

# ECA-LP / ECA-RuleML

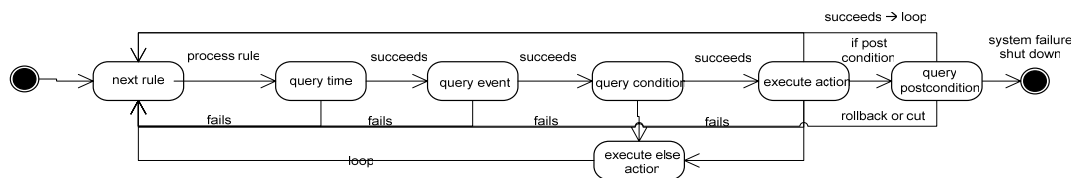
## ECA-LP Syntax – Homogeneous **Event-Condition-Action Logic Programming Language**

**ECA rule:**  $eca (<Time>, <Event>, <Condition>, <Action>, <Post-Cond.>, <Else Action>)^*$

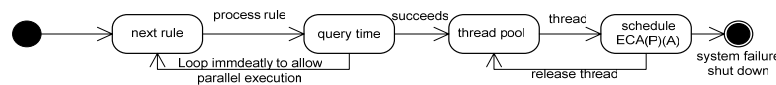
\* All ECA rule parts are optional, except of action; An ECA rule is interpreted as top query

- (Time): Pre-conditional time function used as validity clock / timer
- (Event): Actively detect/listen to internal and external (complex) events (clocked by time function)
- (Condition): Conditional test
- (Action): Internal self-update action or external action with side effects; might be complex and transactional
- (Post-Condition): Post-conditional test; might commit or rollback action; supports cuts and variable quantifications
- (Else Action) Executes alternative action if condition or action fails (akin to "if then else" logic)

## Operational Semantics – ECA Interpreter with Active Query Daemon for arbitrary Rule Engines



### Multi-Threading Parallel Scheduling of Reaction Rules



## Declarative Semantics: Logic Programming

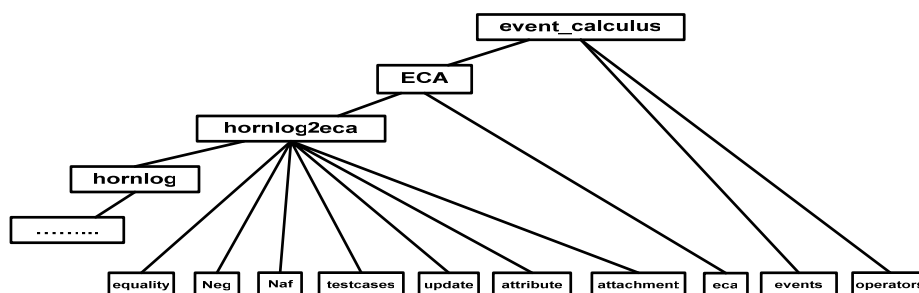
- ECA rule is top query:  $T \wedge E \wedge ((C \wedge A \wedge P) \vee EL) ?$ .
- Declarative Logic Programming semantics for **PROGRAMMING** of ECA functionalities in terms of derivation rules or Boolean-valued procedural attachments (assigning truth values)
- Interval Based Event Calculus
  - Transient and non-transient events/actions
  - State/fluent processing / KR reasoning
  - complex interval-based event / action algebra
- 3-Phases for event
  - (1) definition (2) selection (3) consumption
  - Configurable selection and consumption policies
- Transactional complex updates or external actions
  - Dynamic OID-based transactional LP updates
  - Sequence of transitions with integrity tests and possible rollbacks
  - External actions with side effects via attachments

- ⇒ Homogenous representation with other rule types, e.g. derivation rules, integrity constraints
- ⇒ ECA Interpreter for arbitrary rule engines
  - ◆ Active Reaction Rule Processing
  - ◆ Variables + quantifications, negation, connectives, attachments, preferences
- ⇒ Complex interval-based event / action algebra
  - ◆ Algebra operators, e.g. sequence, xor
  - ◆ Event selection / consumption
  - ◆ Complex actions and active rules
- ⇒ Temporal KR event / action logics
  - ◆ state processing / state transitions
  - ◆ KR reasoning (retrospective / planning)
- ⇒ Transactional OID-based Update Actions
  - ◆ Intensional and extensional updates
  - ◆ Transactional knowledge state transitions with rollbacks/commits
  - ◆ Post-conditional integrity tests

Within the scope of:



## ECA-RuleML: Layered Serialization Syntax for Reaction Rules based on RuleML



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