SENG 471

Software Requirements Engineering

Modelling Functions - Interactions

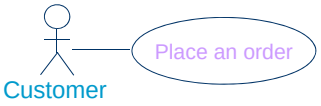
Example: Online Order System

The customer places his order (by adding items, possibly removing items, and then submitting the order). The order clerk retrieves the order from the system and assigns it to a delivery person. The delivery person delivers the order to the customer.

SADT = Structured Analysis and Design Technique
DFD = dataflow diagrams
ET = Event Trace

Moving Towards Specifications

- Provided functions → operations:
  - Description of functions from a user's perspective
  - Connecting functions with data
  - User interaction with functions

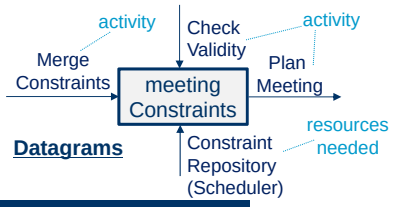


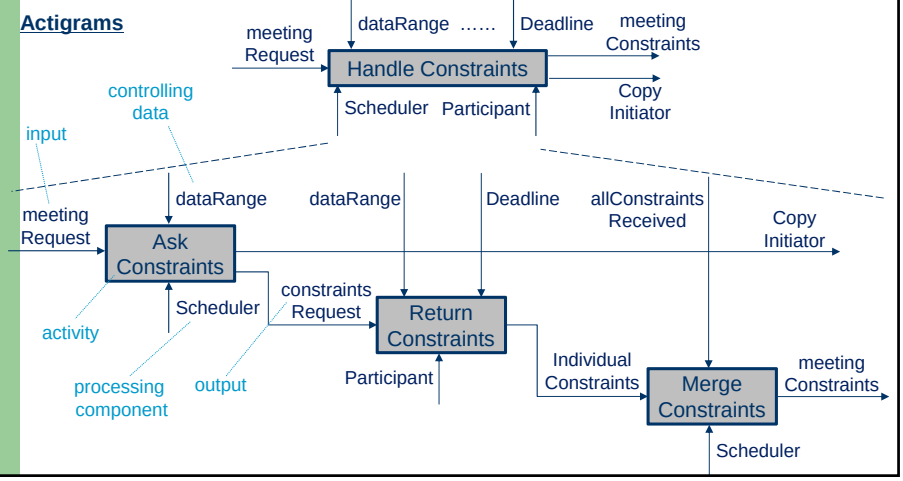
- Approaches
  - Activities and data – SADT diagrams
  - Information flows – DFD
  - System operations – UML use case diagrams
  - Interaction scenarios – ET diagrams (UML sequence diag.)

Dr. Y. Hu

SADT Diag. - activities and data (data-activity duality)

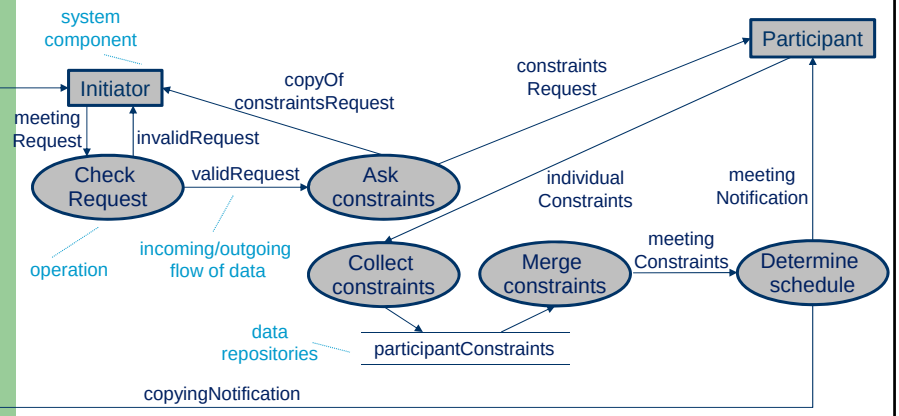
SADT Diag.





DFD: - A simpler though less expressive form of actigrams
- Extra rules needed for triggering and synchronizing data
- Same rules for consistency and completeness as SADT

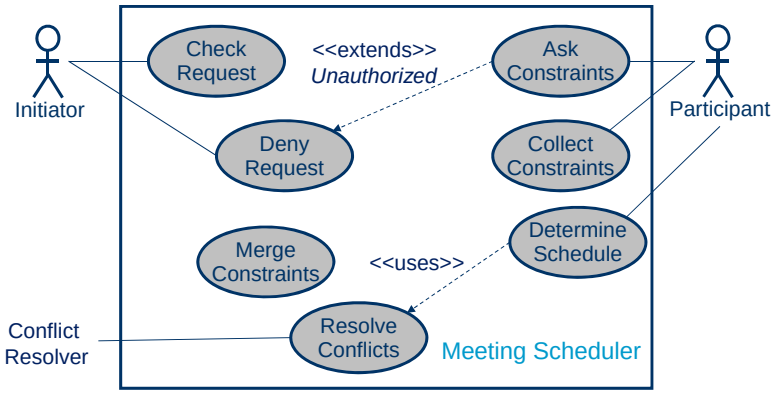
Dataflow Diag. (DFD)



Dr. Y. Hu

Use Case Diag.: - A simple functional outline, fairly vague
- Unclear interaction among operations/components
- Unclear semantics of “uses” and “extends”

UML Use Case Diag.



Dr. Y. Hu

Finding Actors and Use Cases

- Actors ➔ system users, others who the system serves
  - who are the primary user (primary actor)
  - who need support (benefit) from the system
  - who maintain/administrate the system (secondary actor)
  - which hardware devices the system need
  - which other systems the current system interact with
- Use cases ➔ each actor acts upon (receives from) the system
  - which function the actor requires from the system
  - what the actor needs to do
  - whether the actor need to notify (be notified by) the system
  - how the actor's work is made efficient through new functions

Exercise: Online Order System

Prepare SADT, DFD and Use Case diagrams for the online order system:

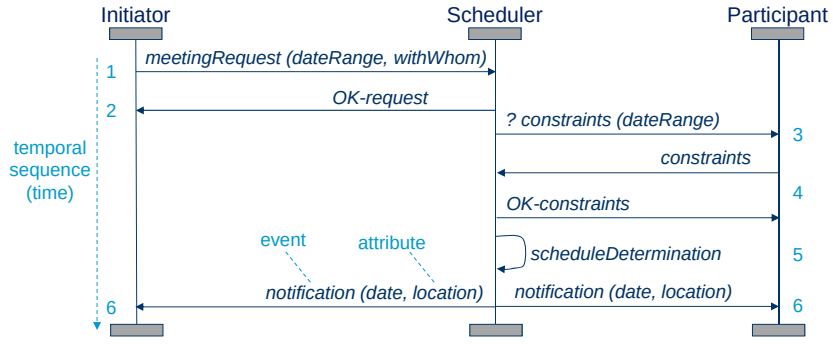
- The customer places his order (by adding items, possibly removing items, and then submitting the order).
- The order clerk retrieves the order from the system and assigns it to a delivery person.
- The delivery person delivers the order to the customer.

Modelling Sequences of Events

- Events trigger state changes of a system
  - SM, SCR
- Events "own" information and behaviour
  - Events don't "know" about other Events' information, but can ask for it.
  - Events collaborate each other to carry out business processes (sending messages to invoke each others' operations).
  - Events only send messages to one another if they "know" each other (an association between them)

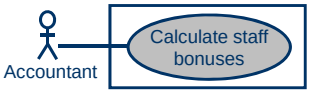
ET diag.: A parallel composition of timelines, associated with the behaviour of a component in an interaction sequence (scenario).

Event Trace (ET) Diagrams

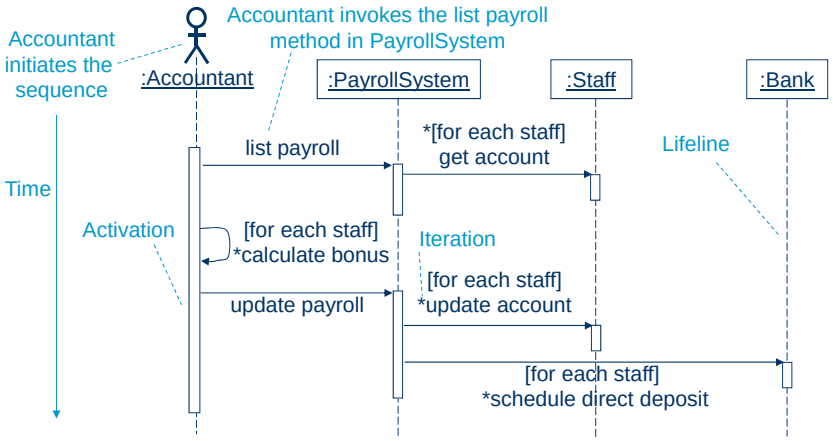


ET diag.: especially appropriate for scenario capture during requirements elicitation and for counterexample visualization during requirements verification.

Sequence Diag.:
Step-by-step what's involved in a use case; May need several sequence diagrams to describe a single use case.



UML Sequence Diagrams



12

Exercise: Online Order System

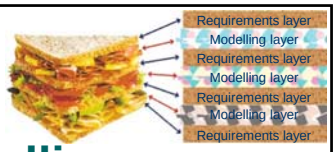
- Prepare a ET and a sequence diagram for the scenario (or use case) Assign Driver:

The order clerk requests a list of drivers from the driver database. Using this database, he selects a driver and the database checks the driver's availability. This is repeated until a driver has be selected (until an available driver is found). Then the order clerk assigns the driver using the database, and the database notifies the driver as a delivery person.

13

Dr. Y. Hu

S/W = software



In Other Words - Modelling

- So far we've seen – all semi-formal:
  - BPMN diagrams (UML activity diagrams)
    - → A business process (workflow) for a target S/W system
  - ER diagrams (UML class diagrams)
    - → Structural aspects of the target system
  - SCR (SM, R-net, UML statechart diagrams)
    - → Behavioural aspects of the target system
  - SADT(DFD, UML use case diagrams)
    - → Operational aspects of the target system
  - ET diagrams (UML sequence diagrams)
    - → Interactions among the structures of the target system

Recap

- So far we've seen – all semi-formal:
  - BPMN diagrams (UML activity diagrams)
    - → Workflow that make up a business process.
  - ER diagrams (UML class diagrams)
    - → Relationship of objects describing an application domain
  - SCR (SM, R-net, UML statechart diagrams)
    - → Behaviour of events (states)
  - SADT(DFD, UML use case diagrams)
    - → Decomposition (data/activities) from a user's perspective
  - ET diagrams (UML sequence diagrams)
    - → Timelines of events in a scenario (a use case)