INVENTIVE

Engineering Design Performance

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April 23, 2008, Klagenfurt

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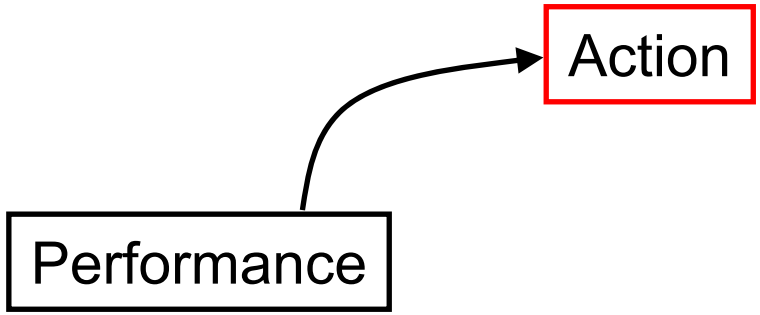
Outline:



- Action vs Characteristic

- Examples:
  - IS Performance
  - Grid Performance
  - Chip Performance
  - Software Performance
  - Network Performance
  - Cabinet Performance
  - Business Performance
  - **Design Performance**
  - Artistic Performance
  - …

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Performance …

Falling
(unintentional)

???

Action

Actor

Performance

Director

- Action vs Characteristic
- Action vs Phenomenon/Event
- Coordinated vs Swarm

manages

Performance

in

Actor

Acting
(intentional)

Definition: intentional coordinated action targeted to pro-actively reaching the goals

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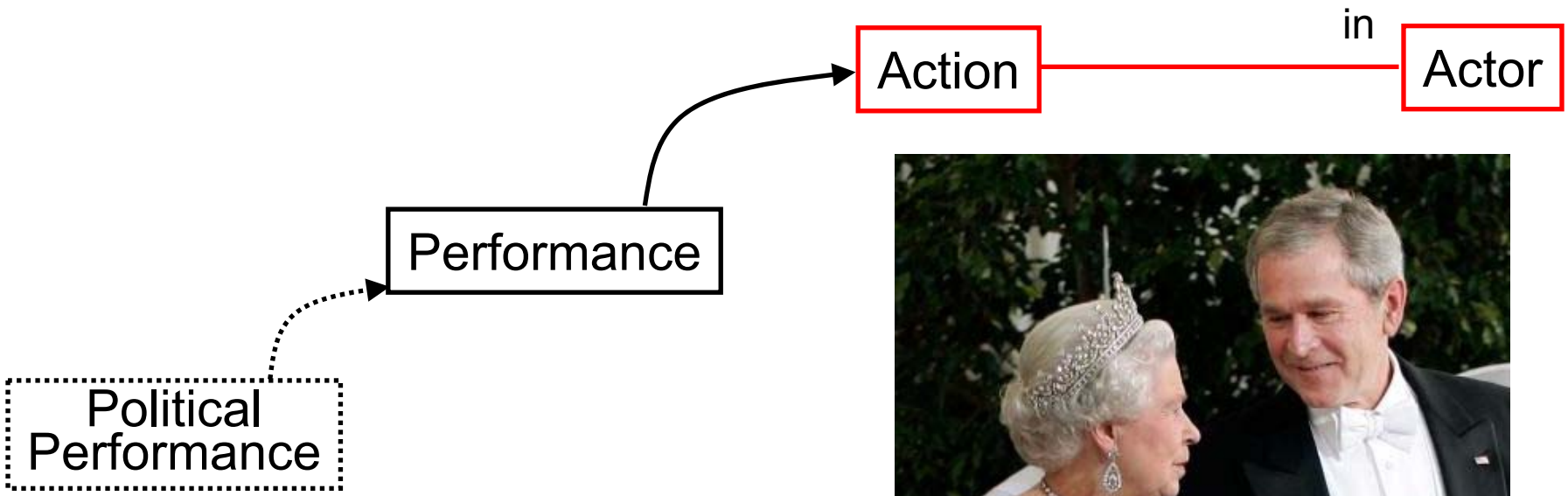
Scope …



Interesting, very high-level, …
not our scope …

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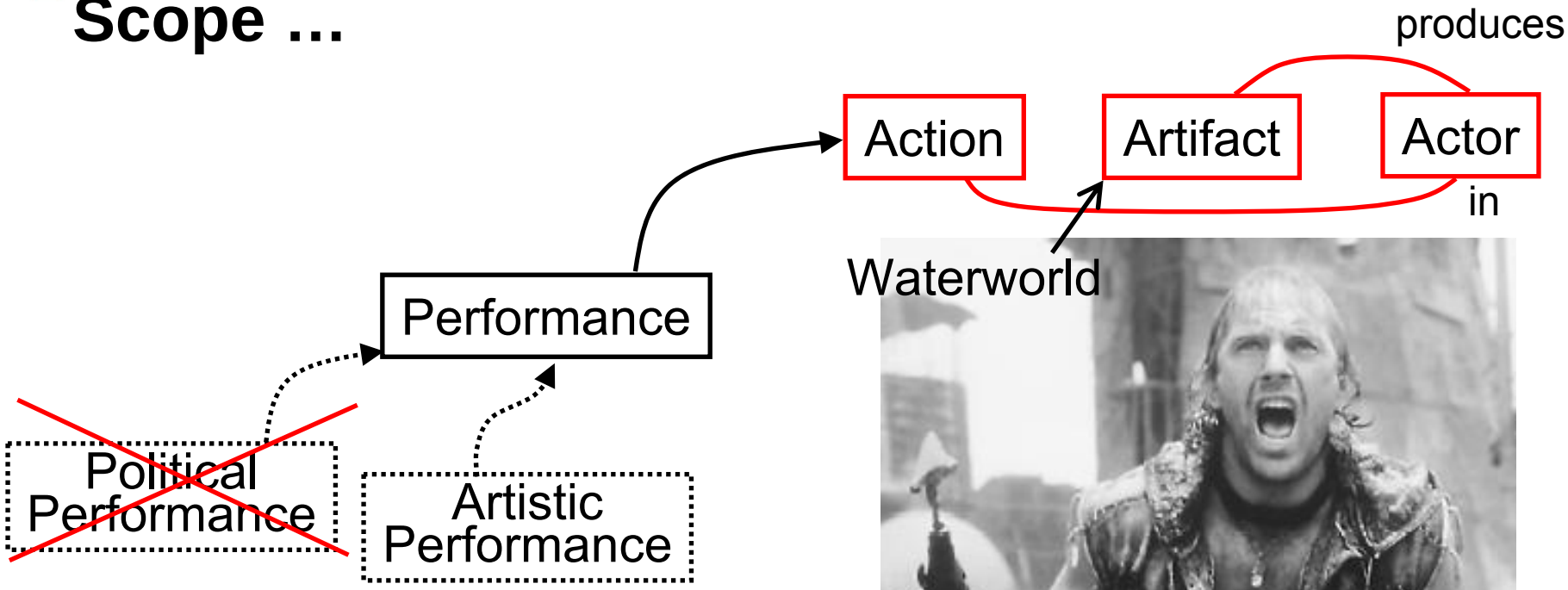
Scope …



- Goal-directed Action
- Not our scope
  - Till conf dinner …

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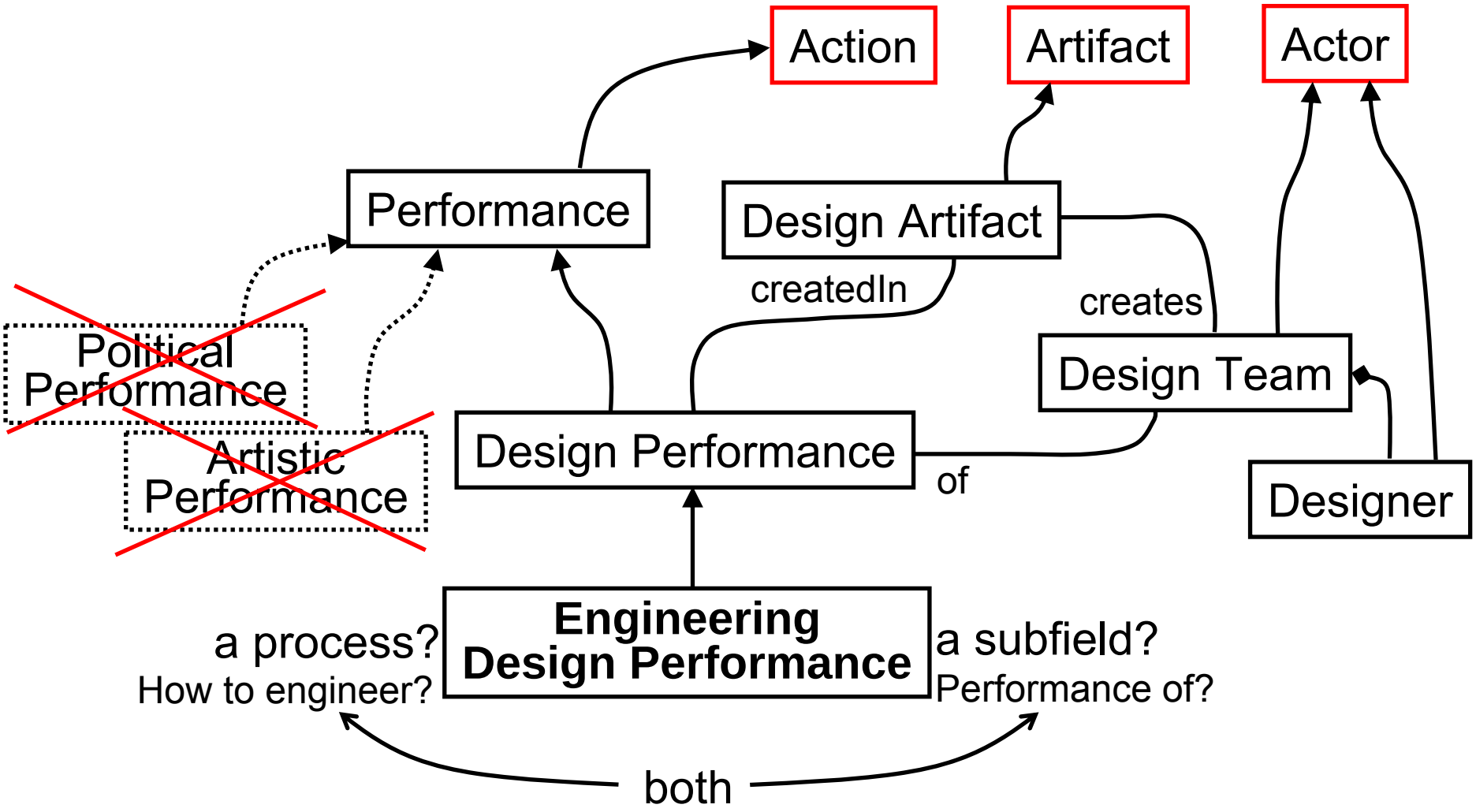
Scope …



PSI: How to engineer design performance in an engineering domain?

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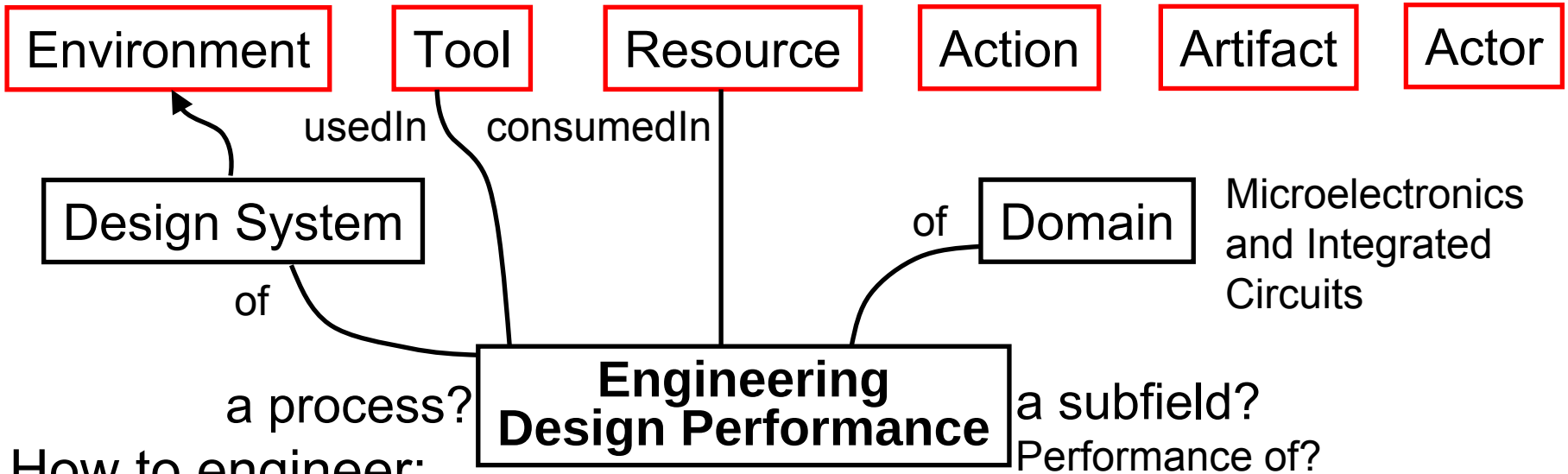
Focus:



How to engineer:

- Create the Model → Framework
- Monitor Environment and Performance → fine-grained Knowledge
- Calibrate the Model → fine-tuned Framework
- Measure and Assess → Corrective Actions
- Simulate → prediction
- Apply Corrective Actions → Management

Focus

PSI **PM3**:
Performance
Measurement and
Management
Methodology

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- Btw, Does this answer to Prof. Mayr's question?

Engineering Design or Another World of "Death March Projects"*

- Not so dependable …

* Coined by Edward Yourdon, Death March, Prentice Hall, 2003

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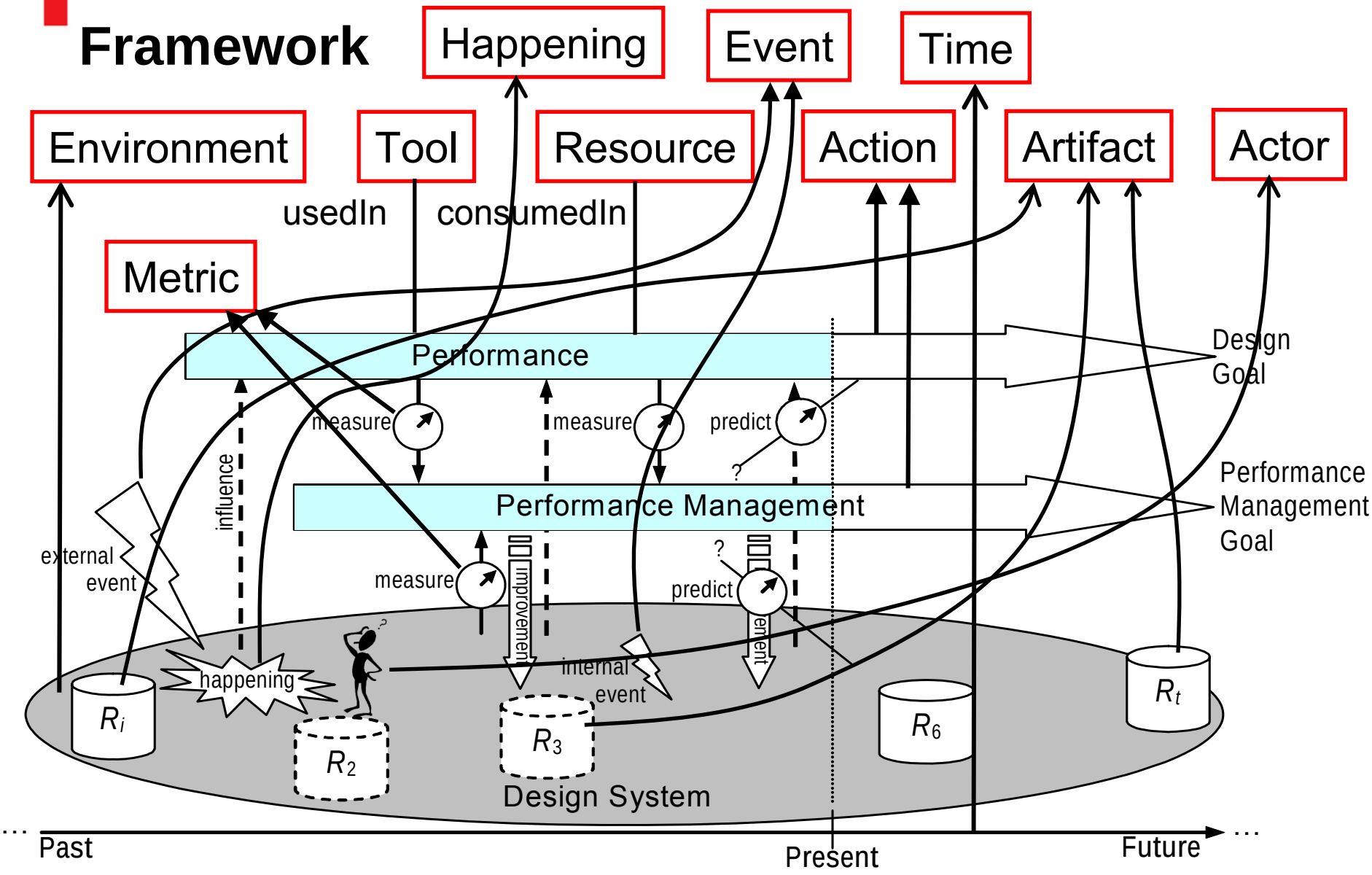
Framework



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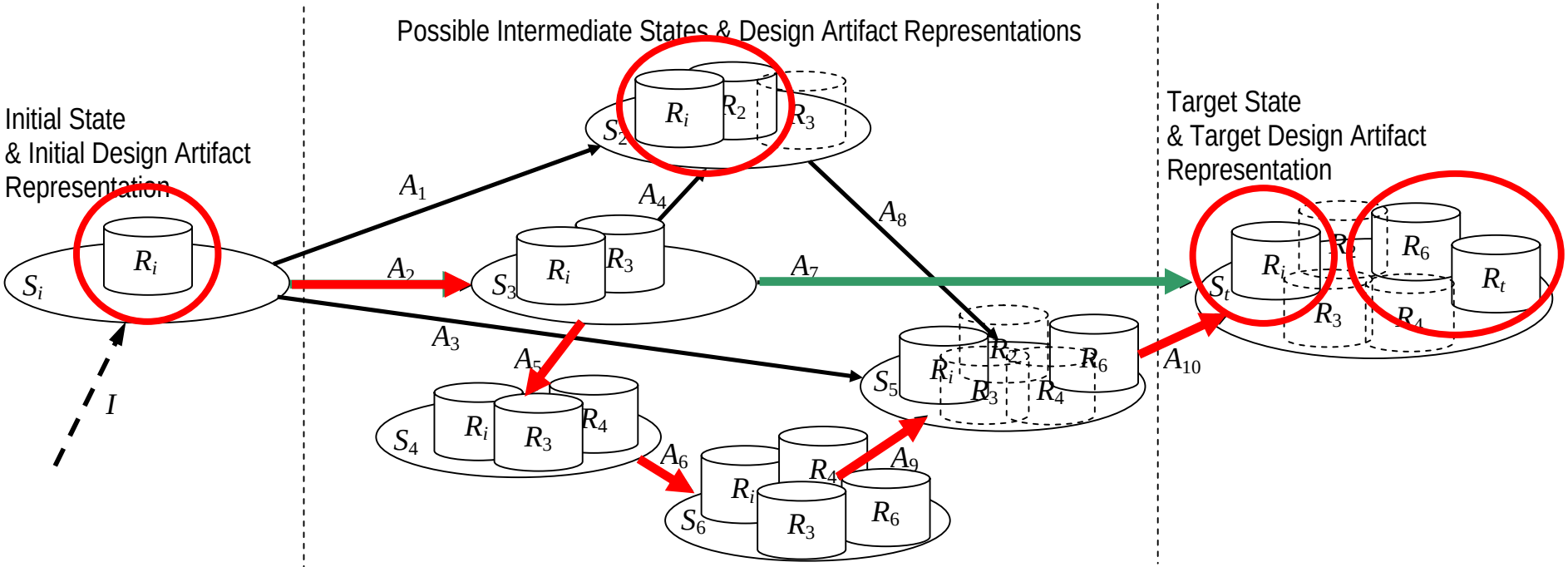
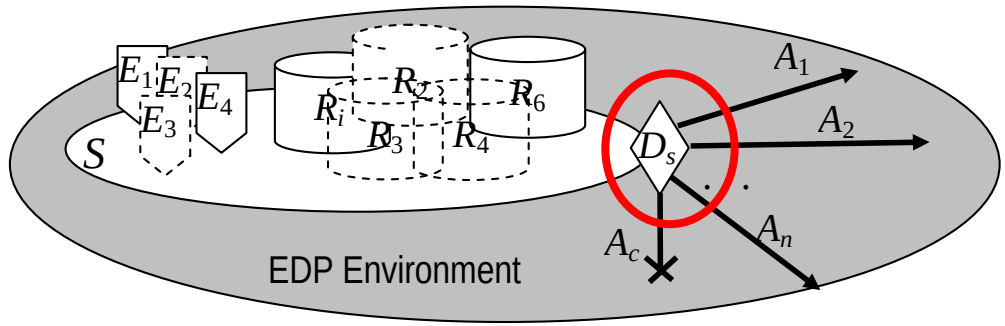
Engineering Design Process

Performance → Design Goal

- A knowledge (transformation) process …



- Characteristic Representations
- Req-sensitive States
- Decisions on Action choice
- Transformation Paths
- Managers and Executors
- Changing Goals …



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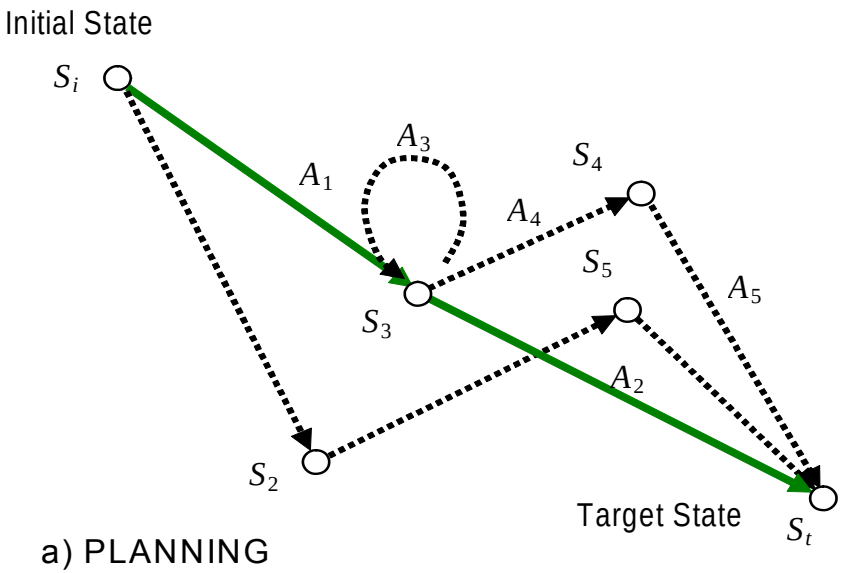
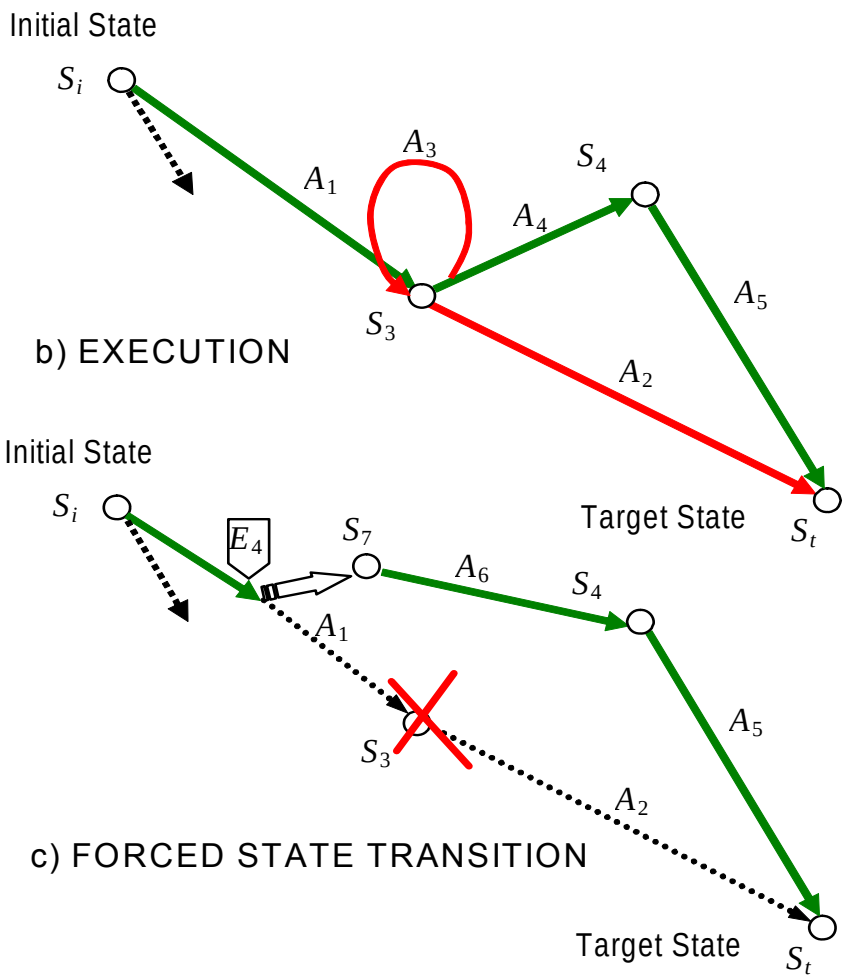
Is the Shortest Path the Best Performance?

Plan-pushed doesn't work:





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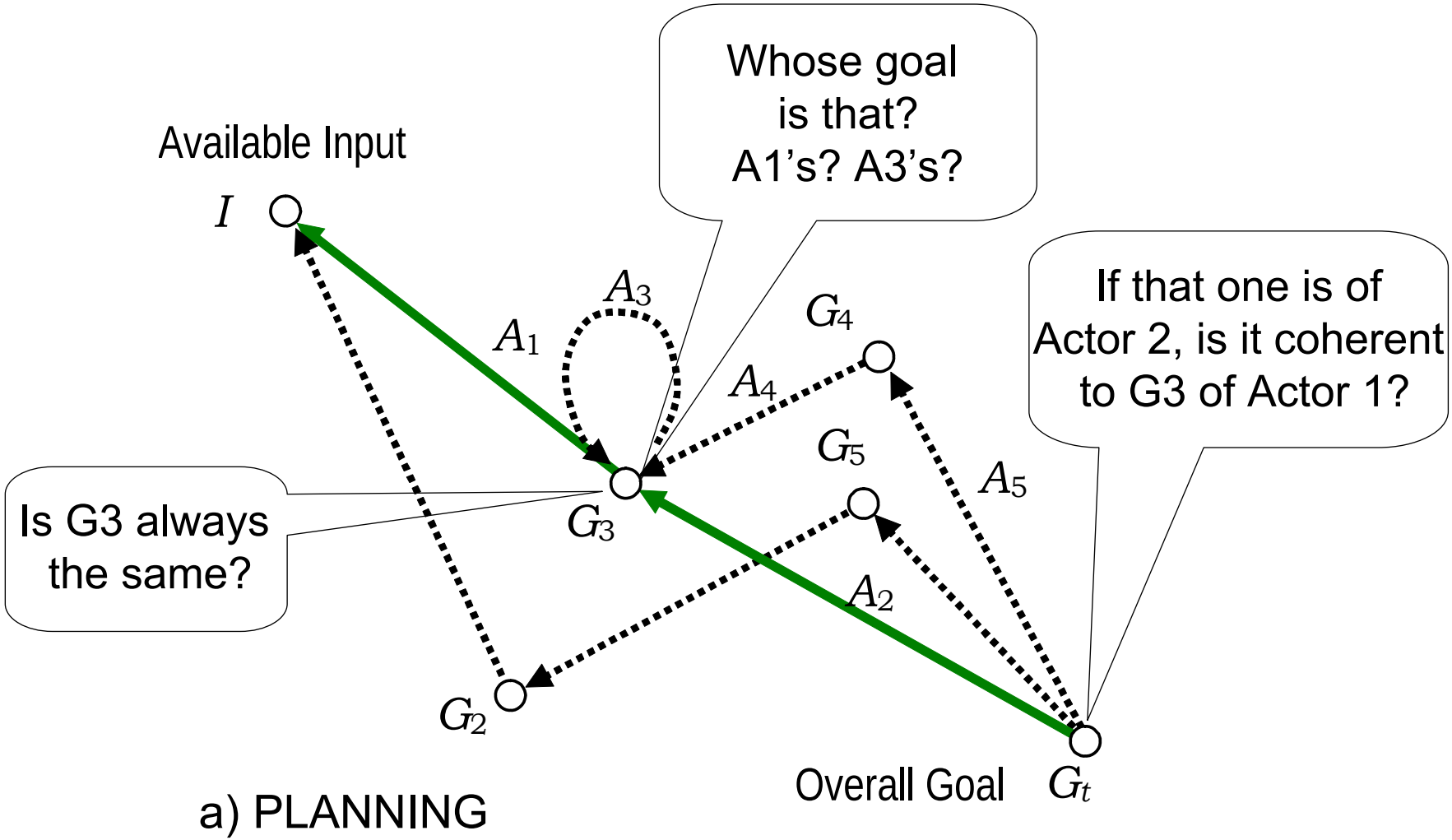
Goals to be Aligned – “Shaker” Planning



… Reaching Agreements …

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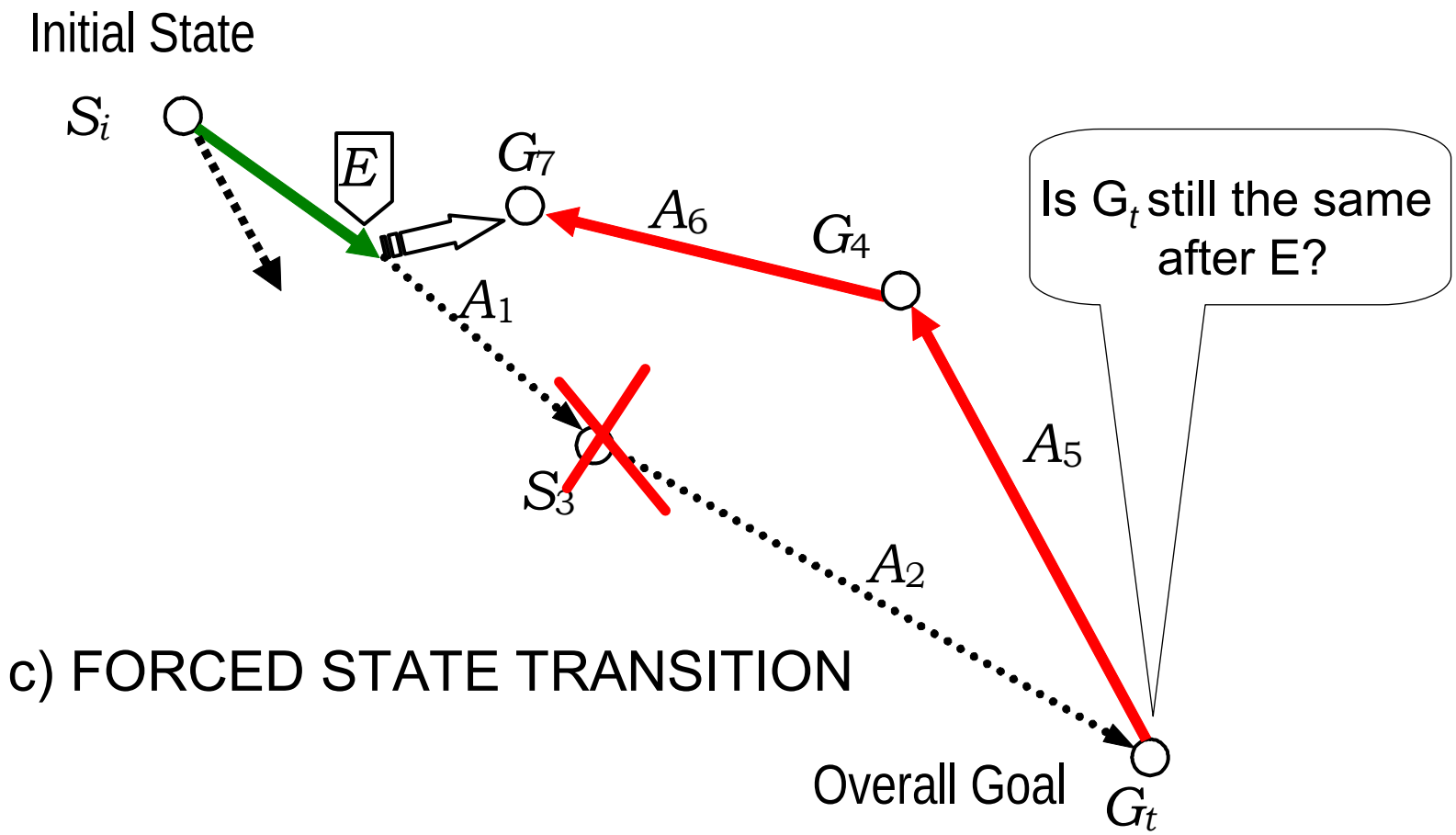
Goals to be Monitored and Managed …



To make sure that the work done is still “useful”

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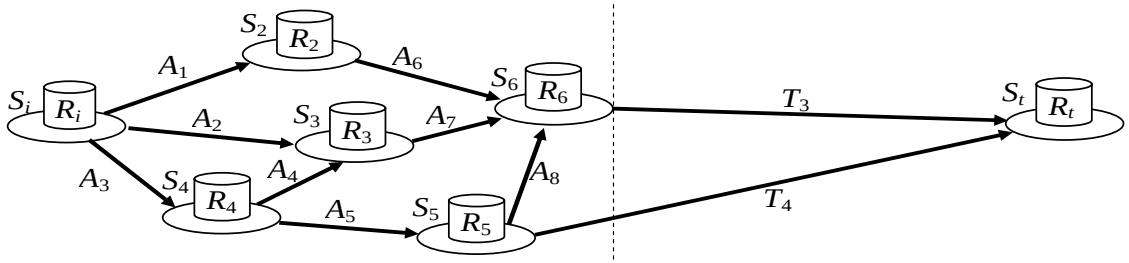
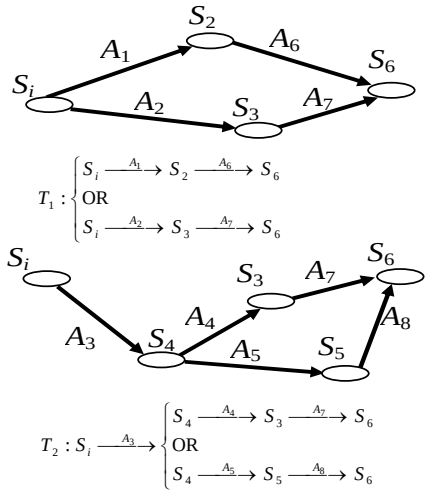
Actions

Subjective views on … and a sort of a classification

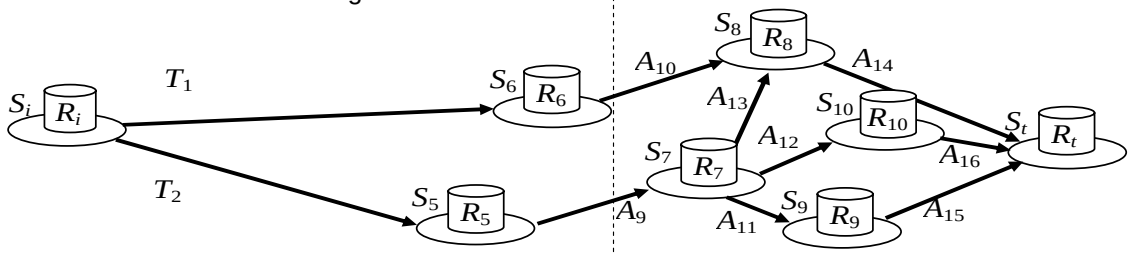
- Compound (a Task) and Atomic (an Activity)

The view of a Front-End Designer

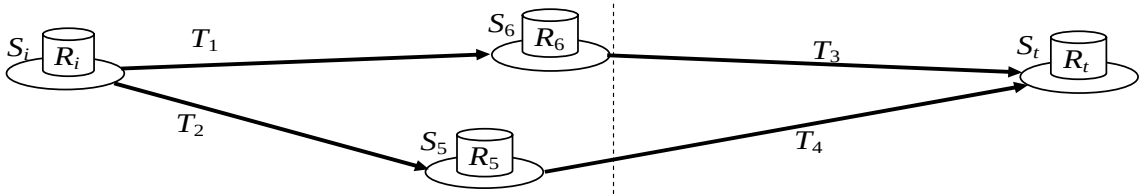




The view of a Back-End Designer



The view of a Project Manager



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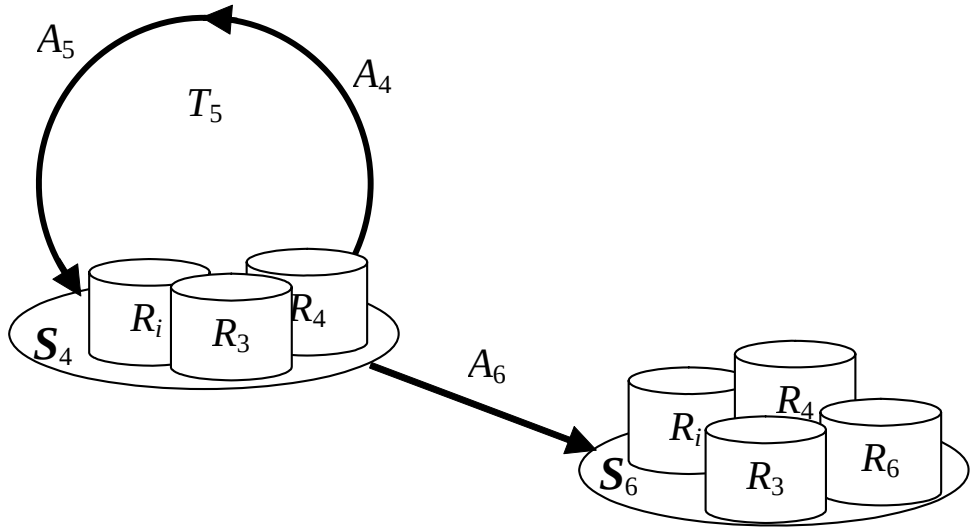
Actions

- Compound (a Task) and Atomic (an Activity)
- State-Transitive and Iterative
  - Iterative:
    - Decomposition
    - Integration
    - Refinement
    - Debugging
    - Verification



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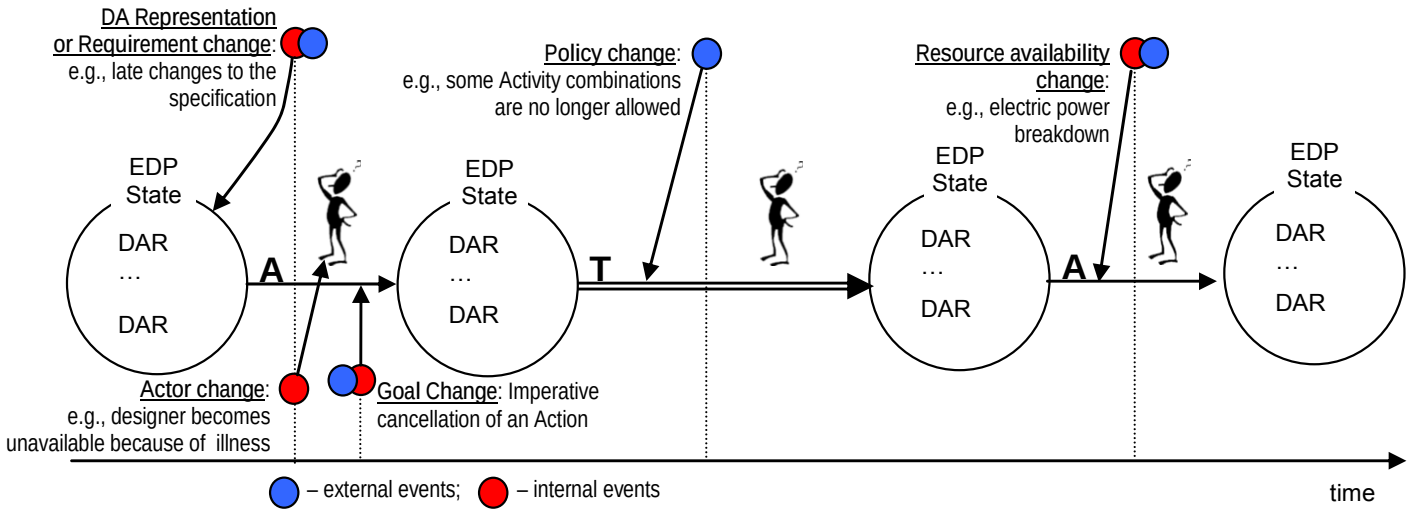
Actions

- Compound (a Task) and Atomic (an Activity)
- State-Transitive and Iterative
- Corrective
  - Rolling back the Transformation Path to a successfully passed State
  - Switching to the next-most possibly optimal Transformation Path (back-up plan)



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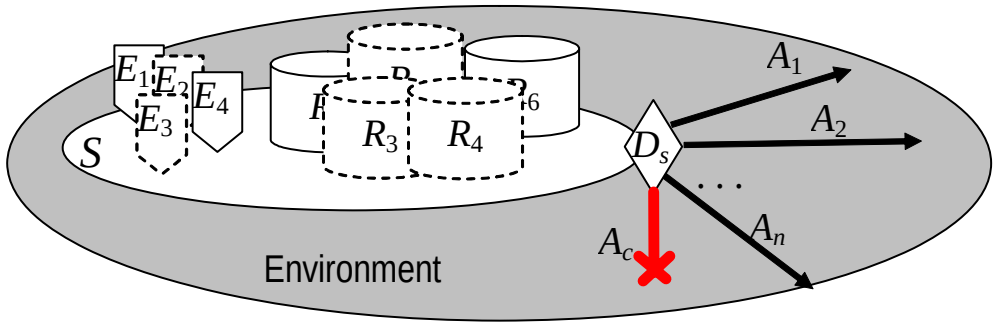
Actions

- Compound (a Task) and Atomic (an Activity)
- State-Transitive and Iterative
- Corrective
- Cessation
  - In success – in target state only
  - In failure – anywhere
  - Leads out of the State space



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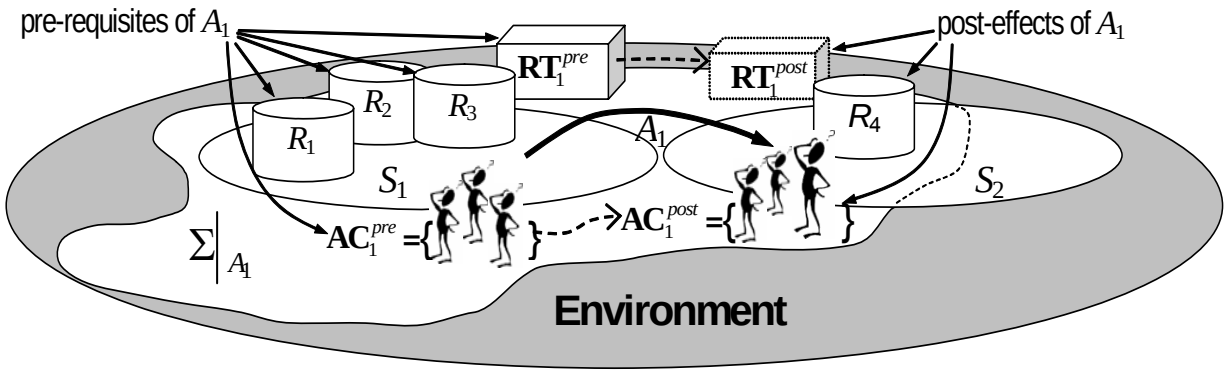
Dependencies



- Action context Σ
- Dependency:

$$\Sigma\Big|_{A_3}^{pre} \cap \Sigma\Big|_{A_1}^{post} \neq \emptyset$$

  - Strong

$$\Sigma\Big|_{A_3}^{pre} \cap \Sigma\Big|_{A_1}^{post} = \Sigma' \subseteq \mathbf{R}_1^{post}$$

  - Weak:
    - Environmental

$$\Sigma\Big|_{A_3}^{pre} \cap \Sigma\Big|_{A_1}^{post} = \Sigma' \subseteq \Sigma\Big|_{A_1}^{post} \setminus \mathbf{R}_1^{post}$$

    - Facilitation

$$\Sigma\Big|_{A_3}^{post} \cap \Sigma\Big|_{A_1}^{post} = \Sigma' \subseteq \mathbf{R}_3^{post}$$

- Pre-req of the source overlap with the post-eff of the target
- Can not do until the results of A1 are not available
- Can do meanwhile …
  - But changes in the Env may influence
  - But the appearance of results may help

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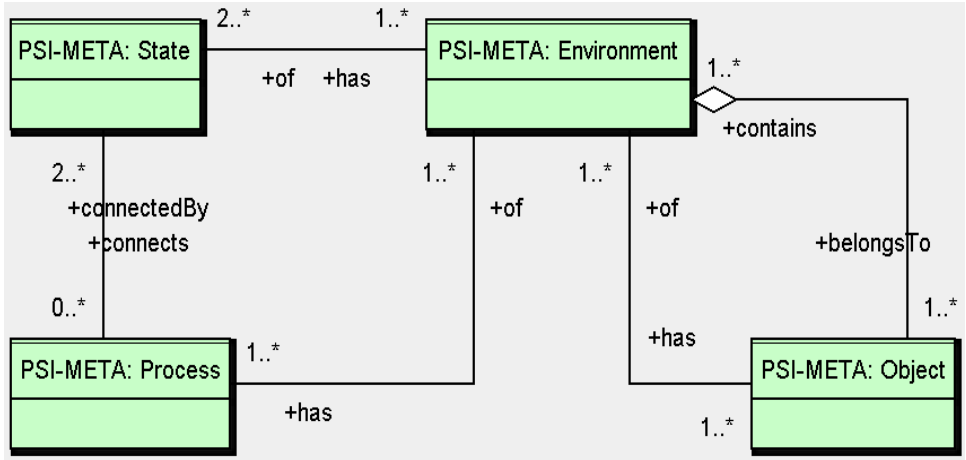
Environments, Events, and Happenings

- **Event**: a manifestation of a Phenomenon which can be sensed
  - Phenomenon: season change
  - Event: Spring
- **Happening**: an act of Event sensing by a particular Observer
  - Happening: I sensed Spring in Australia (take-off), but Autumn in Europe (landing)
- **Environment**: a temporal aggregation of Objects which surround the Process or the Object
  - The aircraft and the runways
- Our ESAS'2008 paper IEEE COMPSAC Conf, to appear …



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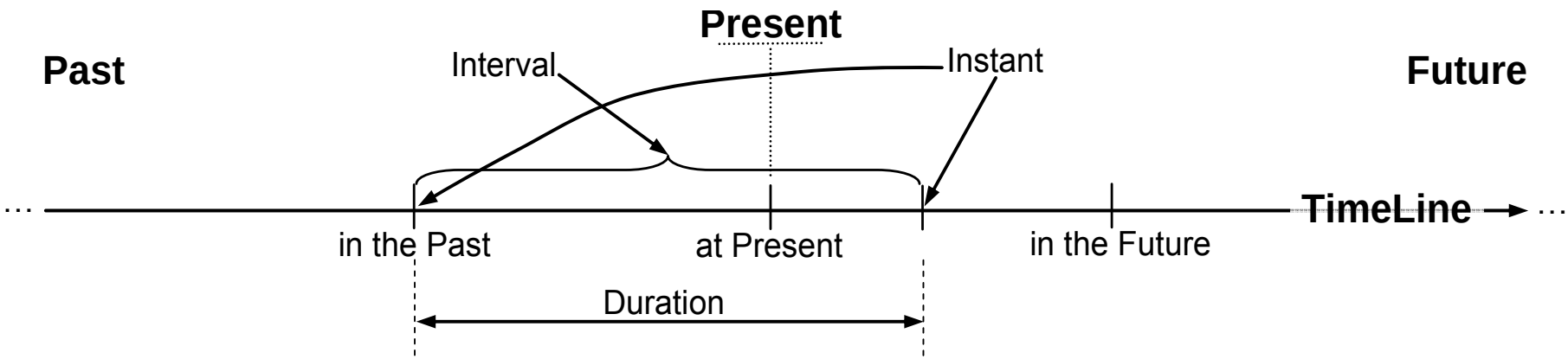
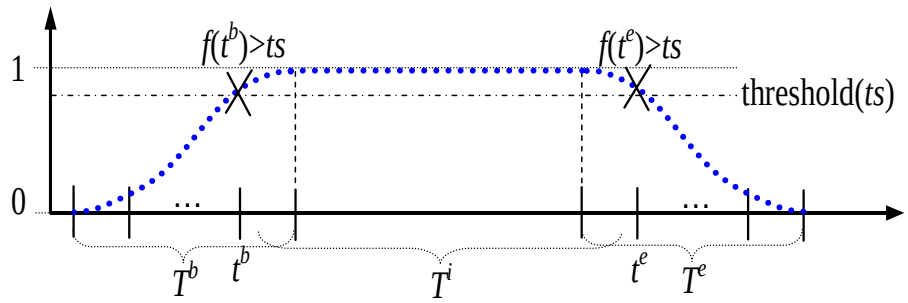
Time



- Linear, anisotropic, discrete
- Time intervals are fuzzy
  - "Springing" schedules



- Our ISTA'2008 paper …

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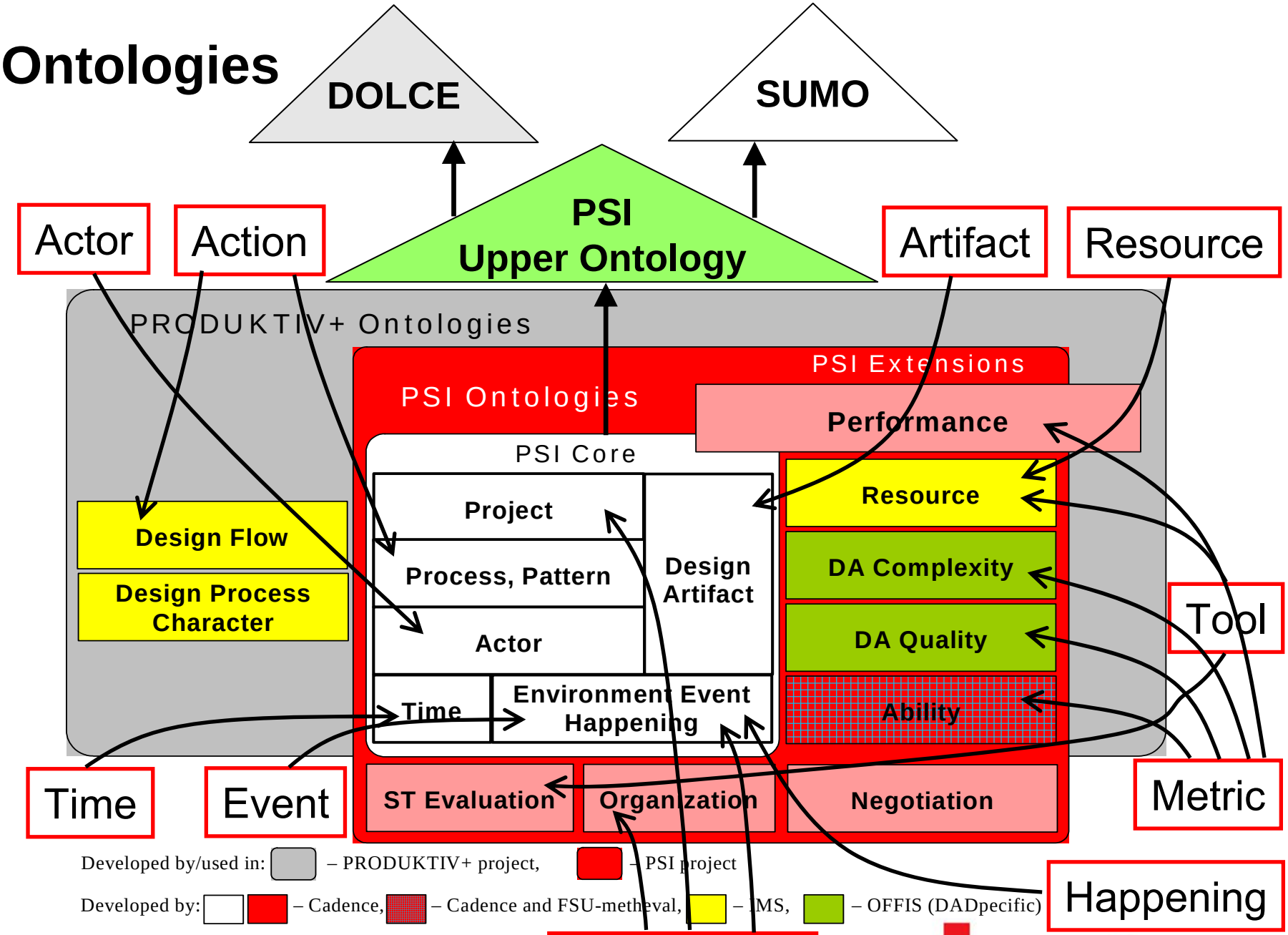
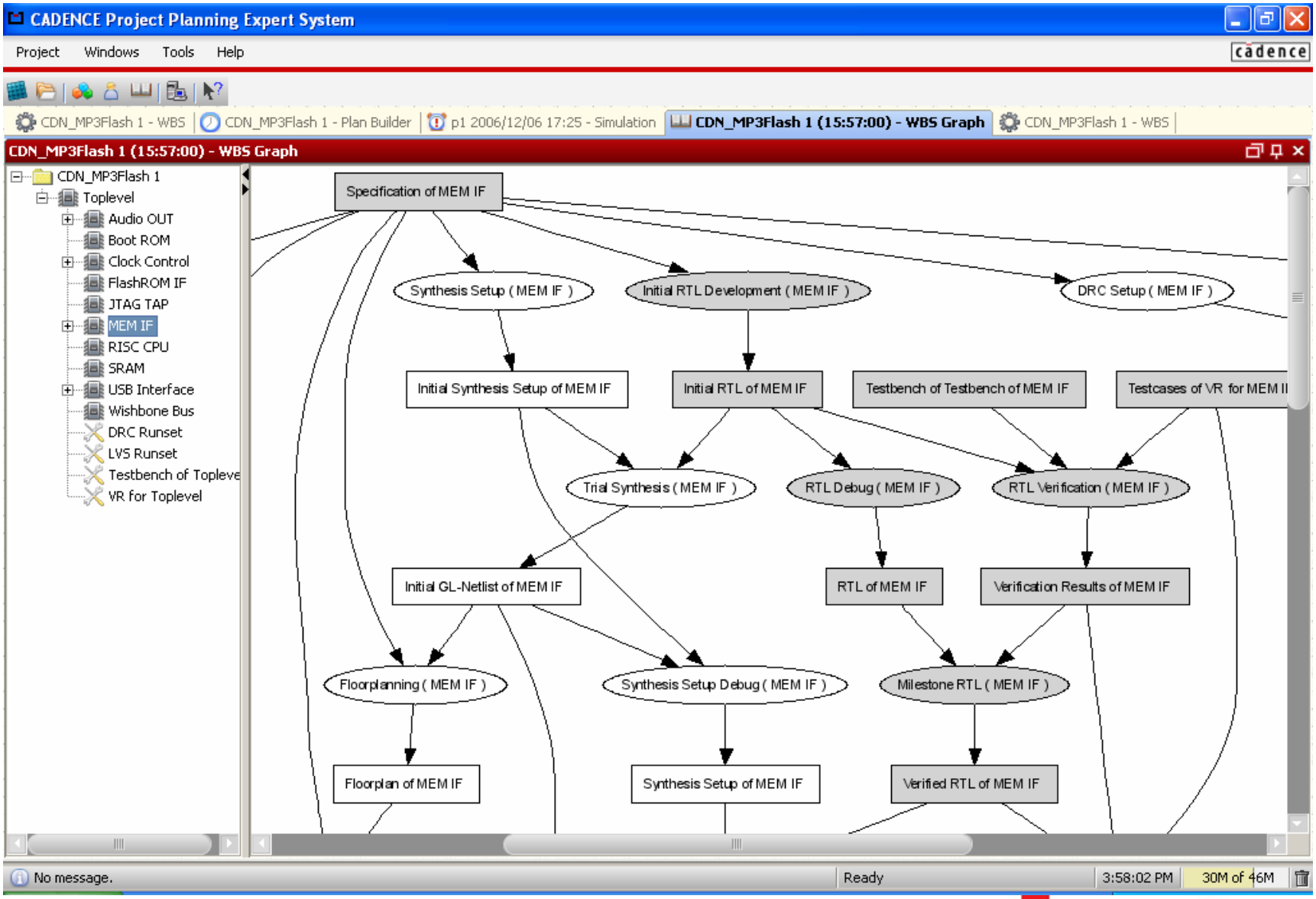
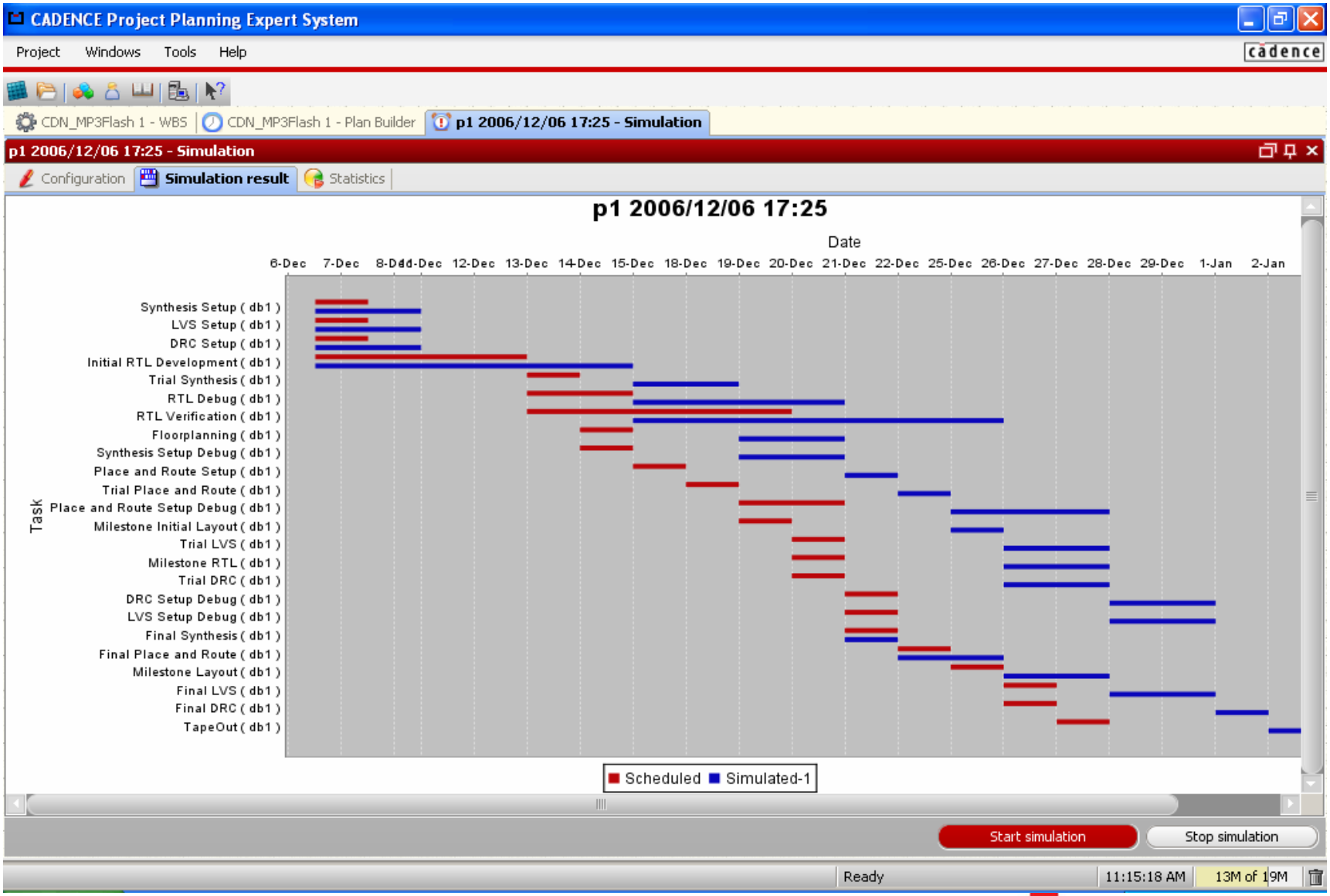
Ontologies



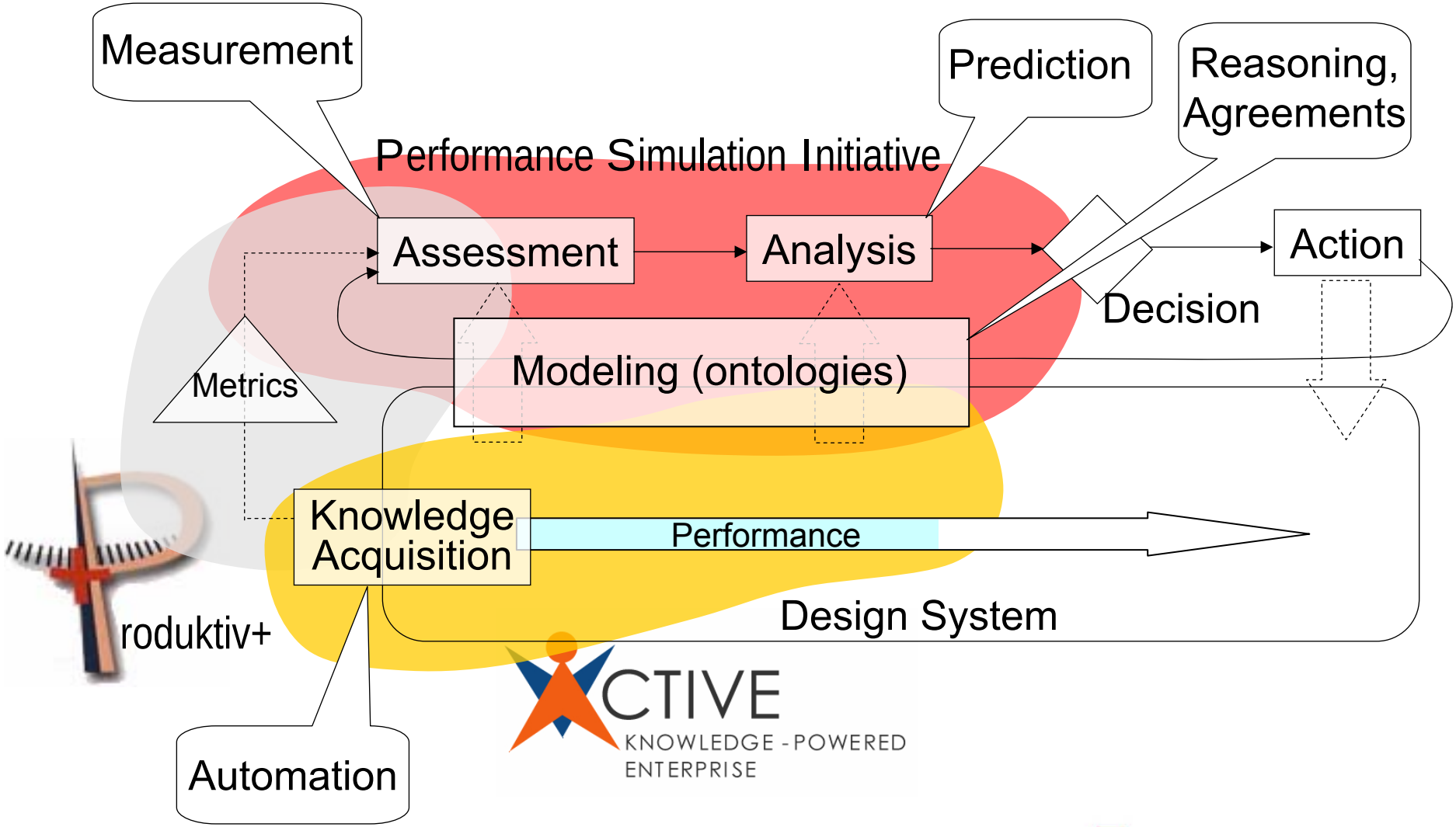
Simulation Tool: WBS generation



Simulation Tool: Design Process Simulation



Agenda for Ongoing and Future Work



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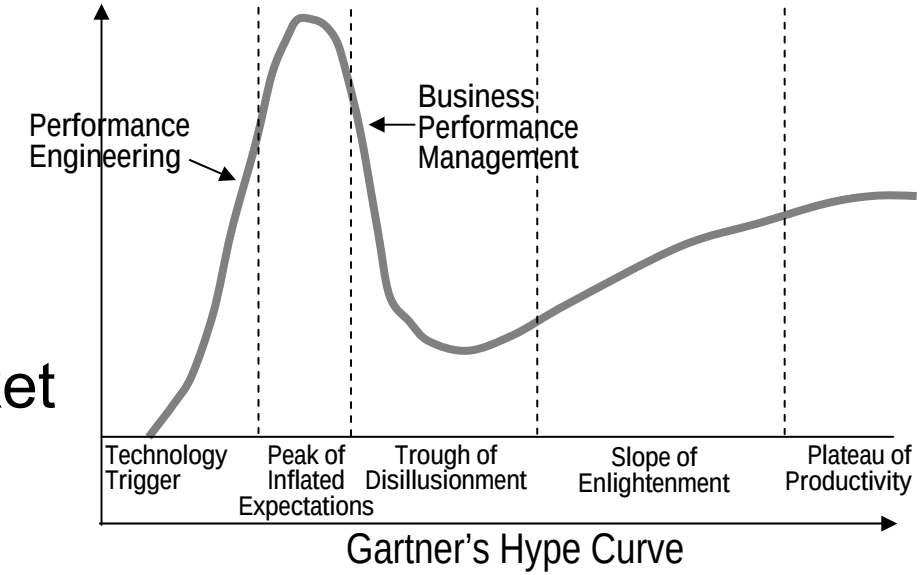
Concluding Remarks



- A growing multi-billion market
  - BSC, PPrism, PPyramid, …
  - Industrial customers are currently disappointed
- Engineering Design Performance
  - Builds upon the reasons of disillusionment in industries
  - Triggers technology development
  - Is challenging in innovative businesses (e.g., design):
    - E.g., effectiveness: design McLaren aiming to be No1 in F1 …
    - E.g., effectiveness and efficiency: spending 100 MY for proving that the approach was wrong …
    - Goals are changing, requirements are vague and contradictory
  - Applicable broader than to one particular industry
    - Software (IS) Design?

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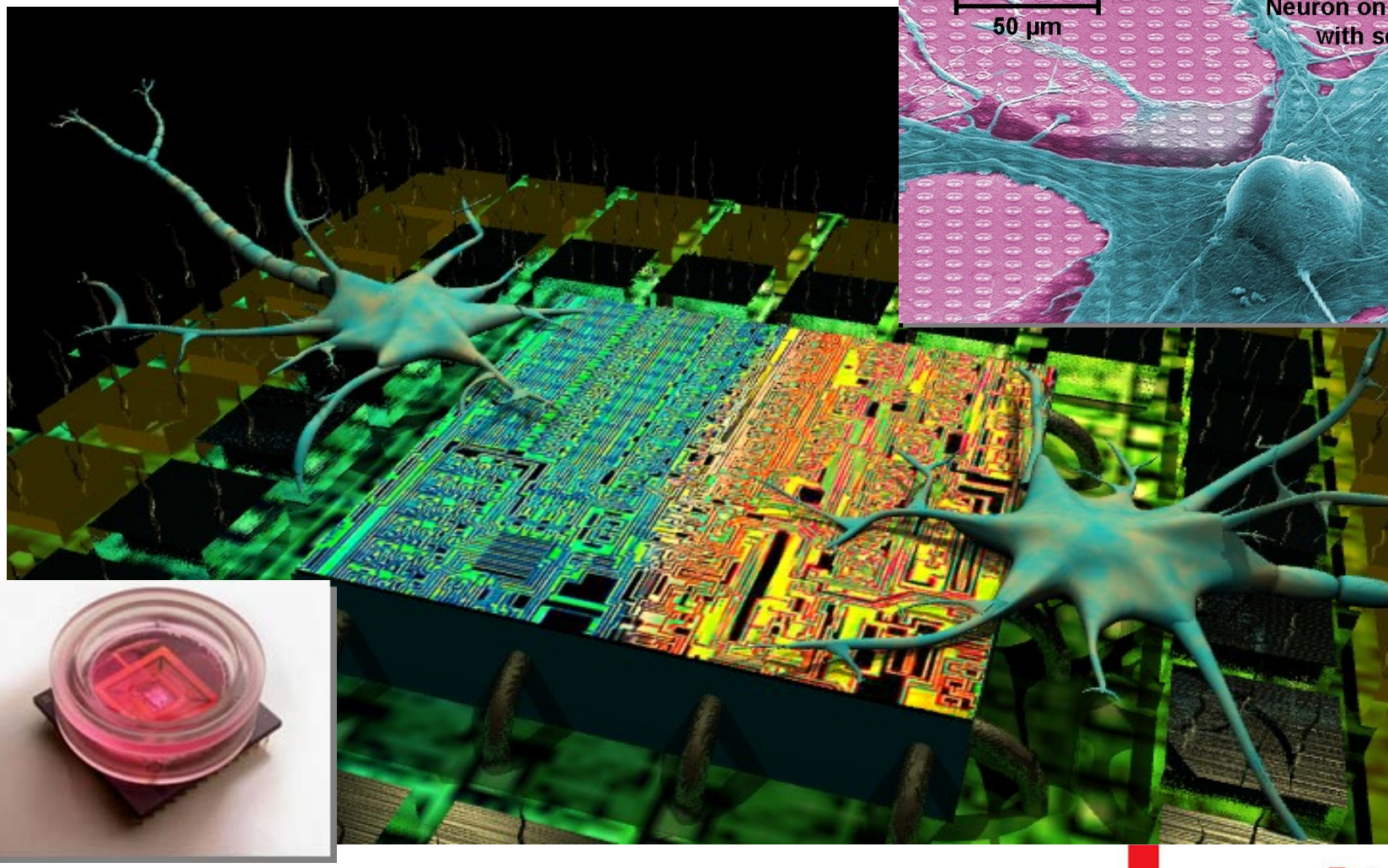
Questions Please



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