H Frameworks

H.1 Overview

Design is hard.
One way to avoid the act of design is to reuse existing designs
[Ralph Johnson]

- Class libraries
- Frameworks — What they are, How they work, Benefits
- Types of Frameworks
- CORBA & Frameworks
- Java & Frameworks

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H.2 References

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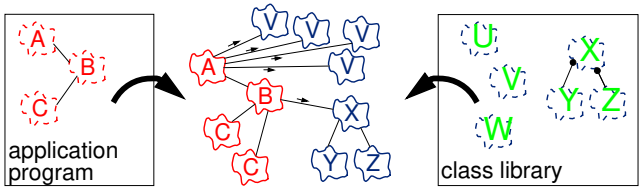
H.3 Frameworks — What, How & Why

1 Classes and Class Libraries

- Class = design for a set of objects
- Class library
  - ◆ Collection of classes
  - ◆ Flow of control: application objects → library objects



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2 Frameworks (What)

- Framework = design for a set of applications
  - ➥ design of a set of objects that collaborate to carry out a set of responsibilities
  - ➥ a way to reuse high-level design
- Framework =
  - set of classes
  - + rules how the objects play together
  - + definition of the interfaces in the game (how can I join)
  - + definition of interfaces to the game (interaction with the outside world)
  - + definition of the goals of the game
- Compared with a hardware board
  - ◆ the board = instance of the Framework
  - ◆ ICs = objects
  - ◆ backplane = ORB

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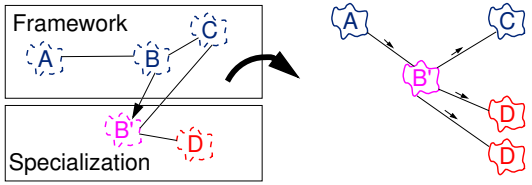
2 Frameworks (What - 2)

- Frameworks
  - ◆ are an application or application skeleton
  - ◆ application developer may
    – add – substitute – modify
    components
  - ◆ Flow of control:
    framework → application object → framework
    "Don't call us, we'll call you" (Hollywood principle)



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3 Frameworks (How)

- Two sorts of interfaces, two ways for customization
- ▲ Client API
  - ➤ external interface of the framework
    (how can other applications interact with the framework)
  - ➤ described in IDL
- ▲ Framework API
  (Black-box Interface for customization)
  - ➤ internal interface of the framework
    (how can new components interact with the rest of the framework
    + how does the framework interact with the new components)
  - ➤ interface described in IDL, protocol for registration & notification
- ▲ Subclasses of framework components
  (White-box Interface for customization)
  - ➤ customization + replacement of components of the framework
  - ➤ polymorphism guarantees interoperation

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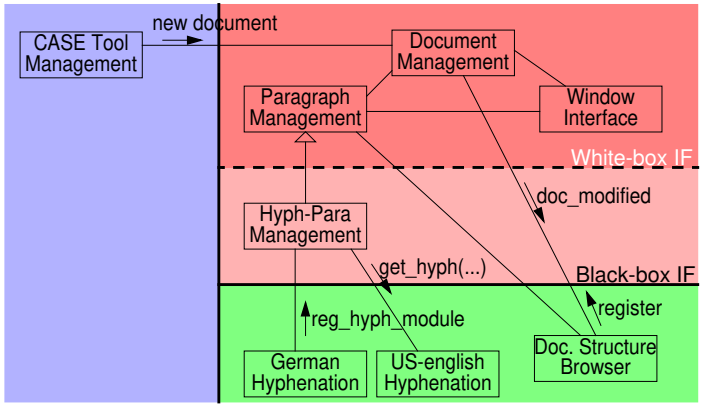
4 Example

- Framework for document processing



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5 Benefits

- Prefabricated infrastructure
  - ➤ reduces coding, debugging & testing
- Architectural guidance
  - ➤ software is wired and ready to go
  - ➤ you just have to plug in your extensions
- Less monolithic applications
  - ➤ small pieces of applications are plugged into existing frameworks
  - ➤ existing frameworks are plugged together
- Foundation for a software components industry
  - ➤ Well-designed general frameworks are the basis for problem-specific solutions
- Reduced maintenance
  - ➤ Frameworks provide the bulk of (hopefully well-tested) code

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H.4 Types of Frameworks

1 Application Frameworks

- Expertise applicable to a wide variety of programs
  - ➤ graphical user interfaces

2 Domain Frameworks

- Expertise in a particular problem domain
  - ➤ manufacturing control
  - ➤ document processing

3 Support Frameworks

- System-level services
  - ➤ file systems, device interaction, ...

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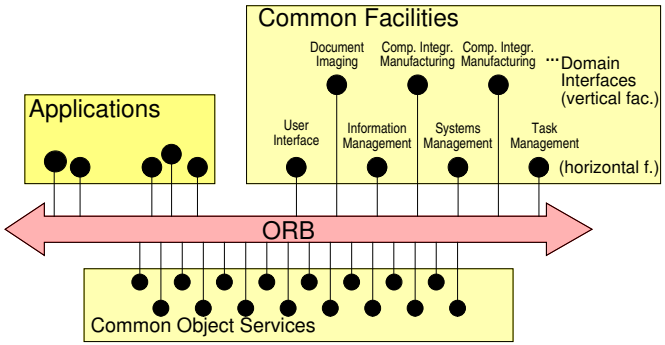
H.5 CORBA & Frameworks (2)

- CORBA Facilities
  - ➤ provide services for business objects
  - ➤ are built on top of Common Object Services
  - ➤ extend the "primitive" COS



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H.5 CORBA & Frameworks

- Main goal of CORBA
  - ➥ infrastructure for business objects

★ Business objects
  - ➤ a representation of a thing active in the business domain
  - ➤ includes
    - – business name and definition
    - – attributes, behavior, relationship, constraints
  - ➤ examples:
    - – a person (customer), a place, a concept (invoice, contract), …
  - ➥ may be used in unpredictable combinations
  - ➥ is independent of specific applications
  - ◆ represents a "everyday life entity" → exists in the "end user's world"
  - ◆ in contrast: entities that make sense only to information systems

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H.6 Java & Frameworks

1 IBM SanFrancisco

- Commercial application framework
  - ➤ automated business management systems
  - ➤ components for
    - – General Ledger
    - – Order Management
    - – Warehouse Management
- Based on Java

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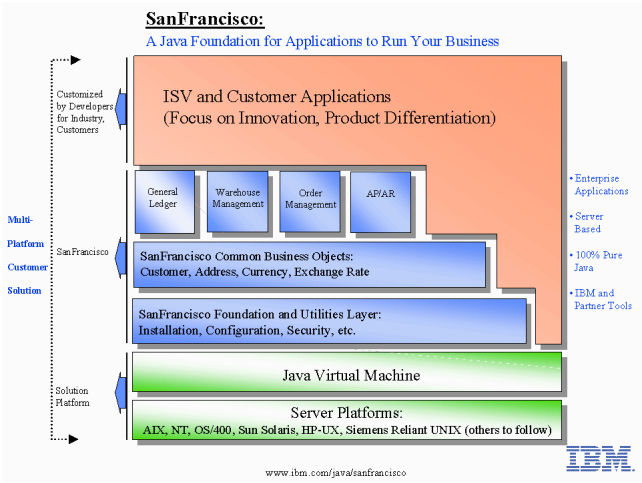
1 IBM SanFrancisco (2)



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2 Java Frameworks

- Java Media Framework
  - ➤ audio and video device control
- Lightweight UI Framework
  - ➤ Customizable user interface environment
- General Administrative Framework

★ Fundamental concepts for building Frameworks with Java:
- ➥ Interfaces to describe type conformance
- ➥ Component technology: Java Beans
- ➥ Enterprise JavaBeans

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3 Enterprise JavaBeans

- Standard multitier component architecture for reusable server components
  - ➥ infrastructure for distributed frameworks
- Application server
  - ➤ execution environment for application components / business objects
  - ➤ most parts of an application's logic moved from clients to server
- Multitier applications
  - ◆ client/server = 2-tier
    - ➤ presentation logic + business logic + data manipulation logic on client
    - ➤ database on server
  - ◆ thin client + distributed server components = multitier
    - ➤ presentation logic on client
      - ➥ thin client
    - ➤ business logic + data manipulation logic = separate server components

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