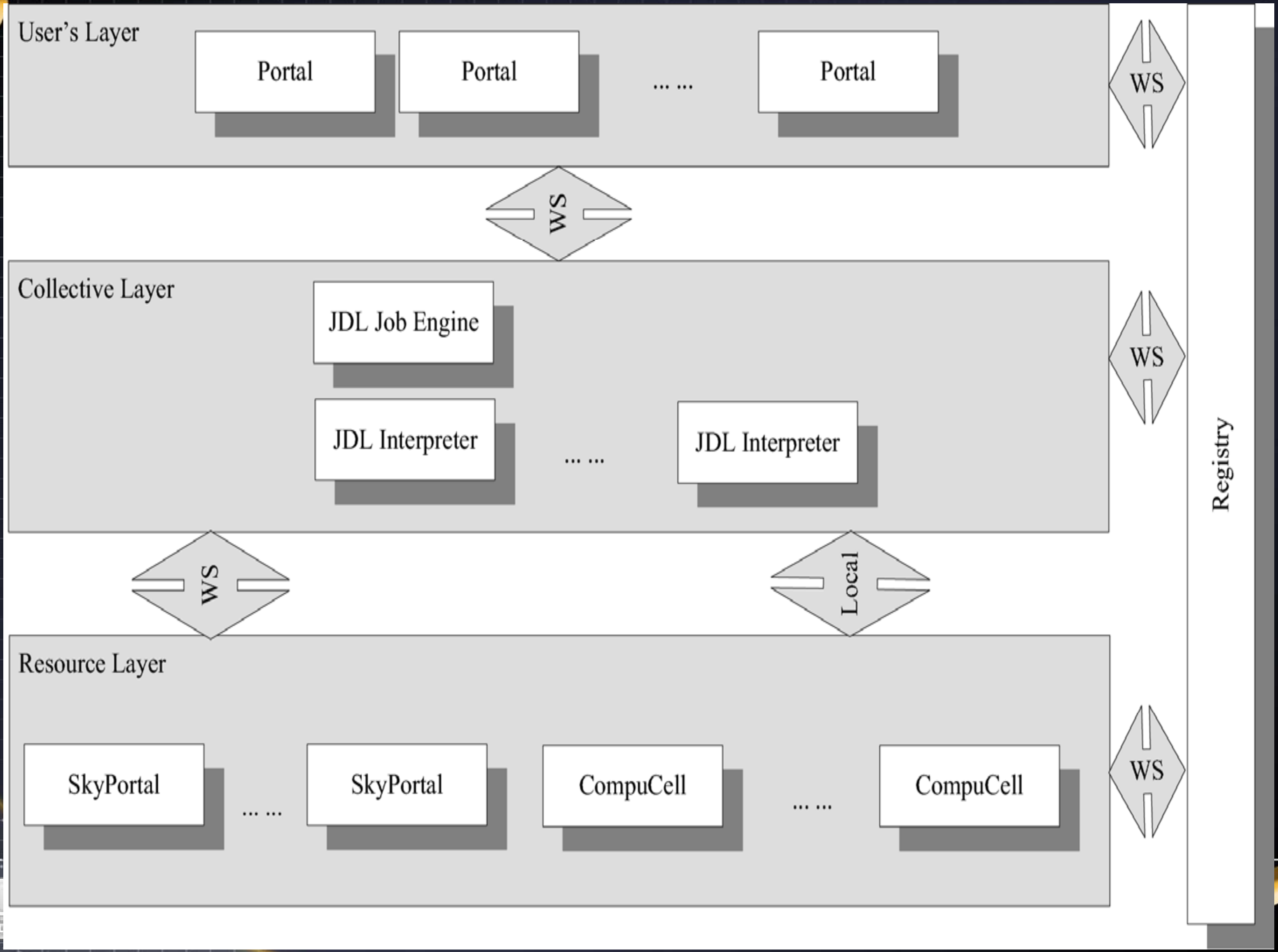
Job Description Language (Sample)



```
<?xml version="1.0" encoding="UTF-8"?>
<PROJECT ID="cc" name="cc">
  <DESCRIPTION/>
  <JOB ID="gettable" name="gettable" type="job">
    <DESCRIPTION/>
    <FUNCTION ID="main" name="main">
        <DESCRIPTION/>
        <STATEMENT>
          <OPERATOR ID="assign" type="assign">
            <VARIABLEREF ref="t"/>
            <FUNCTIONCALL ref="query">
                <PARAMETERS>
                  <PRIMITIVEB value="select glon,glat, j_m, h_m, k_m
from TwoMass where glon&gt;=270 and glon&lt;271 and glat&gt;-10 and glat&lt;10"
/>
                </PARAMETERS>
            </FUNCTIONCALL>
          </OPERATOR>
          <OPERATOR ID="assign" type="assign">
            <VARIABLEREF ref="t"/>
            <FUNCTIONCALL ref="addcol">
                <PARAMETERS>
                  <VARIABLEREF ref="t"/>
                  <PRIMITIVEA value="5"/>
                  <PRIMITIVEB value="h-k"/>
                  <OPERATOR ID="subtraction" type="subtraction">
                    <VARIABLEREF ref="t">
                      <PRIMITIVEB value="h_m"/>
                    </VARIABLEREF>
                    <VARIABLEREF ref="t">
                      <PRIMITIVEB value="k_m"/>
                    </VARIABLEREF>
                  </OPERATOR>
                </PARAMETERS>
              </FUNCTIONCALL>
            </OPERATOR>
```

```
          <OPERATOR ID="assign" type="assign">
            <VARIABLEREF ref="t"/>
            <FUNCTIONCALL ref="addcol">
                <PARAMETERS>
                  <VARIABLEREF ref="t"/>
                  <PRIMITIVEA value="6"/>
                  <PRIMITIVEB value="j-h"/>
                  <OPERATOR ID="subtraction" type="subtraction">
                    <VARIABLEREF ref="t">
                      <PRIMITIVEB value="j_m"/>
                    </VARIABLEREF>
                    <VARIABLEREF ref="t">
                      <PRIMITIVEB value="h_m"/>
                    </VARIABLEREF>
                  </OPERATOR>
                </PARAMETERS>
            </FUNCTIONCALL>
          </OPERATOR>
        </STATEMENT>
      </FUNCTION>
  </JOB>
  <JOB ID="cchist" name="cchist" type="job">
    <DESCRIPTION/>
                  ... ...
  </JOB>
</PROJECT>
```

Architecture



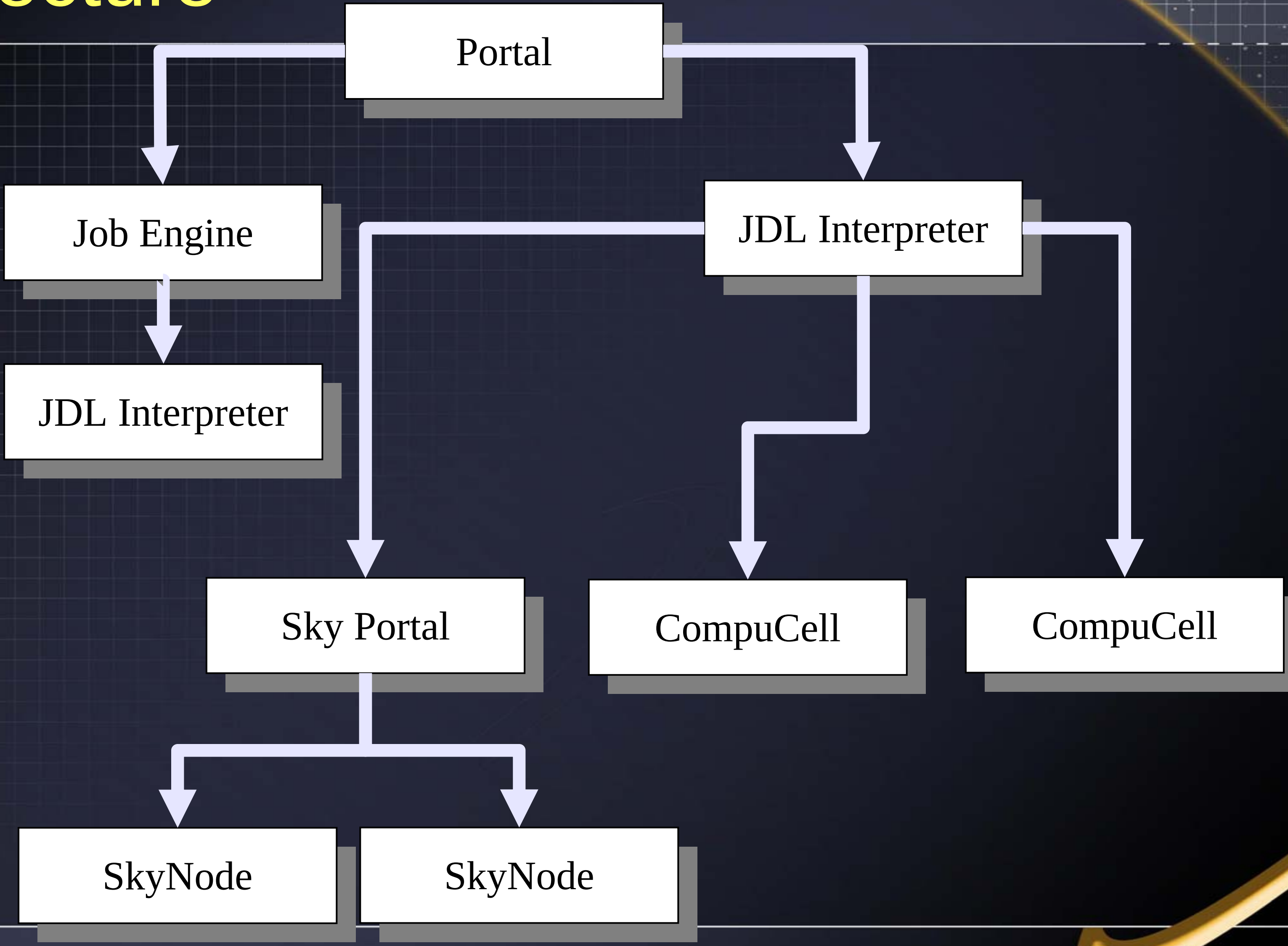
Architecture Components

- Portal
  - Edit JDL programs, submit JDL programs, monitor job Executions
  - Visualizations
- JDL Interpreter
  - JDL Parser
  - Invoke Sky Portal or CompuCell for executing a JDL program
- CompuCell, Computation service
  - Algorithms and existed software container
  - Unified Interface with JDL Interpreter
  - C++ and Java APIs for advanced users
  - Dynamic add algorithm libraries at run-time

Architecture Components

- Sky Portal
  - Data access service, SkyNode container
  - ADQL ,Cross Matching, FTP, specific data transferring interface
- Job Engine
  - Job coordination canter
  - JDL Interpreters controller
  - Monitor jobs status and progress

Architecture



Implementations

- 2005: Prototype A
  - Feasibility
  - Confirmation of the JDL
  - Web technology selection
  - Science: OB star research in 2MASS
- 2006: Prototype B
  - With registry
  - Completed JDL Interpreter
  - Completed CompuCell
  - Simplified workflow
  - without security
  - Science: LAMOST (The Large Sky Area Multi-Object Fiber Spectroscopic Telescope)

Future work

- Authentication and Authorization
- Namespace of CompuCell
- Job coordination
- Data access
- Visualizations
- Parallel computing

Thanks!

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