Building an Environment for Design Reuse

Rajesh Khanna

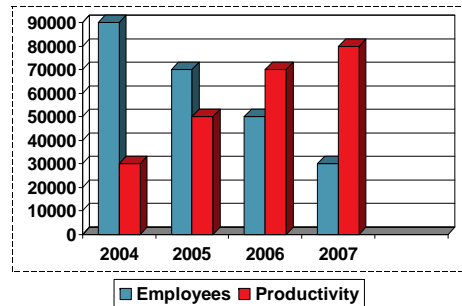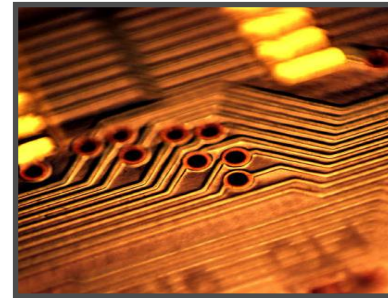Matthew Bromley

Session 7.6

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Overview

- Challenges in PCB Design
- Advantages of Effective Design Reuse
- Traditional Design Reuse Methodology
- Collaborative Reuse – A New Way
- Designer's Flow
- Librarian's Flow
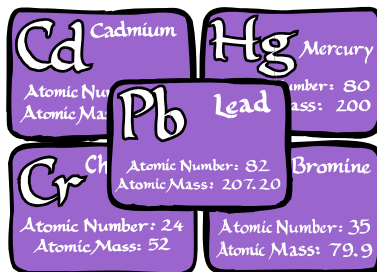- Summary

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Challenges in PCB Design

Increasing Productivity

Increasing Design Complexity

Greater Regulatory Compliance

Globally Distributed Design Teams

Shorter Market Windows

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Advantages of Effective Design Reuse

- Allows capturing of existing logical and physical IP blocks
  - Permits other users to leverage the IP, reducing repetitive development
- Increases overall quality by allowing use of pre-validated IP
  - IP is validated before promoting to a reuse library
- Simplifies complex design issues
  - Complex, multi-discipline design elements can be encapsulated in reuse blocks, allowing design experts to focus in a specific area
- Reduces risk of impact of part obsolescence
  - Enables easier tracking and updating of part changes such as obsolescence or new vendors
- Eases regulatory compliance management
  - Blocks with validated and documented compliance reduce cycle time and rework
- Decreases overall design time
  - Reusing IP in new designs can dramatically reduce design time
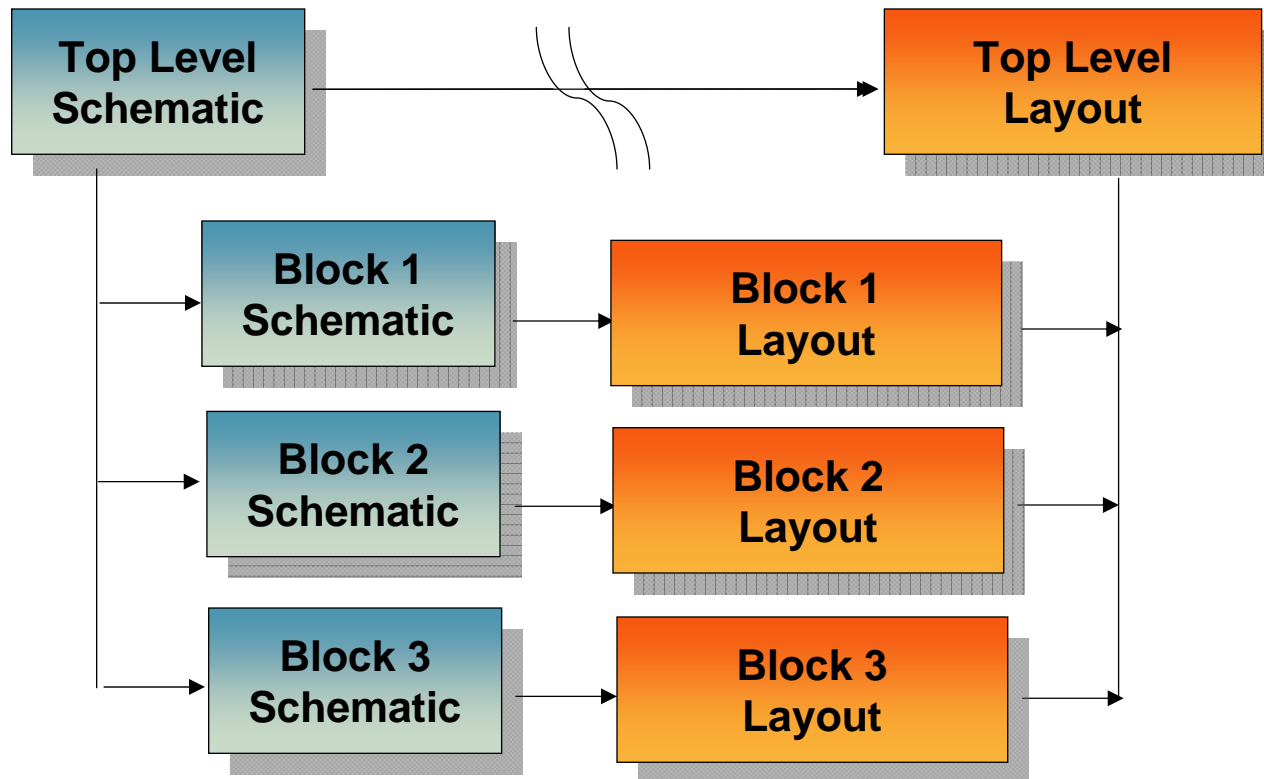
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Elements of a Design Reuse Strategy - A Hierarchical Approach

- There are many advantages to a hierarchical approach
  - Entirely encapsulates design intent
  - Easily captures constraints and packaging information
  - Library objects are shareable

- Design reuse elements can be
  - Schematic block – logical reuse element, either as a distinct block or part of an existing design
  - Physical module – physical reuse element
  - Taken from the context of an existing design (blocks in a design) and promoted to true design reuse elements in a library

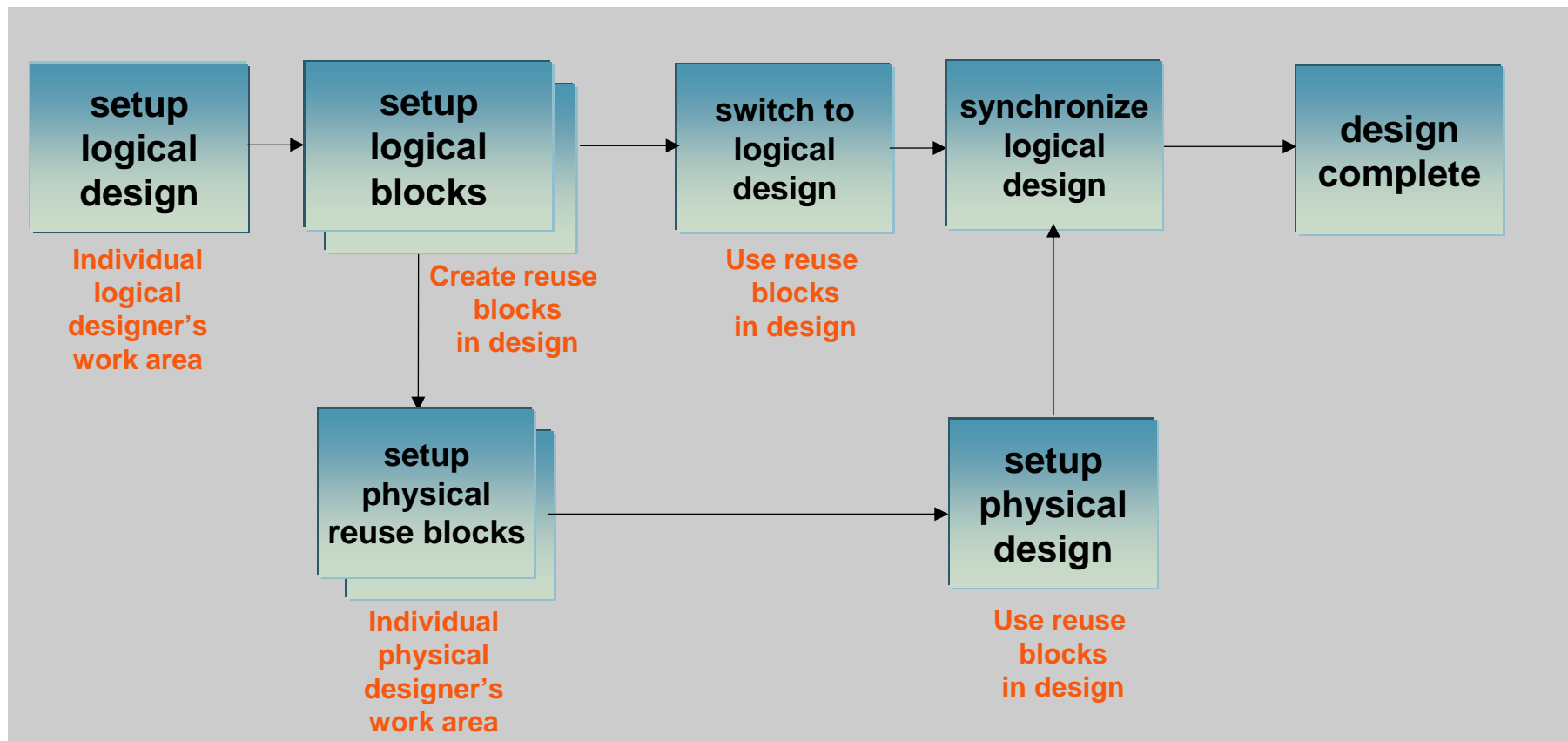- We will review both design reuse from existing designs and as reusable elements in a library

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Design Reuse – as Part of a Design

- Approach design as a collection of elements.
- Create, Store and Retrieve IP from library of existing IP

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Traditional Design Reuse

- Design flow enables creation of reusable blocks

setup logical design	setup logical blocks	switch to logical design	synchronize logical design	design complete

Individual logical designer's work area

Create reuse blocks in design

Use reuse blocks in design

setup physical reuse blocks	setup physical design

Individual physical designer's work area

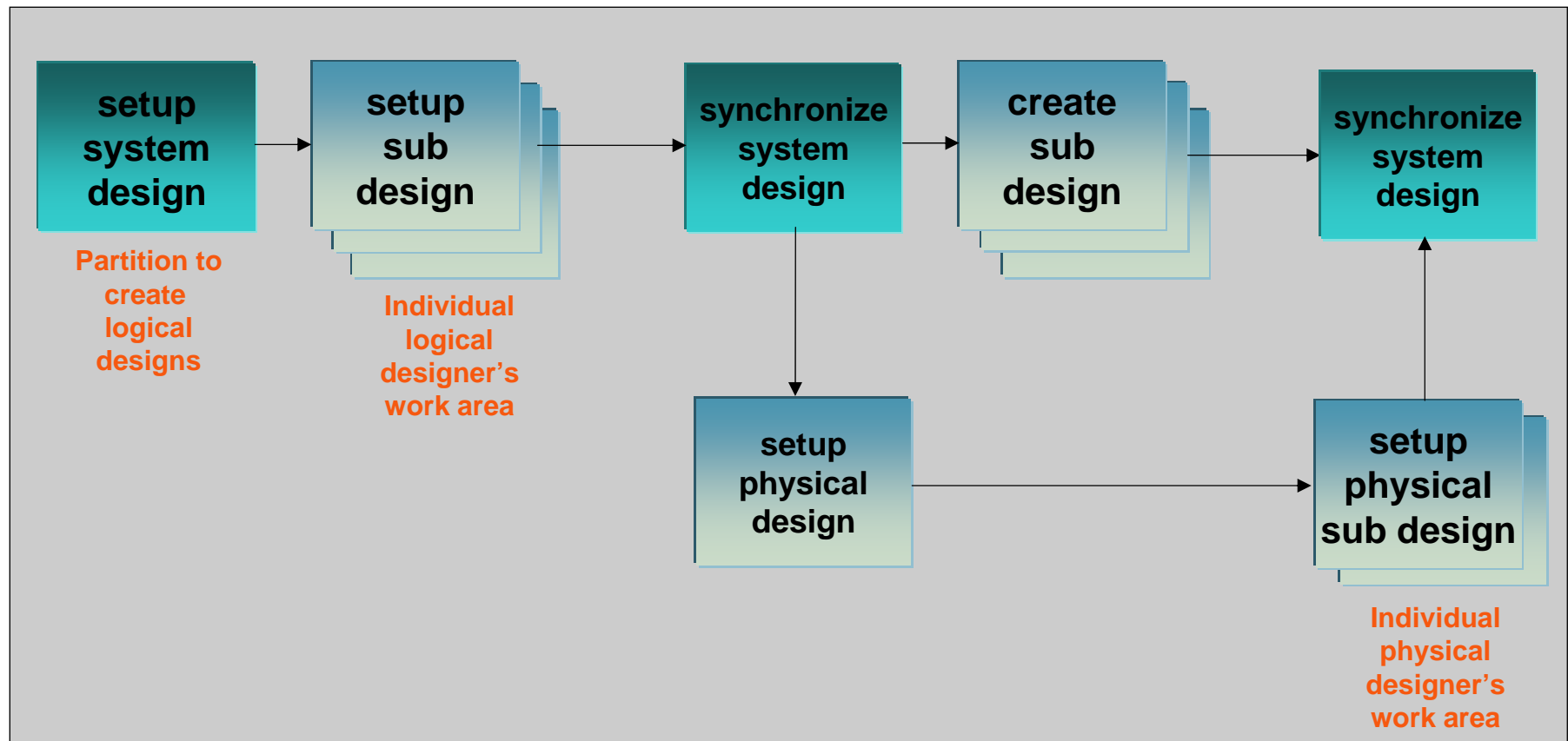**Use reuse blocks in design**

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Traditional Design Reuse

- Advantages
  - Reduction in design time
  - Maximized resource productivity

- Disadvantages
  - Weak support on library side
  - No version management of reuse blocks
  - Very process driven, lacking tool support
  - No good process for "create once, reuse later"

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Collaborative Design Reuse

- Reuse flow enables concurrency

setup system design
Partition to create logical designs

setup sub design
Individual logical designer's work area

synchronize system design

create sub design

synchronize system design

setup physical design

setup physical sub design
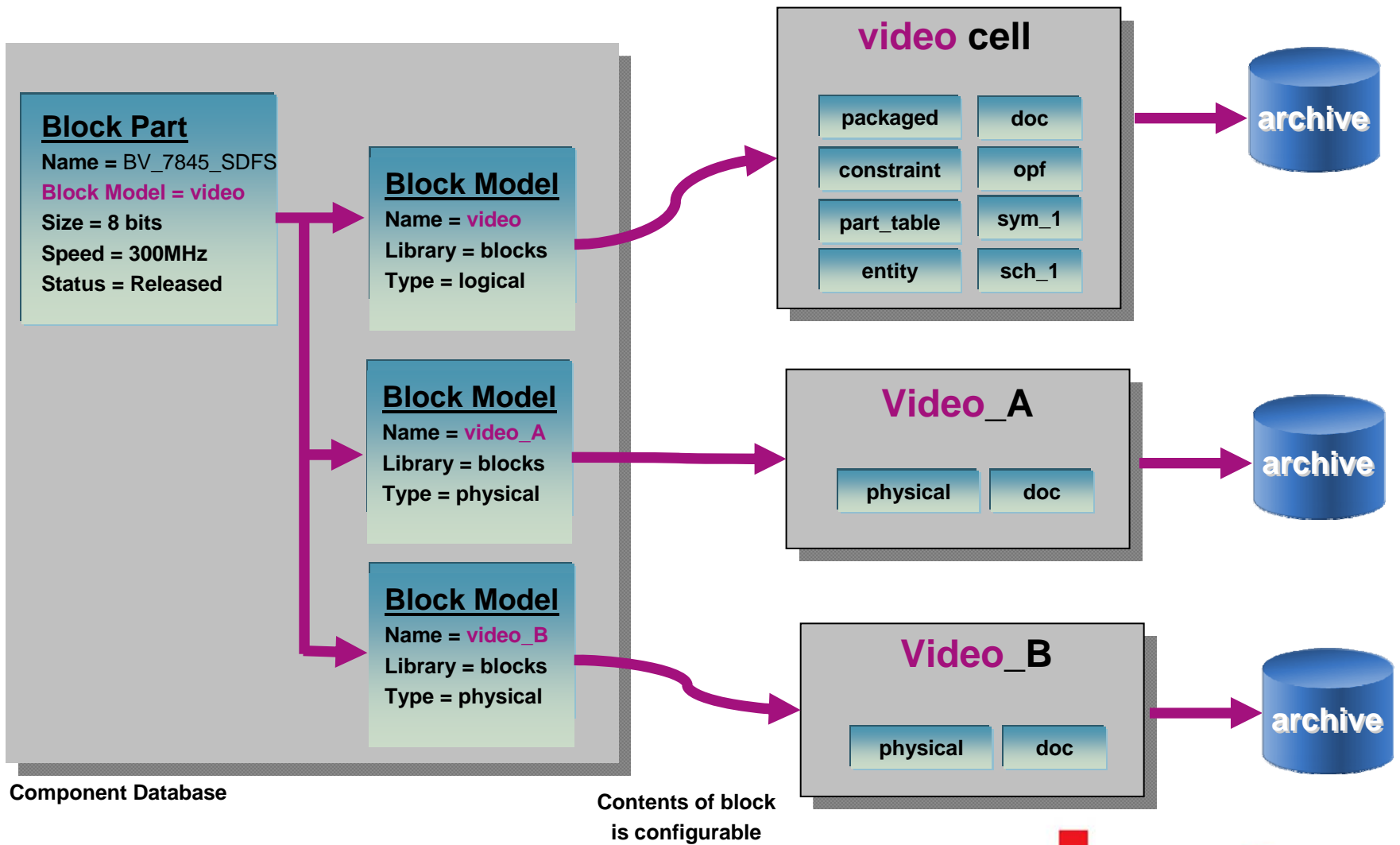**Individual physical designer's work area**

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Comparison of Design Reuse Approaches

- As library elements
  - Treated the same as library components
  - Validation capabilities process for inclusion in the library
  - Same search process as for parts
  - Rich metadata capabilities
  - Promotes reuse upfront in design exploration
  - Enables block management

- As design elements
  - Treated the same as design projects
  - Managed through design data management solution
  - Rich metadata capabilities
  - Can track which designs use which blocks

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What are reuse blocks ?

Block Part
Name = BV_7845_SDFS
Block Model = video
Size = 8 bits
Speed = 300MHz
Status = Released

Block Model
Name = video
Library = blocks
Type = logical

Block Model
Name = video_A
Library = blocks
Type = physical

Block Model
Name = video_B
Library = blocks
Type = physical

Component Database

video cell

packaged	doc
constraint	opf
part_table	sym_1
entity	sch_1

archive

Video_A

physical	doc

archive

Video_B

physical	doc

archive

**Contents of block
is configurable**

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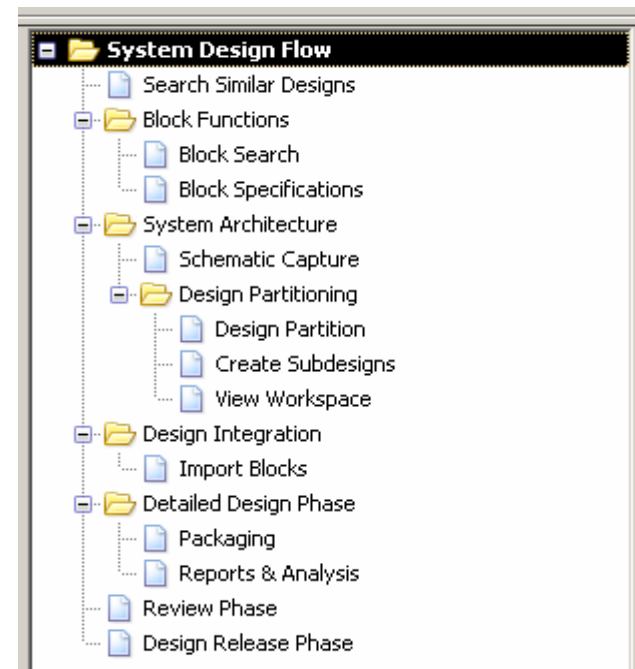# Reuse Methodology – Roles

- ## Designer
  - Plan for reuse at design and system level
  - Creation and modification of reuse blocks
  - Use blocks in a design

- ## Librarian
  - Creation and modification of reuse module metadata
  - Verification and release of reuse blocks in a library
  - Distribution of reuse blocks to multiple design sites

- ## Designers and Librarians
  - Registering reuse blocks as library elements

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Designer's Planning

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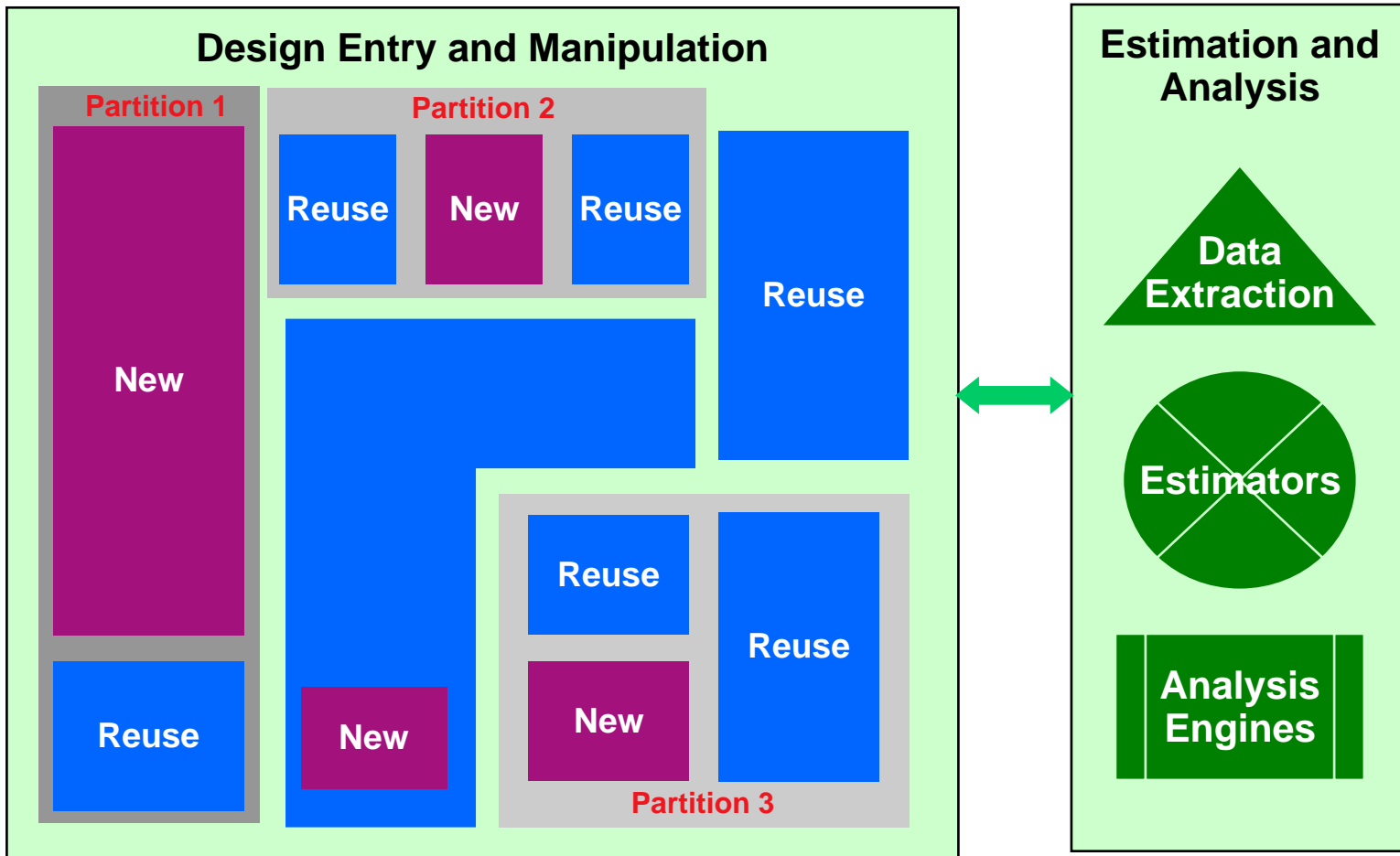
Designer's Flow

- System planning
  - Search and use blocks
  - Create new block interfaces
  - Run analysis and estimation tools
- Design partition
  - Create sub-projects
  - Each sub-project can be a separate layout or a portion of a layout
- Sub-projects gets completed by logical and physical designer
  - Following the normal design flow
  - Allows logical and physical designers to work concurrently
  - Packaging is performed at block level or at a project level
- Design Integration
  - Sub-projects are integrated back to the system project
- Standard DE HDL / PCB Editor tools used by the designers

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Designer Using Reuse Blocks
- How this works in Allegro Design Workbench

- **Blocks are searched for using the component browser**
  - Added to the design using "Add to Design"
  - After block is placed:
    - Local Bill Of Materials is automatically updated
    - Any potential primitive conflicts, between blocks and designs, are resolved so that the design and the block only use one primitive version
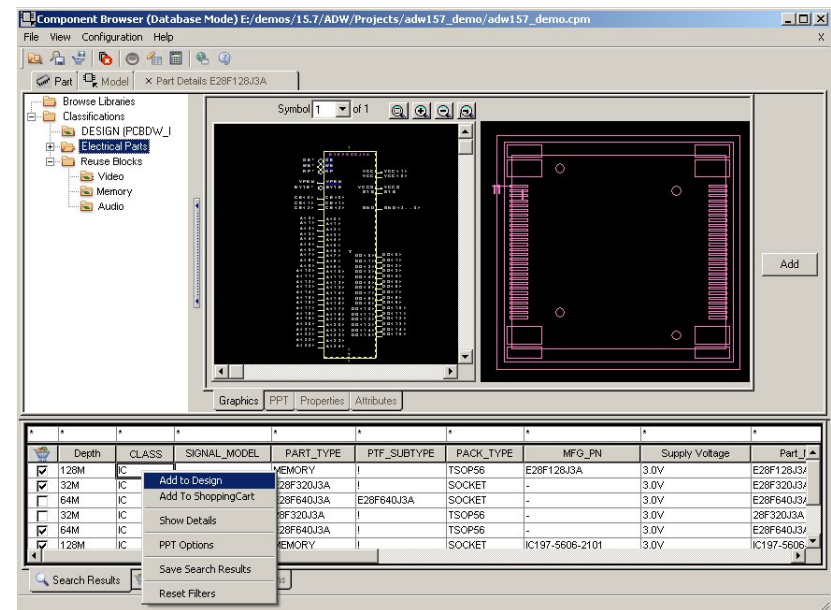
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Reuse Blocks as Library Components
- How this works in Allegro Design Workbench

- ADW supports a library flow for managing blocks
  - Enables a block to be extracted from the design
  - Block can be validated and checked-in to the library vault
  - Block can be associated with a classification
  - Metadata can be added to aid in searching (name-value pairs)
  - Version and "change history" of the blocks are stored
  - Block can be distributed to remote sites through standard ADW process
  - Searching for blocks is performed using the same component browser as searching for parts

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Librarian Flow
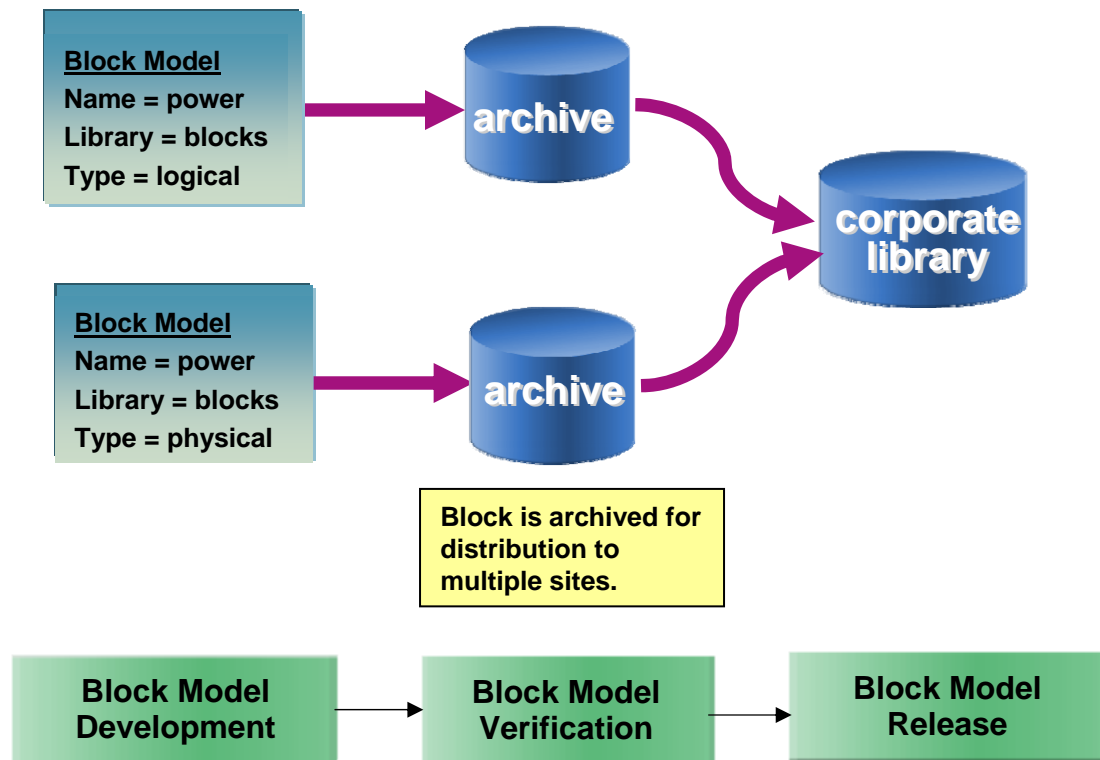## - How this works in Allegro Design Workbench

- Block is completed by designer
    - As a design project
    - Clearly identified in an existing project
    - Block can passed to librarian either manually or through a data managed project
- Librarian follows block flow
    - Creates block metadata
    - Extracts block
- Standard DE HDL / PCB Editor tools used to create or import blocks from the engineer's project into the library environment
- Verify the block
- Check-in/Release
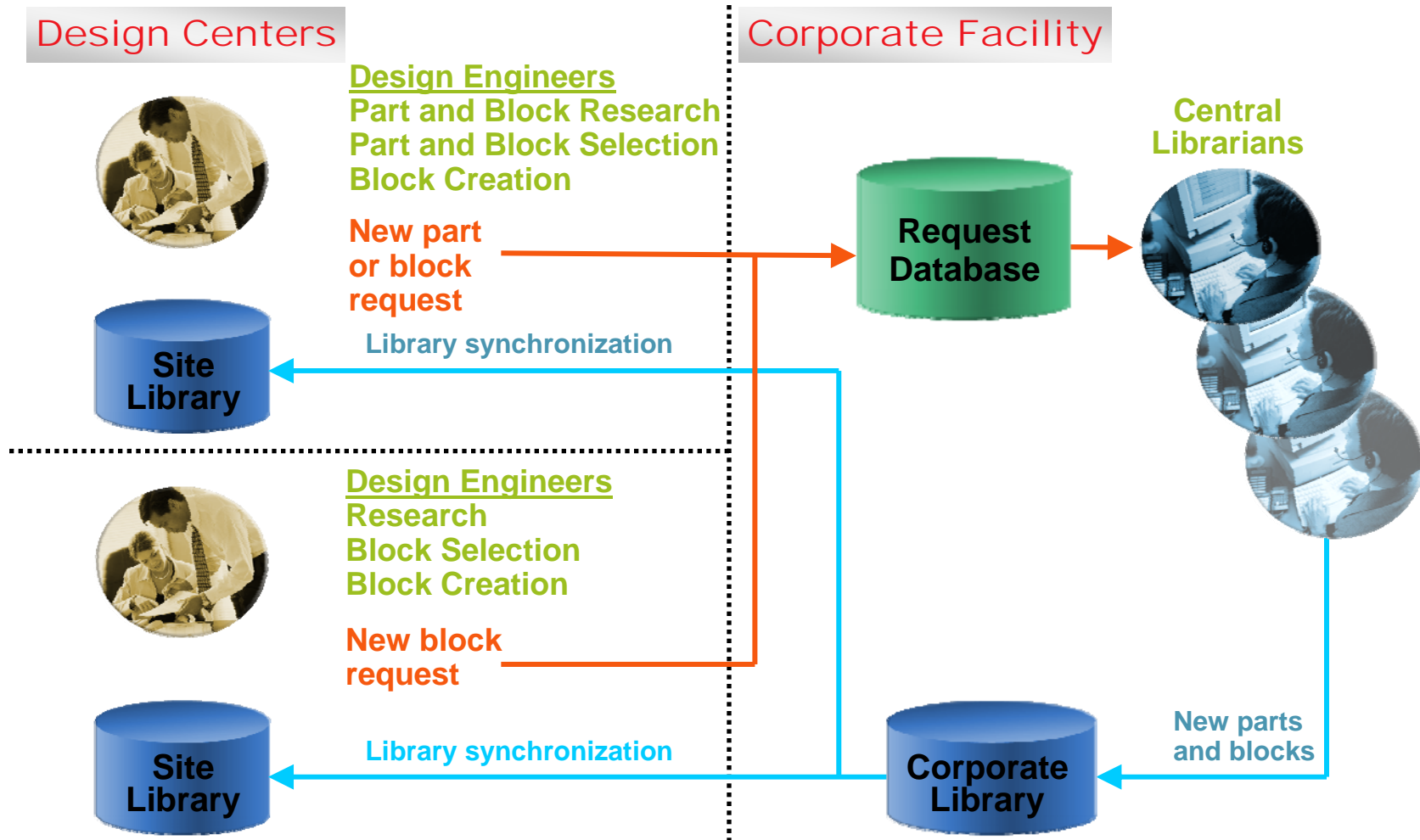- The library process is similar to that for parts

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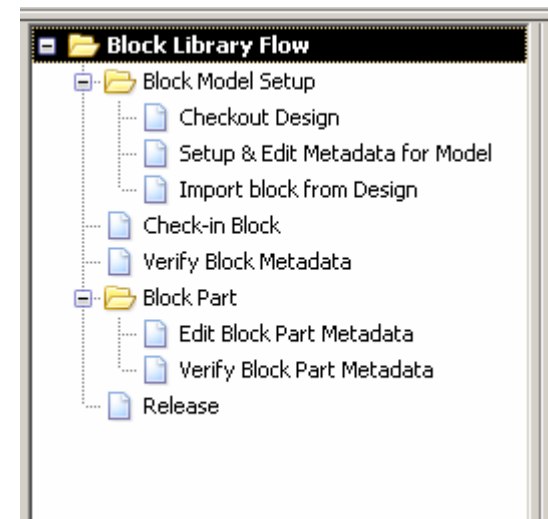
Library Flow
- How this works in Allegro Design Workbench

- Reuse design blocks are handled the same way as any other models

Block Model
Name = power
Library = blocks
Type = logical

Block Model
Name = power
Library = blocks
Type = physical

archive

archive

corporate library

Block is archived for distribution to multiple sites.

Block Model Development → Block Model Verification → Block Model Release

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Multi-site Distribution and Synchronization
- Blocks are treated the same as parts

Design Centers

Corporate Facility

Design Engineers
Part and Block Research
Part and Block Selection
Block Creation

New part or block request

Central Librarians

Request Database

Library synchronization

Site Library

Design Engineers
Research
Block Selection
Block Creation

New block request

Library synchronization

Site Library

**Corporate Library**

New parts and blocks

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Registering Reuse Blocks

- New Block Request/ECO Process

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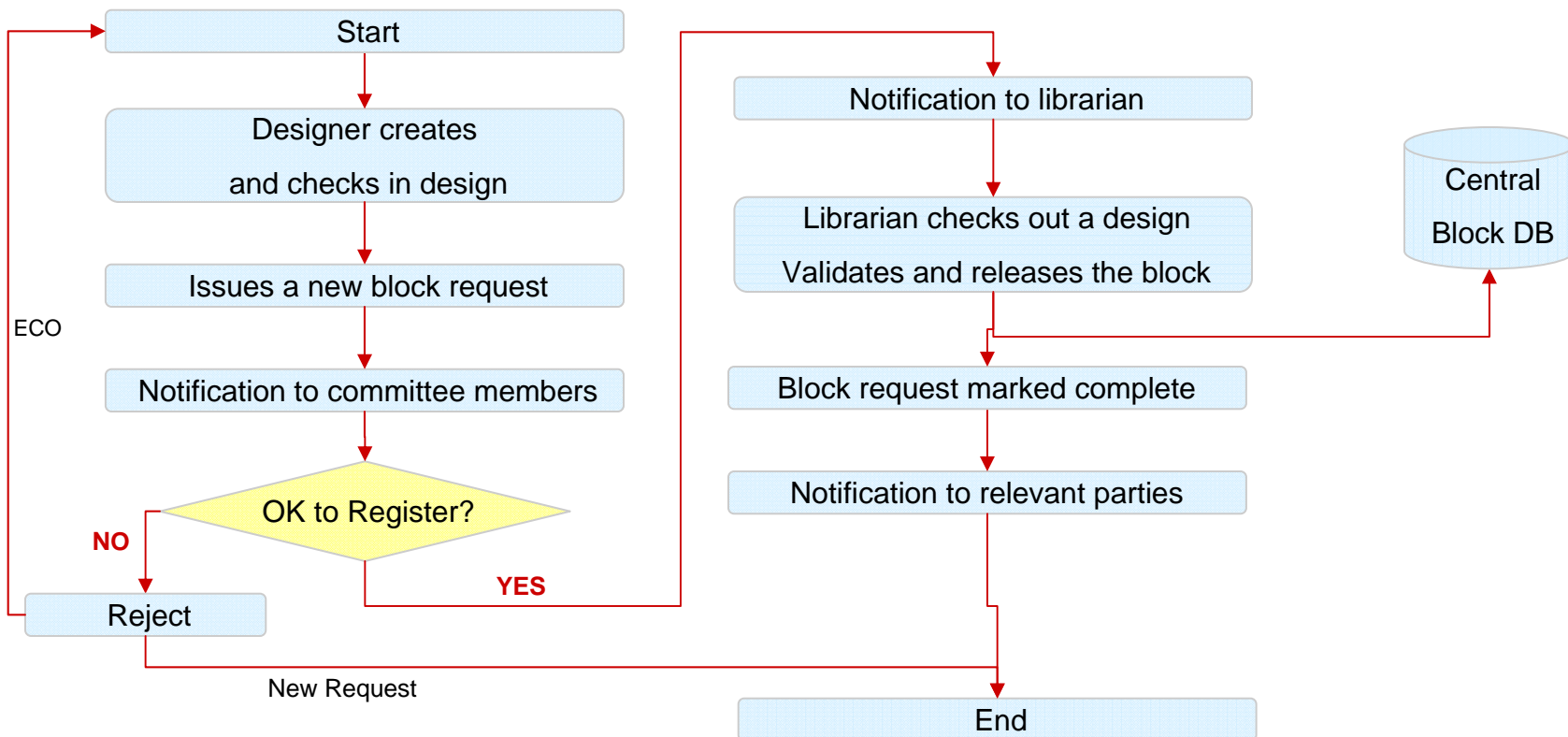
Summary

- Flexible methodology tailored for
  - Logical only reuse
  - Physical only reuse
  - Logical and physical reuse

- Reuse block as library element
  - Enables easy management of library elements
  - Support for global distribution of reuse blocks
  - Powerful cataloging and search capabilities
  - Direct instantiation of block onto schematic
  - Integrated in ADW library management solution

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