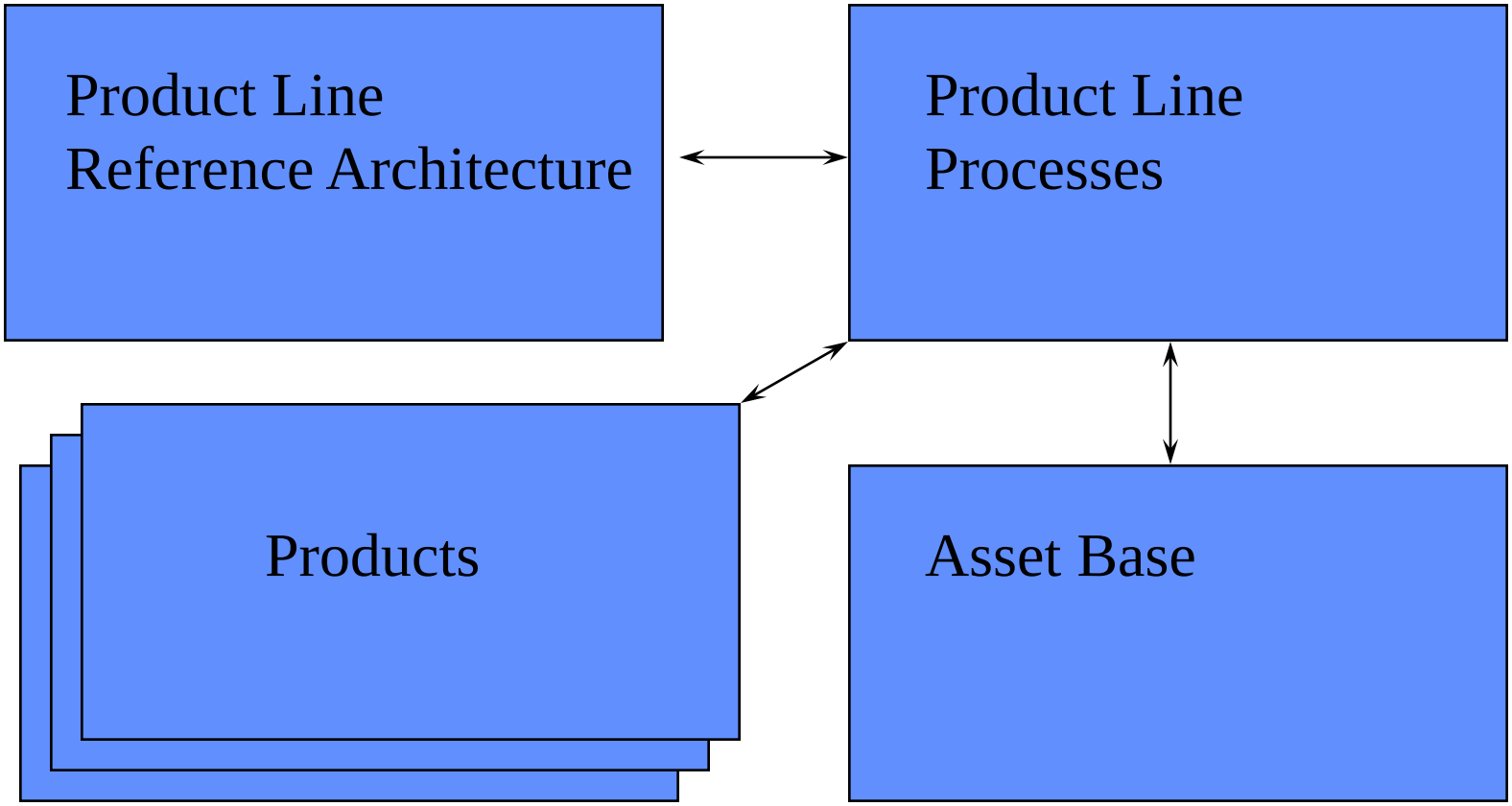
# Product Line

- Begin with product instances
  - legacy based
  - use architecture recovery processes
- Focus on appropriate business domain
  - use domain specific architectural processes
  - map from recovered to domain architecture
- Abstract/Generalize to Product Line Architecture
  - Product Line Reference Architecture
  - Product Line Processes
  - Asset Base
  - Supporting Technology
  - Organizational Issues

# Product Line



# Product Line -

- Reference Architecture
  - Domain-specific prescription or description
  - Parameterized architectural components
  - Refinement into sub-architectures
  - Style descriptions for
    - critical architectural aspects
    - orthogonal aspects - eg, initialization, fault recovery, etc
- Product Line Processes
  - Create/evolve the reference architecture
  - Create/evolve architectural instances
    - instantiate and provision
    - configure and generate
  - Create/evolve asset base
    - shared components
    - specialized components
  - Use asset base for architectural instance/impl

# Product Line

- Asset Base
  - Design component descriptions
    - common interfaces
    - common implementations
    - product-specific implementations
  - Various supporting platforms
  - Product specific components
- Supporting Technology
  - Architecture
    - Analysis - sufficiency, satisfaction
    - Instantiating, provisioning, customization
    - Generation/configuration
  - Design/Implementation
    - Architecture satisfaction analysis
    - Component composition/analysis
    - Connector optimization
    - Run-time generation

# Product Lines

- Organizational Considerations
  - Architecture/Asset base
    - across product lines
    - product line specific
    - product specific
  - Supporting technology
    - global to the company
  - Processes - support multiple product lines

# Styles

- An incomplete architectural prescription
- Focuses on certain aspects of the architecture
  - architectural elements
  - formal characteristics
  - constraints on architectural elements
  - constraints on formal characteristics
- Problem: Restrict the architectural structure
  - for example, strict layering of the architecture
- Solution: layered architecture style
  - constrain the interactions
    - any interaction at elements on the same level
    - no interactions at more than one level away
    - level below: initiate interactions only
    - level above: react interactions only

# Styles

- Problem: multi-dimensional organization
  - Select one as primary, others as secondary
- Solution: Styles for the secondary dimensions
  - primary dimension: architectural elements
  - secondary dimensions then distributed over primary
  - styles define the characteristics of the distributed dimensions
- Useful rule of thumb: a style for a domain
- Problem: multiple domains in any significant architecture
- Challenge: integrating the styles consistently

# Connectors

- Primarily thought of means of communication
  - procedure call, remote procedure call
  - message passing with various levels of service
  - constraints on structure and directions - pipes
  - constraints on quality of service - persistence
- Extremely useful in this context
  - separates computation from interaction
  - can change some non-functional characteristics by changing connectors
    - from prototype to embedded system via connectors (Tracz)
    - improve performance via connector optimization

# Connectors

- Can be used as means of mediation
  - govern access to share data structures
  - provide synchronization, exclusion
    - critical sections
    - monitors
  - determine what is allowed and when
    - readers/writers policies
    - path expressions
- Extremely useful in this context
  - separates mediation control from computation
    - localizes synchronization and exclusion control
    - localizes operational policies
  - separate mediation from communication
  - compose communication and mediation connectors

# Connectors

- Can be used a means of coordination
  - determine control of computation
    - elements of control in communication
    - elements of control in mediation
  - control loci of execution
  - control delivery of data
- Extremely useful in this context
  - separate aspects of control from computation
  - instrumented connectors (Balzer)
    - mutual invocation - like co-routines
    - coordination of computation results and data delivery
  - fault tolerance
    - separate exception handling as a plane of control
    - becomes compositional not integral

# Dynamics

- Allowed dynamic changes
  - creation/destruction of components and connectors (Kramer & Magee)
  - to respond to dynamic system requirements
- Appropriate support for
  - distribution independence
  - dynamic linking, registration (Taylor et al)