

BiVeS & BudHat

Version Control for Computational Models

MARTIN SCHARM

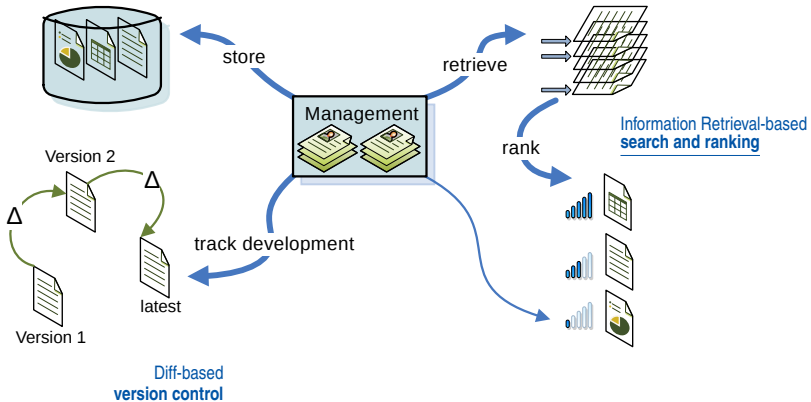
Department of Systems Biology & Bioinformatics
Faculty of Computer Science & Electrical Engineering
University of Rostock

<http://sems.uni-rostock.de>



Gatersleben 2013

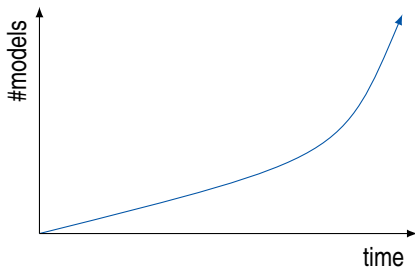
Format-independent,
graph-based storage



<http://sems.uni-rostock.de/>



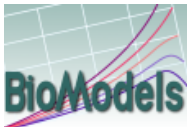
- many models
- multiple versions of each model
- several repositories



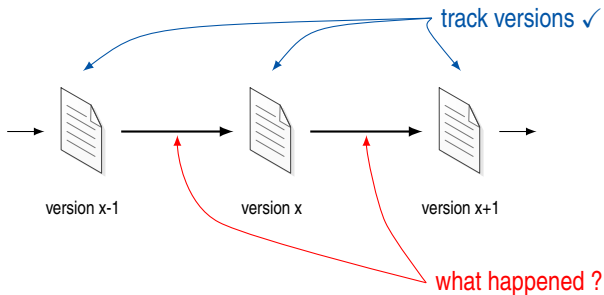
- many models
- multiple versions of each model
- several repositories

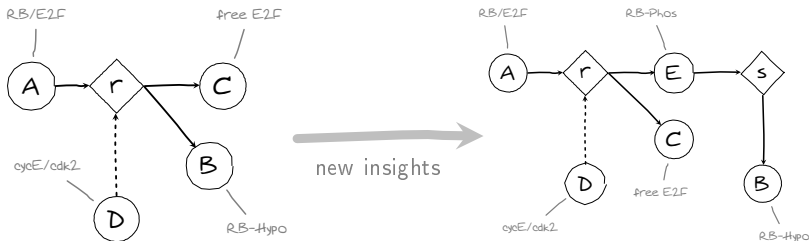


- many models
- multiple versions of each model
- several repositories

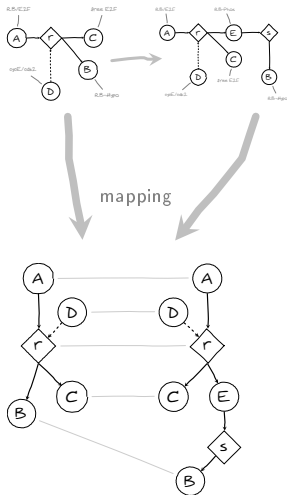


- many models
- multiple versions of each model
- several repositories







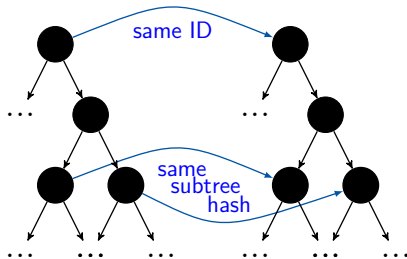
Waltemath *et al.*: Improving the reuse of computational models through version control. *Bioinformatics* (2013) 29(6): 742-728;



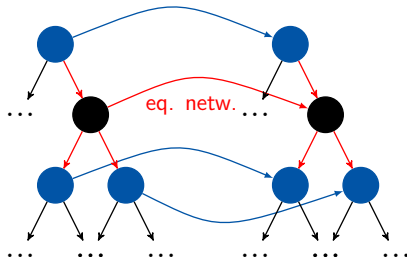
Biochemical Model Version Control System

- compares models encoded in standardized formats (currently:  and )
- maps hierarchically structured content

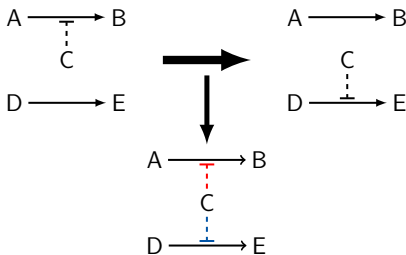
- input: 2 XML documents
- map unambiguous nodes/subtrees
- propagate mapping up/down
- exploit further knowledge of biological systems

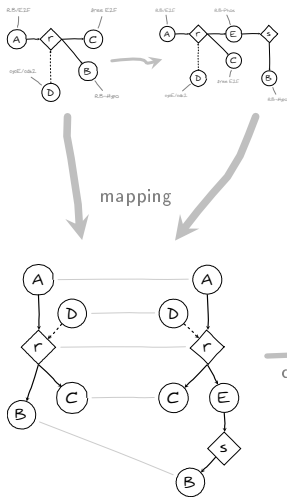


- input: 2 XML documents
- map unambiguous nodes/subtrees
- propagate mapping up/down
- exploit further knowledge of biological systems





- input: 2 XML documents
- map unambiguous nodes/subtrees
- propagate mapping up/down
- exploit further knowledge of biological systems



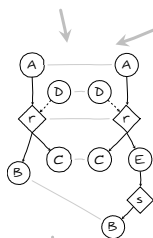


Biochemical Model Version Control System

- compares models encoded in standardized formats (currently:  and )
- maps hierarchically structured content
- constructs a diff (in XML format)
- is able to interpret this diff


```

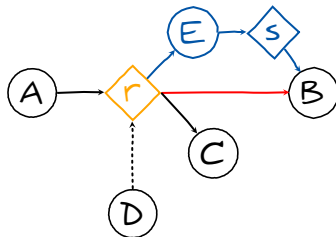
<XML>
  Diff
  |
  |--- moves
  |   |
  |   |--- product of r: C
  |
  |--- deletes
  |   |
  |   |--- product of r: B
  |
  |--- inserts
  |   |
  |   |--- species: E
  |   |--- product of r: E
  |   |--- reaction s
  |
  </XML>
  
```



```

<XML>
Diff
├── moves
│   └── product of r: C
├── deletes
│   └── product of r: B
├── inserts
│   ├── species: E
│   ├── product of r: E
│   └── reaction s
</XML>
    
```

- calls BiVeS to construct the diff
- displays the result in various formats
 - the XML diff
 - a reaction network highlighting the changes using 
 - a human readable report






The Power of BudHat!

<http://budhat.sems.uni-rostock.de>

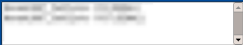
VANTED → BiVeS

Project: BudHat

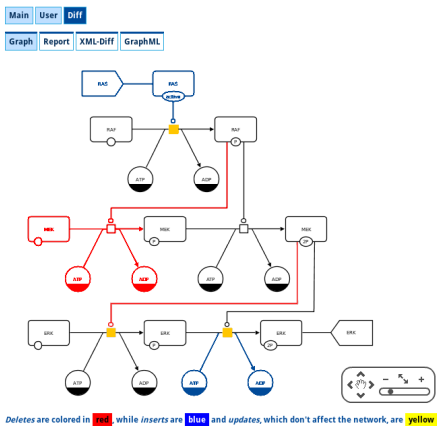
available models



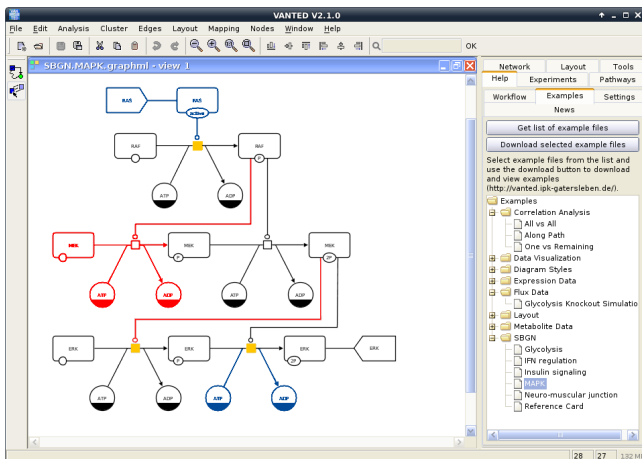
selected models



Compare



VANTED ← BiVeS





VANTED ↔ BiVeS

let's collaborate!

We VANT BiVeS!



jvm

network

cmd

```
import de.uni-rostock.sems.bives.api.SBMLDiff;

[...]
```

```
SBMLDiff differ = new SBMLDiff (sbmlFileA, sbmlFileB);
differ.mapTrees ();
String graph = differ.getGraphML ();

[...]
```



jvm

network

cmd

```
curl -d "file1=http://some.server/model/version1"
-d "file2=http://other.server/model/version2"
-d "get=graphml" bives.server/api
```

```

Transmission Control Protocol, Src Port: 42859 (42859), Dst Port: http (80), Seq: 1, Ack: 1, Len
Hypertext Transfer Protocol
  POST /api HTTP/1.1\r\n
    [Expert Info (Chat/Sequence): POST /api HTTP/1.1\r\n]
      Request Method: POST
      Request URI: /api
      Request Version: HTTP/1.1
      User-Agent: curl/7.30.0\r\n
      Host: bives.server\r\n
      Accept: */*\r\n
    Content-Length: 92\r\n
    Content-Type: application/x-www-form-urlencoded\r\n
      \r\n
      [Full request URI: http://bives.server/api]
Line-based text data: application/x-www-form-urlencoded
  file1=http://some.server/model/version1&file2=http://other.server/model/version2&get=graphml
    
```



jvm

network

cmd

```
java -jar BiVeS.jar path/to/version1 path/to/version2
```



```
git diff 88fealcddf b64477d742 model.file
```



- BiVeS = Difference detection for hierarchically structured content
- BudHat = Prototype to demonstrate the capabilities
- Both tools are open source
- Our goal is to extend existing models repositories with a valuable version control mechanism

That's it! Stay tuned ;-)



@SemsProject

<http://sems.uni-rostock.de>

<http://budhat.sems.uni-rostock.de>

Questions? Suggestions? Recommendations? Drop me an email:

[<martin.scharm@uni-rostock.de>](mailto:martin.scharm@uni-rostock.de)