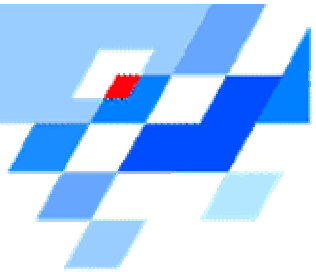
UNIVERSITÄT DORTMUND



Aggressive
Model-Driven Development:
Synthesizing Systems from Models viewed as Constraints

Tiziana Margaria
Bernhard Steffen

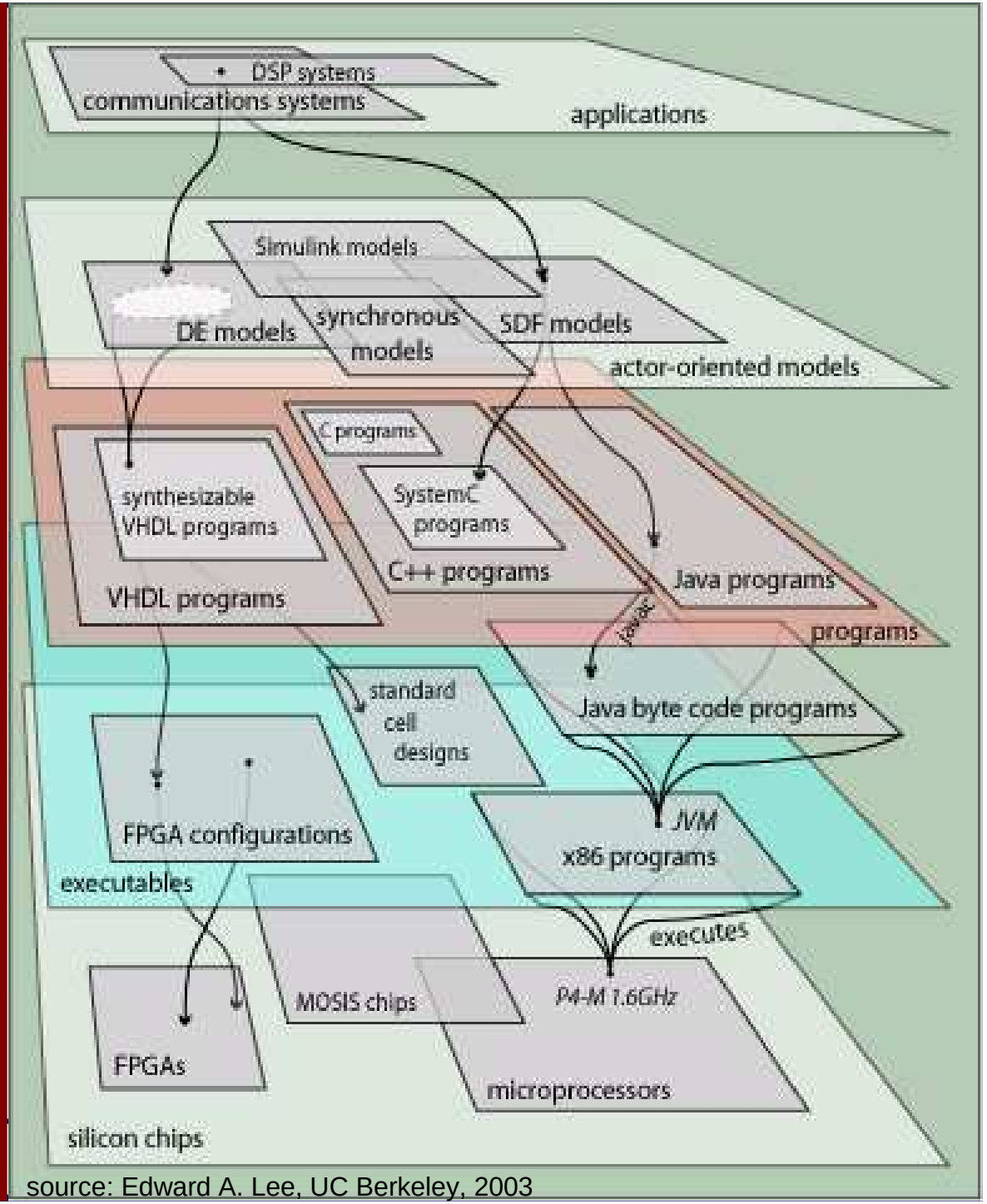
Platforms

(Edward Lee)

Where the
Action Has Been:

Giving the red platforms useful modeling properties (e.g. UML, MDA)

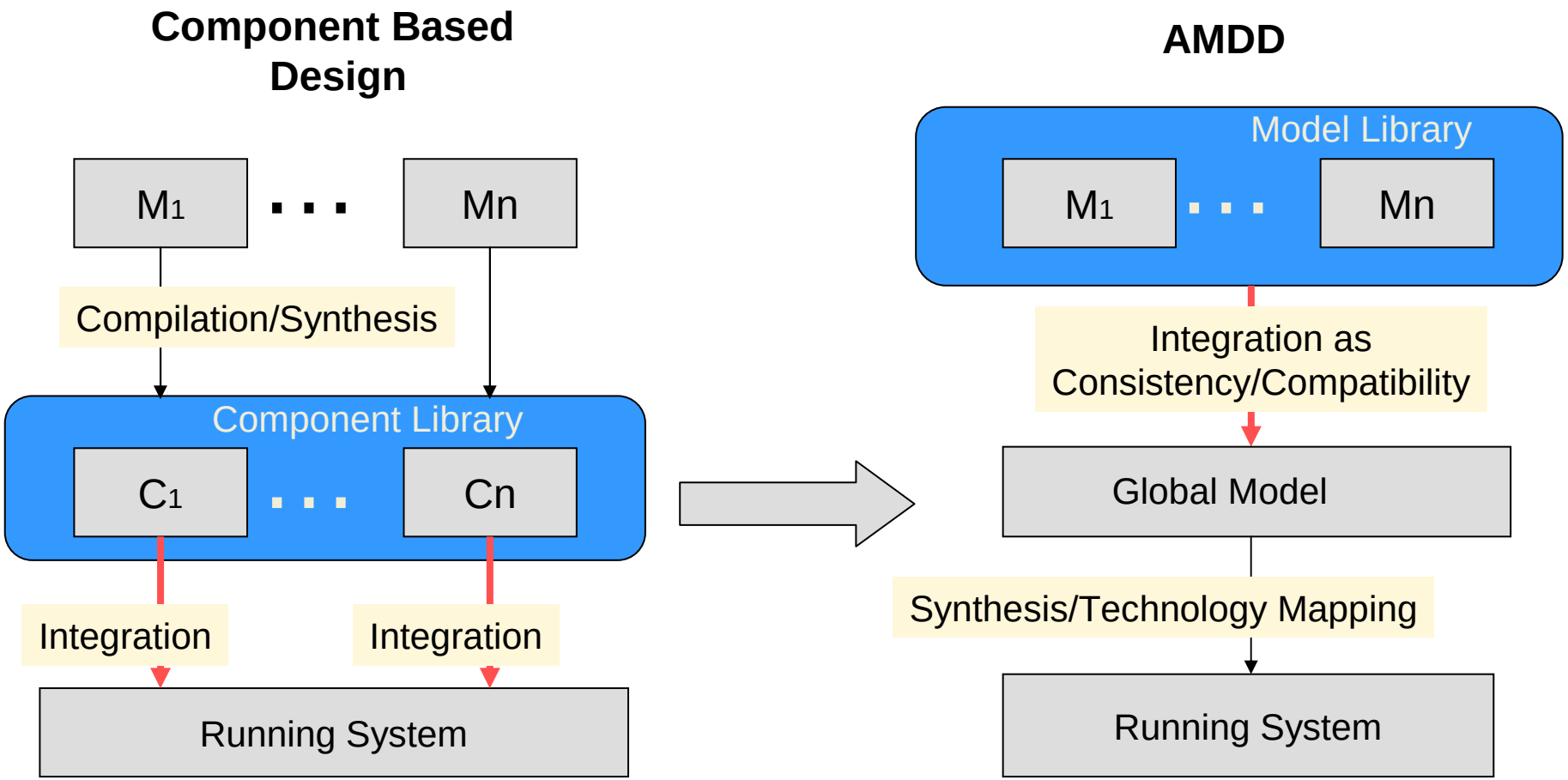
Getting from red platforms to blue platforms.



source: Edward A. Lee, UC Berkeley, 2003

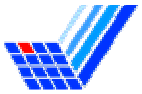
CB Design vs. AMDD

SoC

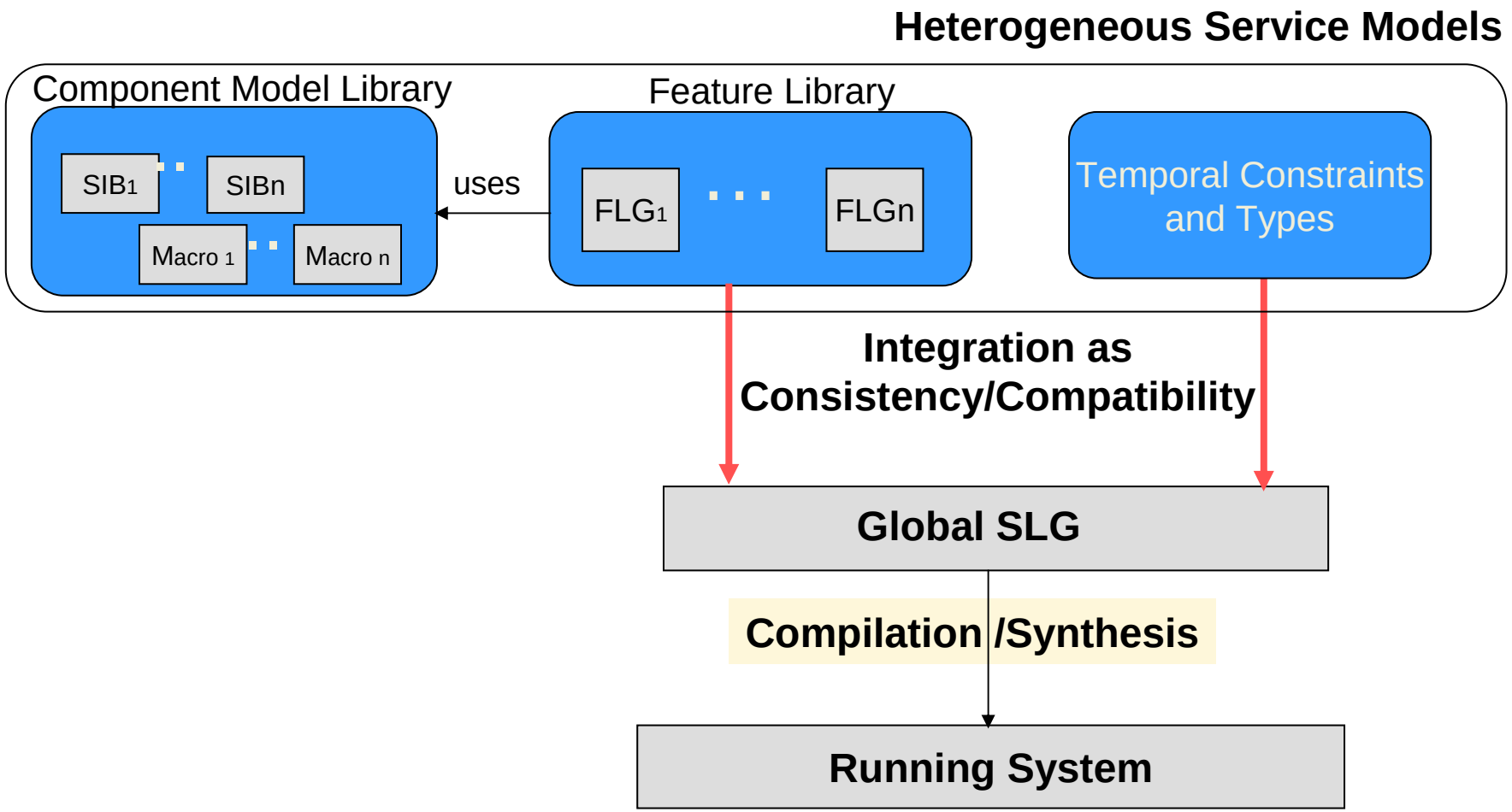


Outline

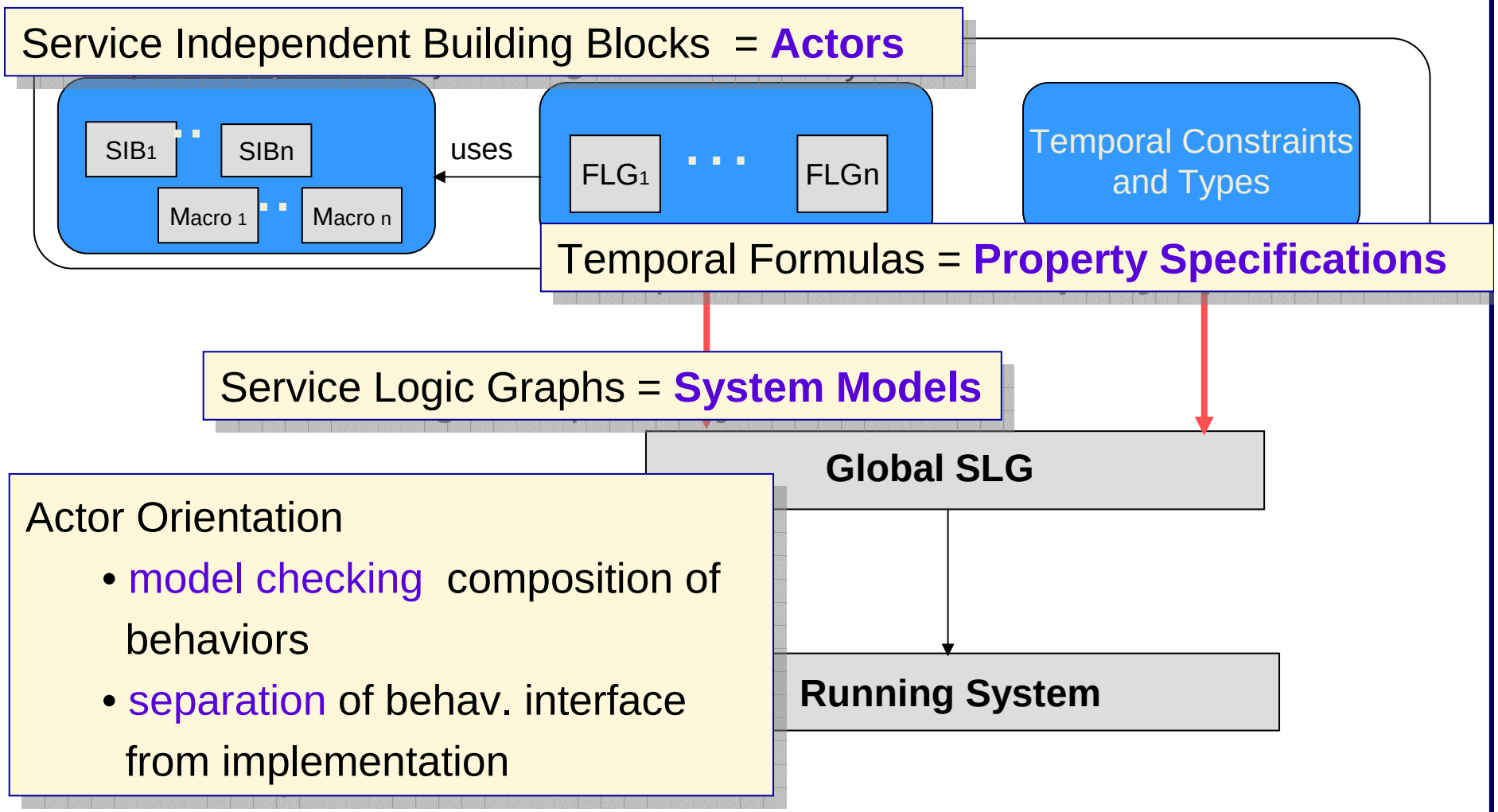
- AMDD as Actor-Oriented approach
- **The ABC as AMDD Environment**
- Two Examples
- Conclusions



ABC‘s AMDD


Heterogeneous Service Models
Component Model Library
SIB1
SIBn
Macro 1
Macro n
uses
Feature Library
FLG1
FLGn
Temporal Constraints and Types
Integration as Consistency/Compatibility
Global SLG
Compilation /Synthesis
Running System

ABC: Library-based, Actor-oriented Modelling & Design



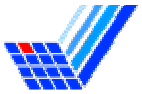
ABC: Library-based, Actor-oriented Modelling & Design

- **Automatic** Compilation and Deployment
- Changes, Verification, Updating at the **Modelling Level**
- **Layered** hiding:

  Distribution,

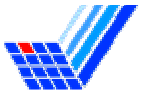
  Real Time,

  Data, …



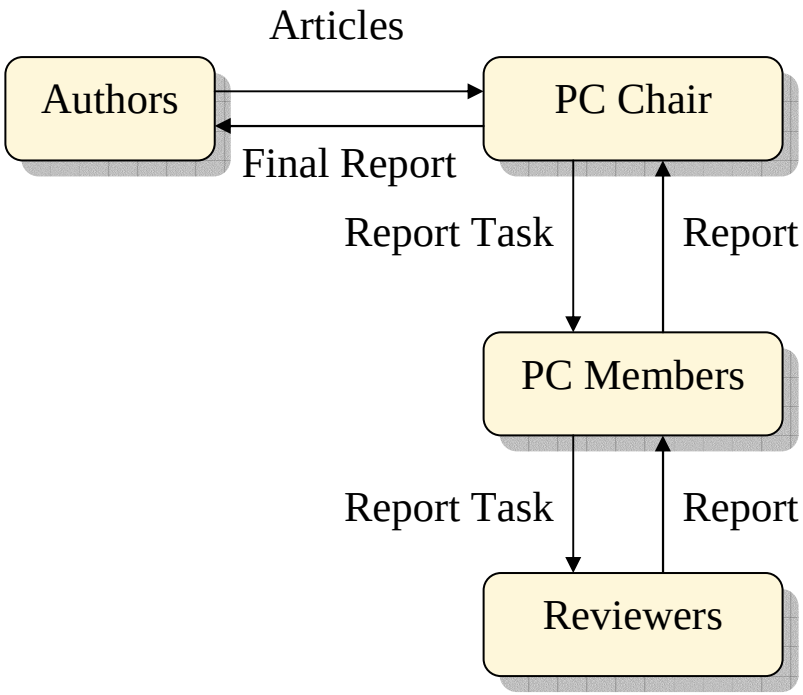
Outline

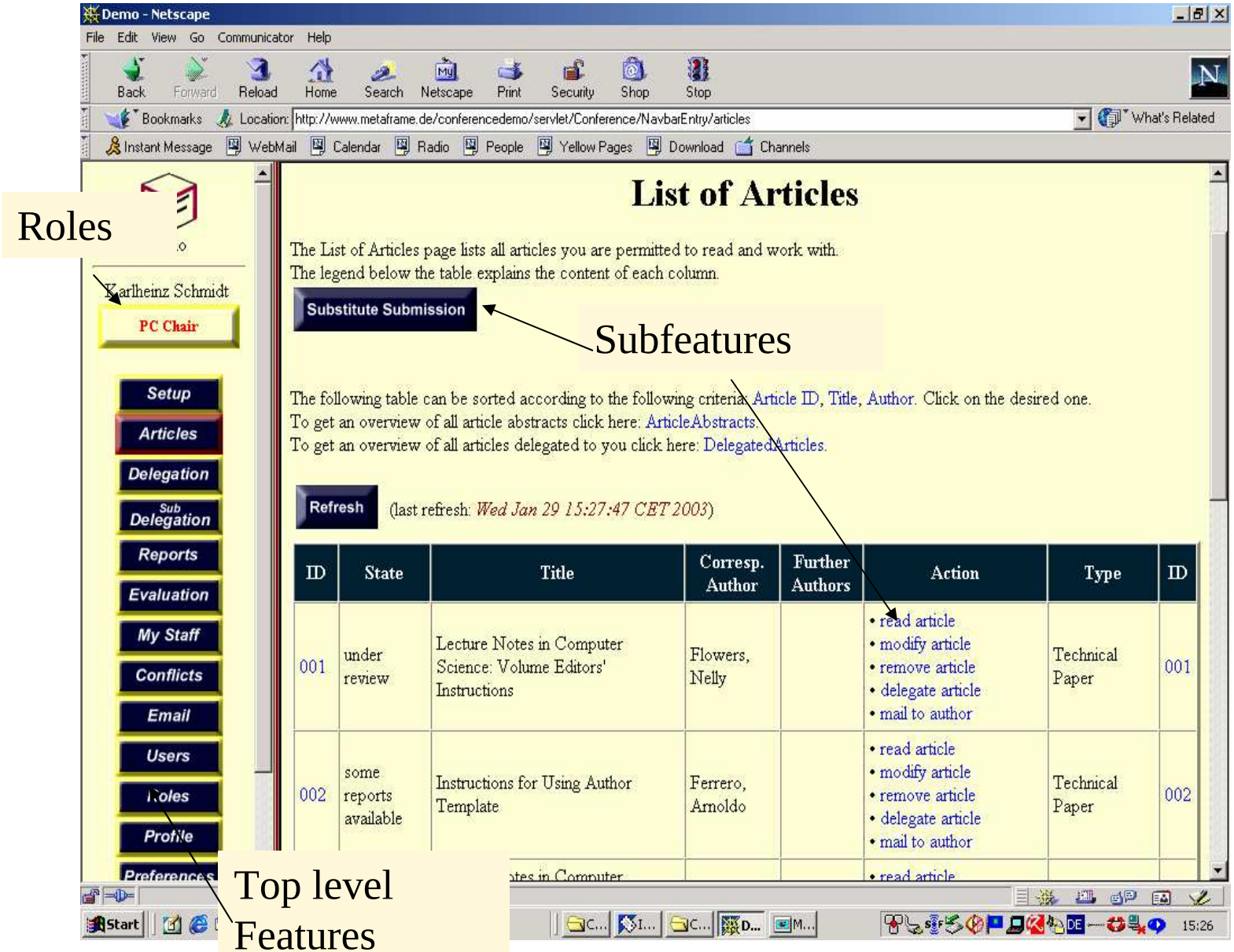
- AMDD as Actor-Oriented approach
- The ABC as AMDD Environment
- **Two Examples**
  - **Design**
  - **Testing**
- Conclusions



1) AMDD for Design:

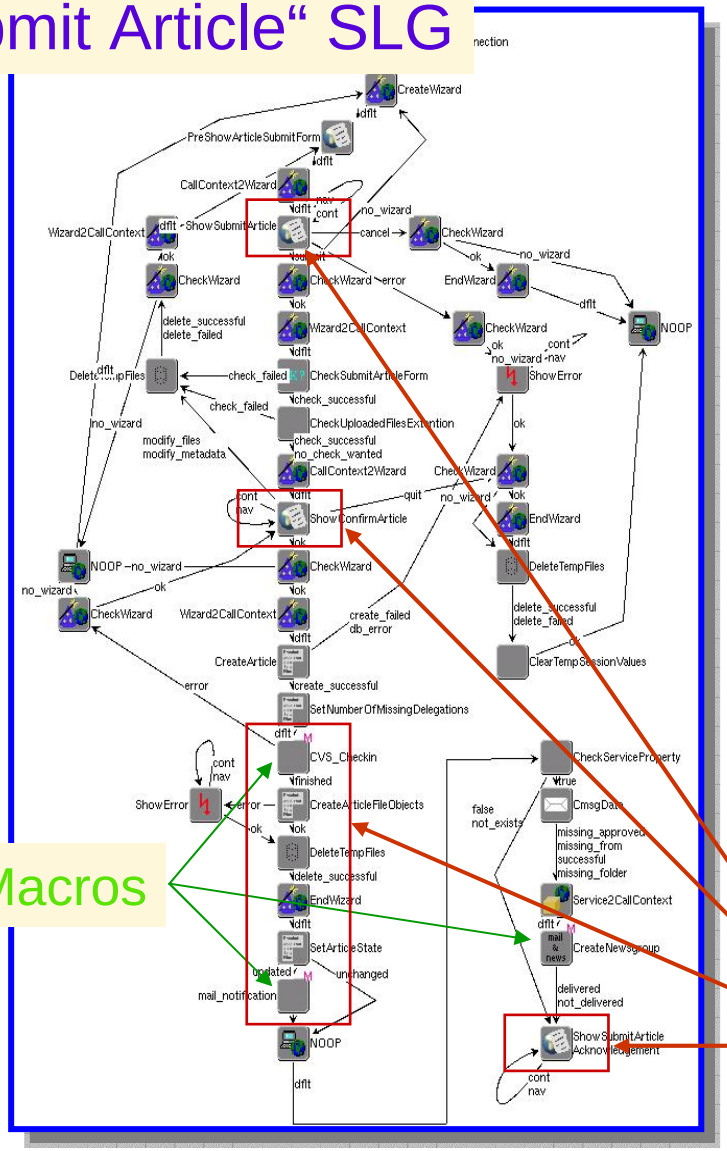
The Online Conference Service




Demo - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Netscape Print Security Shop Stop
Bookmarks Location: http://www.metaframe.de/conferencedemo/servlet/Conference/NavbarEntry/articles
What's Related
Instant Message WebMail Calendar Radio People Yellow Pages Download Channels
Roles
Karlheinz Schmidt
PC Chair
Setup
Articles
Delegation
Sub Delegation
Reports
Evaluation
My Staff
Conflicts
Email
Users
Roles
Profile
Preferences
List of Articles
The List of Articles page lists all articles you are permitted to read and work with.
The legend below the table explains the content of each column.
Substitute Submission
Subfeatures
The following table can be sorted according to the following criteria: Article ID, Title, Author. Click on the desired one.
To get an overview of all article abstracts click here: ArticleAbstracts.
To get an overview of all articles delegated to you click here: DelegatedArticles.
Refresh
(last refresh: Wed Jan 29 15:27:47 CET 2003)
ID
State
Title
Corresp. Author
Further Authors
Action
Type
ID
001
under review
Lecture Notes in Computer Science: Volume Editors' Instructions
Flowers, Nelly
• read article
• modify article
• remove article
• delegate article
• mail to author
Technical Paper
001
002
some reports available
Instructions for Using Author Template
Ferrero, Arnoldo
• read article
• modify article
• remove article
• delegate article
• mail to author
Technical Paper
002
Top level Features
Start
15:26

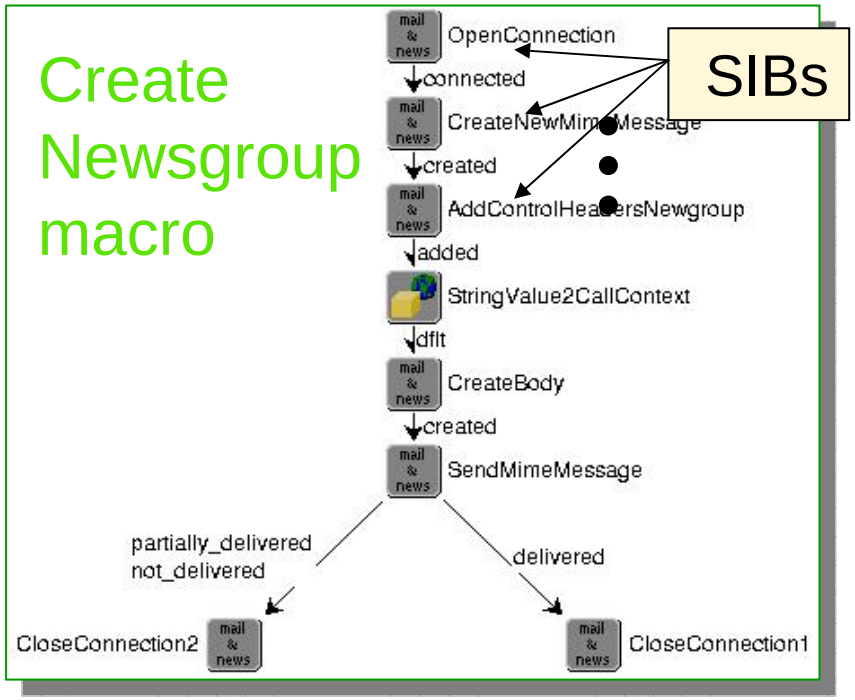
AMDD for Design

„Submit Article“ SLG



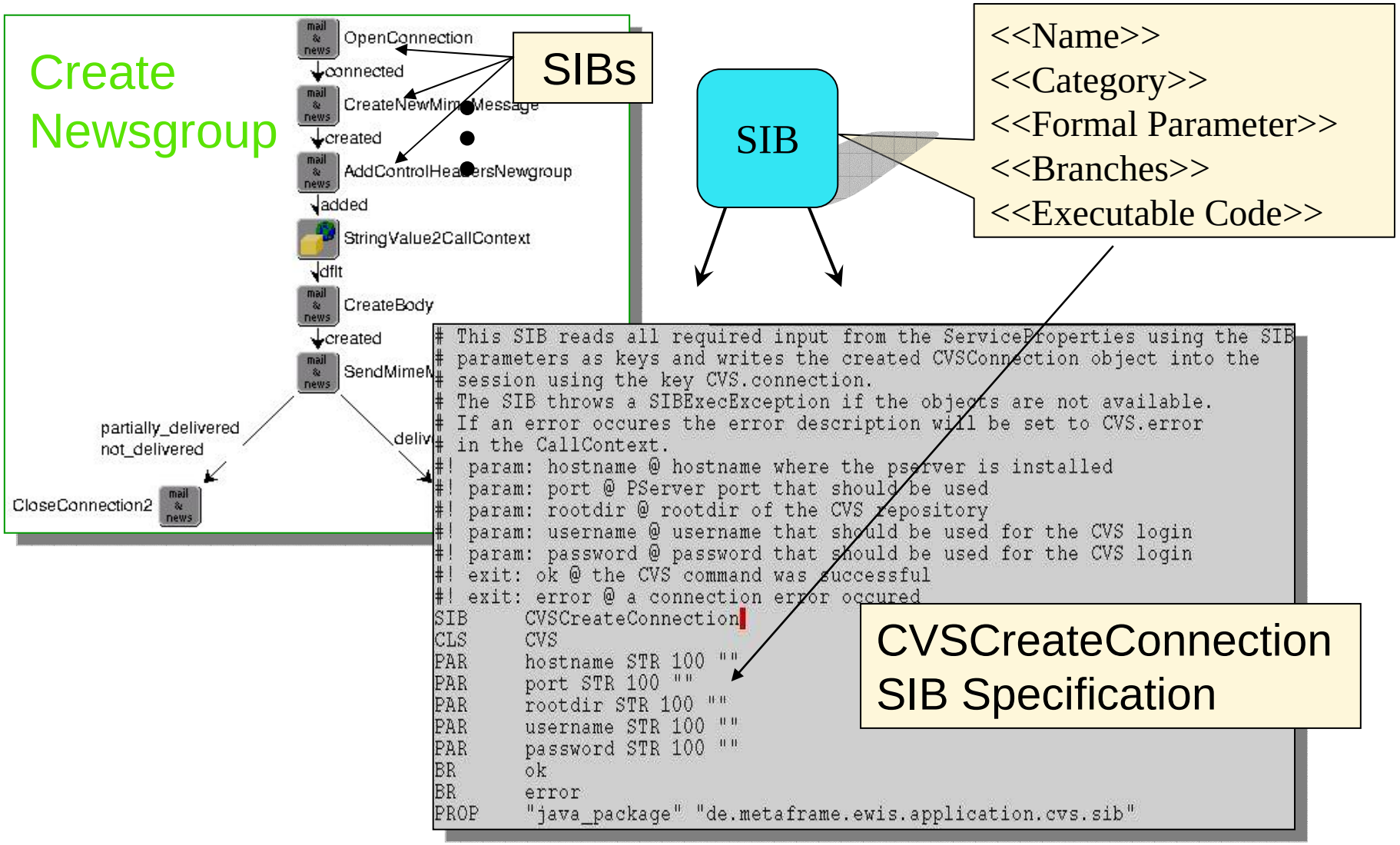
Macros

Create Newsgroup macro

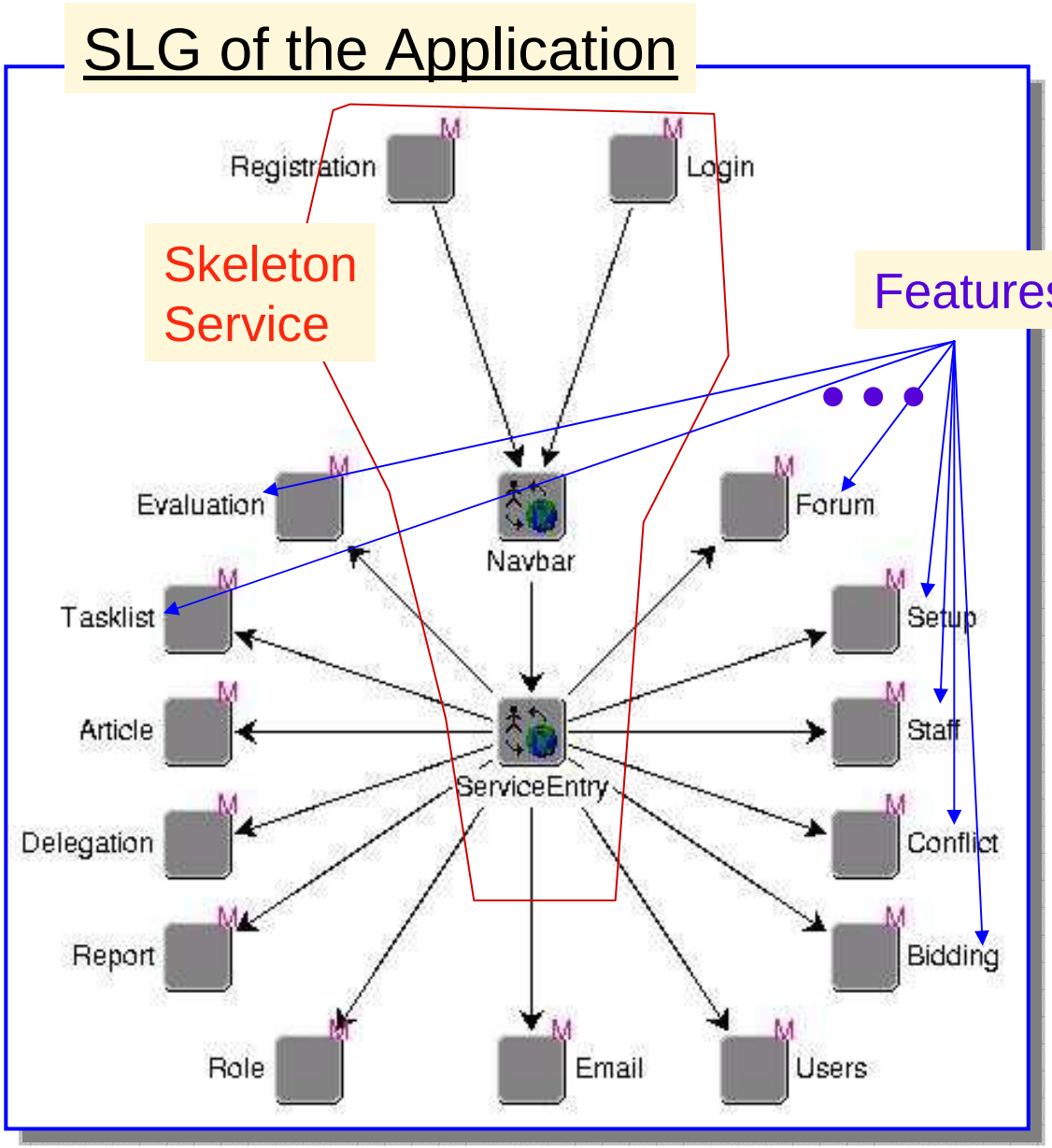


Main Functionalities

The SIB Model



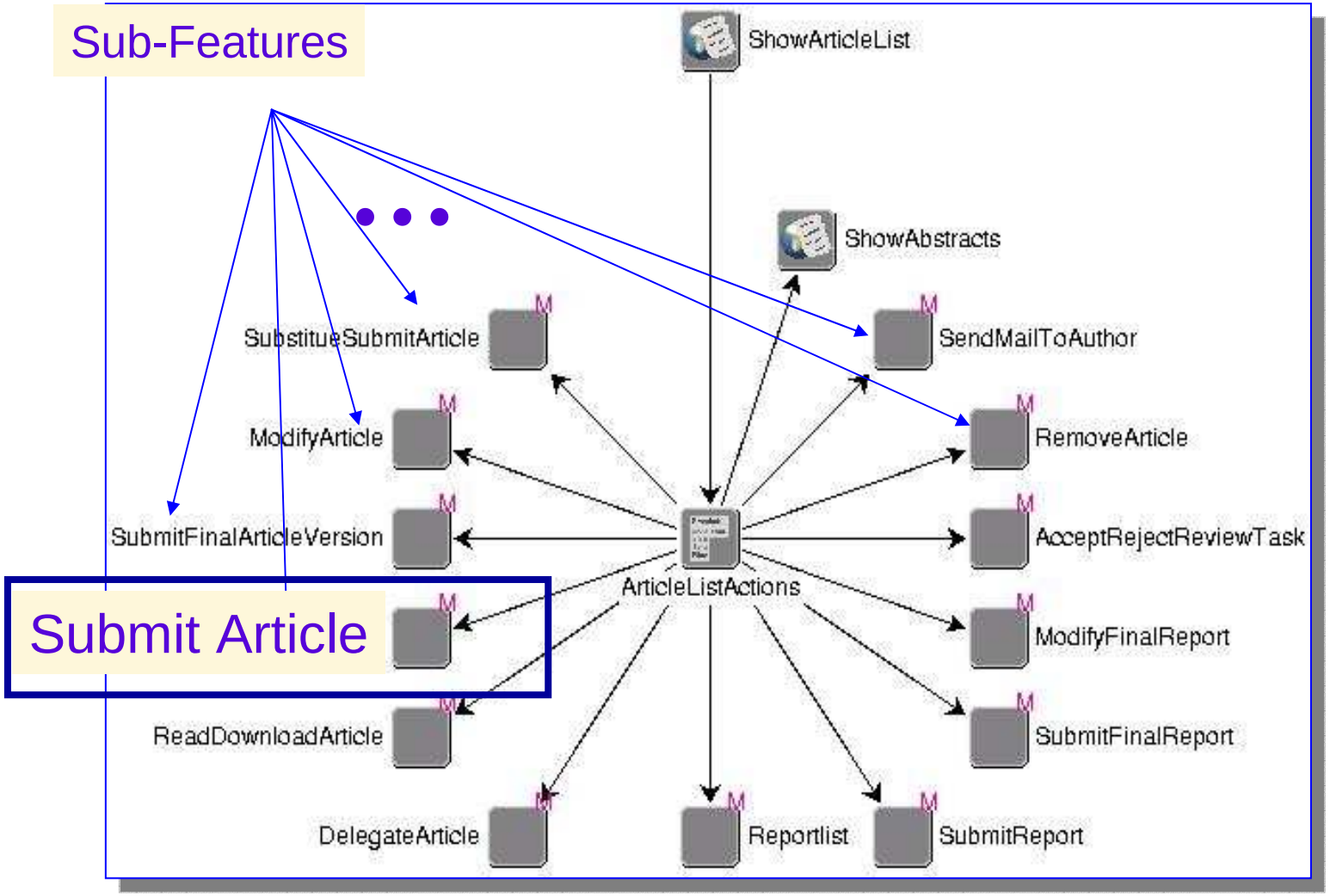
Global Logic Plane



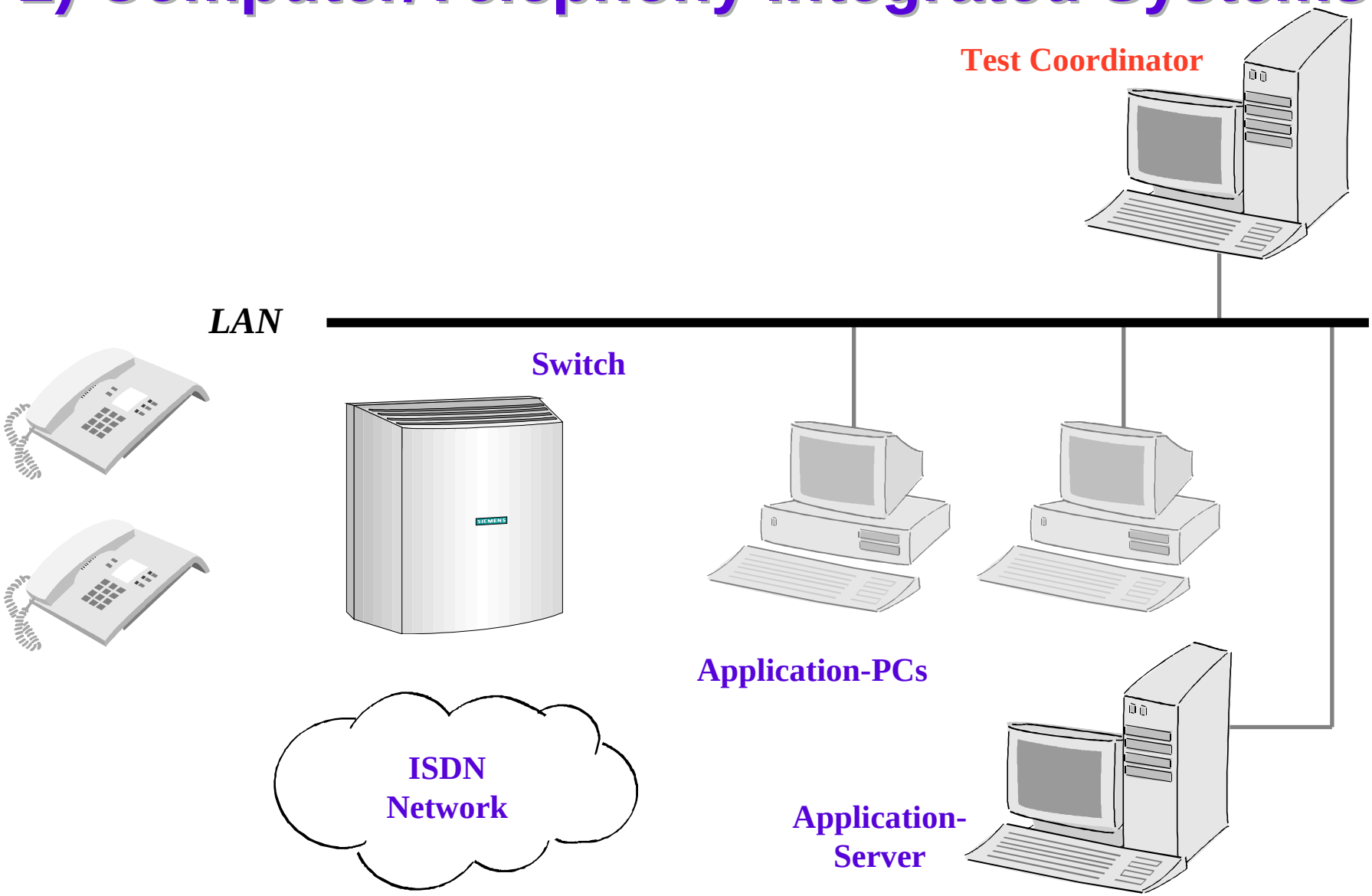
OCS:
2200 SIBs
3500 branches

Feature Logic

„Article“ Feature SLG

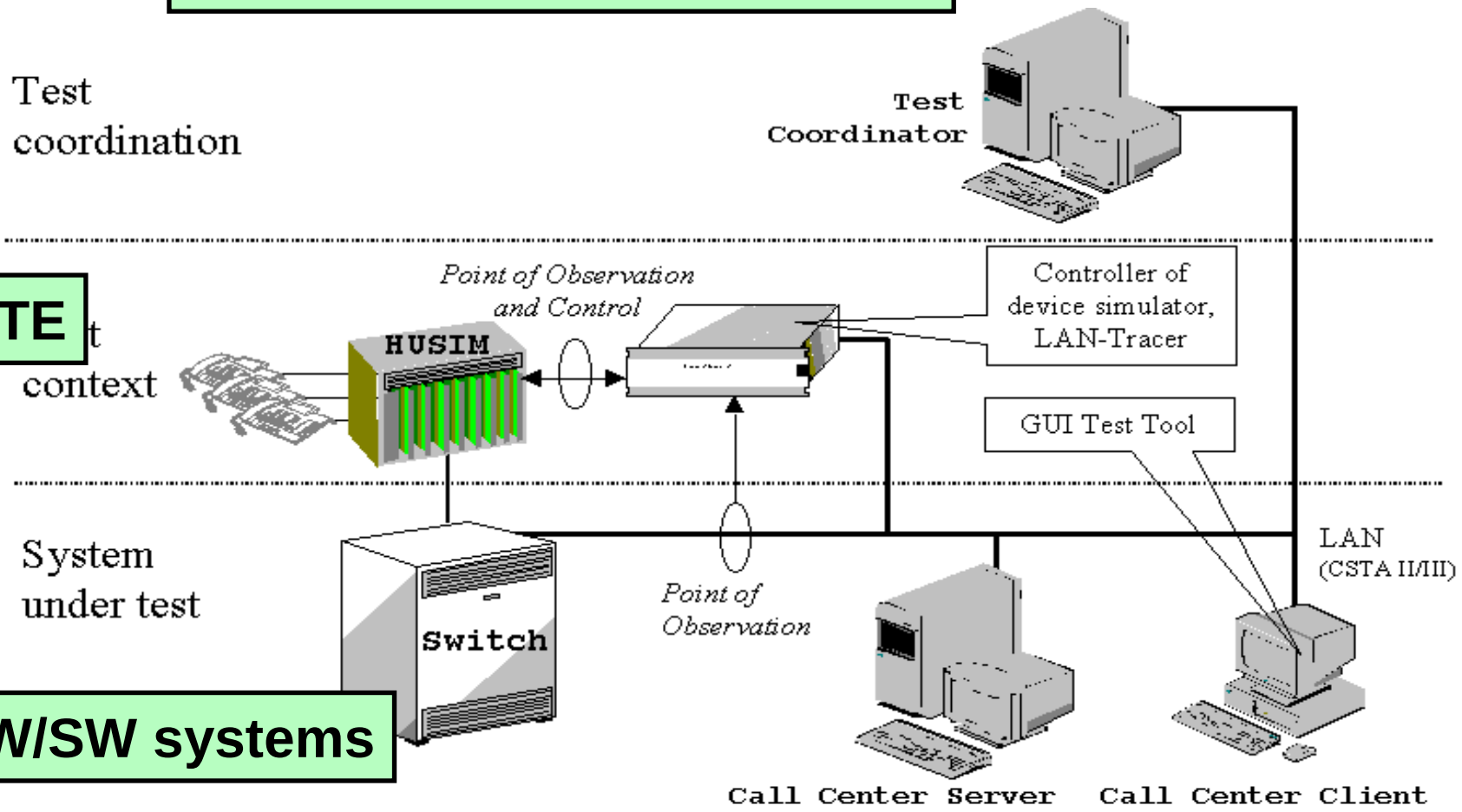


2) Computer/Telephony Integrated Systems



Computer/Telephony Integrated Systems

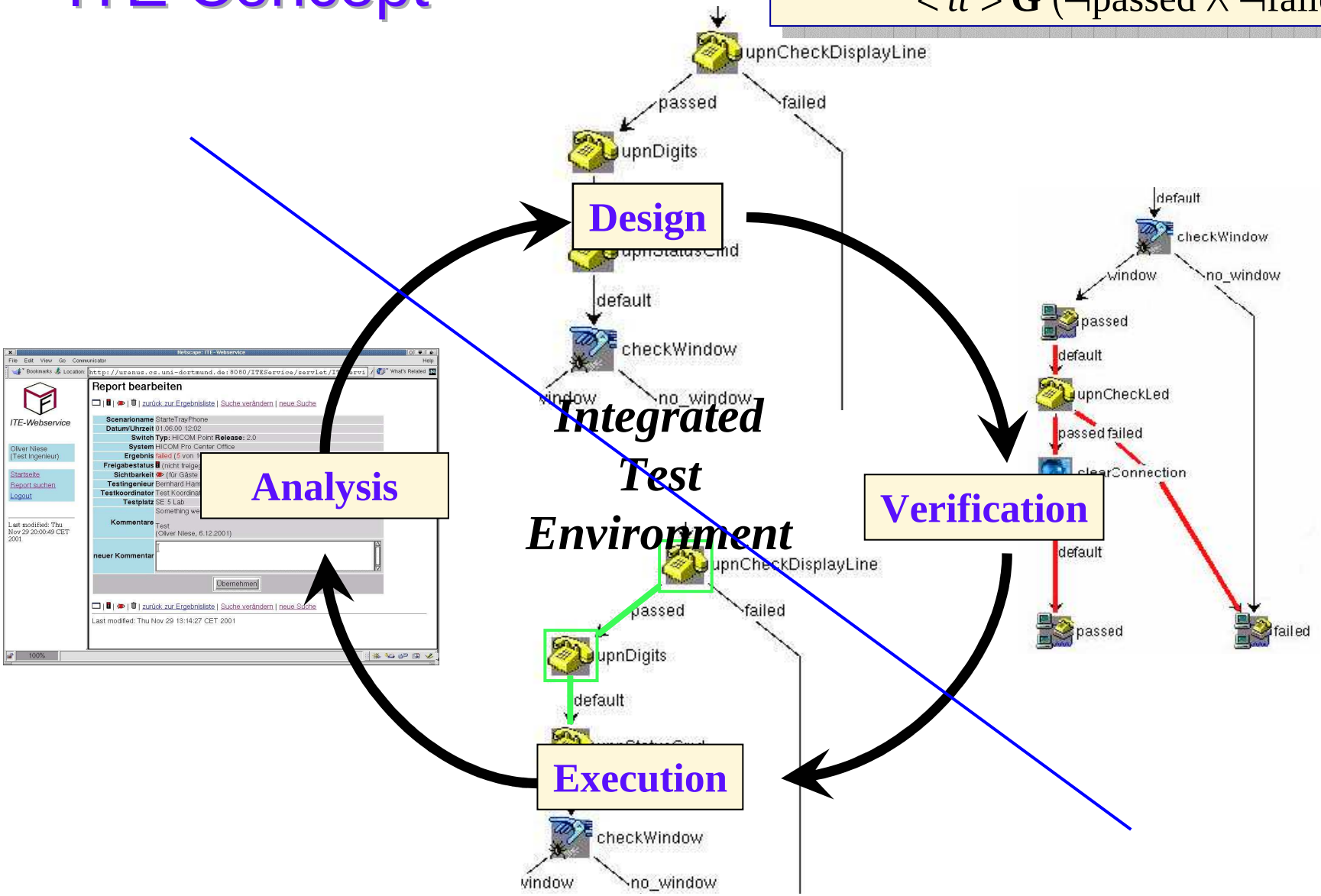
Intelligent Test Management



HW/SW systems

ITE Concept

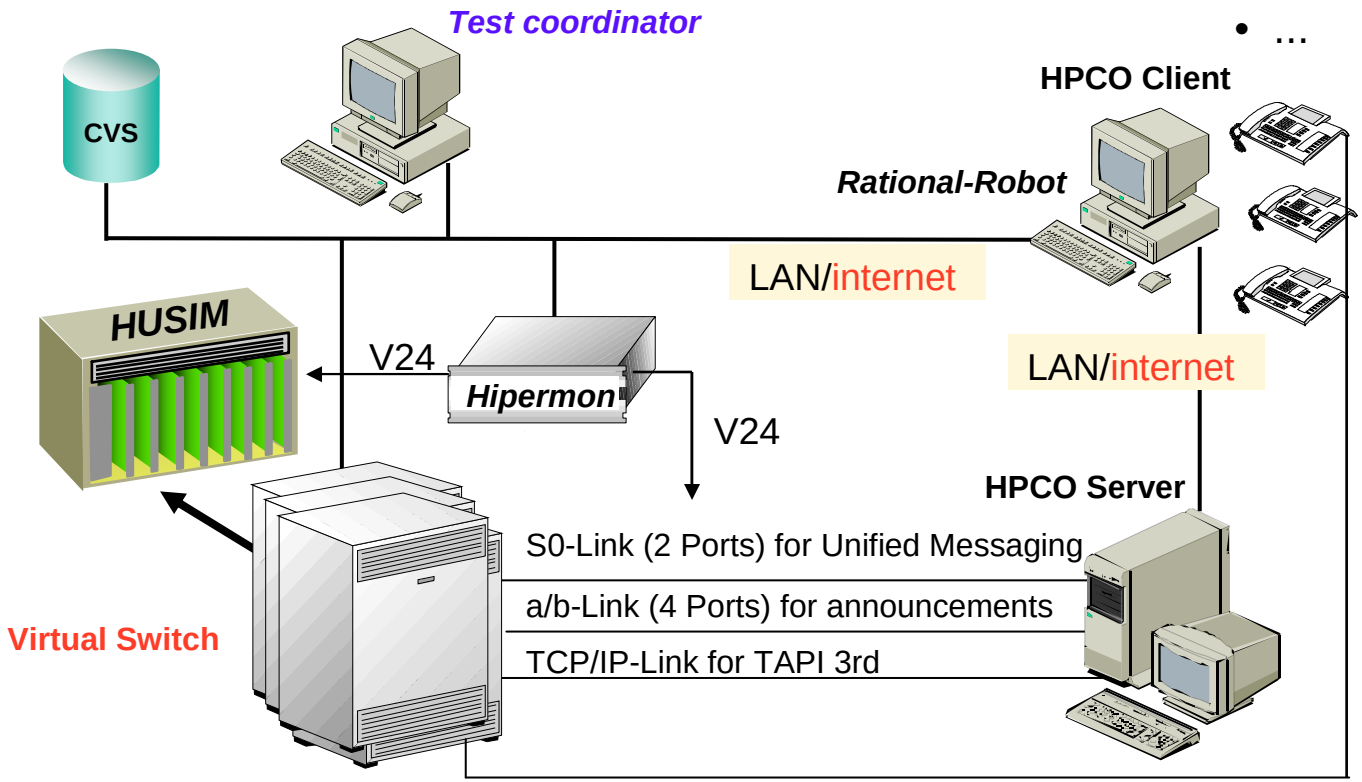
$$\text{passed} \vee \text{failed} \Rightarrow \langle tt \rangle \mathbf{G}\,(\neg\text{passed} \wedge \neg\text{failed})$$



The Evolution Problem:

HiPath AllServe Call Center:

- Unified Messaging Services
- Automated Call Distribution (topic experts)
- Interactive Voice Response (IVR) - dynamic teleworking
- …

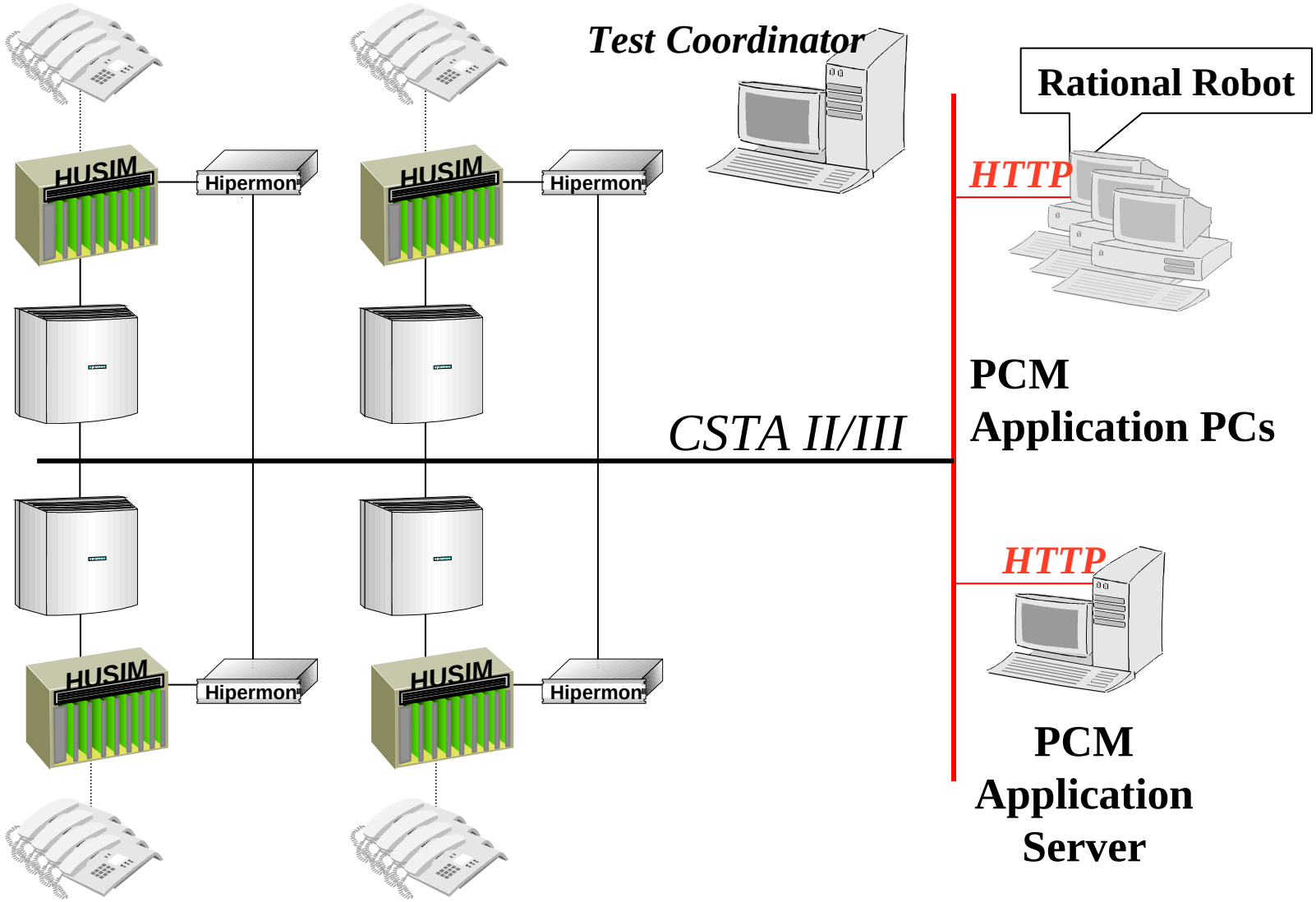


30 ACD-groups

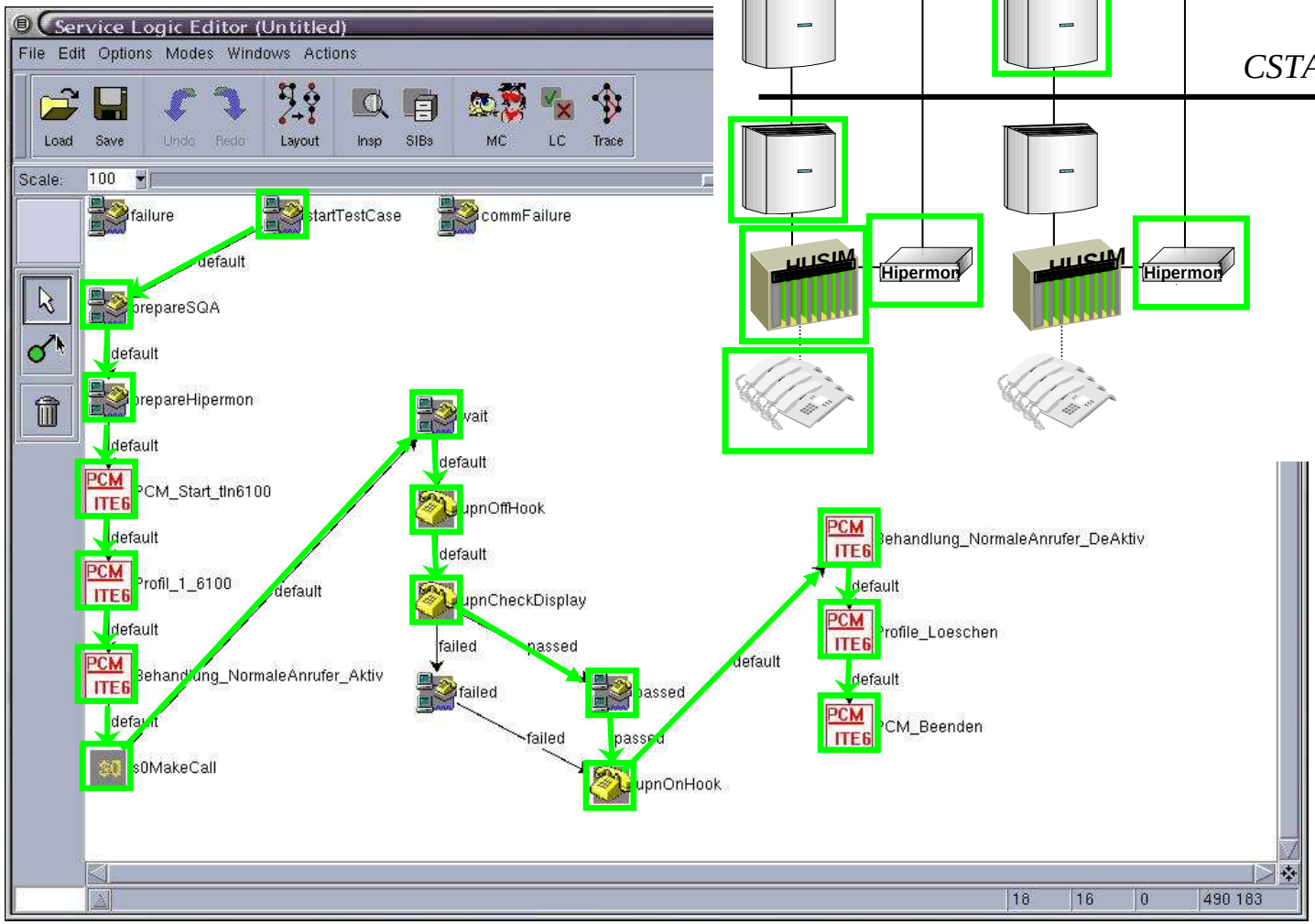
8 Supervisors (PCs)

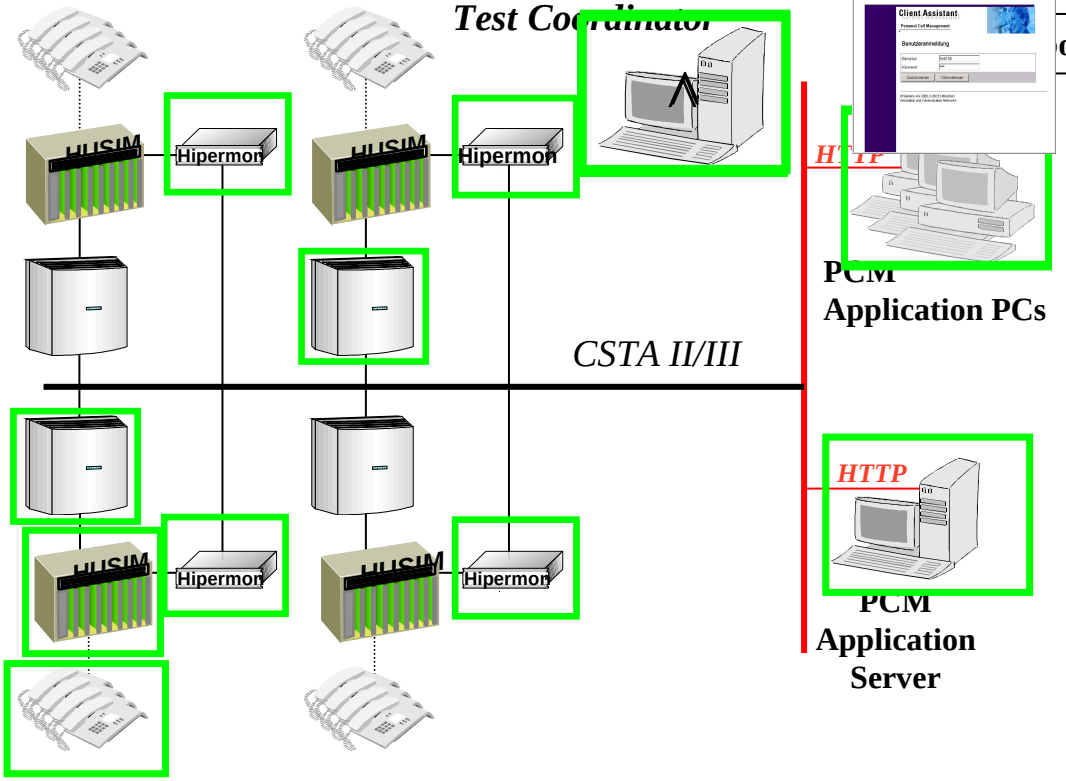
64 Agents (PCs)

Concrete Test Setting : PCM operation



Test Execution

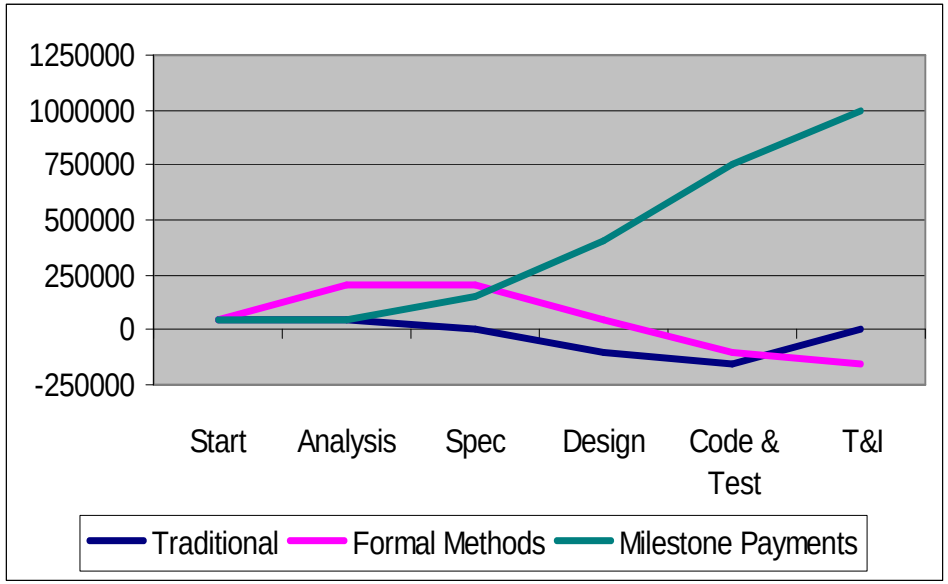




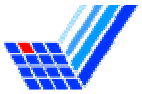
Conclusions

- Approach to designing and testing role-based, distributed, heterogeneous systems with
  - ↗ coordination-oriented model
  - ↗ library-based design & test
  - ↗ library-based consistency checking
  - ↗ incremental formalisation
  - ↗ verification-supported design & test
- global, feasible, open, scalable

Go – No Go Conditions (D. Stidolph – FME 2003)



- Investment curve for the same formal methods and traditional developments
  - Below the Zero Line is Good
  - Negative investment = Profit
- Traditional development breaks even at spec delivery
- Formal methods development costs money until code and unit test is complete



Trend 3: do applications really get more complex faster than our ability to analyze them improves? (no!)

G. Holzmann (FME'03)

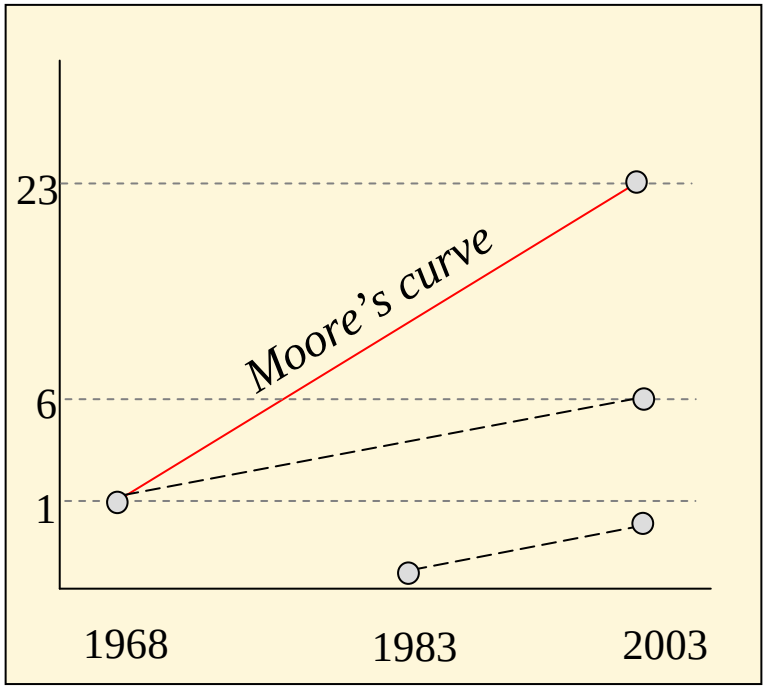
rough indication

- 1968: OS/360 = ~5 Million lines of assembly (~ 1 Million lines of C)
- 2003: WindowsXP = ~64 Million Lines of C/C++ (35 years = 23x18 months)
  - INCREASE: ~2^6 (64 x)
  - MOORE's CURVE: ~2^{23} (>8 million x)

another:

- 1983: trace was 3,507 lines of C
- 2003: spin has 28,687 lines of C

  (20 years = 13.3 x 18 months)
  - INCREASE: ~2^3 (8 x)
  - MOORE's CURVE: ~2^{13} (10,000 x)



simple observation:

in the same amount of time
1 Million lines of C code can be compiled and analyzed far more thoroughly today than **1,000** lines of C-equivalent code in 1968

Challenges

- Feature interaction
- Models for legacy systems
- Decoupling of layers
- Couplings in error models
- Mixed qualitative and quantitative aspects
- Incremental methods
- Compilation and Synthesis

Taxonomy of systems and profiles

Utter specialization of studies:

Will (systems) people (still) be able to talk to each other in 10 years?