



*The Irish Software Engineering
Research Center*

KnowLang Grammar in BNF

Technical Report: LERO-TR2012.xx

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Ver. 1.02

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//*****
//****
//**** KnowLang BNF Grammar
//****
//**** Emil Vassev © 2012
//****
//**** Last modification date: September 12, 2012
//****
//*****

//*****
//**** Predefined Symbols
//****
//**** bof, eof,
//**** corpusIdentifier, ontologyIdentifier, mconceptIdentifier, conceptIdentifier
//**** conceptIdentifier, functionalityIdentifier, stateIdentifier, fileIdentifier
//**** objectArrIdentifier, objectIdentifier, contextIdentifier, relationIdentifier
//**** predicateIdentifier, goalIdentifier, policyIdentifier, metricIdentifier
//**** eventIdentifier, actionIdentifier, errorIdentifier, situationIdentifier
//**** groupIdentifier
//**** vString, vNatural, vDecimal, vNumber, vTime, vDateTime, vBoolean
//****
//*****

```

KL-Spec | bof Knowledge-Spec eof

Knowledge-Spec | Spec-References KL-Spec-Units

Knowledge-Spec | KL-Spec-Units

Spec-References | REFERENCES File-Names ;

File-Names | File-Name

File-Names | File-Name , File-Names

File-Name | fileIdentifier

KL-Spec-Units | KL-Corpuses KL-Operators Inference-Primitives

KL-Spec-Units | KL-Corpuses KL-Operators

KL-Spec-Units | KL-Corpuses Inference-Primitives

KL-Spec-Units | KL-Operators Inference-Primitives

KL-Spec-Units | KL-Corpuses

KL-Spec-Units | KL-Operators

KL-Spec-Units | Inference-Primitives

```

//*****
//*** KL-Corpuses specification *****
//*****

```

KL-Corpuses | KL-Corpus

KL-Corpuses | KL-Corpus KL-Corpuses

KL-Corpus | CORPUS Corpus-Name { KL-Ontology KL-Contexts KL-Logic-Framework }

Corpus-Name | corpusIdentifier

```
//*****  
//**** ontology *****  
//*****
```

KL-Ontology | ONTOLOGY Ontology-Name { KL-Ontology-Seqnce }

KL-Ontology-Seqnce | KL-Ontology-Part

KL-Ontology-Seqnce | KL-Ontology-Part KL-Ontology-Seqnce

KL-Ontology-Part | Metaconcepts-Spec

KL-Ontology-Part | Concept-Trees-Spec

KL-Ontology-Part | Object-Trees-Spec

KL-Ontology-Part | Relations-Spec

KL-Ontology-Part | Predicates-Spec

Ontology-Name | ontologyIdentifier

```
//*****  
//**** metaconcepts *****
```

Metaconcepts-Spec | METACONCEPTS { Metaconcepts-Seqnce }

Metaconcepts-Spec | FINAL METACONCEPTS { Metaconcepts-Seqnce }

Metaconcepts-Seqnce | Metaconcept-Decl

Metaconcepts-Seqnce | Metaconcept-Decl Metaconcepts-Seqnce

Metaconcept-Decl | METACONCEPT Metaconcept-Name { Metaconcept-Decl-Seqnce }

Metaconcept-Decl | FINAL METACONCEPT Metaconcept-Name { Metaconcept-Decl-Seqnce }

Metaconcept-Decl-Seqnce | Context-Name Interpretation

Metaconcept-Decl-Seqnce | Interpretation

Interpretation | vString

Metaconcept-Name | mconceptIdentifier

Context-Name | contextIdentifier

//*****

//*** concept trees *****

Concept-Trees-Spec | CONCEPT_TREES { Concept-Trees-Seqnce }

Concept-Trees-Spec | FINAL CONCEPT_TREES { Concept-Trees-Seqnce }

Concept-Trees-Seqnce | Concept-Decl

Concept-Trees-Seqnce | Concept-Decl Concept-Trees-Seqnce

Concept-Decl | CONCEPT Concept-Name { Concept-Decl-Seqnce }

Concept-Decl | FINAL CONCEPT Concept-Name { Concept-Decl-Seqnce }

Concept-Decl | Explicit-Concept-Decl

Concept-Name | conceptIdentifier

Concept-Names | Concept-Name

Concept-Names | Concept-Name , Concept-Names

Concept-Decl-Seqnce | Concept-Decl-Part

Concept-Decl-Seqnce | Concept-Decl-Part Concept-Decl-Seqnce

Concept-Decl-Part | Concept-Meta

Concept-Decl-Part | Concept-Children

Concept-Decl-Part | Concept-Parents

Concept-Decl-Part | Concept-Properties

Concept-Decl-Part | Concept-Functionalities

Concept-Decl-Part | Concept-States

Concept-Decl-Part | Concept-Impl

Concept-Meta | META { Metaconcept-Name }

Concept-Meta | FINAL META { Metaconcept-Name }

Concept-Children | CHILDREN { Concept-Names }

Concept-Children | FINAL CHILDREN { Concept-Names }

Concept-Parents | PARENTS { Concept-Names }

Concept-Parents | FINAL PARENTS { Concept-Names }

Concept-Properties | PROPS { Concept-Properties-Decl }

Concept-Properties | FINAL PROPS { Concept-Properties-Decl }

Concept-Properties-Decl | Concept-Property

Concept-Properties-Decl | Concept-Property Concept-Properties-Decl

Concept-Property | PROP Property-Name { Concept-Property-Decl }

Concept-Property | FINAL PROP Property-Name { Concept-Property-Decl }

Property-Name | propertyIdentifier

Concept-Property-Decl | TYPE { Concept-Name }

Concept-Property-Decl | TYPE { Concept-Name } CARDINALITY { Property-Cardinality }

Property-Cardinality | vNatural

Concept-Functionalities | FUNCS { Concept-Functionalities-Decl }

Concept-Functionalities | FINAL FUNCS { Concept-Functionalities-Decl }

Concept-Functionalities-Decl | Concept-Functionality

Concept-Functionalities-Decl | Concept-Functionality Concept-Functionalities-Decl

Concept-Functionality | FUNC Functionality-Name { Concept-Functionality-Decl }

Concept-Functionality | FINAL FUNC Functionality-Name { Concept-Functionality-Decl }

Functionality-Name | functionalityIdentifier

Concept-Functionality-Decl | TYPE { Action-Name }

Concept-States | STATES { Concept-States-Seqnce }

Concept-States | FINAL STATES { Concept-States-Seqnce }

Concept-States-Seqnce | Concept-State Concept-States-Seqnce

Concept-State | STATE State-Name { State-Body }

Concept-State | FINAL STATE State-Name { State-Body }

Concept-State | STATE State-Name { }

Concept-State | FINAL STATE State-Name { }

State-Name | stateIdentifier

State-Body | Bln-Expr

State-Names | State-Name

State-Names | State-Name , State-Names

Concept-Impl | IMPL { Impl-Reference }

Impl-Reference | vString

```
/**
 * *****
 *
 * **** explicit concepts *****
 *
 * *****
 */
```


Explicit-Concept-Decl | Goal-Concept
Explicit-Concept-Decl | Error-Concept
Explicit-Concept-Decl | Metric-Concept
Explicit-Concept-Decl | Event-Concept
Explicit-Concept-Decl | Action-Concept
Explicit-Concept-Decl | Policy-Concept
Explicit-Concept-Decl | Situation-Concept
Explicit-Concept-Decl | Group-Concept

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//*****
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```
//**** explicit concept "GOAL" *****
```

Goal-Concept | CONCEPT_GOAL Goal-Name { Goal-Concept-Decl-Seqnce }

Goal-Concept | FINAL CONCEPT_GOAL Goal-Name { Goal-Concept-Decl-Seqnce }

Goal-Concept-Decl-Seqnce | Concept-Decl-Seqnce Goal-Spec-Seqnce

Goal-Concept-Decl-Seqnce | Goal-Spec-Seqnce Concept-Decl-Seqnce

Goal-Spec-Seqnce | SPEC { Goal-Depart-States Goal-Arrive-States }

Goal-Spec-Seqnce | SPEC { Goal-Arrive-States Goal-Depart-States }

Goal-Depart-States | DEPART { State-Names } ARRIVE { State-Names }

Goal-Depart-States | ARRIVE { State-Names } DEPART { State-Names }

Goal-Depart-States | ARRIVE { State-Names }

Goal-Name | goalIdentifier

```
//*****
```

```
//*** explicit concept "ERROR" *****
```

Error-Concept | CONCEPT_ERROR Error-Name { Error-Concept-Decl-Seqnce}

Error-Concept | FINAL CONCEPT_ERROR Error-Name { Error-Concept-Decl-Seqnce}

Error-Concept-Decl-Seqnce | Concept-Decl-Seqnce Error-Spec-Seqnce

Error-Concept-Decl-Seqnce | Error-Spec-Seqnce Concept-Decl-Seqnce

Error-Spec-Seqnce | SPEC { Error-Spec-Parts }

Error-Name | errorIdentifier

Error-Names | Error-Name

Error-Names | Error-Name , Error-Names

Error-Spec-Parts | Error-Spec-Part

Error-Spec-Parts | Error-Spec-Part Error-Spec-Parts

Error-Spec-Part | Error-Number-Decl

Error-Spec-Part | Error-Severity-Decl

Error-Spec-Part | Error-Source-Decl

Error-Number-Decl | ERROR_NUMBER { Error-Number }

Error-Severity-Decl | ERROR_SEVERITY { Error-Severity }

Error-Source-Decl | ERROR_SOURCE { Action-Names }

Error-Number | vString

Error-Severity | vDecimal

//*****

//*** explicit concept "METRIC" *****

Metric-Concept | CONCEPT_METRIC Metric-Name { Metric-Concept-Decl-Seqnce}

Metric-Concept | FINAL CONCEPT_METRIC Metric-Name { Metric-Concept-Decl-Seqnce}

Metric-Concept-Decl-Seqnce | Concept-Decl-Seqnce Metric-Spec-Seqnce

Metric-Concept-Decl-Seqnce | Metric-Spec-Seqnce Concept-Decl-Seqnce

Metric-Spec-Seqnce | SPEC { Metric-Spec-Parts }

Metric-Name | metricIdentifier

Metric-Names | Metric-Name

Metric-Names | Metric-Name , Metric-Names

Metric-Spec-Parts | Metric-Spec-Part

Metric-Spec-Parts | Metric-Spec-Part Metric-Spec-Parts

Metric-Spec-Part | Mtrc-Type-Decl

Metric-Spec-Part | Mtrc-Source-Decl

Mtrc-Type-Decl | FINAL METRIC_TYPE { Mtrc-Type }

Mtrc-Type-Decl | METRIC_TYPE { Mtrc-Type }

Mtrc-Type | RESOURCE

Mtrc-Type | QUALITY

Mtrc-Type | ENVIRONMENT

Mtrc-Type | ENSEMBLE

Mtrc-Source-Decl | FINAL METRIC_SOURCE { Mtrc-Source }

Mtrc-Source-Decl | METRIC_SOURCE { Mtrc-Source }

Mtrc-Source | vString

```
//*****
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```
//**** explicit concept "EVENT" *****
```

Event-Concept | CONCEPT_EVENT Event-Name { Event-Concept-Decl-Seqnce}

Event-Concept | FINAL CONCEPT_EVENT Event-Name { Event-Concept-Decl-Seqnce}

Event-Concept-Decl-Seqnce | Concept-Decl-Seqnce Event-Spec-Seqnce

Event-Concept-Decl-Seqnce | Event-Spec-Seqnce Concept-Decl-Seqnce

Event-Spec-Seqnce | SPEC { Event-Spec-Parts }

Event-Name | eventIdentifier

Event-Names | Event-Name

Event-Names | Event-Name , Event-Names

Event-Spec-Parts | Event-Spec-Part

Event-Spec-Parts | Event-Spec-Part Event-Spec-Parts

Event-Spec-Part | Guards-Decl

Event-Spec-Part | Event-Activation

Guards-Decl | GUARDS { Bln-Expr }

Event-Activation | FINAL ACTIVATION { Event-Expr }

Event-Activation | ACTIVATION { Event-Expr }

Event-Activation | FINAL ACTIVATION { }

Event-Activation | ACTIVATION { }

Event-Expr | Event-Expr-Term

Event-Expr | Event-Expr OR Event-Expr-Term

Event-Expr-Term | Event-Expr-Fact

Event-Expr-Term | Event-Expr-Fact AND Event-Expr-Fact

Event-Expr-Fact | NOT Event-Activ-Fact

Event-Expr-Fact | Event-Activ-Fact

Event-Expr-Fact | (Event-Expr)

Event-Activ-Fact | Time-Activation

Event-Activ-Fact | Goal-Activation

Event-Activ-Fact | Metric-Activation

Event-Activ-Fact | Error-Activation

Event-Activ-Fact | Action-Activation

Event-Activ-Fact | Event-Activation

Time-Activation | ACTIV_TIME { Val-Func-TimeAndDate }

Time-Activation | PERIOD { vNumber Time-Activation-Unit }

Time-Activation-Unit | MSEC

Time-Activation-Unit | SEC

Time-Activation-Unit | MIN

Time-Activation-Unit | HOUR

Time-Activation-Unit | DAY

Time-Activation-Unit | MONTH

Time-Activation-Unit | YEAR

Goal-Activation | ACHIEVED { Goal-Name }

Metric-Activation | CHANGED { Metric-Name }

Error-Activation | RAISED { Error-Name }

Event-Activation | OCCURRED { Event-Name }

Action-Activation | EXECUTED { Action-Name }

Val-Func-TimeAndDate | Val-Func-Time

Val-Func-TimeAndDate | Val-Func-Date

Val-Func-TimeAndDate | Val-Func-DateTime

//*****

//**** explicit concept "ACTION" *****

Action-Concept | CONCEPT_ACTION Action-Name { Action-Concept-Decl-Seqnce}

Action-Concept | FINAL CONCEPT_ACTION Action-Name { Action-Concept-Decl-Seqnce}

Action-Concept-Decl-Seqnce | Concept-Decl-Seqnce Action-Spec-Seqnce

Action-Concept-Decl-Seqnce | Action-Spec-Seqnce Concept-Decl-Seqnce

Action-Spec-Seqnce | SPEC { Action-Spec-Parts }

Action-Name | actionIdentifier

Action-Names | Action-Name

Action-Names | Action-Name , Action-Names

Action-Spec-Parts | Action-Spec-Part

Action-Spec-Parts | Action-Spec-Part Action-Spec-Parts

Action-Spec-Part | Action-Pre-Con

Action-Spec-Part | Action-Post-Con

Action-Spec-Part | Action-Params

Action-Spec-Part | Action-Return

Action-Spec-Part | Action-Errors

Action-Pre-Con | PRE_CON { Bln-Expr }

Action-Post-Con | POST_CON { Bln-Expr }

Action-Params | PARAMS { Concept-Names }

Action-Return | RETURN { Concept-Name }

Action-Errors | FUNC_ERRORS { Error-Names }

//*****

//**** explicit concept "POLICY" *****

Policy-Concept | CONCEPT_POLICY Policy-Name { Policy-Concept-Decl-Seqnce}

Policy-Concept | FINAL CONCEPT_POLICY Policy-Name { Policy-Concept-Decl-Seqnce}

Policy-Concept-Decl-Seqnce | Concept-Decl-Seqnce Policy-Spec-Seqnce

Policy-Concept-Decl-Seqnce | Policy-Spec-Seqnce Concept-Decl-Seqnce

Policy-Spec-Seqnce | SPEC { Policy-Spec-Parts }

Policy-Spec-Parts | Policy-Spec-Part

Policy-Spec-Parts | Policy-Spec-Part Policy-Spec-Parts

Policy-Spec-Part | POLICY_GOAL { Goal-Name }

Policy-Spec-Part | POLICY_SITUATIONS { Situation-Names }

Policy-Spec-Part | POLICY_RELATIONS { Relation-Names }

Policy-Spec-Part | POLICY_ACTIONS { Action-Names }

Policy-Spec-Part | POLICY_MAPPINGS { Condition-Action-Mappings }

Condition-Action-Mappings | Condition-Action-Mapping

Condition-Action-Mappings | Condition-Action-Mapping Condition-Action-Mappings

Condition-Action-Mapping | MAPPING { CONDITIONS { Bln-Expr } DO_ACTIONS { Action-Names } PROBABILITY { Probability-Number } }

Condition-Action-Mapping | MAPPING { CONDITIONS { Bln-Expr } DO_ACTIONS { Action-Names } }

Condition-Action-Mapping | MAPPING { DO_ACTIONS { Action-Names } PROBABILITY { Probability-Number } }

Condition-Action-Mapping | MAPPING { DO_ACTIONS { Action-Names } }

Policy-Name | policyIdentifier

Policy-Names | Policy-Name

Policy-Names | Policy-Name , Policy-Names

//*****

//**** explicit concept "SITUATION" *****

Situation-Concept | CONCEPT_SITUATION Situation-Name { Situation-Concept-Decl-Seqnce}

Situation-Concept | FINAL CONCEPT_SITUATION Situation-Name { Situation-Concept-Decl-Seqnce}

Situation-Concept-Decl-Seqnce | Concept-Decl-Seqnce Situation-Spec-Seqnce

Situation-Concept-Decl-Seqnce | Situation-Spec-Seqnce Concept-Decl-Seqnce

Situation-Spec-Seqnce | SPEC { Situation-Spec-Parts }

Situation-Spec-Parts | Situation-Spec-Part

Situation-Spec-Parts | Situation-Spec-Part Situation-Spec-Parts

Situation-Spec-Part | SITUATION_STATES { State-Names }

Situation-Spec-Part | SITUATION_ACTIONS { Action-Names }

Situation-Name | situationIdentifier

Situation-Names | Situation-Name

Situation-Names | Situation-Name , Situation-Names

//*****

//*** explicit concept "Group" *****

Group-Concept | CONCEPT_GROUP Group-Name { Group-Concept-Decl-Seqnce}

Group-Concept | FINAL CONCEPT_GROUP Group-Name { Group-Concept-Decl-Seqnce}

Group-Concept-Decl-Seqnce | Concept-Decl-Seqnce Group-Spec-Seqnce

Group-Concept-Decl-Seqnce | Group-Spec-Seqnce Concept-Decl-Seqnce

Group-Spec-Seqnce | SPEC { Group-Spec-Parts }

Group-Spec-Parts | Group-Spec-Part

Group-Spec-Parts | Group-Spec-Part Group-Spec-Parts

Group-Spec-Part | Group-Members

Group-Spec-Part | Group-Council

Group-Members | FINAL MEMBERS { Member-Names }

Group-Members | MEMBERS { Member-Names }

Group-Council | FINAL COUNCIL { Member-Names }

Group-Council | COUNCIL { Member-Names }

Member-Names | Member-Name

Member-Names | Member-Name , Member-Names

Member-Name | Concept-Name

Member-Name | Object-Name

Member-Name | Goal-Name

Member-Name | Error-Name

Member-Name | Metric-Name

Member-Name | Event-Name

Member-Name | Action-Name

Member-Name | Policy-Name

Member-Name | Situation-Name

Member-Name | Group-Name

Group-Name | groupIdentifier

```
//*****
```

```
//**** object trees *****
```

Object-Trees-Spec | OBJECT_TREES { Object-Trees-Seqnce }

Object-Trees-Spec | FINAL OBJECT_TREES { Object-Trees-Seqnce }

Object-Trees-Seqnce | Object-Decl

Object-Trees-Seqnce | Object-Array-Decl

Object-Trees-Seqnce | Object-Decl Object-Trees-Seqnce

Object-Trees-Seqnce | Object-Array-Decl Object-Trees-Seqnce

Object-Decl | OBJECT_ARRAY Object-Array-Name [vNatural] { Object-Decl-Seqnce }

Object-Decl | FINAL OBJECT_ARRAY Object-Array-Name [vNatural] { Object-Decl-Seqnce }

Object-Decl | OBJECT_ARRAY Object-Array-Name [vNatural] { }

Object-Decl | FINAL OBJECT_ARRAY Object-Array-Name [vNatural] { }

Object-Decl | OBJECT_ARRAY Object-Array-Name [] { }

Object-Decl | FINAL OBJECT_ARRAY Object-Array-Name [] { }

Object-Array-Name | objectArrIdentifier

Object-Decl | OBJECT Object-Name { Object-Decl-Seqnce }

Object-Decl | FINAL OBJECT Object-Name { Object-Decl-Seqnce }

Object-Decl | OBJECT Object-Name [vNatural] { Object-Decl-Seqnce }

Object-Decl | FINAL OBJECT Object-Name [vNatural] { Object-Decl-Seqnce }

Object-Name | objectIdentifier

Object-Decl-Seqnce | Object-Decl-Part

Object-Decl-Seqnce | Object-Decl-Part Object-Decl-Seqnce

Object-Decl-Part | Object-Concept

Object-Decl-Part | Object-Properties

Object-Decl-Part | Object-Impl

Object-Concept | INSTANCE_OF { Concept-Name }

Object-Concept | FINAL INSTANCE_OF { Concept-Name }

Object-Properties | PROPS { Object-Properties-Decl }

Object-Properties | FINAL PROPS { Object-Properties-Decl }

Object-Properties-Decl | Object-Property

Object-Properties-Decl | Object-Property Object-Properties-Decl

Object-Property | PROP Property-Name { Object-Name }

Object-Property | FINAL PROP Property-Name { Object-Name }

Object-Property | PROP Property-Name { Object-Array-Name [vNatural] }

Object-Property | FINAL PROP Property-Name { Object-Array-Name [vNatural] }

Object-Impl | IMPL { Impl-Reference }

//*****

//*** relations *****

Relations-Spec | RELATIONS { Relations-Seqnce }

Relations-Spec | FINAL RELATIONS { Relations-Seqnce }

Relations-Seqnce | Relation-Decl

Relations-Seqnce | Relation-Decl Relations-Seqnce

Relation-Decl | RELATION Relation-Name { Relation-Decl-Seqnce }

Relation-Decl | FINAL RELATION Relation-Name { Relation-Decl-Seqnce }

Relation-Decl | RELATION { Relation-Decl-Seqnce }

Relation-Decl | FINAL RELATION { Relation-Decl-Seqnce }

Relation-Decl-Seqnce | Concept-Pair Relation-Probability

Relation-Decl-Seqnce | Concept-Pair

Concept-Pair | CONCEPT_PAIR { Concept-Name , Concept-Name }

Relation-Probability | PROBABILITY { Probability-Number }

Relation-Name | relationIdentifier

Probability-Number | vDecimal

Relation-Names | Relation-Name

Relation-Names | Relation-Name , Relation-Names

//*****

//*** predicates *****

Predicates-Spec | PREDICATES { Predicates-Seqnce }

Predicates-Spec | FINAL PREDICATES { Predicates-Seqnce }

Predicates-Seqnce | Predicate-Decl

Predicates-Seqnce | Predicate-Decl Predicates-Seqnce

Predicate-Decl | PREDICATE Predicate-Name { Predicate-Decl-Seqnce }

Predicate-Decl | FINAL PREDICATE Predicate-Name { Predicate-Decl-Seqnce }

Predicate-Decl-Seqnce | Predicate-Decl-Part

Predicate-Decl-Seqnce | Predicate-Decl-Part Predicate-Decl-Seqnce

Predicate-Decl-Part | Predicate-Entries

Predicate-Decl-Part | Predicate-States

Predicate-Decl-Part | Predicate-Expression

Predicate-Entries | ENTRIES { Concept-Names }

Predicate-States | STATES { State-Names }

Predicate-Expression | EXPRESSION { Bln-Expr }

Predicate-Name | predicateIdentifier

```
//*****  
//*** contexts *****  
//*****
```

KL-Contexts | CONTEXTS { KL-Contexts-Seqnce }

KL-Contexts-Seqnce | Context-Decl

KL-Contexts-Seqnce | Context-Decl KL-Contexts-Seqnce

Context-Decl | CONTEXT Context-Name { Context-Decl-Seqnce }

Context-Decl-Seqnce | Context-Ambient-Trees Context-Situations

Context-Decl-Seqnce | Context-Situations Context-Ambient-Trees

Context-Situations | CONTEXT_SITUATIONS { Situation-Names }

Context-Ambient-Trees | AMBIENT_TREES { Ambient-Trees-Decl }

Ambient-Trees-Decl | Ambient-Tree-Decl

Ambient-Trees-Decl | Ambient-Tree-Decl Ambient-Trees-Decl

Ambient-Tree-Decl | AMBIENT_TREE { Ambient-Tree-Seqnce }

Ambient-Tree-Seqnce | Tree-Concept Ambient-Concepts

Ambient-Tree-Seqnce | Ambient-Concepts Tree-Concept

Tree-Concept | TREE_CONCEPT {Concept-Name}

Ambient-Concepts | AMBIENT_CONCEPTS {Concept-Names}

```
//*****  
//*** logic framework *****  
//*****
```

KL-Logic-Framework | LOGIC_FRAMEWORK { KL-Logic-Framework-Decl }

KL-Logic-Framework-Decl | Facts-Decl Rules-Decl Constraints-Decl

```
//*****  
//*** Facts *****
```

Facts-Decl | FACTS { Facts-Decl-Seqnce }

Facts-Decl-Seqnce | Fact-Decl

Facts-Decl-Seqnce | Fact-Decl Facts-Decl-Seqnce

Fact-Decl | FACT { Bln-Expr => Bln-Expr }

```
//*****  
//*** Rules *****
```

Rules-Decl | RULES { Rules-Decl-Seqnce }

Rules-Decl-Seqnce | Rule-Decl

Rules-Decl-Seqnce | Rule-Decl Rules-Decl-Seqnce

Rule-Decl | RULE { Rule-Body-Decl }

Rule-Body-Decl | IF Bln-Expr THEN Do-Section

Rule-Body-Decl | IF Bln-Expr THEN Do-Section ELSE Do-Section

Rule-Body-Decl | IF Bln-Expr THEN Do-Section ELSE Rule-Body-Decl

Do-Section | Do-Actions

Do-Section | Do-Predicates

Do-Actions | DO_ACTIONS { Action-Names }

Do-Predicates | DO_PREDICATES { Predicate-Names-Bln }

Predicate-Names-Bln | Predicate-Name

Predicate-Names-Bln | NOT Predicate-Name

Predicate-Names-Bln | Predicate-Name , Predicate-Names-Bln

Predicate-Names-Bln | NOT Predicate-Name , Predicate-Names-Bln

//*****

//**** Constraints *****

Constraints-Decl | CONSTRAINTS { Constraints-Decl-Seqnce }

Constraints-Decl-Seqnce | Constraint-Decl

Constraints-Decl-Seqnce | Constraint-Decl Constraints-Decl-Seqnce

Constraint-Decl | CONSTRAINT { Constraint-Body-Decl }

Constraint-Body-Decl | Bln-Expr

Constraint-Body-Decl | IF Bln-Expr THEN Then-Section

Constraint-Body-Decl | IF Bln-Expr THEN Then-Section ELSE Then-Section

Constraint-Body-Decl | IF Bln-Expr THEN Then-Section ELSE Constraint-Body-Decl

Then-Section | Bln-Expr

Then-Section | NO_ACTIONS { Action-Names }

Then-Section | NO_PREDICATES { Predicate-Names }

```
//*****  
//**** Bln-Expr *****  
//*****
```

Bln-Expr | Bln-Term

Bln-Expr | Bln-Expr OR Bln-Term

Bln-Term | Bln-Fact

Bln-Term | Bln-Term AND Bln-Fact

Bln-Fact | Bln-Prim

Bln-Fact | NOT Bln-Fact

BIn-Prim | BIn-Reln

BIn-Prim | Val-Boolean

BIn-Prim | (BIn-Expr)

BIn-Reln | Num-Expr Comp-Oper Num-Expr

BIn-Reln | Time-Fact Comp-Oper Time-Fact

BIn-Reln | Concept-Object-Reln

Val-Boolean | vBoolean

Val-Boolean | Predicate-Name

Concept-Object-Reln | Concept-Name IS Concept-Name

Concept-Object-Reln | INSTANCE_OF (Object-Name , Concept-Name)

Concept-Object-Reln | MEMBER_OF (Member-Name , Group-Name)

Concept-Object-Reln | RELATED (Member-Name , Member-Name)

Concept-Object-Reln | COUNT(Member-Name) Comp-Oper vNatural

Concept-Object-Reln | vNatural Comp-Oper COUNT(Member-Name)

Concept-Object-Reln | REALIZED (Concept-Name)

Concept-Object-Reln | EXECUTED_IN (Action-Name , Situation-Name)

Concept-Object-Reln | EXECUTED_IN (Action-Name , Policy-Name)

Concept-Object-Reln | EXECUTED (Action-Name)

Concept-Object-Reln | OCCURRED (Event-Name)

Concept-Object-Reln | RAISED (Error-Name)

Concept-Object-Reln | Relation-Name Comp-Oper Relation-Name

Concept-Object-Reln | Member-Name Comp-Eq-Diff-Oper Member-Name

Time-Fact | Val-Func-Time

Time-Fact | Val-Func-Date

Time-Fact | Val-Func-DateTime

Val-Func-Time | vTime

Val-Func-Time | timeIdentifier

Val-Func-Time | GET_TIME

Val-Func-Date | vDateTime

Val-Func-Date | dateIdentifier

Val-Func-Date | GET_DATE

Val-Func-Date | activtimeProperty

Val-Func-DateTime | vDateTime

Val-Func-DateTime | dateTimeIdentifier

Val-Func-DateTime | GET_DATETIME

Num-Expr | Num-Expr Math-Oper Num-Expr

Num-Expr | Num-Fact

Num-Fact | Num-Prim

Num-Fact | + Num-Fact

Num-Fact | - Num-Fact

Num-Prim | Val-Number

Num-Prim | (Num-Expr)

Val-Number | vNumber

Comp-Oper | <

Comp-Oper | >

Comp-Oper | <=

Comp-Oper | >=

Comp-Oper | Comp-Eq-Diff-Oper

Comp-Eq-Diff-Oper | =

Comp-Eq-Diff-Oper | <>

Math-Oper | +

Math-Oper | -

Math-Oper | *

Math-Oper | /

Math-Oper | ^

//*****

//**** KB Operators specification *****

//*****

KL-Operators | Ask-Operators Tell-Operators Ontology-Operators

Ask-Operators | ASK_OPERATORS { Ask-Operators-Seqnce }

Ask-Operators-Seqnce | Ask-Operator Ask-Operators-Seqnce

Ask-Operator | ASK_BEHAVIOR { }

Ask-Operator | ASK_BEHAVIOR { Goal-Name }

Ask-Operator | ASK_BEHAVIOR { Situation-Name, Goal-Name }

Ask-Operator | ASK_BEHAVIOR { State-Name }

Ask-Operator | ASK_RULE_BEHAVIOR { Bln-Expr }

Ask-Operator | ASK_CURR_STATE {}

Ask-Operator | ASK_CURR_STATE { Impl-Reference }

Ask-Operator | ASK_CURR_SITUATION { Impl-Reference }

Tell-Operators | TELL_OPERATORS { Tell-Operators-Seqnce }

Tell-Operators-Seqnce | Tell-Operator Tell-Operators-Seqnce

Tell-Operator | TELL_ERR { Impl-Reference, Impl-Reference }

Tell-Operator | TELL_SENSOR { Data-Reference, Impl-Reference }

Tell-Operator | TELL_ACTION { Concept-Names, Impl-Reference }

Tell-Operator | TELL_ACTION { Behavior-Seq, Concept-Names, Impl-Reference }

Tell-Operator | TELL_OBJ_UPDATE { UPDATE {Property-Names, Data-Reference} Impl-Reference }

Tell-Operator | TELL_CNCP_UPDATE { UPDATE {Property-Names, Data-Reference} Impl-Reference }

Behavior-Seq | Action-Names

Property-Names | Property-Name, Property-Names

Data-Reference | vString

Ontology-Operators | ONTOLOGY_OPERATORS {}

```
//*****
```

```
//*** Inference Primitives specification *****
```

```
//*****
```

Inference-Primitives | INFERENCE {}