Model-Centered Architecture, Web Services, and Interoperability

Chad S. Matsalla

`matsallac@agr.gc.ca`

Agriculture & Agri-Food Canada

Today's Topics

- Modeling

- File formats are bad news

- Moving objects is hard

- The solution - Mister Model

- An example - Java speaks Bioperl

Why Model in UML?

- Design can be the most important part
- Design can be the most *fun* part
- Models are important artifacts
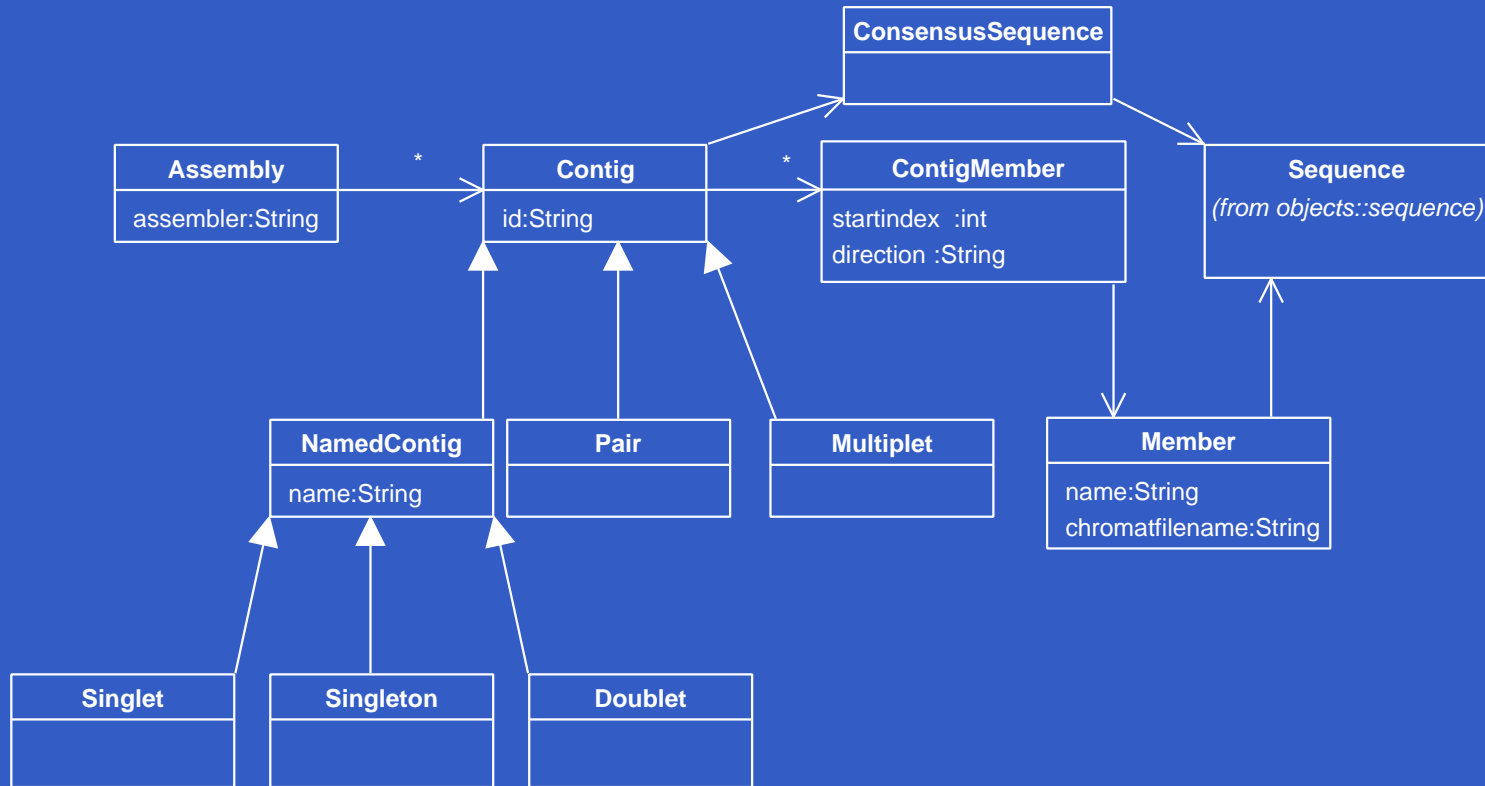- XML Schema/DTD are not for modeling

A Shallow Object - A Sequence

SimpleSequence

sequence: String
name: String

A Deep Object - A Sequence Assembly

File formats and CGIs are trouble

Have you...

- struggled with with a file format?

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- published those specifications?

- *HATED THOSE THINGS?*

Is XML the answer?

```
<assembly>
    <contig>
        <assembler name=phrap>
        <member>
            <name>
                Chad1
            </name>
        </member>
        <member>
            <name>
                Chad2
            </name>
        </member>
    </contig>
</assembly>
```

Is XML the answer?

- Specification
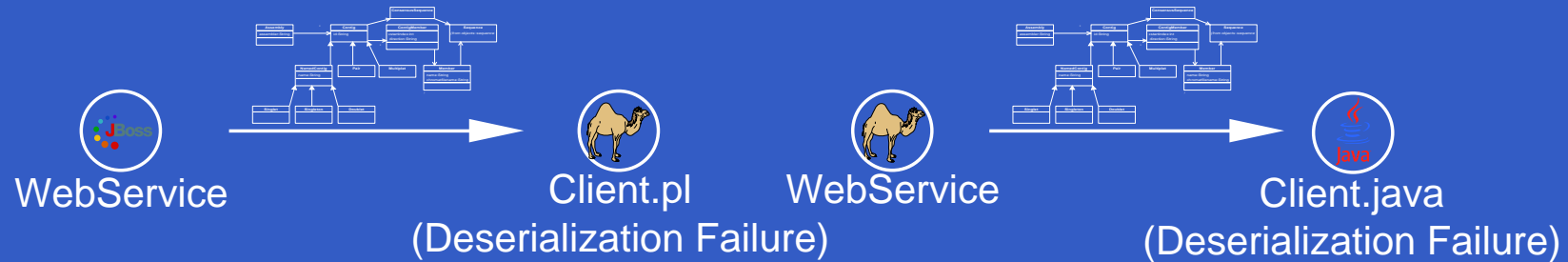
Is XML the answer?

- Specification

- Validation

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- Parsing

Is XML the answer?

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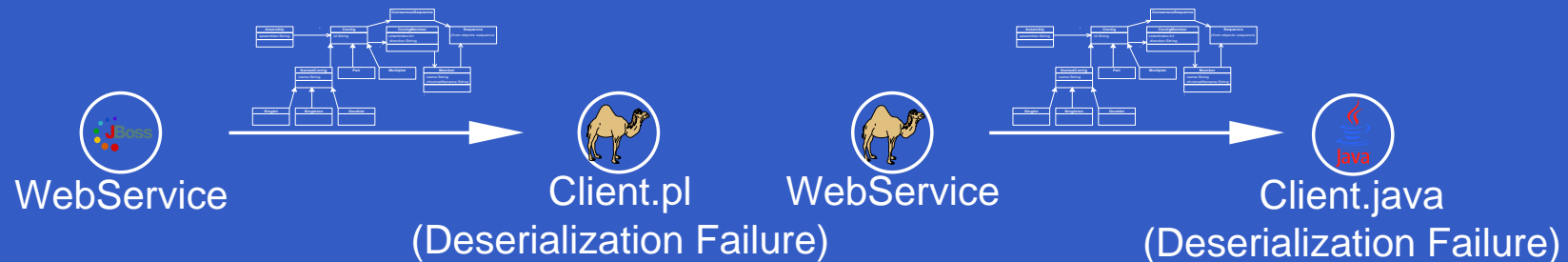
- Parsing

- *** Web Services ***

The Emperor's New Clothes

WebService → Client.pl (Deserialization Failure)

WebService → Client.java (Deserialization Failure)

- When languages differ, deserialization failure occurs

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- Dirty tricks have to be used to persuade deserialization

The Emperor's New Clothes

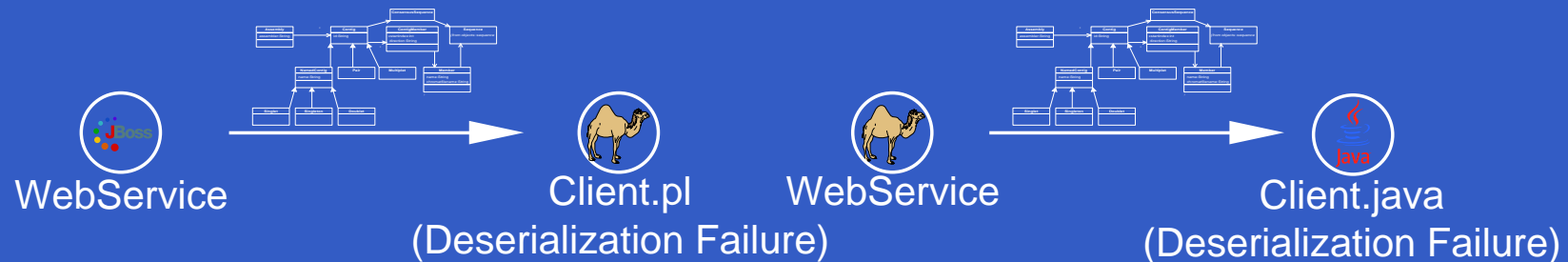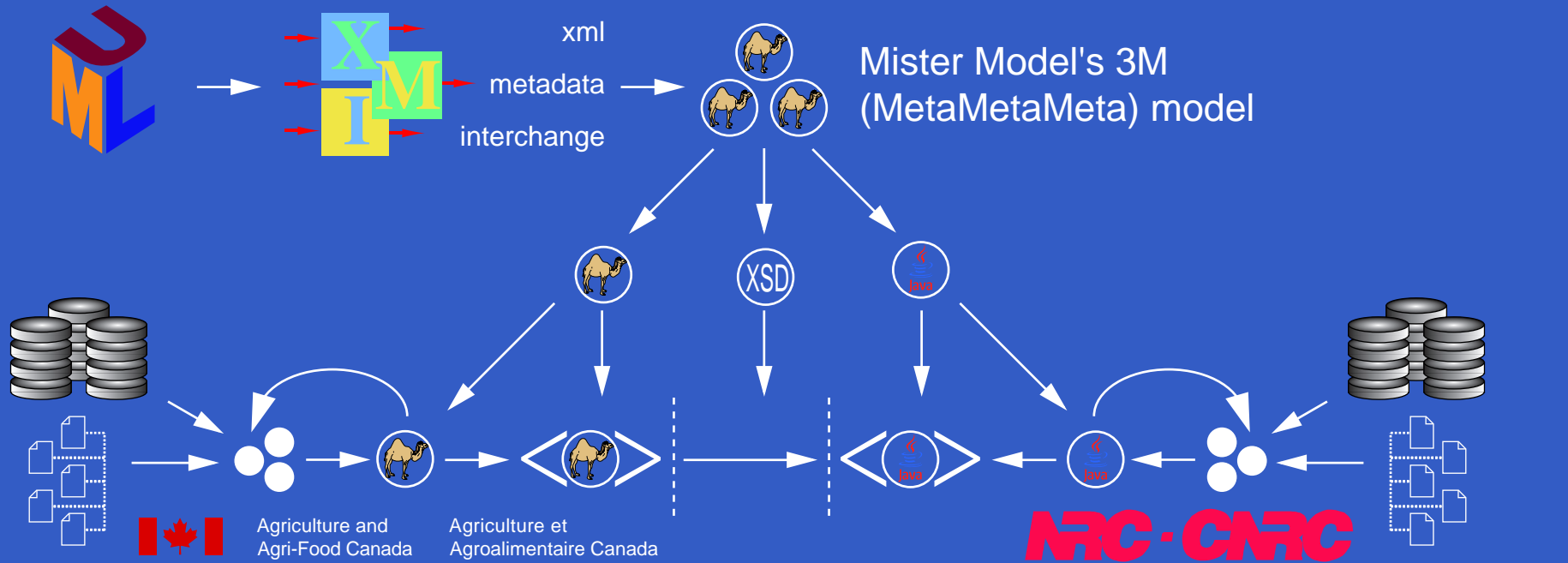WebService → Client.pl (Deserialization Failure)

WebService → Client.java (Deserialization Failure)

- When languages differ, deserialization failure occurs

- Dirty tricks have to be used to persuade deserialization

- Does this defeat the purpose of using XML? Why bother if you need a parser?

Mister Model

xml

metadata

interchange

Mister Model's 3M
(MetaMetaMeta) model

XSD

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Does This Work?

Yes! Benefits include:

- Serialization works out of the box for Perl and Java

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- Less time has to be spent documenting
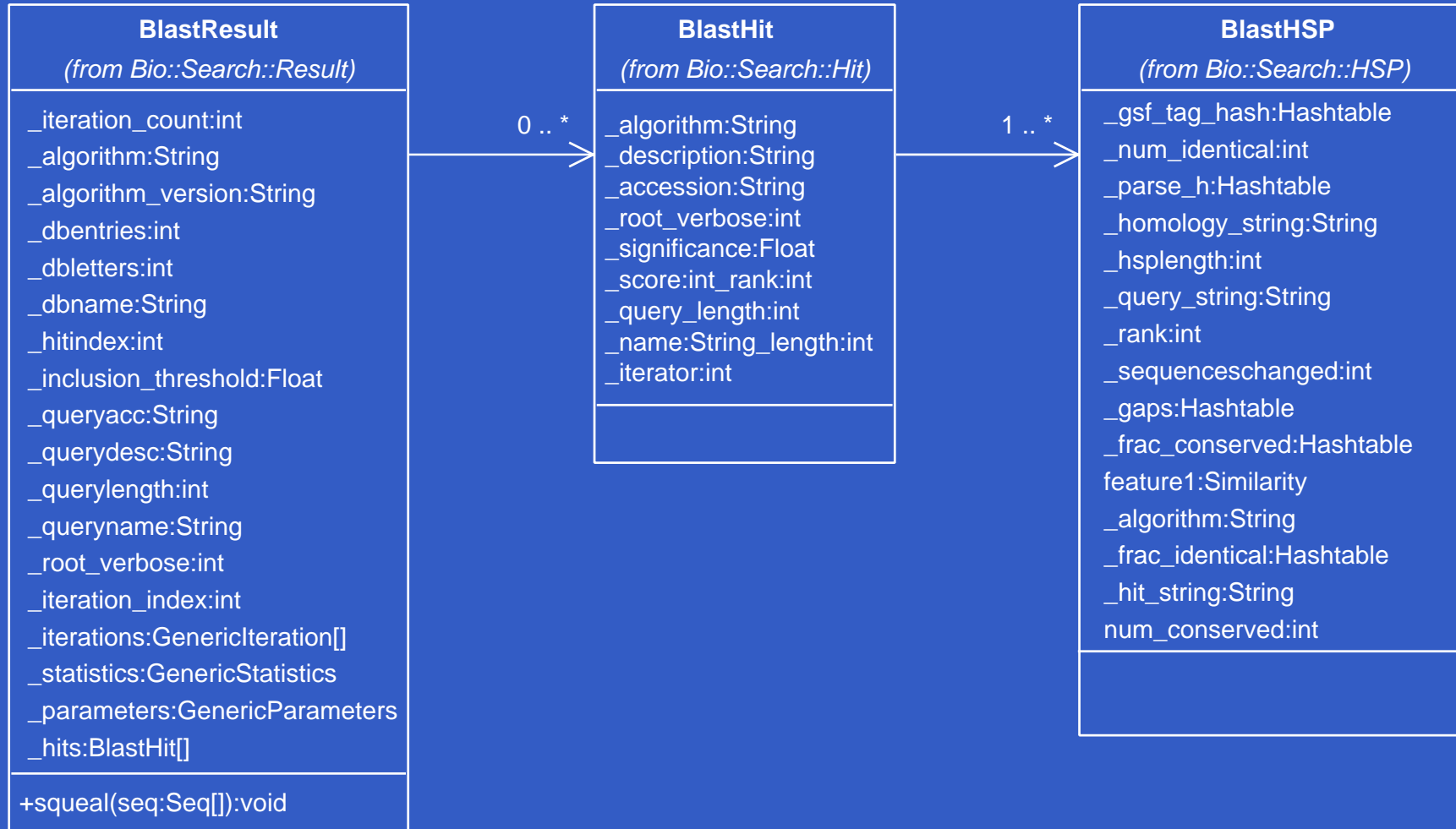
Does This Work?

Yes! Benefits include:

- Serialization works out of the box for Perl and Java

- UML models help document the system

- Less time has to be spent documenting

- More time can be spent designing and implementing

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A Simplified Bioperl Blast Report Object

BlastResult

(from Bio::Search::Result)

_iteration_count:int
_algorithm:String
_algorithm_version:String
_dbentries:int
_dbletters:int
_dbname:String
_hitindex:int
_inclusion_threshold:Float
_queryacc:String
_querydesc:String
_querylength:int
_queryname:String
_root_verbose:int
_iteration_index:int
_iterations:GenericIteration[]
_statistics:GenericStatistics
_parameters:GenericParameters
_hits:BlastHit[]

+squeal(seq:Seq[]):void

0 .. *

BlastHit

(from Bio::Search::Hit)

_algorithm:String
_description:String
_accession:String
_root_verbose:int
_significance:Float
_score:int_rank:int
_query_length:int
_name:String_length:int
_iterator:int

1 .. *

BlastHSP

(from Bio::Search::HSP)

_gsf_tag_hash:Hashtable
_num_identical:int
_parse_h:Hashtable
_homology_string:String
_hsplength:int
_query_string:String
_rank:int
_sequenceschanged:int
_gaps:Hashtable
_frac_conserved:Hashtable
feature1:Similarity
_algorithm:String
_frac_identical:Hashtable
_hit_string:String
num_conserved:int

A Swing Application

Swing Talks to a Perl Web Service
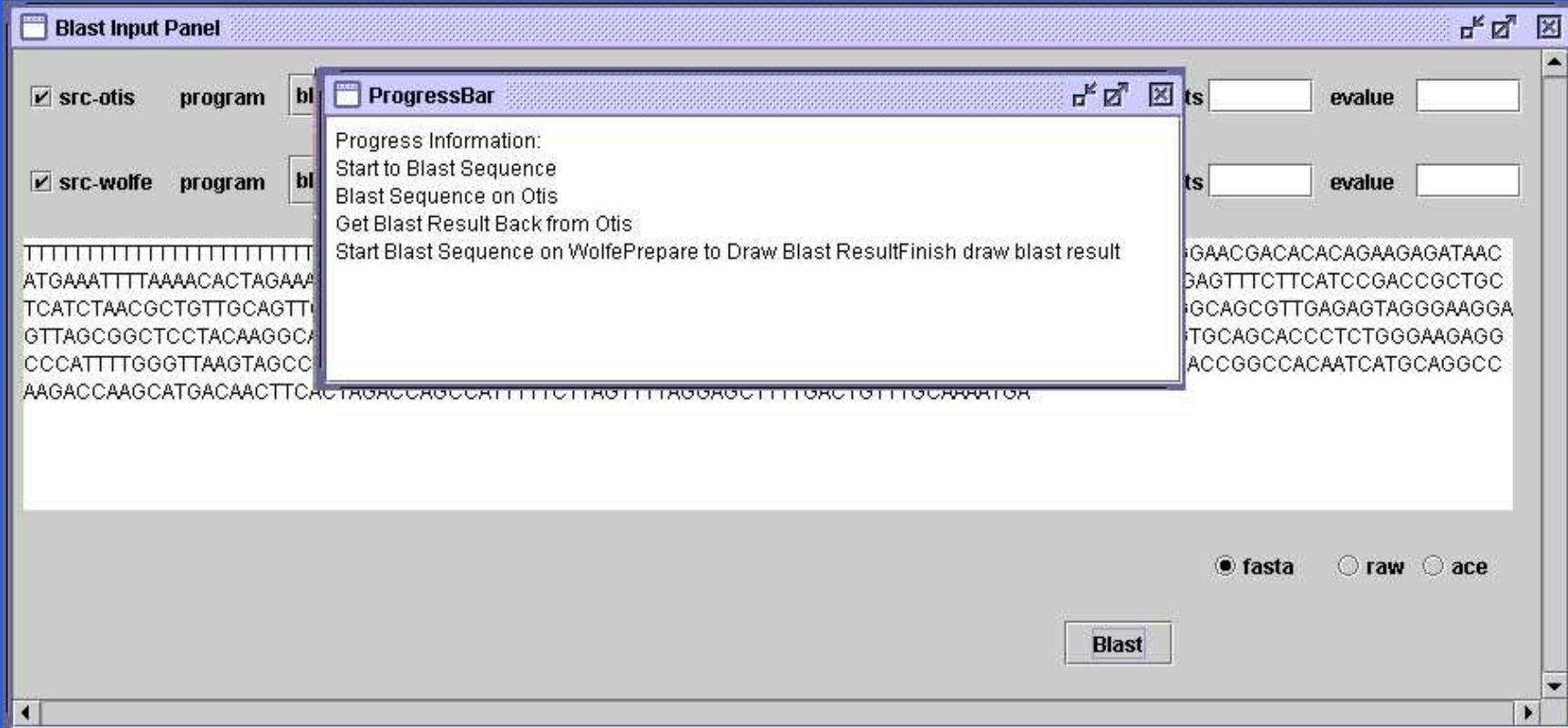
Swing Renders Bioperl
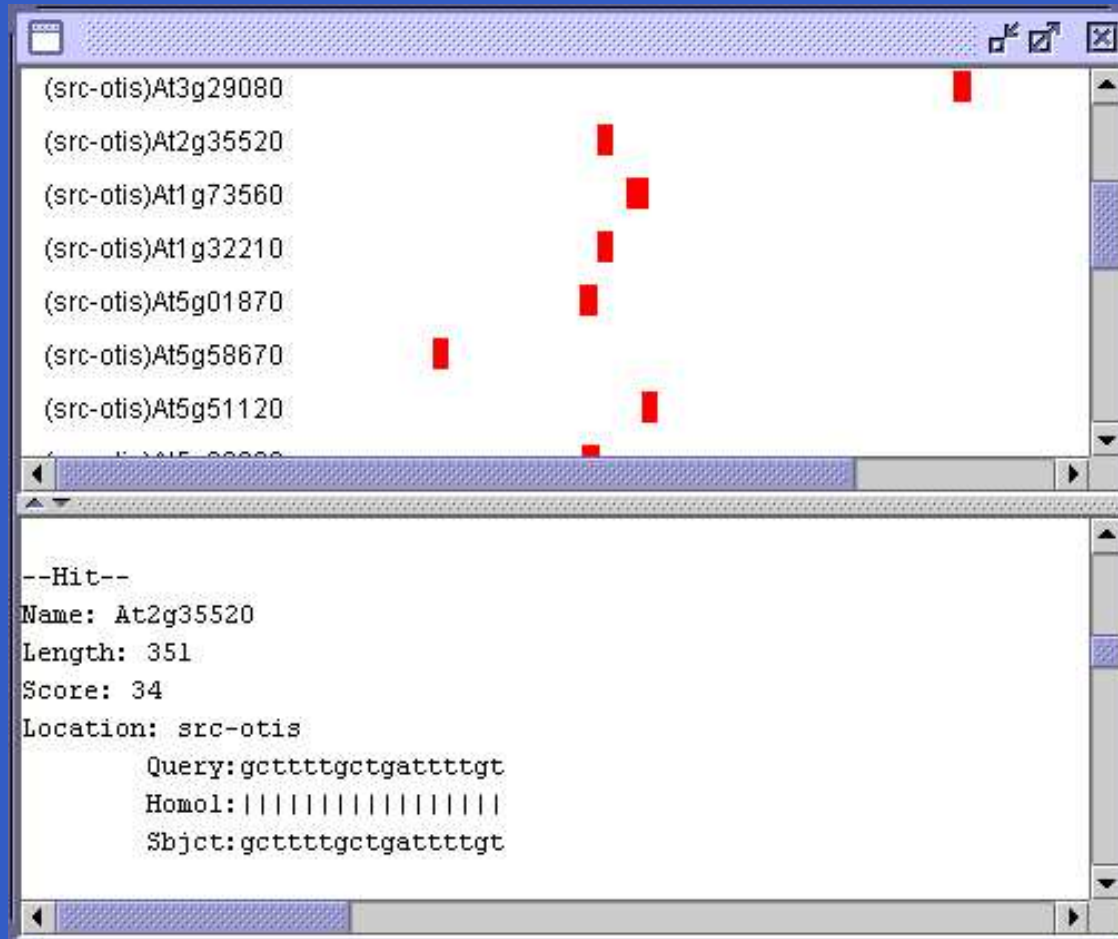
Oops

Additional help:

- The system received an exception from the server when trying to reassemble a contig.
- There could be numerous reasons for this

org.apache.axis.AxisFault

```
-------------- EXCEPTION  --------------
MSG: If you want me to create a PrimarySeq object for your empty sequence
STACK Bio::Seq::SeqWithQuality::new /home/httpd/otismain/html/webservices/
STACK Bio::Seq::SeqFactory::create /home/httpd/otismain/html/webservices/e
STACK Bio::SeqIO::phd::next_seq /home/httpd/otismain/html/webservices/expe
STACK Bio::Assembly::IO::ace::next_assembly /home/httpd/otismain/html/webs
STACK ca::gc::aafc::saskatoon::services::AssemblyService::assembly_to_asse
STACK ca::gc::aafc::saskatoon::services::AssemblyService::reassembleContig
STACK (eval) /usr/lib/perl5/site_perl/5.8.0/SOAP/Lite.pm:2191
STACK (eval) /usr/lib/perl5/site_perl/5.8.0/SOAP/Lite.pm:2182
STACK SOAP::Server::handle /usr/lib/perl5/site_perl/5.8.0/SOAP/Lite.pm:215
STACK SOAP::Transport::HTTP::Server::handle /usr/lib/perl5/site_perl/5.8.0
STACK SOAP::Transport::HTTP::CGI::handle /usr/lib/perl5/site_perl/5.8.0/SO
STACK toplevel /home/httpd/otismain/html/webservices/experimental/Assembly

----------------------------------------
```
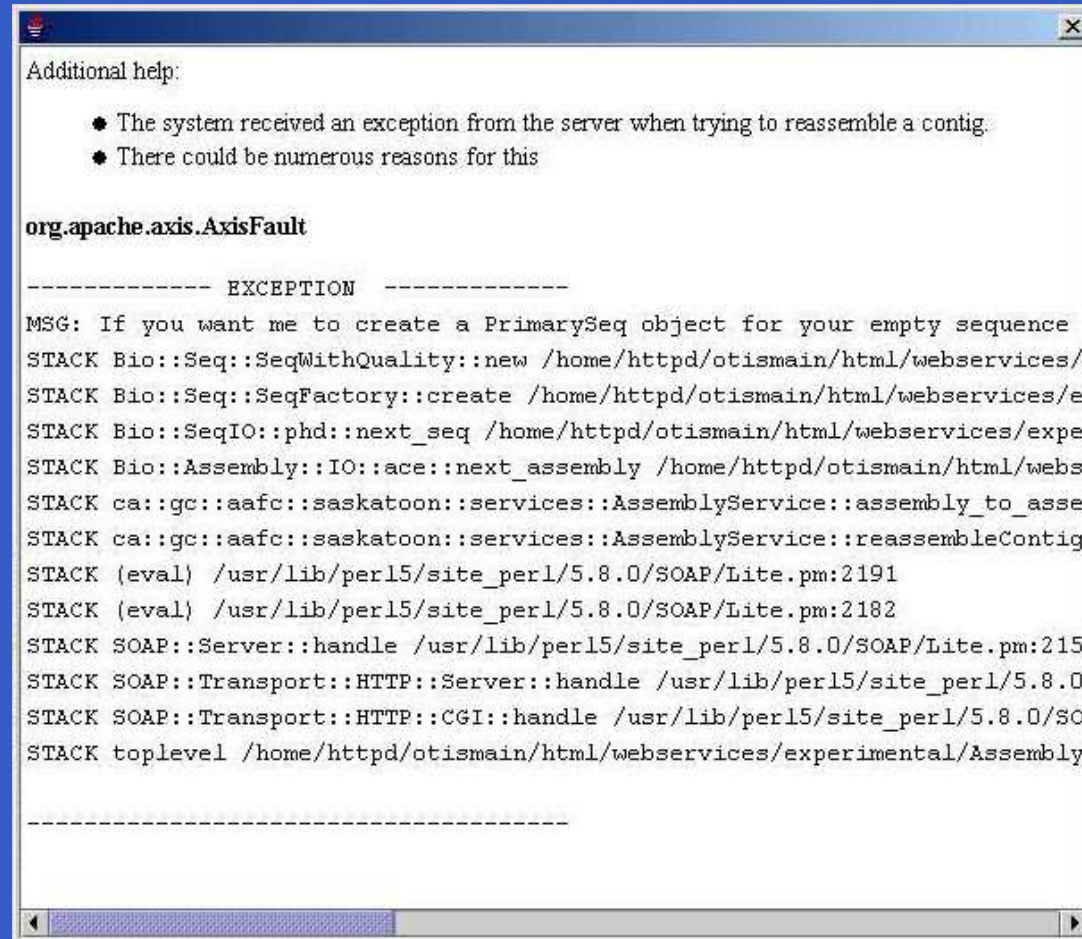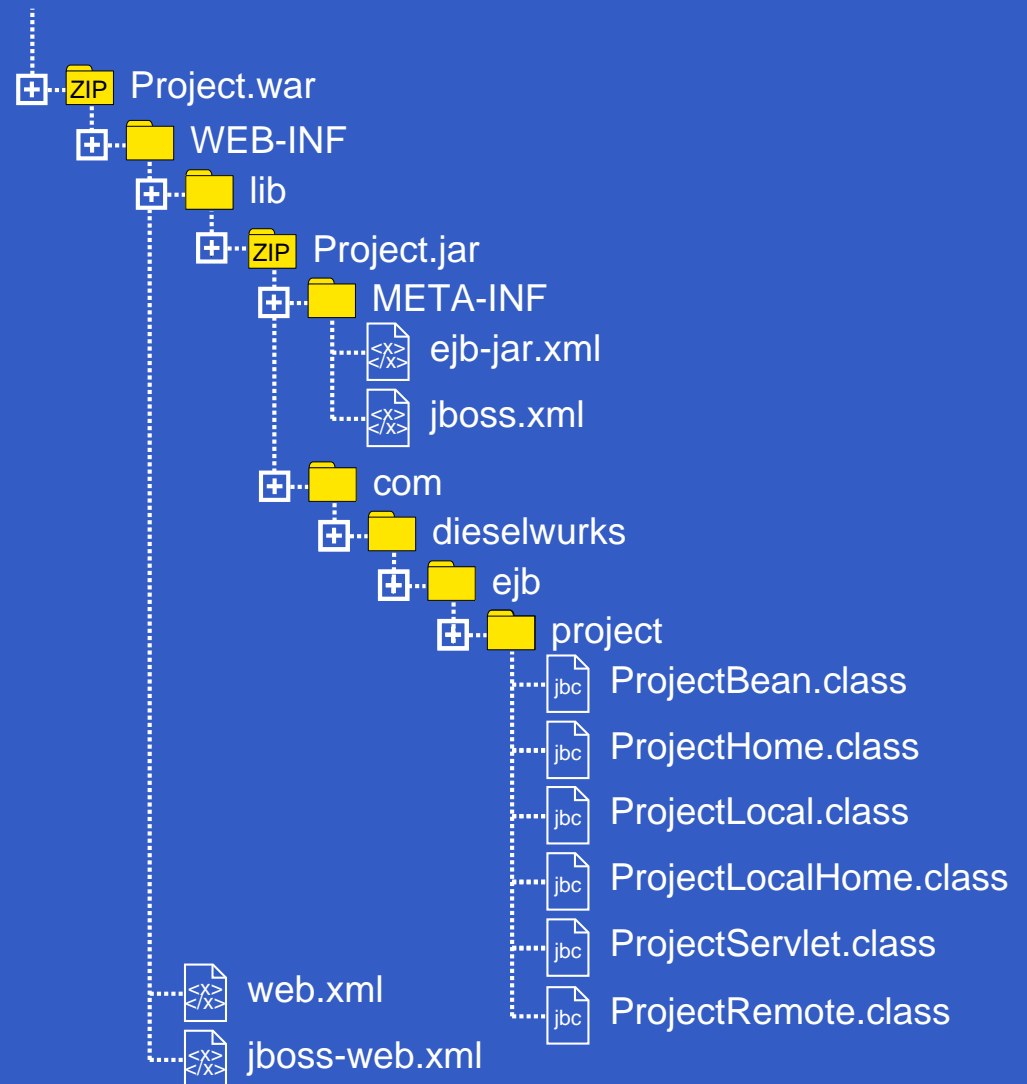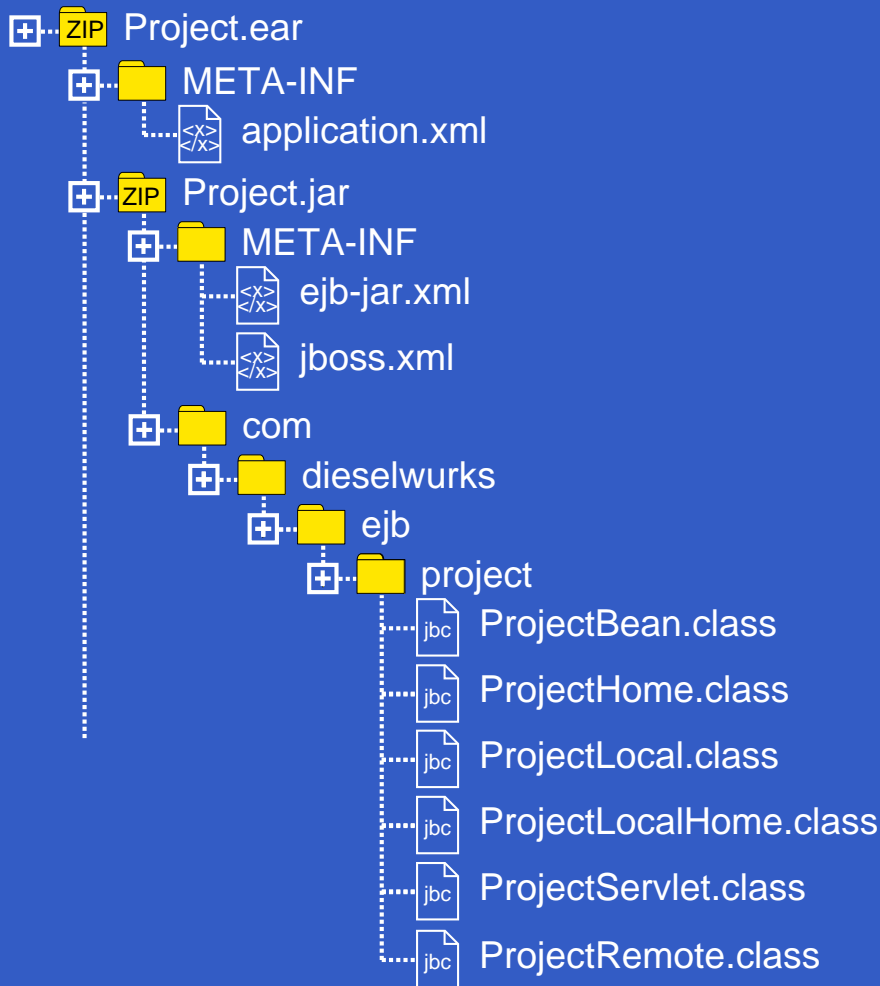
Web Services - Java

ZIP Project.ear
  META-INF
    application.xml
  ZIP Project.jar
    META-INF
      ejb-jar.xml
      jboss.xml
    com
      dieselwurks
        ejb
          project
            ProjectBean.class
            ProjectHome.class
            ProjectLocal.class
            ProjectLocalHome.class
            ProjectServlet.class
            ProjectRemote.class

ZIP Project.war
  WEB-INF
    lib
      ZIP Project.jar
        META-INF
          ejb-jar.xml
          jboss.xml
        com
          dieselwurks
            ejb
              project
                ProjectBean.class
                ProjectHome.class
                ProjectLocal.class
                ProjectLocalHome.class
                ProjectServlet.class
                ProjectRemote.class
    web.xml
    jboss-web.xml

Web Services - Perl

ws Project.ws

pm Project.pm

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Mister Model's Availability

- Mister Model is a system of Perl modules

- A paper is written and should be published 'real soon now'

- Source will be placed on Sourceforge in late August

- Contact Chad if you want it right away <Chad Matsalla> matsallac@agr.gc.ca

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