22. The San Francisco Framework for Business Applications

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San Francisco – Obligatory Literature

- K.A. Bohrer: Architecture of the San Francisco frameworks
  http://researchweb.watson.ibm.com/journal/sj/372/bohrer.html

San Francisco – Secondary Literature

- P. Monday, J. Carey, M. Dangler. SanFrancisco Component Framework: an introduction. Addison-Wesley, 2000. Overview on San Francisco and its layered architecture.
- J. Carey et al.: SanFrancisco Design Patterns: blueprints for business software. Addison-Wesley, 2000.
- IBM SanFrancisco Documentation Entry
  http://csiserv01.centerprise.com/techdoc/SF/doc_en/ibmsf.sf.FS_DocumentationEntry.html

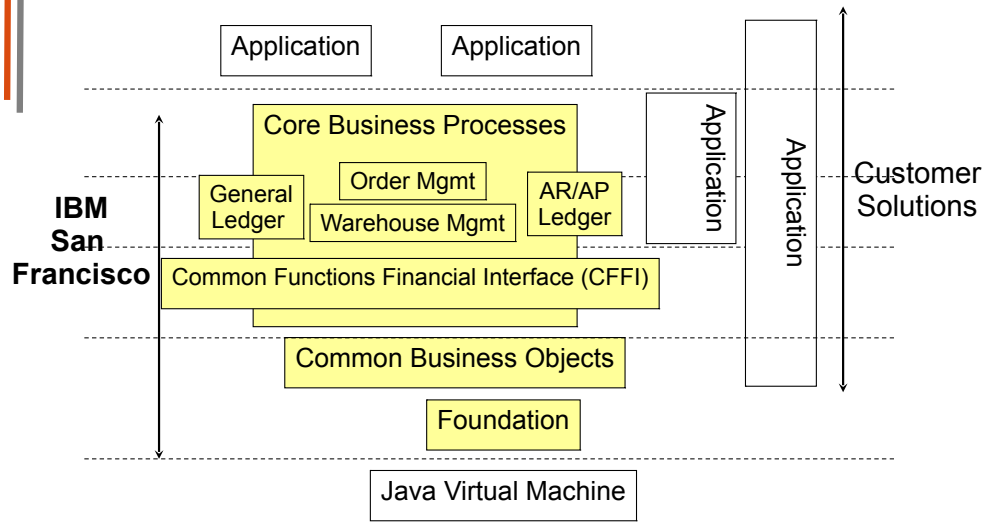
What is San Francisco (SF)?

- Business framework of IBM, to support the building of business applications
  - started in March 1995, initial release Aug 1997
- Arranged as layered frameworks
- Supporting distributed applications
- Based on business-specific Design Patterns
- Design goals
  - flexibility by using object-oriented framework technology
  - maximal reuse
  - isolation from underlying technology
  - focus on the core, provide the common tasks of every business application
  - rapidly building quality applications
  - integration with existing systems

San Francisco Architecture (1)

- Three layers:
  - bottom: ***Foundation*** provides infrastructure and services (transactions, collections, administration, conflict control, installation), hides differences in underlying technology
  - middle: ***Common Business Objects*** provides implementations of business objects that are common to more than one domain
  - top: ***Core Business Processes*** provides business objects and default business logic for selected vertical domains (accounts receivable, accounts payable, general ledger, order management warehouse management)

San Francisco Architecture (2)



Predefined Business Objects (from the Domain Model)

- General business objects
  - Address, currency
  - Company
  - Business partner, customer
  - Decimal structure of numbers, number series generator
  - Document location
  - Fiscal calendar
  - Initials
  - Natural calendar
  - Payment method and payment terms
  - Unit of measure
- Financial business objects
  - Money, account, currency gain, loss account
- Generalized mechanisms
  - Cached balances
  - Classification
  - Keys and Keyables

Component Model of SF: User-Defined *Entities*

- **Entities**: ***Dynamically extensible components*** in SF
  - *materials*, also persistent
  - with global identifiers (*handles, guids)*
    - Created via factories, entered into *containers*
    - Split into interface class and implementation class
- Entities are similar to *Java Entity Beans.*
  - Hence, IBM started a move to port onto EJB, but this was very difficult
- Standard Functions:
  - constructor (factory method). Calls a global factory
  - initialize
  - getters and setters
  - set ownership of an entity (to an entity container)
  - destroy
  - externalizeToStream
  - internalizeFromStream
- Global functions:
  - begin, commit, rollback transaction
  - Manage *work area* for a thread

Business Processes

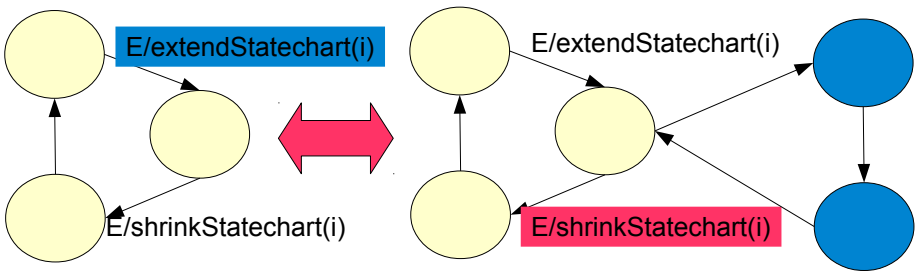
- Common Function Financial Interface (CFFI): common functionality used by other business processes
- Warehouse management
  - Stock movements
  - Quality control
- Order management (sales, purchase)
  - Order data interchange planning
  - Pricing, discounts, order acknowledgment
- Accounts payable (AP), Accounts receivable (AR)
  - Payment process
  - Business task transfer to other partners
- General ledger
  - Journaling (creating, validating, maintaining journals)
  - Closing at the end of a financial year

Extending San Francisco

- Classes can be marked as *extension points*
  - Naming scheme E<number>_<name>
    - inheriting from *Entity*
- Business objects are extensible by *subclassing* (white-box extension)
- Subclasses of class *PropertyContainer* are extensible via a special Design Pattern
  - New attributes (properties) can be added dynamically, without recompilation. Access works via hash tables
- *Policy classes* implement business rules
  - *Strategy* (TemplateClass) as extension points
  - *ChainOfResponsibility* as extension points (for multiple policy objects and multiple business rules), e.g., for specific rules of product, system, company, globally
  - *Composite* as extension points: Policies may be added that search for policies (higher-order policies) in composite data structures
- *Dynamic identifiers* for extending value ranges of business value domains

Lifecycle of Business Objects (Business Workflow, Process)

- A business workflow in SanFrancisco is described by an *extensible* statechart
  - However, in the form of a state transition *and* decision table
  - The table rows contain conditions and actions (CA-Rules) and change the state of the process
- The statechart can be extended dynamically with new paths
  - As an action, a transition can extend the statechart (or shrink it)



San Francisco Design Patterns (1)

- San Francisco uses both GOF-Pattern and new business-related Design Patterns
- Special patterns developed that meet particular problems of business applications
  - analyzing typical business applications and developing generic solutions for recurring problems
  - encourage object-oriented implementation of business software
  - several patterns for several aspects of business tasks

SF Design Patterns (2)

Foundational Patterns:
- Class Replacement
- Special Class Factory
- Property Container (extensible class)
- Business Process Command

Process Patterns:
- Cached Aggregate
- Keyed Attribute Retrieval
- List Generation

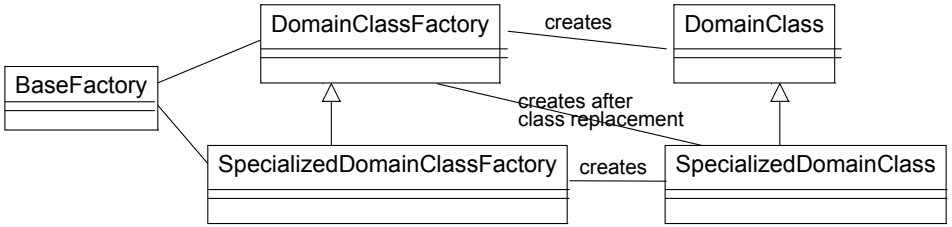
Behavioral Patterns:
- Simple Policy
- Chain of Responsibility-Driven Policy
- Token-Driven Policy

Structural Patterns:
- Controller
- Key/Keyable
- Generic Interface

Dynamic Behavioral Patterns:
- Extensible Item
- Hierarchical Extensible Item
- Business Entity Lifecycle
- Hierarchy Information
- Decoupled Processes

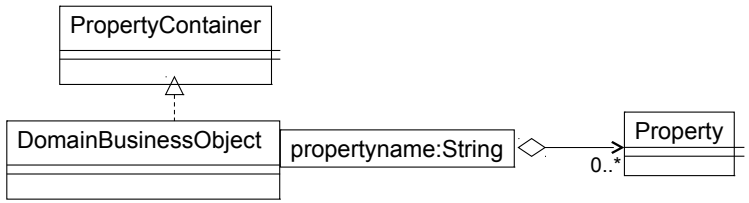
Selected SF Patterns: Class Replacement

- Intent: change the behavior without changing the class or application logic. Provides a kind of *super factory*, a factory delivering factories
- Motivation: replace provided business objects with others that have been tailored for a specific application
- *Related Patterns*: Abstract Factory and Factory Method



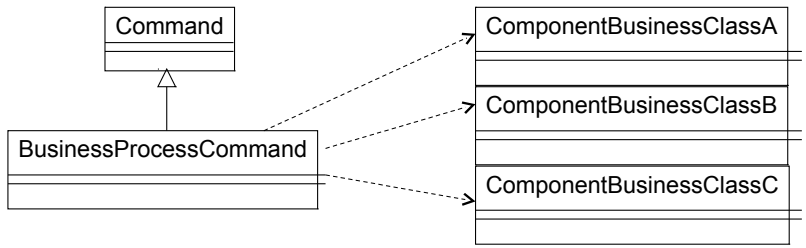
Selected Patterns: Property Container

- Intent: dynamically extend an instance of a business object with new properties (dynamically new attributes)
- Motivation: adding dynamically new data, properties or capabilities to specific instances of business objects
- Related Patterns: Chain of Responsibility, Controller



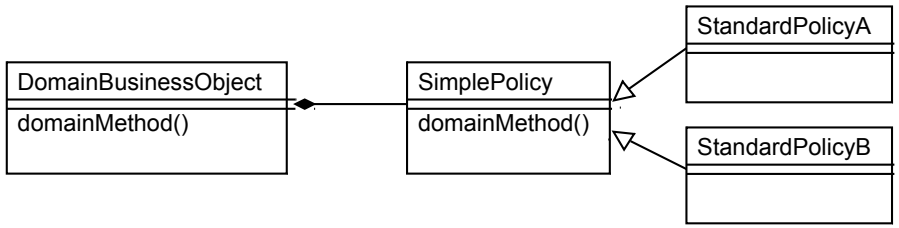
Selected Patterns: Business Process Command

- Intent: a logical business object is implemented as multiple physical objects and support one business process
- Motivation: encapsulating a business process (a *tool)* in a command, thus a logical object combines a group of physical objects
- Related Patterns: Command, Template Method, Facade



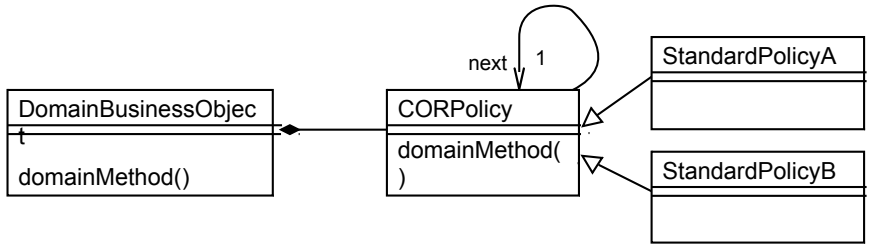
Selected Patterns: Simple Policy

- Intent: encapsulate business rule as a set of methods in an object, make them interchangeable and produce independence from affected business objects
- Motivation: different versions of a algorithm are required dependent on the specific situation in a company
- Related Patterns: Simple Policy is a Strategy. Additionally, the strategy method implements a method in the domain business objects with the same name (method factoring). Hence, the BO *delegates* the computation of the business rule to the strategy



Selected Patterns: Chain-Of-Responsibility-Policy

- Intent: encapsulate business rule(s) as a chain-of-responsibility
- Motivation: many rules are available for a business case and must be exchanged dynamically.
- Related Patterns: A typical 1-TH-pattern. COR-Policy is a Chain, combined with a Strategy. The Chain is searched for appropriate rules that apply to the current state of business.
  - Search order can be changed by higher-order policies



What Have We Learned?

- Big business frameworks are structured according to the principles of variability and extensibility we have studied in the course.
- IBM San Francisco manages extension points and types them with certain framework hook patterns, e.g., Strategy/Policy, or Chain.

The End