Requirements to UML to Engineering Drawing Traceability Mechanisms

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Overview

- Problem Statement
- Shortcomings of Present Day Tools
- Proposed Approach
- Project Scope and Objectives
- Software Architecture
- Example

Problem Statement

- Often, the underlying cause of catastrophic and expensive failures is minor mistakes or omission in communication of design intent
- Almost all grave software problems can be traced back to conceptual mistakes made before the programming was initiated

Shortcomings of Present Day Tools

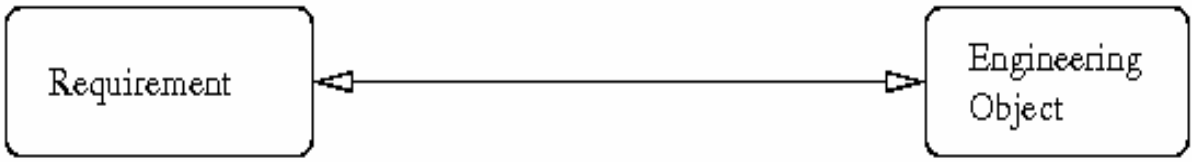
1. Support for separation of design concerns (e.g., from the beginning, topology/connectivity concerns are connected to geometry concerns) is weak.

2. There is a lack of comprehensive support for spatial reasoning. As such, the tools are not easily extensible to layers of services.

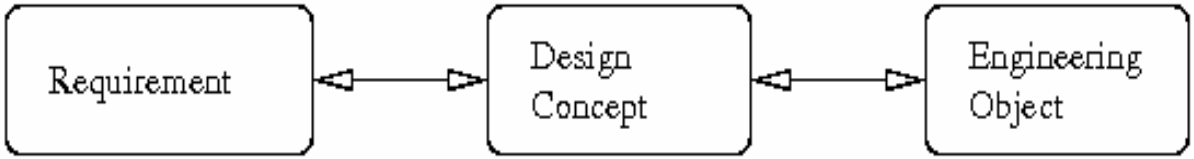
3. Support for traceability of requirements to the engineering system itself is nonexistent.

Proposed Approach

State–of–the–Art Traceability Model



Proposed Traceability Model



Project Scope and Objectives

Modeling and Visualization of the Washington, D.C. Metro System – the first-cut implementation will:

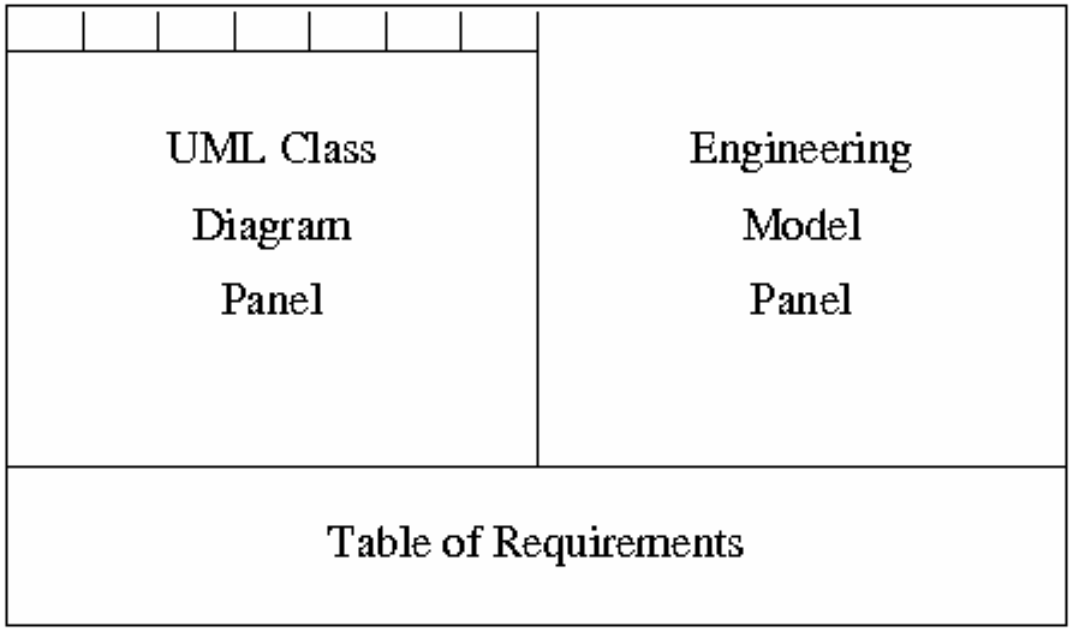
1. Focus on early stages of design, where component selection, positioning and connectivity are the principle concerns.

2. Represent ontologies as UML class diagrams.

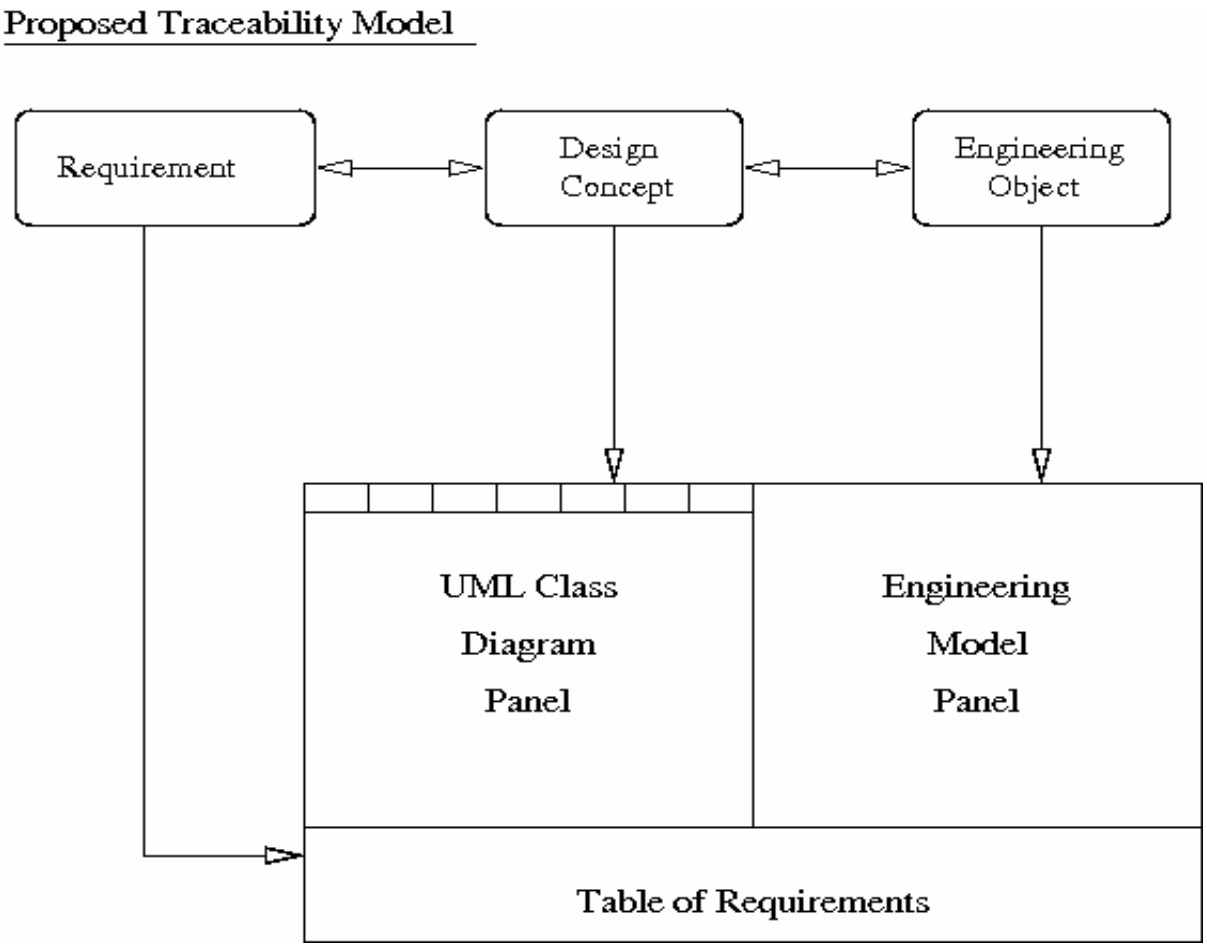
3. Not consider system- and component-level behavior.

4. Not consider assignment of functions to components.

Software Architecture Design: GUI Design



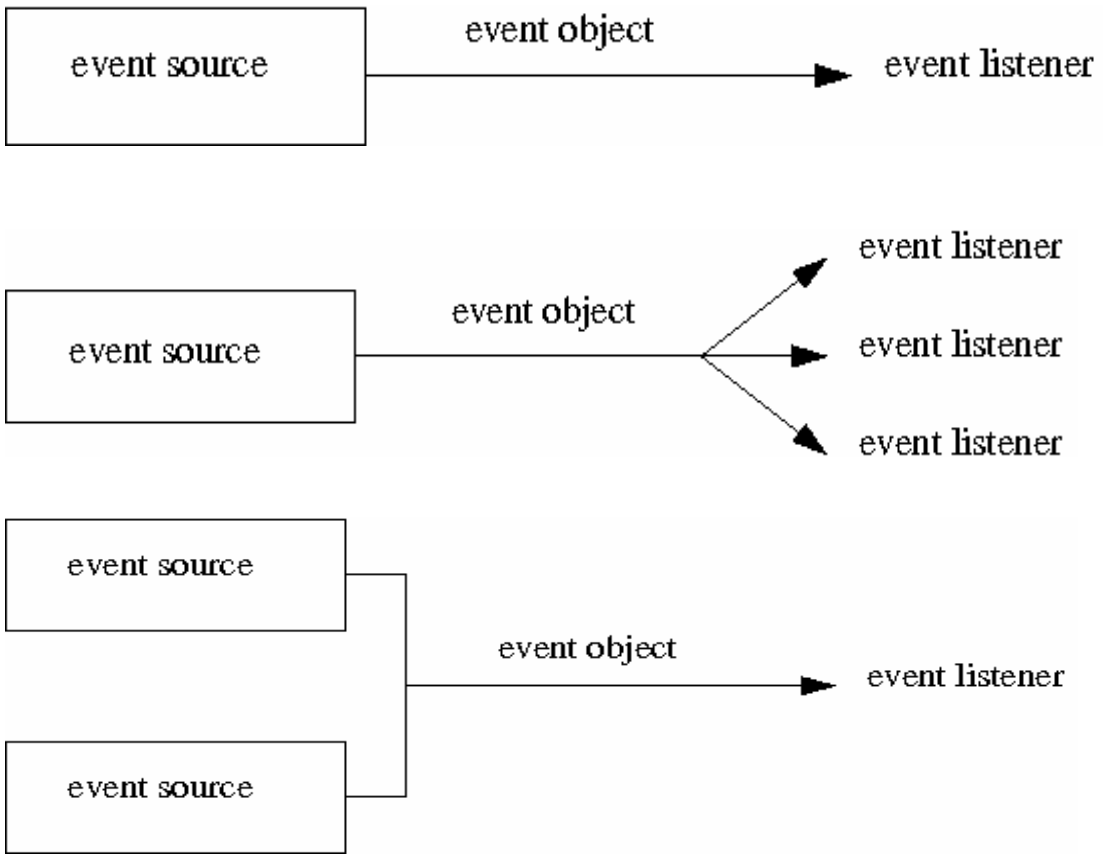
Software Architecture Design: GUI Design



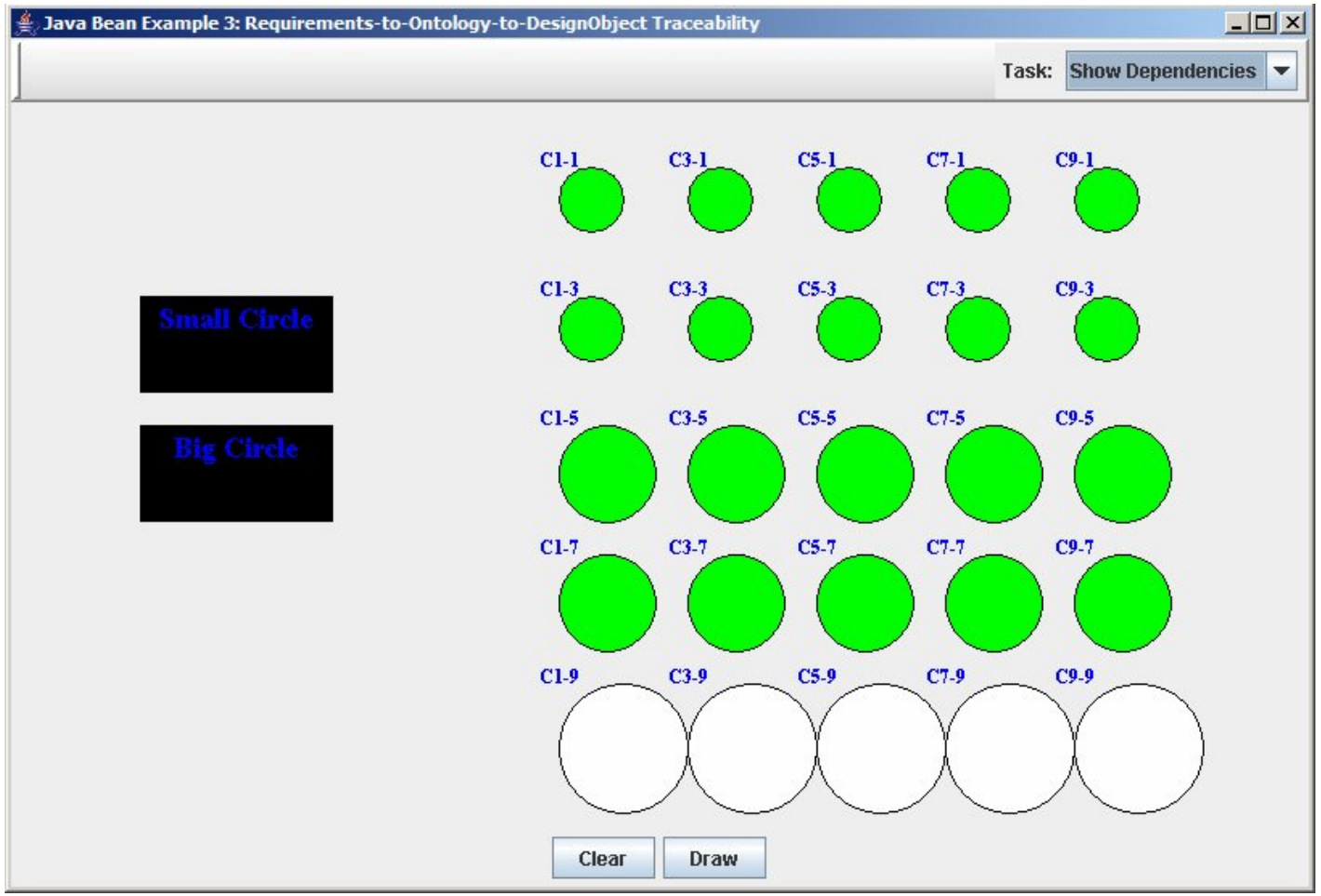
Software Architecture Design: Java Delegation Event Model

- Based on the Publish-Subscribe design pattern
- The DEM refers to publishers as “event sources” and subscribers as “event listeners”

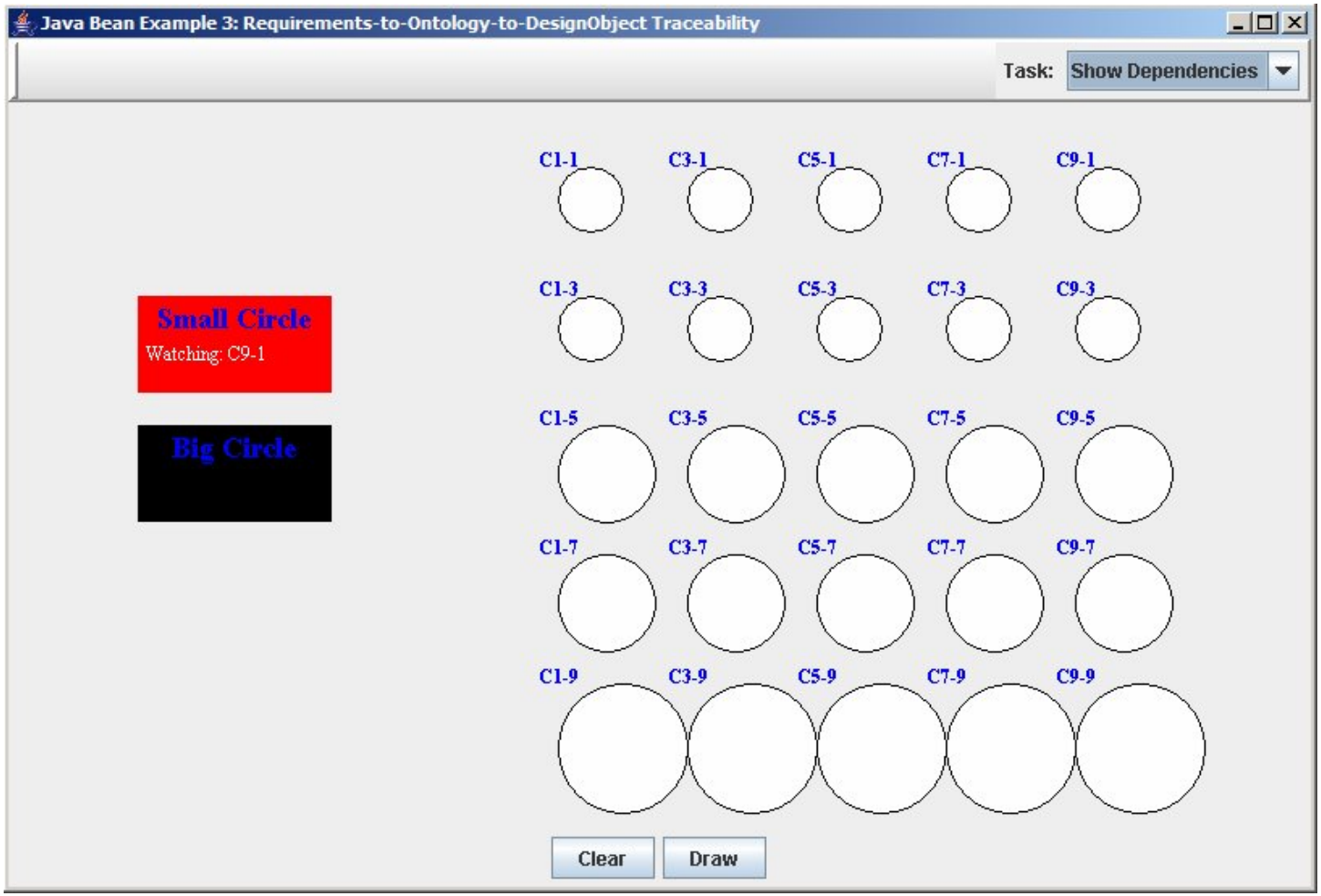
Software Architecture Design: Listener-Driven Events



Software Design Architecture: Listener-Driven Events (cont)



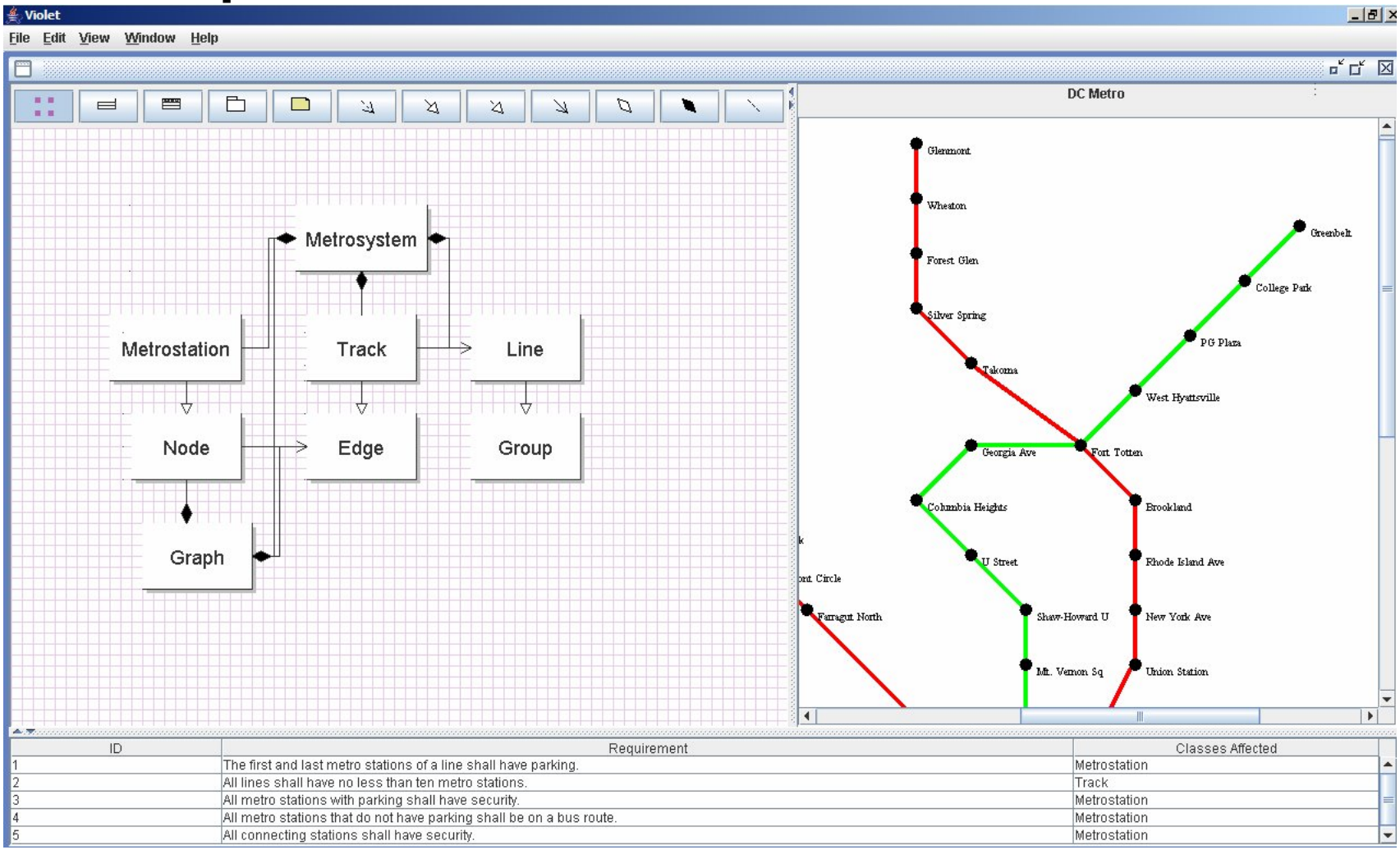
Software Design Architecture: Listener-Driven Events (cont)



Software Architecture Design: Violet UML Editor

- Supports the drawing of Class Diagrams, Sequence Diagrams, Use Case Diagrams, State Diagrams, and Object Diagrams
- Completely free, not platform-dependent
- Built on a graph framework
- See http://horstmann.com/violet/

Washington, D.C. Metro System Example



ID	Requirement	Classes Affected
1	The first and last metro stations of a line shall have parking.	Metrostation
2	All lines shall have no less than ten metro stations.	Track
3	All metro stations with parking shall have security.	Metrostation
4	All metro stations that do not have parking shall be on a bus route.	Metrostation
5	All connecting stations shall have security.	Metrostation