

RuleML Overview and Position Statement

The RuleML Initiative

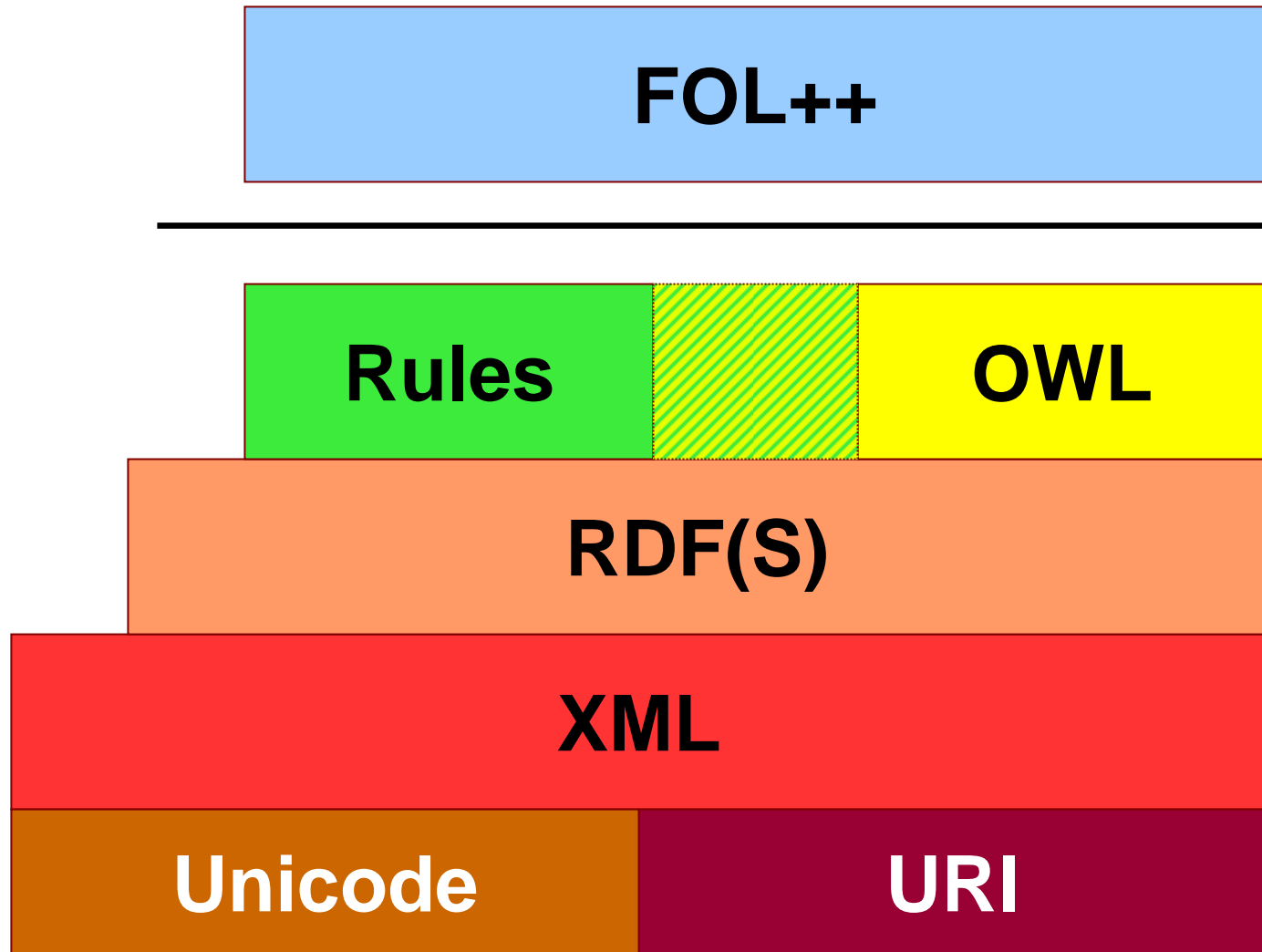
Prepared by (in alphabetical order):
Harold Boley, Mike Dean, Benjamin Grosf,
Michael Kifer, Said Tabet, Gerd Wagner

W3C Workshop on Rule Languages for Interoperability
Position Paper [[96](#)]: 27-28 April 2005

<http://www.ruleml.org>

The Web Rule Language in its Context

RuleML, WSML, SWSL View



Introduction

- The RuleML Initiative was formed in 2000 to provide a neutral platform for semantic **interoperation** of rules, across the Web, between commercially important rule systems:
 - Production rules
 - Relational databases
 - Prolog
 - Event-Condition-Action rules
- ... → Enable rule-based Semantic Web Services
- Pioneered webized representation of a modular family of rule sublanguages, catering to a variety of needs on the Web

RuleML is ...

An open *semantic* standard for

- *Semantics* founded on logical knowledge representation

1. Rule Modeling:

- Data model integrates
 - Ordered XML trees
 - Labeled RDF graphs
- Abstract syntax uses MOF
 - Mappings for OMG PRR [[53](#)] and SBVR [[85](#)]

2. Rule Classification: Modular Family of

- XML Schemas and associated
- (Model-Theoretic, Well-Founded) Semantics

RuleML is ...

An open semantic standard for **Rule**

3. **Serialization:** XML, RDF, Presentation

4. **Distributedness:** Fully webized, cf. N3 [[94](#)]

5. **Interoperation:**

- Mature experience with RDF/RuleML [[93](#)] and OWL: [SWRL](#) [[81](#)]; also with F-logic: [SWSL](#) [[124](#)]
- Adapt Sublanguages, write XSLT, ... Translators, or establish APIs such as JSR94 [[107](#)]

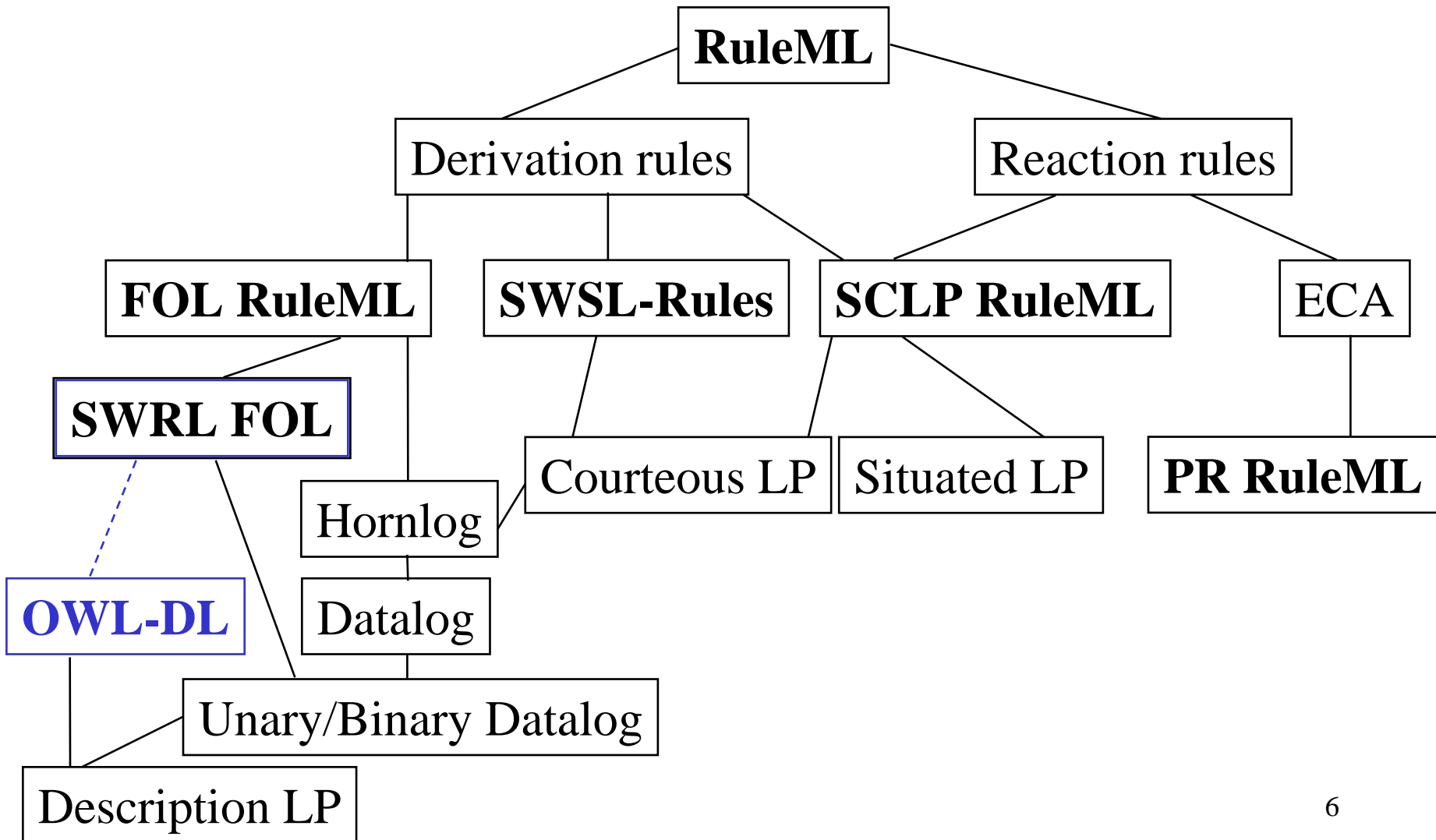
6. **Execution:** Mandarax, jDREW [[49](#)], Jess, XSB ...

7. **Tools:** SweetRules V2.1, IW Editor, ...

RuleML Identifies ...

- Expressive **sublanguages**
 - for Web rules
 - explored mostly with
 - *Derivation* rules: to derive beliefs
 - *Reaction* rules: to perform actions
 - empowering their **subcommunities**

SWRL FOL, SWSL-Rules in RuleML Family



RuleML Specification & Interoperation

- Rule Family specified via XML Schemas
 - All sublanguages, pre-release: [RuleML 0.89](#)
 - First Order Logic, cf. SCL [103]: [FOL RuleML](#) 0.9
 - With Ontology language, cf. [81]: [SWRL](#) 0.7
 - A Semantic Web Rule Language combining OWL and RuleML
 - With Services language, cf. [124]: [SWSL](#) 0.91
- Rule Translators in & out (e.g. Jess, XSB)
 - Interoperation between many commercially important rule systems

FOL RuleML: Syntax and Semantics

- **Spec:** <http://www.w3.org/Submission/2005/SUBM-FOL-RuleML-20050411>
- **Modular** combination of syntactically characterized new sublanguages with:
 - Explicit quantifiers
 - Head disjunctions
 - Equivalence and Negation
- Semantics is FOL model theory
- (Pragmatics via performatives)

Slotted (FOL) RuleML Extension

- N-ary relations and constructors can contain set of slots ('user-labeled arcs')
 - Enables Object Oriented modeling:
 - **rdf:Descriptions** (rather than triples)
 - RDFS and OWL class descriptions
 - Positional logic ☠ Frame logic (F-logic)
- Serialization of SWSL-Rules

Some RuleML Use Cases

- RACSA, RALOCA, RACOFI: Rule Applying Agents for Comparison Shopping, Learning Object Comparison, and COllaborative FIltering (led to inDiscover.net)
- [NBBizKB](#): New Brunswick Business Knowledge Base uses OO RuleML for data validation and [integration](#)
- [AgentMatcher](#): e-Learning metadata interchanged in Weighted OO RuleML
- [Teclantic](#): Startup project descriptions for Atlantic technology transfer in Weighted OO RuleML
- Regulatory guidelines for financial services in the US, Can, and UK by Inference Web Inc.
- MITRE Convoy Mission [[28](#)]

SweetRules & MIT RuleML Use Cases

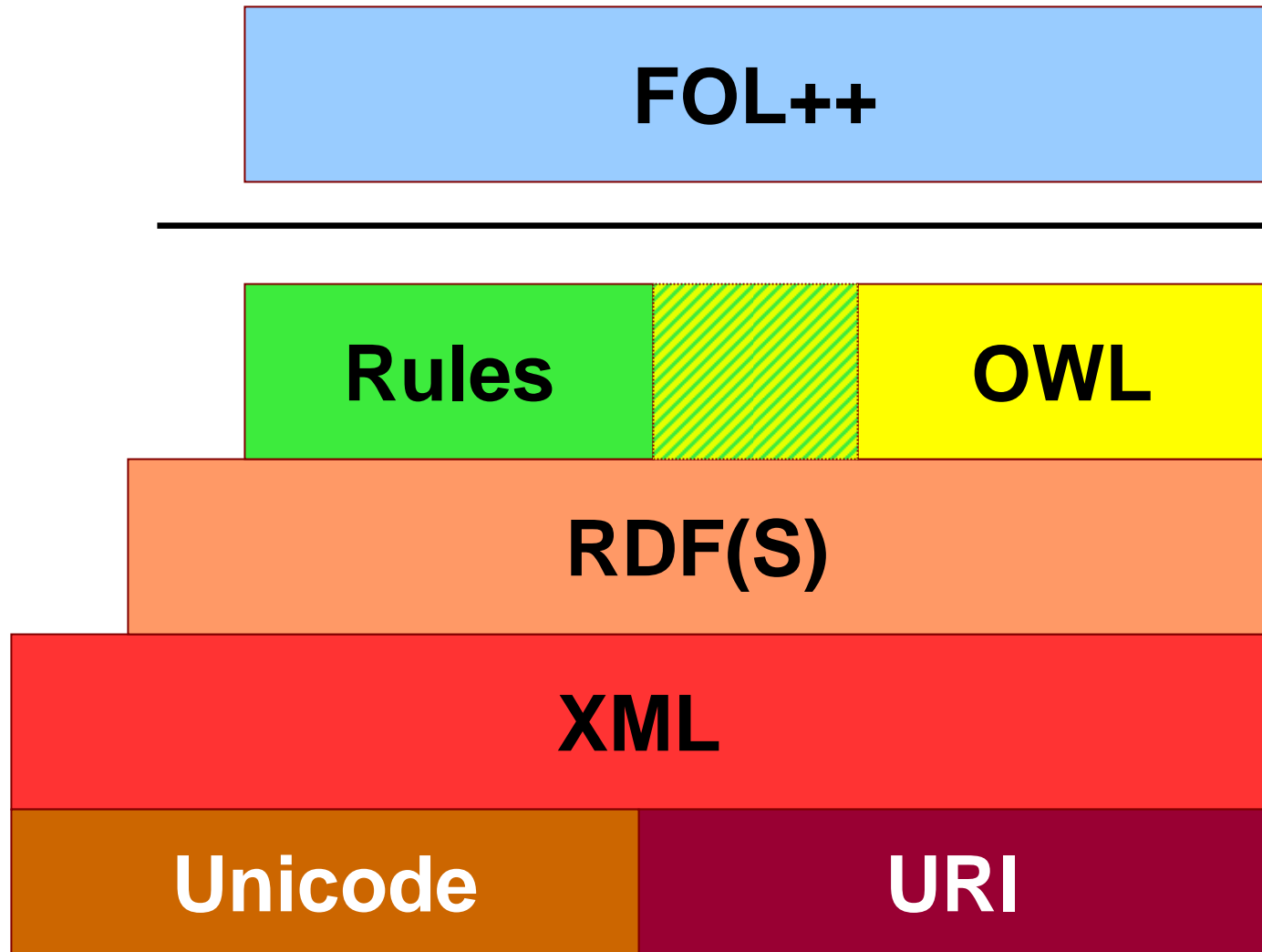
- Contracts/negotiation, advertising/discovery
 - E-procurement, E-selling
 - Pricing, terms & conditions, supplier qualification, ...
- Monitoring:
 - Exception handling, e.g., of contract violations
 - Late delivery, refunds, cancellation, notifications
 - Notifications, personal messaging, and other workflow
- Trust Policies: authorization, confidentiality & privacy, security, access control
 - E.g., financial services, health care
 - *Extensive analysis of business case/value*
- Semantic mediation: rule-based ontology translation, context-based information integration
- Object-oriented process ontologies: MIT Process Handbook
 - With default inheritance

Lessons from RuleML Experience

- Rule standardization process requires
 - Long-term vision
 - Engaging with all stake-holders
 - Full understanding of needs of various communities
- Each sublanguage also requires very strict and explicit scope to guarantee delivery of mature results in a phased fashion
- Focussing on certain sublanguages will be necessary for planned W3C Working Group

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Position Based on Experience

- Since 2000 the RuleML Initiative has engaged/collaborated with:
 - Large variety of use cases: finance, insurance, e-commerce, supply-chain, security & trust, biomed, ...
 - RDF, N3, TRIPLE
 - OWL, DL, Joint Committee
 - Semantic Web Services, SWSI, WSMO
 - Development of dozens of tools
- Pioneered webized representation of modular family of rule sublanguages, catering to a variety of needs on the Web

Position: Proposed Scope of WG (1)

First Phase (ca. 9 months):

- Start with LP expressiveness including Datalog Horn + NAF + logical functions
- Enable use of RDF and of OWL-DL [[81](#)]
- Draw especially on:
 - Use cases
 - RuleML, SWSL [[124](#)], WSML [[44](#), [128](#)], N3 [[94](#)], TRIPLE [[98](#)], SCL/KIF [[103](#)]

Position: Proposed Scope of WG (2)

First Phase (cont'd):

- Add some subset of following ten features:
 - Slotted/Frame syntax; webized OIDs/labels
 - Datatyping; lists
 - Signature declarations
 - Lloyd-Topor: syntactic sugar for enriched connectives
 - Integrity constraints, mutual exclusions, functional dependency
 - Prioritized conflict handling, cf. Courteous
 - Procedural attachments, cf. Situated:
 - built-ins/tests/sensors
 - actions/effectors
 - events/time
 - Hilog: syntactic sugar for restricted higher-order
 - User-defined head equality and functions
 - Reification

Position: Proposed Scope of WG (3)

Second Phase (additional ca. 6-9 months):

- Extend for more expressiveness as required by more use cases and doable in that period
 - Vote now for your top k out of 10 😊

Upcoming Events

- **Workshop on Protégé with Rules**
- Will be held in conjunction with [8th Intl. Protégé Conference](#), on 8 July 2005
- Deadline for paper or abstract submissions: 1 June 2005
- <http://www.med.univ-rennes1.fr/~cgolb/Protege2005/ProtegeWithRulesCFP.htm>

- **RuleML-2005: International Conference on Rules and Rule Markup Languages for the Semantic Web**
- Will be held in conjunction with [ISWC-2005](#), on 10-11 November 2005
- Deadline for paper submissions: 1 July 2005
- <http://2005.ruleml.org>