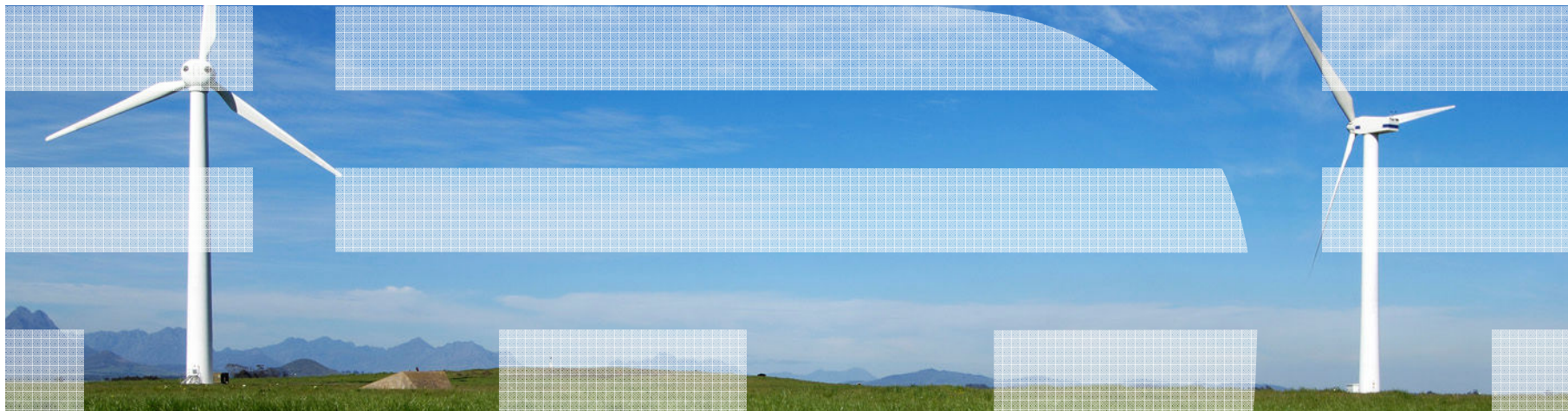


Requisitos, trazabilidad y validación de sistemas con IBM Rational DOORS

Francisco J. López Minaya
Rational Technical Solution Architect
francisco.lopezminaya@es.ibm.com



Productos cada vez más inteligentes e innovadores en cualquier área



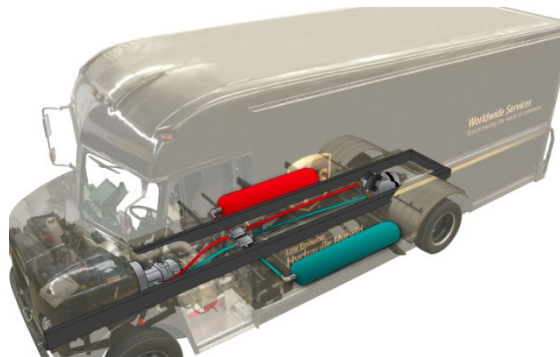
Smarter automobiles



Smarter health care



Smarter devices



Smarter hybrid vehicles



Smarter energy



Smarter defense systems

¿Qué retos se nos plantean? ¿Dónde nos duele?

Sistemas cada vez más complejos: más información.

Equipos de trabajo geográficamente distribuidos: diferentes formas de trabajo, diferentes formatos

Cliente exige productos de mayor calidad y libres de fallos



Equipos de trabajo no distribuidos pero de diferentes disciplinas

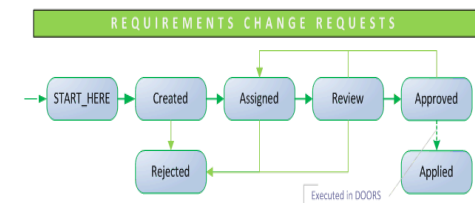
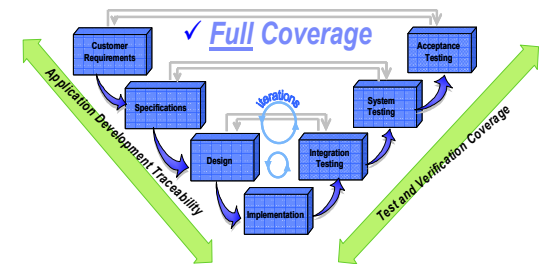
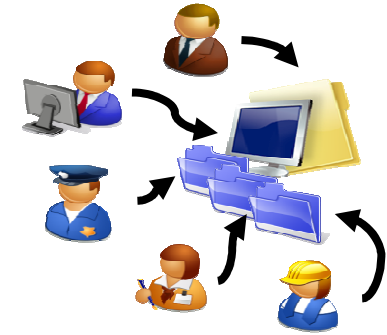
Regulaciones y estándares exigen demostrar evidencias

Cambio constante. Gestión impacto de cambios

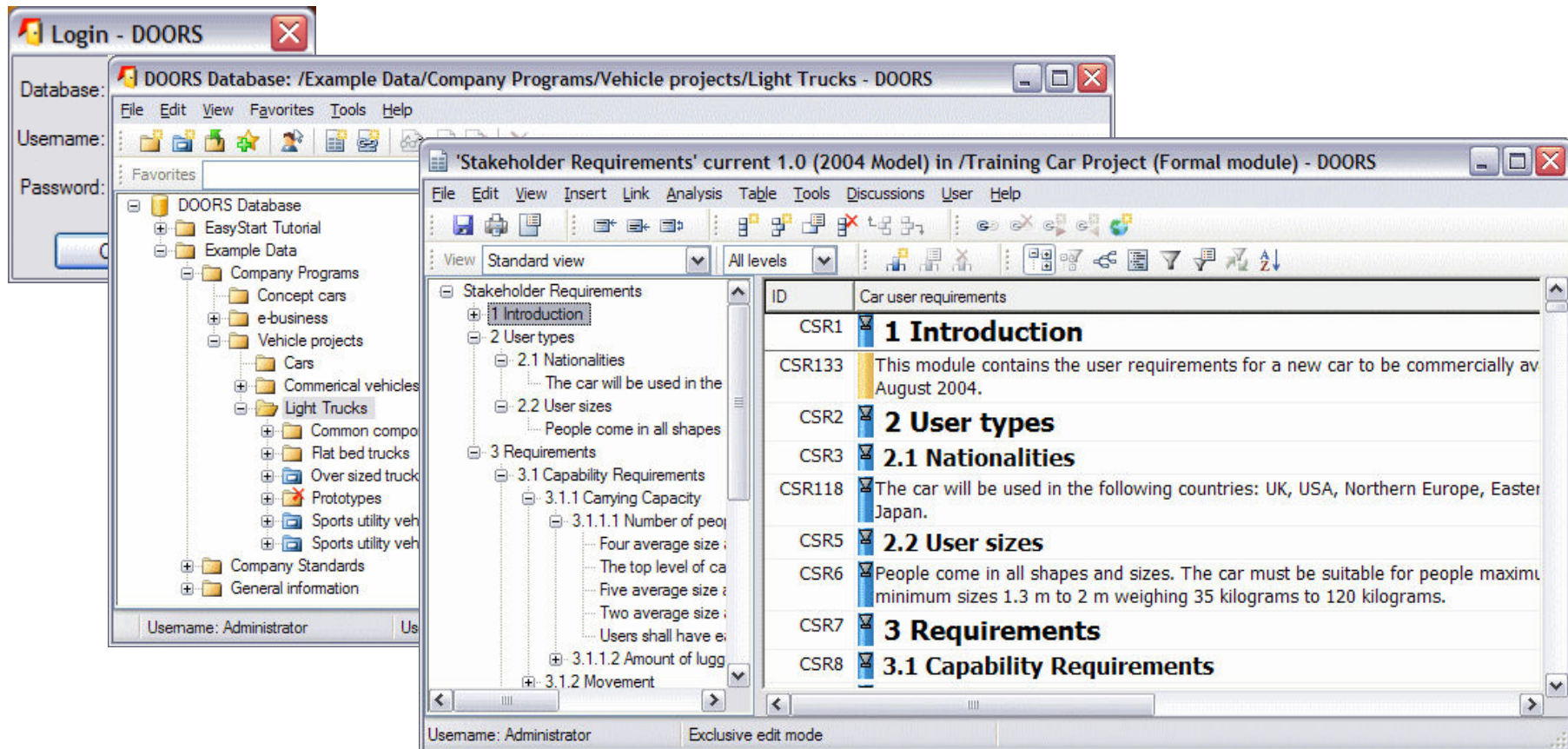
Generación de documentación

IBM Rational DOORS

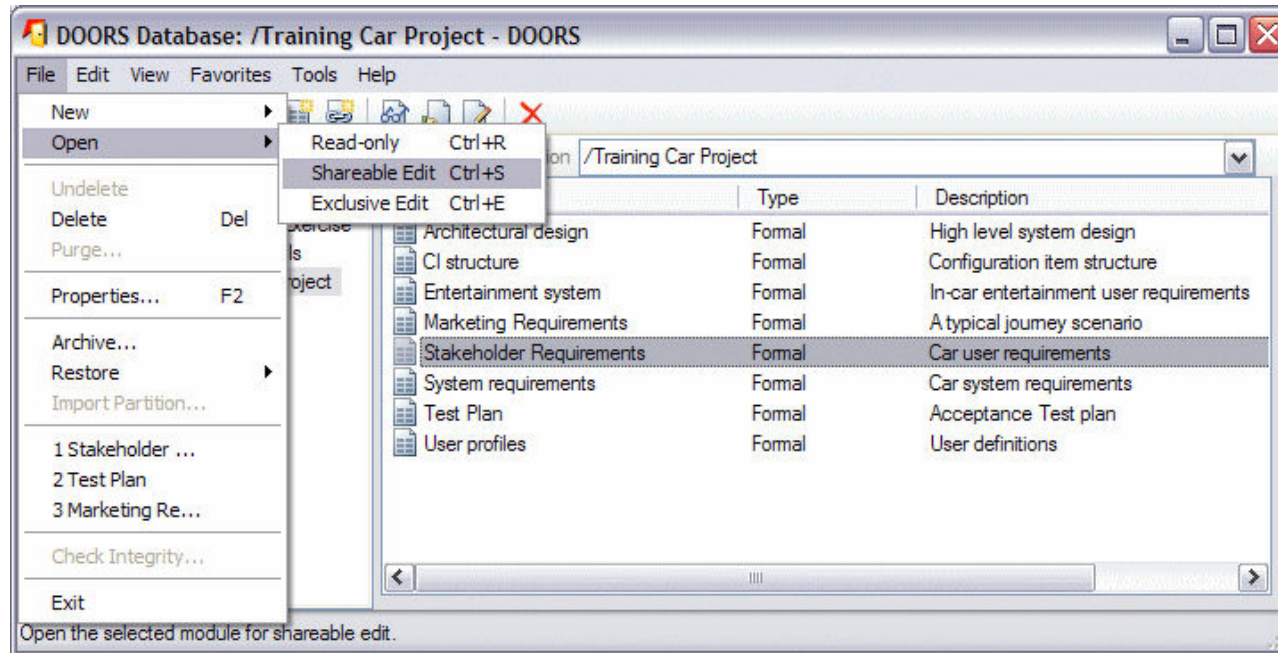
- Plataforma de colaboración
 - Centralizar, organizar, estructurar, trazar y gestionar los requisitos del producto
 - Información actualizada **accesible** para todos los miembros del equipo. Facilita la **colaboración** y **comunicación** entre ellos.
 - **Acceso controlado**, permisos de acceso
- Trazabilidad
 - **Establecer relaciones** entre requisitos, entre requisitos y pruebas, entre requisitos y diseño software, entre requisitos y diseño hardware (diseño mecánico, eléctrico, etc)
 - Demostrar que el sistema final **cumple los requisitos** de cliente
 - Demostrar que el sistema final está **probado**
 - **Control** de los procesos de desarrollo/construcción y verificación&validación desde los requisitos
- Gestión del cambio
 - Análisis de **impacto de cambios**, **seguimiento** del estado de los cambios
- Flexibilidad
 - Fácil implementación de cualquier **proceso de desarrollo**






Acceso controlado y organización de la información



Acceso simultáneo a la información



Modo de apertura:

- Sólo lectura**  acceso sólo lectura, permite editar a otros usuarios
- Edición compartida**  permite editar a varios usuarios simultáneamente
- Edición exclusiva**  edición exclusiva del documento

Acceso remoto a través de DOORS Web Access

- Todo el equipo trabaja con la misma versión de requisitos
- Revisión y edición de requisitos vía web
- Visualización y exploración de la trazabilidad
- Distribución de requisitos y comunicación con el resto del equipo utilizando URLs http
- Comunicación con usuarios de DWA o DOORS a través de los foros de discusión

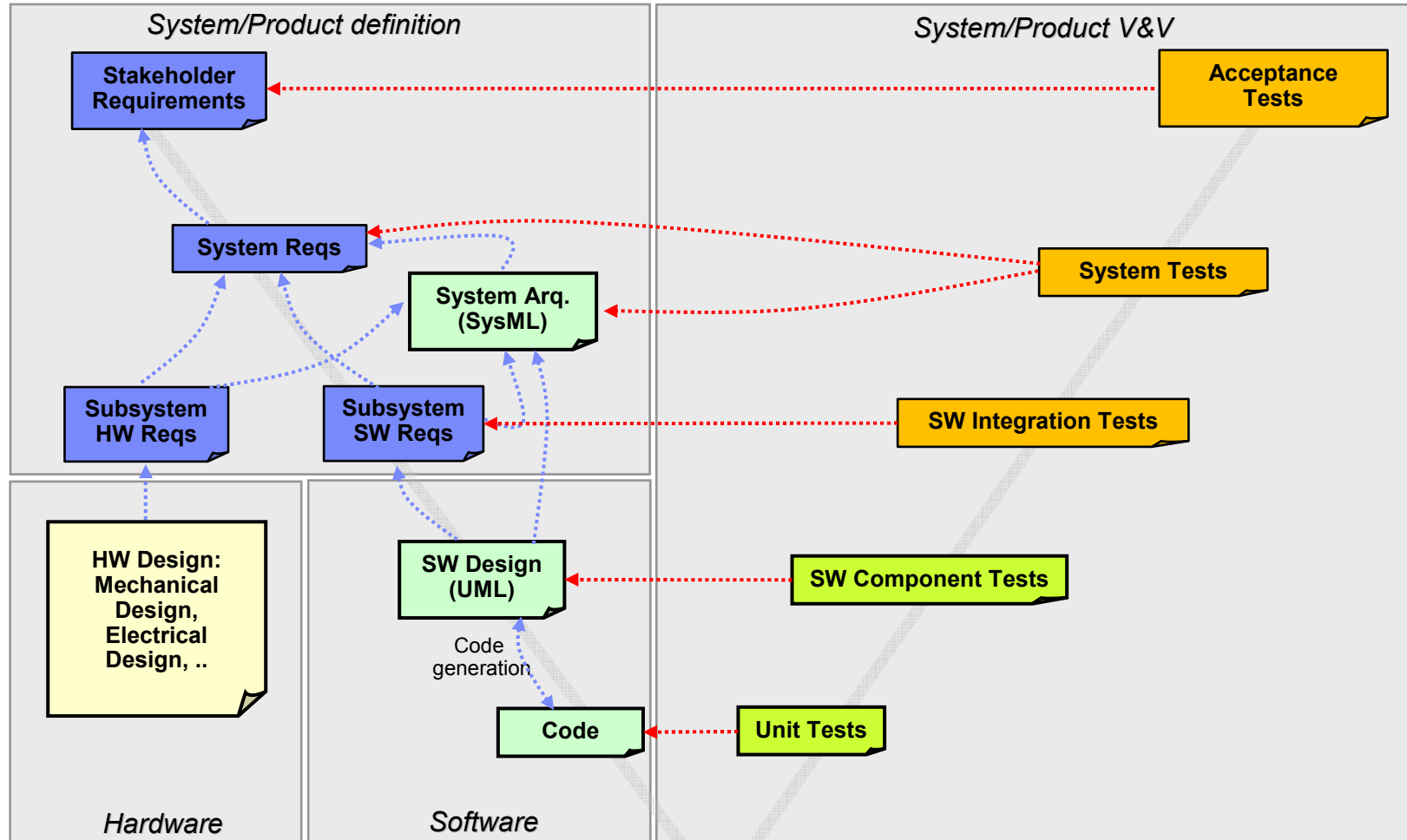
The screenshot displays the Rational DOORS Web Access interface within a Mozilla Firefox browser window. The browser's address bar shows the URL `http://212.209.58.153:8081/dwa/dwa.jsp#`. The interface includes a top navigation bar with options like 'Goto URL', 'Layout', 'Package', and 'Help'. On the left, a 'DOORS Database' pane shows a tree structure for 'New Family Car Project Requirements', including 'Entertainment System', 'Marketing Requirements', 'Stakeholder Requirements', and 'System Requirements'. The central workspace is titled 'System Requirements' and features a 'View: Standard View' dropdown, a search bar, and a bar chart showing 'Time to stop' (0 to 30 seconds) for different speeds (100 kph, 200 kph). Below the chart is a table of requirements:

Id	Description
TRN-S	1.2.4 Clutch Controls
TRN-S	The car's clutch controls will be functional by standard footwear.
TRN-S	1.2.5 Control direction
TRN-S	1.2.5.1 Straight line
TRN-S	The car shall have a mechanism to enable it to be moved forwards or backwards.
TRN-S	1.2.5.1.1 Direction mechanism

The right-hand pane shows 'Attributes' and 'Discussions' for the selected requirement. The 'Attributes' section includes fields like 'User', 'Object Heading', 'Object Text', 'Object Short Text', 'Comments', 'Cost', 'Industrial area', 'Object Type', 'Priority', 'Progress', and 'Status'. The 'Discussions' section shows a list of discussions with edit icons.

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Proceso de desarrollo de sistemas



Gestión de Trazabilidad con DOORS

The screenshot displays the DOORS interface with a traceability matrix. The columns are labeled as follows:

- User Reqs**: Points to the 'User Requirements' column.
- System Reqs**: Points to the 'Functional Requirements' column.
- Subsystem Reqs**: Points to the 'Design' column.
- Tests**: Points to the 'Test Plan' column.

ID	User Requirements	Functional Requirements	Design	Test Plan
TRN-CSR-35	3.1.2.3 Stopping			
TRN-CSR-36	Users shall be able to stop safely.	<p>FR-23</p> <p>The car shall be able to stop from 10 kilometers per hour to 0 kph in 2 seconds.</p> <p>FR-24</p> <p>The car shall be able to stop from 30 kilometers per hour to 0 kph in 6 seconds.</p>	<p>TRN-AD-48</p> <p>Disc brakes</p> <p>TRN-AD-48</p> <p>Disc brakes</p> <p>TRN-AD-48</p> <p>Disc brakes</p>	<p>TRN-TP-34</p> <p>High Speed Braking Test</p> <p>TRN-TP-35</p> <p>Low Speed Braking Test</p> <p>TRN-TP-34</p> <p>High Speed Braking Test</p> <p>TRN-TP-35</p> <p>Low Speed Braking Test</p> <p>TRN-TP-34</p> <p>High Speed Braking Test</p>

At the bottom of the screenshot, the status bar shows: Username: Dave Mason, Exclusive edit mode.

Trazabilidad total en una única vista

Matrices/Vistas de trazabilidad

- **Representación semi-gráfica** de la trazabilidad
- **Contenido dinámico**, actualizado en tiempo real con la creación de nuevos links
- **Vistas de trabajo**, útiles en el día a día: requisitos cubiertos, requisitos no cubiertos, impacto de cambio, etc.
- Pueden incluirse directa y automáticamente en un **report**, **evitando malgastar tiempo en formateo, construcción y mantenimiento** de estas matrices.
- Estas matrices son las **evidencias** de implementación o verificación/validación exigidas por el cliente o por las diferentes regulaciones o normativas a cumplir en nuestra industria.
- Construcción muy **sencilla**, a través de un asistente

Creación de relaciones de trazabilidad

The image shows two overlapping windows from the Rational software interface. The left window, titled "Stakeholder Requirements Specification" current 0.1 in /1, displays a table of requirements for a Coyote UAV. A context menu is open over requirement UAV-8, with options like "Make Link From Start", "Make Link To Start", "Move", "Copy", "Copy then link from Start", "Copy then link to Start", and "Cancel". The right window, titled "System Requirements Specification" current 0.0 in /2, displays a table of system requirements. A mouse cursor is positioned over requirement SRSUAV-7, which is highlighted with a red box and labeled "Nuevo Link".

ID	Object Type	Stakeholder Requirements Specification for the Coyote UAV
UAV-5	*	2 Requirements
UAV-6	Requirement	The UAV is shall be a multipurpose and reusable U... multimission capability.
UAV-74	Requirement	The UAV shall...
UAV-75	Requirement	This is a new stakeholder requirement
UAV-7	Requirement	It shall operate at altitudes of up to 30,000 feet.
UAV-8	Requirement	It shall operate at altitudes of up to 30,000 feet.
UAV-9	Requirement	It shall operate at altitudes of up to 30,000 feet.
UAV-10	Requirement	It shall operate at altitudes of up to 30,000 feet.
UAV-11	Requirement	The UAV shall be capable of flying complex flight...
UAV-12	Requirement	The UAV shall be capable of flying complex flight...
UAV-13	Requirement	The UAV shall be capable of flying complex flight...
UAV-14	Requirement	The UAV shall be capable of flying complex flight...
UAV-15	Requirement	The UAV shall be capable of flying complex flight...
UAV-16	Requirement	The UAV and manned control capability from the g...

ID	Object Type	System Requirements Specification	Priority
SRSUAV-1	*	1 Overview	
SRSUAV-2	*	The Unmanned Air Vehicle System is a system solution to a medium-range reconnaissance in hostile environments with limited attack capability.	
SRSUAV-3	*	It is a medium-range long endurance UAV system that can carry a variety of payloads to assist in ground, air and sea operations.	
SRSUAV-4	*	A full UAVS consist of four UAVs and a ground Mission Planning and Control System.	
SRSUAV-5	*	2 System Requirements	
SRSUAV-74	*	2.1 UAV Vehicle	
SRSUAV-6	Requirement	The CUAV is shall be a multipurpose and reusable UAV with multimission capability.	High
SRSUAV-78	Requirement	This is a new system requirement..	Medium
SRSUAV-7	Requirement	It shall operate at altitudes of up to 30,000 feet.	High
SRSUAV-8	Requirement	It shall operate at altitudes of up to 30,000 feet.	High
SRSUAV-9	Requirement	It shall operate at altitudes of up to 30,000 feet.	Medium
SRSUAV-10	Requirement	It shall operate at altitudes of up to 30,000 feet.	Medium
SRSUAV-11	Requirement	The UAV shall be capable of flying complex flight plans with the operational goal of orbit surveillance of point targets.	Medium
SRSUAV-12	Requirement	The UAV shall be controllable from the ground station CMPCS.	High
SRSUAV-13	Requirement	The UAV shall be capable of flying complex flight plans with the operational goal of systematic area search.	High
SRSUAV-14	Requirement	The UAV shall be capable of flying complex flight plans with the operational goal of ground route or road based (synonym) search.	High

Creación con drag & drop

Trazabilidad entre requisitos de varios niveles

Stakeholder Reqs (UAV-)

System Reqs (SRSUAV-)

Flight Mngmt Reqs (FMS-)

Missile Control Reqs (MCS-)

ID	Object Type	Stakeholder Requirements Specification for the Coyote UAV	System <- Missile Control Subsystem	System <- Flight Management Subsystem
UAV-5	*	2 Requirements		
UAV-6	Requirement	The UAV is shall be a multipurpose and reusable UAV with multimission capability.	SRSUAV-6	SRSUAV-6
UAV-74	Requirement	The UAV shall...	SRSUAV-78	SRSUAV-78
UAV-75	Requirement	This is a new stakeholder requirement	SRSUAV-78	SRSUAV-78
UAV-7	Requirement	It shall operate at altitudes of up to 30,000 feet.	SRSUAV-7	SRSUAV-7
			MCS-11	FMS-11
			MCS-13	SRSUAV-14
			MCS-20	FMS-14
			SRSUAV-14	
			MCS-13	
			MCS-14	
UAV-8	Requirement	It shall reach ground speeds of up to 100 knots in cruise mode.	SRSUAV-8	SRSUAV-8
UAV-9	Requirement	It shall reach ground speeds of 150 knots in dash mode.	SRSUAV-9	SRSUAV-9
UAV-10	Requirement	It shall carry payloads up to 450 lbs for durations exceeding 24 hours.	SRSUAV-10	SRSUAV-10
UAV-11	Requirement	The UAV shall fly unimpeded in low visibility environments while carrying reconnaissance or attack payloads.		
UAV-12	Requirement	The UAV shall be controllable from the ground station CMPCS.	SRSUAV-12	SRSUAV-12
UAV-13	Requirement	The UAV shall be capable of of flying complex flight plans with the operational goal of systematic area search.	SRSUAV-13	SRSUAV-13
			MCS-13	FMS-13
UAV-14	Requirement	The UAV shall be capable of of flying complex flight plans with the operational goal of ground route or road based (synonym) search.	SRSUAV-14	SRSUAV-14
			MCS-13	FMS-14
			MCS-14	
UAV-15	Requirement	The UAV shall be capable of of flying complex flight plans	SRSUAV-15	SRSUAV-15

Username: Administrator | Exclusive edit mode

Trazabilidad entre requisitos y elementos de diseño software

The screenshot shows the Rational software interface for 'System Requirements Specification' current 0.0 in /2. System Requirements Specifications (Formal module) - DOORS. The table below represents the data visible in the interface.

ID	Object Type	System Requirements Specification	Allocated to (System Architecture)
SRSUAV-3	*	It is a medium-range long endurance UAV system that can carry a variety of payloads to assist in ground, air and sea operations.	
SRSUAV-4	*	A full UAVS consist of four UAVs and a ground Mission Planning and Control System.	
2 System Requirements			
2.1 UAV Vehicle			
SRSUAV-6	Requirement	The CUAV is shall be a multipurpose and reusable UAV with multimission capability.	Package: UAV_Vehicle
SRSUAV-78	Requirement	This is a new system requirement..	Package: UAV_Vehicle
SRSUAV-7	Requirement	It shall operate at altitudes of up to 30,000 feet.	Package: UAV_Vehicle
SRSUAV-8	Requirement	It shall reach ground speeds of up to 100 knots in cruise mode.	Package: UAV_Vehicle
SRSUAV-9	Requirement	It shall reach ground speeds of 150 knots in dash mode.	Package: UAV_Vehicle
SRSUAV-10	Requirement	It shall carry payloads up to 450 lbs for durations exceeding 24 hours.	Package: UAV_Vehicle
SRSUAV-11	Requirement	The UAV shall fly unimpeded in low visibility environments while carrying reconnaissance or attack payloads.	Package: UAV_Vehicle block: Flight_Management
SRSUAV-12	Requirement	The UAV shall be controllable from the ground station CMPCS.	Package: UAV_Vehicle
SRSUAV-13	Requirement	The UAV shall be capable of of flying complex flight plans with the operational goal of systematic area search.	Package: UAV_Vehicle
SRSUAV-14	Requirement	The UAV shall be capable of of flying complex flight plans with the operational goal of ground route or road based (synonym)	Package: UAV_Vehicle

Trazabilidad entre requisitos y elementos de diseño hardware

The screenshot shows a window titled "'PSS 000' current 0.0 in /2. PSS (Formal module) - DOORS". The interface includes a menu bar (File, Edit, View, Insert, Link, Analysis, Table, Tools, User, NAVANTIA, WEXP, Analyst, Help) and a toolbar. Below the toolbar is a view configuration area with 'VACRM Assurance' and 'All levels' selected. The main area is a table with the following columns: 'DOORS UID', 'Platform System Specifications', 'CAT0', 'Technical Documentation Associated', and 'Remarks'.

DOORS UID	Platform System Specifications	CAT0	Technical Documentation Associated	Remarks
PS000 - 4	This Specification defines details of Contractual technical aspects, i.e., ship's features, components, equipment, structure and materials, to be fulfilled during the ship's.	Inspection	0736350020R NOISE REPORT INF.LR 20080527 1111000010S SHELL EXPANSION APR.LR 20080508	
PS000 - 10	A margin provided in the ship design so that future systems can be added after the Ship is commissioned to the Commonwealth. FOR INFORMATION: XXX	Analysis		
PS000 - 12	This margin covers potential modifications in relation to GFE throughout design and construction with regard to GFE identified in the Contract.			
PS000 - 14	With the purpose of defining a later installation / integration of systems not installed in the ship			

A red box highlights the 'Technical Documentation Associated' column for the first row. A red arrow points from this box to a separate red-bordered box containing the text: "Diseños mecánicos, eléctricos, informes técnicos asociados con el requisito".

At the bottom of the window, the status bar shows 'Username: flopez' and 'Exclusive edit mode'.

Trazabilidad con las pruebas

The screenshot displays the Rational software interface for managing system requirements and tests. The main window is titled "'System requirements' current 0.2 (a) in /Training Car Project (Formal module) - DOORS".

Left Panel: System requirements tree

- System requirements
 - 1 Functional Requirements
 - 1.1 Power car
 - 1.1.1 Move car
 - 1.1.1.1 Accelerate car
 - 1.1.2.1 Without Win
 - The car shall be
 - The car shall be
 - The car shall be
 - 1.1.2.2 With winds f
 - The car shall be
 - The car shall be
 - 1.2 Control car
 - 1.3 Illuminate car
 - 1.4 Control windows
 - 1.5 Control sun roof
 - 1.6 Maintain visibility
 - 1.7 Stabilize occupants
 - 1.8 Protect passengers
 - 1.9 Protect environmental
 - 1.10 Modularity
 - 1.11 Control entertainment
 - 1.12 Communicate
 - 1.13 Calculate
 - 1.14 Accommodate
 - 2 System constraints

Table: Car system requirements

ID	Car system requirements	Requirement Status	Associated Tests & Status
SR1635	1.1.2.1 Without Winds	✓	
SR1009	The car shall be able to accelerate from 0 to 100 Kilometers per hour in 10 seconds on standard flat roads with winds of 0 kilometers per hour.	✓	TP-26.1 Action: In a flat road without winds, accelerate the car from 0 to 100 Km/h and observe the time taken Expected Result: The time taken must be less or equal than 10 seconds. Test Status: Pass
SR1010	The car shall be able to accelerate from 100 to 150 kilometers per hour at a rate of 5 kilometers per second on standard flat roads with winds of 0 kilometers per hour.	✓	TP-26.1 Action: In a flat road without winds, accelerate the car from 0 to 100 Km/h and observe the time taken Expected Result: The time taken must be less or equal than 10 seconds Test Status: Pass TP-26.2 Action: Continue accelerating from 100 to 150 Km/h and observe the total time taken (from 0 km/h) Expected Result: The time taken from the beginning must be less or equal than 20 seconds. Test Status: Pass
SR1011	The car shall be able to accelerate from 150 to 200 kilometers per hour at a rate of 3 kilometers per second on standard flat roads with winds of 0 kilometers per hour.	✓	TP-26.1 Action: In a flat road without winds, accelerate the car from 0 to 100 Km/h and observe the time taken Expected Result: The time taken must be less or equal than 10 seconds. Test Status: Pass TP-26.2 Action: Continue accelerating from 100 to 150 Km/h and observe the total time taken (from 0 km/h) Expected Result: The time taken from the beginning must be less or equal than 20 seconds. Test Status: Pass TP-26.3 Action: Continue accelerating from 150 to 200 Km/h and observe the total time taken (from 0 km/h) Expected Result: The time taken from the beginning must be less or equal than 38 seconds. Test Status: Pass
SR1636	1.1.2.2 With winds from 10 to 20 km/h	✗	
SR1632	The car shall be able to accelerate from 0 to 100 Kilometers per hour in 12 seconds on standard flat roads with winds from 10 to 20 kilometers per hour.	✗	TP-36.1 Action: In a flat road without winds, accelerate the car from 0 to 100 Km/h and observe the time taken Expected Result: The time taken must be less or equal than 12 seconds. Test Status: Undetermined

Bottom Panel: Username: Administrator, Exclusive edit mode

Análisis de impacto de cambios

ID	User Requirements	Functional Requirements	Design	Test Plan
TRN-CSR-55	3.1.6.1.3 Clutch			
TRN-CSR-56	Users shall be able to operate the clutch, if fitted, in standard footwear.	FR-167 There shall be a standard lightweight clutch.	TRN-AD-45 Clutch	TRN-TP-36 Lightweight footwear control test
TRN-CSR-57	3.1.6.1.4 Gears			
TRN-CSR-58	Users shall be able to operate gears, if fitted, with minimal effort.	FR-169 The car shall be fitted with a lightweight 5 speed manually operated gearbox.	TRN-AD-14 Gearbox	TRN-TP-36 Lightweight footwear control test
TRN-CSR-59	3.1.7 Visibility			
TRN-CSR-60	3.1.7.1 Day light			
TRN-CSR-61	Users shall have maximum daylight visibility from within the vehicle.			
TRN-	3.1.7.2 Night time			

Evaluación del impacto de cambios de forma rápida y fiable a través de links

Un cambio en

impacta en

y en

Compleitud, progreso del proyecto

ID	User Requirements	Functional Requirements	Design	Test Plan
TRN-CSR-55	3.1.6.1.3 Clutch			
TRN-CSR-56	Users shall be able to operate the clutch, if fitted, in standard footwear.	FR-167 There shall be a standard lightweight clutch.	TRN-AD-45 Clutch	TRN-TP-36 Lightweight footwear control test
TRN-CSR-57	3.1.6.1.4 Gears			
TRN-CSR-58	Users shall be able to operate gears, if fitted, with minimal effort.	FR-169 The car shall be fitted with a lightweight 5 speed manually operated gearbox.	TRN-AD-44 Gearbox	TRN-TP-36 Lightweight footwear control test
TRN-CSR-59	3.1.7 Visibility			
TRN-CSR-60	3.1.7.1 Daylight			
TRN-CSR-61	Users shall have maximum daylight visibility from within the vehicle.			
TRN-	3.1.7.2 Night time			

Fácil detección de requisitos no satisfechos, sin prueba asociada, etc...

Los huecos muestran los requisitos no satisfechos, trabajo que falta por hacer

Beneficios Gestión de trazabilidad con DOORS

- **Control de los procesos de desarrollo, construcción y validación y verificación del producto** a partir de los requisitos
- **Cumplimiento** con estándares y normativas
 - CMMI: trazabilidad bi-direccional
 - FDA, IEC 61508, DO-178B: trazabilidad hasta código
 - ...
- La gestión de la trazabilidad con DOORS facilita actividades de **análisis** como:
 - Análisis de **impacto de cambios**
 - Control y seguimiento del **progreso** del proyecto
 - **Cobertura de pruebas**

Problemas en el ámbito de la documentación...

- Los **ingenieros malgastan** su **tiempo**:
 - ...formateando documentos
 - ...recopilando información de diferentes fuentes
 - ...manteniendo la documentación actualizada
- **Retrasos** en los entregables por tiempo malgastado en edición
- Las **prisas** y la **edición manual** aumentan el riesgo de **errores**
 - Contaminación de la información por mala edición
 - Errores en formato
 - Documentación de baja calidad
- Hoy se actualiza **documentación** que mañana estará **obsoleta**...



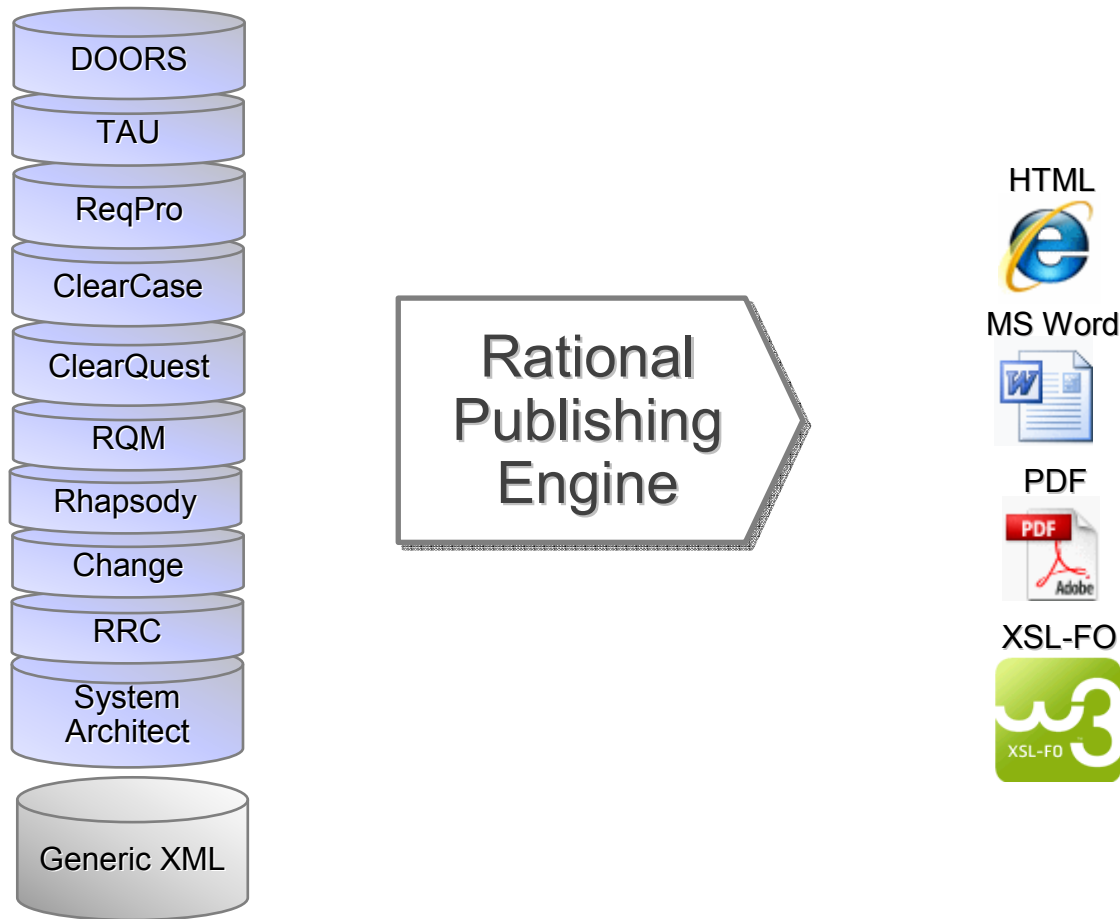
“Studies by AIIM and Ford Motor Company estimate that knowledge workers spend 15-25% of their time on non-productive information-related activities.”

–IDC whitepaper: High Cost of Not Finding Information


IBM Rational Publishing Engine (RPE)

- Automatiza la generación de documentación desde productos **Rational** y desde **otras** aplicaciones
- Permite crear documentos extrayendo información de **múltiples fuentes** en una única generación.
- Permite obtener documentos en **diferentes formatos** de salida (MS Word, PDF, HTML, XML) en el mismo proceso de generación
- Permite definir la **estructura, contenido y formato** de los documentos de forma **independiente** del **origen** de la información y del formato de **salida**: *RPE Document Template*
- **Definición** de plantillas de forma **rápida y sencilla** mediante un entorno gráfico intuitivo y fácil de utilizar: *RPE Document Studio*.
- **Reutilización** de plantillas: *Shared Template Library*
- Plantillas predefinidas listas para su utilización

RPE – Múltiples fuentes y formatos de salida



Resultado



IBM Rational software

System Requirements Specification

Author: Demo (IBM Rational Software)
 Last saved: 09/02/2009 05:14
 Version: 1.0
 Status: Delivery
 Pages: 13

System Requirements 4/13 Rational software

2 System Requirements

2.1 UAV Vehicle

The CUAV is shall be a multipurpose and reusable UAV with multimission capability. [SR SUAV-6]
 This is a new system requirement. [SR SUAV-7]
 It shall operate at altitudes of up to 30,000 feet. [SR SUAV-7]
 It shall reach ground speeds of up to 100 knots in cruise mode. [SR SUAV-8]
 It shall reach ground speeds of 150 knots in dash mode. [SR SUAV-9]
 It shall carry payloads up to 450 lbs for durations exceeding 24 hours. [SR SUAV-10]
 The UAV shall fly unimpeded in low visibility environments while carrying reconnaissance or attack payloads. [SR SUAV-11]
 The UAV shall be controllable from the ground station CMPCS. [SR SUAV-12]
 The UAV shall be capable of of flying complex flight plans with the operational goal of systematic area search. [SR SUAV-13]
 The UAV shall be capable of of flying complex flight plans with the operational goal of ground route or road based (synonym) search. [SR SUAV-14]
 The UAV shall be capable of of flying complex flight plans with the operational goal of orbit surveillance of point targets. [SR SUAV-15]
 The UAV and manned control capability from the ground station shall provide sustained 24 hour flight with real-time visual, infra-red or radar telemetry with target recognition preprocessing. [SR SUAV-16]
 The Communications shall be jam resistant in environments that are not high ECM. [SR SUAV-17]
 Control commands shall be encrypted. [SR SUAV-18]
 Telemetry data shall be compressed and un-protected. [SR SUAV-19]
 Telemetry rates for visual telemetry shall support 30 frames-per-second at 640 x 400 resolution. [SR SUAV-20]
 Range of flight is shall be fully supported within line of sight (LOS) range and be considerably less than this. This is because the Coyote is capable of being passed among different CMPCSs. [SR SUAV-21]
 For navigation the Coyote has on-board global positioning system based navigation and shall be directly controllable from the ground station. [SR SUAV-22]
 The Coyote shall not require specialized launch and recovery vehicles. [SR SUAV-23]

IBM Rational 2009 System Requirements Specification (version 1.0)

Traceability Matrix 8/13 Rational software

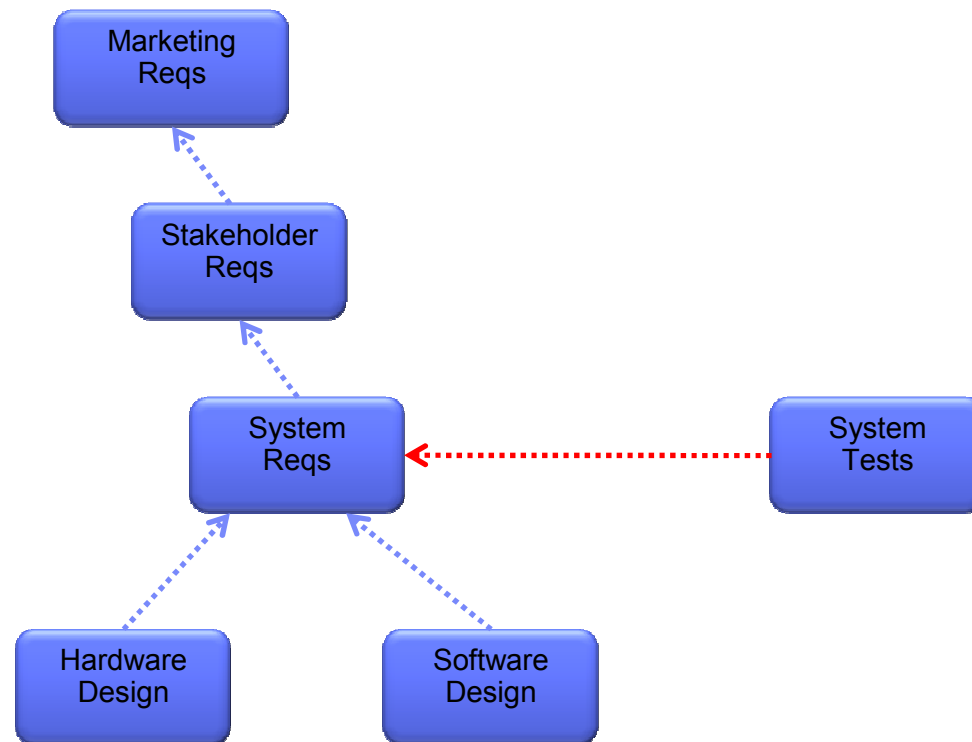
3 Traceability Matrix

ReqID	System Requirements	Flight Management Req	Missile Control Req
SRSUAV-6	The CUAV is shall be a multipurpose and reusable UAV with multimission capability.		
SRSUAV-7	This is a new system requirement		
SRSUAV-7	It shall operate at altitudes of up to 30,000 feet.	FMS-11	MCS-11 MCS-13 MCS-20
SRSUAV-8	It shall reach ground speeds of up to 100 knots in cruise mode.		
SRSUAV-9	It shall reach ground speeds of 150 knots in dash mode.		
SRSUAV-10	It shall carry payloads up to 450 lbs for durations exceeding 24 hours.		
SRSUAV-11	The UAV shall fly unimpeded in low visibility environments while carrying reconnaissance or attack payloads.	FMS-11	MCS-20
SRSUAV-12	The UAV shall be controllable from the ground station CMPCS.		
SRSUAV-13	The UAV shall be capable of of flying complex flight plans with the operational goal of systematic area search.	FMS-13	MCS-13
SRSUAV-14	The UAV shall be capable of of flying complex flight plans with the operational goal of ground route or road based (synonym) search.	FMS-14	MCS-13 MCS-14
SRSUAV-15	The UAV shall be capable of of flying complex flight plans with the operational goal of orbit surveillance of point targets.	FMS-15	MCS-15
SRSUAV-16	The UAV and manned control capability from the ground station shall provide sustained 24 hour flight with real-time visual, infra-red or radar telemetry with target recognition preprocessing.		
SRSUAV-17	The Communications shall be jam resistant in environments that are not high ECM.	FMS-17	MCS-17
SRSUAV-18	Control commands shall be encrypted.	FMS-18	MCS-18
SRSUAV-19	Telemetry data shall be compressed and un-protected.		
SRSUAV-20	Telemetry rates for visual telemetry shall support 30 frames-per-second at 640 x 400 resolution.		
SRSUAV-21	Range of flight is shall be fully supported within line of sight (LOS) range	FMS-21	MCS-21

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Demostración

Modelo de Datos Ejemplo





Francisco J. López Minaya
Rational Technical Solution Architect
francisco.lopezminaya@es.ibm.com

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