

Authority Engineering Formal Theory

Presentation 1.0

Authority Engineering Formal Foundations RC-1

Status: FORMAL PRESENTATION DRAFT - COMPILED FROM RC-1

Purpose

This document makes the existing RC-1 formal core explicit as one many-sorted first-order theory presentation. It does not add an Authority Engineering primitive, definition, law, axiom, theorem, or empirical claim. Its purpose is to state exactly what language is being used, what counts as a model, and which existing RC-1 constraints form the presented sentence set.

Logic and universe of discourse

The background logic is many-sorted first-order logic with equality.

An interpretation has one nonempty carrier set for each declared sort. There is no intended real-world domain fixed by this presentation: State, Transition, Guard, System, and all other sorts are formal carriers. Their Authority Engineering interpretation remains only the source-bound interpretation already recorded in RC-1 and its glossary.

Complete formal signature

Sorts

Agent, Analysis, Assessment, Attack, Decision, Degree, ExecutionCondition, Fabric, Flow, Future, Guard, Intention, Organization, Outcome, Path, Role, Stack, State, Surface, System, TFH, TFV, Time, Topology, Transition

Total functions

Function	Type
src	Transition -> State
tgt	Transition -> State

Predicate signatures

Predicate(s)	Type
STOICAnalysis	Analysis
FidelityAssessment	Assessment

Publication Record

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Corpus Context

Corpus: Authority Engineering

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The prior Zenodo record remains the citable record until its new version is published.

Predicate(s)	Type
AuthorityAttack, BreaksSystem	Attack
Material	Decision
Dynamic	ExecutionCondition
Legitimate	Flow
Realized	Outcome
Continuous, TraversalOrMutation	Path
Identifiable	Role
Distributed	System
C, CCR	Transition
Holds, LocallyValid	Agent x Intention
DegreeOf	Assessment x Degree
Manipulates	Attack x Flow
OwnershipTest	Decision x Organization
FabricOf	Fabric x System
SharedOrIntersecting	Future x Future
Present	Guard x State
Over	Intention x Future
Incompatible	Intention x Intention
AuthorizedToInitiate, AuthorizedToInterrupt, AuthorizedToOwnConsequence	Role x Decision
Member	Role x Organization
SMember	Stack x Guard
StackAt	Stack x State
Within	State x System
A, BAR, IntendedAuthority, Local, Meaningful, Observable, Preq, Proceed, Reachable, Sigma, Stop	State x Transition
SurfaceOf	Surface x System
HMember, HOwner	TFH x Guard
VMember	TFV x Guard

Predicate(s)	Type
Earlier	Time x Time
TopologyOf	Topology x System
Accumulated	Transition x Time
DecisionRelation	Decision x State x Transition
FlowRelation	Flow x State x Transition
Owns, Participates, Supplies	Guard x State x Transition
IntendedRelation	Intention x State x Transition
Carries, Preserved	Path x State x Transition
DistributedRealization	State x Transition x System
FutureCondition	State x Transition x Time
OnSurface	Surface x State x Transition
BeforeH	TFH x Guard x Guard
HAt	TFH x State x Transition
VAt	TFV x State x Transition
TopoMember	Topology x State x Transition
FlowInTopology	Flow x Topology x State x Transition
BoundedOutcome	Outcome x State x Transition x ExecutionCondition
Assesses	Assessment x Outcome x State x Transition x ExecutionCondition
CarriedBy	Fabric x Path x State x Transition x System
Modifies	Transition x State x Transition x Time x Time
Contains	Agent x Agent x Intention x Intention x Future x Future
Studies	Analysis x Transition x State x Transition x Surface x Topology x Time x Time

The source meaning and background/representation status of each nonlogical symbol remain controlled by 26-l-ae-background-parameter-glossary-rc1.md. This document supplies formal type information; it does not convert a background symbol into Authority Engineering theory.

Terms and well-formed formulas

Variables are sorted. A variable of sort S is a term of sort S . If $f : S_1 \times \dots \times S_n \rightarrow S$, then $f(t_1, \dots, t_n)$ is a term of sort S whenever each argument has the matching sort. If $P : S_1 \times \dots \times S_n$ is a predicate, then $P(t_1, \dots, t_n)$ is an atomic formula when its arguments match those sorts. Equality is permitted only between terms of the same sort. Formulas are closed under not, and, or, implies, iff, and sorted universal and existential quantification. A sentence is a formula with no free variables.

Structures, satisfaction, and models

A signature structure M supplies:

1. one nonempty domain for each sort;
2. total interpretations of src and tgt with the displayed types; and
3. an interpretation of each predicate as a relation of its displayed type.

Satisfaction is the ordinary Tarskian satisfaction relation for many-sorted first-order logic: atomic predicates are true exactly when the interpreted tuple belongs to their relation; equality compares denotations; Boolean connectives use their usual truth clauses; and sorted quantifiers range over the appropriate sort domain.

An RC-1 model is a structure M that satisfies every sentence in T_RC1 below. For any sentence ϕ , $T_RC1 \models \phi$ means that every RC-1 model satisfies ϕ . This defines semantic consequence; RC-1 does not yet adopt a separate proof calculus.

Theory sentence set T_RC1

T_RC1 is the closed set of the following 33 existing RC-1 sentences:

RC-1, BAR-definition, GC-1, GC-2, HC-1, HC-2, HC-3, HC-4, VC-1, VC-2, SC-1, SS-1, SS-2, CT-1, CT-2, AS-1, AS-2, AT-1, AT-2, FB-1, FB-2, FB-3, ST-1, ST-2, CC-1, CC-2, OT-1, OT-2, OT-3, AA-1, AA-2, CF-1, CF-2.

The exact machine-readable formulas are in 34-l-ae-rc1-formal-theory-presentation.smt2. The formulas are compiled without substantive change from the current RC-1 constraints. The SMT-LIB file is the authoritative machine-readable expression of this sentence set; module documents remain the source-bound prose interpretation.

Status of statements

Class	RC-1 status
Logical assumptions	Many-sorted first-order logic with equality; nonempty sort domains; total interpretations for declared functions.
Explicit formal definition	The BAR biconditional is an explicit definitional convention within the presentation.
Theory sentences	All 33 compiled constraints are T_RC1 sentences. Their technical role is to define the presented model class.

Class	RC-1 status
Authority Engineering axioms	None designated. The theory-sentence status does not promote a constraint to an AE axiom or Foundational Law.
Empirical assumptions	None added.
Theorems / derived propositions	None registered. Semantic consequence is now defined, but no proof calculus or proof objects are supplied.
Invariants	None designated or proved.

What this completes and what it does not

This presentation completes the missing formal-language, well-formedness, model-class, satisfaction, and theory-sentence layers for the existing RC-1 constraints. It does not complete semantic adequacy of the source definitions: the documented partial necessary-condition encodings and background parameters remain partial. It also does not establish empirical validity, theorem proofs, a proof calculus, or Authority Engineering axioms.