

# Capital

## An Integrated Electrical Engineering Environment

Capital is a comprehensive software suite for electrical systems engineering of large platforms such as cars, aircraft, and sophisticated machines. These platforms have substantial electronic content, so the electrical distribution systems within them are complex. Trends such as power-train electrification and increased autonomy compound the challenges.

Capital delivers advanced automation across a flow extending from electrical/electronic architecture definition, through detailed electrical design and wire harness manufacturing, to documentation & diagnostics. Powerful functionality of particular importance to the electrical domain is available: examples include functional verification, manufacturing process generation, and configuration & design change management.

Rich data modeling and data management are central to Capital, complementing the Model Based Enterprise philosophy. Architected for enterprise deployments, Capital is built to integrate with adjacent domains such as requirements capture, mechanical CAD, and manufacturing execution. IT needs for scalability, security features and modern computing environments are supported. Capital can be deployed into an Oracle RDBMS environment or with its own embedded database.

Capital tools are in use globally by many of the world's largest engineering companies.

# Manage

## Manage and Integrate Data

Capital is a data centric suite delivering benefits such as managed supplier data exchange, data re-purposing, and process control. Capabilities such as user, library, and release management are inherent to all Capital products.

## Define

### Optimize Electrical/Electronic Architecture vs Targets

Capital's define tools help optimize electrical/electronic architectures against targets such as cost, weight, or bandwidth headroom. And while architectures have significant long term impacts, the pace of new feature development means implementation decisions are now made throughout a platform's life.



Up to US\$50/car EDS cost reduction  
- Tier 1 Supplier -

Functions and signals are assigned to device and network resources either manually or using configurable rules, avoiding the need for complex mappings. Implementation proposals can be exported to the embedded software, network, and hardware domains for detailed design. Semi-static signal & message dictionaries can be built (example: SAE J1939), and a full network implementation generated. The electrical implementation flows natively into Capital's Design tools.

Capital also supports device-definition ("device transmittals" or "interface control documents"), providing a managed and secure environment for this data. Both signal and wiring connectivity can be automatically inferred, and integration with multi-board device design is available.

Capital's Enterprise tools augment these. Sophisticated integrations are available with common MCAD and PLM platforms, creating a digital thread with these adjacent applications. Capital is able to publish and consume web services (SOA), and uses OSLC for integrations with requirements capture and test case management tools. A robust API is available enabling the creation of forward-compatible extensions such as custom checks or rule decks, using Java or Java script plug-ins. Library and design data can be automatically synchronized between multiple databases, and IT health monitoring is available. A configurable, web based tool complements in-application data reporting.

define

design

manage

produce

maintain

## Design

### Maximize Development Process Productivity & Data Quality

Capital's Design tools maximize electrical system and wire harness development efficiency and data quality. They provide a comprehensive environment spanning signal connectivity capture, system based and platform level wiring design, and harness design & engineering. Multiple powerful technologies are available; including rules based composite & modular wiring synthesis, electrical simulation & component sizing, and automatic component selection.



50% EDS design time reduction  
- Heavy Truck OEM -

Configuration complexity is a particular challenge in this domain so multiple paradigms such as effectivity, composite/derivative, and modular (KSK) are natively supported. Configuration complexity optimization & verification is also available. Configurable control over design change processes is available, together with extensive design change reporting.

Technologies including rules-based data synthesis, configurable & extensible checking, self-documentation, audit trail traceability, and authentication & workflow control minimize compliance costs and maximize safety. Functional verification is available, and a dedicated tool rigorously generates electrical FMEA reports for electrical designs. Standard models such as VHDL-AMS can be used for simulation and analysis.

## Produce

### Improve Manufacturing Efficiency

Capital's Produce tools improve the efficiency of harness manufacturers. Dedicated specifically to this industry, the tools act directly on per-checked harness design data to dramatically streamline manufacturing engineering tasks. This frees engineers to explore alternatives in order to find the most efficient manufacturing process, and reduces response times to new or changed designs.

Key among these tasks is the creation of a structured bill of process (SBOP): the assembly sequence by which each harness is built. This is done automatically by mapping harness designs onto a digital representation of factory facilities.



Weeks to hours test pattern generation time reduction  
- Helicopter OEM -

Based on the SBOP, highly graphical operator instructions can be automatically generated that reflect the specific harness design and its manufacturing process. Several complementary products are also available, covering tasks activities as subassembly (production module) design and formboard design. Specialized functionality such as automatic fixture selection and detection of inventory matches is provided.

90% Reduction in electrical engineering change orders (ECOs)  
- Aerospace OEM -

## Maintain

### Speed Documentation Creation & Fault Diagnosis

Capital Maintain tools reduce the cost and improve the accuracy & timeliness of service publications by creating formatted documentation directly from data. These powerful applications automatically combine electrical and other data sources (such as diagnostic codes, location views, and repair procedures) into interactive technical publications. As-built and as-maintained data can augment the publications packages.



80% Electrical Documentation Time Reduction  
- Automotive OEM -

These publication packages are highly navigable, and provide advanced features such as configuration-specific views, signal tracing, and language switching. The packages can be integrated into large scale field maintenance environments, substantially improving troubleshooting efficiency. Mobile devices are supported.

The technology can also be used to create interactive documentation for activities such as design reviews and design change assessment.

Technology is also available to trace related data across different abstractions, greatly assisting design change reconciliation. Schematics can be rendered directly from connectivity data, for example so that data held in a third party legacy system can be re-used. The appearance of all diagram types can be automatically controlled using a powerful styling engine, ensuring compliance with corporate standards.

# Training and Services

Multiple levels of training and services are available to provide essential tools, expertise, and know-how to get maximum value from your investment in Capital technology. These include support services, consulting, instructor-led and web-based on-demand training, and at-elbow support. 24/7 customer support is provided, including a rich library of on-line resources.

With expertise in process re-engineering, Capital environment set-up and tool-flow integration, Mentor's Capital Consulting Practice works with Mil-Aero, Automotive and Industrial customers to realize optimized time-to-productivity and on-budget deployment of Capital. In accelerating the de-risked deployment, adoption and environment optimization of Capital, our experts provide legacy data migration services enabling customers to move into the Capital environment and decommission legacy systems while preserving their investment in existing design data.

Training services are also available led by experienced technology trainers. From entry-level and getting started, through advanced topics for experienced users, our training classes and on-demand libraries contain everything you need to get the most out of Capital products.

# About Mentor

Mentor Graphics Corporation, a Siemens business, is a world leader in electronic hardware and software design solutions, providing products, consulting services, and award-winning support for the world's most successful electronic, semiconductor, and systems companies.

Corporate headquarters are located at 8005 S.W. Boeckman Road, Wilsonville, Oregon 97070-7777.

Web site: <http://www.mentor.com>.

©2018 Mentor Graphics Corporation, all rights reserved. This document contains information that is proprietary to Mentor Graphics Corporation and may be duplicated in whole or in part by the original recipient for internal business purposes only, provided that this entire notice appears in all copies.

In accepting this document, the recipient agrees to make every reasonable effort to prevent unauthorized use of this information. All trademarks mentioned in this document are the trademarks of their respective owners.

**Mentor**<sup>®</sup>  
A Siemens Business