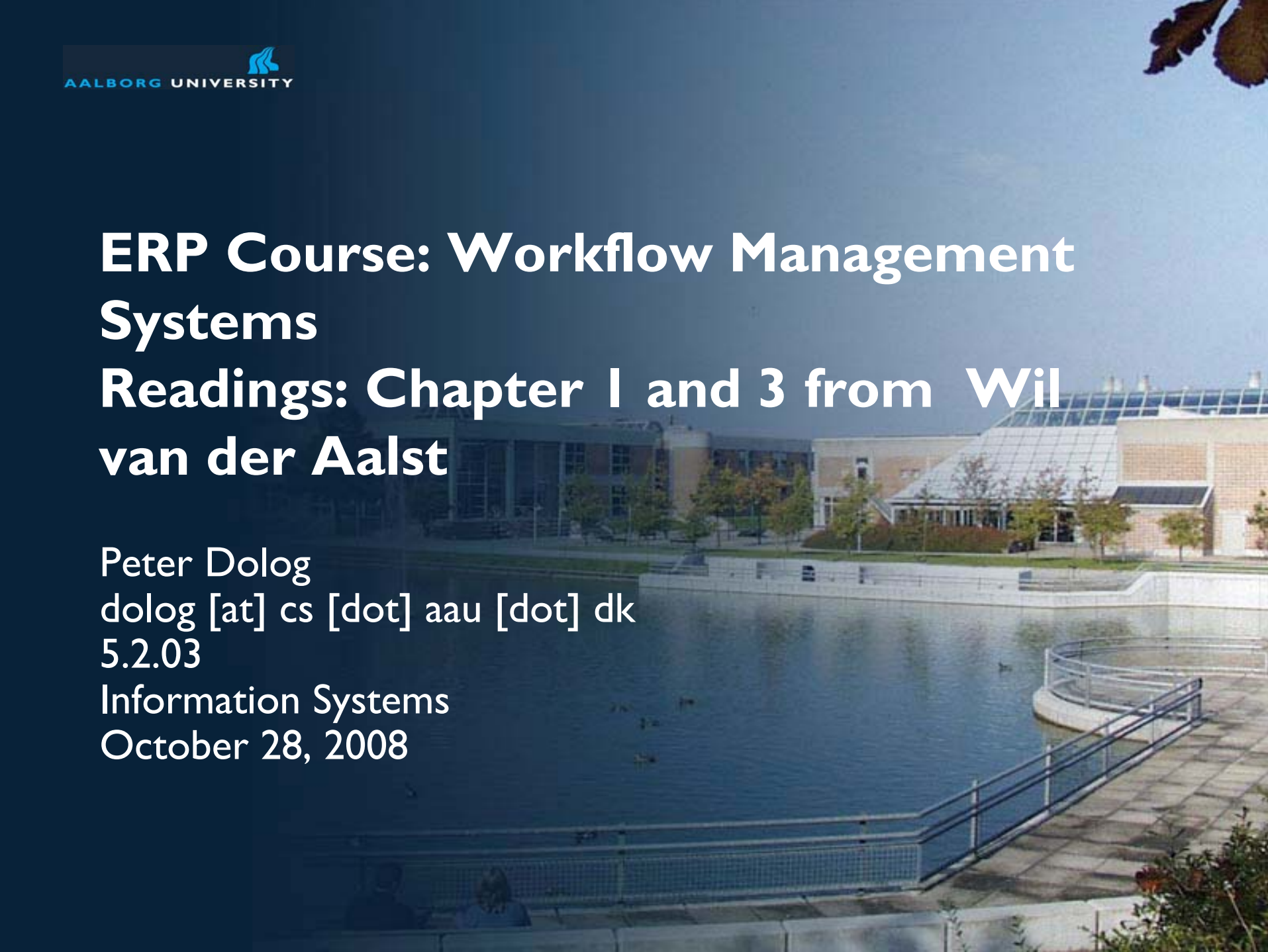

AALBORG UNIVERSITY

ERP Course: Workflow Management Systems
Readings: Chapter 1 and 3 from Wil van der Aalst

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5.2.03
Information Systems
October 28, 2008

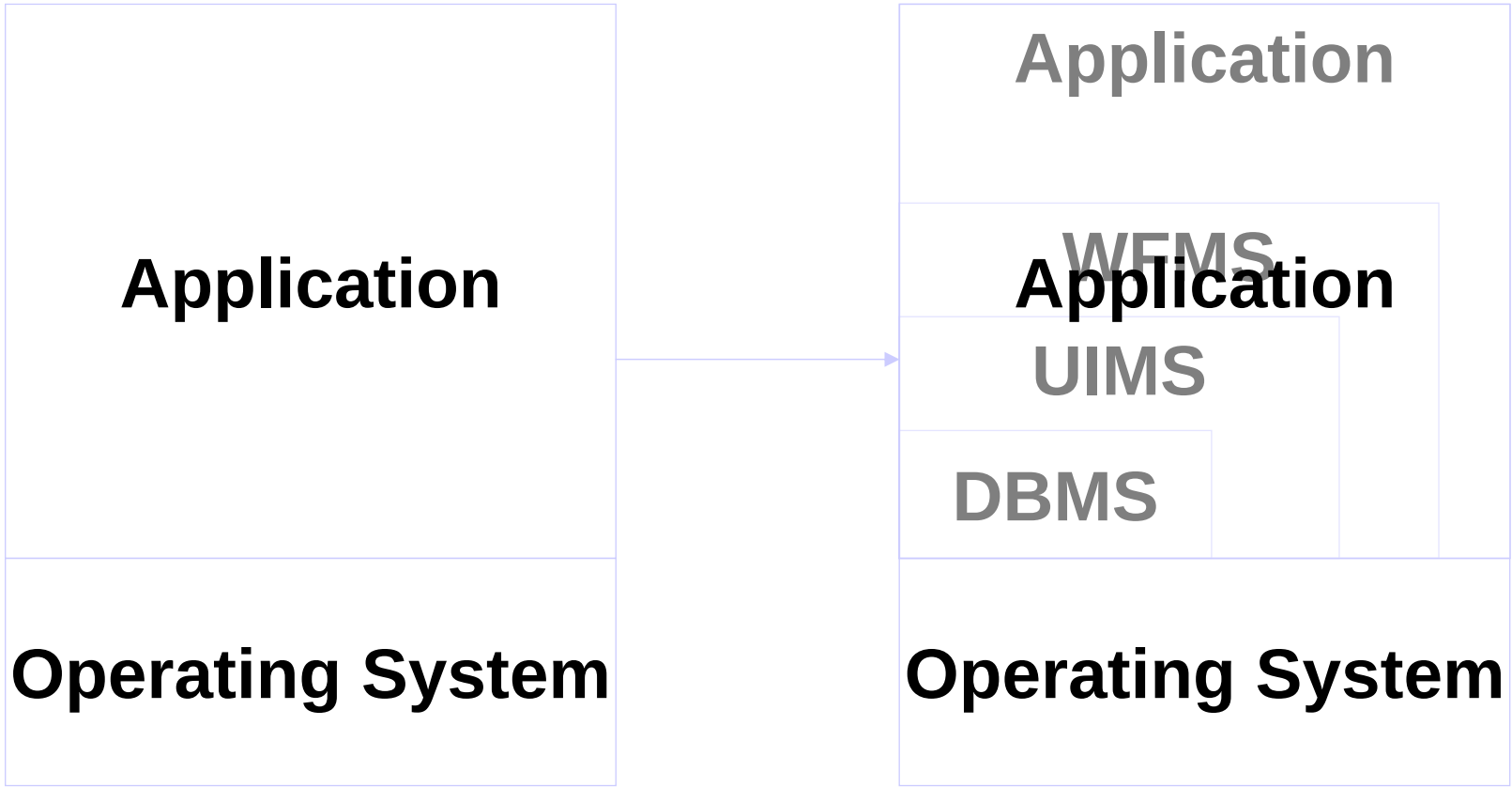
Workflow Management Systems

Workflow is a term used to describe the tasks, procedural steps, organizations or people involved, required input and output information, and tools needed for each step in a business process.

A workflow management system (WFMS) is a software package that can be used to support the definition, management and execution of workflow processes.

A workflow system (WFS) is a system based on a WFMS that supports a specific set of business processes through the execution of computerized process definitions

Separation of Concerns



Workflow Systems (Wil van der Aalst)

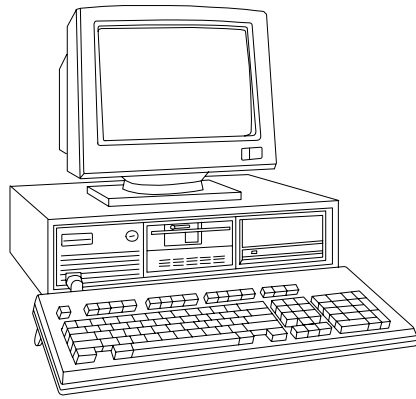
human oriented

system oriented

groupware

workflow

transaction processing



P2P = Person To Person

A2P = Application To Person

A2A = Application To Application

Basic Concepts

Case – thing/item/work/service to be produced/solved/served
Process/Procedure
Tasks – logical step applicable for many cases; can have several work items
Conditions – assigned to the tasks; determine orders, usually based on attributes
Activities – performance of a task on a case by a resource

Processes

Primary – produce products
Secondary – support processes (maintanance, marketing, financial administration, human resource management)
Tertiarty – managerial processes

Resources

Resource
(participant, actor, user, agent)
A resource can execute certain tasks for certain cases.
Human and/or non-human (printer, modem): limited capacity.

Resource class
A set of resources with similar characteristic(s).

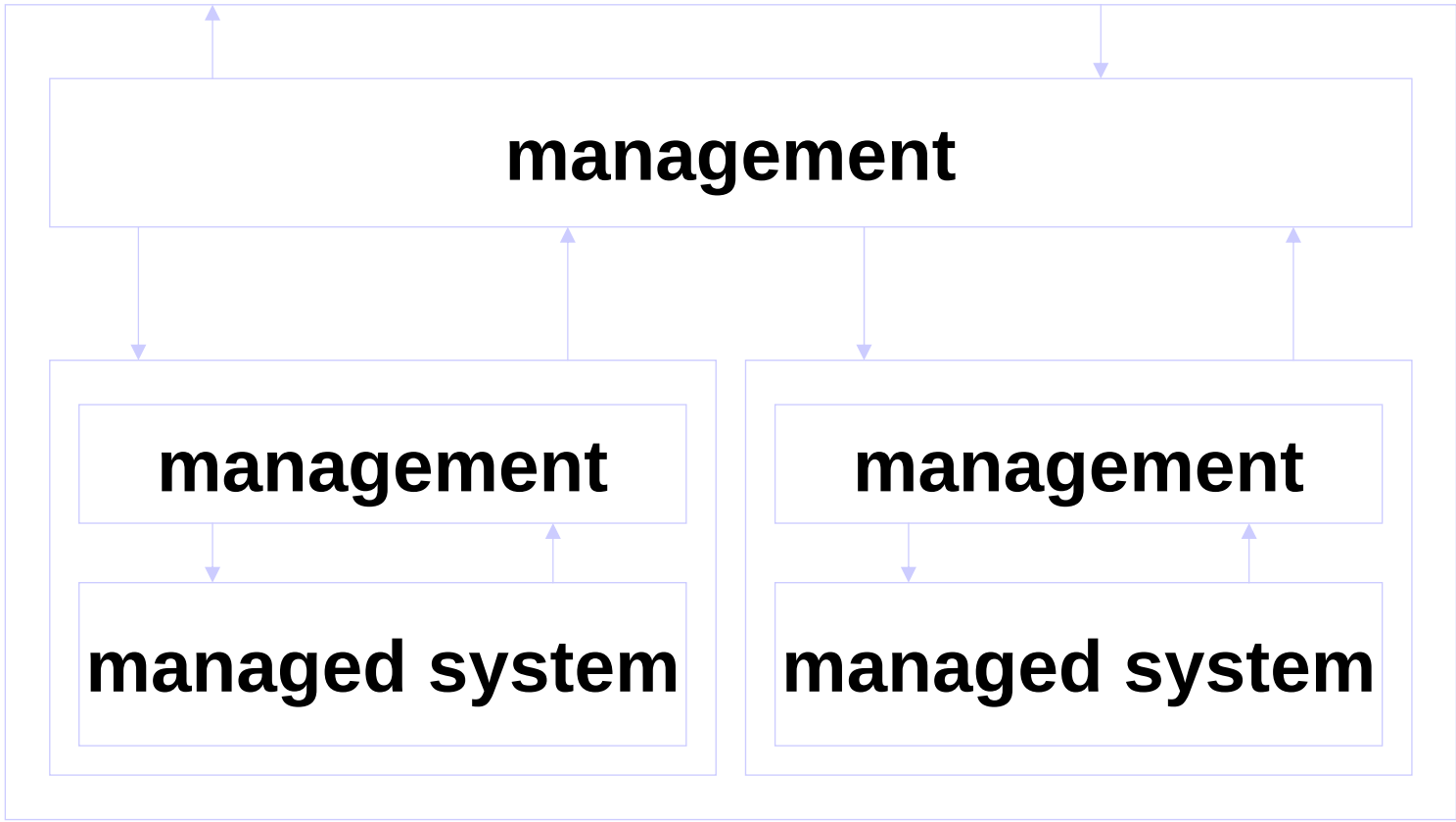
Role
(skill, competence, qualification)
Classification based on what a resource can do.

Group
(department, team, office, organizational unit)
Classification based on the organization

Resource Organization

Hierarchical
Matrix
Network

Managing Processes



Management

Real Time – frequent (control of machines and vehicles)
Operational – decisions made regularly (allocation of resources, routing and cases)
Tactical – decisions are made periodicaly (capacity planning and budgeting)
Strategic – decisions are made on long term basis (structural aspects of processes)

Information Systems for BP

Office Information Systems
Transaction-Processing Systems
Knowledge Management Systems
Decision Support Systems
Control Systems

Modelling Workflows

Petri Nets

A classical Petri net is a four-tuple (P,T,I,O) where:

P is a finite set of places,

T is a finite set of transitions,

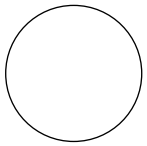
I : P x T -> **N** is the input function, and

O : T x P -> **N** is the output function.

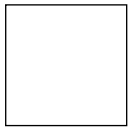
The state (marking) of a Petri net (P,T,I,O) is defined as follows:

s: P-> **N**, i.e., a function mapping the set of places onto {0,1,2, … }.

Graphical Symbols for Petri Nets



Place

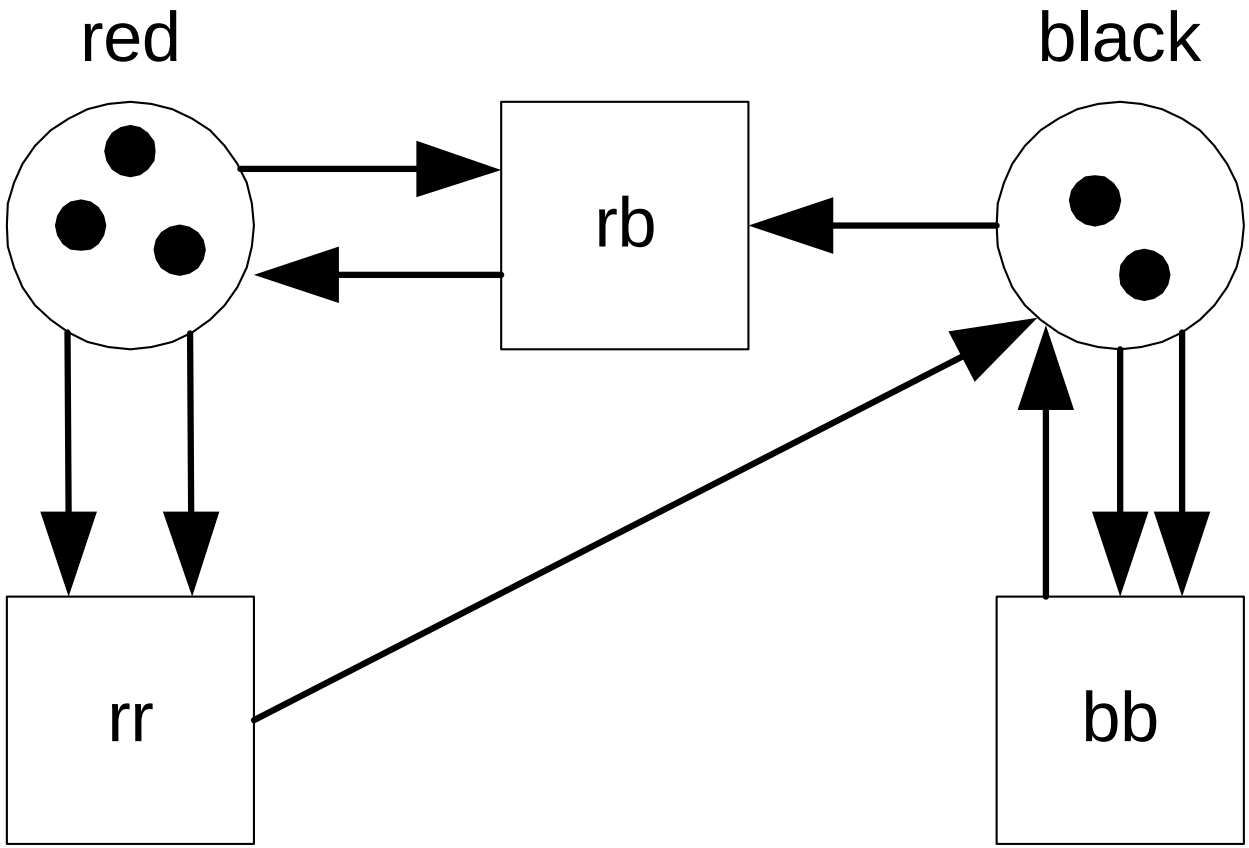


Transition

Arc

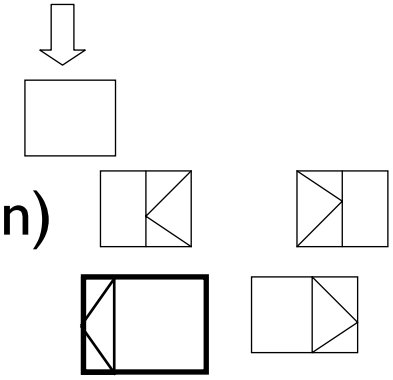
Token

Example



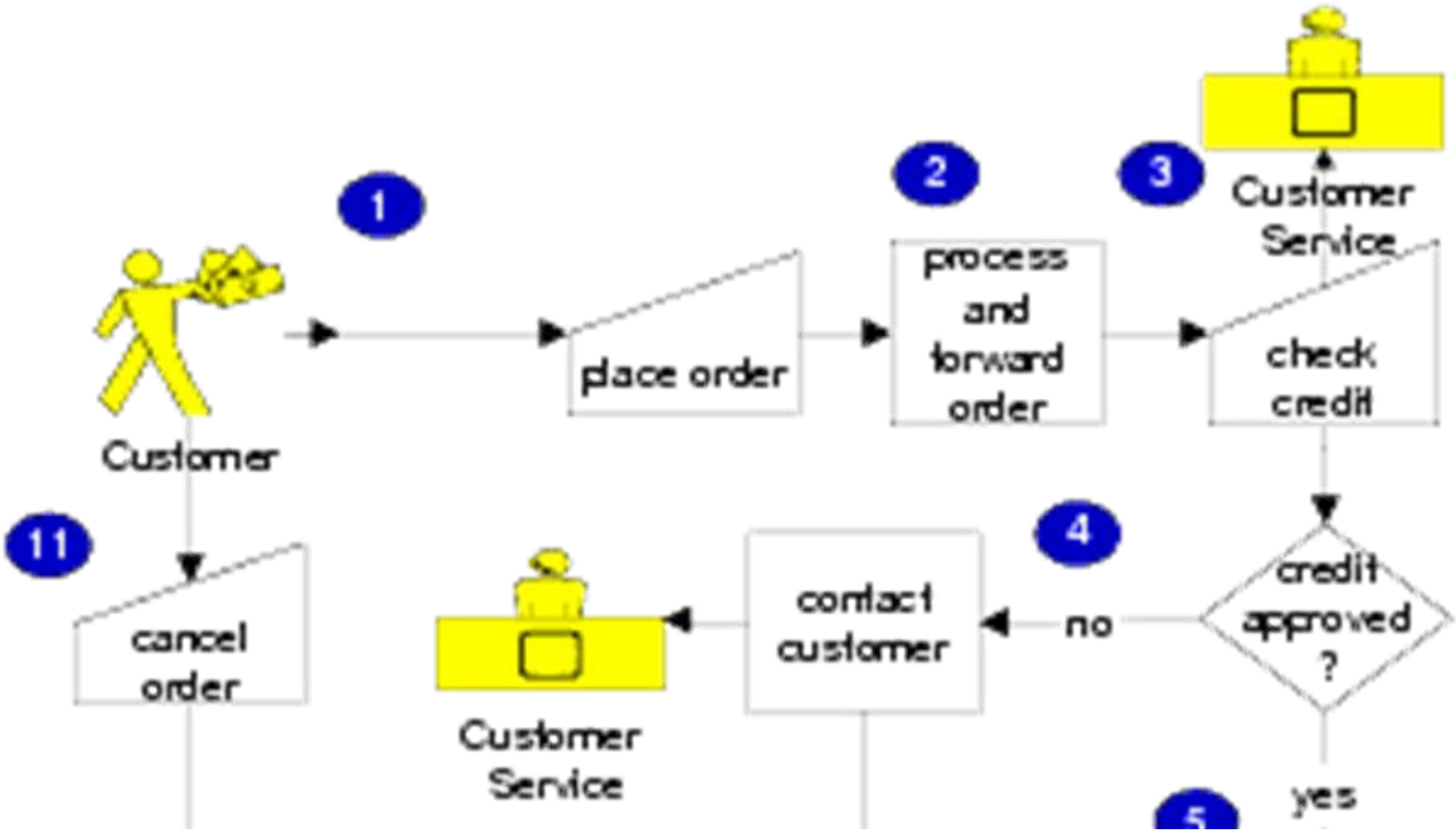
Network Structures

Causality
Human Intervension
Parallelism (AND-split - AND-join)
Choice (XOR-split – XOR-join)
Iteration (XOR-join - XOR-split)
Capacity constraints

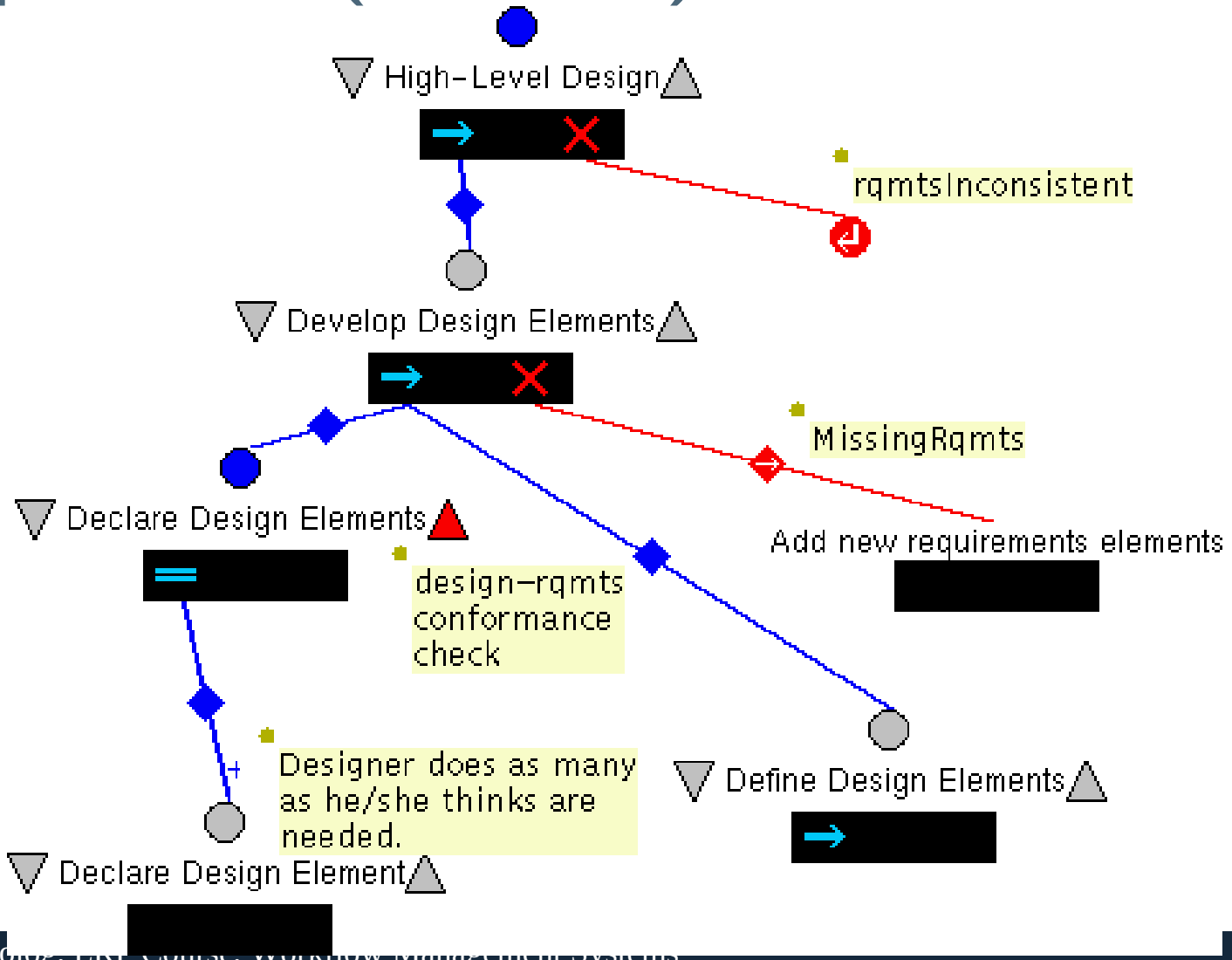


- Feedback loop
- Mutual exclusion
- Alternating

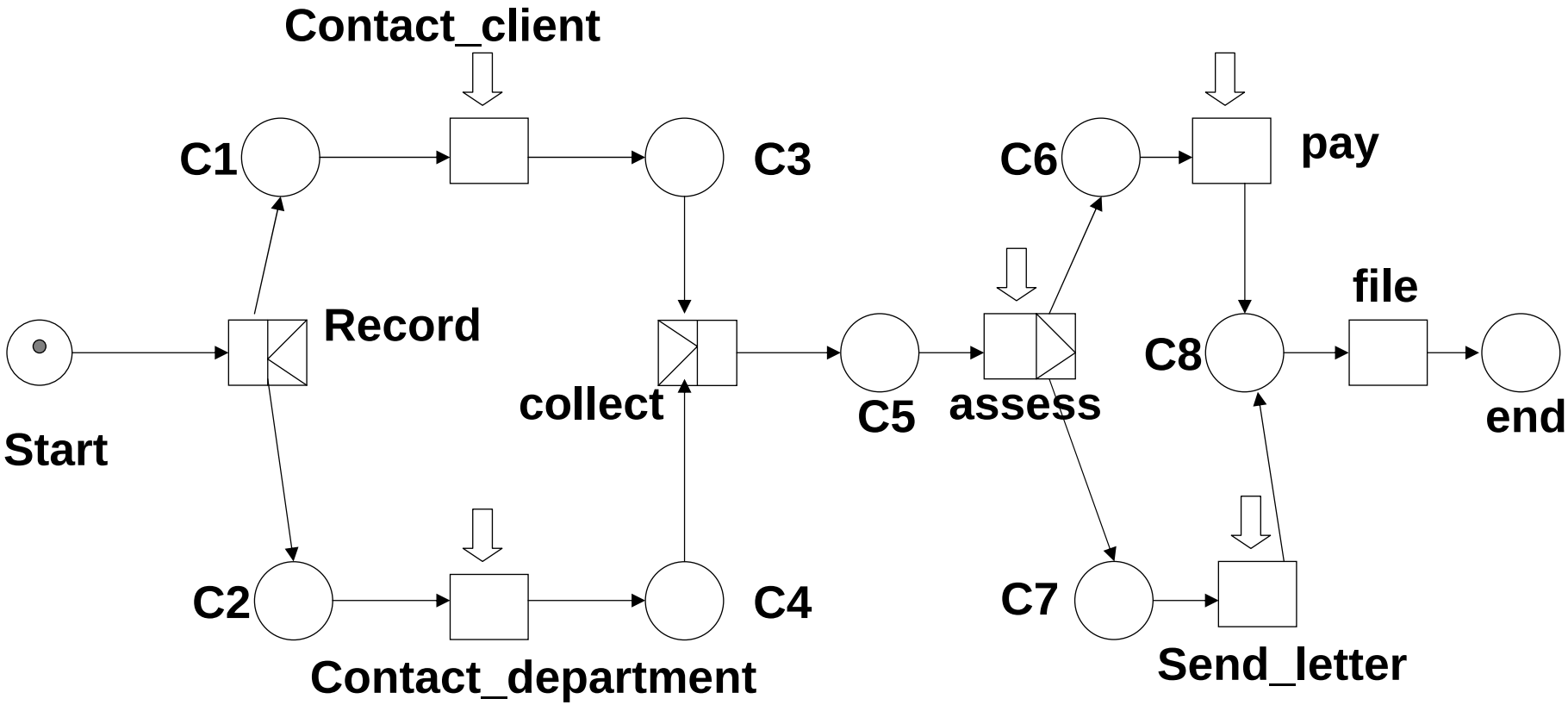
Mappings to Domain Symbols



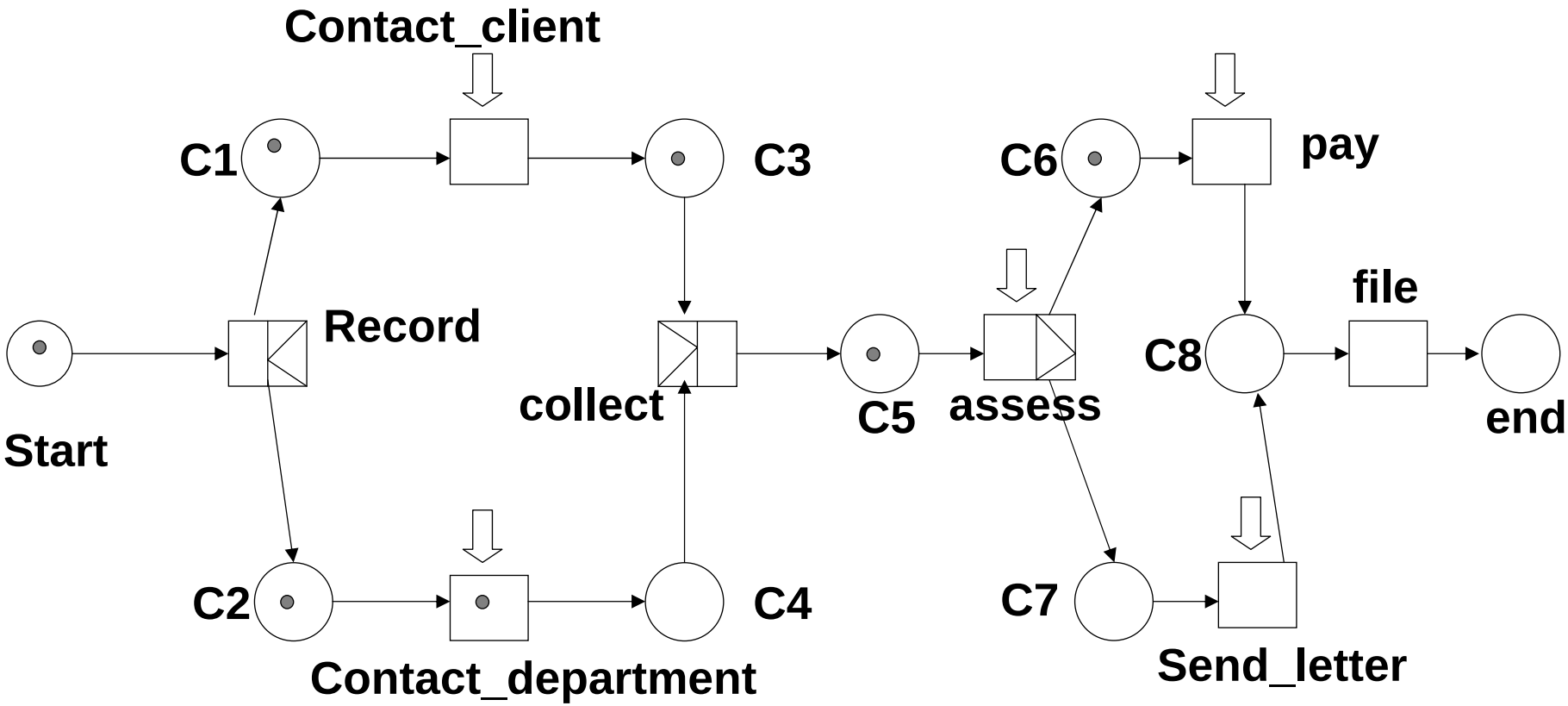
Requirements (from SOE)



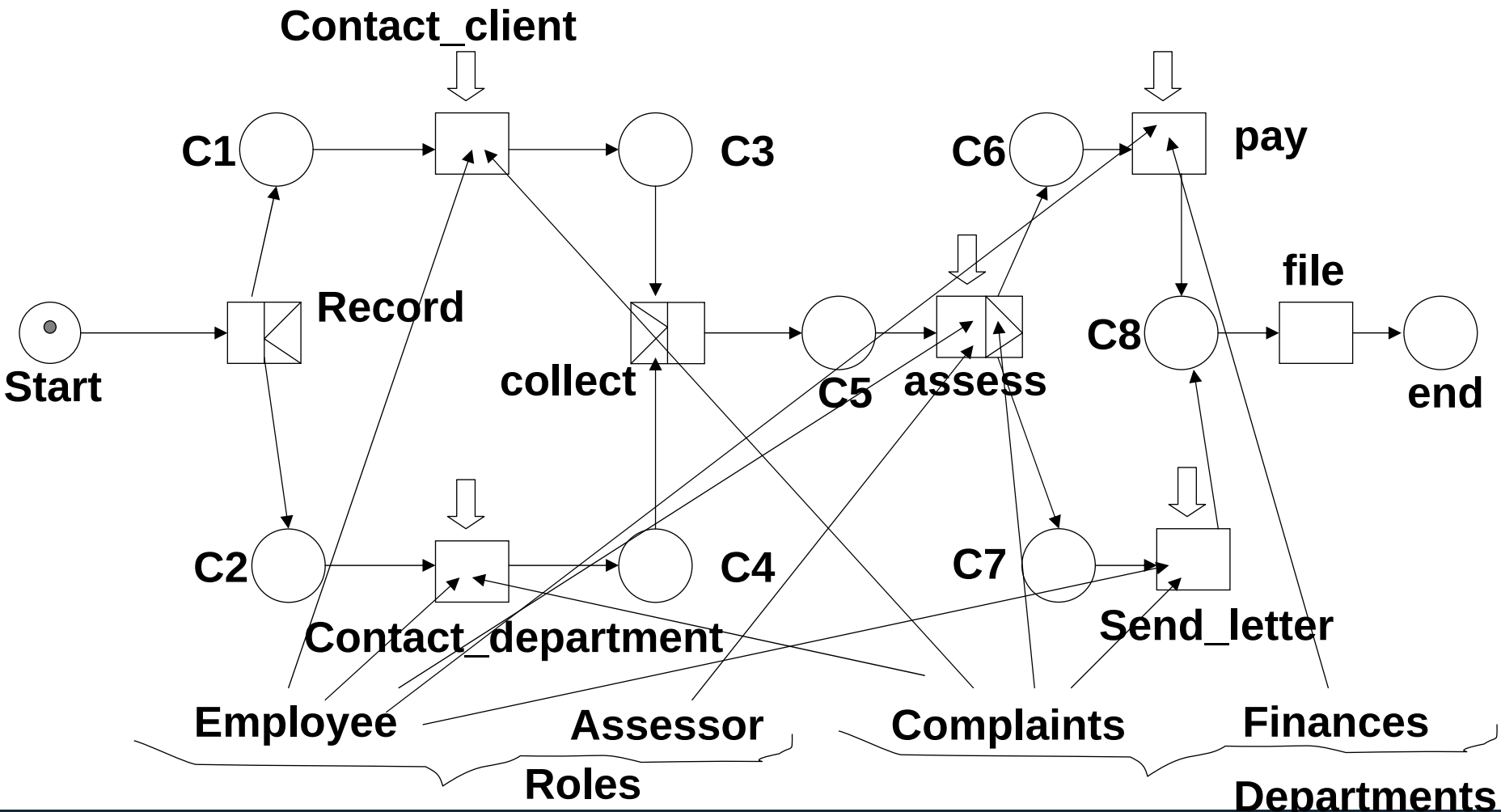
Process for Insurance Complaint



More Cases


Contact_client
C1
C3
C6
pay
Record
collect
C5
assess
file
C8
Start
end
C2
C4
C7
Contact_department
Send_letter

Allocating Resources



Roles of Tokens

Tokens can play the following roles:

a **physical object**, for example a product, a part, a drug, a person;

an **information object**, for example a message, a signal, a report;

a **collection of objects**, for example a track with products, a warehouse with parts, or an address file;

an **indicator of a state**, for example the indicator of the state in which a process is, or the state of an object;

an **indicator of a condition**: the presence of a token indicates whether a certain condition is fulfilled.

Roles of Places

a type of **communication medium**, like a telephone line, a middleman, or a communication network;

a **buffer**: for example, a depot, a queue or a post bin;

a **geographical location**, like a place in a warehouse, office or hospital;

a possible **state or state condition**: for example, the floor where an elevator is, or the condition that a specialist is available.

Role of Transition

an **event**: for example, starting an operation, the death of a patient, a change seasons or the switching of a traffic light from red to green;

a **transformation of an object**, like adapting a product, updating a database, or updating a document;

a **transport of an object**: for example, transporting goods, or sending a file.

Real Situation

Pool of workflows ready to be followed at the next step
Pool of candidate work items to be executed at the next step
Pool of cases to deal with
Pool of resources which can be selected

Problem is how to find optimal number of resources to have to achieve a certain performance of a company with number of tasks to be followed according to the workflows

Allocating Principles

In what order are the work items transformed to activities?

- How many resources are available and how many work items are pending?

By which resource are the activities carried out?

- Ability to perform some tasks

Heuristics for work item allocation

FIFO
LIFO
Shortest Processing Time (SPT)
Shortest Rest-Processing Time (SRPT)
Longest Rest-Processing Time (LRPT)
Earliest Due Date (EDD)

Heuristics for Resource Allocation

Let resource practice its specialty
As far as possible, let a resource do similar tasks in succession
Strive for the greatest possible flexibility for the near future

Allocation methods in workflow engines:
Push driven approach:

- Matching resource properties with work items properties

Pull driven approach

- Resources themselves take an initiative

Bottlenecks in the Workflows

Number of cases in progress too large
Completion time too long compare to the actual processing time
Level of service too low

Performance Indicators

External performance indicators (case-oriented)

- Avarage completion time, reliability of completion time

Internal performance inficators (ressource oriented)

- What effort is required to achieve external performance
- Level of resource utilization, number of cases per ressource, in progress, number of rollbacks, rate of turnover

(Re-)designing Workflows

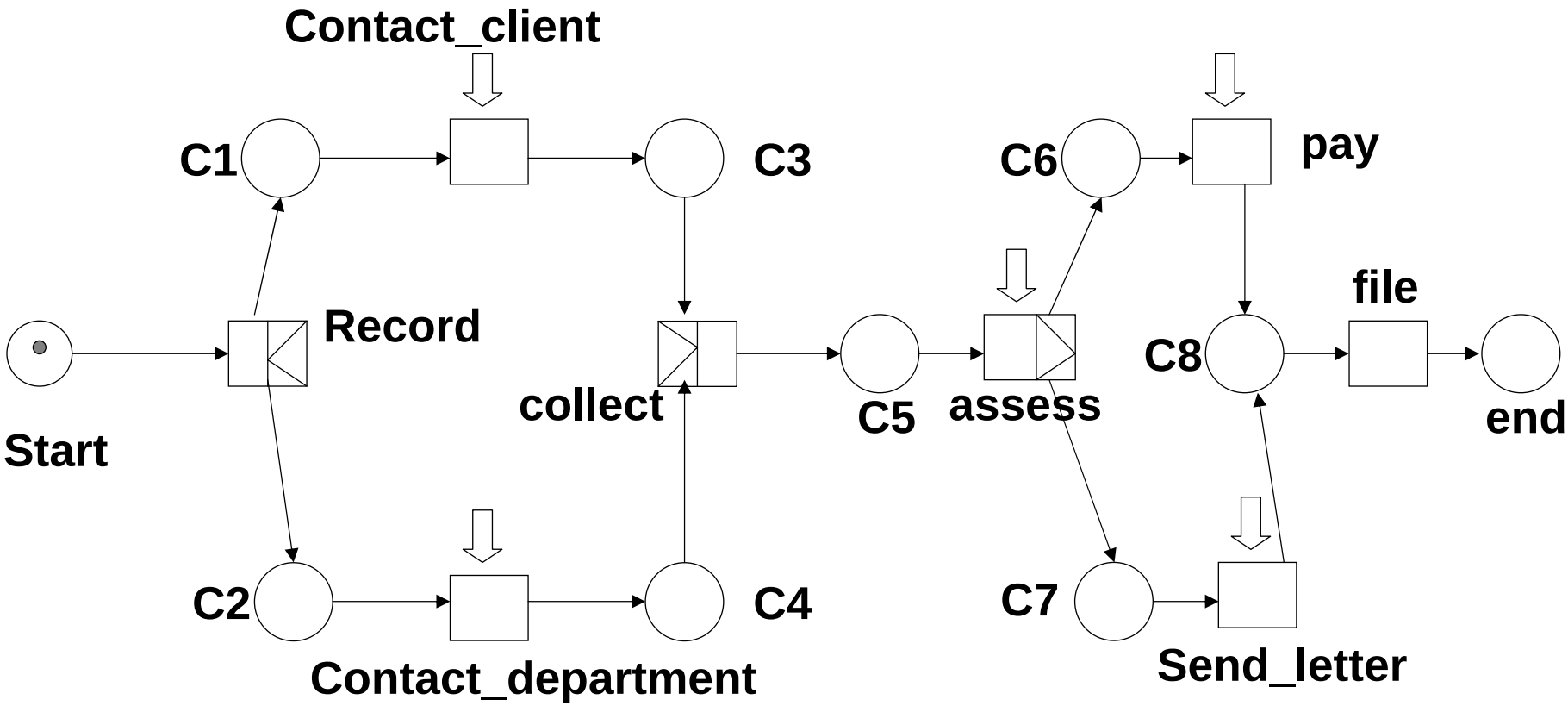
What? – select a workflow that has to be re-designed
Why? – establish an objective of the workflow to be (re)designed
How? – esteblish steps which must be carried out and in which oder
Who? – allocate resources

Principles

Establish Objectives
Ingnore the existence of resources when defining the process
As far as possible, make one person responsible for processing of a case (case manager)
Check the need for each task
Consider the scope of tasks
Strive for the simplest possible process
Carefully weigh a generic process vs. several versions of the same process

Principles (cntd.)

Carefully weigh specialization vs. generalization
As far as possible, try to achieve parallel processing of tasks
Investigate the new opportunities opened up by recent developments in networking and databases
Treat geographically scattered resources as if they are centralized
Allow a resource to practice its specialty
As far as possible, allow the resource to perform perform similar tasks in succession
Try to achieve as much flexibility as possible for the future
Allow a ressource to work as much as possible on the same case


Contact_client
C1
C3
C6
pay
file
Record
collect
C5
assess
C8
Start
end
C2
C4
C7
Send_letter
Contact_department