Graphical Systems Modeling with UML / SysML

Activity diagrams

© Piotr Ciskowski
Perspectives - views:

architecture
- class diagram
- object diagram
- composite structure diagram
- package diagram

behavior
- sequence diagram
- activity diagram
- state machine diagram
- interaction overview diagram
- communication diagram
- timing diagram
- package diagram

Logical view

Use case view

Dynamic View

Deployment View

Implementation View

system scope & functionality
- use case diagram
- package diagram

software
- component diagram
- package diagram

hardware
- deployment diagram
- package diagram
Activity diagram

- presents system’s dynamic - behavior - logic
- captures the logic of use cases’s scenarios
  - operations
  - algorithms
  - systems - subsystems
  - system processes - business processes
- equivalent to: flow charts - steps + decisions
  - data flow charts
- graphical representation of sequential and/or concurrent flow control and data control
  - flow activities, actions and objects
  - decision, iteration, concurrency
- general view on processes: use case → class → activity → sequence → ...
  state machine
ACTIVITY DIAGRAM ELEMENTS
Activity diagram elements

- initial node - final node - flow final
- activity - action
- flow
- condition - decision - merge
- fork - join
  - partition
- sub-activity
Activities vs. Actions
Activities and actions

- decomposition: activities \(\Rightarrow\) sub-activities \(\Rightarrow\) actions

- activities - actions:

  - Calculate Gross Salary
  - Solve equation
  - Calculate Delta

\[
\text{salary} := \text{workingHours} \times \text{hourRate}
\]

\[
\text{delta} := b^2 - 4ac
\]
Activities and actions

- decomposition: activities ⇒ sub-activities ⇒ actions

- actions:
  - atomic
  - call behavior - call operation
  - accept event - accept time event - send signal
  - write variable - value specification
  - create object - destroy object
  - other
Control flow

SEQUENCES
Control flow

- sequential - logging

```
enter
login
```

```
Enter password
```

```
```
Control flow

DECISIONS
Control flow

- decisions:
  - Monday morning
  - Wake up
    - [hungry] Have breakfast
    - [not hungry] Keep on sleeping / dreaming
Control flow

- decisions:

  Monday morning

  Wake up

  [hungry] / [not hungry]

  Have breakfast / Keep on sleeping / dreaming
Control flow

CONCURRENCY
Control flow

- concurrency:

```
Print invoice  Print receipt  Issue shipment letter

Prepare shipment  Send shipment notification

Dispatch shipment

(joinSpec = (A and C) or (B and C))
```

example: based on Wrycza et al., Język UML 2.0 w modelowaniu… (modified)
Control flow

• concurrency:

example: based on Wrycza et al., Język UML 2.0 w modelowaniu... (modified)
Control flow

- concurrency:

  [corporate]
  client
  [private]

  Print invoice
  Print receipt
  Issue shipment letter

  Prepare shipment
  Send shipment notification

  Dispatch shipment

  example: based on Wrycza et al., Język UML 2.0 w modelowaniu… (modified)
OTHER ELEMENTS
Other elements:

- data flow
- input/output pins
- activity parameters
- weights (constraints)
- signals
- partitions

(image: Visual Paradigm help)
Other elements:

- data flow
- input/output pins
- activity parameters
- weights (constraints)
- signals
- partitions

- expansion regions
- exception handlers
- interruptible activity regions
Other elements:

- data flow
- input/output pins
- activity parameters
- weights (constraints)
- signals
- partitions
- expansion regions
- exception handlers
  - interruptible activity regions
SUMMARY
Activity diagram

Steps:

1. identify main activities and actions - based on use case scenario
2. connect activities with flow control paths
3. decompose structured activities into activities and activities into actions
4. add decisions and concurrency
5. add data flow
   - input and output pins, activity parameters
   - data stores, buffers
6. add partitions and subpartitions
7. introduce special regions:
   - expansions
   - exceptions