9ème édition
de la

JOURNÉE FRANCAISE DE L'INGÉNIERIE DES EXIGENCES

3 Jours

6 Webconférences

Inscription gratuite

Du 15 au 17 Novembre 2022
De 11h30 à 14h30

IREB International Requirements Engineering Board

GASQ

CFTL Comité Français des Tests Logiciels

COMMENT OPTIMISER LA GESTION DES EXIGENCES PROVENANT DE DIFFÉRENTES SOURCES (PARTIES PRENANTES ET/OU OUTILS D'INGÉNIERIE) ?

CHRISTOPHE LADIESSE

Valeo
SMART TECHNOLOGY FOR SMARTER MOBILITY

FRANÇOIS-XAVIER DE LAUNET

Polarsoft
The ALM Expert

ARCAD SOFTWARE

103,300 employees

64 R&D centers

184 Production sites

31 countries

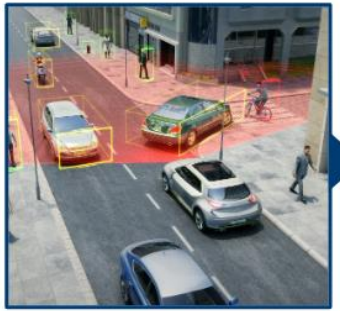
17.3 bn Total sales

22.1 bn Order intake

1.7 bn Dedicated to R&D effort

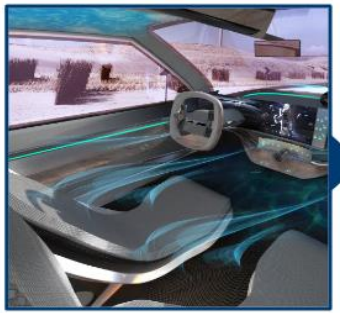
55% of order intake involves innovations

ELECTRIFICATION ACCELERATION



ADAS ACCELERATION

LIGHTING EVERYWHERE



INTERIOR EXPERIENCE REINVENTION

MEGATRENDS IMPACTING INTERIOR EXPERIENCE

2031

L3 EMERGENCE
=> NEW ACTIVITIES

20% CARS IN 5G
> CAR OFFICE

SHARED AR

INTERIOR FULLY DIGITALIZED
TO ANTICIPATE USER NEEDS

2026

L2 30% CARS
> HYPOVIGILANCE TO FIX

70% CONNECTED CARS
> E-MEETING...

L3 EMERGENCE
> NEW ACTIVITIES

DIGITALIZED OCCUPANT
FOR SAFETY / COMFORT

2021

L0..L1: 80% CARS
> DRIVING TASK

60% CONNECTED CARS
> ECALL/BCALL

DIGITALIZED CAR
TO MODEL COMFORT

FROM DRIVING TASKS
TO OTHER ACTIVITIES

FROM LONELY EXPERIENCE
TO SHARED EXPERIENCES

FROM PHYSICAL
TO DIGITAL WORLD

Requirement prioritization

VALEO use “Kano model” concept

- Fundamental : Basic function that “Must be”
- Established : End-user function “expected” or “attractive”
- Advanced: Attractive function maturity/performance

Fundamental

- Have a direct impact in the **physical system architectural design**
  - SW infra, Hardware
  - End user, safety and cybersecurity function parts that could affect the architecture
- Affect external system interfaces
- Functions have software driven main calibration and configuration parameters

Established

- Have a complete functionality implementation of end user functions (**Applicative SW**), including functions that have an impact on the Product and manufacturing process)
- The calibration parameter usage is maximized to allow functions fine tuning and avoid recompiling the software.

Advanced

- Only Late Change Requests from OEM’s or from Project Life
- All Functions shall be frozen
- Algorithm Fine tuning, Functions Performance adaptation, and Customer KPIs robustness achieved.
- The evolution is only on the SW side. Changes must not affect the Hardware and associated tests and manufacturing)

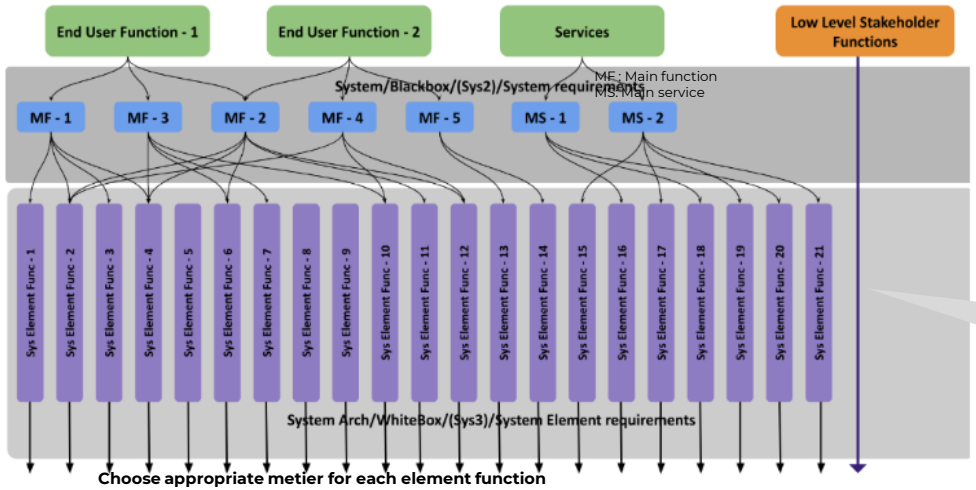
Requirement decomposition

From End User Function (EUF) to system logical architecture elements

Stakeholders needs analysis

Black box definition

Logical architecture (white box definition)



Example of Low level function:

"Vehicle network message definition (Can DBC)"

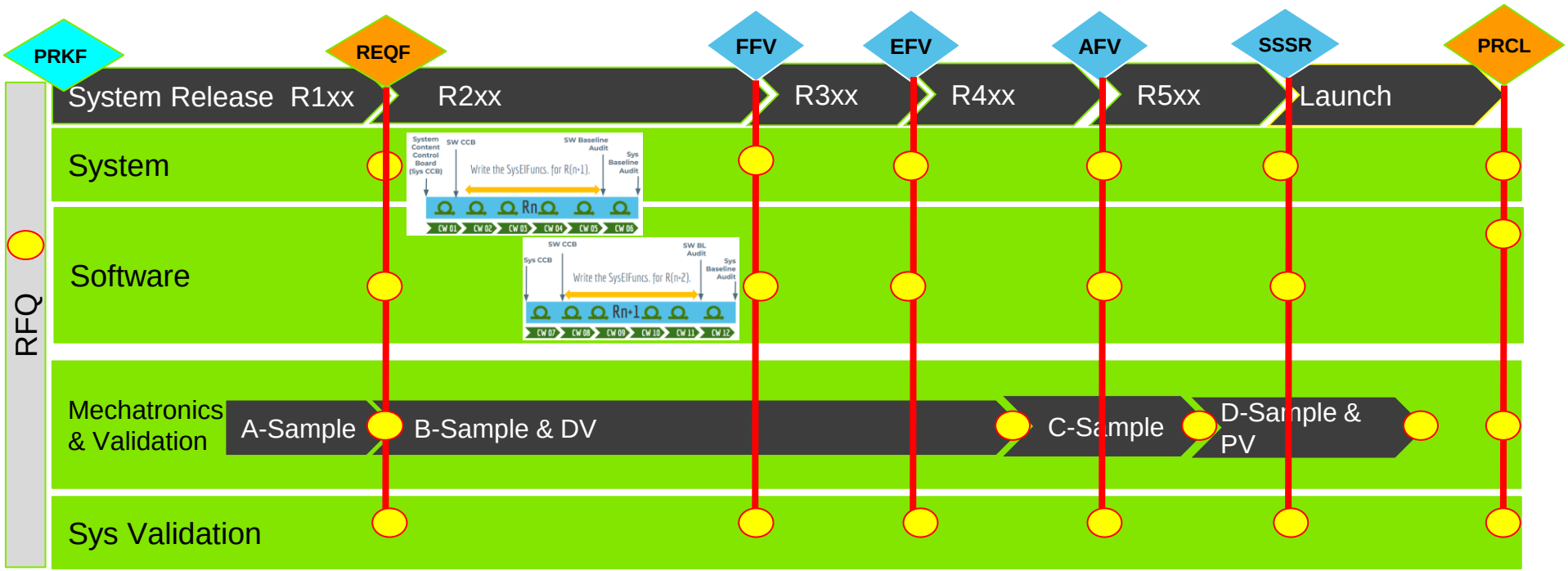
Requirement "distribution" (Skip engineering refinement)

Example of End User function:

"The Driver Monitoring System shall alert the driver if his drowsiness level is more than X (KSS Level X)"

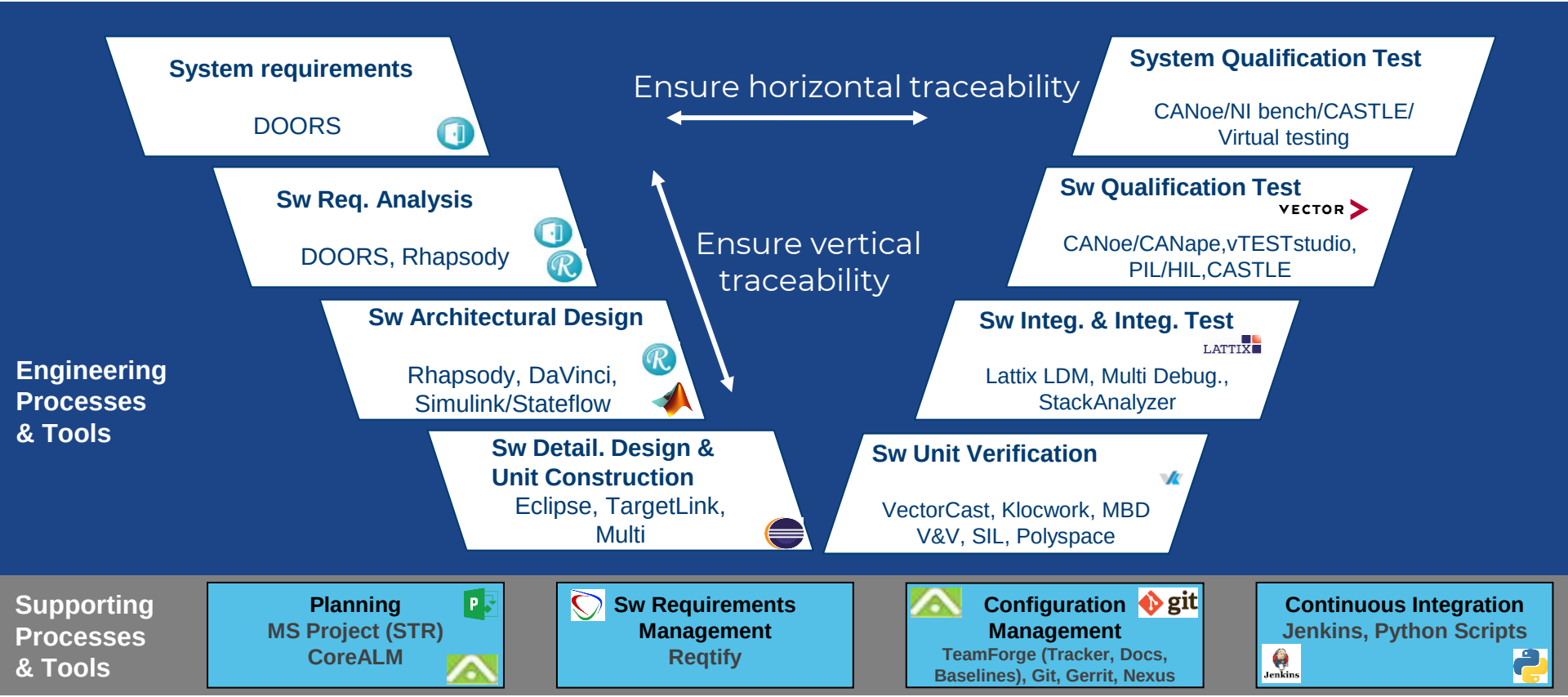
Iterative development

6 week iterations mapped to xFV engineering gate and customer expectations



System and software engineering tools environment

Need to have the most efficient tool for each layer of engineering



Requirements from different stakeholders

In product development, requirements are defined at several engineering levels :

- Project level : customer specification (main stakeholder), standards, regulation/legislation, safety, company internal constraints
- System level :
  - Specification
  - Architecture
- Software specification
- Software Architecture and Design
- Source code
- Verifications (Unit tests, Integration, Validation)

Requirements from different stakeholders

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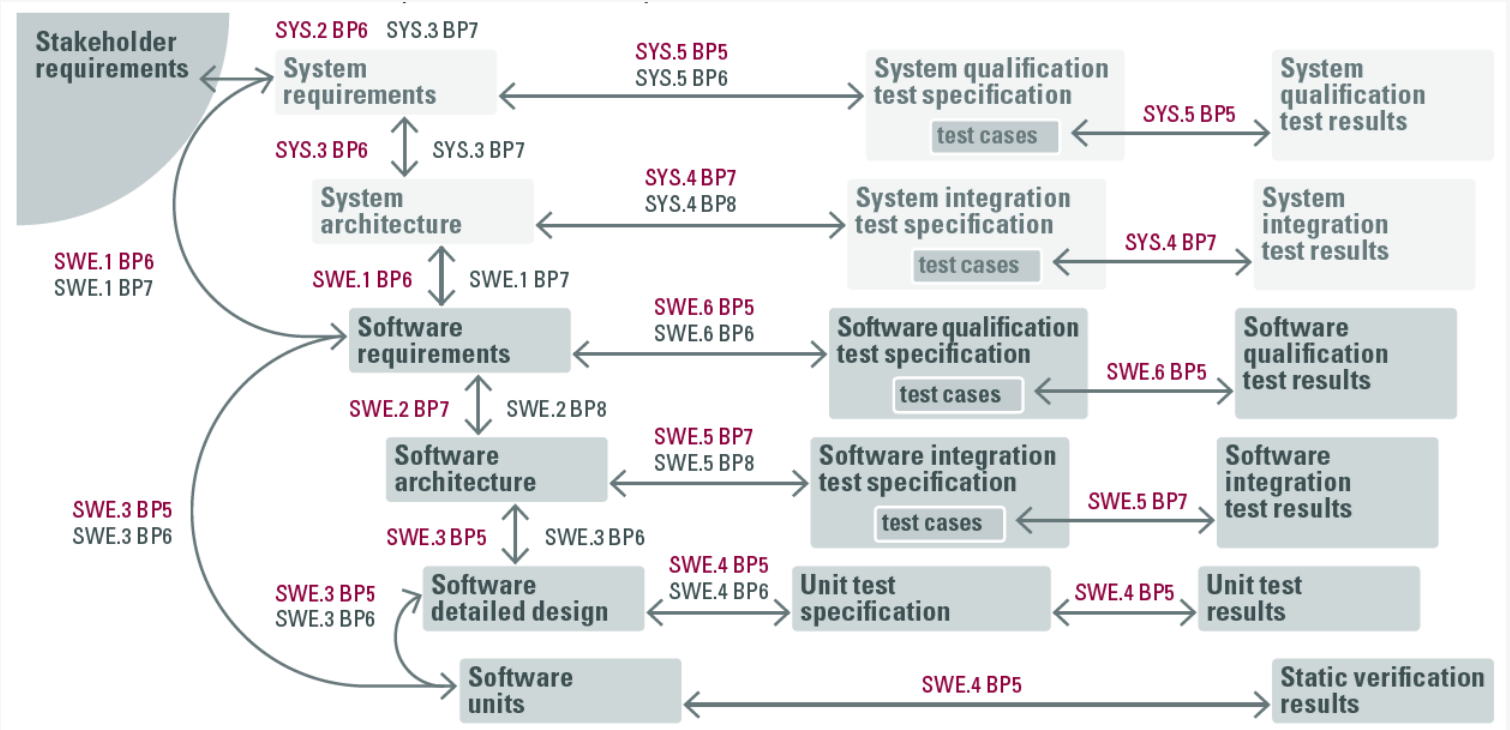
In automotive environment, bi-directional traceability is required.
It is mandatory to reach Automotive SPICE®



Requirements from different stakeholders

Shall requirements really be refined and detailed at each levels ?

This can leads to bad practice like copy / paste at each level.
One solution is the distribution of requirements.

System Specification

ID	Description	Software Feature	Verification Strategy	aRefinementMandatory
MDC_DTC_0008	The DTC 0x9Dxxxx shall be set when the IR illumination has been deactivated by diagnostic using routine DID 0x31 0x01Bxxx.	Diag_AE	SwTest	No

Software Specification

ID	Description	Software Feature	Verification Strategy	aRefinementMandatory
SRS_DTC_0008	The DTC 0x9Dxxxx shall be set when the IR illumination has been deactivated by diagnostic using routine DID 0x31 0x01Bxxx.	Diag_AE	SwTest	No

What are the criteria to consider requirements at the correct level ?

- Interfaces used in the requirements shall be correctly defined and understood by the related metier
- Decomposition done at the defined level. For specification, it is often allocated to only one main function
- Requirement shall be accepted by the metier

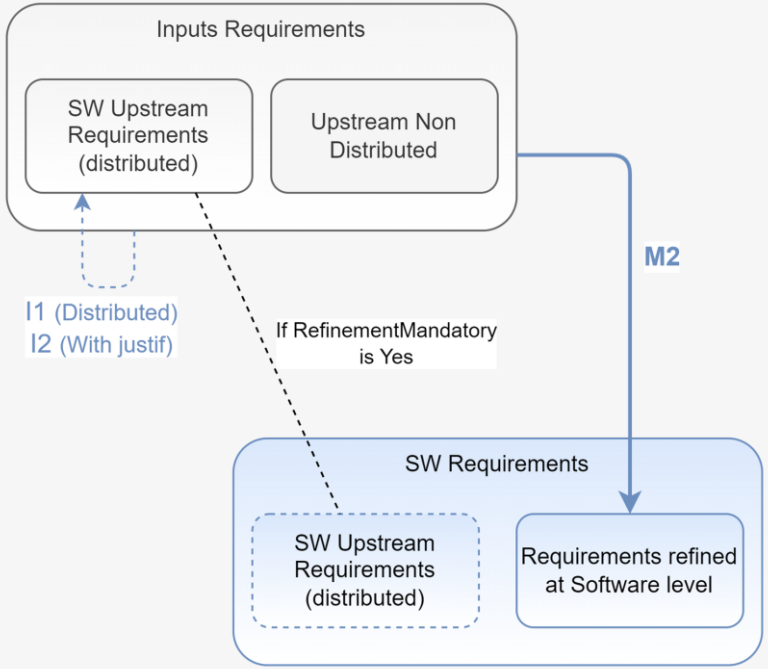
Requirements from different stakeholders

Explicit distribution :

- Usage of attribute to define if requirements shall be refined (e.g. : RefinementMandatory)
- If refinement is not needed, justification to be added to

Good practice :

- Ensure distributed requirements have justification (e.g. in an attribute Rationale)
- Check the percentage of distributed requirements



Requirements from different stakeholders

Implicit distribution :

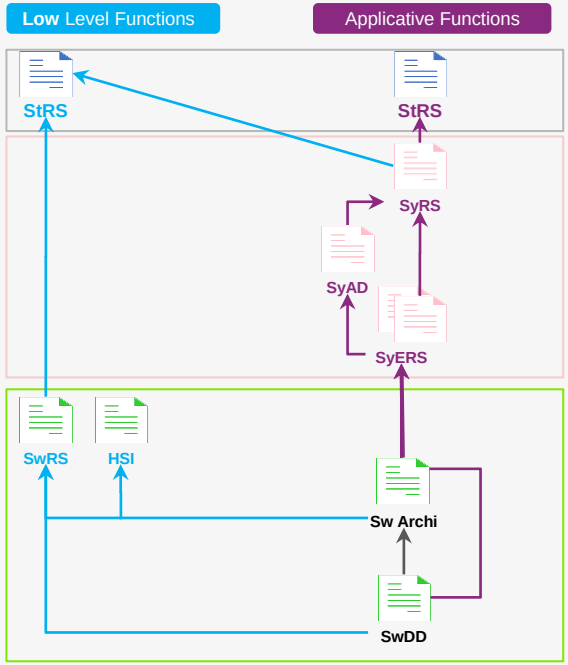
- No specific attribute but defined by strategy and allocation of requirements :
    - All low level stakeholders requirements
    - Inputs requirement allocated to strictly one component are distributed directly to design

Pro :

- Easier understanding for traceability model
- Easier calculation of metrics

Cons :

- Needs some exception cases
- Method between each teams is different



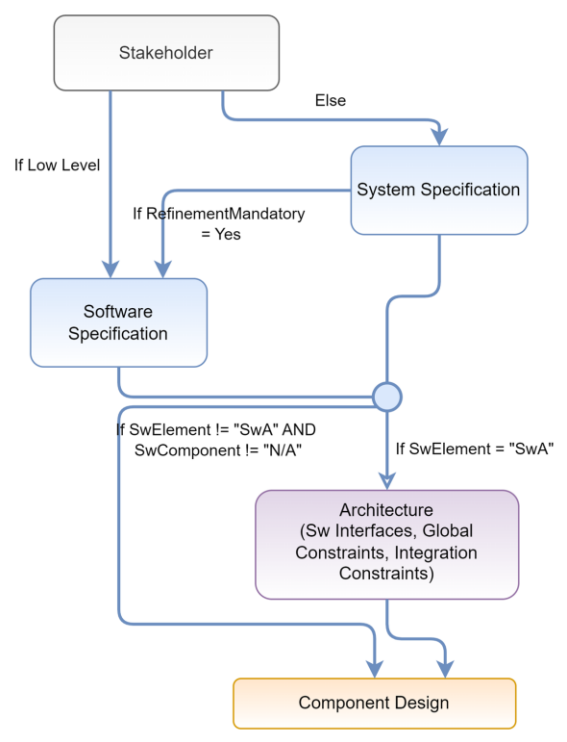
Requirements from different stakeholders

At which level shall be done distribution ?

Distribution can be done at several levels, even consecutive ones.
So organisation shall define the limit to ensure the needed activities are done

Rules we give us are :

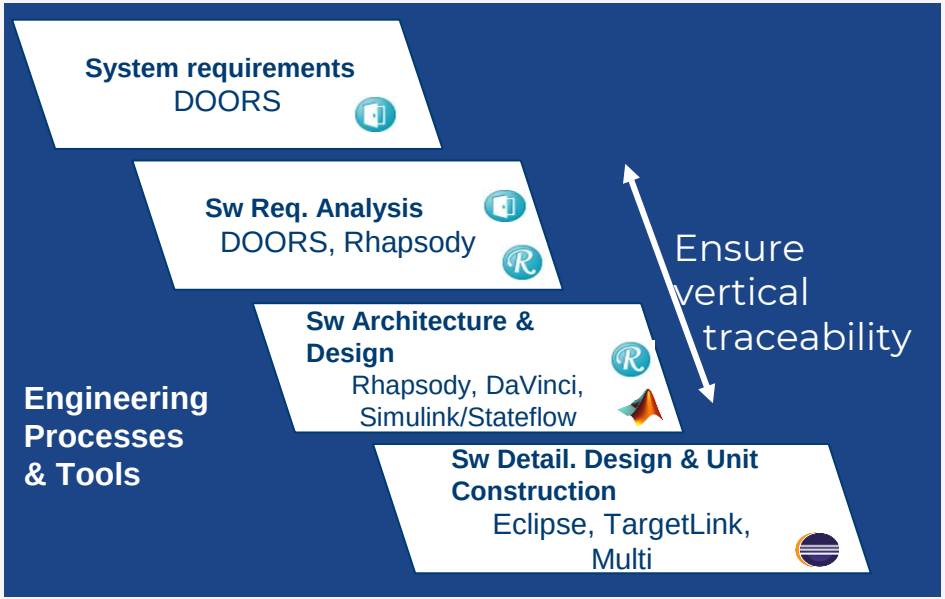
- No customer requirement shall directly be allocated to SW Architecture & Design, refinement done either in Software or in System Requirement Specification.
- Requirement shall be done either at Global Architecture or Component Design level



Requirements from different tools

During product development, several tools are used to answer the need of each level of definition.

- For Specification (Customer / System / Software) generally textual requirement are used in :
  - MS Word / IBM Doors / Polarion / Code Beamer / Modern Requirements / Jama Connect
- For System / Software Architecture and Design are often done in :
  - SysML / UML tools : IBM Rhapsody / Sparx Enterprise Architect / Dassault Magic Draw / Vector PREEvision
  - Autosar tools : Vector DaVinci, EB Tresos
  - Mathworks Simulink / Stateflow
- Source code in development environment like :
  - Eclipse, GHS Multi, Visual Studio Code



Requirements from different tools

Need to have the most efficient tool for each layer of engineering

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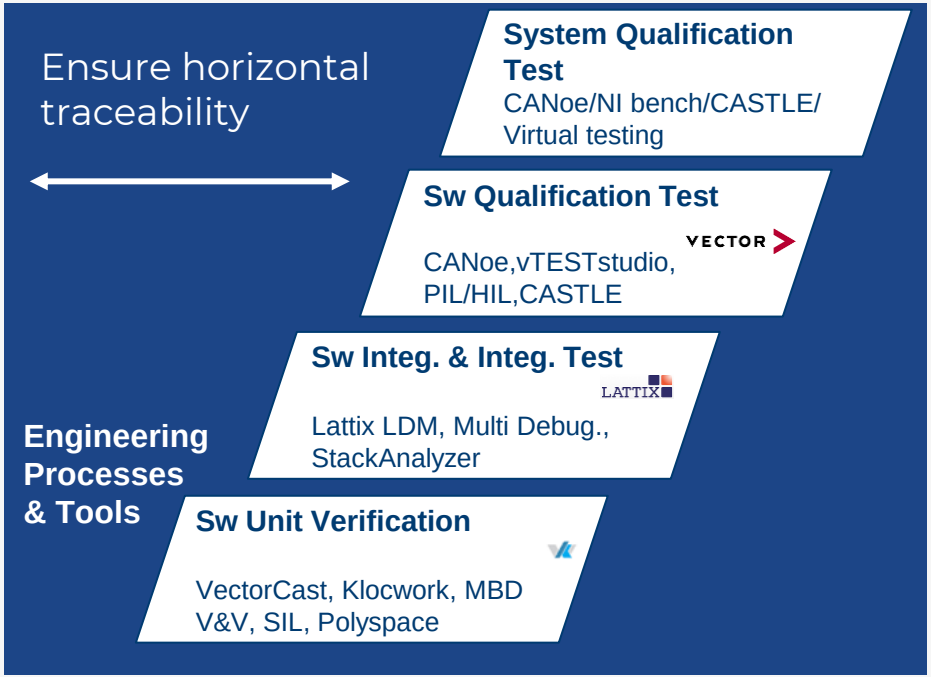
During verification and validation activities, we also used lot of different tools depending of types of tests, projects, programming language

- For Sw Unit Test and Verification :
  - VectorCast, IBM RTRT, Klocwork, MBD V&V, Polyspace, CUnit
- For Integration tests :
  - Lattix, Stack Analyzer, VectorCast, Tessy, RobotFramework, Google Tests, Internal tools
- Validation / Qualification Test :
  - Vector Canoe & vTestStudio, NI Bench, RobotFramework



Requirements from different tools

Several solutions possible :

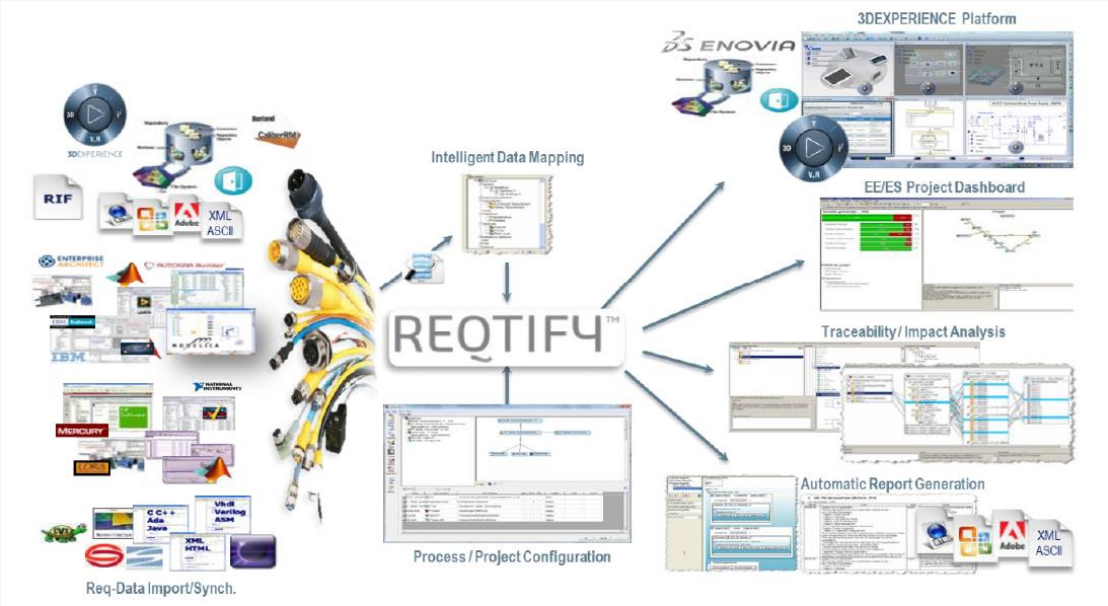
- Write or import all requirements in same tool : e.g. Doors
- Use an ALM which include interface with several tools :
  - Polarion, Codebeamer, … with OSLC integration (Open Services for Lifecycle Collaboration)
  - Environment with tools from same company.
    - E.G IBM JAZZ Server with Doors NG, Rhapsody Model Manager, Team Concert
- Use an external tool which allows parsing of different type of documents :
  - Develop own internal tool with all the needed interfaces
  - Use commercial tool like Dassault REQTIFY

In all cases, list of attributes shall be clearly defined and common for each engineering level.

Requirements from different tools

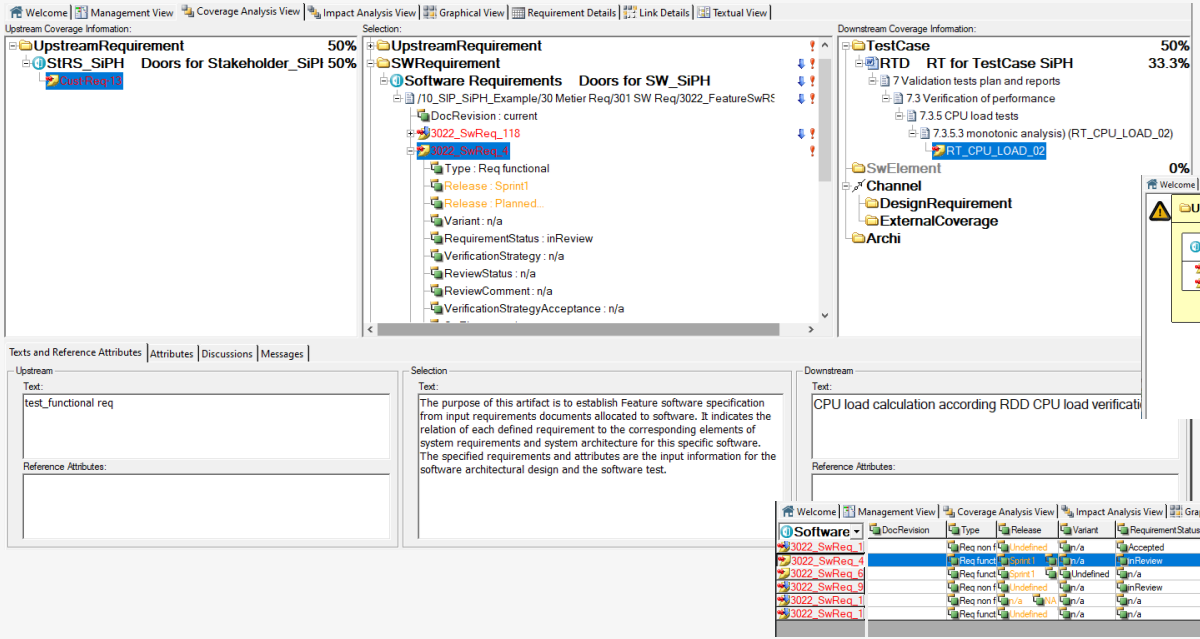
The tool Dassault REQTIFY allows us to handle several topics :

- Interfaces with many tools :
  - IBM DOORS, MS Word, Excel, GDocs, Adobe PDF, ReqIf
  - TeamForge, CodeBeamer, Jira, Jama, Integrity, Polarion, Dimension, CVS, Git
  - Rhapsody, Enterprise Architect, Simulink, Tresos, ARXML
  - Code, Eclipse, XML, JSon



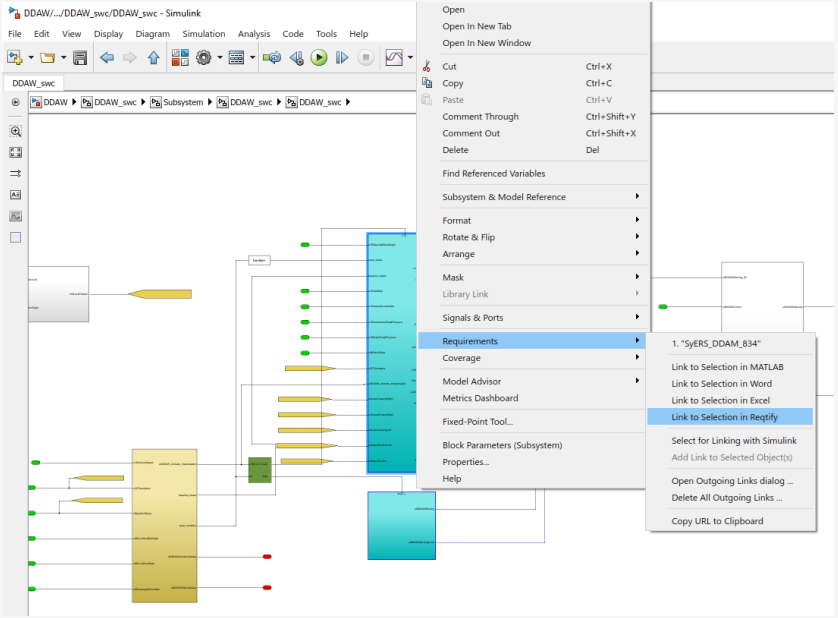
Requirements from different tools

- Customisable configuration to filter requirements and get all needed attributes
- Different views to display Upstream / Downstream links and perform easier change impact analysis

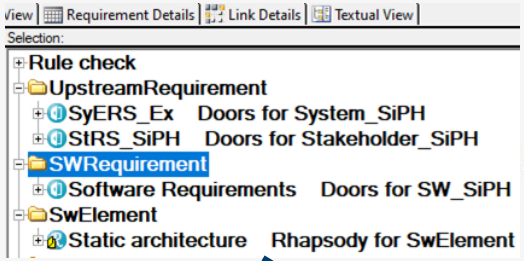


Requirements from different tools

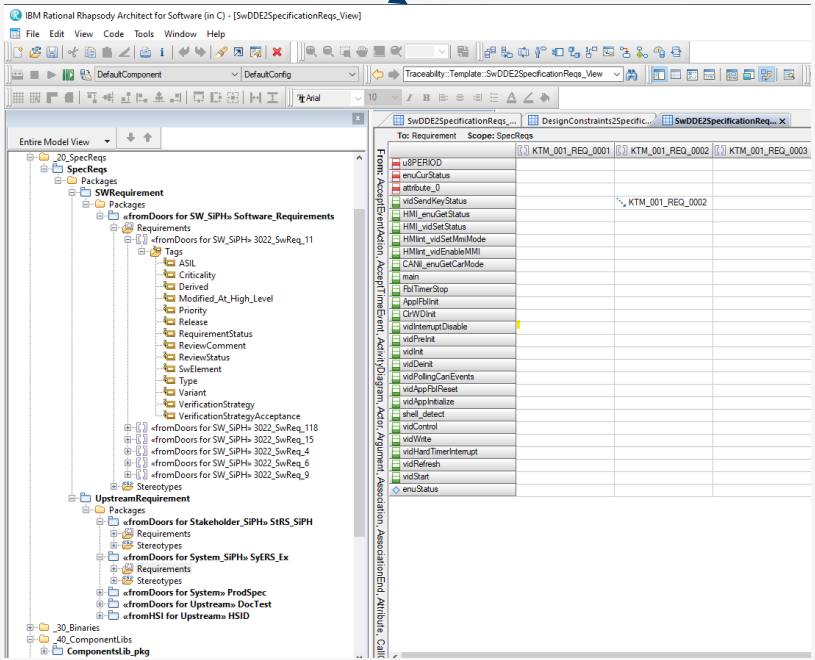
- Synchronization of requirements between tools without intermediate file :
    - Specification requirements to IBM Rhapsody and Simulink / Stateflow



Simulink Requirements Toolbox with Reqtify plugin



Add high level requirements

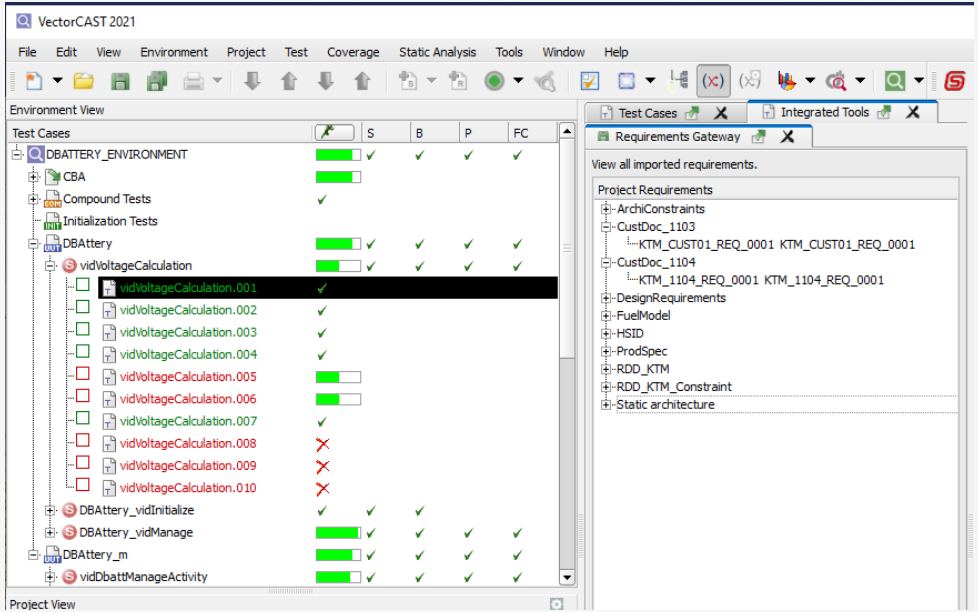


Requirements from different tools

- Synchronization of requirements between tools without intermediate file :
  - Architecture / Design requirements to VectorCast

VectorCast Requirements Gateway for Reqtify

Also available for codebeamer, Jama Connect and Siemens Polarion



Requirements from different tools

- Generate traceability rep raceability :

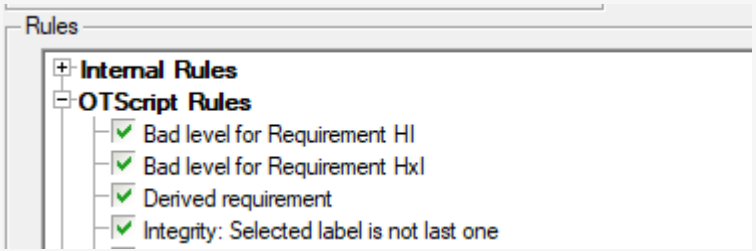
Metric	Definition	Denominator	Numerator	Value (%)
M1	SW Inputs acceptance rate	Number of SW Inputs Requirements : 3843	Number with accepted by metier status : 3843	100
M2	Upstream satisfaction	Number of Upstream Non	Number of satisfied by	

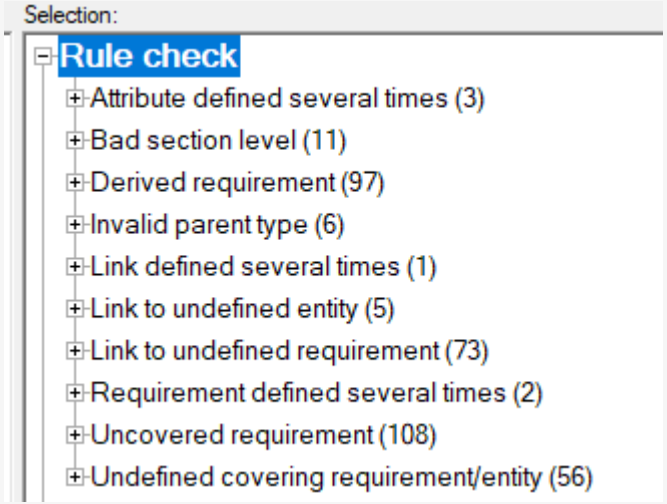
Identifer	RefinementMandatory	Satisfied by SwReq	Satisfied by DesignReq	Satisfied by RTElement	Link to Archi	Implementation Status	Verified by	Metier Comments
1ST181606_20028_REQ_0189	Yes	1ST181606_3201_REQ_0008				Implemented	IT_COM_07	Software: Status: Accepted Comments:
1ST181606_20028_REQ_0002	No		AppCan_vidSetImpact			Implemented	TID-10413	Software: Status: Accepted Comments: [EAS 30/09/2020]: RefinementMandatory = No [DISTRIBUTED] Requirement is clear and does not need refinement
1ST181606_20028_REQ_0003	No		AppCan_vidSetImpact			Implemented	TID-10415	Software: Status: Accepted Comments: [EAS 30/09/2020]: RefinementMandatory = No [DISTRIBUTED] Requirement is clear and does not need refinement
1ST181606_20028_REQ_0004	No		AppCan_vidSetImpact			Implemented	TID-10417 TID-10418	Software: Status: Accepted Comments: [MGH 1/12/2020]: Need to planned for R13.1 [MGH 29/11/2020]: requirement changed to clarification. please refer to SIQ artf1132453 [EAS 30/09/2020]: RefinementMandatory = No [DISTRIBUTED] Requirement is clear and does not need refinement
1ST181606_20028_REQ_0006	No		CD_APP_01			Implemented	TID-10410	Software: Status: Accepted Comments: [MG 25/10/2020]: RefinementMandatory = No [DISTRIBUTED] Requirement is clear and does not need refinement
1ST181606_20028_REQ_0007	No		CD_APP_01			Implemented	TID-10411 TID-10422	Software: Status: Accepted Comments: [MG 25/10/2020]: RefinementMandatory = No [DISTRIBUTED] Requirement is clear and does not need refinement

M7b	Other Design test rate	Number of design requirements with other verification strategy : 44	Number verified by test cases : 44	100
M8	Archi test rate	Number of Archi requirements : 261	Number of verified by test cases : 256	98.0
M8a	Integration Archi test rate	Number of Archi requirements with integration verification strategy : 239	Number of verified by test cases : 235	98.3
M8b	Other Archi test rate	Number of Archi requirements with other verification strategy : 22	Number of verified by test cases : 21	95.4

Requirements from different tools

- Generate errors in tools and reports :
  - Internal rules (which can be disabled)
  - Custom rules in OTScript
  - Additional rules generated in reports





Error	Requirement	Doc	Description	AE	Related data
RefinementMandatory not defined	DRECU-II-128	11205_CustReq_DDS_R01-01_2020-01	For each fault record, the ECU shall support a unique Ignition Cycle Counter, indicating the number of consecutive ignition cycles since a DTC firstly became confirmed but was no longer active.	AR_DTC_AE	Undefined
RefinementMandatory not defined	DRECU-II-1197	11205_CustReq_DDS_R01-01_2020-01	At the end of each consecutive Ignition Cycle that the DTC is "confirmed but not active", the Ignition Cycle Counter shall be incremented by 1.	AR_DTC_AE	Undefined
RefinementMandatory not defined	DRECU-II-142	11205_CustReq_DDS_R01-01_2020-01	If the Ignition Cycle Counter reaches its maximum value of 255 and the DTC still remains "confirmed and not active" the value shall remain latched at 255.	AR_DTC_AE	Undefined

Requirements from different tools

Our experience with Reqtify tool :

- Pros :
  - Interfaces with many tools
  - Allow to create project template to share parsing rules, traceability model, rules, reports across all projects
  - Highly customizable for reports and filtering

- Cons :
  - Fully depend to Dassault support if interfaces need to be added, updated for new version or corrected due to issue. (2 Reqtify releases per year + patches)
  - Creation of types need knowledge about regular expressions
  - Specific OTScript language used for creation of custom reports and command line script
  - All tools shall be installed on local computer. For Doors, workaround with servlet provided
  - A web access can be setup but very simplified (without edit, reload functions)

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The ALM Expert

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