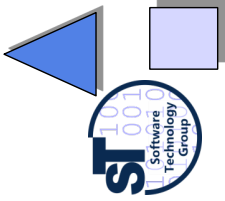# Component-Based Software Engineering (CBSE) Announcements

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http://st.inf.tu-dresden.de

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Elements of the Course

▲ Lecturing
- Do not miss one, they should give you a short and concise overview of the material

▲ Reading
- Slides on "Obligatory Literature" require you to read papers from the web
  - TU Dresden has subscription to ACM Digital Library and IEEE Explorer
- Slides on "Secondary Literature" contain useful but optional literature

▲ Exercise with Florian Heidenreich
- Exercise sheets
  - Handed out every week, with some breaks
  - You have one week to solve them on your own
  - After that, solutions will be explained in the Exercise
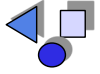
Reading Along the Lectures

- Unfortunately, the course is not covered by any book
  - About 60% is covered by the blue book "Invasive Software Composition"
  - Most of the rest on classical component systems by Szyperski in the book "Component Software. Beyond object-oriented computing. Addison-Wesley."
- You have to read several research papers, available on the internet
  - Marked by "Obligatory Literature"
- Secondary Literature is non-mandatory, but interesting reading. Can be done during the course
- Other Literature is not to be read, but also interesting.
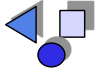
Obligatory Literature

- During the course, read the following papers, if possible, in sequential order.
- Every week, read about 1 paper (3-4h work)
- Course web site

Obligatory Literature

- [ISC] U. Aßmann. Invasive Software Composition. Springer, 2003.
- C. Szyperski. Component software. Beyond object-oriented computing. Addison-Wesley. Bestseller on classical component systems.

Papers

- D. McIlroy. Mass-produced Software Components. 1st NATO Conference on Software Engineering.
- CORBA. Communications of the ACM, Oct. 1998. All articles. Overview on CORBA 3.0.
- Others will be announced.

Recommended Literature

- I. Forman, S. Danforth. Meta-objects in SOM-C++. Very good book on meta object protocols and meta object composition.
- Journal Software - Tools and Techniques. Special Edition on Componentware, 1998. Springer. Good overviews.
- R. Orfali, D. Harkey: Client/Server programming with Java and Corba. Wiley&Sons. Easy to read.
- CORBA. Communications of the ACM, Oct. 1998. All Articles.

Recommended Literature

- [GOF, Gamma] E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns. Addison-Wesley 1995. Standard book belonging to the shelf of every software engineer.
  - The book is called GOF (Gang of Four), due to the 4 authors
- Alternatively to GOF can be read: [Remark: If you have already studied GOF intensively, do not read these]
  - A. Tesanovic. What is a pattern? Paper in Design Pattern seminar, IDA, 2001. Available at home page.
  - On Composite, Visitor: T. Panas. Design Patterns, A Quick Introduction. Paper in Design Pattern seminar, IDA, 2001. Available at home page.
  - P. Pop. Creational Patterns. Paper in Design Pattern seminar, IDA, 2001. Available at home page.

Less Important

- K. Czarnecki, U. Eisenecker. Generative programming . Addison-Wesley 2000. Good overview on aspects, but not on components
- F. Griffel. Componentware. dpunkt-Verlag. In German. A lot of material.

Please, Please Be Aware – There Will Be Pain!

- This course is not like a standard course
- It treats rather advanced material, the concept of graybox engineering
- No single book exists on all of that at all
  - ISC covers about 60%
  - Please, collaborate!
  - Read the articles
  - Ask questions!
  - Do the exercise sheets
- The exam can only be done if you have visited all lectures and solved all exercise sheets
- Learn continuously! One week before the exam is too late!
- Be aware: you have not yet seen larger systems
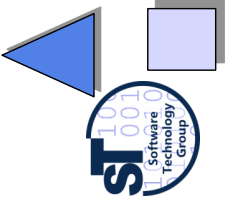 - Middle-size systems start over 100KLOC

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The Positive Side

- If you follow carefully, you will discover an exciting world of graybox composition, a new way to *extend* software
- The gain is worthwhile the pain!

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Component-based Software
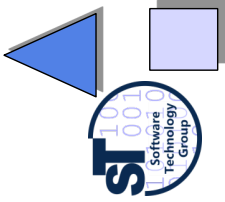# *Contents and Goals*

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Course Contents

- **Part I: Basics**
  - History and overview: Criteria for composition
  - Basics: Reflection and metaprograming, Meta-object protocols (MOP), Metadata, Finding components
- **Part II: Classical component systems (Black-box composition systems)**
  - Classical component systems: Development Process, Problems
  - Enterprise Java Beans (EJB)
- **Part III: Architecture systems and languages (Advanced black-box composition systems)**
  - Corba
  - Web services
  - Architecture Systems
- **Part IV: Gray-box composition (Invasive composition)**
  - Composition Filters
  - Generic Programming (BETA)
  - View-based programming: Hyperspace programming
  - Calculi for component systems
  - Aspect-oriented software development: AOSD and AOP
  - Invasive software composition
- **Part V: Universal Composition**

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Component-Based Software Goals

Main Goals

- Understand the concept of a *component,* frameworks and product lines
  - Variability, extensibility, and glueing are three central goals
- There are other central concepts for component models than classes and objects
  - Understand greybox fragment-based composition
  - why it introduces new forms of static extensibility
  - why other static component models are special cases of it
- Understand dynamic composition
- Understand frameworks not only as collections of classes, but collections of components
- Understand components as collections of standardized role types
- Understand connectors as role models plus protocol

The Hypothesis of Composition

- There are only two basic kinds of compositions
  - static composition (can be modeled as fragment-based invasive compositions)
  - dynamic composition (use assignment and extension of runtime values)
- There are only some basic operations, on code or on data
  - Variability with *bind* operator
  - Extensibility with *extend* operator
  - *Glue* with glue code operators
  - *Select* to select fragments from a fragment universe
- There are additional operations for both scenarios:
  - copy, rename, unbind

The End