Verifying Recursive Active Documents with Rewriting Rules

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DataBase World Shift

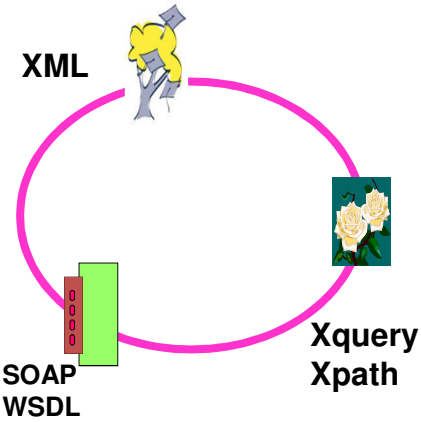
Usual Closed Data Base

Query data
Add data
Delete data

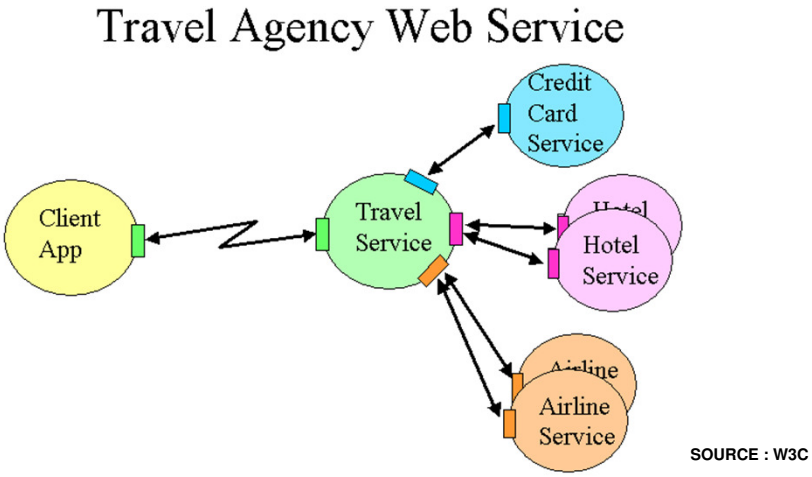
No question on evolution of data

Shift to

The open world, wwweb.

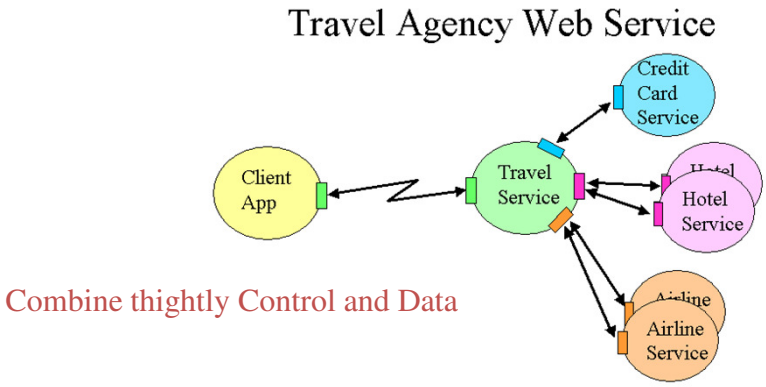


Open World: Web Services



Composite (web) services, sharing parts of the same data document.
How these services combine? Unexpected behaviors?

Model and Algorithm for documents



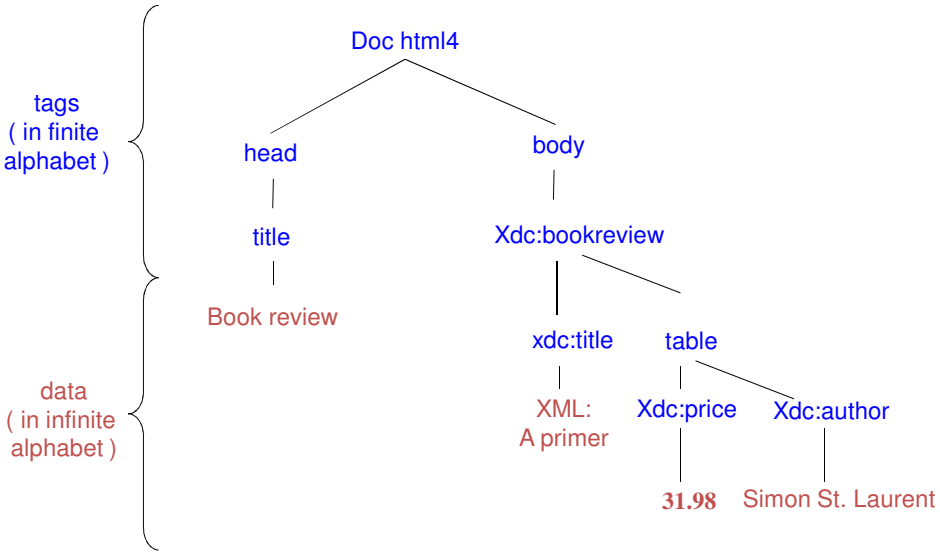
Combine thightly Control and Data

I We need models to describe evolution of documents
II We need algorithms on these models (decidability issue)
(to be used by designers of services)

Rich SemiStructured Data = XML

```
<html xmlns="http://www.w3.org/HTML/1998/html4"
      xmlns:xdc="http://www.xml.com/books">
 <head><title>Book Review</title></head>
 <body>
  <xdc:bookreview>
   <xdc:title>XML: A Primer</xdc:title>
   <table>
    <tr align="left">
     <td><xdc:author>Simon St. Laurent</xdc:author></td>
     <td><xdc:price>31.98</xdc:price></td>
</tr>
   </table>
  </xdc:bookreview>
 </body>
</html>
```

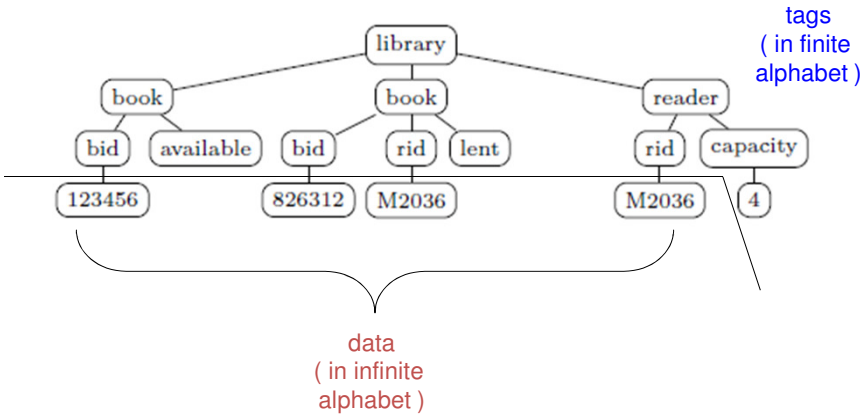
XML Documents modeled as Trees



DTPRS:
Data Tree Pattern Rewrite System

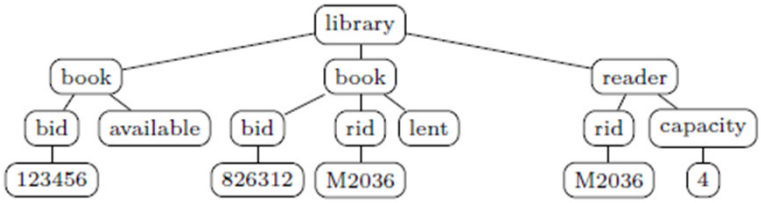
close in spirit to Guarded AXML
Abiteboul et al.
ANR MDCA « Docflow »

Example: Library



Here: 2 books (123456 and 826312), 1 reader (M2036).
One book available (123456) and one book is lent to reader M2036.
Reader M2036 can still borrow 4 other books (capacity).

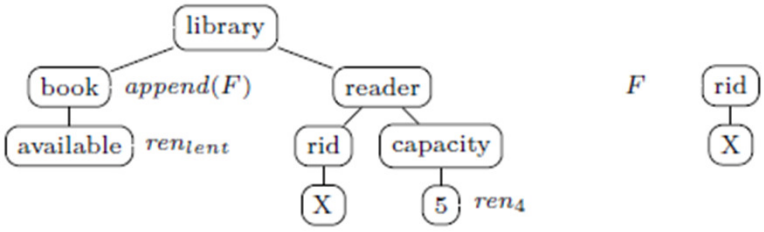
Modeling evolution of document?



Evolution:
For tags:
- *add* (new book, new reader)
- *delete* (reader unsubscribe)
- *change* (available -> lent -> available)

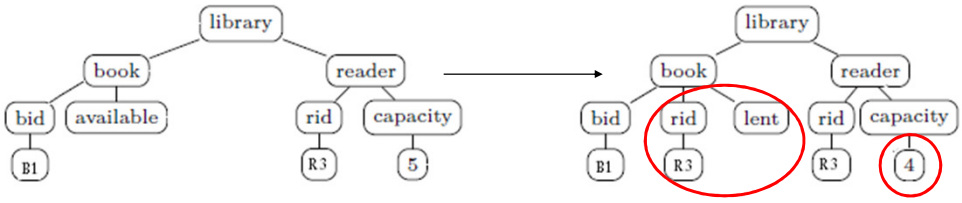
For data:
- *copy* (when reader borrows a book, its rid is copied)
- *produce fresh* data (bid/rid when new book arrives or new reader subscribes)

Example of DTPRS transition rules



Locator of transition-rule « reader-borrow-book »

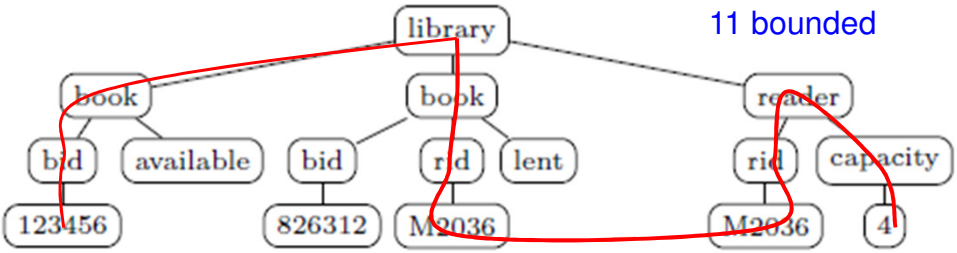
Evolution of the document when rule reader-borrow-book used.



Positive-Bounded DTPRS

Positive-bounded DTPRS if following restrictions :

- positive (no negation: cannot say something is not here)
- there is a bound B on the size of the simple paths on every reachable document, using parent/child relations and same data relation (implies depth B bounded).



11 bounded

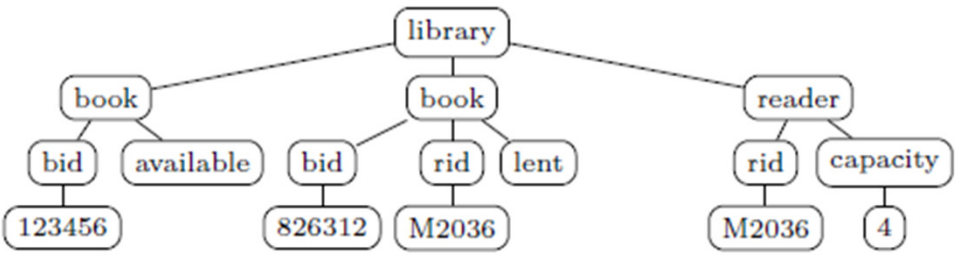
Results for Positive-Bounded DTPRS

Decidability: Termination, Reachability of a state/Tree Pattern

Undecidability : Confluence, Boundedness

Resort to theorem proving, Sat solving modulo theory

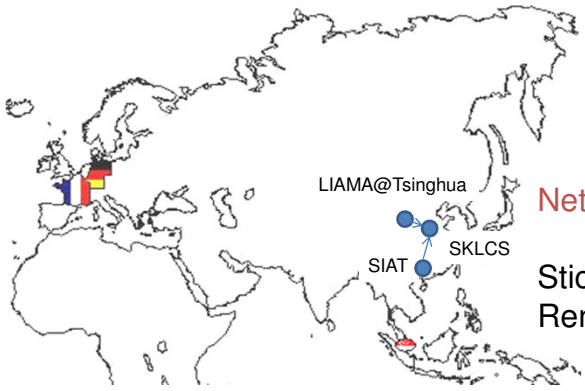
=> Frederic Blanqui



Conclusion

Future: Make it applicable!

1) Symbolic computation, way of representing infinitely many config
2) need good abstraction, refinement only when needed etc…
3) Use complementary techniques from other communities (AUR@)



Networking around Aur@

Stic Asia:
Rennes-Vietnam-C.A.S.-NUS