Innovate2010

The Rational Software Conference

Let's build a smarter planet.

Sachi Mangala

Rational CCM Solutions for Systems

The premier software and product delivery event.

Agenda

Integrated Product Change Management

Electronics Verification Management Solution (EVMS)

Configuration Management for IC Development

Systems Customer Success

Rational CCM Solutions Recap

Integrated Product Change Management

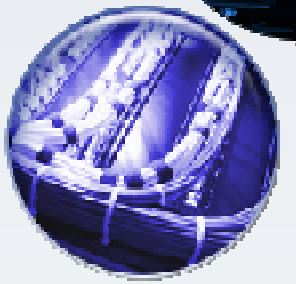
Key Challenges for Systems Development

- **Increasing complexity and accelerating changes**
- Unrelenting financial pressures and need to **better manage risk**
- **Compliance** with key engineering and design processes
- **Effectiveness of organizationally & geographically distributed teams**
- Building **more innovative products** to grow the business

Aerospace and defense

High-rigor electronics

Automotive



Telecom

What's Behind These Failures and Increasing Costs?

Business Issues

Product missed customer needs	46%
Late to market/missed demand	33%
Poor commercialization / promotion	26%
Product quality	24%
Pricing	23%
No clear product differentiation	19%

The CIO's Guide to the PERFECT Launch: Translating Innovation to Business Benefit, AMR Research, 2005

Engineering Priorities

Improve communication and collaboration across disciplines	**71%**
Increase visibility into status of requirements	**49%**
Increase ability to predict system behavior prior to testing	**46%**
Implement or alter new product development processes for a multi-disciplinary approach	**43%**
Increase real time visibility of product Bill of Materials (BOM) throughout the development process	39%

Aberdeen Group, System Design: New Product Development for Mechatronics, Michelle Boucher, David Houlihan, January, 2008

Integrated Product Change Management

within Enterprise Systems Engineering

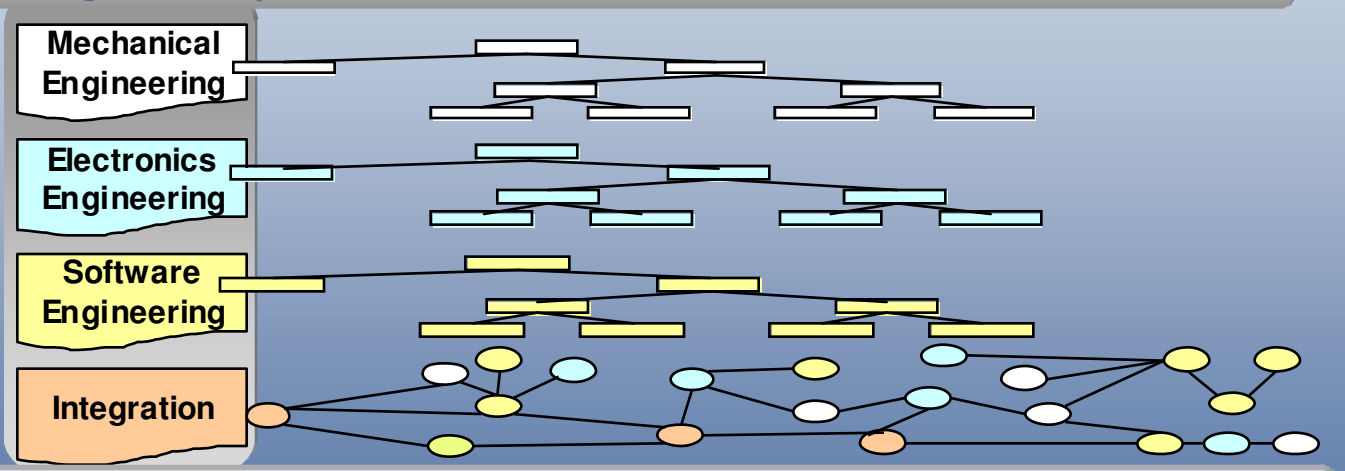
Customer Needs | Define Operation Reqt's. | Define System Reqt's. | Develop Concept | Preliminary Definition | Detail Definition | Product / System Build | Product / System Deliver | Run / Support / Maintain

Business Analysis: *Enterprise Architecture, Business Process Mgmt, Product Mgmt, Portfolio Mgmt*

Program and Project Management: *Cost Accounting, Scheduling, Measurements, Reporting, Risk Mgmt*

Requirements Definition & Architectural Design: *System Partitioning*

Detailed Design and Implementation



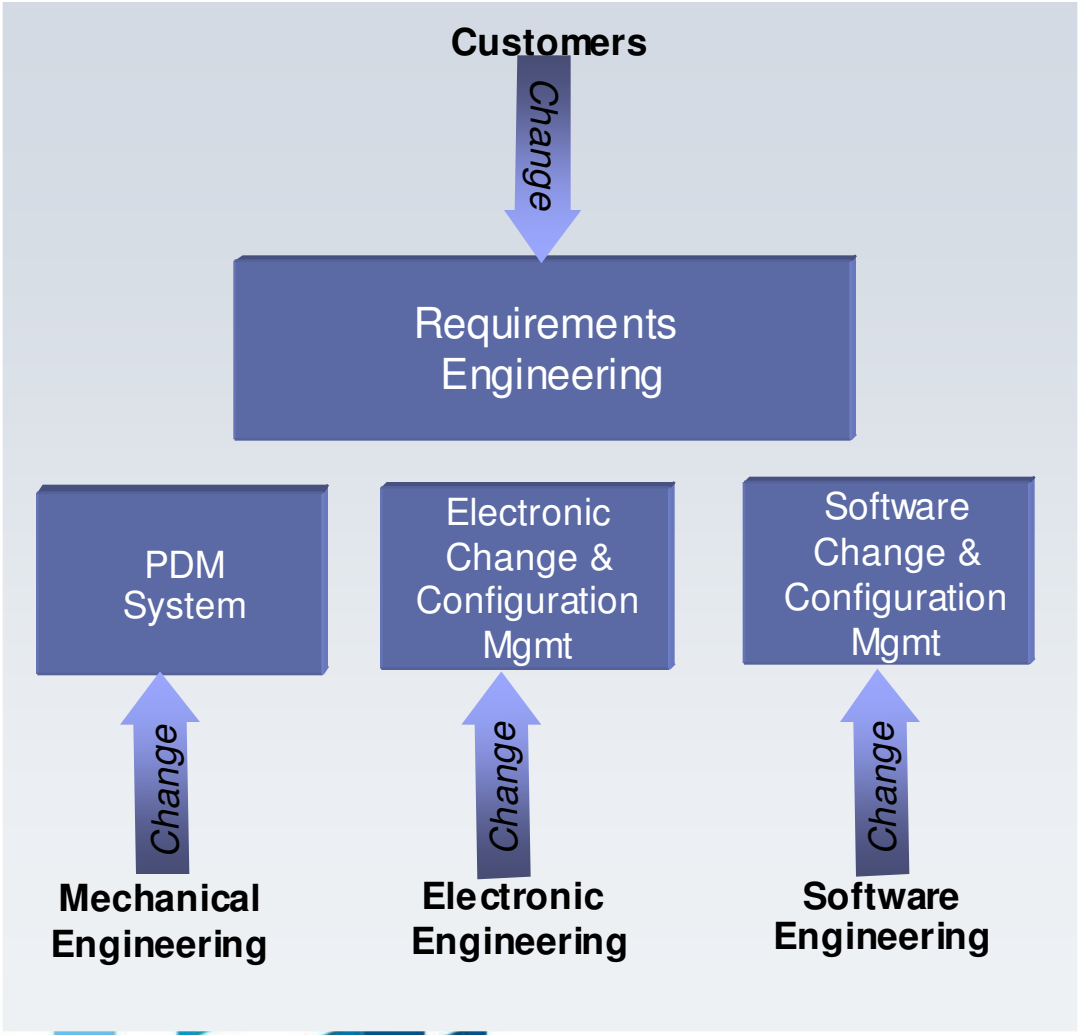
Verification and Validation

Requirements Management

Change Management: *Collaboration, Process support & Automation* **Configuration & Asset Management**

Integrated Product Change Management:

through Requirements Change Management



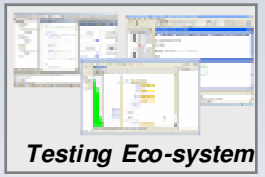
- Reduce the time to propagate changes throughout the entire design team
  - Reduce turn-around-time in design & defect resolution
  - Reduce discovering 'missed' changes late in the project
- Improve management of multiple engineering disciplines
  - Increase visibility of schedules, including impact of requirements & product changes
  - Enhance the ability to manage project costs
- Leverage existing investment in Product Data Management (PDM), and Software development platforms

Establish a collaboration and change management hub

Connect disparate workgroups with a communication hub

Capture customer requests & market driven enhancements

Manage Portfolio & Product Priorities

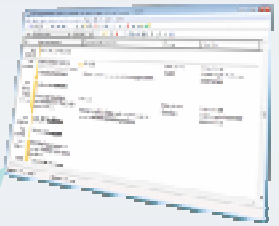


Execute Tests

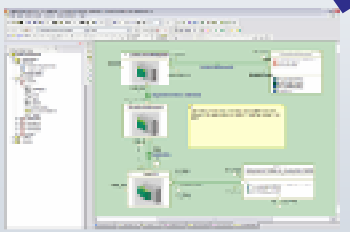
Collaboration, Process, Workflow

Change Management

Capture & manage requirements



Report & Analyze



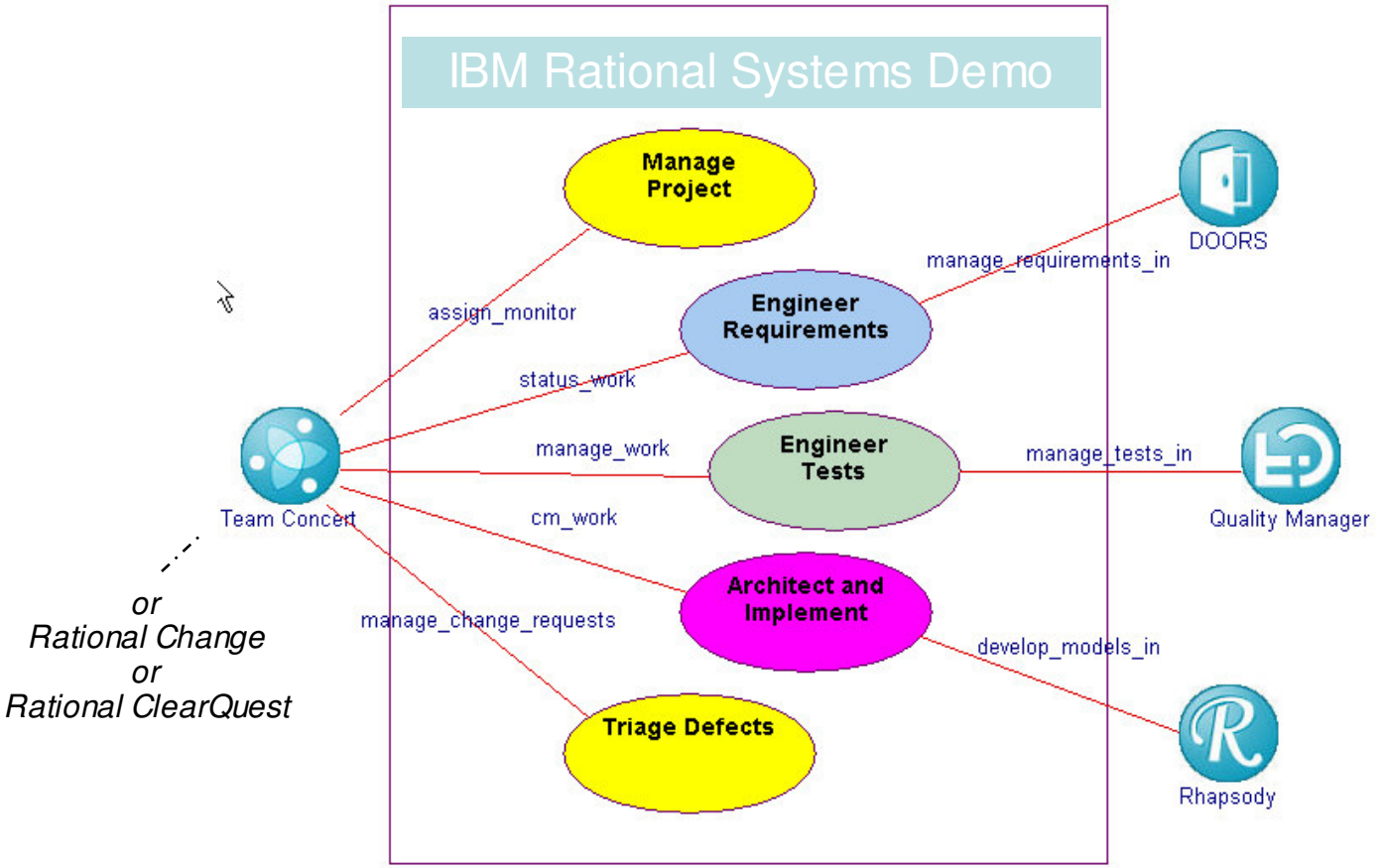
Develop Model-Driven System -> Software

Collaborate across Development Disciplines

- Software
- Electrical
- Mechanical

Integrate Suppliers

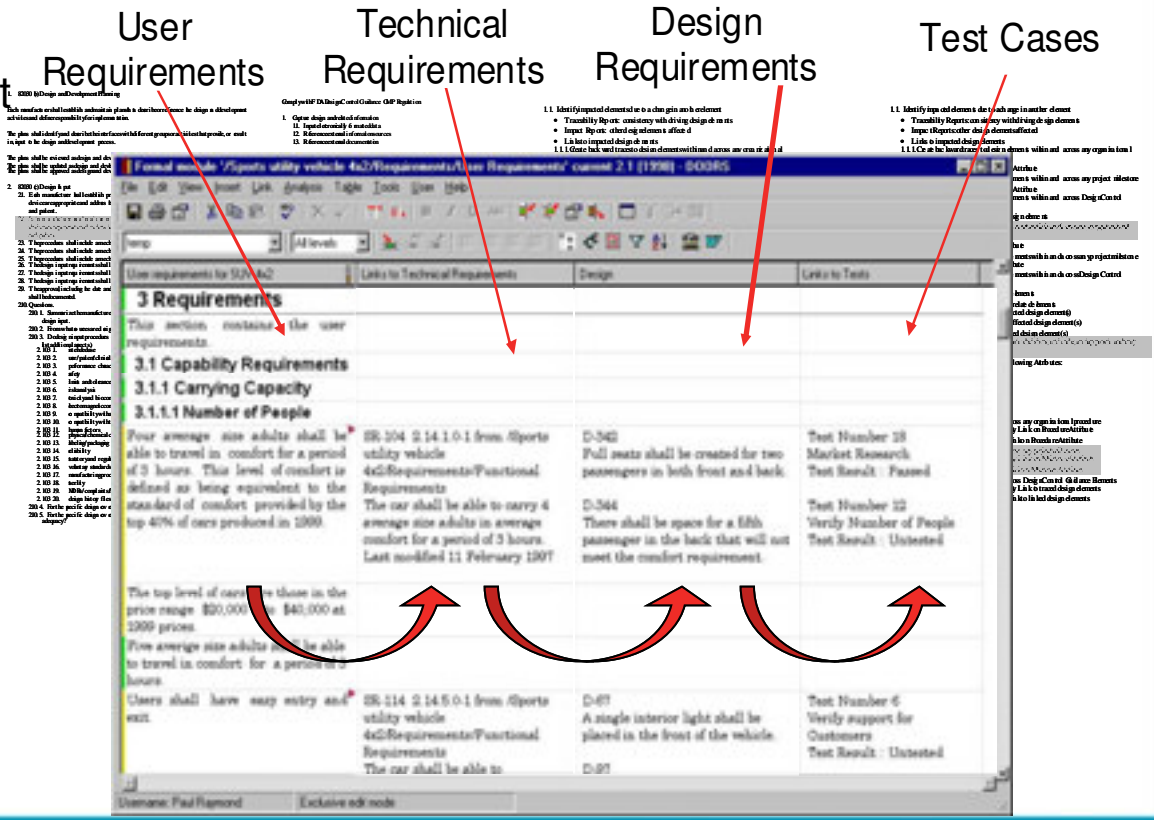
Example: Rational Team Concert as a collaboration and change management hub



Apply Requirements Change Management

Manage change across development domains using centralized requirements change management

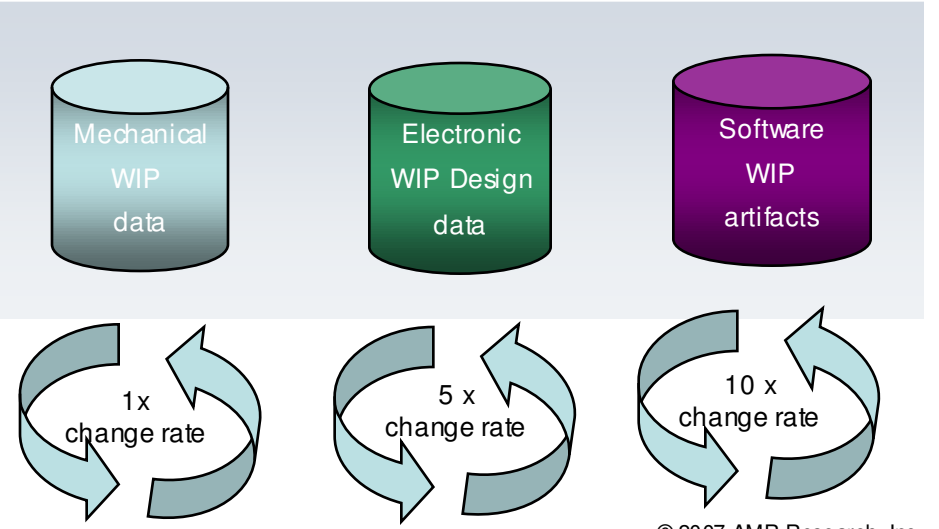
- Requirements are shared across the development lifecycle
- Requirements are shared across Software, hardware and electronic development domains and suppliers
- Requirements Change Management
  - *Reduce the risk and costs of project scope creep*
  - *Help ensure that all appropriate stakeholders are involved*
  - *Automate the workflow*
  - *Monitor requirements volatility.*
  - *Provide traceability*
  - *Efficient & virtual change control board*



Help ensure cross-domain communication by integrating specialized change management tools

Why not one Change Management system?

- Domain tools may have:
  - Existing integrations with other domain tools
  - Built-in features and processes for domain specific needs
  - 'Language' that targets a domain
- Software changes more rapidly than HW



IBM is uniquely qualified to integrate diverse systems for managing change across multiple development domains.

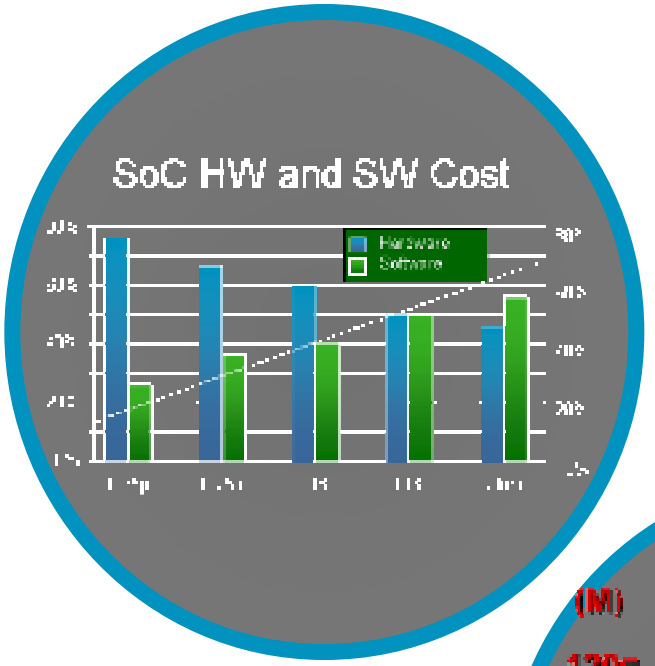
IBM's approach includes:

- Requirements Change Management across the domains and product lifecycle
- Existing integrations between IBM Rational Software and tools used in Systems / Product development
- IBM Services and IBM Rational platforms and frameworks for integration
  - Jazz SOA
- IBM experience in implementing Systems and PLM solutions

Electronics Verification Management Solution (EVMS)

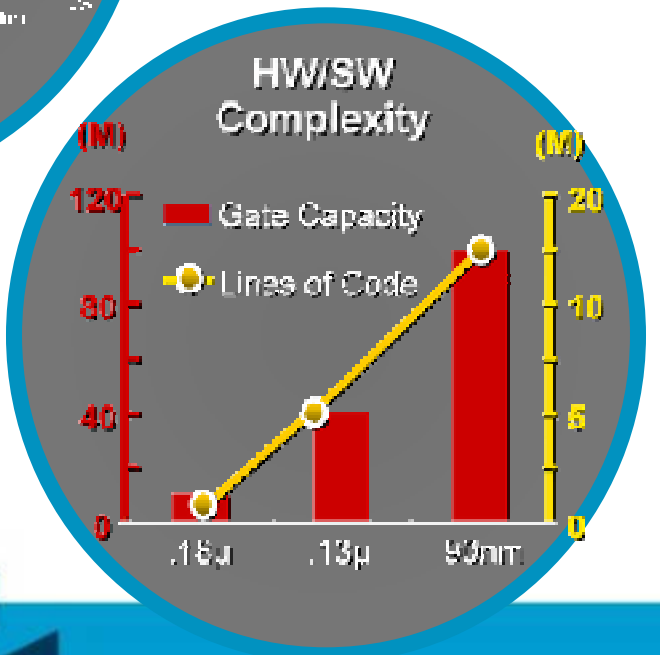
Driving Towards First Time Right Designs

IC Development – Increased Complexity and Cost



Design 1st Time Right is no longer just a hardware design challenge as most electronics products require embedded software

Since 90nm generation, embedded software development costs and challenges exceed hardware design



Modern chip complexity is driving coverage verification to validate new designs before first silicon and to speed time-to-market

- Coverage verification simulations approaching 1 million per day are the norm
- HPC compute farm must scale to meet increasingly complex verification needs
- HPC compute farm must be utilized to the maximum extent possible

Enterprise Verification Management Solution

Implementation and Integration Best Practices

System Verification Solution Blueprint

cadence™

Rational. software

Tivoli. software

IBM Systems
Simplify your IT.

Hardware and Software Verification Automation & Management
- Incisive Functional Verification Platform
- OVM & Plan-to-Closure Methodology
- Incisive Enterprise Manager & vPlans

Hardware and Software Design Management
- Requirements and MDSE
- Design / Build / Test
- Change & Defect Management

EDA 24x7 Workload Management
- Systems and Storage Management
- Distributed Resource Management
- Infrastructure Management
- Security Management

Compute Farm & IT Optimization
- BladeCenter®, iDataPlex™, e1350 Clusters
- Systems Director, Job Auto Submit
- Virtualized & single-or-multi-tier Storage
- Scale out File Services

Operational Advantages:

- **Time-to-market**; more simulations with less time in verification
- More predictable/higher **system level quality**
- Improved project **visibility** & **schedule predictability**
- Greatly improved **first silicon quality**; reduced number of re-spins
- Global **design team productivity** improvement
- **Higher utilization** of compute farm resources
- **Capacity planning** for future development requirements

Manage Failure Analysis and Coverage Closure

cadence™

Plan

Verification closure?

Yes

Done

No

React

Execute

Measure

Progress visibility

Compliance management

Rational. software

Tivoli. software

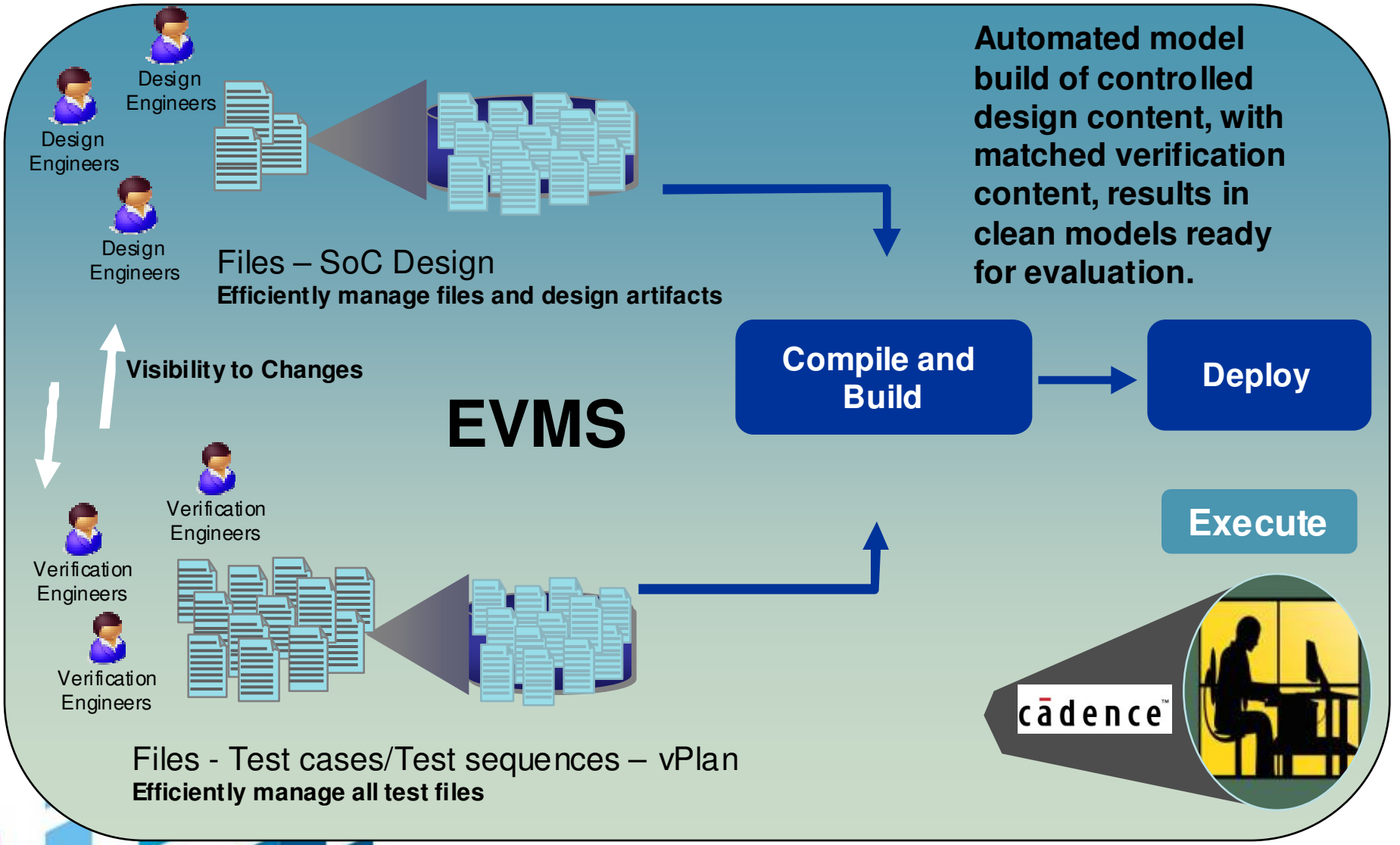
IBM EVMS

IBM Systems
Simplify your IT

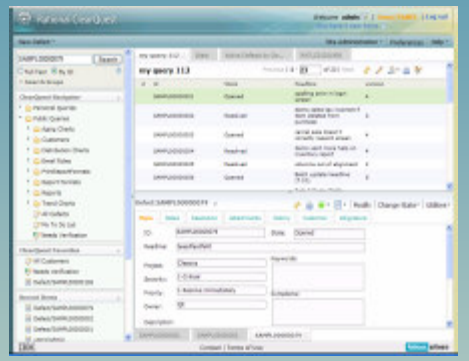
Status **Failure** **Metrics**

Execute Test plan, against models under change control, on Compute Farm

Change Management and Automated Build Management

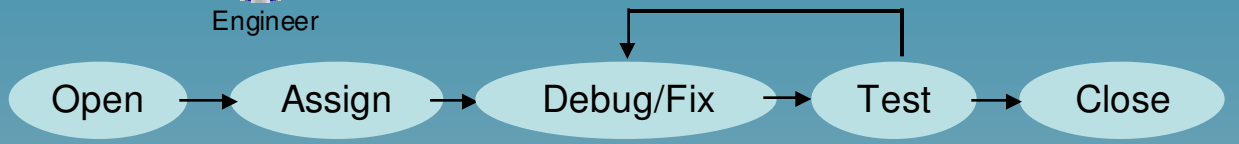


Defect Management – Project Status



"What bugs have been assigned to me?"
"What bugs should I work on first?"


Engineer

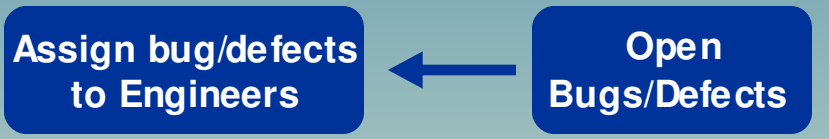


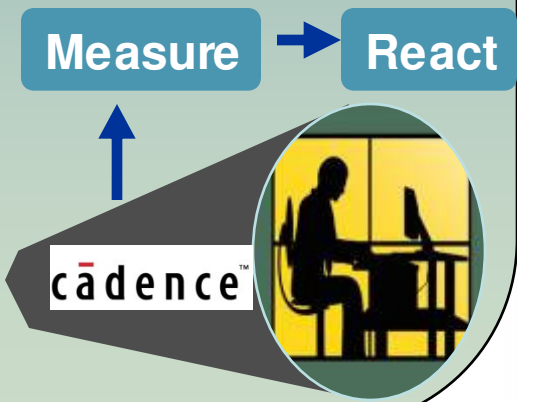

Engineer


Program Manager

EVMS

Integration between IBM Rational Clearquest and Cadence Incisive Enterprise Manager brings integrated defect management to the Verification Process

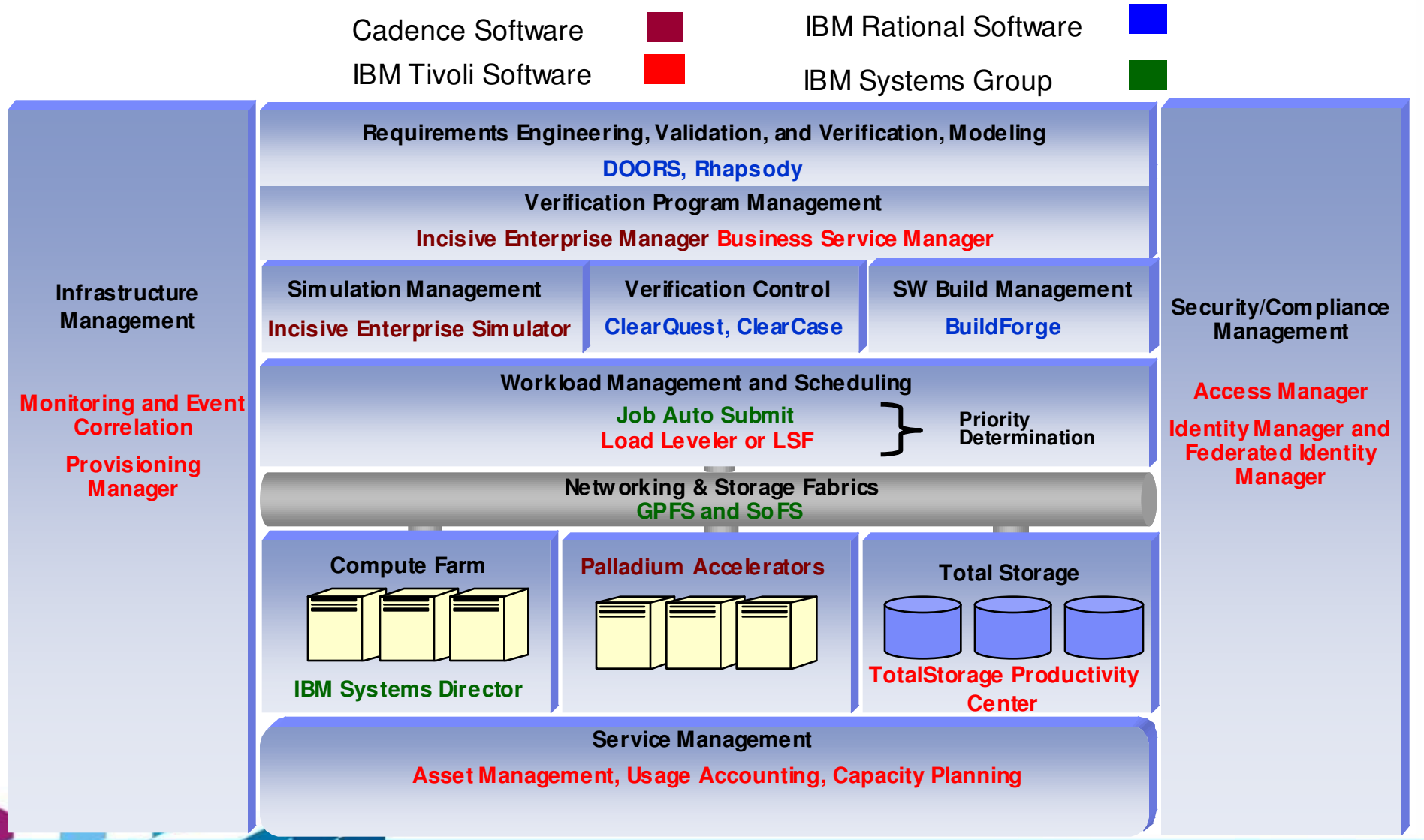




Visibility into Program Status

"How are design and verification changes distributed across the team?"
"Who is available to take on a mission-critical bug fix?"
"How many defects are still outstanding?"
"How many defects have been submitted for this design?
"How long is it taking to fix the average bug?"
"How long is taking to implement design and verification changes?"
"How many defects are in the verifying state?"

IBM and Cadence Architecture for System Verification



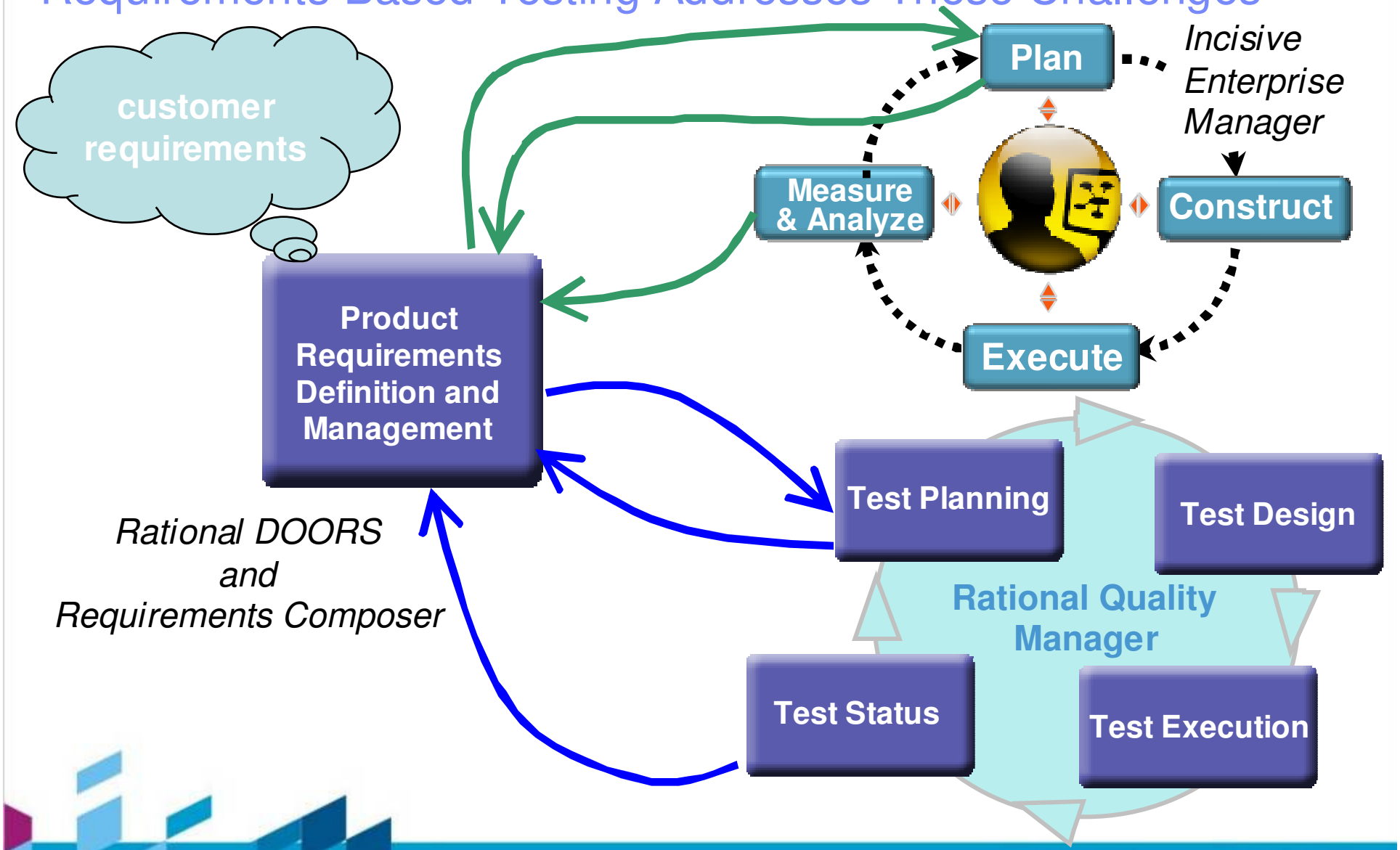
Solution Value Proposition *Gains realized using EVMS*

- **Defect Management – *"are we done with Verification…"***
  - Applying EVMS at block, unit, multi-unit and system level simulation enable teams to catch problems earlier in the process, avoiding costly respins and mistakes and improving product quality and time to market
  - Integrated bug tracking and visibility through development cycle reduces escapes
- **Resources – Compute Farm**
  - Allows for extremely effective use of simulation resources, reduction in support costs, & capacity planning along with dynamic prioritization of workload via job auto submit
  - Ability to schedule and utilize geographically dispersed farms as one large resource
  - Improved utilization by 40 – 45 % on an existing compute farm
  - Facilitated by Scale out File Services offering for global file system and storage infrastructure
- **Time to Market**
  - Product development cycle can be compressed dependent on complexity
  - 50 -100% improvement in productivity dependent on complexity and stage of maturity
- **Re-spins minimized**
  - Using DFM / DFT tools integrated with EVMS targets and leverages first time right silicon
  - Material savings – less scrap, less product loss
- **GA Predictability**
  - Measurement of completeness allows for role based management visibility to product the develop cycle and milestones via dashboard

System Verification Challenges

- Hardware and software teams needs to be responsive to changes
  - Changing requirements are difficult to communicate
- Hardware verification and software testing needs to ensure the quality of the product
  - Difficult to link back to the bigger product requirements
- Tracking changes across the verification process can be time consuming
  - Too dynamic to try to track via traditional paper process's
  - Traceability of requirements to verification is critical
- Compliance to standards difficult to trace
  - Automotive / Telecom industries need protocol compliance tracking

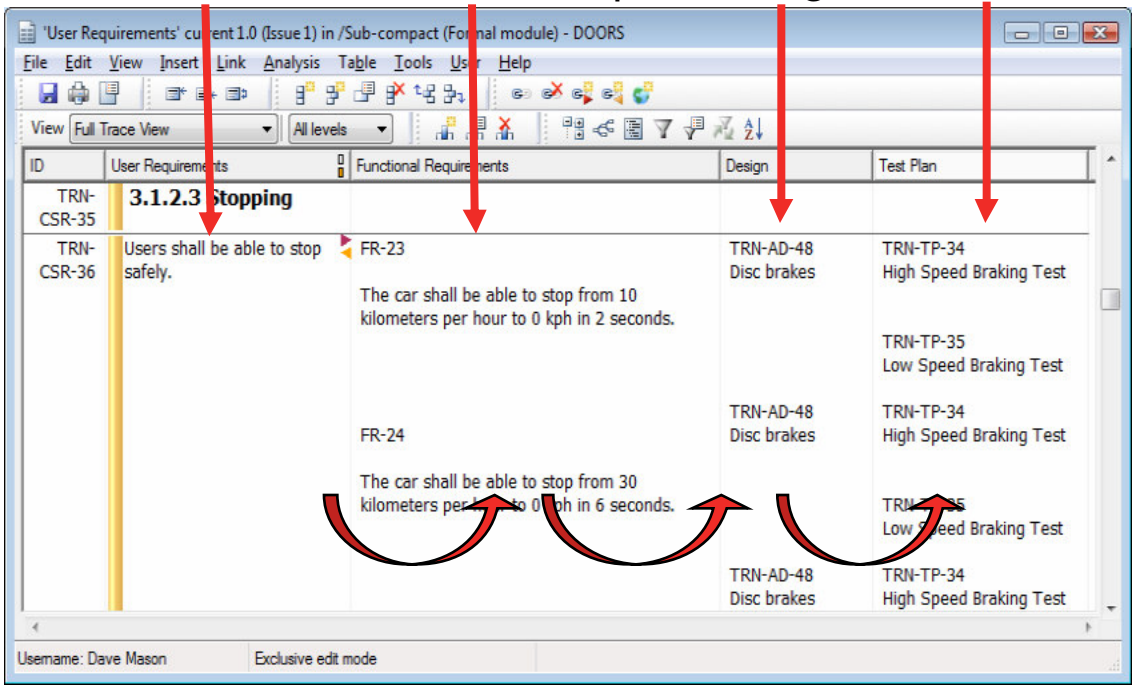
Requirements Based Testing Addresses These Challenges



Requirements Based Testing Provides Process Automation

Both teams are working against the right set of requirements

User Reqs Technical Reqs Design Test Plans



Quality is conformance to requirements

Tests based on requirements ensure deliverables meet customer expectations

- One set of tools and processes to capture and manage requirements
- Traceability from requirements through test plans for hardware and software
- Test planning and execution tools optimized for hardware and software testing
- Automated process for validating test coverage against product requirements
- Common process to mange changes to requirements throughout the lifecycle
- Notification of test teams when a requirement is changed

Integrated Configuration Management for Semiconductor IC Development using Rational ClearCase

Why ClearCase for IC Design?

- ClearCase is primarily used for software development, but there are analogies – especially in the "*semi-custom*" design methodology:

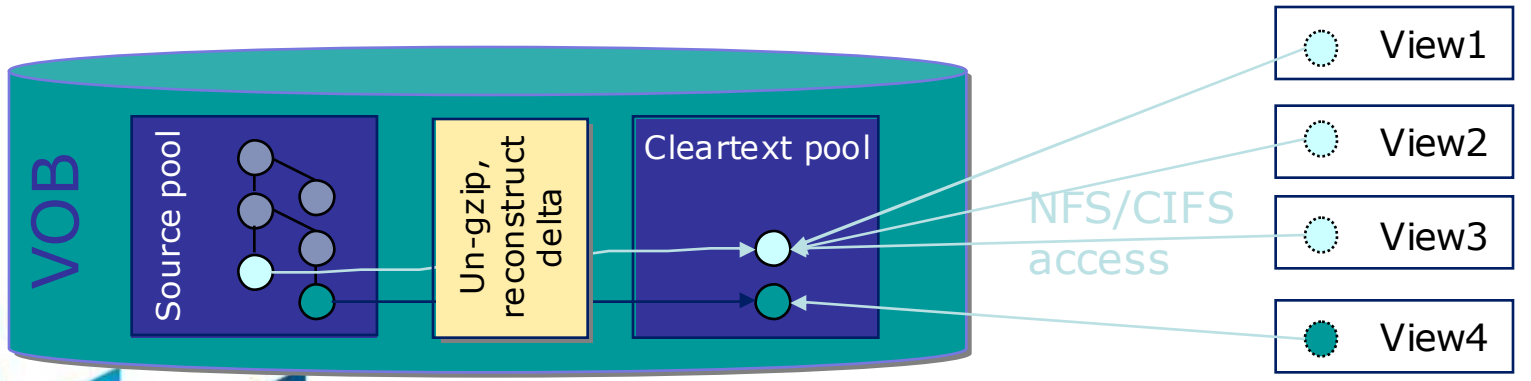
Software	Hardware	*common*
C, C++, Java	VHDL, Verilog (RTL)	*Programmatic sources*
compile, link	synthesize, place and route	*Automated build steps*
debug, lint, Purify, …	LVS, DRC, extraction, …	*Verification*

- One uniform system for all development disciplines
  - Specification, software, system-level, hardware, firmware, documentation, …
- Covers the full range of features for small projects (one site, few engineers) up to enterprise projects
  - Example: major baseband chip: 7 sites, dozens of engineers
- Available for all major platforms (Solaris, Linux, Windows, …)
  - Same data visible and modifiable on all platforms
- Supported as major offering by dedicated company (Pure Atria ⇨ Rational ⇨ IBM Software Group since 2003)

Unique ClearCase Features (1)

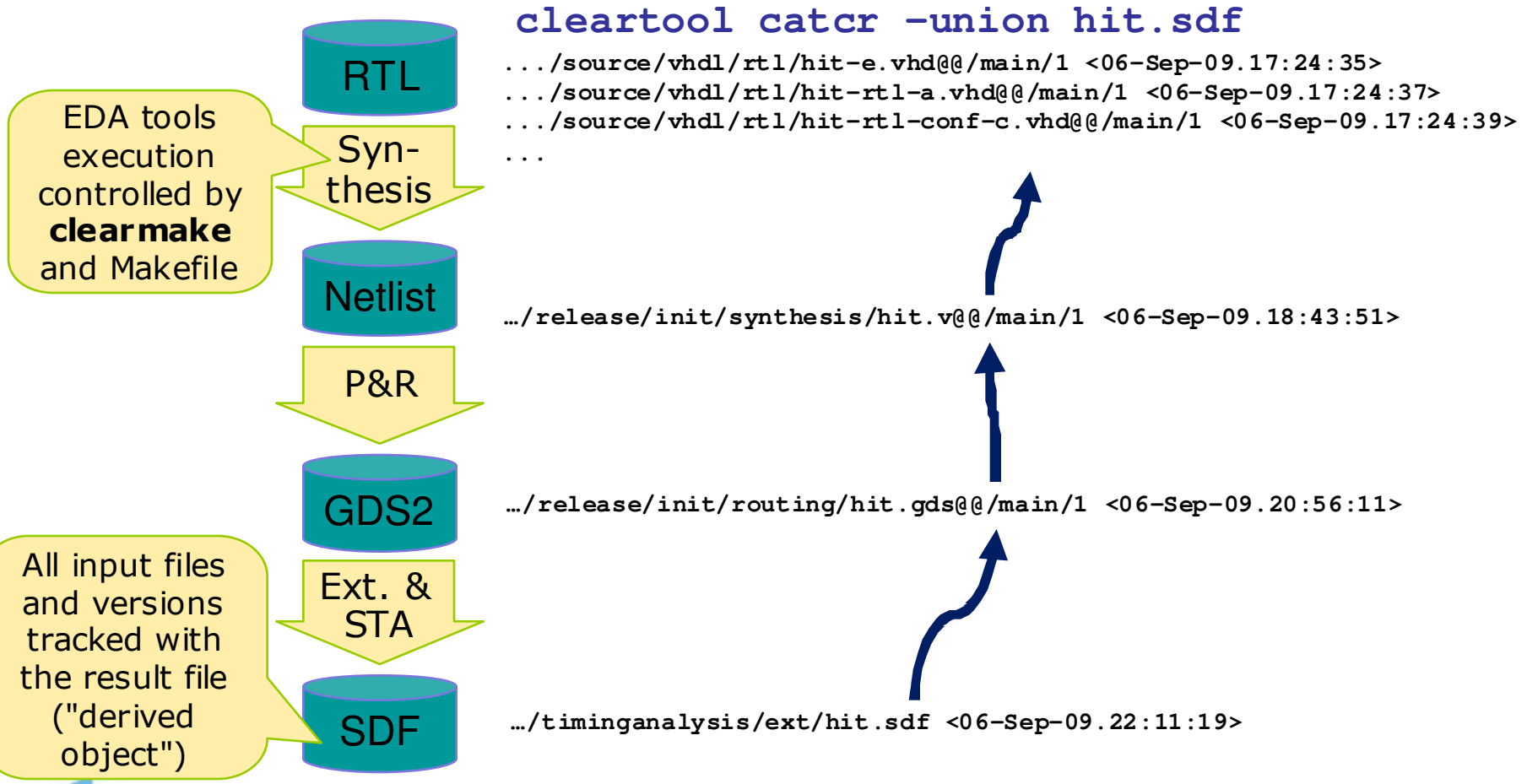
- "Dynamic Views" allow instantaneous updates of the user's work area
  - Immediate push of new versions into work areas
  - Change of config spec has immediate effect – no "populate"
  - Immediate access to any version (**`chip.v@@/main/12`**)

- Optimized storage
  - Text file versions stored as deltas –
    no problem to store many thousands RTL file versions efficiently
  - Binary file versions are stored zipped (or as delta – depends on content)
  - Each version is stored only once, not per work area!



Unique ClearCase Features (2)

- Dependency tracking via **clearmake** and derived objects



- Seamless dependency chain tracked from RTL to GDS2!

Unique ClearCase Features (3)

- Transparency across platforms
  - Dynamic View workarea accessible and operable from both UNIX and Windows:
  - Immediate visibility of changes, results, etc. (according to *config spec*)
  - … or choose another view type from below, if this is not what you want

- Mix of workarea types
  - Depending on the preferred use model of the particular development disciplines, choose “your” type of workarea / view:
  - Dynamic View: instant updates, efficient storage, maximum transparency
  - Snapshot View: traditional copy workarea, with rich feature set of the native client
  - Remote Client (CCRC): simplified client, based on / integrated with Eclipse; uses a central server, i.e. no extra replica needs to be created
    - CCRC can still be combined with MultiSite replicas
  - …but all important data eventually is checked in to the VOB, and thus becomes visible to any type of View/Workarea

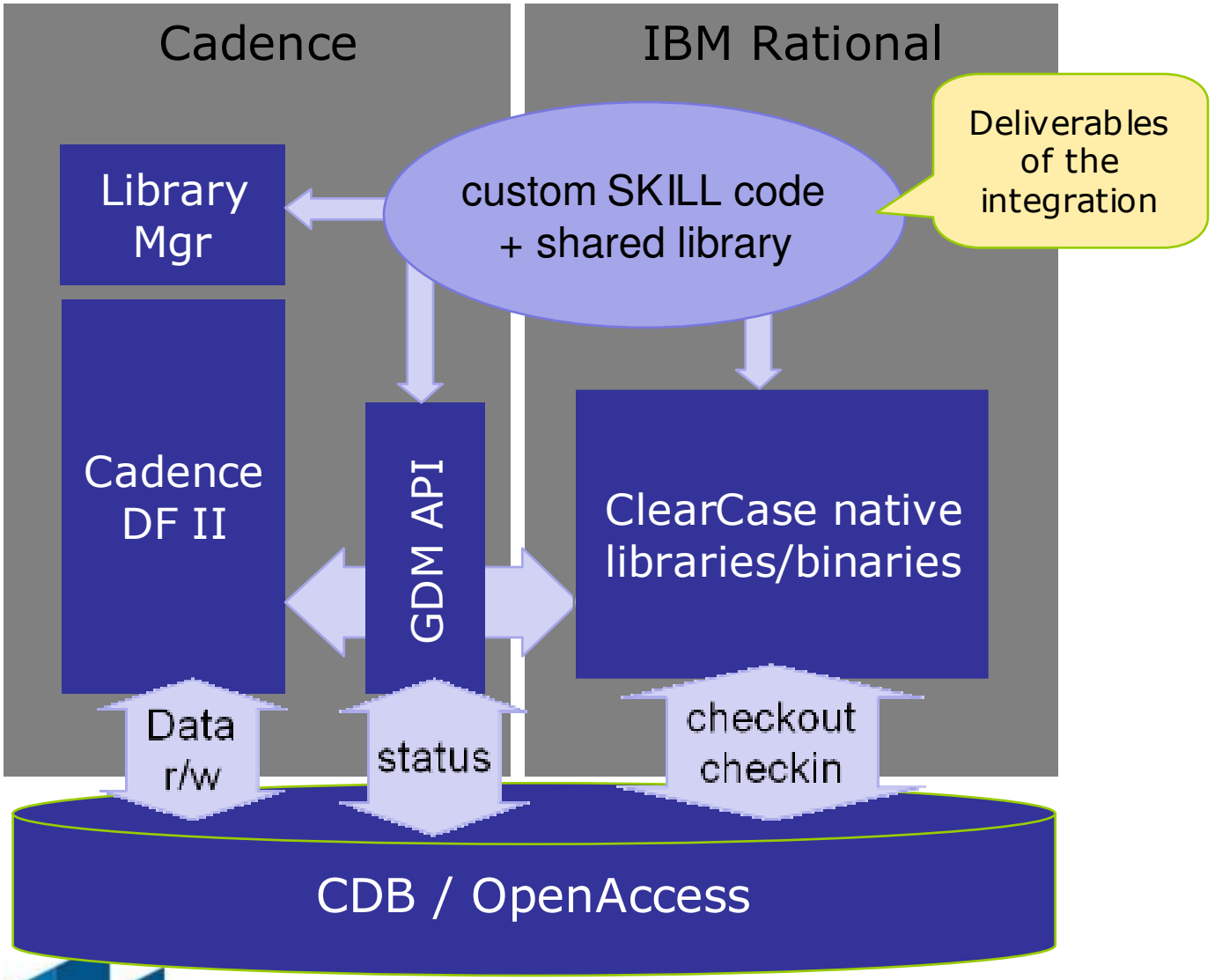
ClearCase and Analog/Mixed-Signal Development

- Main tool is the Cadence Design Framework ("Virtuoso")
  - Serves as primary user interface and design entry tool for analog/mixed-signal design
  - Has a binary database (CDB/OpenAccess), which does not provide any merge facility
  - MultiSite with site-branches is not applicable: site-specific branches would require merges
  - Request-for-mastership is the solution for strict single-stream development

- IBM Rational is working on a Cadence/ClearCase integration
  - The integration allows to exercise version control on the Cadence database
  - …using the predefined Cadence menus (Library Manager etc.)
  - Request-for-mastership is integrated to enable multi-site collaboration in single-stream mode
  - Integration will be built on Cadence 6.x version and ClearCase 7.0.x/7.1.x

- With this solution, entire systems can be developed in a uniform CM environment
  - Hardware, firmware, software, system-level models, documentation, …
  - Proper baselining across all disciplines – for cross-discipline system tests

Architecture of Cadence/ClearCase Integration



Systems Customer Success

Customer Success: Create and sustain market demand

Hydraulic hybrid delivery vehicles

What's smart?

- Innovative technology for urban delivery trucks in stop-and-go traffic
- Smart software to optimize energy usage and reduce greenhouse gases

Smarter business outcomes

- 60-70% increase in fuel economy, according to EPA
- 40% reduction in CO_2 emissions

How Rational enables smarter products

- Software modeling to optimize system performance
- Automatic generation of in-vehicle software code

"The suite of Rational tools, including Rhapsody, DOORS, ClearCase and ClearQuest, provides ***an integrated software framework that allows us to deliver innovative products more quickly and efficiently."***

Customer Success: Smarter products rely on global collaboration

Mobile access to medical images

What's smart?

- Provides medical professionals access to complex medical images on mobile devices
- Helps facilitate prompt access to medical imaging data – anytime or anywhere*

Smarter business outcomes

- Reduced hospital operations costs
- Reliable, secure, scalable delivery of medical images and reports

How Rational enables smarter products

- Collaboration across globally distributed development teams
- Change management across the end-to-end software lifecycle

"We rely on Synergy and Change to manage the complexity of the software and to ensure that our global development teams operate as one, for the best result to our customers. This software from IBM is part of our livelihood; it's our DNA."

*Product not yet released

A large manufacturer of communications and electronics equipment reduces time-to-market

Challenge

- Needed to keep pace with rapidly changing technology and maintain innovation over competition
- Limited reuse of components due to the manual code generation as part of the software development lifecycle
- Needed to integrate disparate legacy systems and harmonize enterprise data to create a single view of the organization and be effective through the supply chain

Solution

- Selected Rational Test RealTime as part of a solution including ClearCase, ClearQuest, RequisitePro and Rose RealTime
- Implemented a suite of IBM Rational products which would integrate with existing development products and SAP enterprise resource planning (ERP) system

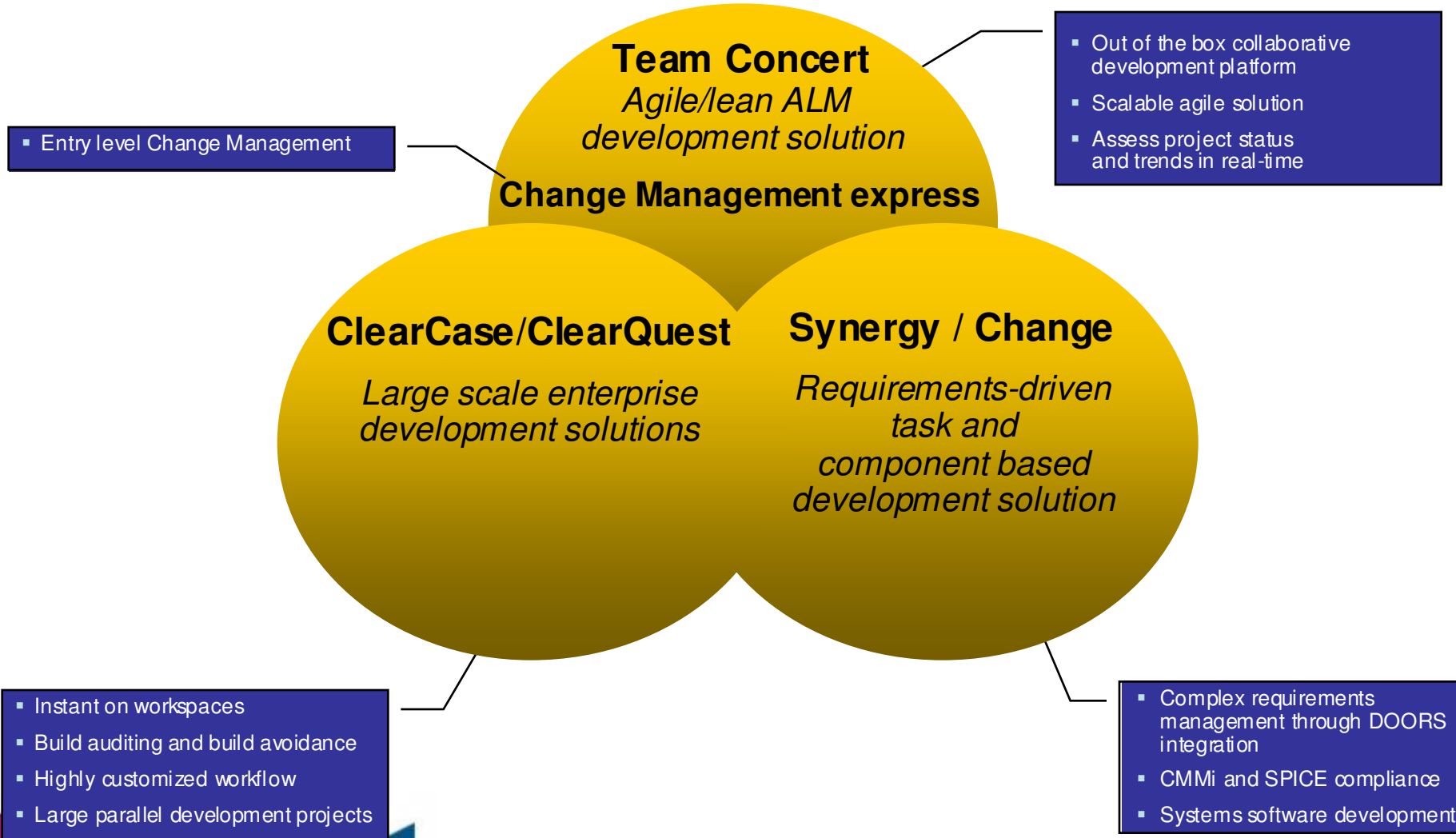
Business Benefits

- Dramatically reduced the total cost and time-to-market for new software products
- Established a core architecture which can be used to develop many derivatives of the software application increasing efficiency and reuse
- Improved ability to communicate and drive collaboration across the development team

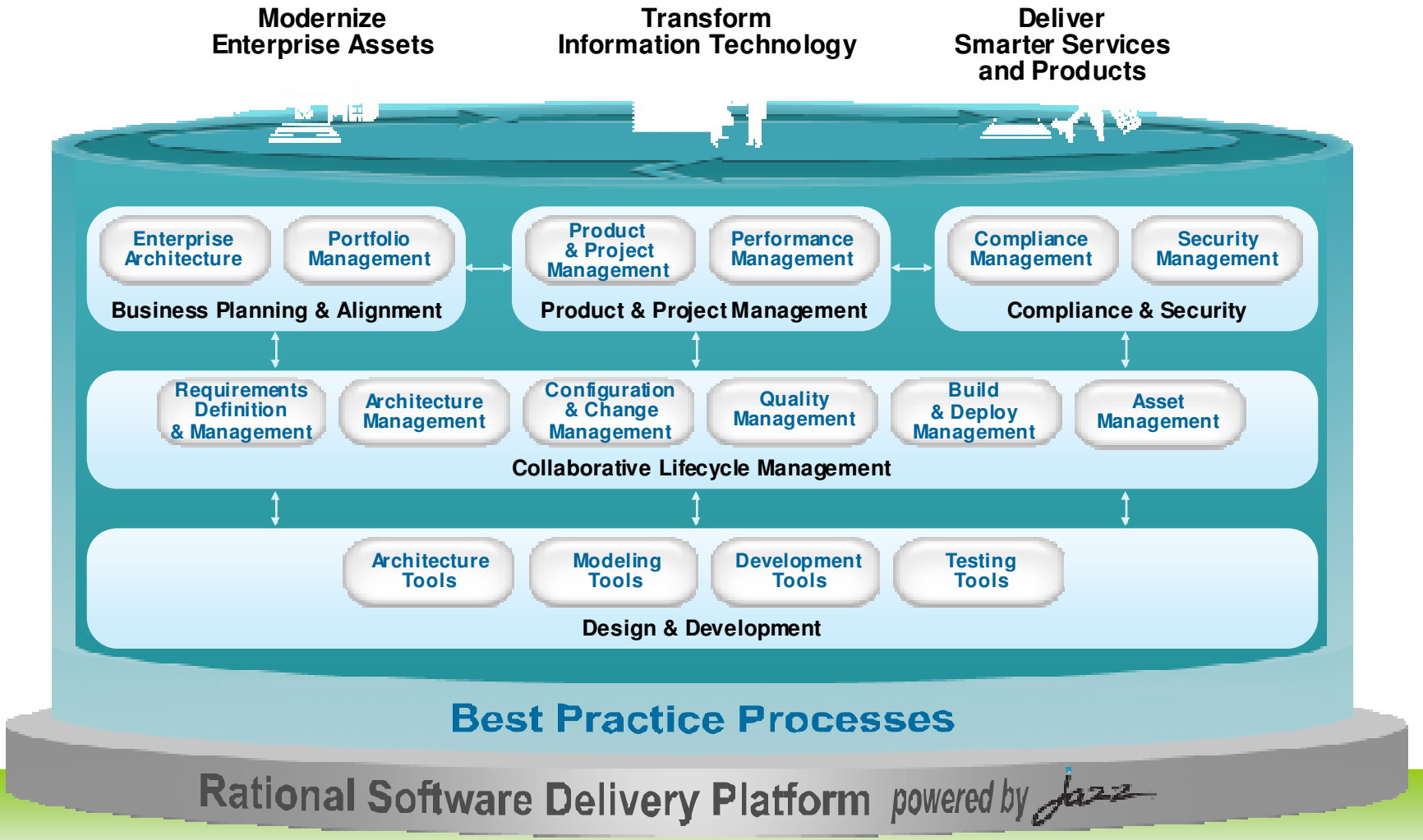
Rational CCM Solutions Recap

Rational Change and Configuration Management Solutions

Products to address every organization's unique needs



IBM Rational software delivery capabilities



IBM and Business Partner Ecosystem

The IBM Rational Jazz Platform

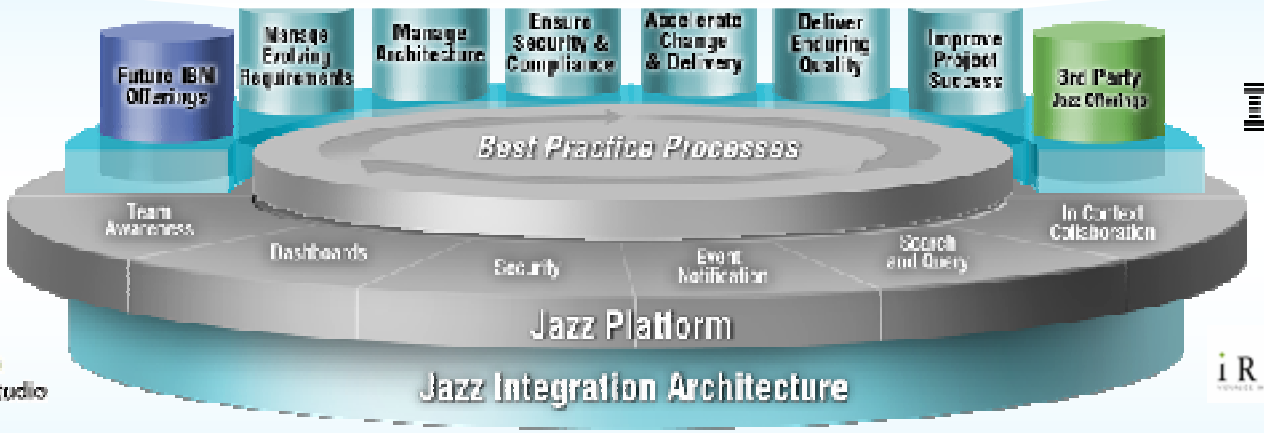
Rational Insight
Gain insight based on real-time and historical trend information

Rational Project Management
Manage global projects and resources

Rational Requirements Composer
Elicit, capture, elaborate, discuss, and review requirements

Rational Team Concert
Unify by "thinking & working" in unison with real-time project heath

Rational Quality Manager
Coordinate quality plans, processes and resources



SUBVERSION
eclipse
Visual Studio
Web 2.0

IBM Business Partner
IBM
Jazz Offerings
Telelogic
Mainsoft
cm-logic
QSM
iRise
RAVENFLOW

Rational ClearQuest
Rational Asset Manager
Rational Build Forge
Rational RequisitePro
Rational ClearCase

Rational. software
Powered by Jazz

More dynamic integration leveraging Jazz "Open Services for Lifecycle Collaboration" services

Rational Integrations

New and Enhanced!

- Rational Software Architect
- Rational Application Developer
- Rational AppScan & Tester portfolio
- Rational DOORS
- Rational Systems Architect

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THANK YOU