Flexible Artifact-Centric Process Models

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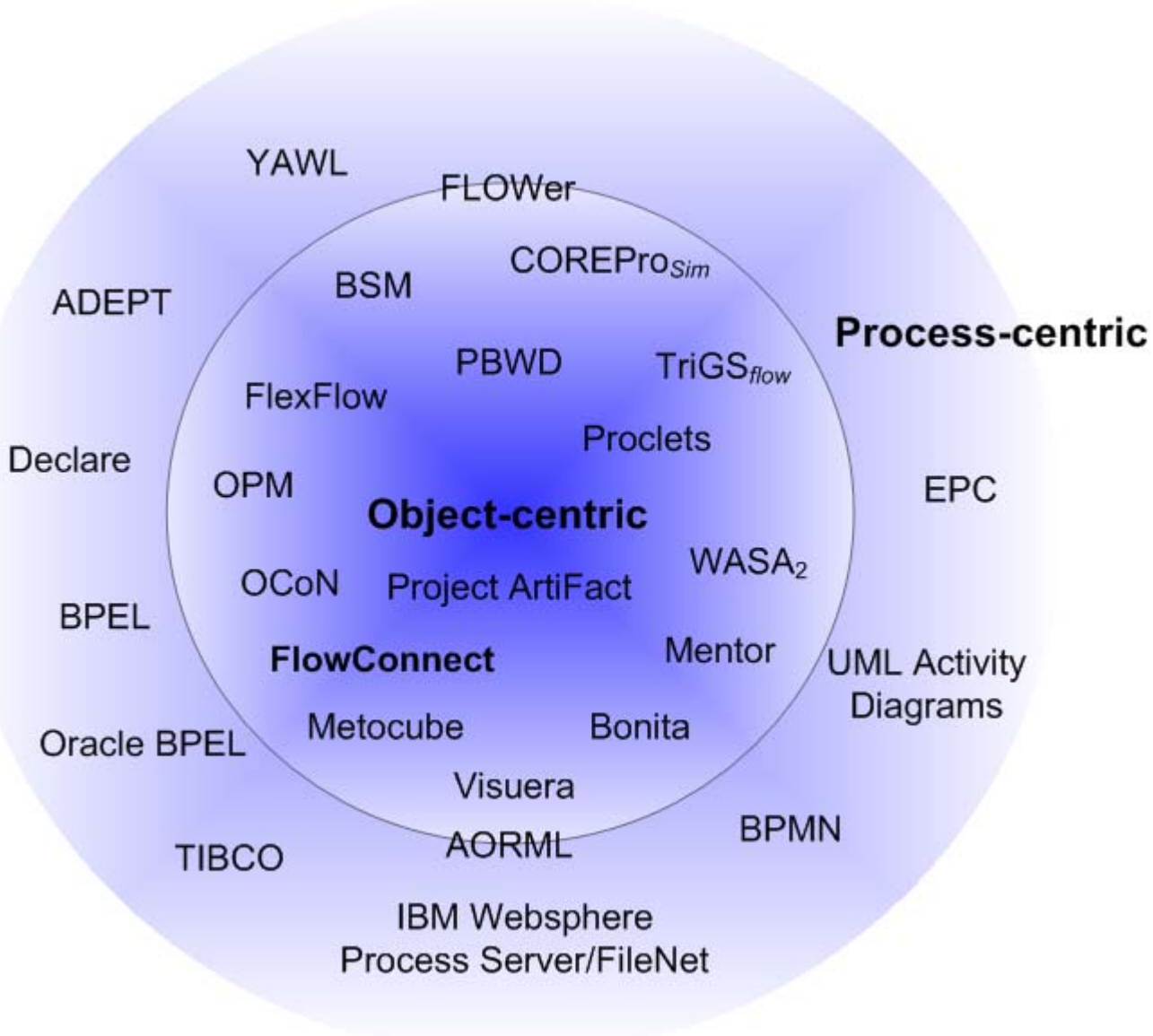
Activity-Centric vs. Artifact-Centric

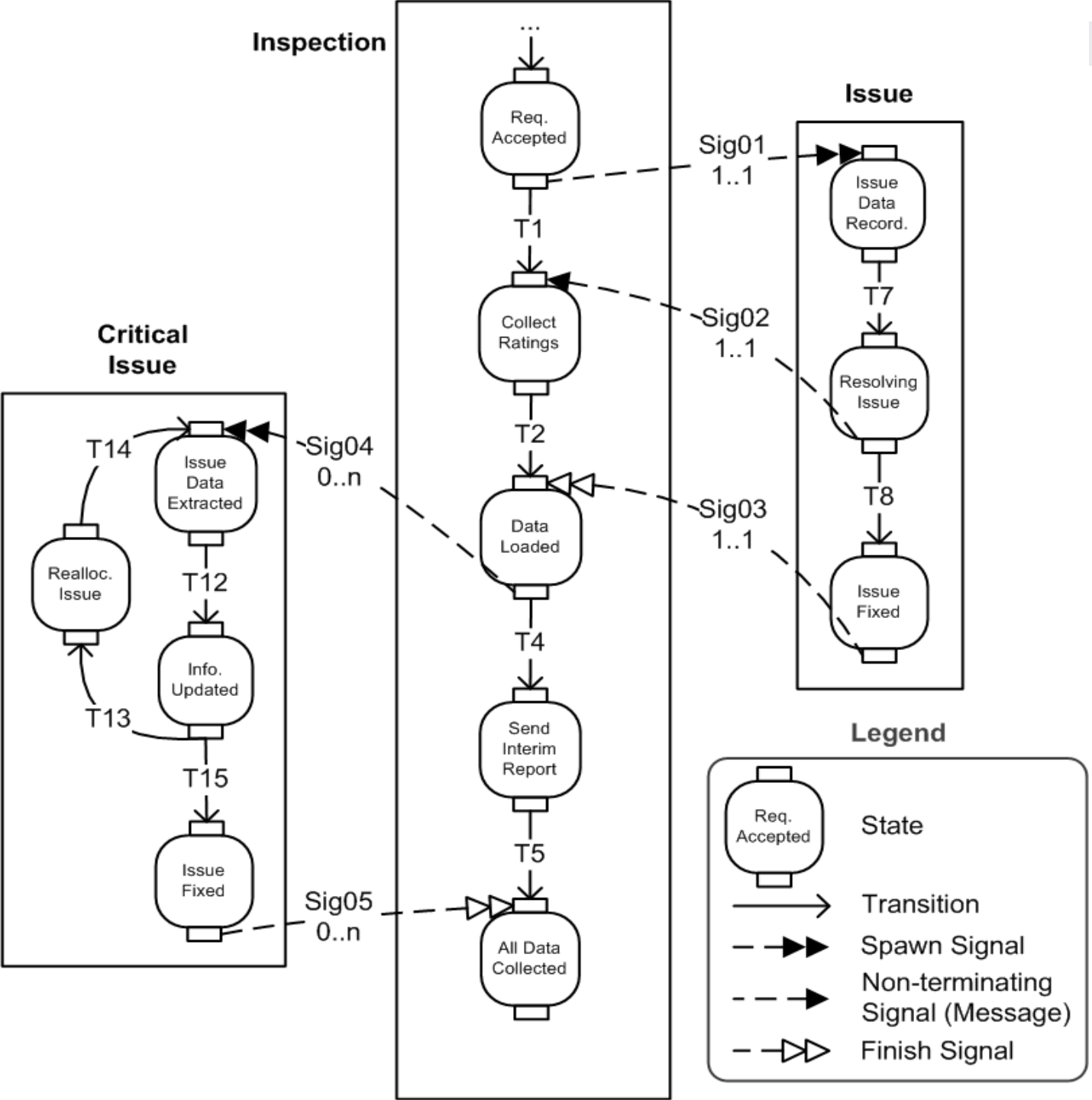


Background: FlowConnect

- Small BPM solution provider (ca. 15 people)
- Over many years, it has built a workflow engine based on *business objects* (artifacts)
- At design level, processes are informally captured as interconnected state machines
- At the implementation level, state machines are encoded in relational tables
- Manual design-to-implementation conversion
- Needs a more formalised design language

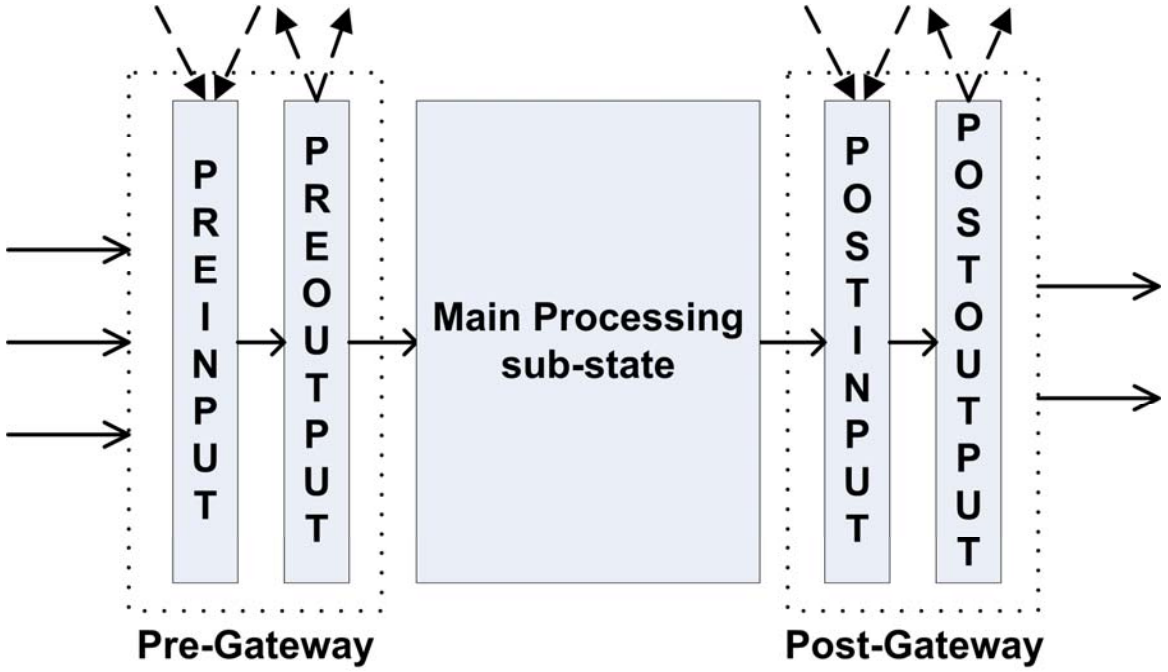
Base FlowConnect Model

- Object model = set of object types
- Object behavior = state machine where:
  - Transitions are labelled with ECA rules
  - States contain one or multiple tasks
  - States have input/output gateways for inter-object communication
- Signals
  - Spawn signals (*1..1*, *0..1*, *1..n*, *0..n*)
  - Messages
  - Return signals
- Signals are buffered


Inspection
...
Req. Accepted
T1
Collect Ratings
T2
Data Loaded
T4
Send Interim Report
T5
All Data Collected
Issue
Sig01 1..1
Issue Data Record.
T7
Sig02 1..1
Resolving Issue
T8
Sig03 1..1
Issue Fixed
Critical Issue
T14
Issue Data Extracted
Sig04 0..n
T12
Info. Updated
T13
Realloc. Issue
T15
Issue Fixed
Sig05 0..n
Legend
Req. Accepted
State
Transition
Spawn Signal
Non-terminating Signal (Message)
Finish Signal

Base FlowConnect Model (cont.)

- Structure of a state



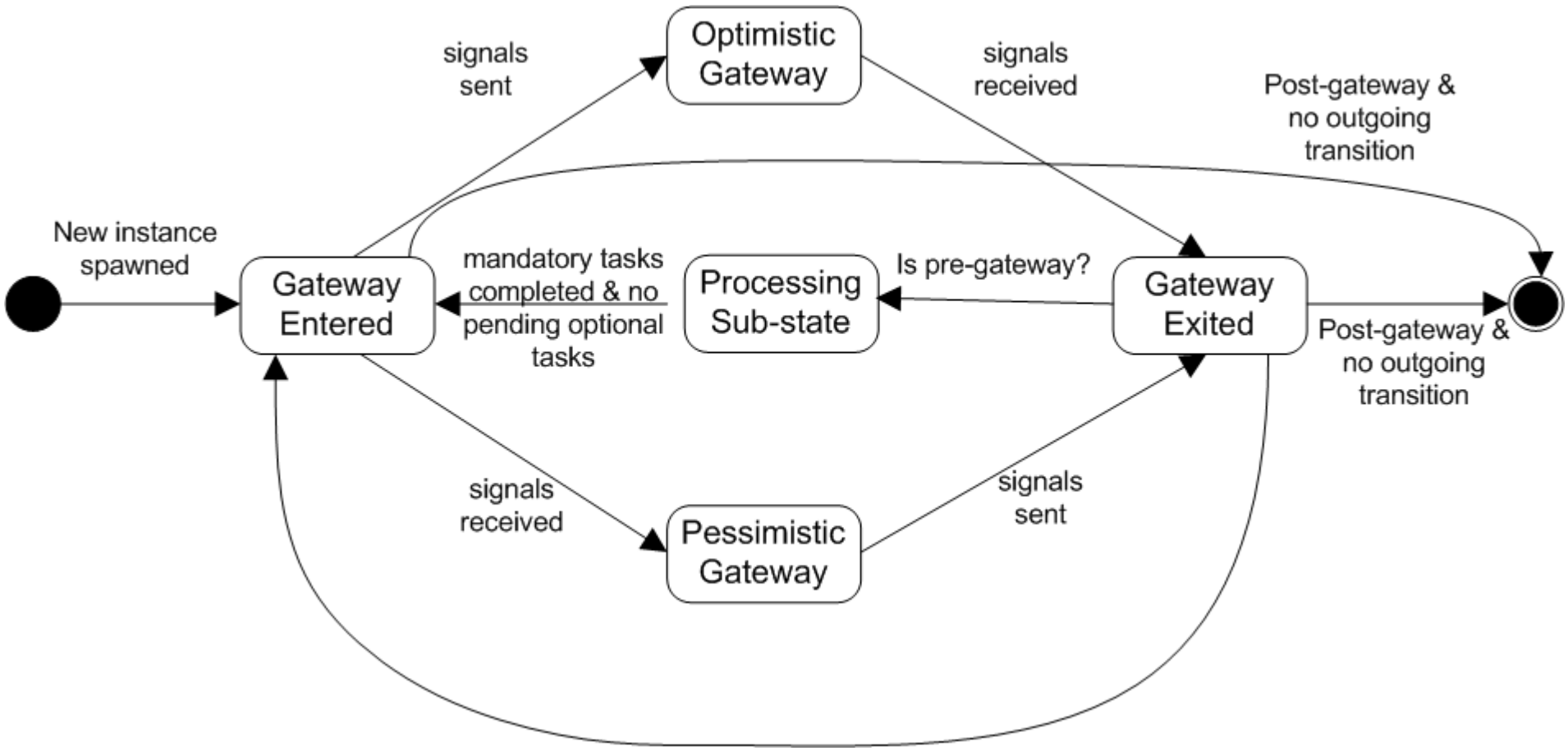
Base FlowConnect Model (cont.)

- Synchronization time:
  - *Optimistic*: send then receive
  - *Pessimistic*: receive then send
- Synchronization condition
  - Wait-for-one: one signal of any type
  - Wait-for-all: one signal of each type
  - Wait-for-some: condition on the set of received signals

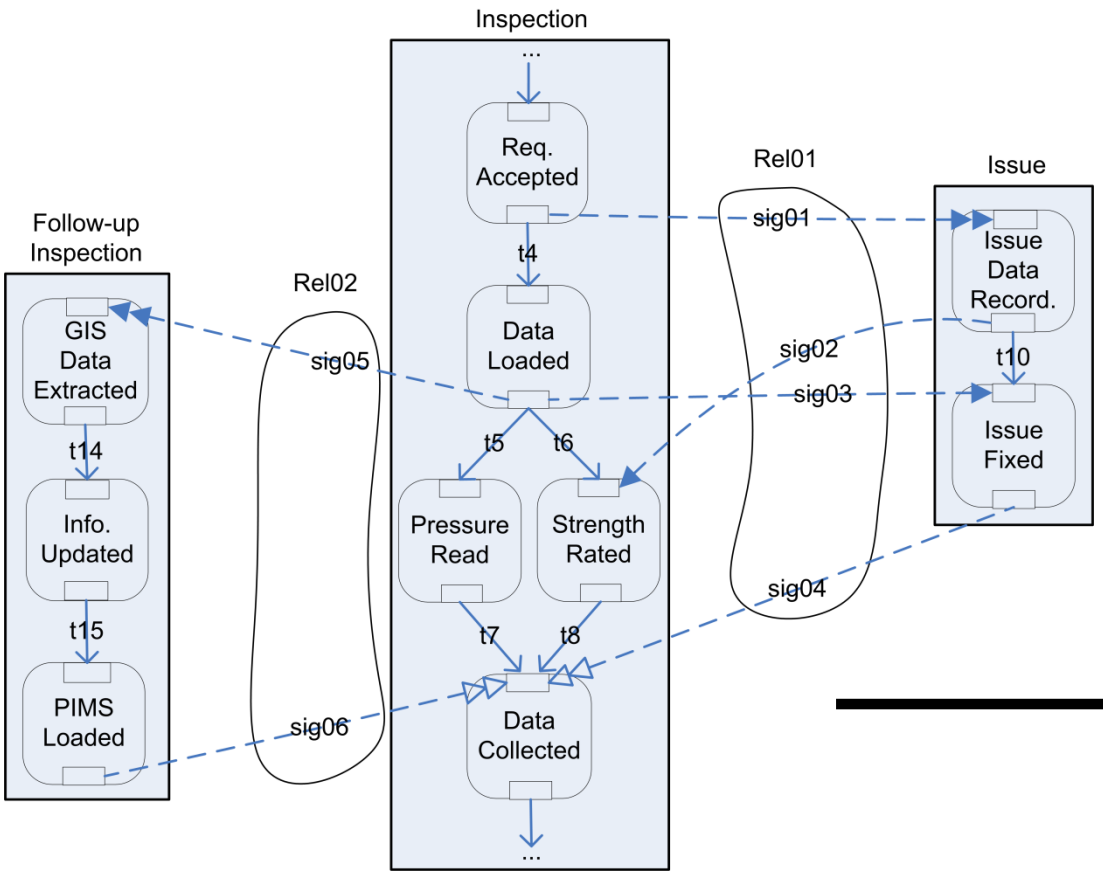
Base FlowConnect Model (cont.)

- A state may have multiple tasks
  - Compulsory
  - Optional tasks
  - More generally: *N..M* constraints *(M >= N >=0)*

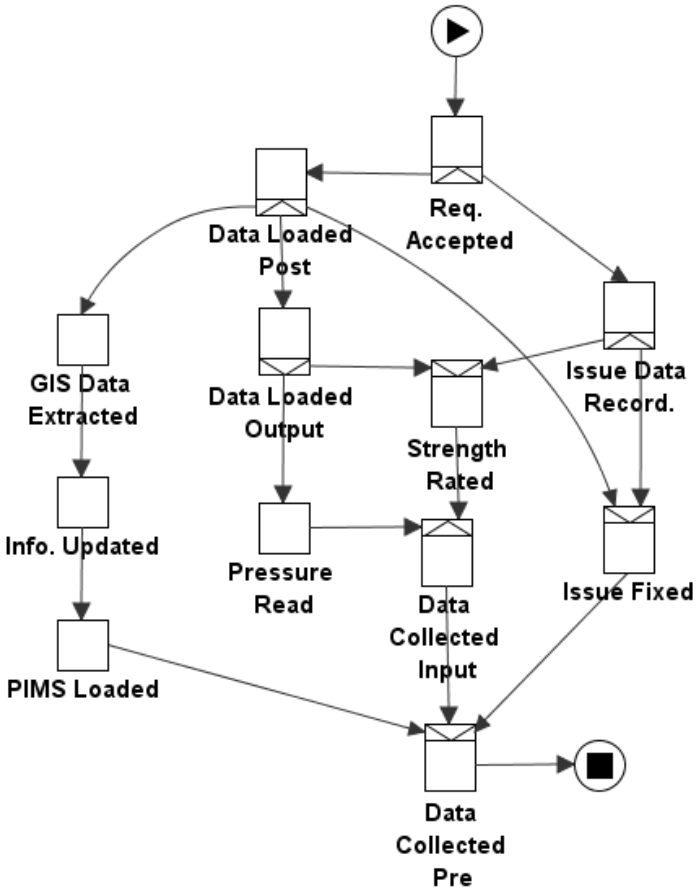
Overview of Operational Semantics



FlowConnect to YAWL



FlowConnect Model



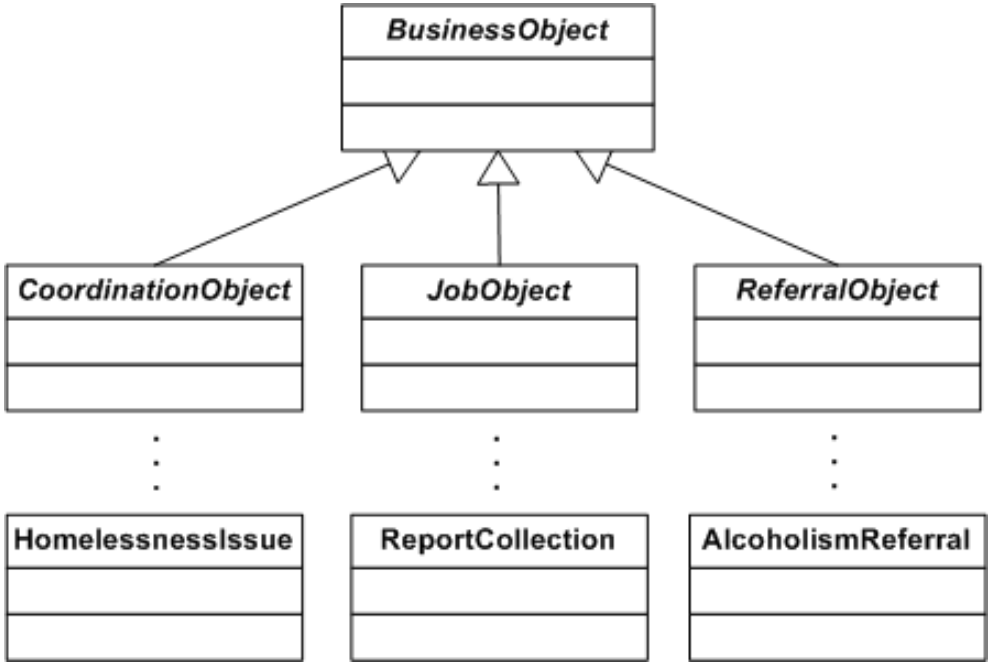
YAWL Model

Phase 2: Flexibility

- In 2007, FlowConnect engaged in a major project in the human services domain
- Base model was found too rigid, e.g.
  - A Health Assessment process may require additional Tests and Treatments, but we don't know in advance which ones nor when
  - During a homelessness process a social worker may discover additional issues (e.g. alcoholism, drugs) outside the scope of the homelessness process.

Additional concepts

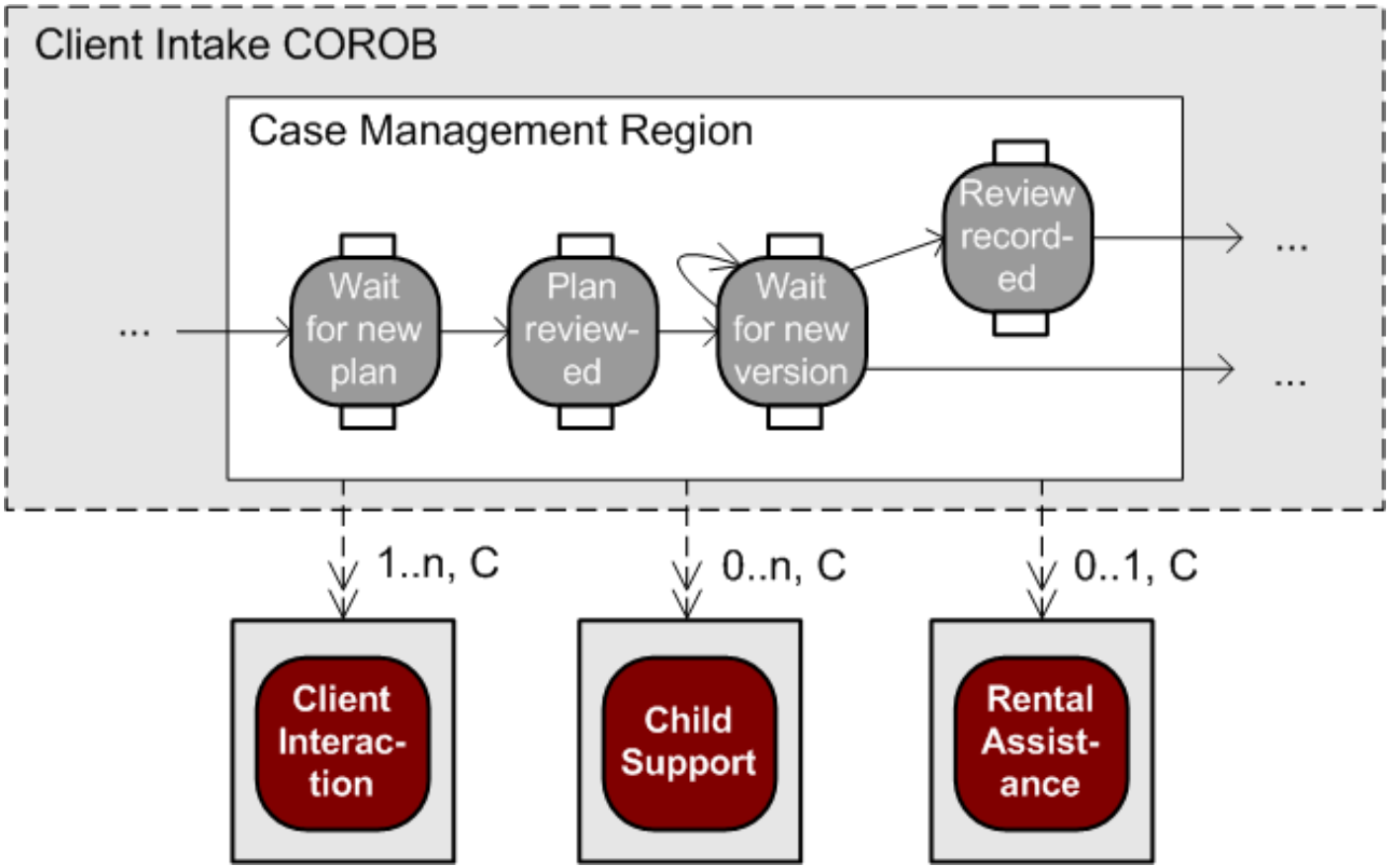
- Distinction between:
  - Coordination objects
  - Job Objects (tasks)
  - Referral objects (for runtime referral)



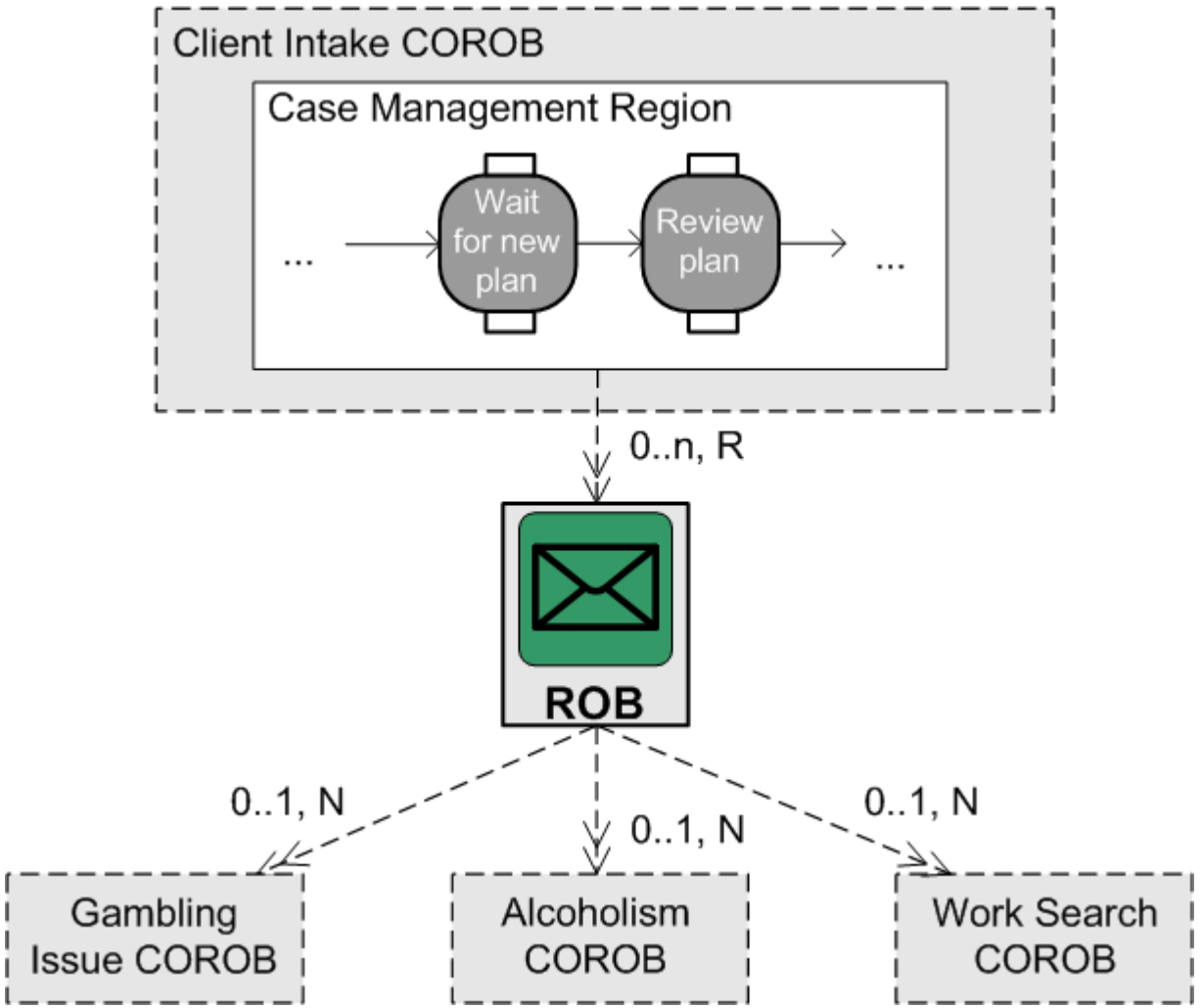
Additional concepts

- *Creation regions*: grouping of states
- Dynamic (creation) signals
  - Signals that are enabled within the boundaries of a creation region
  - Can be raised anywhere in a creation region (or anywhere in a lifecycle)

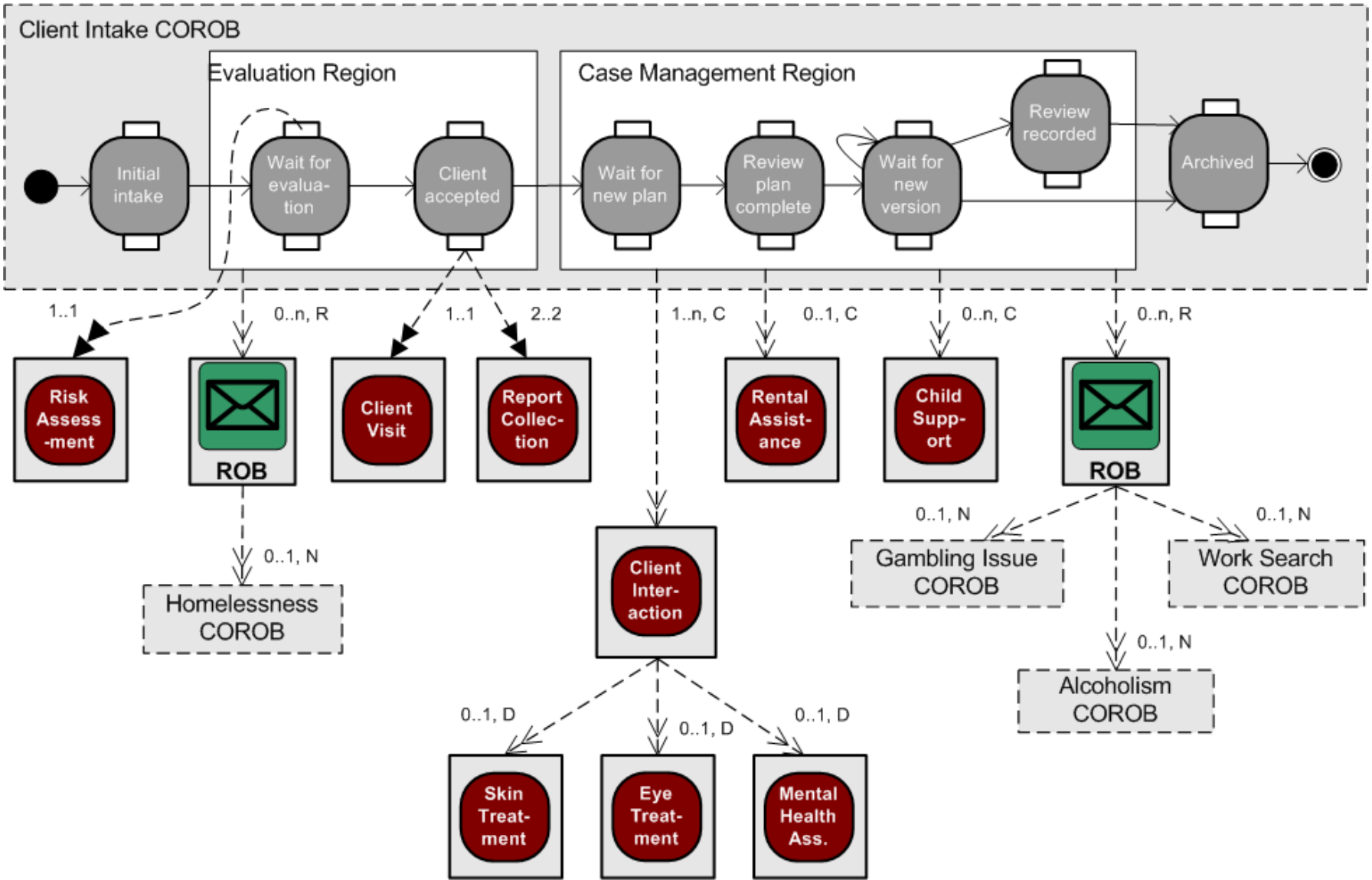
Direct Creation Flexibility



Indirect Creation Flexibility



How it looks at the end…



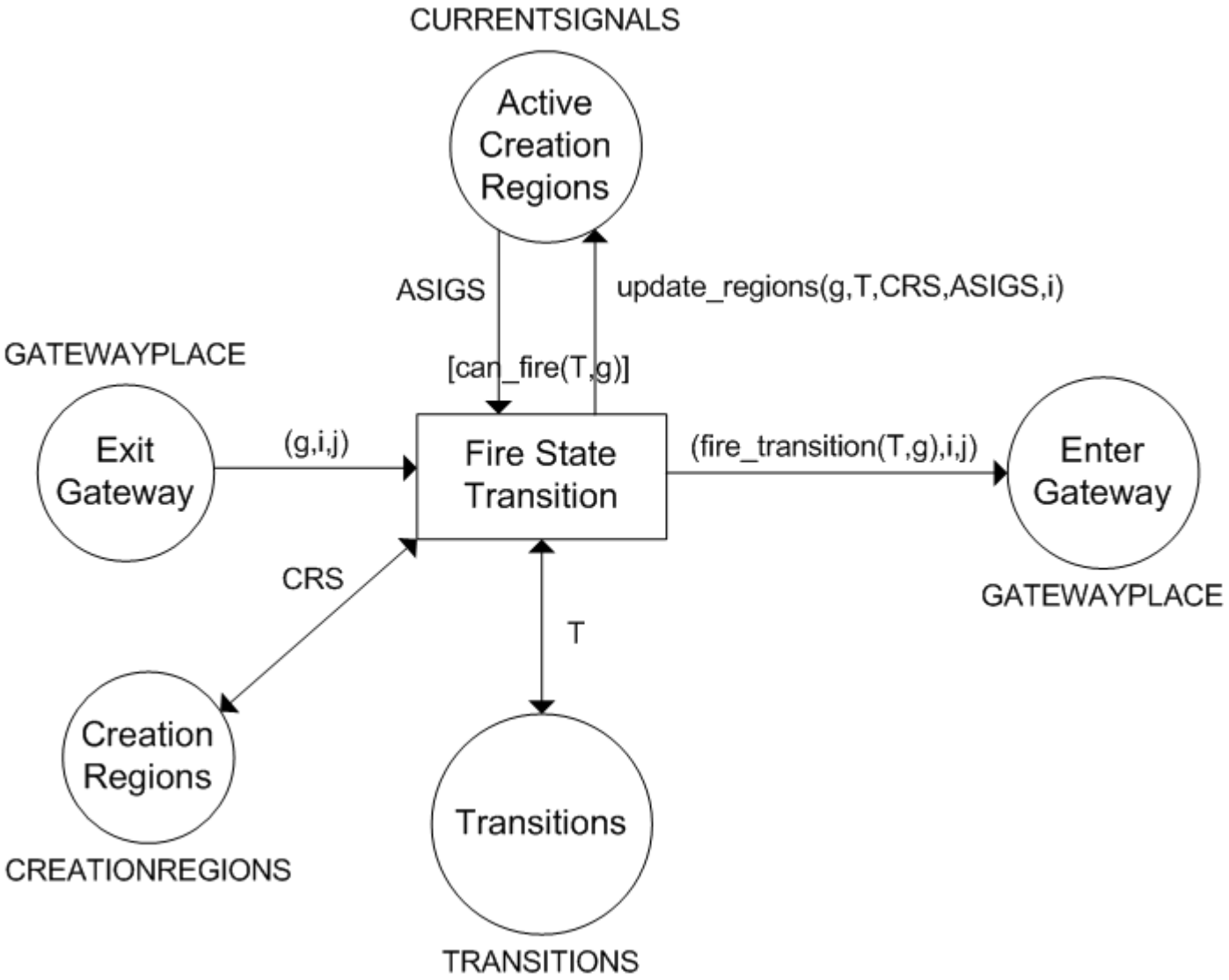
Phase 3: Simulation

- Motivation
  - Detect bottlenecks (cycle time analysis, resource utilization analysis)
  - Costing
    - Assign costs to artifacts
    - Understand how much flexibility costs
- How should simulation specs for object-centric models look like?

Towards simulation

- Colored Petri Net (CPN) encoding a CPN interpreter
- Tool for transforming FlexConnect models into SML data structures to feed the CPN
- Future: Extending FlexConnect with resource pools, resource capacity, cost, probability distributions for task durations, transition firing, signal sending, etc.

CPN encoding: Fire Transition



CPN Encoding: Dynamic Signal