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Component Technology Neutral Implementation

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Topics

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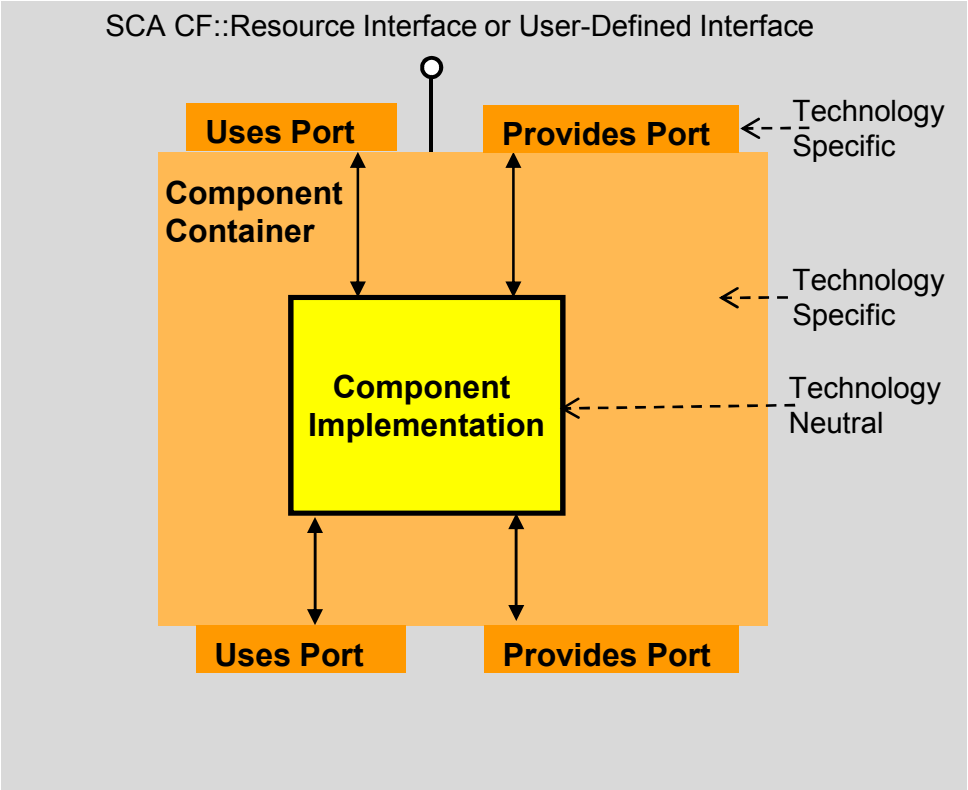
- Component Design Pattern
- Component Container Design Pattern
- Component Ports Interface Definition
- Component Provides Port Design Pattern
- Component Uses Port Design Pattern
- Component Implementation Design Pattern
- Demonstration

Component Design Pattern

- A Component's Implementation can be viewed as containing:
  - Component Container – Technology Specific
  - Component Implementation – Technology Neutral
  - Component Ports – Technology Specific
    - Uses Ports
    - Provides Ports
- The Component Implementation must be isolated from technology in order to be reusable.
- SCA 4.1
  - Architecture is Technology Neutral but 1) does not mean a Component Implementation is Technology Neutral 2) nor prevents Component Technology Neutral Implementations
  - Provides Portable Component CORBA implementations



Component Design Pattern - Reuse Goal Illustration

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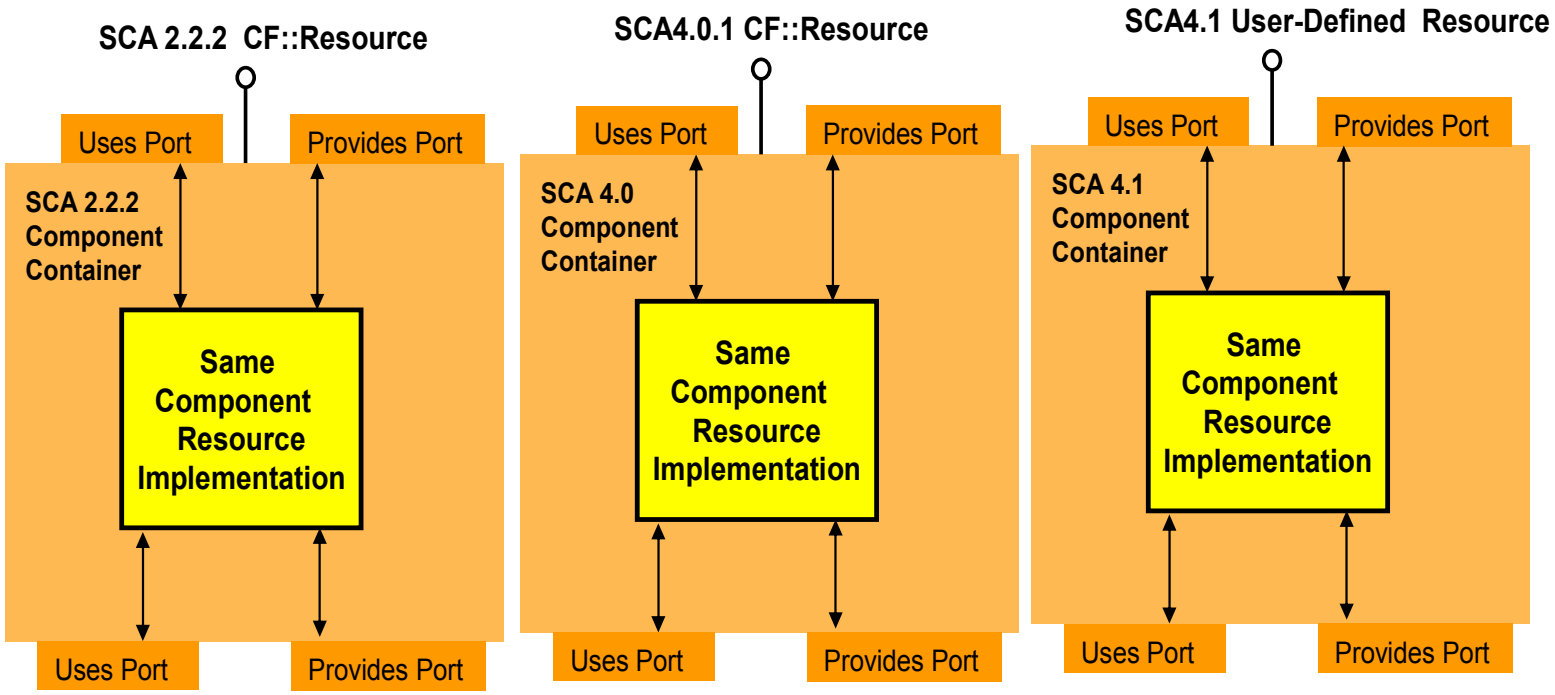
- Goal is to able to plug a component's implementation into different component technology containers
- Three component technology containers (SCA 2.2.2, SCA 4.0.1 and SCA 4.1) illustrated below where the same component implementation is plugged into along with different ports technologies (e.g., CORBA, DDS, POSIX IPC, etc.) for each component container.



Component Design Pattern – Specific Technologies

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- Technology
  - Component Framework Technology
    - SCA 2.2.2, SCA 4.01, SCA 4.1,
    - CORBA Component Model
    - Etc.
  - Middleware Technology
    - CORBA, RT CORBA,
    - Data Distribution Service,
    - POSIX IPC (Queue, Shared Memory, etc.)
    - Etc.
  - Programming Language: C, CPP, Java, etc.

Component Container Design Pattern

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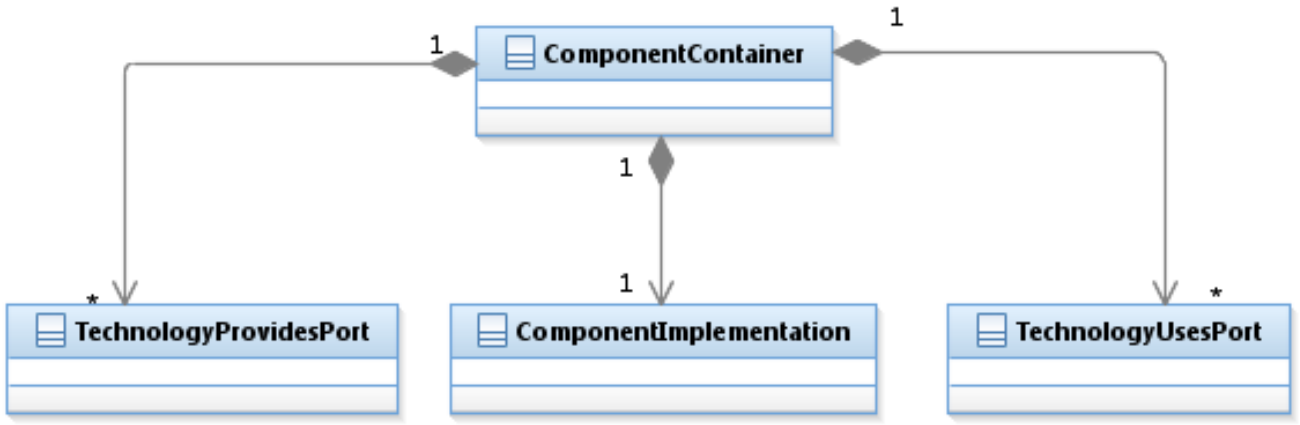
- Responsibility
  - Setups the component ports
  - Associates the component ports with the component implementation
  - Transforms Component Framework base interface operations into implementation interface operations
    - Configuration, Life Cycle, Test, Control, etc.



Component Ports Interface Definition

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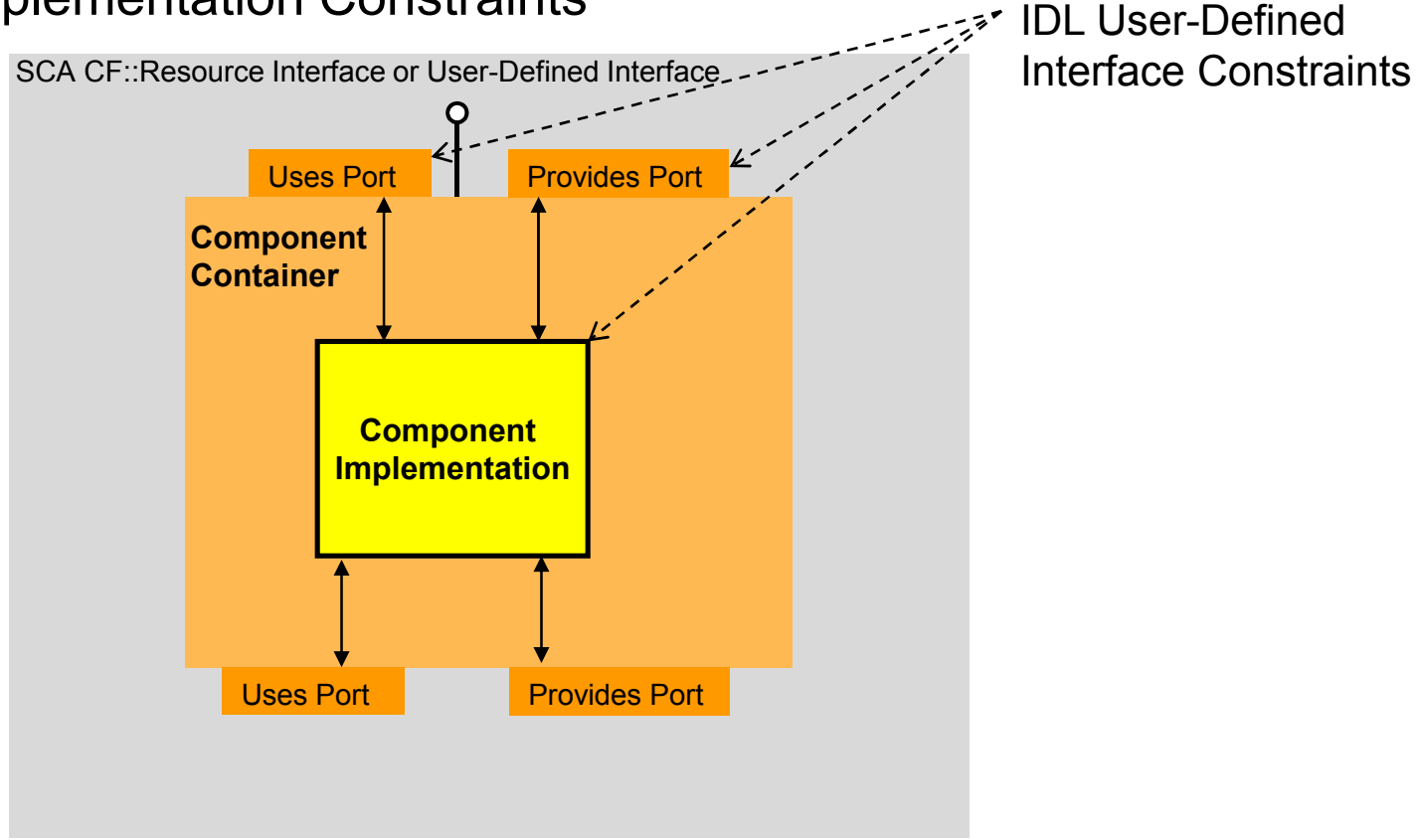
- In order to obtain a component technology neutral implementation, one must place constraints on port interfaces
  - Object Management Group (OMG) Interface Definition Language (IDL™) is used to define port interfaces
    - IDL is an industry standard for specifying an interface
    - Standard mapping of IDL to an implementation language (e.g., C, C++, Java, Ada, etc.)

      UML interface definition is not considered since there is a minimum set of UML primitive types defined and there are no standard UML language profiles for translating an interface into programming language code
  - IDL Constraints
    - CORBA predefined types (any, object, primitive types)

      CORBA name space restriction in generated code from IDL Compiler
    - Typedefs for IDL primitive types and primitive sequence types must be used
  - SCA Constraints
    - SCA Properties, DataType

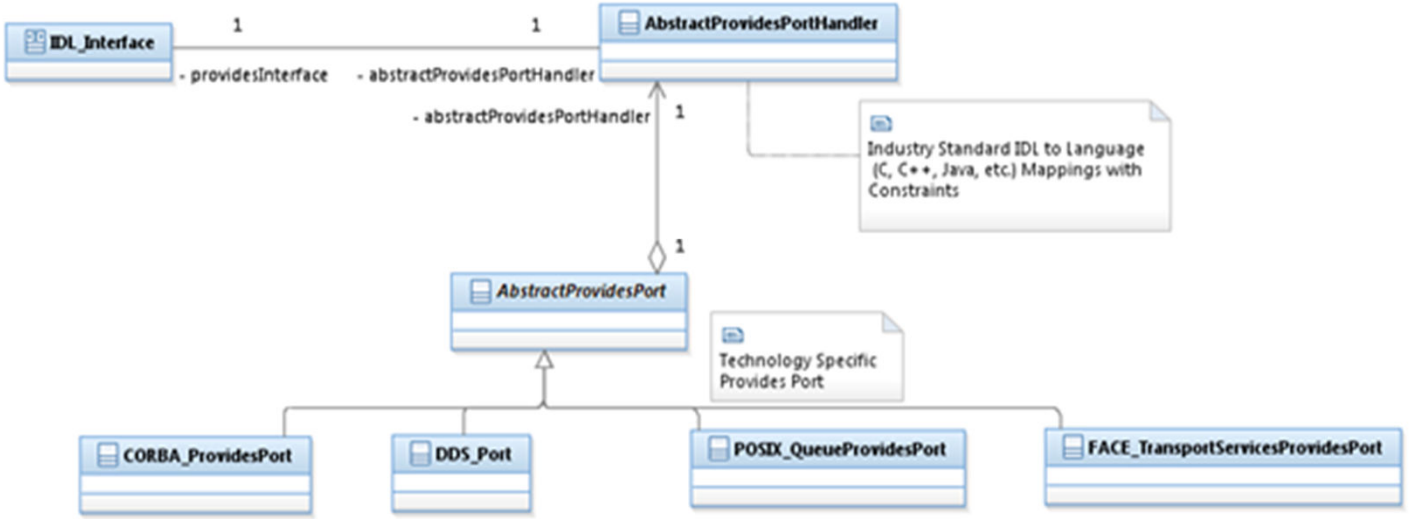
Component Ports Interface Definition, cont'd

- In order to obtain Component Implementation PSM independence need to define Constraints are at two levels:
  - IDL User-Defined Interface Constraints
  - Implementation Constraints



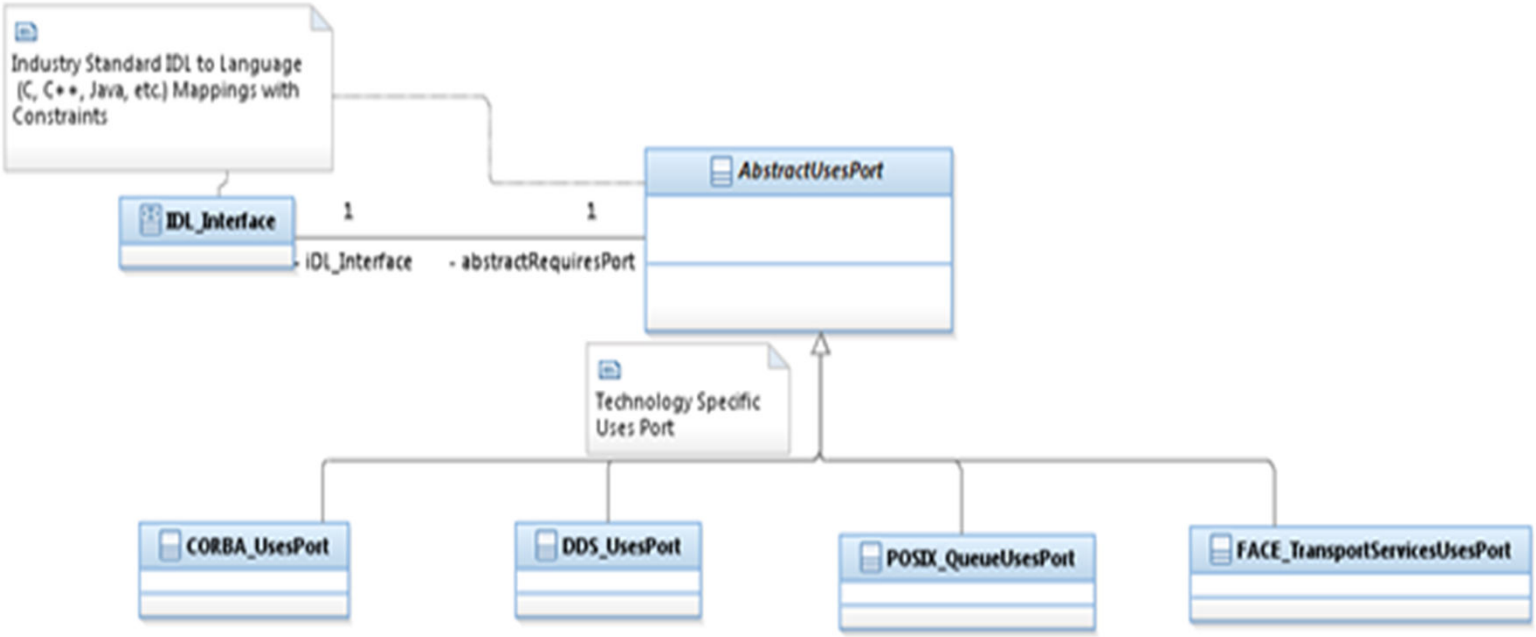
Provides Port Design Pattern

- Abstract Provides Port Handler is the class that provides interface operations that adheres to IDL standard language mappings and is where the provides interface requests are sent to.
- Abstract Provides Port provides abstraction for all technology specific provides ports and is associated with the Abstract Provides Port Handler.
- Technology Specific Provides Port is middleware technology specific class that handles the incoming technology requests and delegates the request to the Abstract Provides Port Handler.



Uses Port Design Pattern

- Abstract Uses Port - Uses Port Base class that is technology neutral following CORBA IDL standard language mappings for an interface.
- Technology Specific Uses Port (e.g., CORBA, DDS, Queues, Device Driver, etc.) class handles outgoing requests and receives requests from a component's implementation class.



Component Implementation Design Pattern

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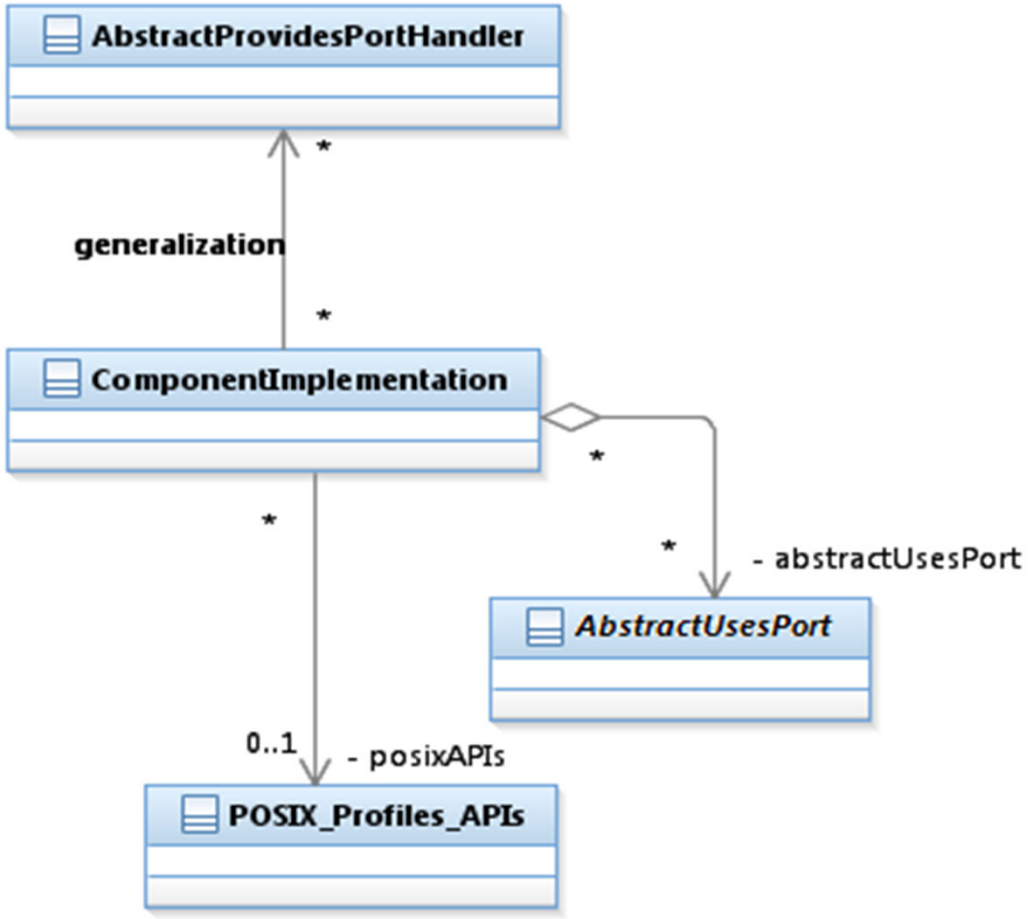
- Implementation Constraints
  - SCA interface Restrictions
    - PropertySet, TestableInterface, Port, Port Supplier, PortAccessor, etc.
  - Middleware Technology usage restriction
    - CORBA name space and operations
    - Even though POSIX gives one portability, the recommendation is hide POSIX IPCs behind ports so implementation code is not impacted in using a different middleware technology
- Design Pattern
  - Abstract Provides Port Handler is inherited by a component implementation. Component implementation handles provides interface requests by its Abstract Provides Port Handler operations that are implemented by component implementation.
  - Abstract Uses Port is an attribute of a component implementation. A component implementation sends requests to another component by its Abstract Uses Ports.

Component Implementation Design Pattern, cont'd



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Spectra/CX Demonstration of Component Technology Neutral Implementation