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RÉUNION COMET

RETOUR D'EXPÉRIENCE SUR LE DÉPLOIEMENT
DU MBSE POUR LA MODÉLISATION D'ARCHITECTURES

10/10/2024

HISTORIC:

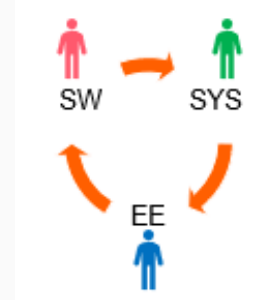


- Start of engineering system approach in RENAULT = 2000 why ?
 - Difficulties encountered at generalisation of CAN Network and increase of ECUs number
 - Failure Modes and Limp home not consistent
 - Difficulties due to interactions between many ECUs
- ➔ Start of engineering system approach in some domains in RENAULT Engineering
 - Power Train
 - Chassis
 - EE Architecture
 - Body
- ➔ 2005 Official Decision to create System Engineering and to build a process
 - First we did only Requirement Engineering using Doors Tool
 - At beginning partial coverage of car perimeter
- ➔ 2010-2017
 - Use of « Arkitect » tool, which was the continuation of an internal Renault research project
- ➔ 2017-today
 - Choice to use « Magic Draw »

WHY WE DECIDED TO USE MBSE?



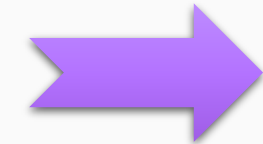
- Software Defined Vehicle & SOA* Enabler → to build a platform based on services
- Features oriented design → business oriented
- Create an evolving architecture & Agile compatible
- Ease collaboration between system engineers...and others
- Traceability from features to parts and SW components
- Part of the digital continuity and Renault Virtual Twin



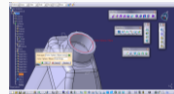
PRESENTATION TITLE
10/10/2024

WHAT DOES IT REPRESENT?

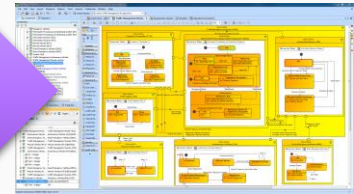
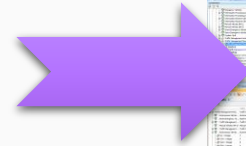
Documents/Delivrables



Revolution



Magic Draw
SYS&SW architecture
models



Models

WHAT WE CARED FROM THE BEGINNING..



Invest first then reuse:

- Initially deploy MBSE is a cost to establish a first set of models / a basis corresponding to the product .
- All assets in models can then be reused, evolved.

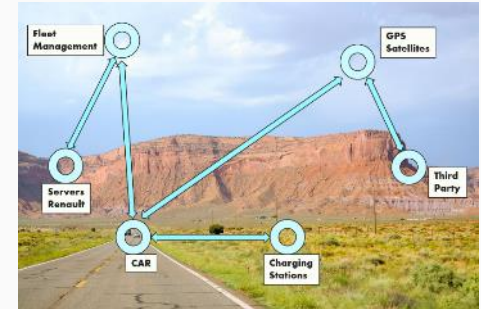


Tool structure & organization:

- > Models organized in levels and connected all together in a whole MBSE structure
- > Fit with human organization (roles, responsibilities&rights on models objects)

Data quality is key: difference between doing organized models and chaos

- > Shared data must be structured to be accessible, uniquely defined & administrated
- > Dedicated people to administrate and officialize these shared data
- > Modelling rules have been defined
- > Checks of models conformity are needed



THE JOURNEY TO DEPLOY MBSE (NOT FINISHED!)



SDV step 1
600 features

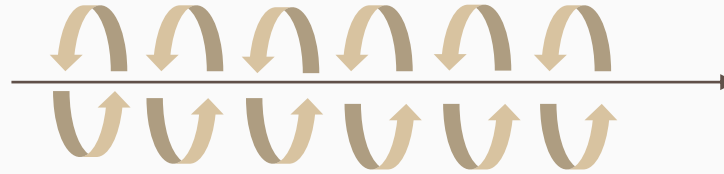


Small project
One model
100 features



Step by step build&deploy
Process / Methods / Tool

Each step : MBSE process stabilization



Short&quick corrective loops :

- Process&methods, tools bugs corrections
- Target : limited impact on work already done by system teams.

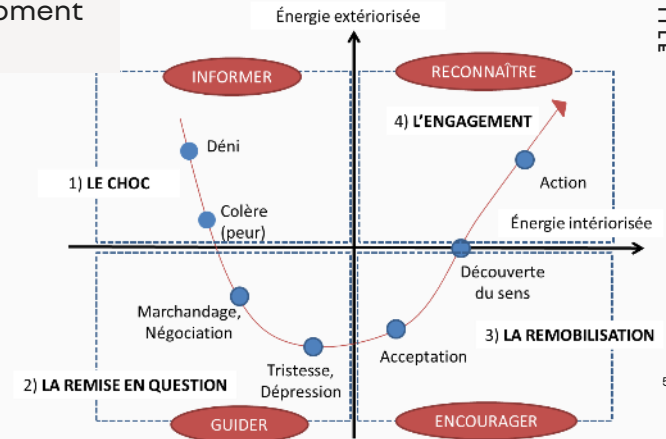
Never try to do all at once but split into Minimum Valuable Product step considering :

- cost&delay (tool, ressource,training) & enterprise strategy, product development
- change management for people (skills, mindset, committment)

We thought it will be a big challenge ..we didn't expect that much!



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RENAULT AMPERE



THE JOURNEY TO DEPLOY MBSE (NOT FINISHED!)



- RENAULT has a structured System Engineering Approach:
 - We have 3 different levels which are linked together:
 - Top Level is an System of System Level
 - Middle Level is at Vehicle Level
 - First Level is a breakdown of vehicle level in 45 subsystems which are defined by their mission and not as a bundle of parts

Remark: no ATA Chapters in automotive so each Car Maker Company has its own system list according to its way of working

Renault Choice was to define systems according to their mission and not as a bundle of parts

Because we need:

- Mutualisation of parts (specially for ECUs) that means that functions of different systems may be allocated to a single part
- Let more flexibility to constructional architecture

THE JOURNEY TO DEPLOY MBSE (NOT FINISHED!)



- Training of system teams is very important
 - No body in RENAULT can have access to Magic Draw without having a specific training before
 - All 45 System Leaders have attend a training by « CESAM » which has been customized by Renault according to Renault specificities
 - Other System members are trained by Renault SE engineering Deployment Team



- Referentials are a key point because all system teams in Renault believe they are spécific and they think they can work their way.



REFERENTIALS:



- Extended features (SOS)



- Features Véhicule



- Feature Subsystem (45)



- SubSystem List

- Intersystem flows referentials

- Life Cycle Phases

- Technical Actors, Human Actors



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BENEFITS OF WORKING WITH MBSE:

- To use MBSE encourage to think Re-Use
- Allows to detect early Design issues because it makes visible misalignments between systems
- Allows to absorb the complexity of new Vehicles and prepare Vehicle Software Architecture / Development
- Allows to prepare systems Integration and validation
- Encourages to identify and define shared objects which are administrated into referentials
- Encourages collaboration between system teams
- Encourages System Teams to think about synchronisation to be compliant Agile
- Creation of a complete tool chain approach ALM/MBSE/MBSW in order to implement Continupous Integration



TOMORROW: SIMULATION AT BENEFICE OF DESIGN / IA



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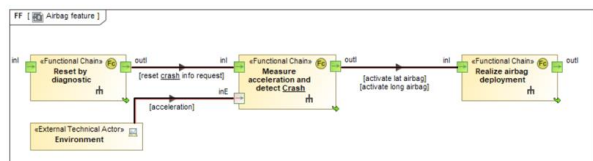
We want to avoid scenario written in text:

- Because text scenarios are not exhaustive
- Because text introduces errors
- Because text scenarios don't allow to create simulations

We want to simulate scenarios involving the contribution of many subsystems because :

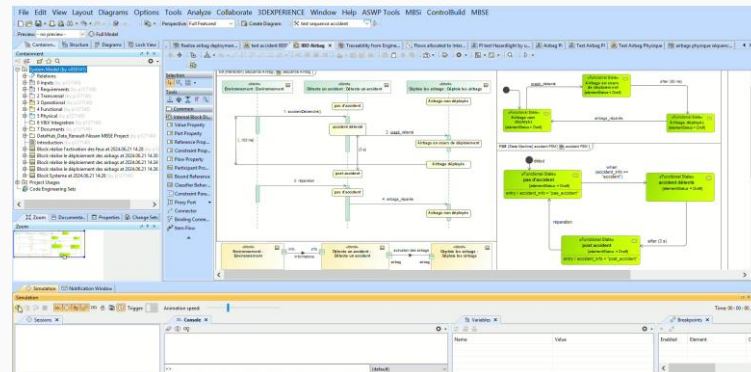
- there are interactions between features that we must detect and specify ASAP
- We need to be shure that what we have described as a scenario is really what we want
- Modes/states at SOS level are linked with modes/states at vehicle level which are linked with Modes and states at subsystem level

Architecture Statique



Scénarios Textuels

#	Name	ID	Pre-condition	Triggering Event	Action	Post-condition	Main Actor	Secondary Actor	Comment
1	step1		«EV» pass = 'W' step closed L_IGN _POWER ON _TRACON ON _Occupant in flear position	middle severity crash occurs for example: PFR110 PFR330	vehicle analysis crash signal	threshold reached			PFR110 = Collision with head right wall at 10km/h PFR330 = Collision with head right wall at 10km/h
2	step2		«EV» pass = 'W' step closed L_IGN _POWER ON _TRACON ON Middle severity crash occurred	Threshold for the activation	activation of the appropriate active protection components for an occupant in flear position (belt and lap pretensioner activation)	appropriate active protection components are deployed			





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THANK YOU