

# Grundzüge der Wirtschaftsinformatik *Introduction to Business Information Systems*

Unit 7

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<http://www.heppnetz.de/teaching/gwi/>

## Link to the Previous Unit

- **Last Unit:**
  - How can one computer send data and instructions to another computer?
  - How can data be transmitted over wires, radio communication, or fiber optic cables?
  - How do the Internet and its services work?
- **Today:**
  - Which security problems exist in networks, and what can we do to mitigate them?
  - Which methods and tools exist for designing and developing software for business problems?
  - Which notations exist for representing data structures and program execution?

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## Structure of the Lecture

- Unit 1:** Introduction
- Unit 2:** Central Processing Units
- Unit 3:** Storage and Data Structures
- Unit 4:** Input and Output Devices
- Unit 5:** Software
- Unit 6:** Networks, Data Interchange, and the Internet
- Unit 7:** [Design, Development, Deployment, and Operations of Information Systems](#)
- Unit 8:** Office Applications
- Unit 9:** Enterprise Applications
- Unit 10:** Supply Chain Applications and E-Business
- Unit 11:** Management Support Systems
- Unit 12:** Exam Review

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## Network Security Threats and Protection

## Assignment from last week

- WI1, pp. 151-322; IBIS, pp. 169-194
- Review the slides

WI1 = Hansen/Neumann: Wirtschaftsinformatik 1; WI2 = Hansen/Neumann: Wirtschaftsinformatik 2; IBIS = Wigand et al: Introduction to Business Information Systems.

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## Your Data is at Risk

- Loss
- Manipulation and Corruption
- Unauthorized Access and Usage
- Abuse of your computer for attacking others

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## Malware (Malicious Software)

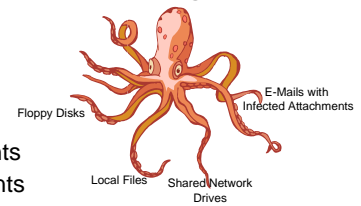
- Computer Viruses
- Trojan Horses
  - Password sniffer, Keyboard logger
  - FTP clients
- Worms
- (Advertising) Spyware

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## How Malware Propagates

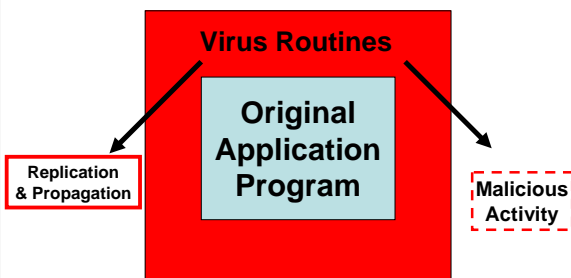
- Media exchange (floppy disk, ZIP, CDR, memory stick,...)
- E-mail attachments
- Infected documents
- Network drives
- Security leaks in the Operating System or Application software



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## Computer Virus

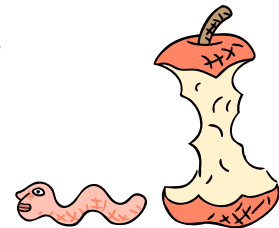


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## Computer Worm

A self-replicating computer program. Computer viruses attach themselves to, and becomes part of, another executable program; a worm is self-contained and does not need to be part of another program to propagate itself.



([http://en.wikipedia.org/wiki/Computer\\_worm](http://en.wikipedia.org/wiki/Computer_worm))

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## Trojan Horses

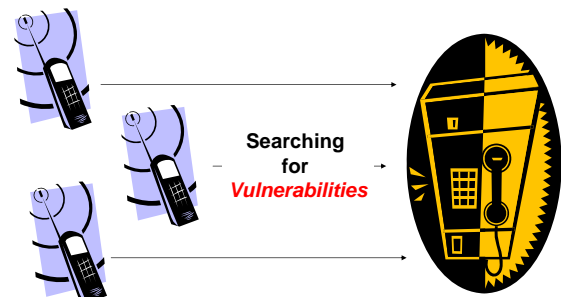
Program that appears to be a useful tool but secretly performs malicious activities



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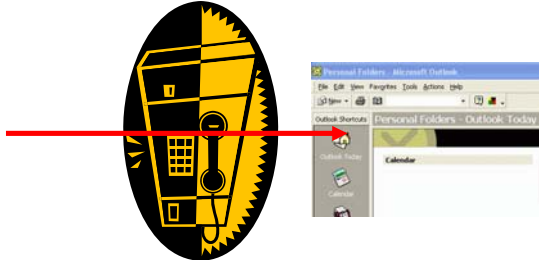
## Malicious Internet Traffic



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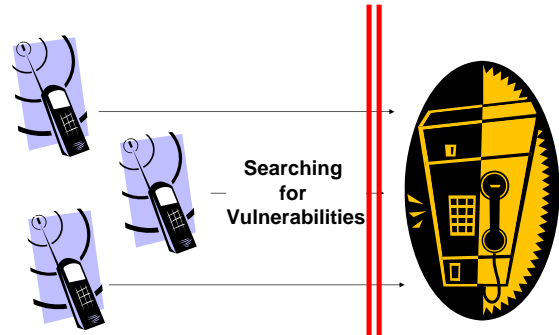
## Security Leaks in Software



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## Firewall



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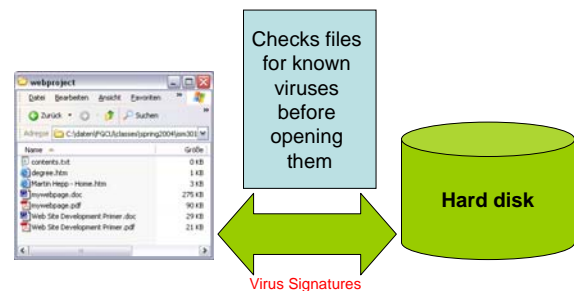
## Spyware

- Collect information from your computer and transmit it, without telling you, to a remote computer
- May steal credit card details, passwords, ...

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## Virus Scanner



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## Protect Yourself!

- Backups
- Firewall
- Anti-Virus Software
- Software Updates
- Behavior

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## Updates for Windows and MS Office



<http://windowsupdate.microsoft.com>  
<http://office.microsoft.com/productupdates>

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## Hoaxes

- Malicious Code (Virus and Trojan ) Warnings
- Urban Myths
- Sympathy Letters and Requests to Help Someone
- Traditional Chain Letters
- Threat Chains

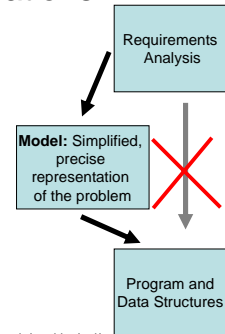
Information about hoaxes:  
<http://hoaxbusters.ciac.org>

<http://www.heppnetz.de/teaching/gwi/>

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## Modeling in Information Systems: Foundations

- Same as an architect builds a small-scale model first before actually building a house, we first create models before developing software
- Models can be used to discuss and validate the appropriateness of the solution at lesser costs.
- Absolutely necessary for complex problems.

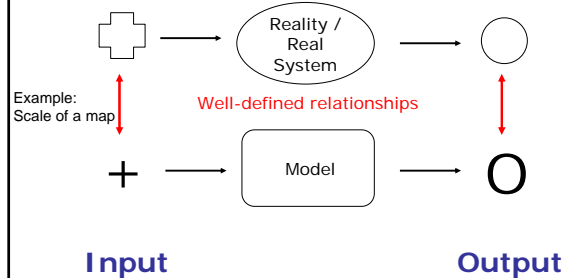


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## Design, Development, Deployment, and Operations of Information Systems

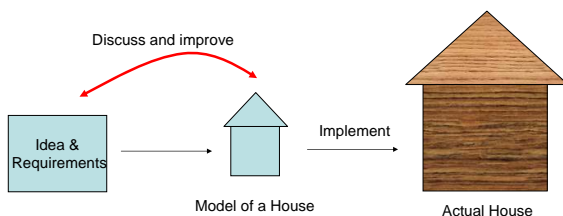
## Model



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## Architects build models first ...



**Bottomline:** For complex engineering challenges, it makes sense to first create a model of the solution before implementing it.

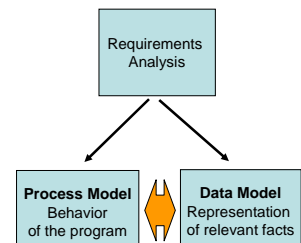
Studying the model is **cheaper** and allows for **earlier feedback**.

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## Modeling: Foundations

- **Example: Credit Approval**
  - We want to develop a program that checks whether a bank should approve a credit application.
- **Principle:**
  - Check whether all current accounts are within their agreed limits
  - Check whether all agreed limits plus the new credit does not exceed the bank's internal limit for that customer.



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## Modeling: Most Important Perspectives

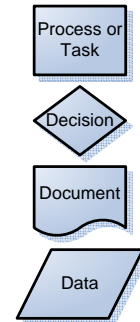
- **Use Case:** How will the system be typically used?
  - Example: „Bank clerk enters credit application“
- **Control flow:** What is the proper order of activities in a process?
  - Example: *Before a credit can be approved, the current credits must be checked.*
- **Data:** Which elements and attributes are relevant?
  - Example: *We need to store customers and their addresses in the system.*

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## Modeling Control Flows: Basic Flow Chart

- **Process or Task:** Single Activity or Sub-Process
- **Decision:** Decide upon alternative next tasks
- **Document or Data:** Access to this document or type of data is required in a task or decision

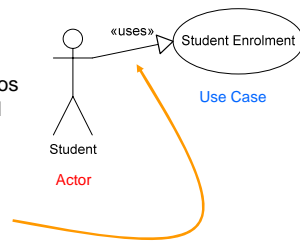


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## UML Use Case Models

- Diagram type for modeling
  - Use cases (scenarios of usage of the final system)
  - Actors (individuals using the system)
  - Relationships and dependencies between actors and use cases

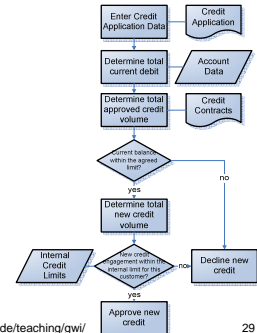


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## Basic Control Flows: Example

- Check whether all current accounts are within their agreed limits
- Check whether all agreed limits plus the new credit does not exceed the bank's internal limit for that customer.

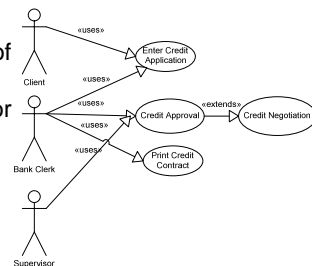


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## UML Use Case Models

- **Use cases:** Scenarios of usage of the final system
- **Actors:** Individuals or roles using the system
- Relationships and dependencies between actors and use cases

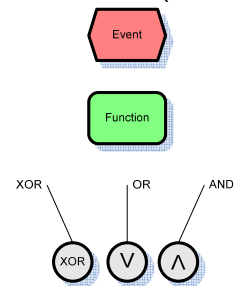


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## Modeling Control Flows: Event-driven Process Chains (EPCs)

- **Events:** Changes in the state of the world
  - Example: Arrival of a client, update of a dataset
- **Functions:** Activity
  - Example: Check credit status, compute interest, ...
- **Logical Connectors:** Determine conditions between events and following functions
  - AND: All must apply
  - OR: One or multiple
  - XOR: Exactly one



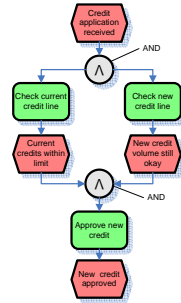
cf. Keller/Scheer/Nüttgens (1992)

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## EPC: Example

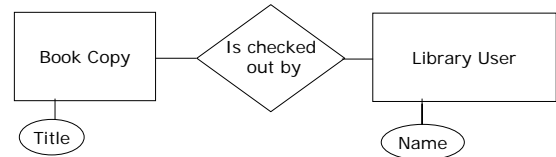
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## Entity-Relationship Model: A very simple library

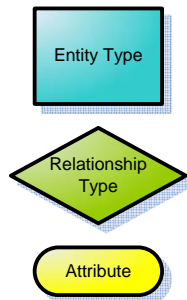


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## Modeling Data Structures: Entity-Relationship Modeling

- **Entity Type:** A set of objects of the same kind
  - Examples: Customer, Invoice, Student, Contract
- **Relationship Type:** A set of links of the same type that exist between entity types
  - Example: isMarriedTo
- **Attribute:** A relevant property of an entity or relationship type
  - Example: Name of a customer, date of a wedding, ....



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## Entity vs. Entity Type

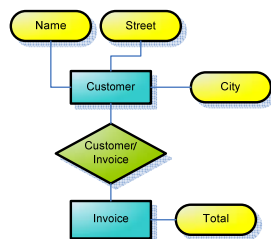
- **Entity** = an object in reality
  - A specific order, a particular staff member,...
- **Entity type:** Set of entities of the same type
  - „order“, „staff member“
- Similar for relationship vs. relationship type
- In an entity-relationship model, the symbols represent entity types and relationship types.

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## Modeling Data Structures: Entity-Relationship Modeling

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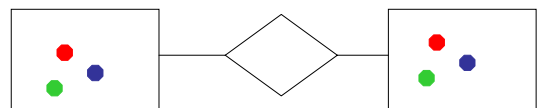


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## Cardinality Constraints

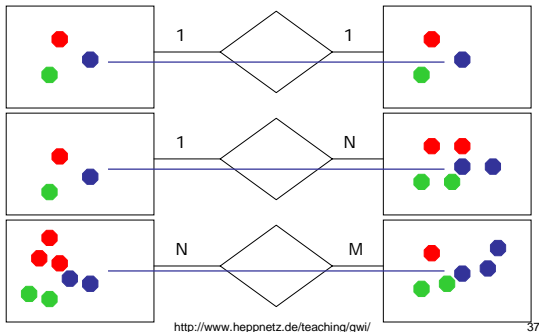
- One can specify quantitative constraints on relationships between entity types.
- Example: „Each client must have exactly one credit agreement.“



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## Cardinality Constraints: 3 Types



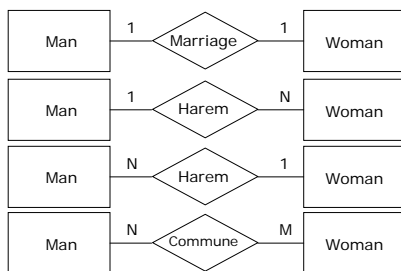
## Software Engineering Approaches

- Sequential Approach: Waterfall Model
- Iterative Approach: Spiral Model
- Rapid Prototyping
- Extreme Programming

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## Cardinality Constraints: Example



## Assignment for Next Week

- WI1, pp. 323-523
- Review the slides

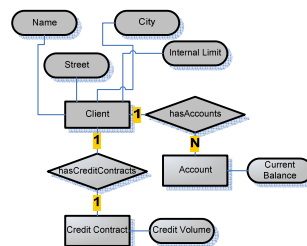
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## Entity-Relationship Modeling: Example with Cardinality Constraints

- For a credit approval system, we need to store
  - Clients
  - Accounts
  - Credit Contracts
- It must be represented
  - Which account belongs to which client
  - Which credit contract belongs to which client



Thank you!

The slides and additional materials will be available at

<http://www.heppnetz.de/teaching/gwi/>