Cable Design Reuse Across Hierarchical Boundaries

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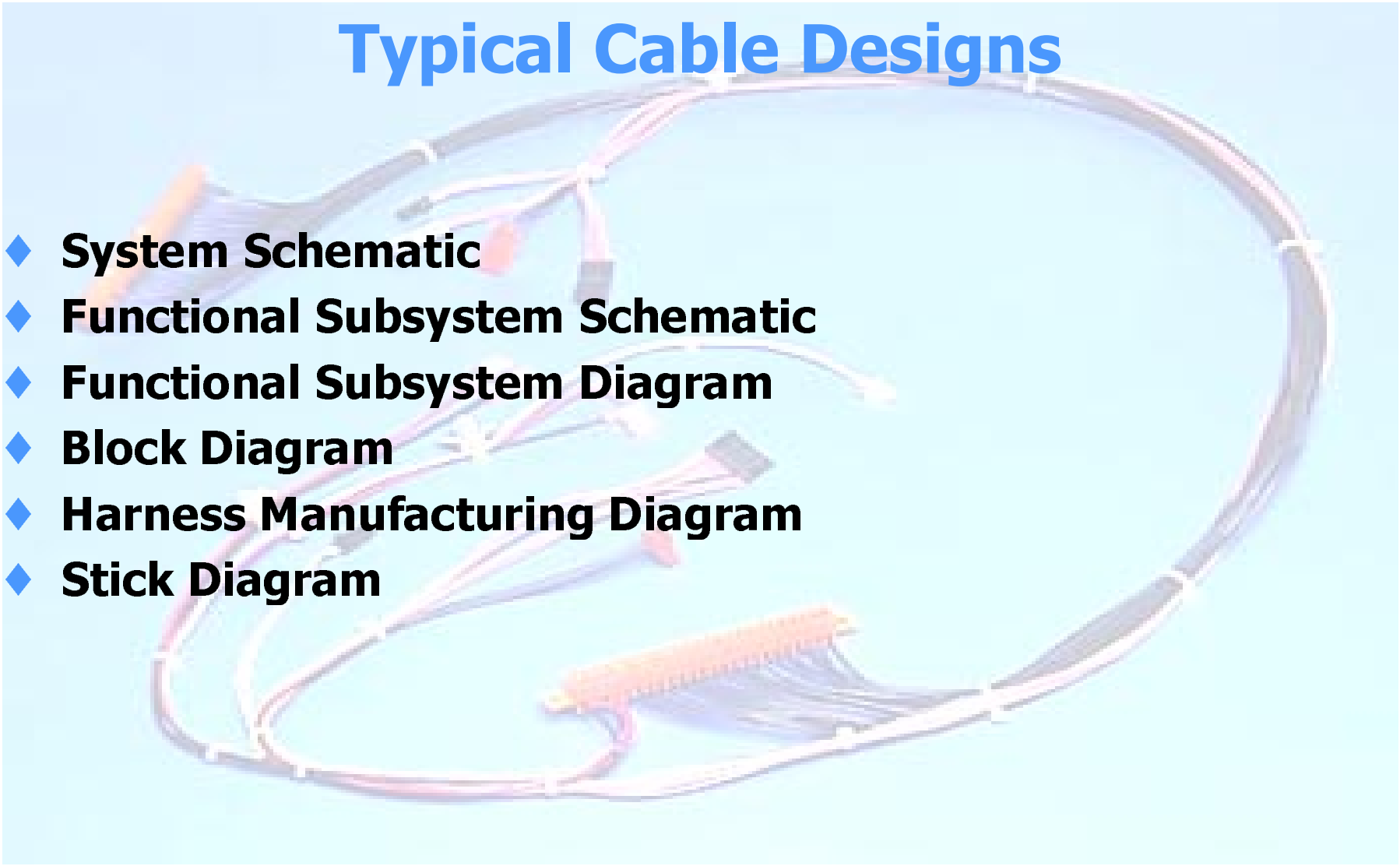
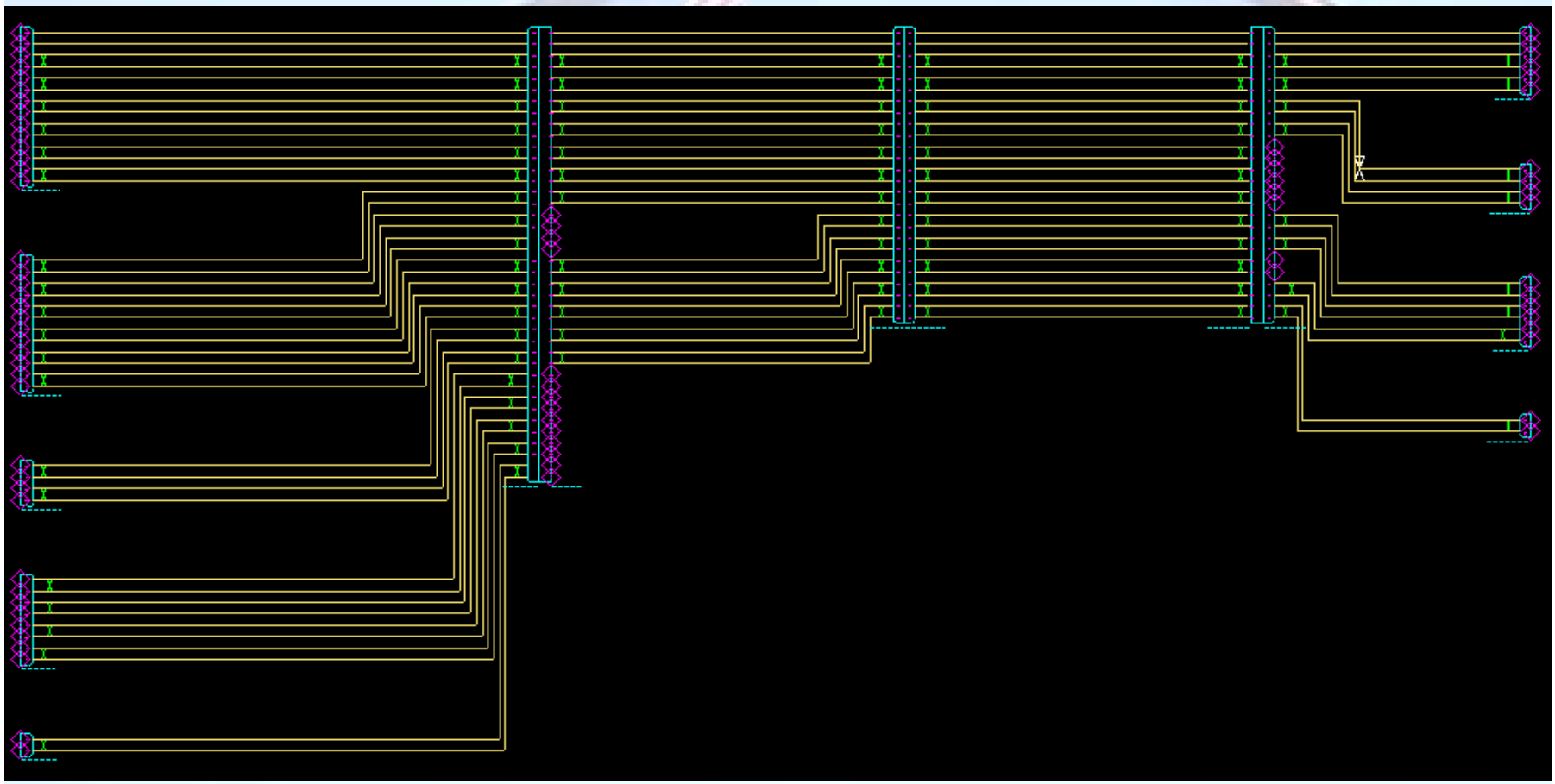
Typical Cable Designs

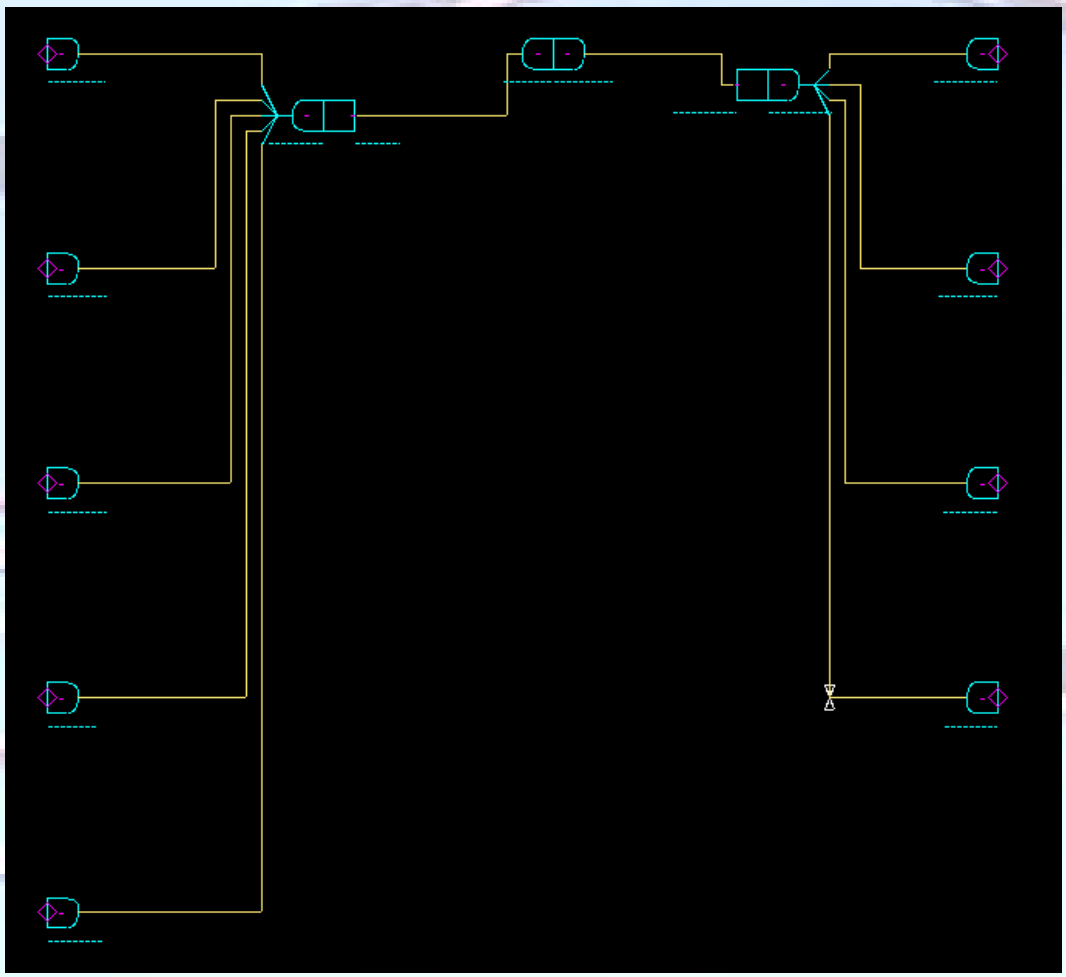


- System Schematic
- Functional Subsystem Schematic
- Functional Subsystem Diagram
- Block Diagram
- Harness Manufacturing Diagram
- Stick Diagram

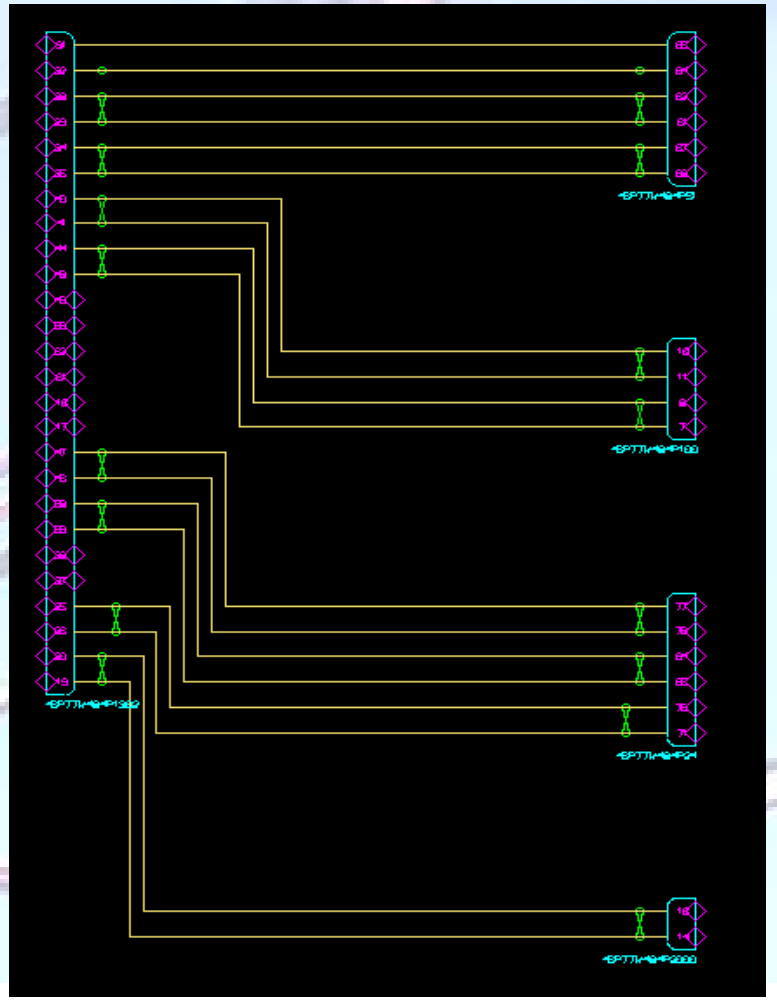
Example System Design



Example Block Diagram



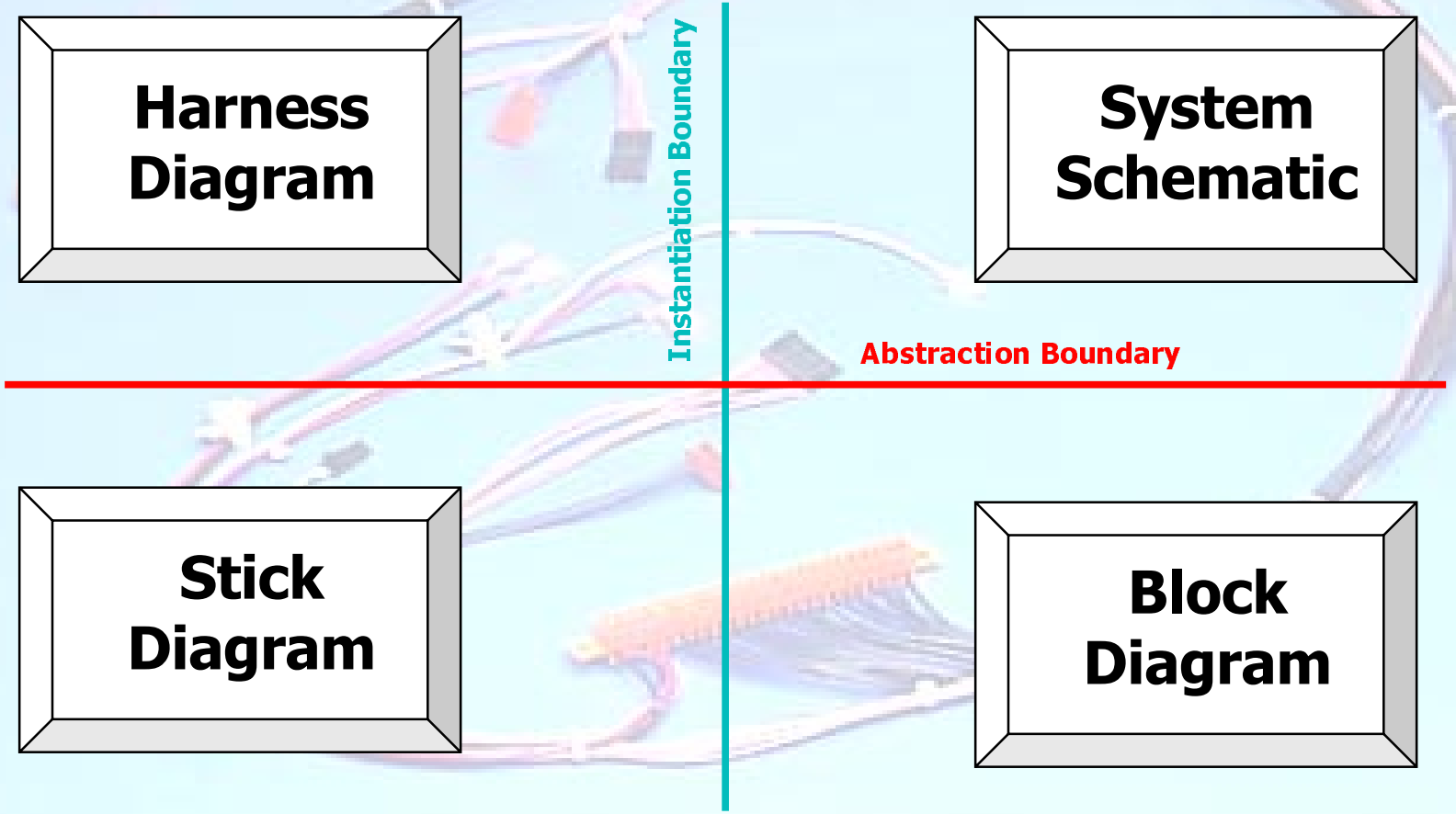
Example Harness Diagram



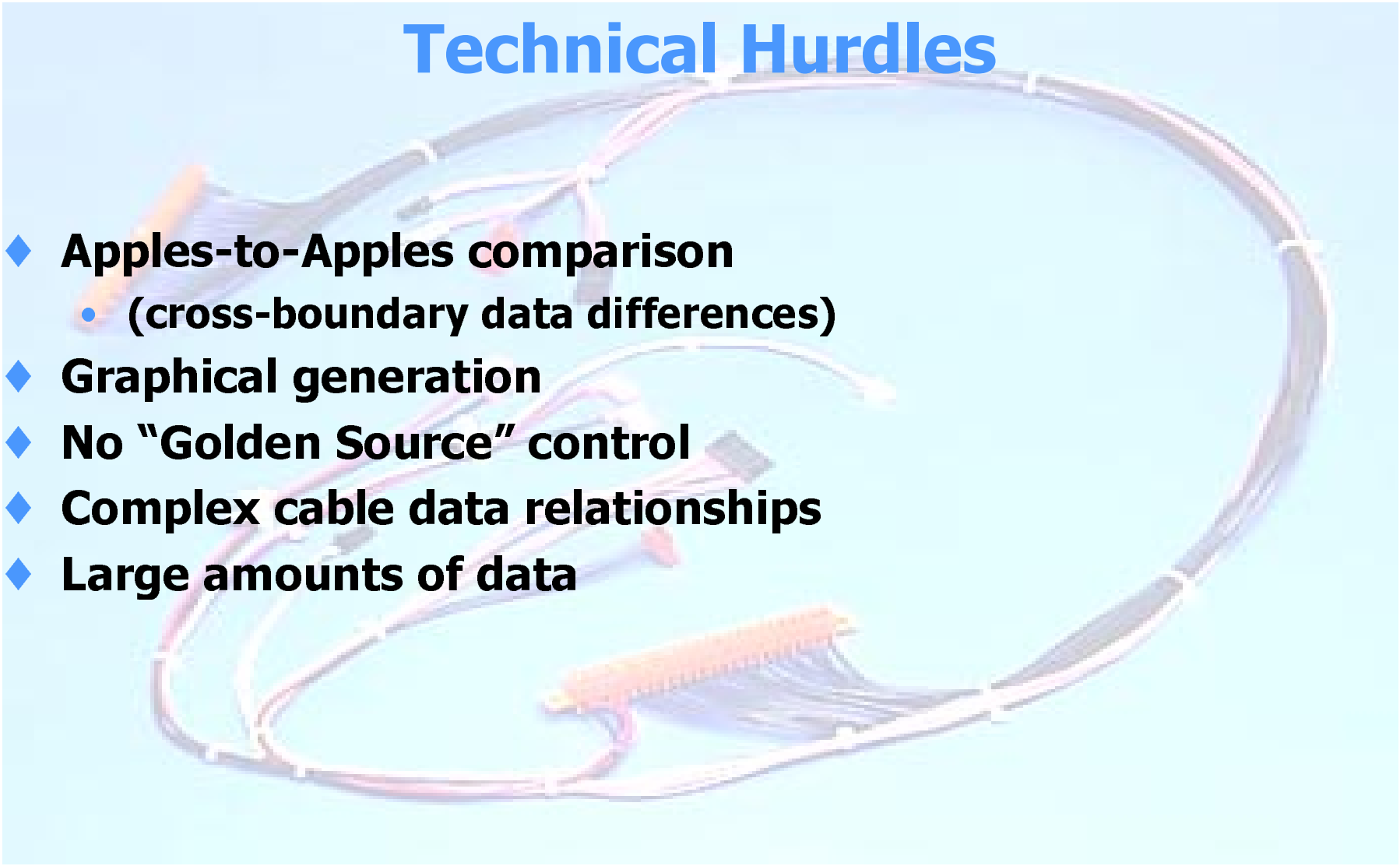
Designer Objectives

- Enter design data into any diagram
- Enter data only once
- Automatically copy changes to related diagrams
- Ensure design data accuracy in all diagrams
- Incremental design
- Reusable entities
  - Hierarchical instantiation
- Reserve locations
  - Logical or physical areas

Boundary Hurdles



Technical Hurdles



- Apples-to-Apples comparison
  - (cross-boundary data differences)
- Graphical generation
- No "Golden Source" control
- Complex cable data relationships
- Large amounts of data

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Data Transfer Methodology

1. Generate comparable data sets
2. Compare source and target data
3. Generate lists of differences
   - Additions
   - Deletions
   - Attribute Changes
4. Perform work from each list
   - Automatic and User-Interactive

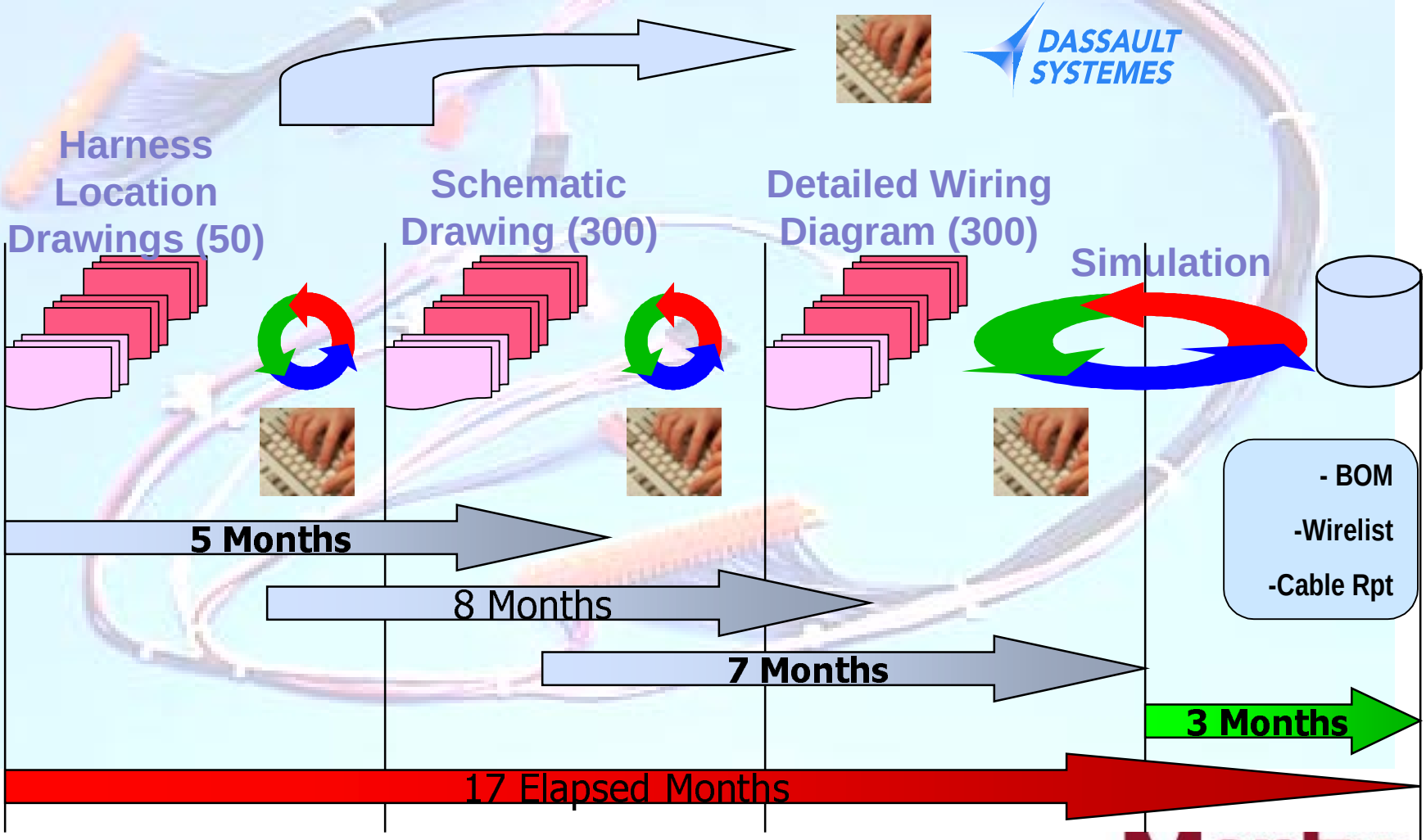
Core Technology

- Common wirelist database for all design types
  - Currently based in ASCII
  - Allows easy translation from most 3rd party wirelists
- Stand-alone interactive diagram generator
  - Written in C++
  - Creates design data from wirelist
  - Semi-automatic operation with user interaction
- Additional layer created for deletions and changes

Offshoot Capabilities

- **Hierarchical signal tracing**
  - **Signals connect across multiple diagrams and types**
- **Automatic diagram generation**
  - **Diagram-type specific place & route algorithms**
- **Cross-diagram highlighting**
- **Virtual diagrams**
  - **On-the-fly disposable diagrams**
  - **Traced signals**
  - **Data subsets**
  - **Customer databases**

Typical Design Process



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Ideal Design Process

Harness
Location
Drawings

Schematic
Drawings

LCable

Detailed Wiring
Diagrams

DASSAULT SYSTEMES
CATIA

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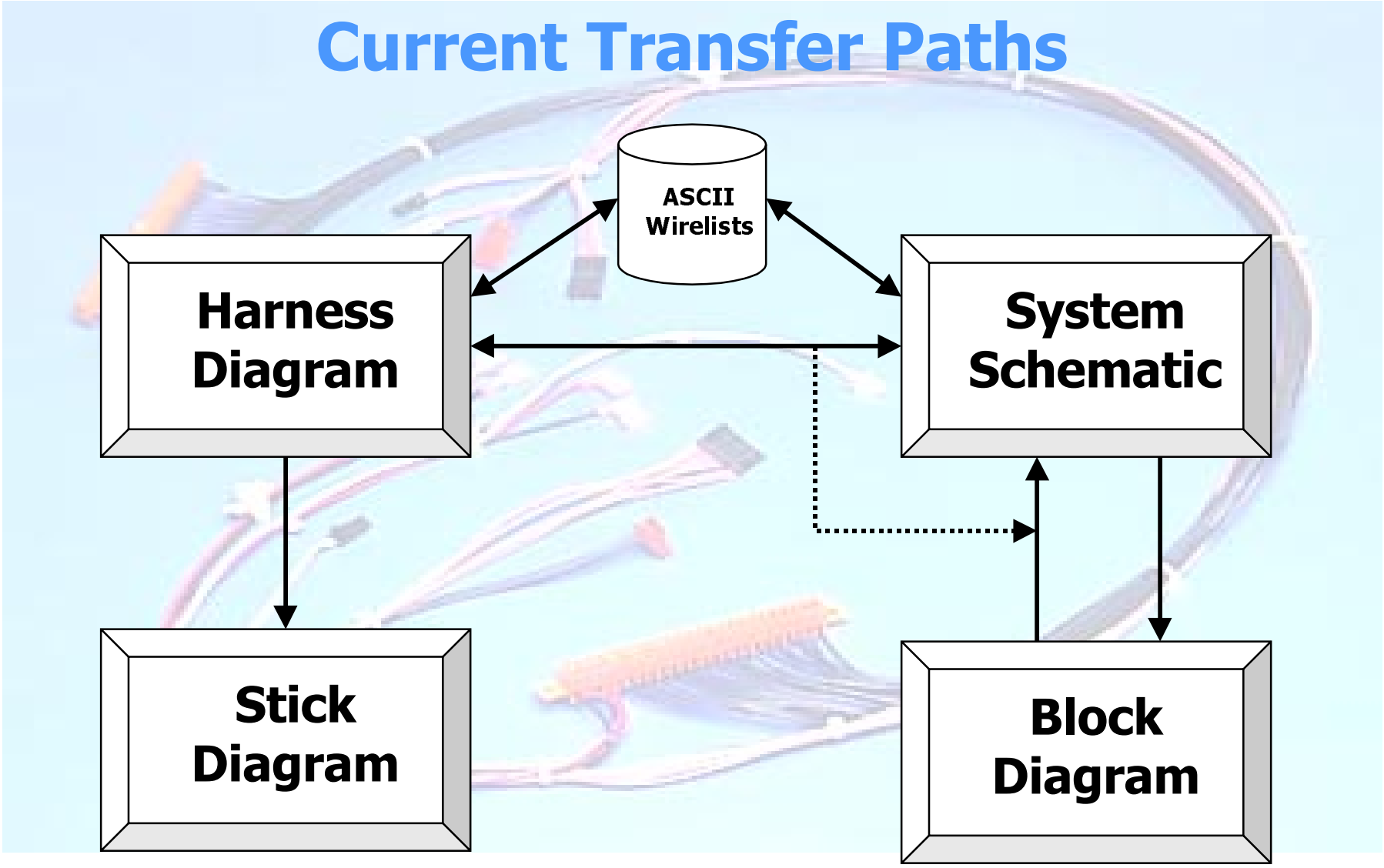
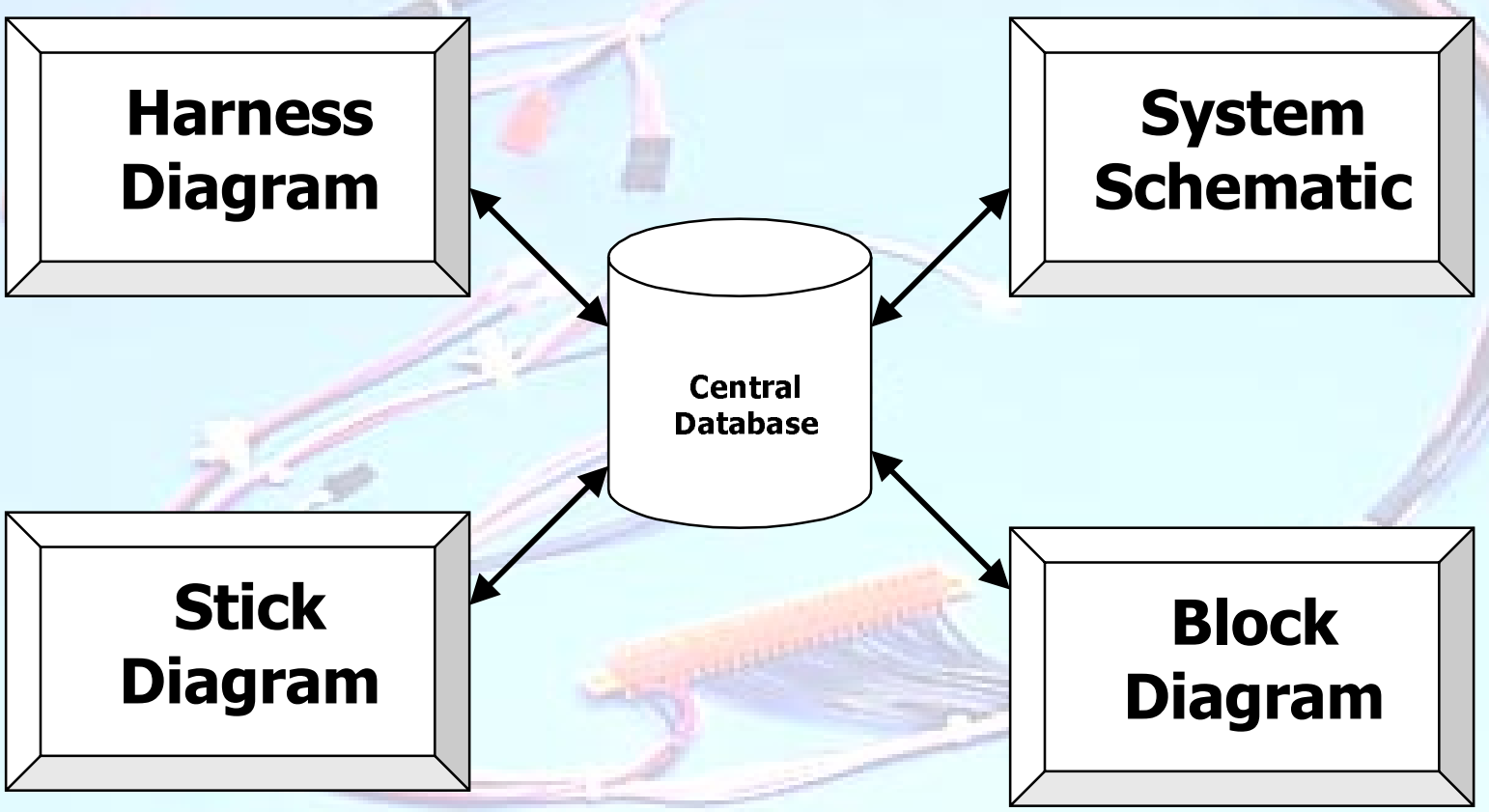
Current Transfer Paths



Central Database Proposal



Central Database Features

- Stores all data and complex relationships
- Single repository -- golden source
- Procedural Interface
  - Allows underlying database flexibility
- Check-in/check-out system with high granularity
  - Allows multiple designers to work in all design areas
  - Allows reservation of physical locations

The Graphics Question

Where do we store the design graphics - if anywhere?

Saving graphics - multiple views

- **Graphics ready every time**
- **No clear data owner**
- **Allows adherence to graphical design standards**
- **Requires incremental updates from central DB**

Not saving graphics

- **Must regenerate drawings (or portion) every time**
- **Central database is "golden source"**
- **Removes aesthetic layout burden during normal work**
- **Must still generate data for manufacturing**

The Graphics Answer

We can do both!

- **Customizable for every client**
  - **Mix of sources, graphics, and databases**
- **Graphics are NOT "golden source"**
  - **But changes are checked into the database**
- **Graphics can be produced via all existing methods**
  - **Automatic, interactive methods**
- **Diagrams (if they exist) can be updated**
  - **Incremental changes propagated from database**

Next Steps

- Develop list of database requirements
- Develop procedural interface
- Work out prototype with our own database
- Adapt API to one or more client DBMS

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