

“A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible. There are no prima donnas in engineering.”

Freeman Dyson



“To define it rudely but not ineptly, engineering is the art of doing that well with one dollar, which any bungler can do with two after a fashion.”

Arthur Wellesley



“Scientists dream about doing great things.  
Engineers do them.”

James A. Michener



“An optimist will tell you the glass is half-full; the pessimist, half-empty; and the engineer will tell you the glass is twice the size it needs to be”

Anon



“Engineers like to solve problems.  
If there are no problems handily  
available, they will create their own  
problems.”

Scott Adams



“Mechanical Engineers build weapons, Civil Engineers build targets”

Anon



“The engineer's first problem in any design situation is to discover what the problem really is.”

Anon



“Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it.”

Sir Henry Royce





“Engineers are not boring people, we just get excited over boring things”

Anon



“Experience is something you don’t get until just after you need it”

Anon



“Death and Taxes are unsolved engineering problems”

Romana Machado



“I derive satisfaction from doing something that is useful for other people. I enjoy what I do, I was born to be an engineer.”

B. Gordon Founder, CEO Analogic



“An expert is a man who has made all the mistakes, which can be made, in a very narrow field.”

Neils Bohrs



“It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.”

Charles Darwin



“Everything should be made as simple as possible, but not simpler.”

Albert Einstein



“Simplicity – The art of maximizing the amount of work not done.”

Anon





“Programming today is a race between software engineers striving to build bigger and better idiot-proof programs, and the Universe trying to produce bigger and better idiots. So far, the Universe is winning.”

Anon



“An engineer is someone who is good with figures, but doesn't have the personality of an accountant.”

Anon



“Engineering problems are under-defined, there are many solutions, good, bad and indifferent. The art is to arrive at a good solution. This is a creative activity, involving imagination, intuition and deliberate choice.”

Ove Arup



“Engineering is the art of modelling materials we do not wholly understand, into shapes we cannot precisely analyse so as to withstand forces we cannot properly assess, in such a way that the public has no reason to suspect the extent of our ignorance.”

Dr AR Dykes



“Normal people... believe that if it ain't broke, don't fix it.  
Engineers believe that if it ain't broke, it doesn't have enough  
features yet.”

Scott Adams



# Rational Systems and Software Engineering **Symposium**

An open, connected systems approach for  
product and systems development



**Andrew Foster** C.Eng M.Eng MIET  
Solution Offering Lead – Systems Engineering  
IBM Software



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What my friends think I do



What my customer thinks I do



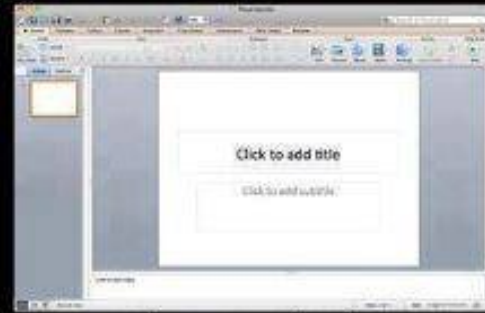
What society thinks I do



What my parents think I do



What I think I do



What I really do



## 2013 - Voyager leaves the solar system...

*Imagine what the next 36 years will bring.*

- Launched in 1977
- It was designed for a 4 year mission to explore Saturn
- Now 11.7 Billion miles from earth and traveling at 38,000 miles per hour
- Operates on technology that would be considered worthless today
  - 8-track tape recorder
  - Computers with one-240,000th the memory of a low-end iPhone



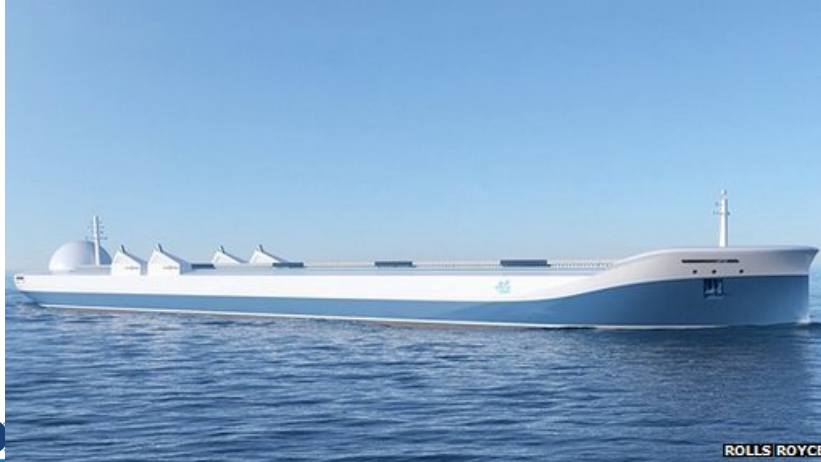
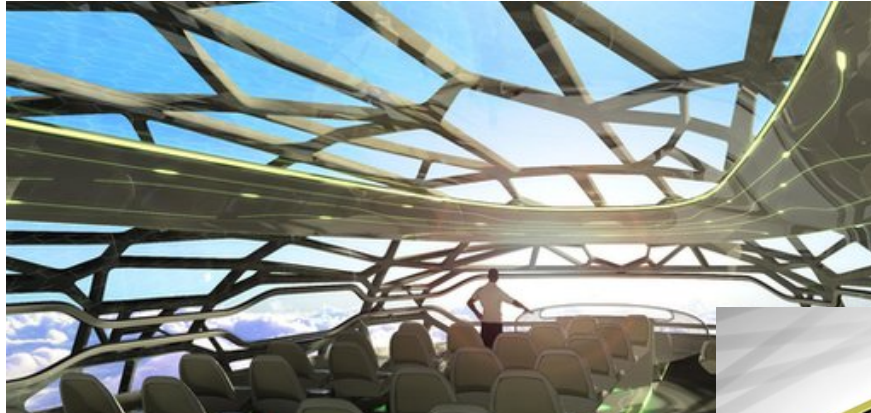
# State of the art...

## McLaren P1



Attribution: Norbert Aepli, Switzerland

# The Future?



# Global Trends

*influencing next generation products*



# So how can systems engineering prepare and adapt?

## More Openness

- Information systems becoming more open to allow engineers to establish traceability in more complex and unpredictable ways
- Engineers from all disciplines able to visualise, analyse, and organise information across the spectrum of product lines

## More Intelligence

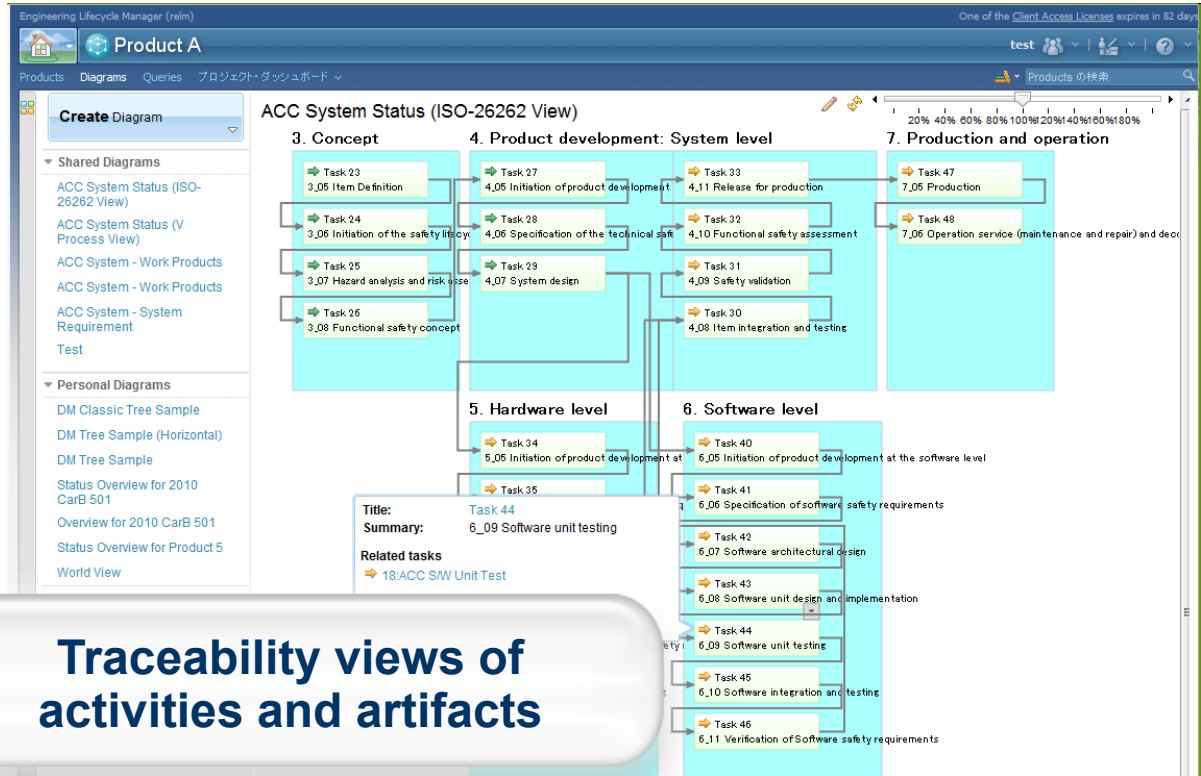
- Advanced analytic engines that can query large scale, complex linked data sets with a M2M understanding of context
- Automation that can aggregate and report data in more intelligent ways to help engineers make more informed decisions

## More Connected

- Social channels will allow faster and richer interaction with stakeholders
- Greater instrumentation of product and systems will facilitate high fidelity operational feedback

# The IBM solution for systems and software engineering

More  
Openness



Traceability views of  
activities and artifacts



# The IBM solution for systems and software engineering

## Integrated Planning and Collaborative Dashboards

More Intelligence

The screenshot displays the Rational Team Concert interface for the 'Adaptive Cruise Control' project. The dashboard includes several key sections:

- Project Description:** Details the project area and Adaptive Cruise Control teams.
- Server Status:** Shows database connection, services, memory usage (20% free of 256MB), version (1.9.0.2), and uptime (4 days, 12 hours).
- Work Item Queries:** Lists various queries such as 'New unassigned', 'Open assigned to me', and 'Open created by me'.
- Graphical presentation of queries:** A horizontal bar chart titled 'Open current milestone (20) Owned By' showing ownership distribution among team members like Michelle, Deb, Tazuo, Bob, Marco, and Scott.
- Build Duration:** A bar chart showing build durations in hours.
- Unassigned Defects Blocking Test Execution:** A section for tracking defects.

Callouts highlight features: 'Easy access to favorite queries' points to the 'Work Item Queries' section, and 'Information related to the dashboards viewer' points to the overall dashboard layout.

IBM.

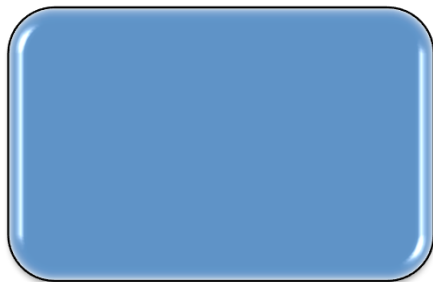
IBM.

Done

Log Out

rtc:9444

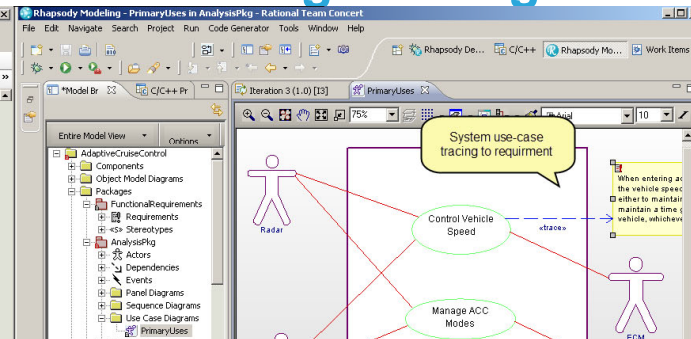
# The IBM solution for systems and software engineering



System Functional Requirements' current 0.0 in /Adaptive Cruise Control (Formal module) - DOORS

ID	Requirement
18	<b>1.8 ACC Requirement 000</b> Follow Mode - The ACC system maintains a target speed when the forward vehicle is present within the Time Gap or clearance of the vehicle's speed is maintained at the target speed.
20	<b>1.9 ACC Requirement 009</b> Deceleration Control - The ACC system decelerates the vehicle by lowering the Brake Control Module and sending a brake deceleration comm. Control Module.
22	<b>1.10 ACC Requirement 0010</b> The maximum allowed braking effort of the system is 1 MPH per 1.5 second.
24	<b>1.11 ACC Requirement 0011</b> During brake deceleration events, the Brake Co
26	<b>1.12 ACC Requirement 0012</b> Acceleration Control - The ACC system acceler
28	<b>1.13 ACC Requirement 0013</b> The Engine Control Module tries to maintain the rate of up to 1 mph per 1.5 seconds.
30	<b>1.14 ACC Requirement 0014</b> Adjusting the Time Gap - The driver can adjust the clearance between the two vehicle therefore the time gap value to decrease and then increase.
32	<b>1.15 ACC Requirement 0015</b> Reaction to a Slow Moving or Stopped Vehicle - is not able to maintain the time gap within the 1.5 seconds). The clearance between the ACC decreasing or the minimum vehicle speed of 25 the ACC system enters 'ACC standby' and alerts Required' text message on the instrument clus

System requirement linked to task



System Functional Requirements' current 0.0 in /Adaptive Cruise Control (Formal module) - DOORS

ID	Test Cases	Test Status	Verdict
1	<b>1 Adaptive Cruise Control Functional Requirements</b>	Not Approved	Passed
2	<b>1.1 ACC Requirement 001</b> Initialization - The ACC shall initialize to the ACC off state whenever the ignition key is cycled from the OFF position to the ON position.	(6) Test Adaptive Cruise Enabled.	Not Approved
4	<b>1.2 ACC Requirement 002</b> Entering ACC standby - The ACC system shall enter 'ACC standby' mode when ACC 'On' button.		
6	<b>1.3 ACC Requirement 003</b> The following conditions must be met for the system to enter 'ACC active' in response to cruise switches: Brake Switch = brake not applied Vehicle Speed >= 30 mph		
10	<b>1.4 ACC Requirement 004</b> Entering ACC active via SET - The ACC system	(9) Test Set Desired Speed.	Not Approved

Test coverage and status reported in DOORS

Rational Quality Manager - Mozilla Firefox

Tanuj's Dashboard

Reports on test coverage

Overview and state of software builds ready for test

Task assignments in RTC added to the RQM test dashboard

Test Case	Status	Created
Adaptive Cruise Control Team Events (7) (new)		
* Provide the Summary Section for TestCase: Test Follow Mode (46)	Apr 1, 2010	
* Provide the Summary Section for TestCase: Test Deceleration Control (46)	Apr 1, 2010	
* Provide the Manual Steps Section for TestCase: Test Vision@ExecutionScript: Determine Object Present Script (46)	Mar 31, 2010	
* Provide the Manual Steps Section for TestCase: Test Vision@ExecutionScript	Mar 31, 2010	
Adaptive Cruise Control Team build 201004010800	Apr 1, 2010	
Failed: ACC Dev Team build 201004010800	Apr 1, 2010	
Failed: ACC Dev Team build 201004010850	Apr 1, 2010	
Failed: ACC Dev Team build 201003311024	Mar 31, 2010	

Test cases' count of how many requirements associated  
May 26, 2010 4:31:10 AM

Requirements, Design, Verification, Test, all connected



Thank You.

