

Enabling Semantic Web Programming by Integrating RDF and Common Lisp

An Introduction to NRC's "Wilbur" RDF & DAML Toolkit

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Common Lisp & Frame Systems

- **Traditional approaches to “procedural attachment”**
 - object-oriented approach
 - access-oriented approach, slot dæmons
- **Our previous approaches**
 - BEEF: frame system with added OOP features
 - PORK: OOP language with added frame system features
 - using CLOS metaobject protocol
- **Wilbur approach: low-level**
 - input/output
 - easy translation of RDF data structures to CL data structures
 - exception handling
- **Wilbur exposes a “frame API” where RDF graphs look like frames, slots, and values**

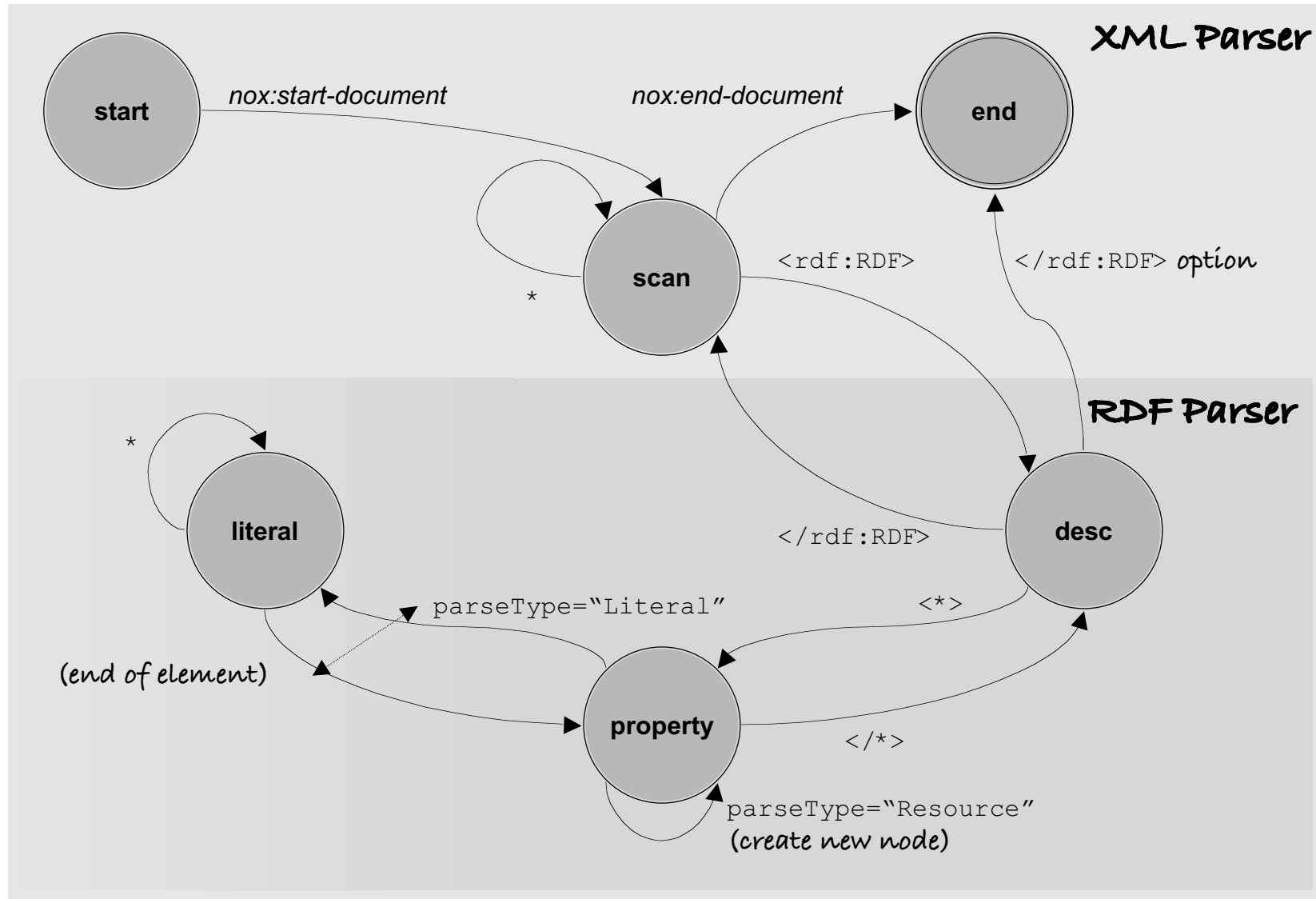
Input & Output

- **Printed representation ↔ input of “parsed” data**
 - CL “read/print equivalence”
 - strict: same object identity
 - non-strict: “similar” objects
 - **Node (URI) literals, embedding in source files**
 - XML NS -style qualified names

Example: `!rdf:type` → node instance with URI
`"http://www.w3.org/1999/02/22-rdf-syntax-ns#type"`

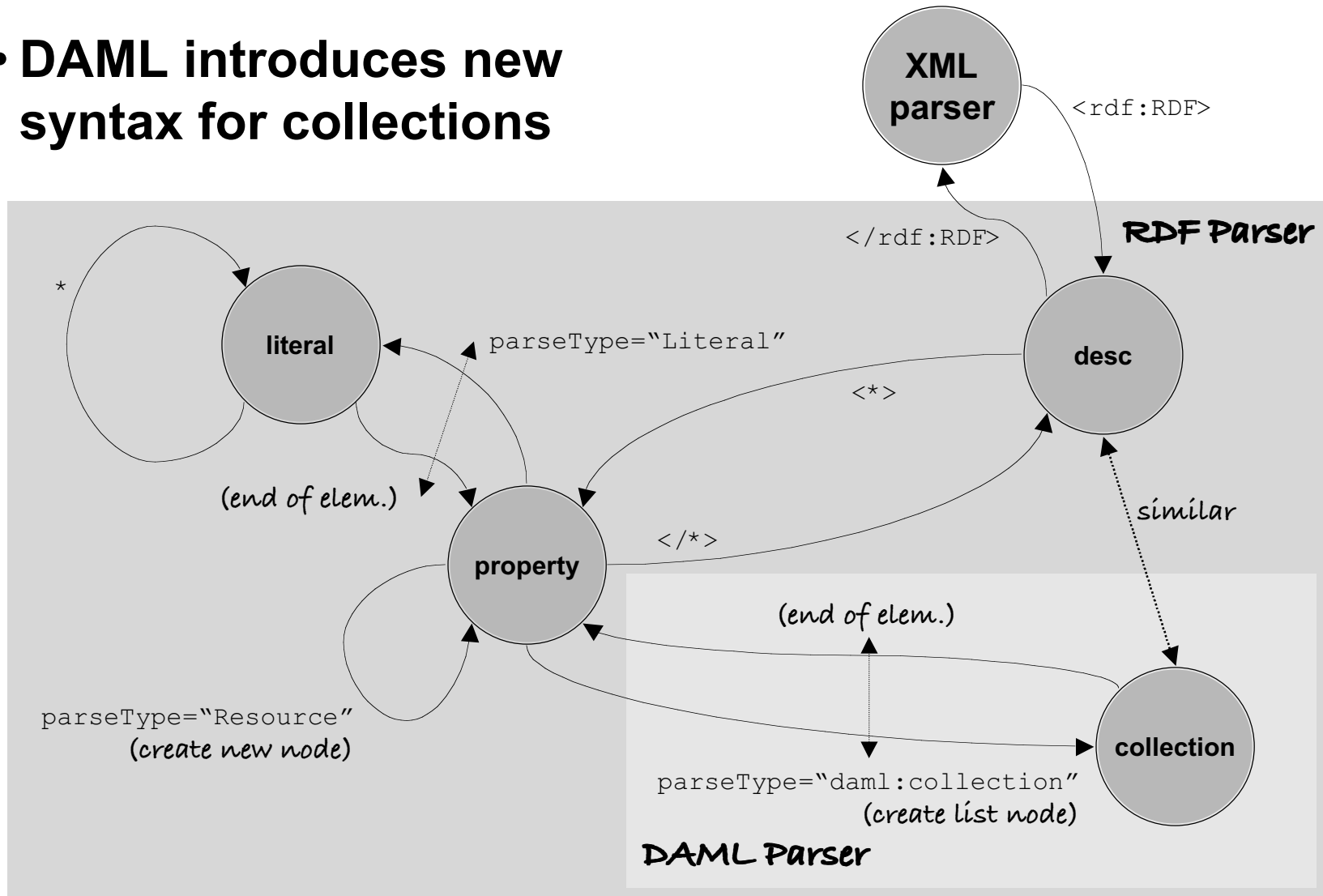
- **Parsers**
 - RDF/XML (w/ DAML extensions)
 - N-Triples
 - “dialects” (e.g., DMoz)
- **HTTP Client**

Wilbur RDF Parsing Algorithm



Wilbur DAML Parsing Algorithm

- DAML introduces new syntax for collections



Data Structure Conversions

- **Collections**

- RDF collection model is “awkward”...
- Common Lisp collection model is natural and well integrated into the language

- **Query language**

- Easy selection of nodes from an RDF graph
- Pattern matching of subgraphs
 - query patterns are regular expressions
 - queries define traversal through a graph
- Easy conversion of collections to CL lists

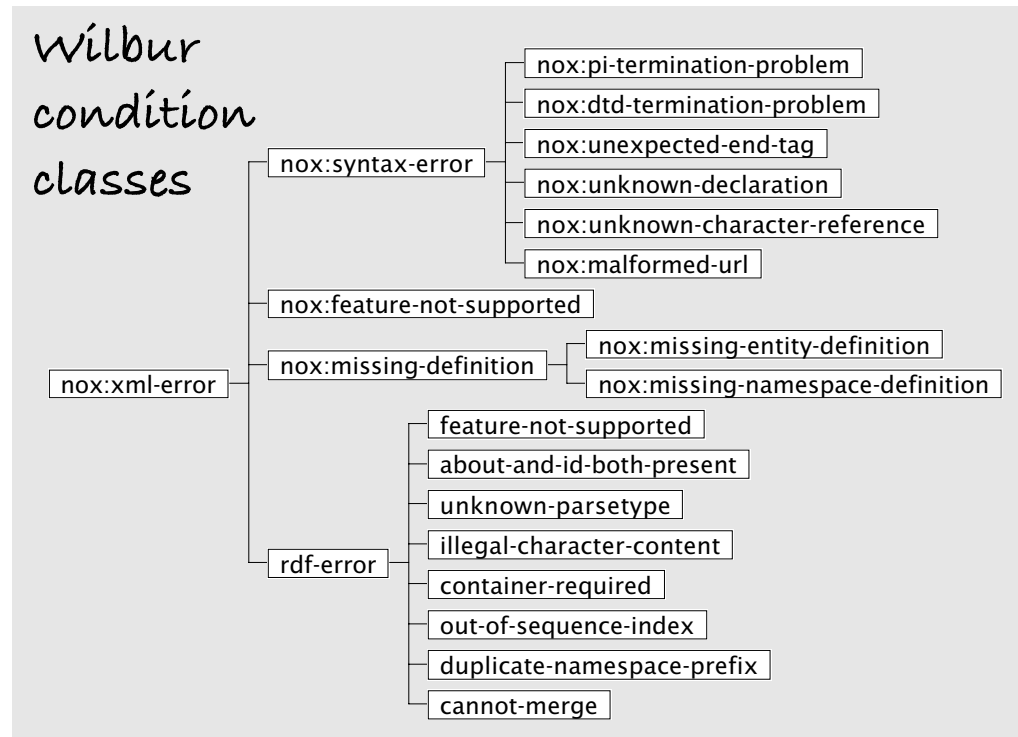
Example: query pattern

```
(:seq (:rep* !daml:rest) !daml:first)
```

converts a DAML list into a CL list

Exception Handling

- **CLOS has a very powerful exception signaling mechanism**



- **Wilbur signals all errors and anomalies**
 - RDF conditions are always signaled as “continuable”
- **Fine-grained condition hierarchy allows selective response by calling program**

Future Development

- **Tools**

- **RDF Serializer**
- **RDF(S) Validator**
- **editor**
- ...

- **OKBC interface**

- **More support for DAML (e.g., reasoning)**

- **Closer integration of CLOS programming model**

Conclusions

- **An attempt to create a programming environment for RDF and DAML**
 - Did we succeed? Too early to tell...
 - (we are looking for a few good users)
- **Input and output integration makes it easy to interface with RDF data**
- **Frame-based view makes it easy to understand RDF**
- **Query language makes it easy to “convert” RDF data structures to Common Lisp**

Questions?

- <mailto:ora.lassila@nokia.com>
- <http://purl.org/net/wilbur/>

"I called this meeting in order to get suggestions. I need new ideas for the web. People are already getting sick of reading the word 'SOME PIG!' If anybody can think of another message, or remark, I'll be glad to weave it into the web. Any suggestions for a new slogan?"

- Charlotte (in "Charlotte's Web" by E.B. White)