The Rule Interchange Format and Its Dialects

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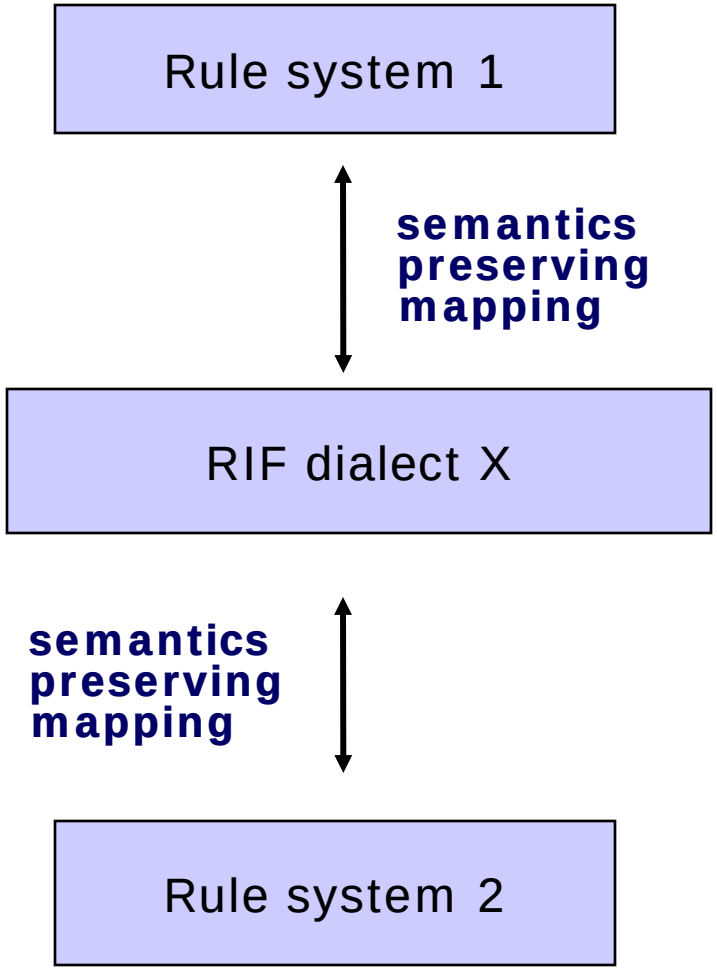
Outline

- What is Rule Interchange Format (RIF)?
- RIF Framework
- Current Logic Dialects
- Status/Conclusion

What is RIF?

- A collection of *dialects* (rigorously defined rule languages)
- Intended to facilitate rule sharing and exchange
- Dialect consistency

  Sharing of RIF machinery:
  - XML syntax
  - Presentation syntax
  - Semantics



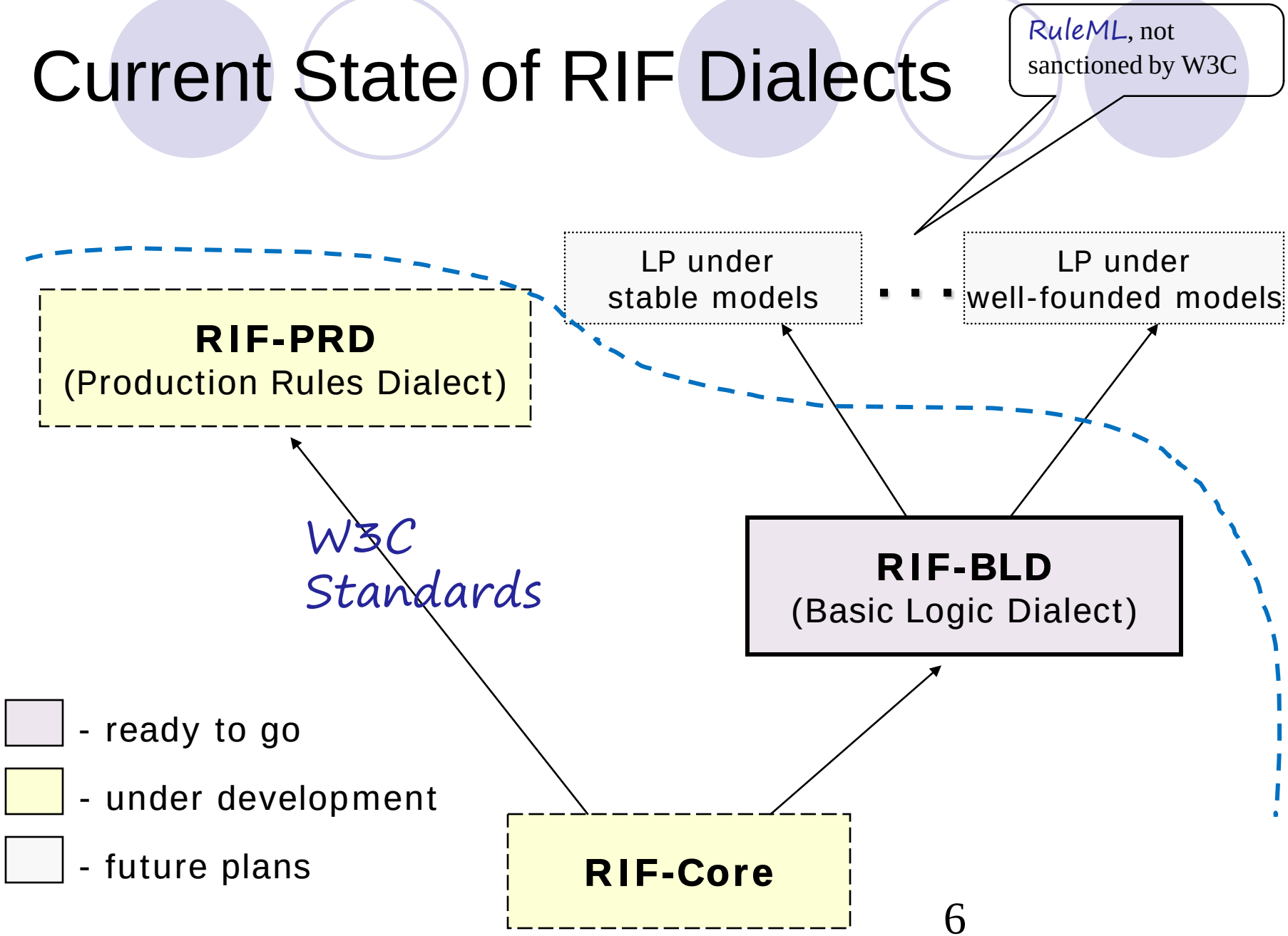
Why Rule *Exchange*? (and not The One True Rule Language)

- Many different paradigms for rule languages
  - Pure first-order
  - Logic programming/deductive databases
  - Production rules
  - Reactive rules
- Many different features and syntaxes
- Different commercial interests
- Different preferences, aesthetics

Why RIF *Dialects*? (and not just *one* dialect)

- Again: many paradigms for rule languages
  - First-order rules
  - Logic programming/deductive databases
  - Reactive rules
  - Production rules
- Many different semantics
  - Classical first-order
  - Stable-model semantics for negation
  - Well-founded semantics for negation
  - ... ...
- A carefully chosen set of interrelated dialects can serve the purpose of sharing and exchanging rules over the Web

Current State of RIF Dialects



Technical Part

- W3C didn’t allow the development of useful logic dialects beyond the basics
- But it did allow to develop RIF-FLD, a framework for future such dialects
- RIF-FLD: The RIF Framework
  - What?
  - Why?
  - How?

What Is The RIF Framework?

- Formal guidelines for constructing RIF dialects in a consistent manner
- Includes:
  - Syntactic framework
  - Semantic framework
  - XML framework

Why Create a RIF Framework?

- Too hard to define a dialect from scratch
  - RIF-BLD is just a tad more complex than Horn rules, but requires more than 30 pages of dense text
- Instead: define dialects by *specializing* from RIF-FLD
  - RIF-BLD can be specified in < 3 pages in this way
- RIF-FLD is a "*super-dialect*" that ensures that all dialects use the same set of concepts and constructs

RIF-FLD (cont'd)

- RIF-FLD is not a fully specified dialect ...
  ... but a *framework* for dialects
- Very general syntax, but several parameters are not specified – left to the actual dialects
- Very general semantics, but several aspects are under-specified – left to the actual dialects
- General XML syntax – the actual dialects can specialize

RIF-FLD's Syntactic Framework

- Presentation syntax
  - Human-oriented
  - Designed for
    - Precise specification of syntax and semantics
    - Examples
    - Perhaps even for rule authoring
  - Maps to XML syntax
- XML syntax
  - For exchange through the wire
  - Machine consumption

RIF-FLD Syntactic Framework (cont'd)

- General (and extensible) so other dialects' syntaxes can be expressed by *specializing* the syntax of FLD
- Interpretable in model-theoretic terms
  - because FLD is intended as a framework for *logic-based* dialects with model-theoretic semantics

RIF-FLD Semantic Framework

- Defines *semantic structures* (a.k.a. *interpretations*)
  - Structures that determine if a formula is true
  - Very general. Gives semantics to:
    - Frame syntax, predicate syntax, predicates with named arguments
    - Higher-order features
    - Reification
  - Supports multivalued logics
    - For uncertainty, inconsistency

Semantic Framework (cont'd)

- Logical entailment
  - Central to any logic
  - Determines which formulas entail which other formulas
- Unlikely to find one notion of entailment for all logic dialects because

Semantic Framework (cont'd)

- Thus, RIF-FLD under-specifies the semantics
  - Defines entailment parametrically, leaves parameters to the actual dialects
  - Parameters: *intended models*, sets of truth values, etc.
  - Entailment between sets of formulas:
    - *P* |= *Q* iff

      every ***intended*** model ***I*** of *P* is also a model of *Q*

Other Issues: Link to the Web World

- Symbol spaces
  - Partitions all constants into subsets; each subset have different semantics
    - rif:iri – these constants denote objects that are universally known on the Web (as in RDF)
    - rif:local – constants that denote objects local to specific documents
    - Data types: symbol spaces with fixed interpretation (includes most of the XML data types + more)
- Document formulas, meta-annotations, ...

Logic Dialects

- RIF-BLD, the basic logic dialect (a W3C recommendation)
  - Horn rules, no negation
  - Frames, predicates/functions with named arguments
  - Equality both in rule premises and conclusions
- Also a subset called RIF-CORE
- RIF dialects defined under the RuleML umbrella
  - RIF-CASPD, the core answer set programming dialect
    - Extends BLD with negation based on stable models
  - RIF-CLPWD, the core logic programming dialect based on the well-founded semantics
    - Extends BLD with negation based on the well-founded models
  - RIF-URD, the uncertainty rules dialect
    - Extends BLD with uncertain rules

Current Status

- RIF is good for academia and industry, but
  - Few tools
  - Slow uptake
  - Partly because W3C made it hard to develop something useful for rule systems other than production rules
  - The only thing we could push through was the RIF-FLD framework for defining future RIF dialects.
    - Some useful RIF dialects were defined under RuleML

Implementations

- http://www.w3.org/2005/rules/wiki/Implementations
- Ontobroker
- SILK
- RIF4J
- RIFTR
- … … …

RIF Links

- FLD: http://www.w3.org/TR/rif-bld/
- BLD: http://www.w3.org/TR/rif-bld/

- CASPD: http://ruleml.org/rif/RIF-CASPD.html
- CLPWD: http://ruleml.org/rif/RIF-CLPWD.html
- URD: http://ruleml.org/rif/URSW2008_F9_ZhaoBoley.pdf

Thank You!

Questions?