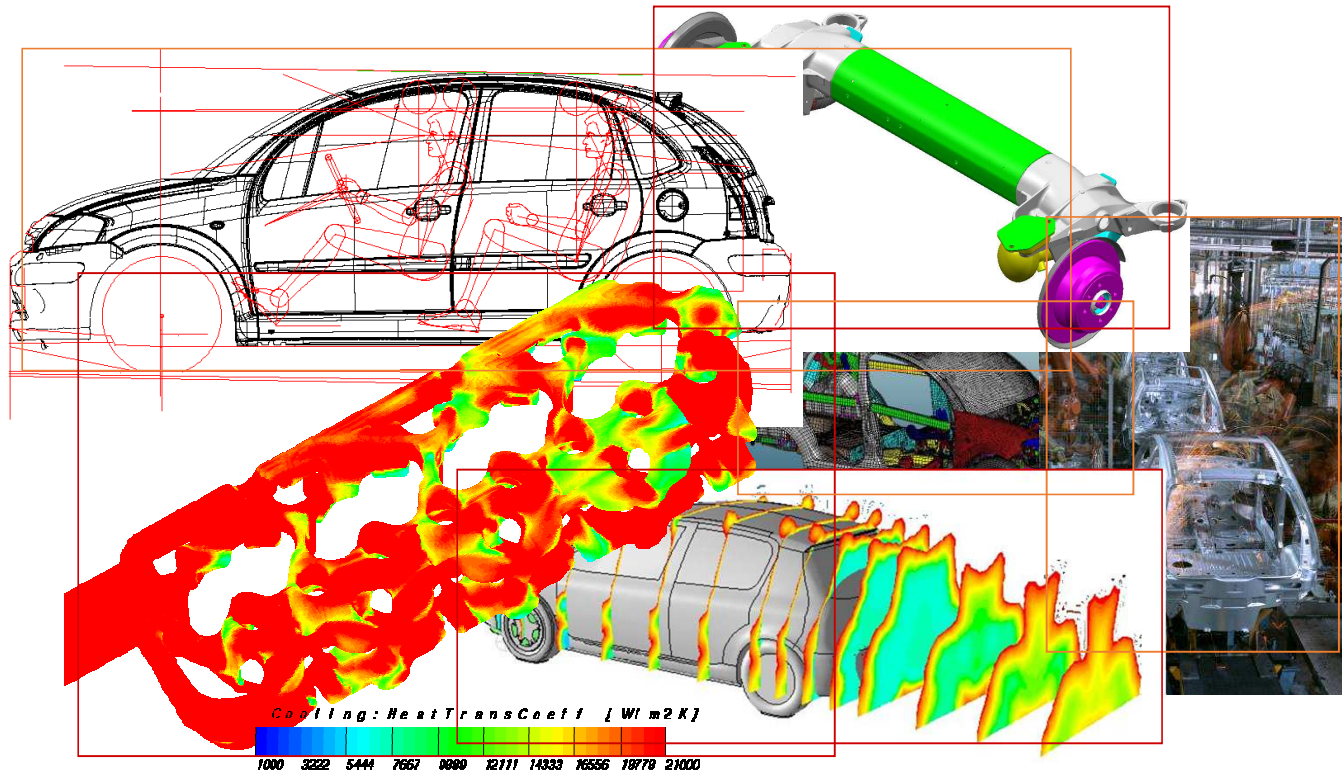
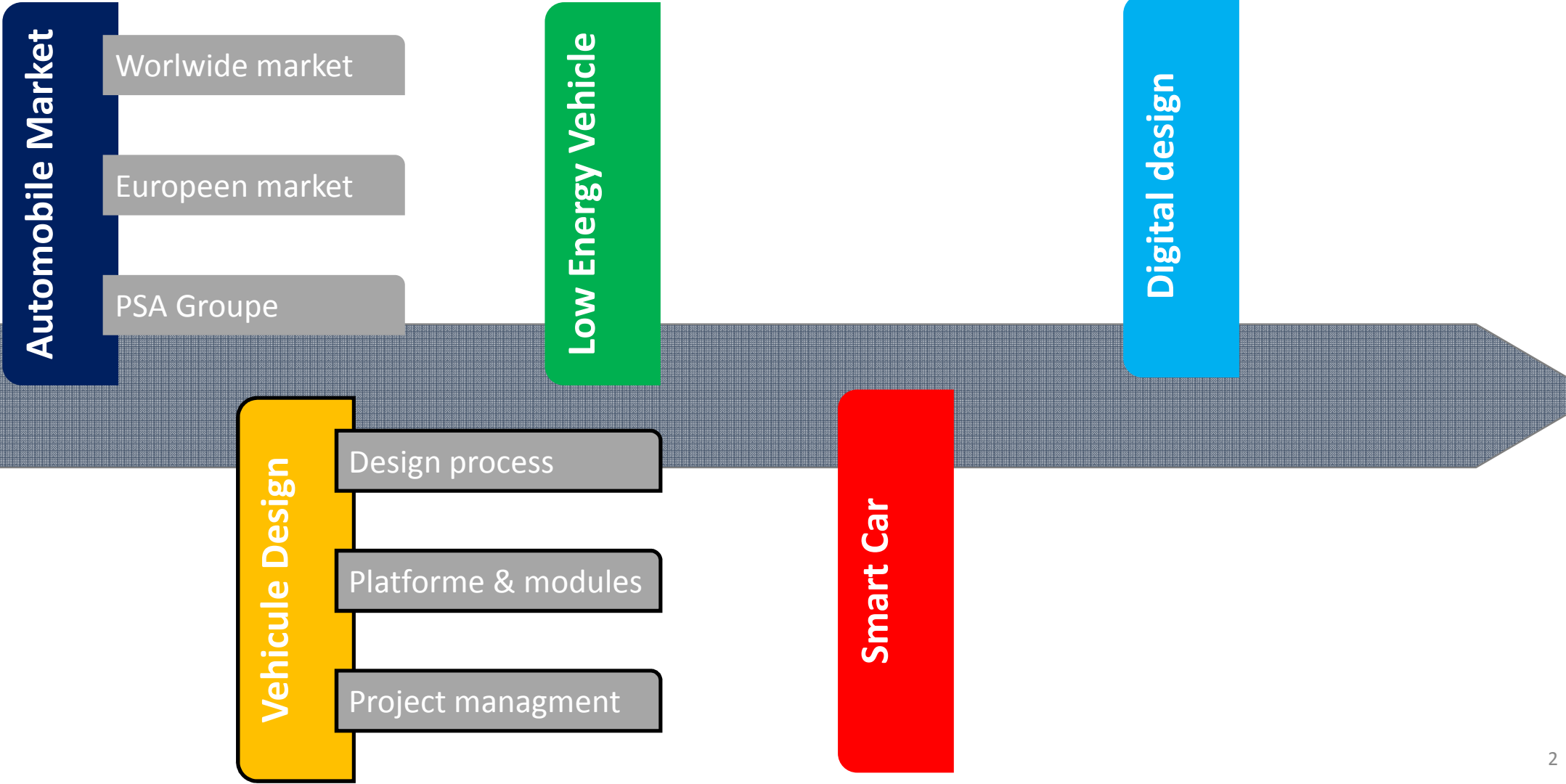


Vehicle System Design



Module description



Vehicle Design

To sell cars in a very competitive market



To satisfy the customer

Build a huge number of vehicle

To innovate, to differ from others

Optimize expenses

Respect regulation

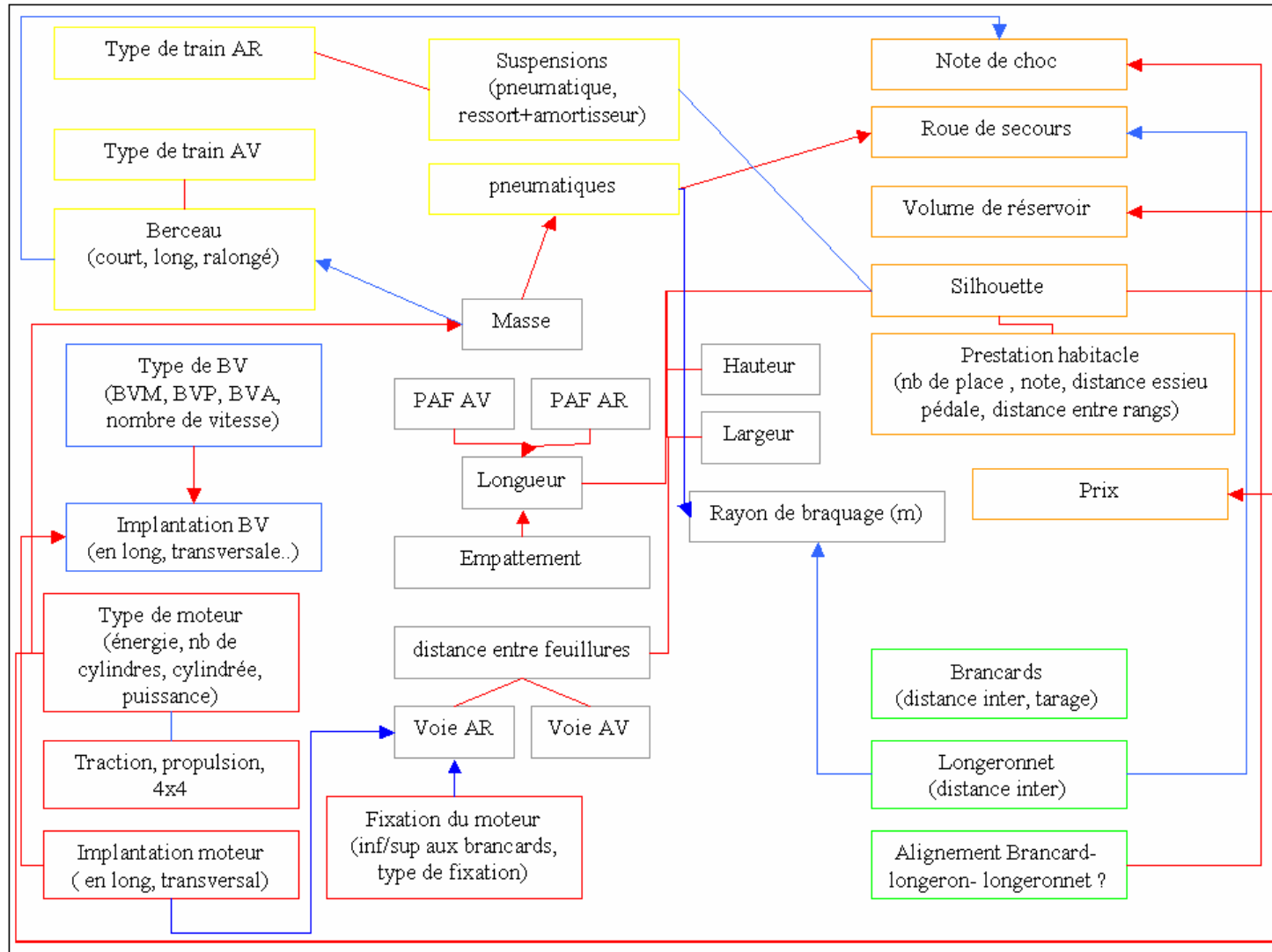
Summary

- 1- V-model lifecycle
- 2 – Platform and modules
- 3 – Project organization
- 4 – Main vehicle design phases

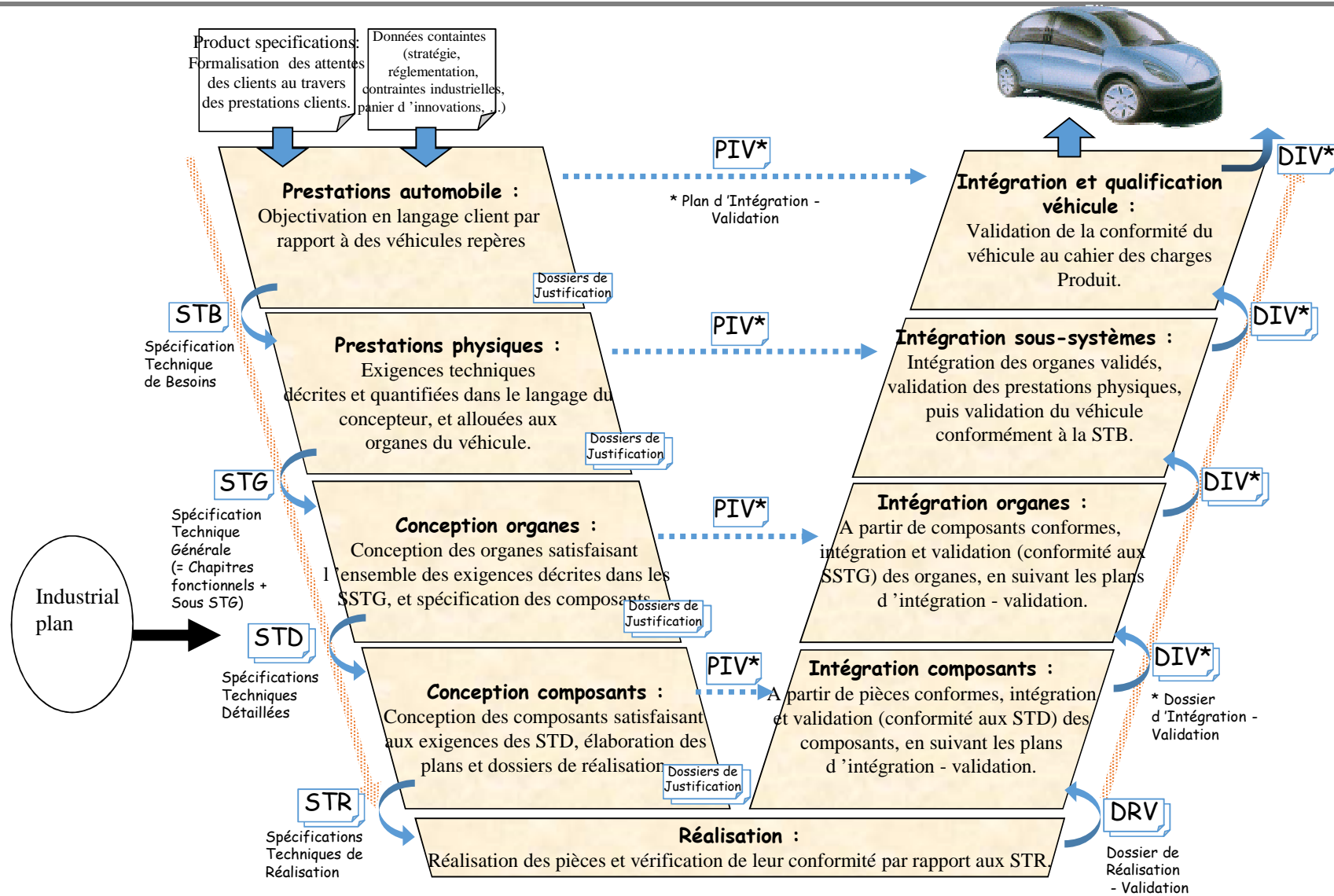
Summary

- 1- **V-model lifecycle**
- 2 – Platform and modules
- 3 – Project organization
- 4 – Main vehicle design phases

Mechanical parameters of vehicle design



V-Model lifecycle



Summary

1- V-model lifecycle

2 – Platform and modules

3 – Project organization

4 – Main vehicle design phases

Definition & gains

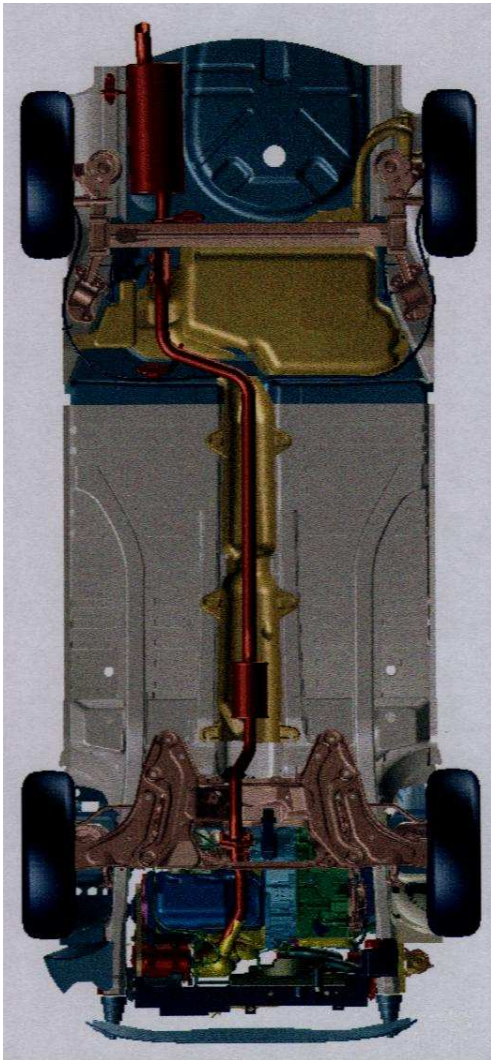
A platform is defined by :

- By a set of parts and components carried over on several projects
- By functionals scenarios
- By mechanical or geometrical limits

Benefits of a platform policy :

- Economical profits
- Design timing
- Quality improvement

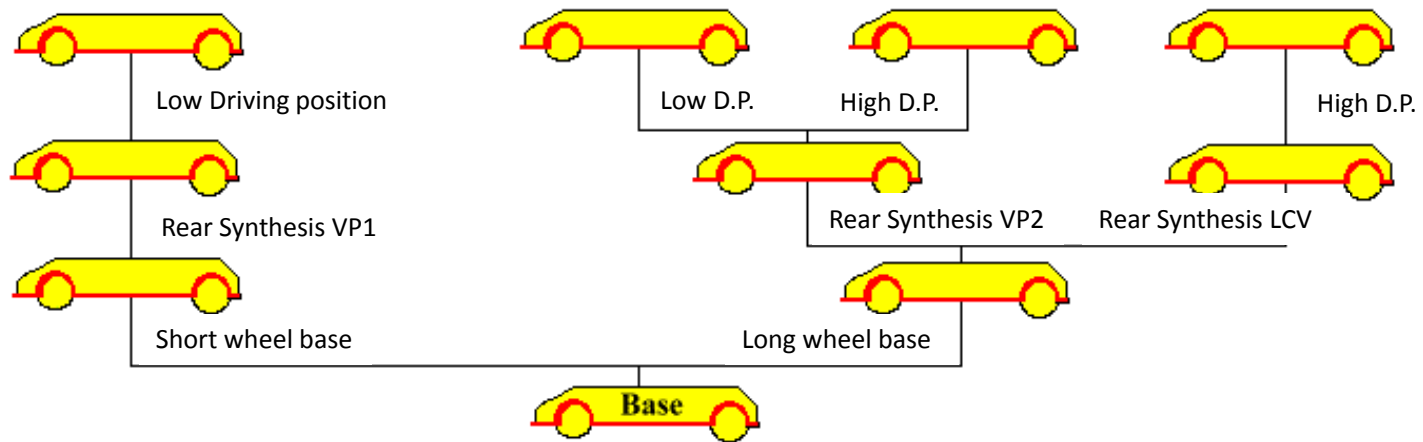
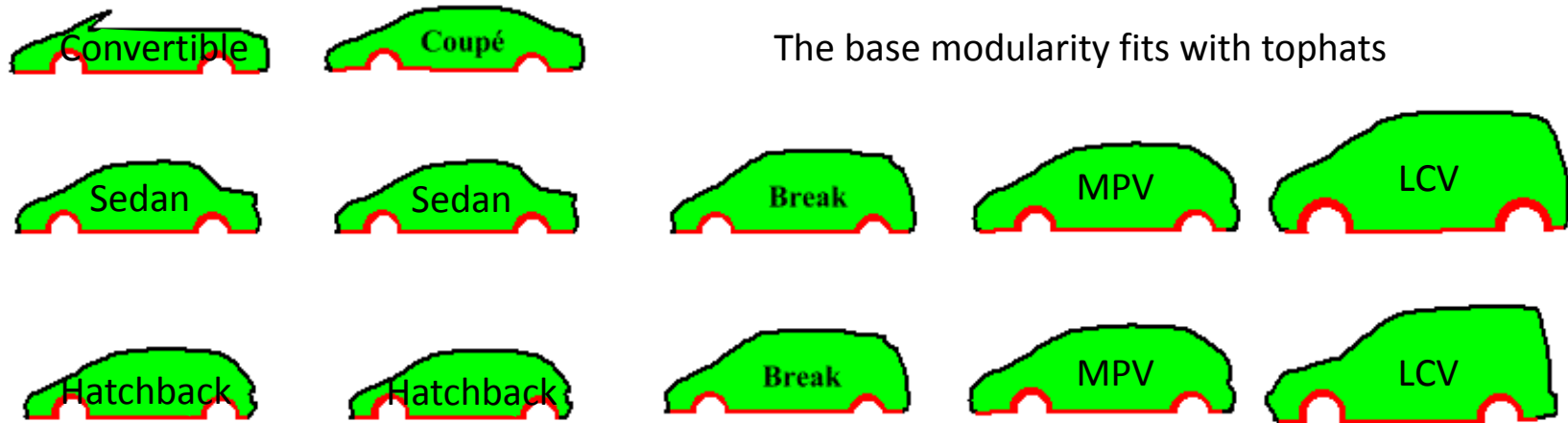
Platforme perimeter



- Power train
- Body structure
- Seats frame
- Steering
- pedals
- Heating and air conditioning unit
- Engine cooling
- Suspension and transmission
- Exhaust system
- Tank
- Electrical architecture

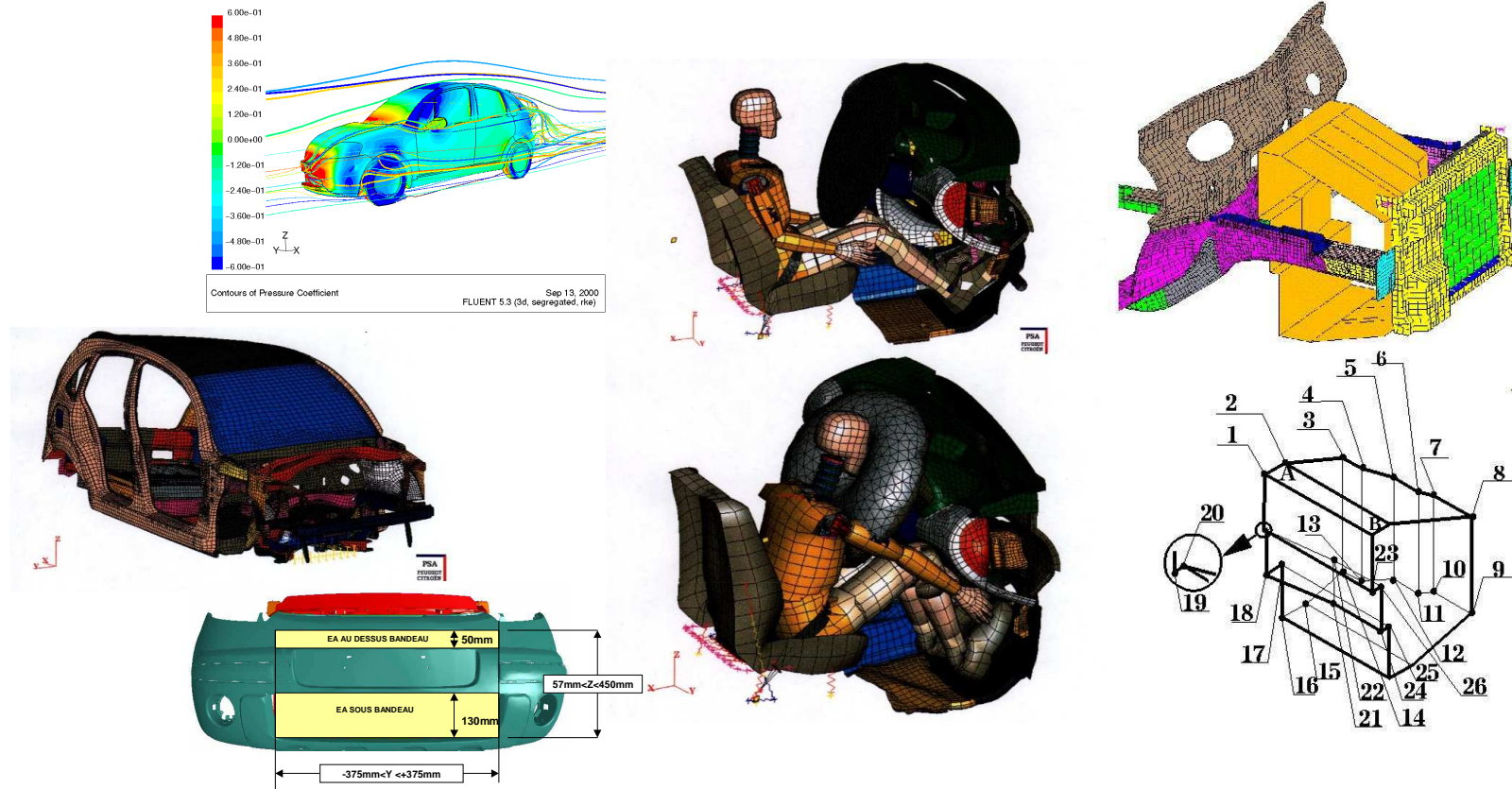


Platform policy and vehicle architecture



Functional scenario

Functional strategy (crash, NVH, cabin an engine cooling, aerodynamics under-body...) the same for every vehicle.



PSA PEUGEOT CITROËN 

Mechanical and geometrical limits

Mechanical limits = component limit

Example :

- Weight of the vehicle: braking system, axle and frame sizing, crash sizing, dynamic performances.
- Torque and weight of the engine : transmission, tires, PWT suspension

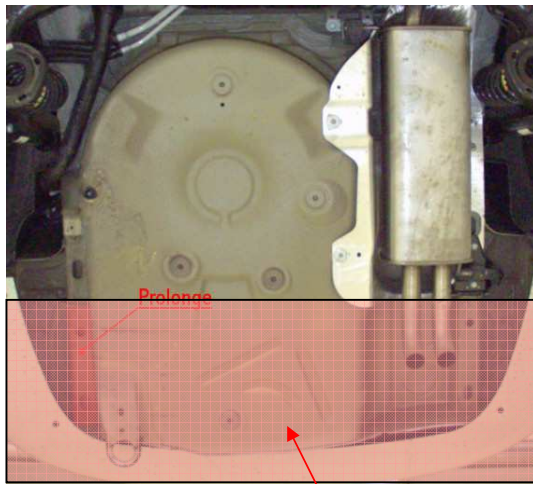
Geometrical limits= Possible dimensions on the platform

Example :

- Seat Height : posture settings. Ergonomics et interfaces on dash panel
- Base Wheel: length of the vehicle

Exemple VAG

Difference between break and sedan



Break



bicorps

Added or stretched parts

Politique Modulaire

Sub-assembled parts that facilitate the assembly and to reduce the costs of design.

Example Smart Forfour:

- Module dash board
- Module rear carter window



Summary

1- V-model lifecycle

2 – Platform and modules

3 – Project organization

- a- Why a specific organization ?
- b- Schedule / quotation
- c- Operational management

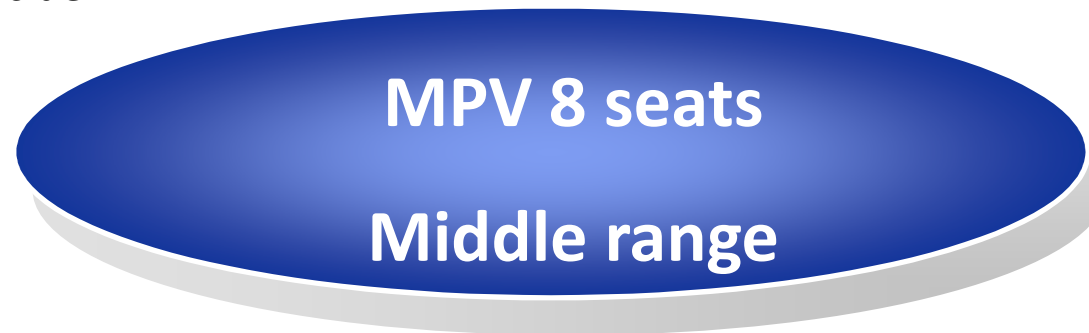
4 – Main vehicle design phases

Starting point...

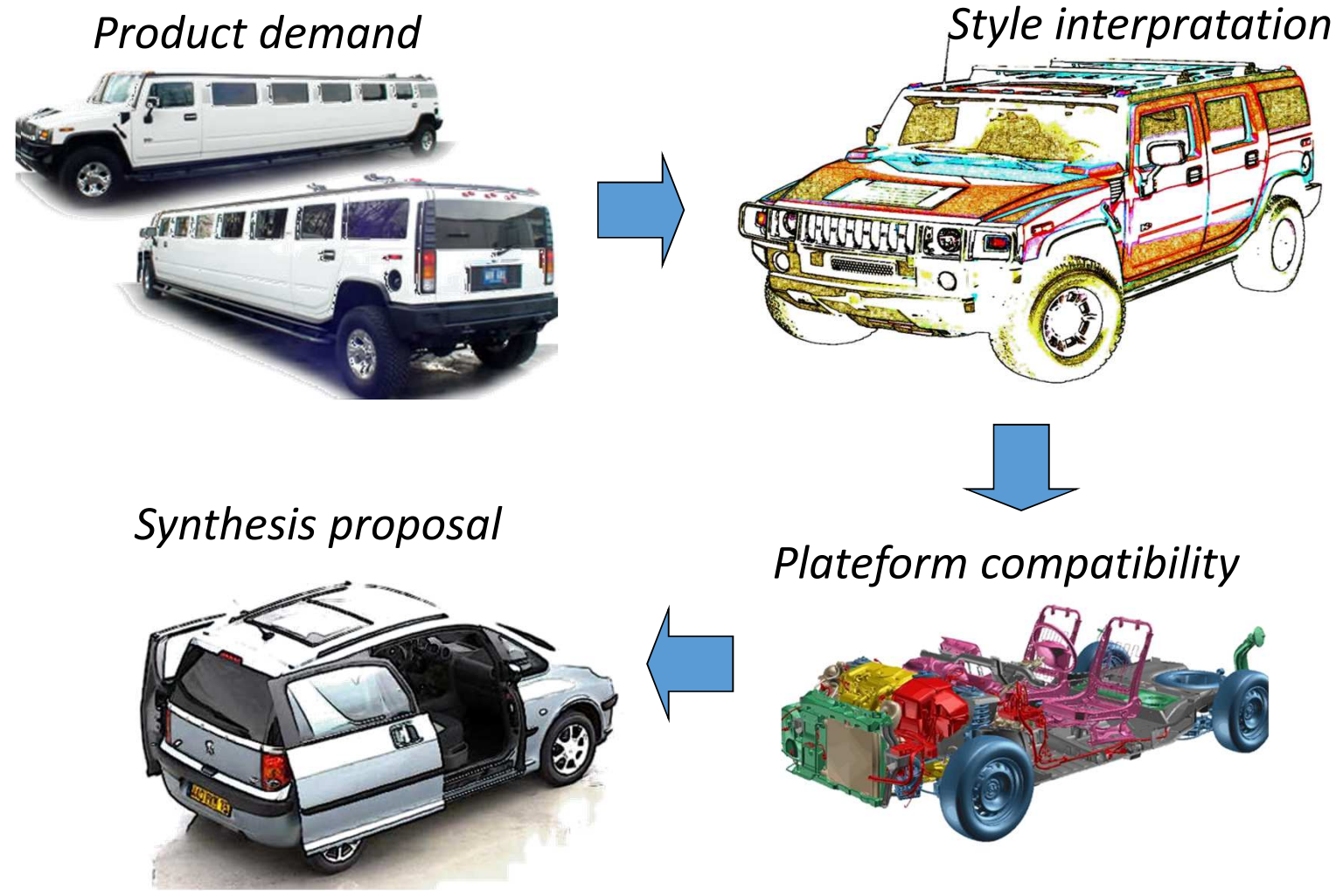
→ A code in the strategic plan or an exploration demand



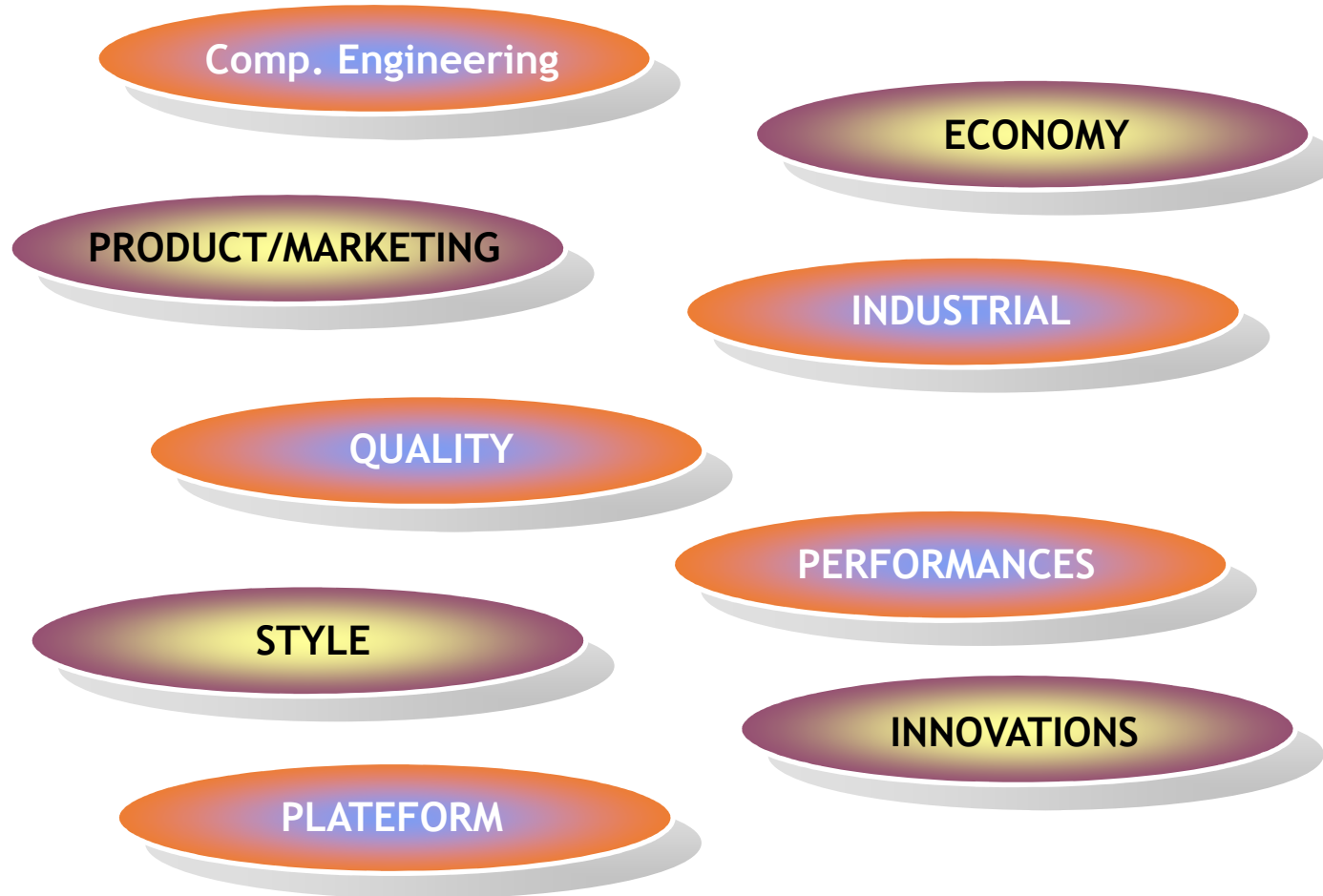
→ A clue



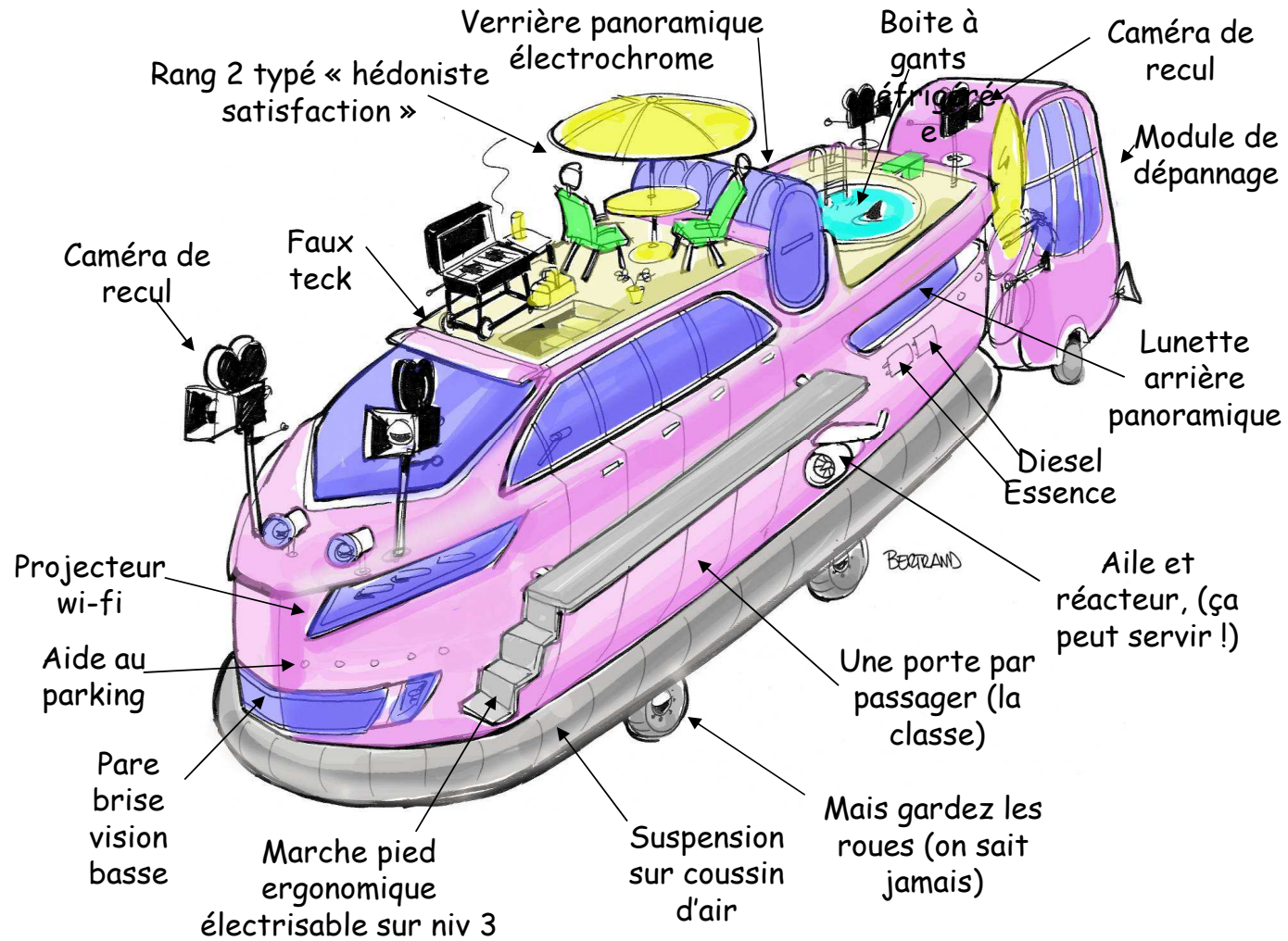
An other example of starting point...



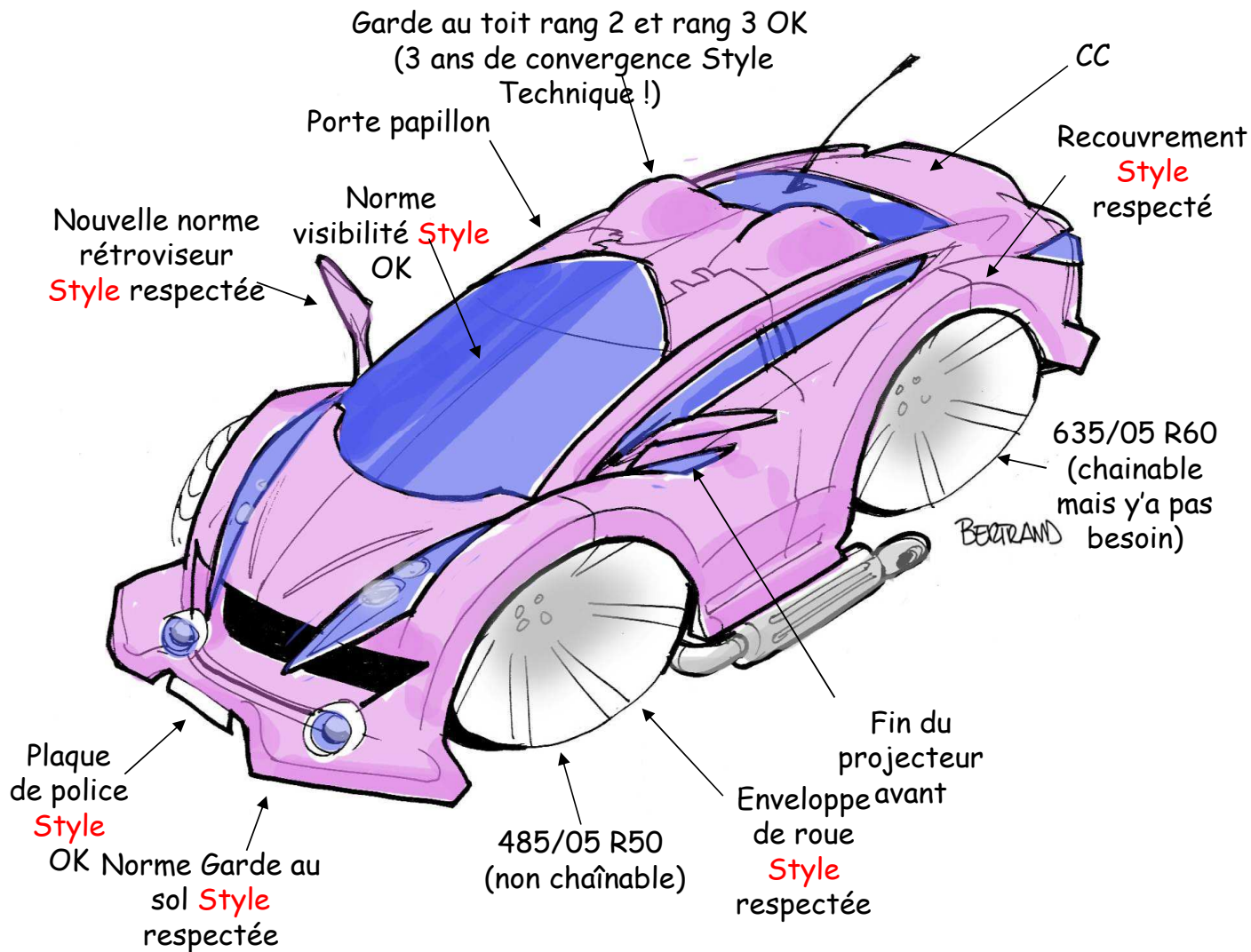
From a same starting point, each entity as a vision



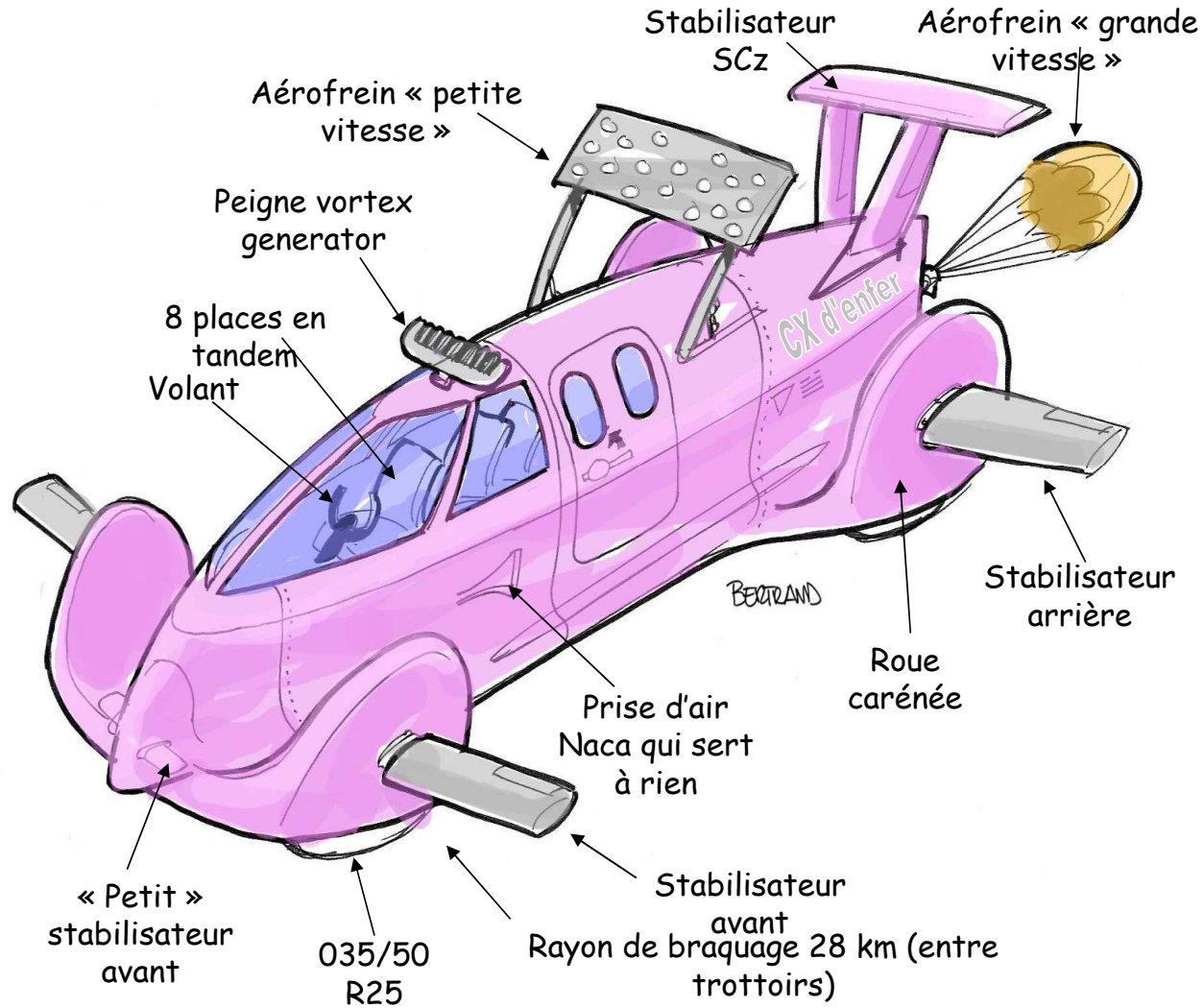
Product vision...



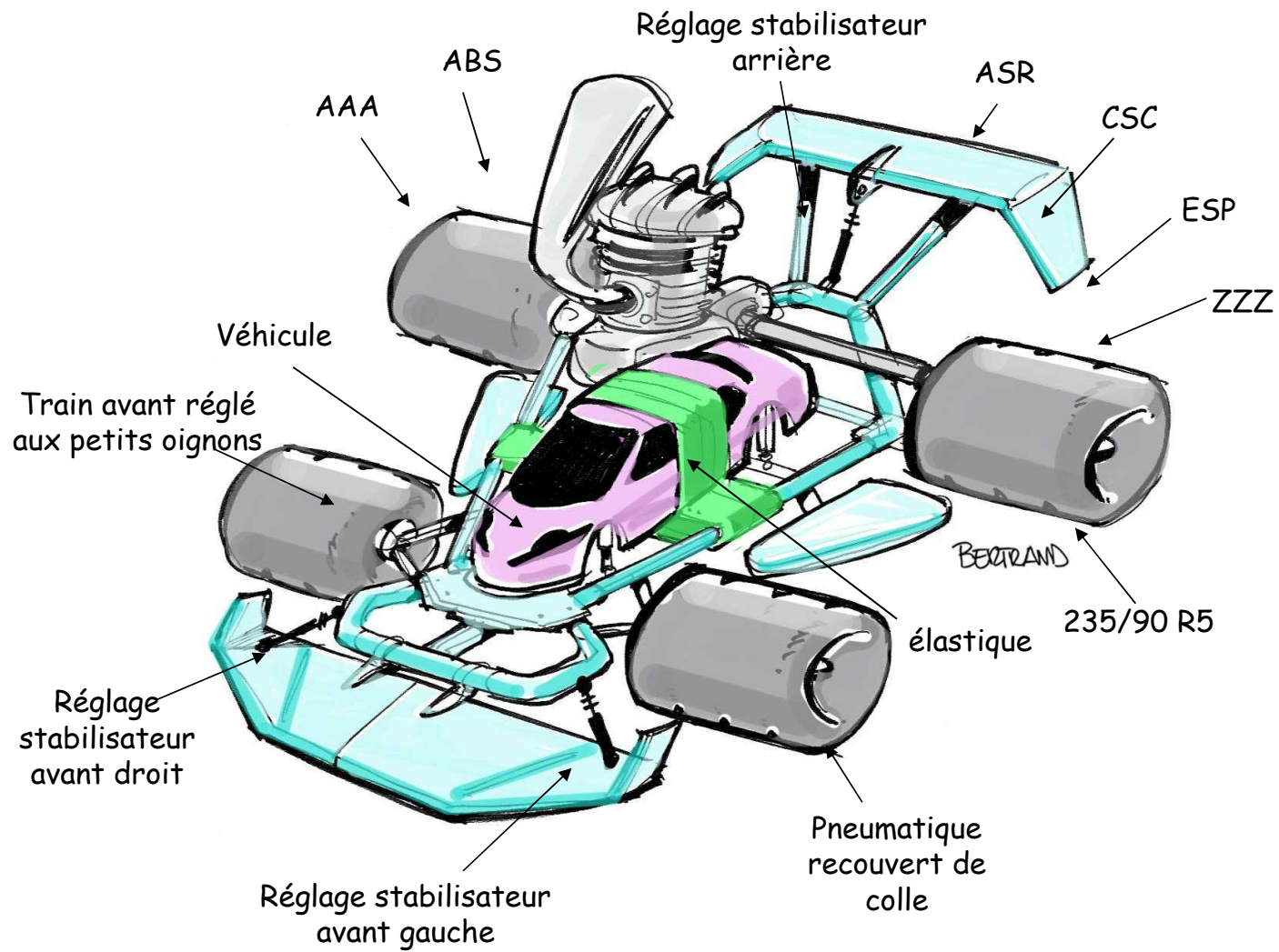
Style vision



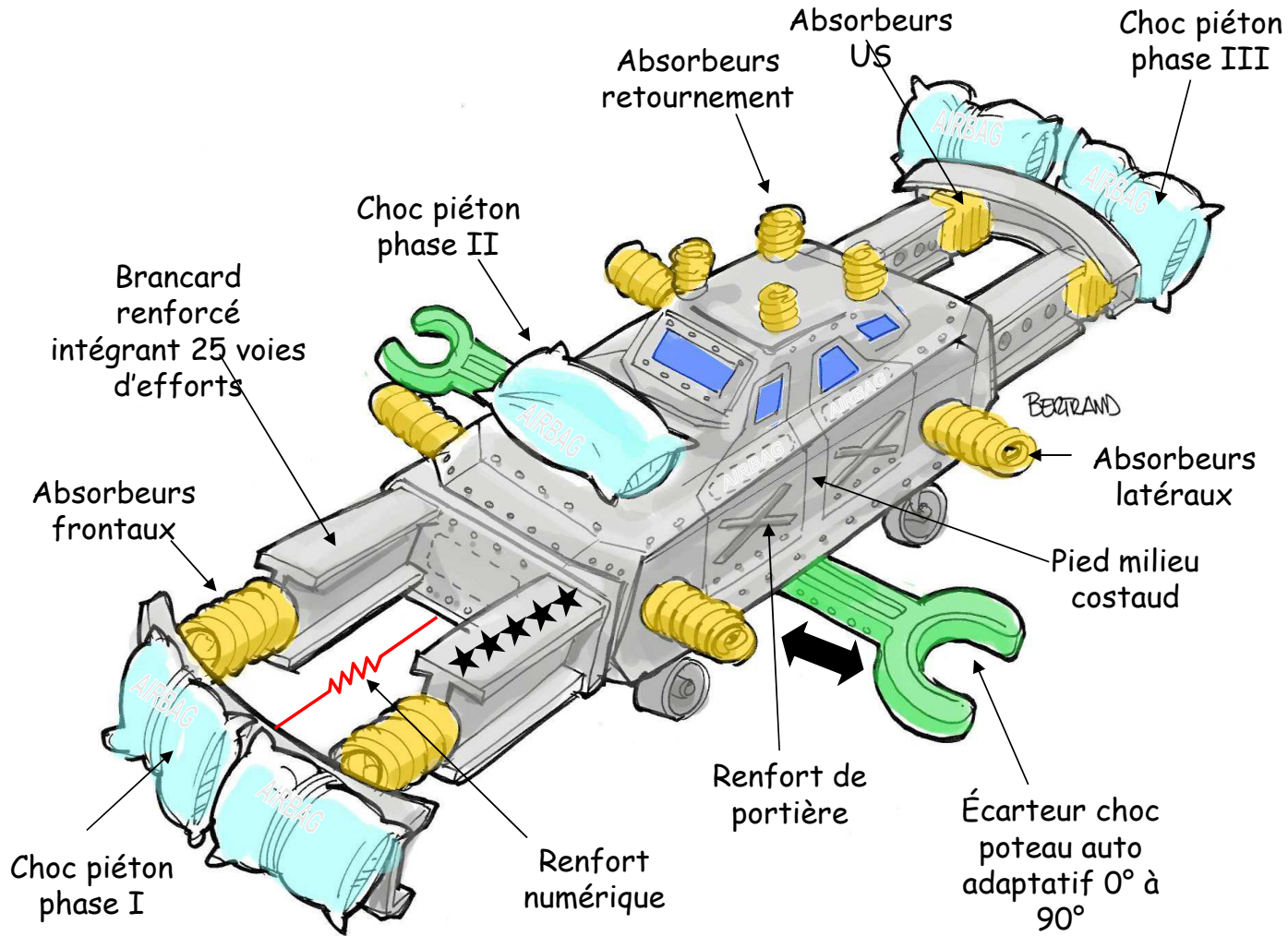
Aerodynamic vision



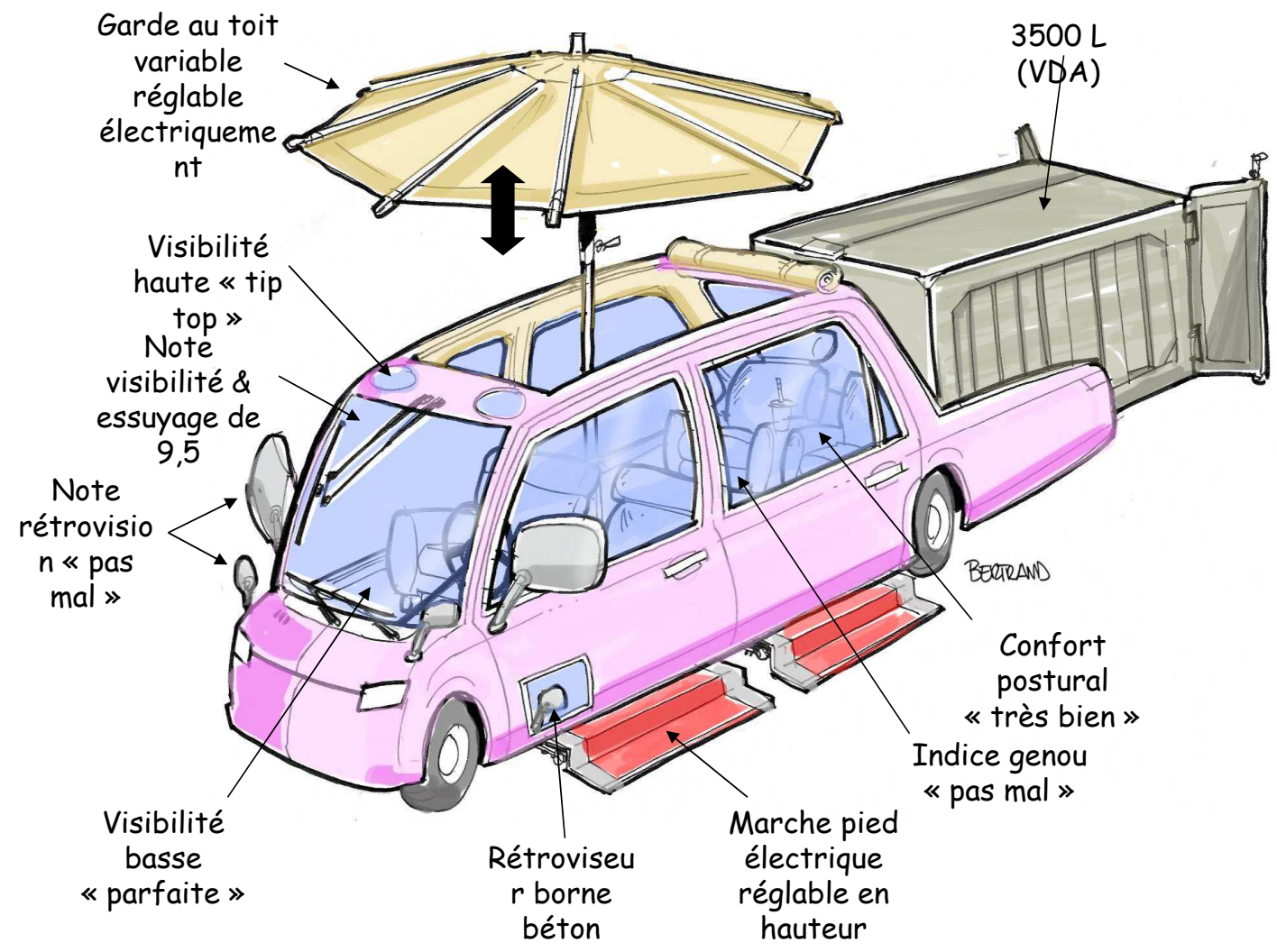
Dynamic vision



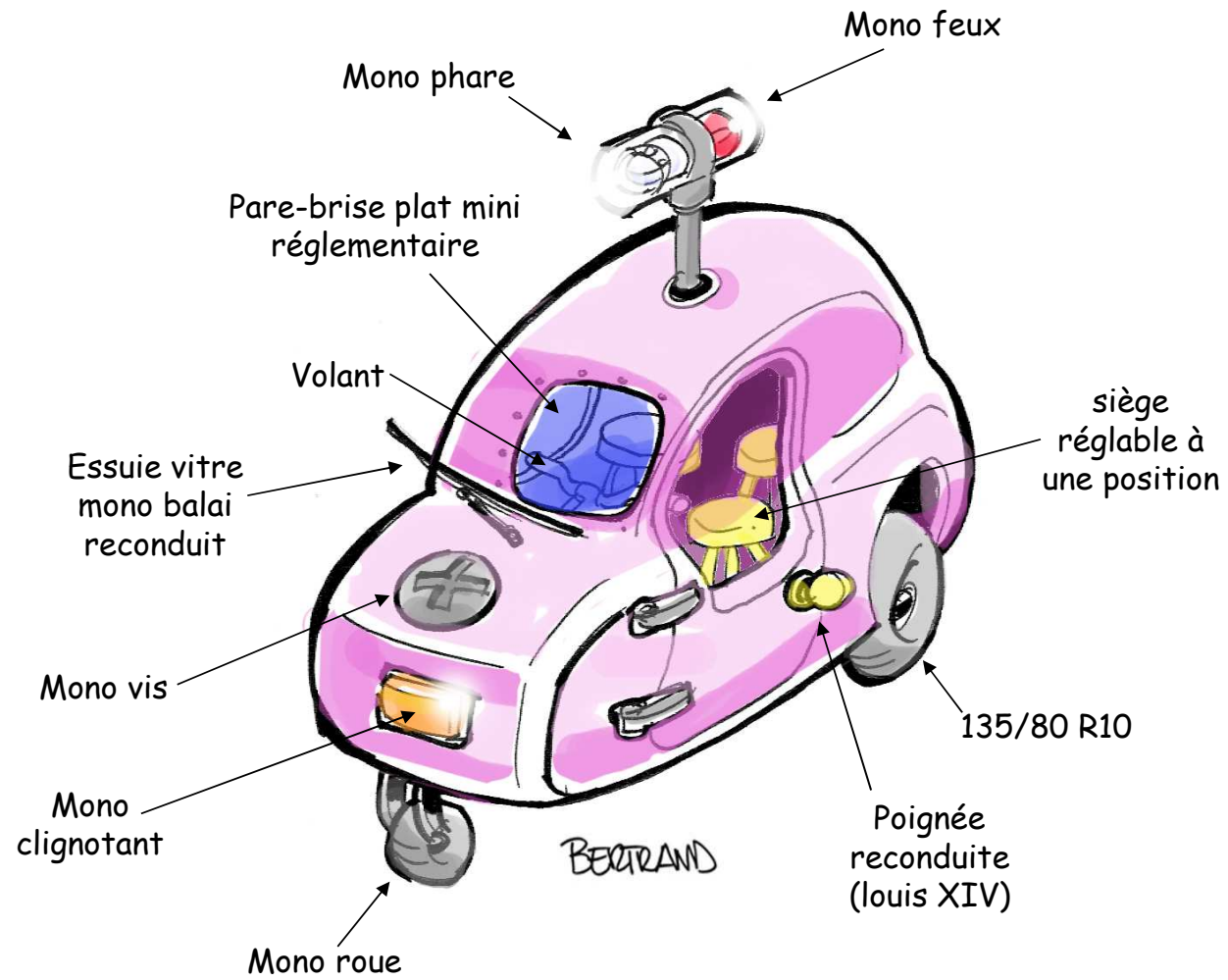
Crash safety vision



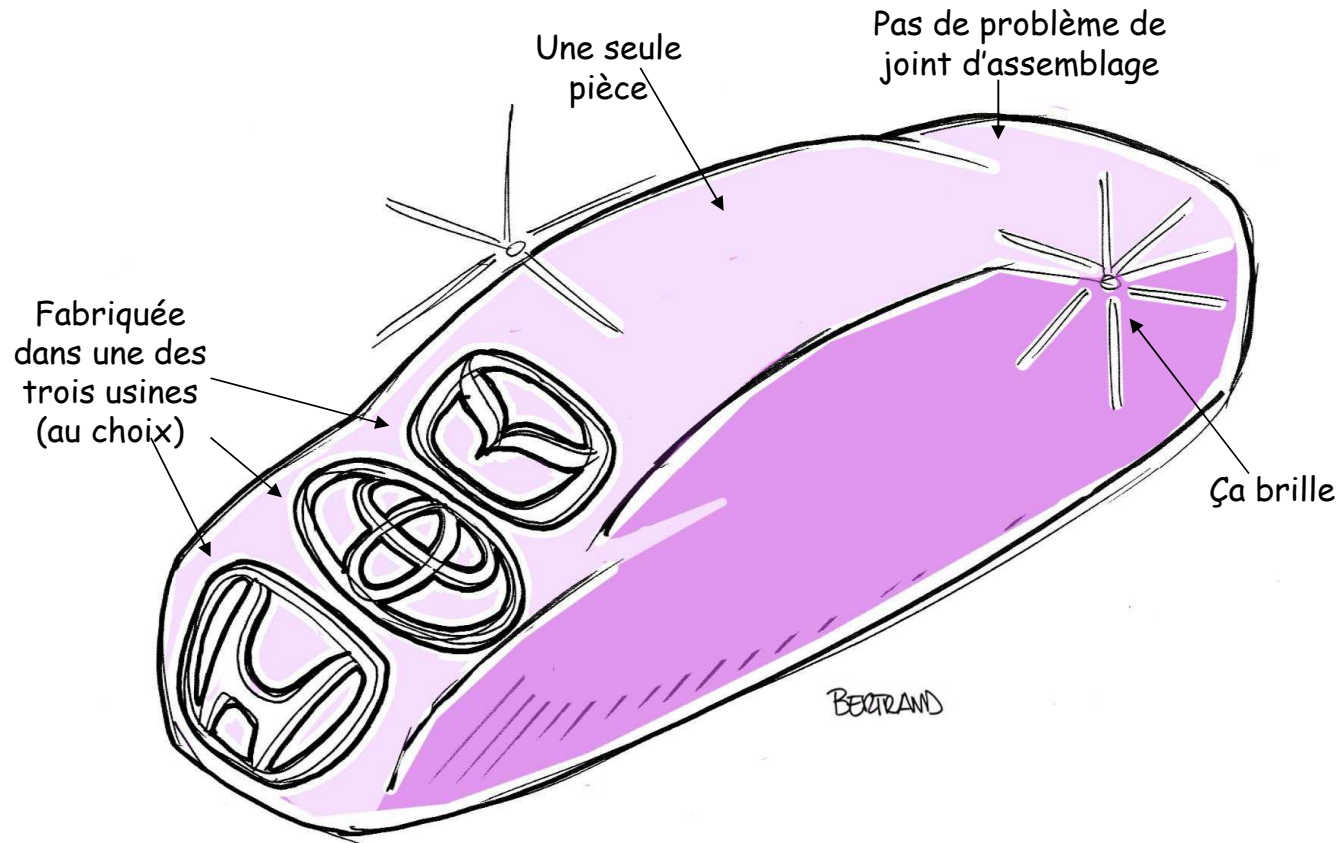
On board attributes vision



Economic vision

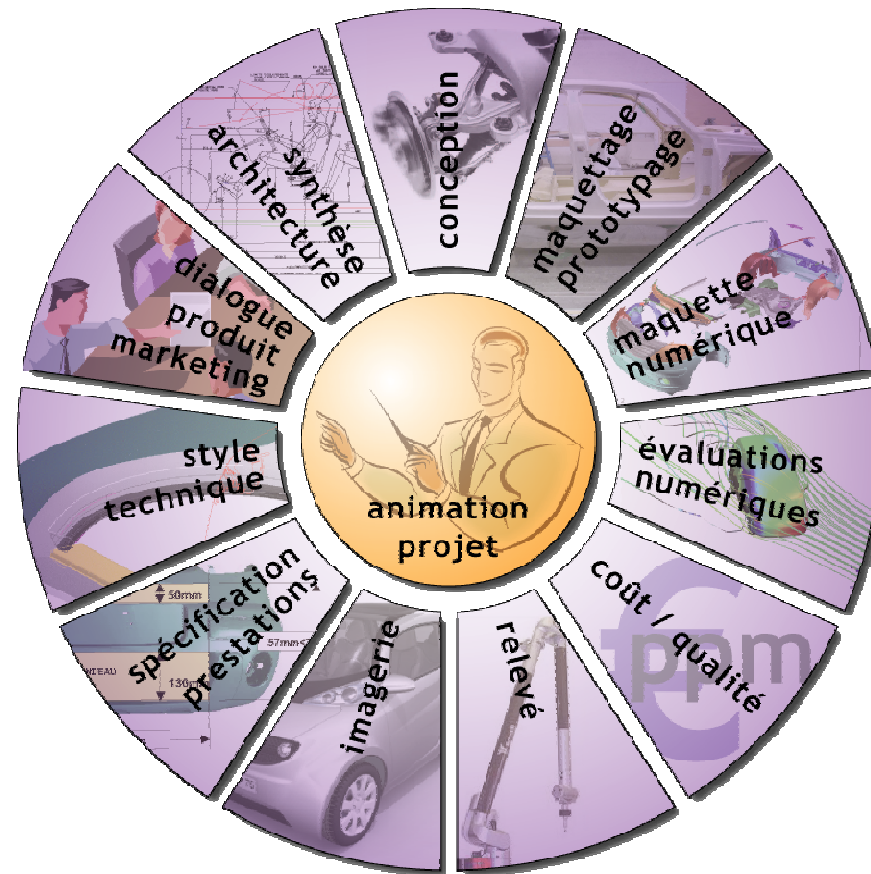


Quality vision



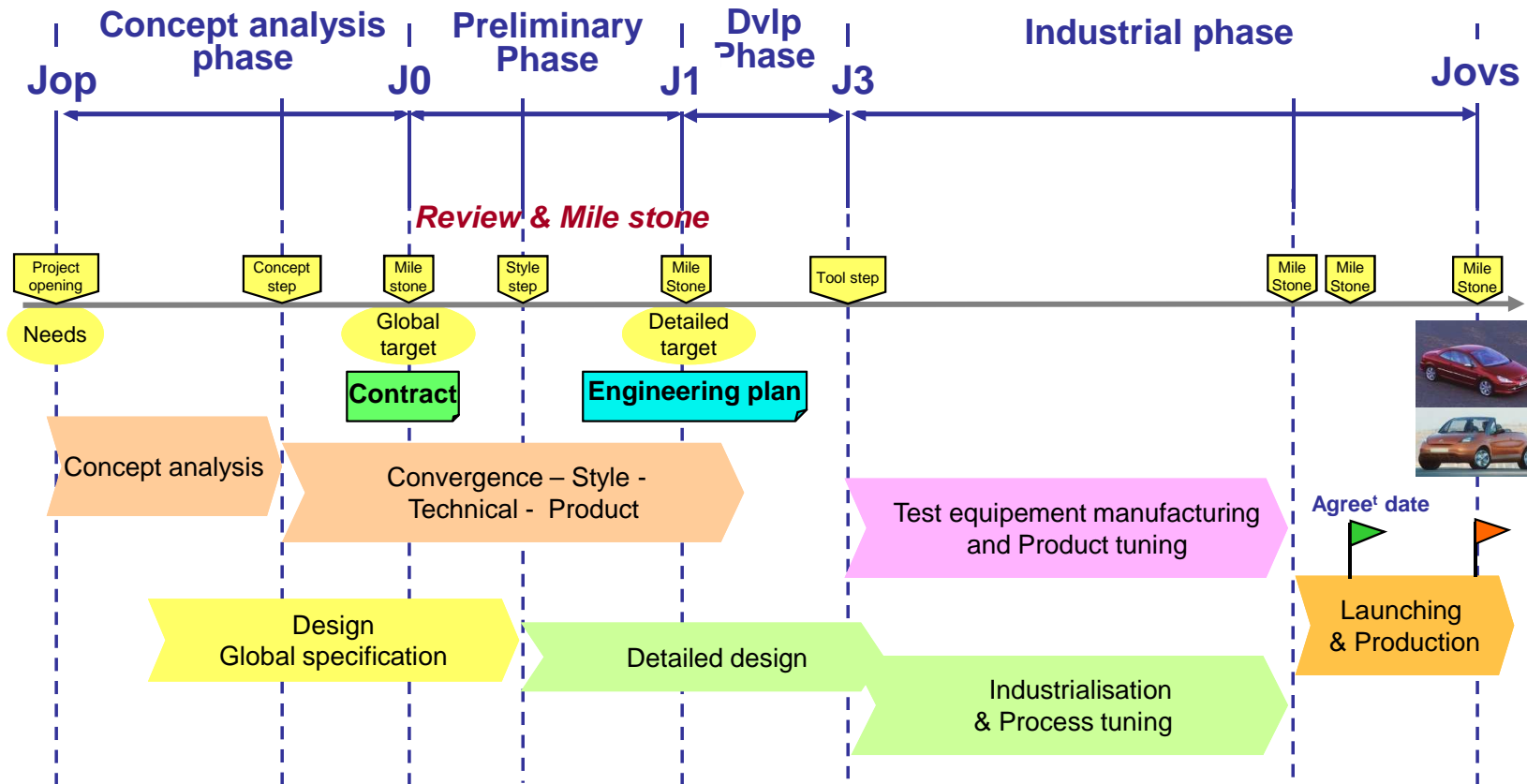
Sum up

*A compromise has to be found to propose a synthesis that satisfied every-body :
Transversal animation and project management*

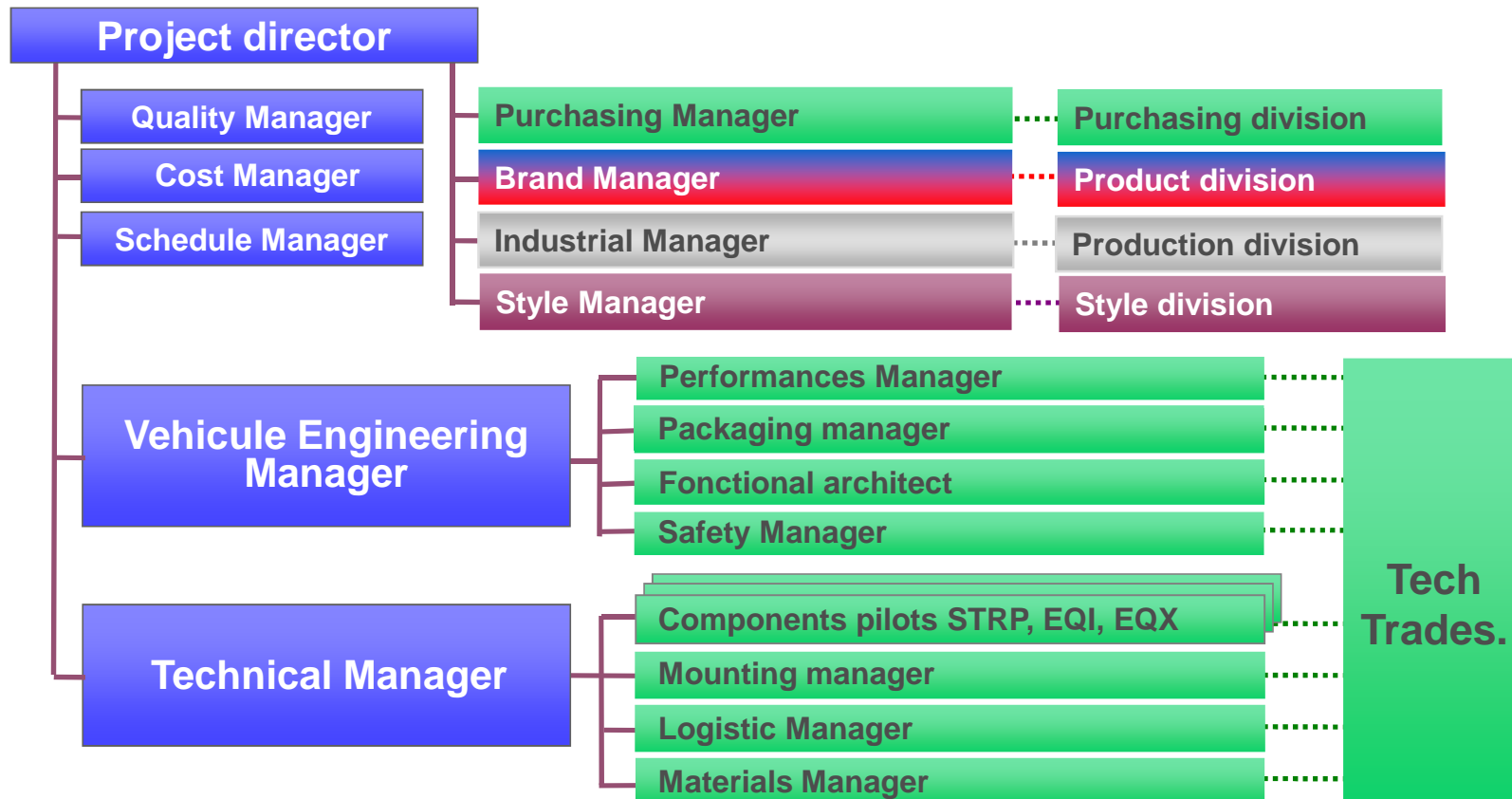


Operational development process

4 phases, 7 main activities

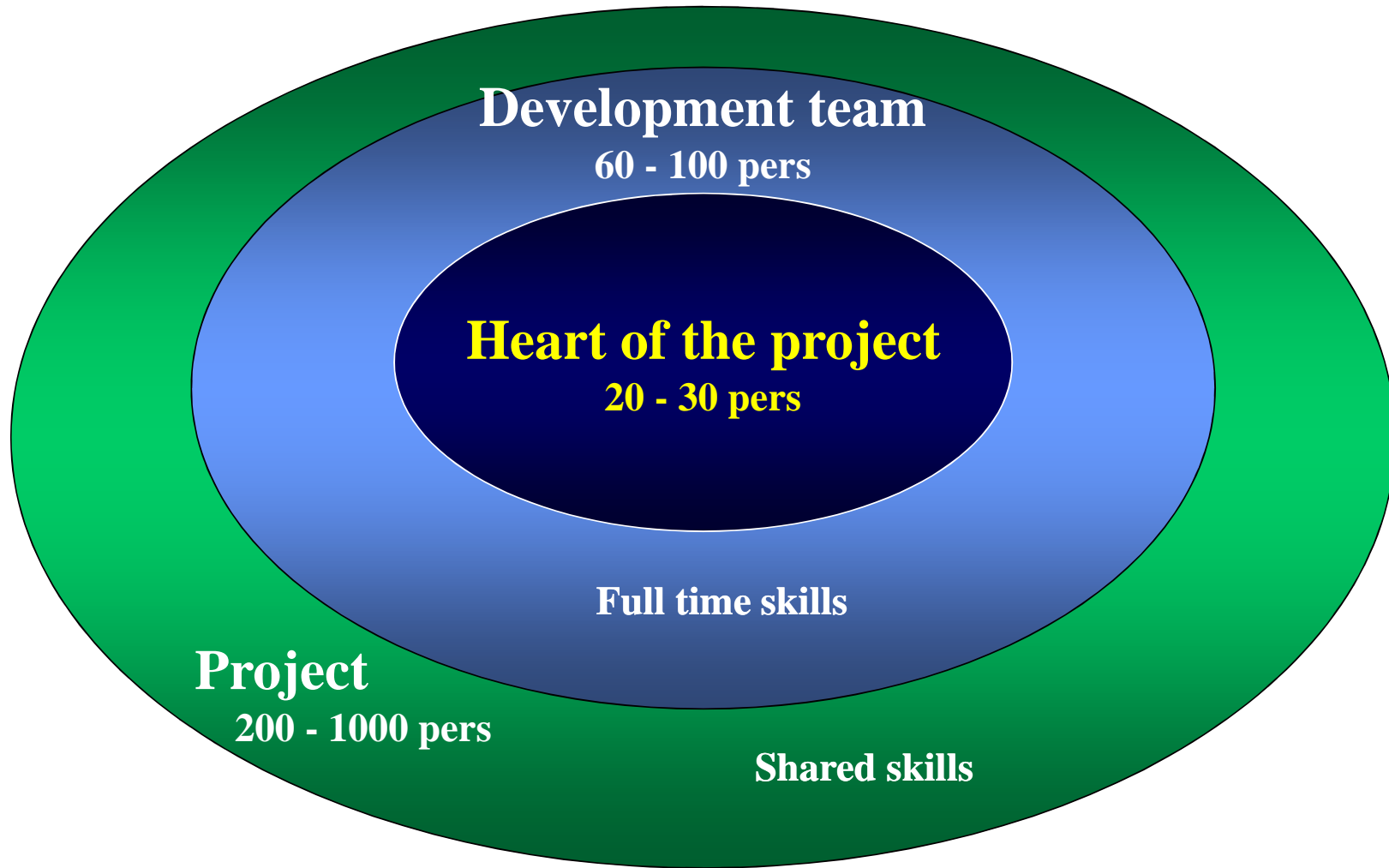


Project team



Operational management

Global project team



Summary

1- V-model lifecycle

2 – Platform and modules

3 – Project organization

4 – Main vehicle design phases

a- Specification phase

b- Style phase

c- Detailed design

d- Integration phase

e- Industrialisation

Specification phase

Contributors: Marketing /product , Synthesis manager for each field, product/process manager

Pilot: Performances Manager

Inputs:

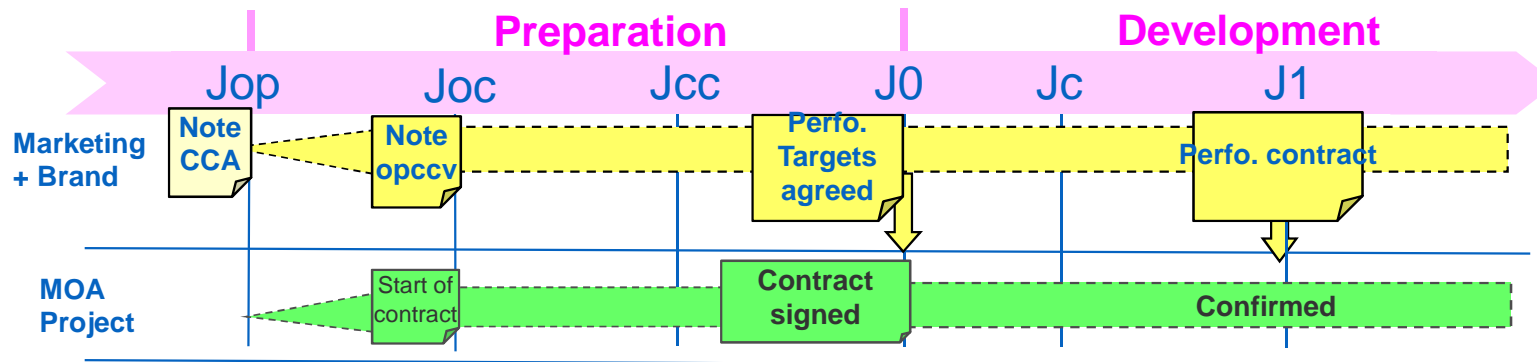
- Product demand, reference vehicle

Outputs:

- Need specification : mesurables customer requirement
- Technical specification : Engineer requirements for technical division.

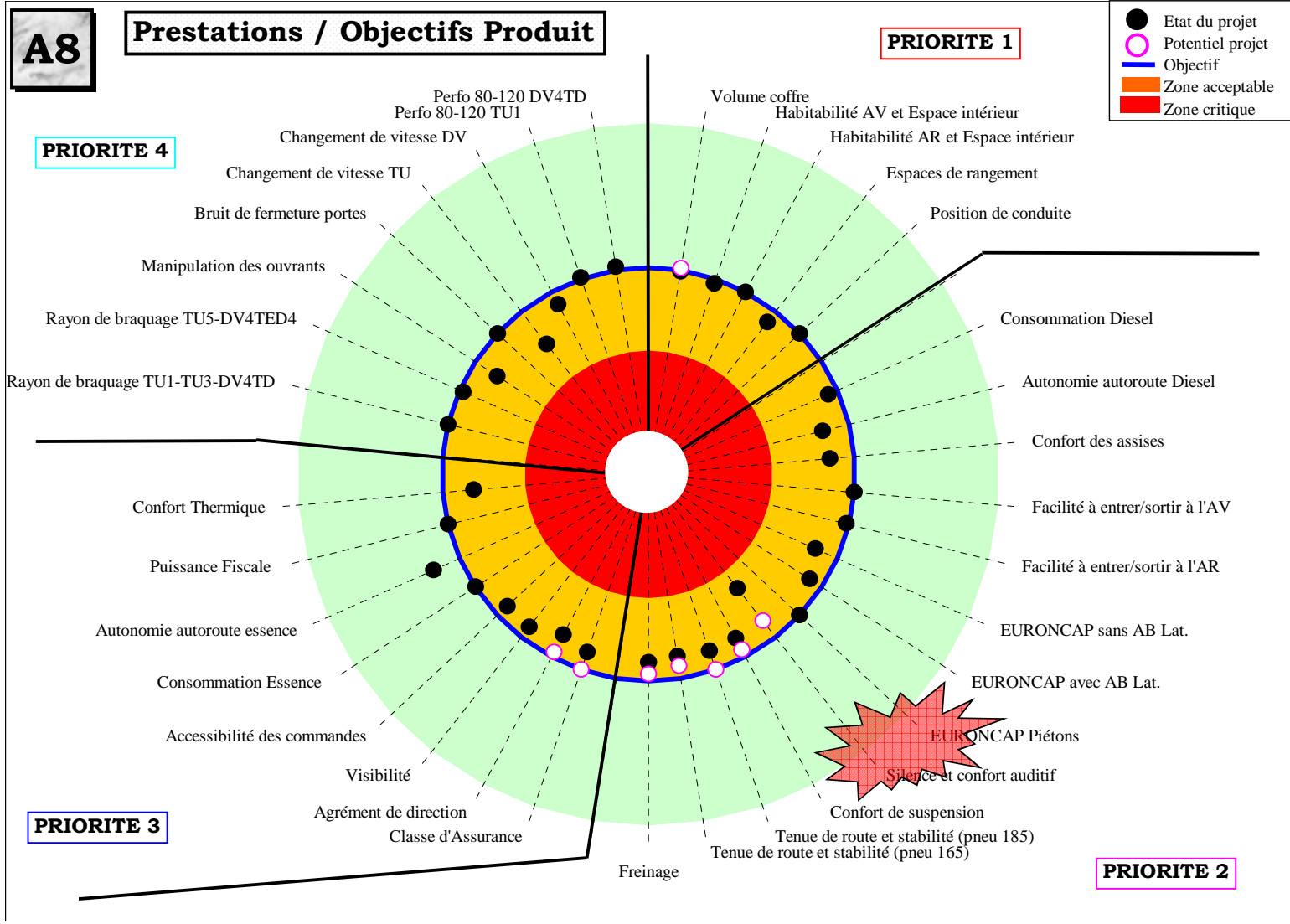
Phase de spécifications

Definition of vehicle performances



- ❑ The initialization of the project is the description of the vehicle concept that is required. This demand is agreed by group and brand marketing.
 - note OPCCV
- ❑ The Brand marketing manage the quantification of vehicle performances, controlled by group marketing.
 - note OPCCV
- ❑ The Brand marketing take the lead at J0 on the detailed description of performances for functional and components
 - Performances contract at J1
 - Diversity reference at launch

Need specification phase:



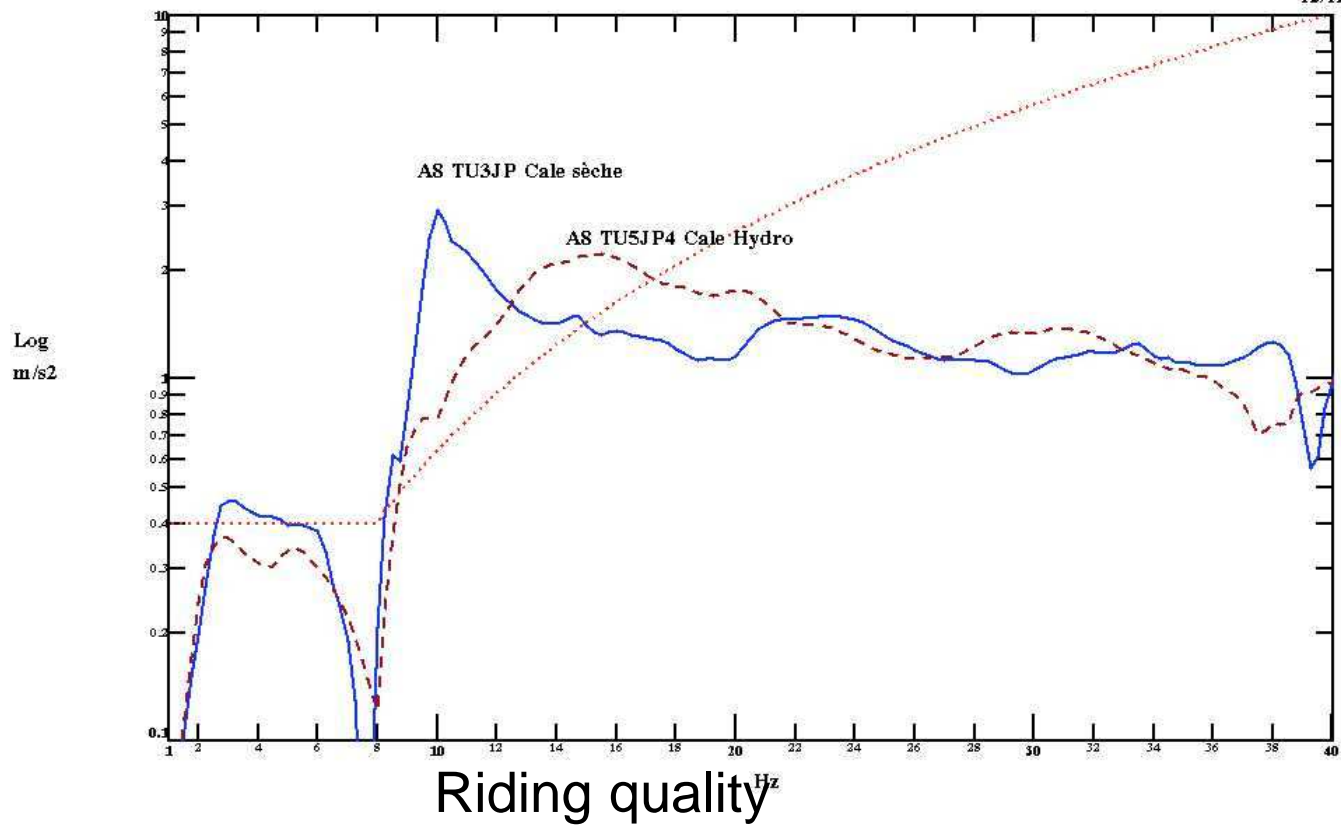
Technical specification phase :

CRITERES P.S.A. Balayage sinus 1-45Hz +/-1mm

Essieu.....: AV EN PHASE
 Vehicule.....: AS1 PR 19111 / EP19168
 Configuration.....: 2p14
 Pneumatiques.....: TU3 = 165/70R14 - TU5/DV = 185/60R15
 Pression AV/AR.:
 Observations.....: Place AVD

SIMULATEUR DE ROUTE Velizy (tel.:20-25-04)
 DPTA/DMFV/PHV/ACV-VY

12/12/00



Style creation phase

Contributors: Style trade, technical designers

Pilot: Architect (packaging)

Inputs:

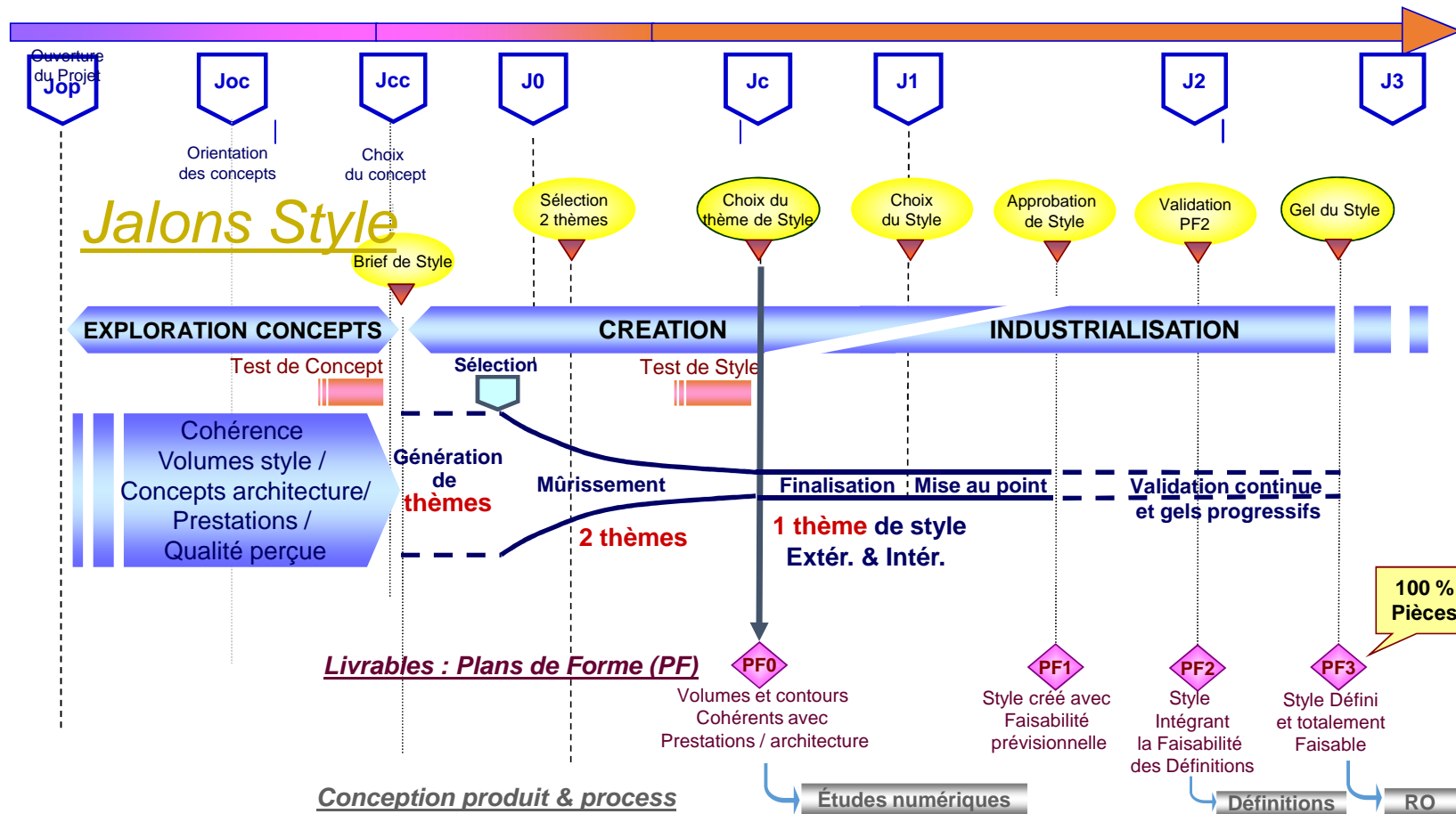
Technical constraints (1/5ème, carry over of platform parts, technical spécification) and product inputs

Outputs:

3D outline drawing for a detailed design of the vehicule matching with project targets (performances, cost, quality, mounting, ...).

Operational development plan

Style / Technical / Performances Convergence



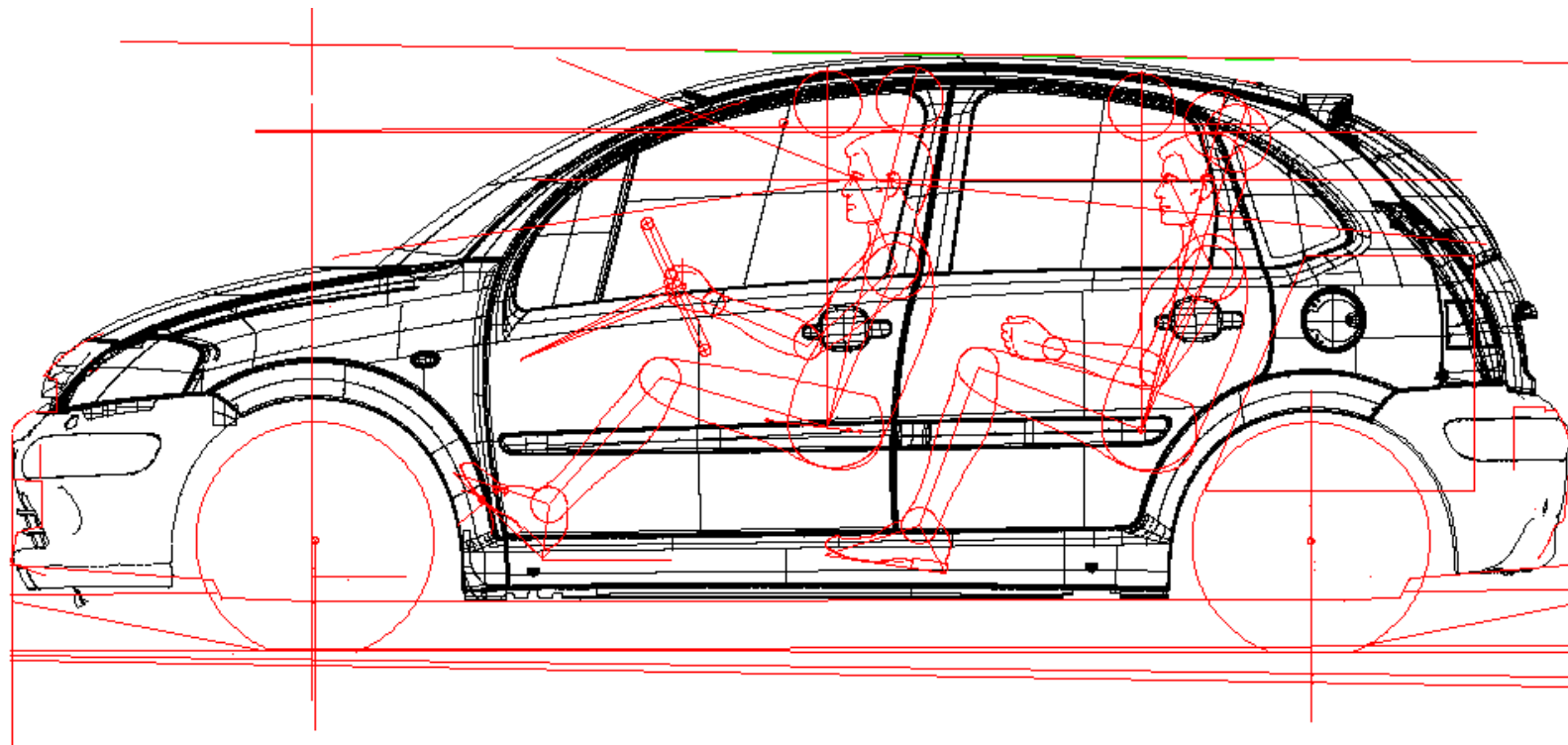
Style design phase

Outside style sketches



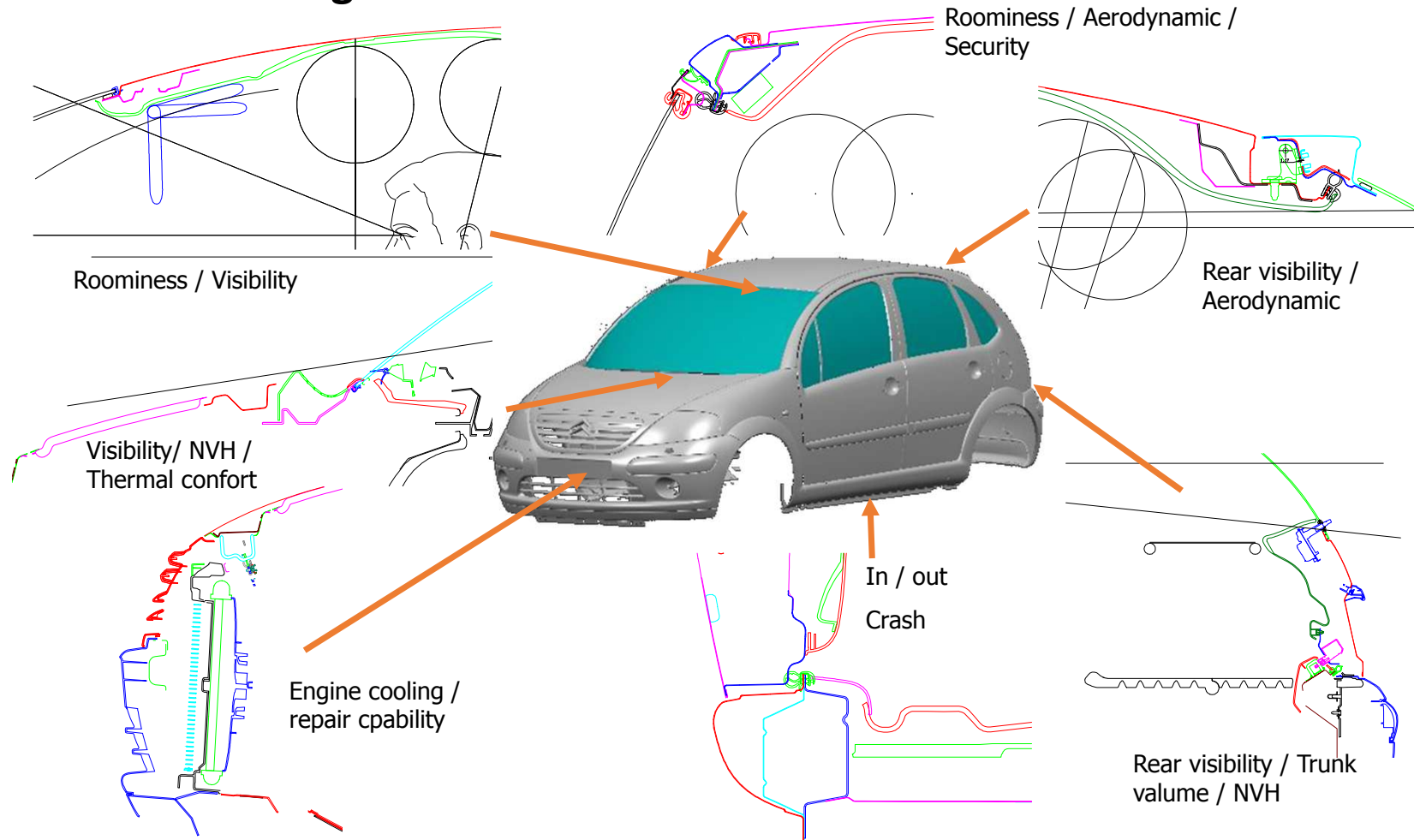
Style design phase

style/technical convergence



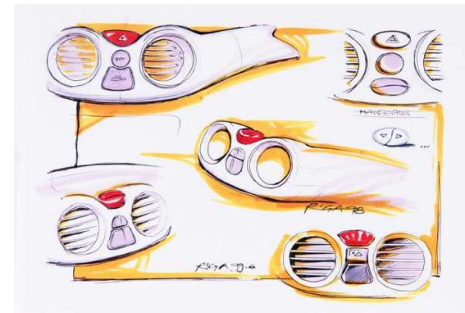
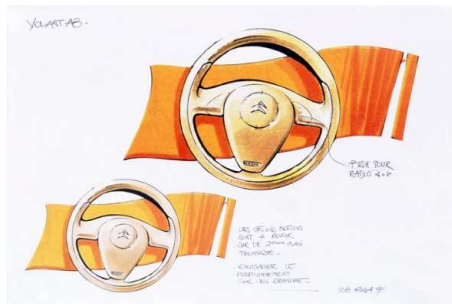
Style design phase

Style/technical convergence



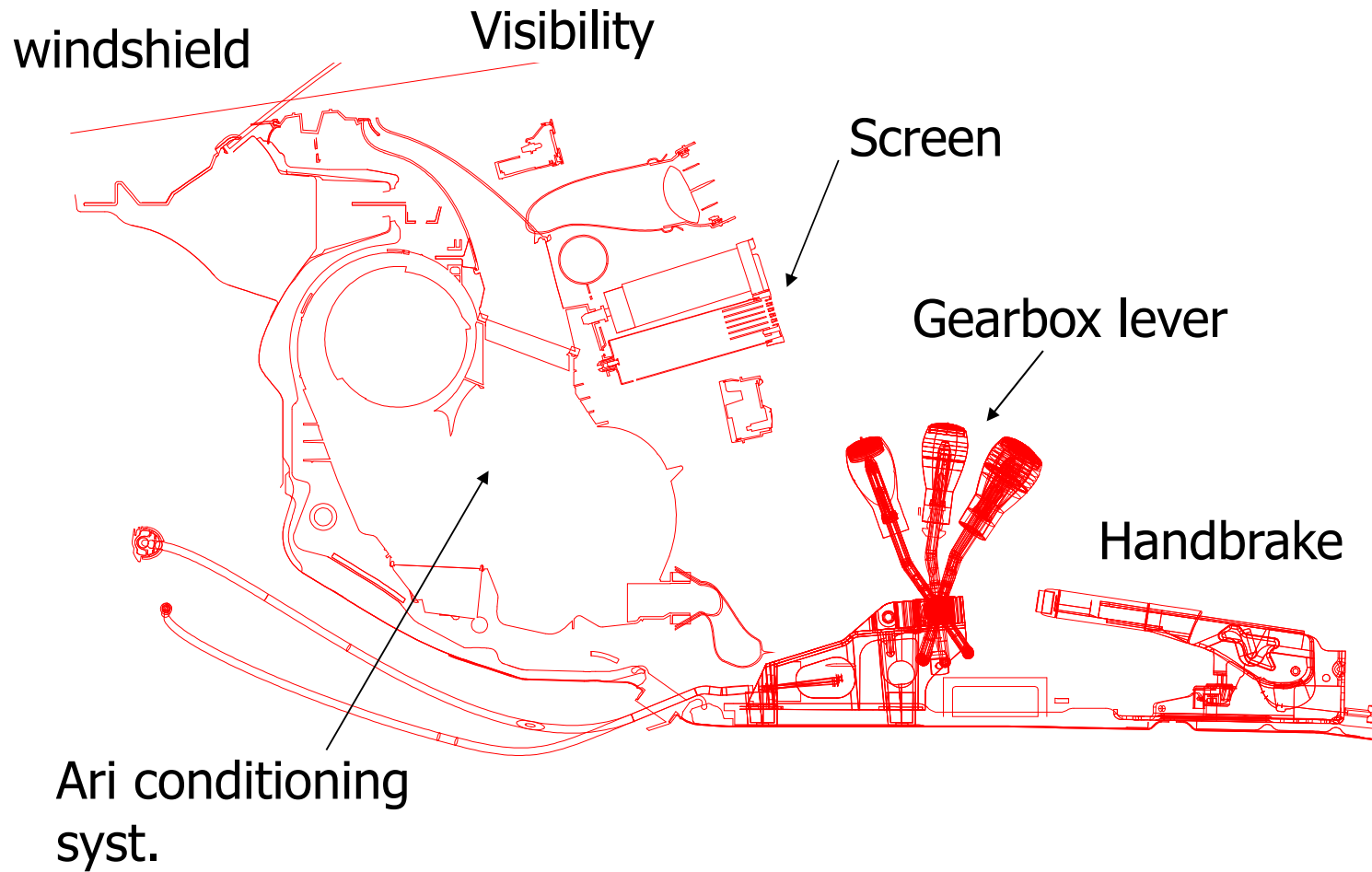
Style design phase

Inside style sketches

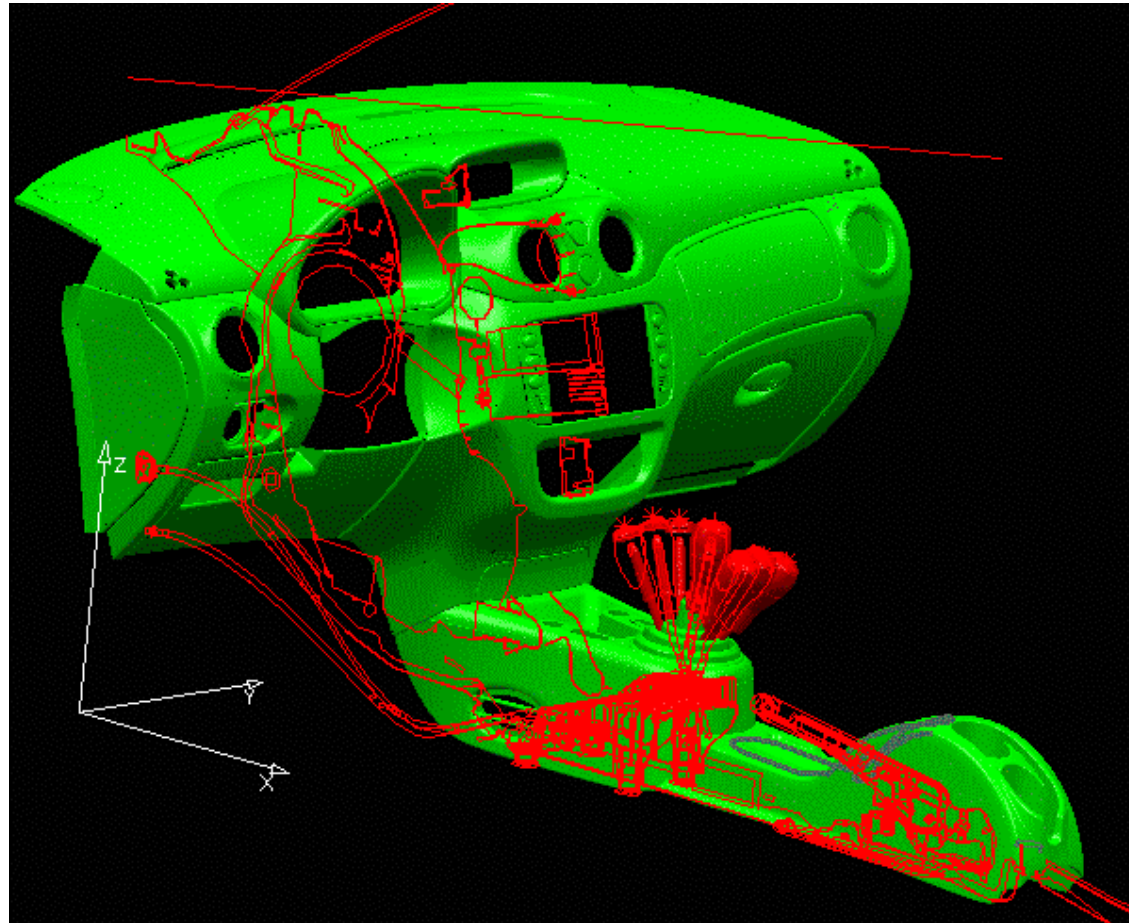


Style design phase

Drive station design



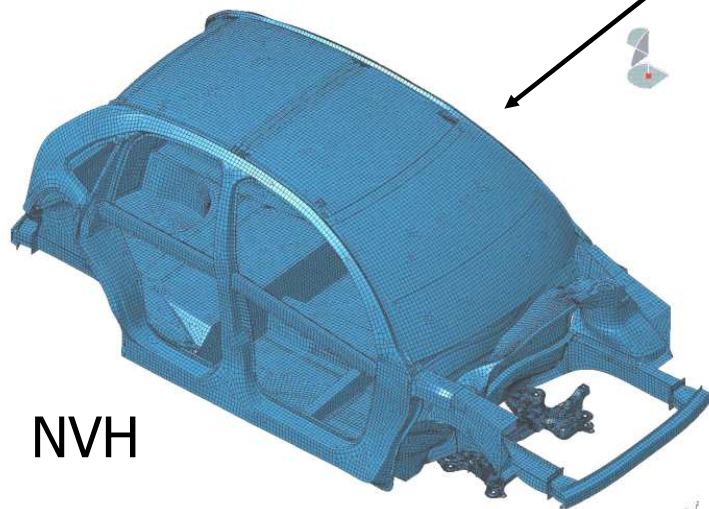
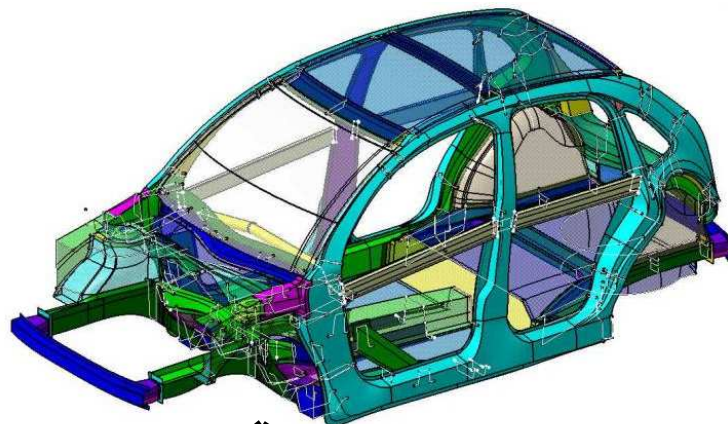
Style design phase



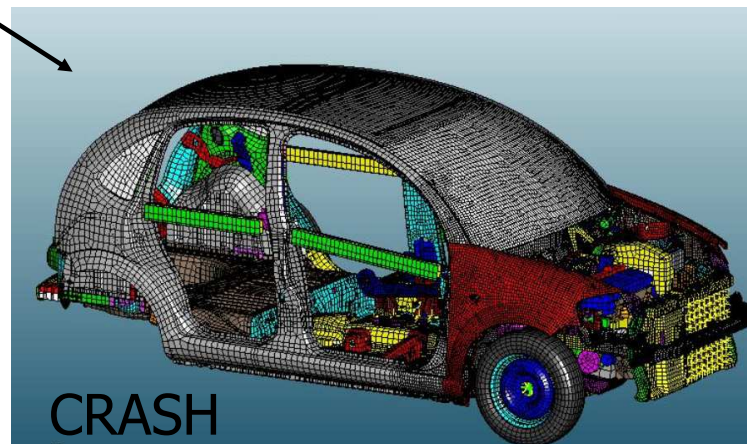
Style design phase

Pre-sizing

CAD model



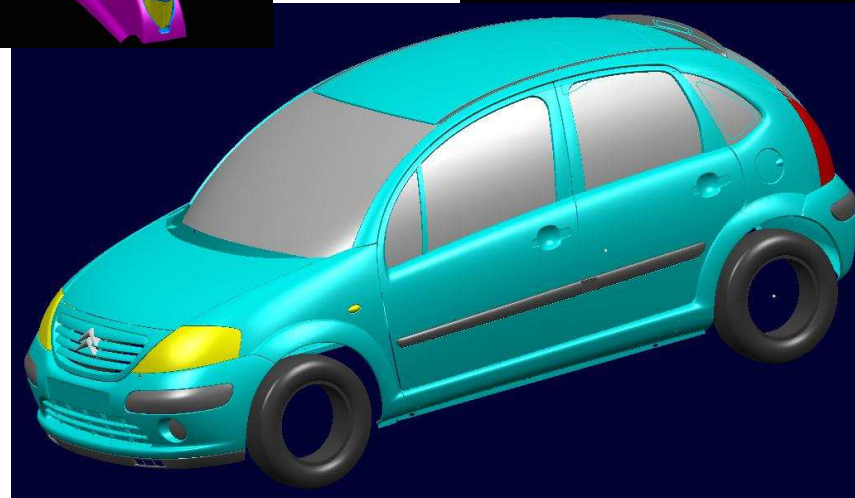
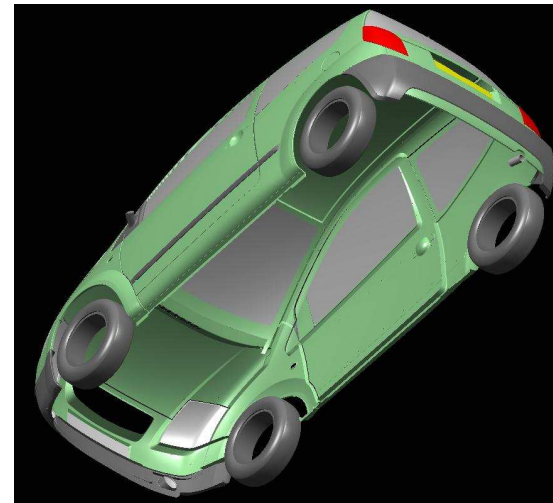
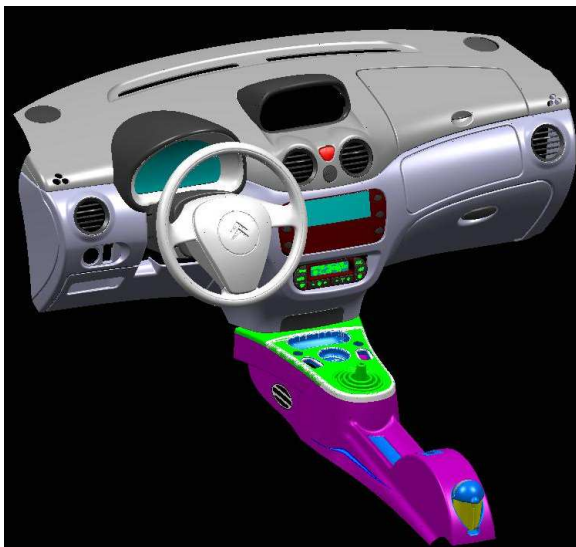
NVH



CRASH

Style design phase

Final 3D outline drawing



Components product / process design phase

Contributors : Product/Process designers, mounting et logistic, suppliers.

Inputs:

- Technical specification
- 3D outline drawings
- Target manufacturing synopsis
- Quality, Cost, timing targets

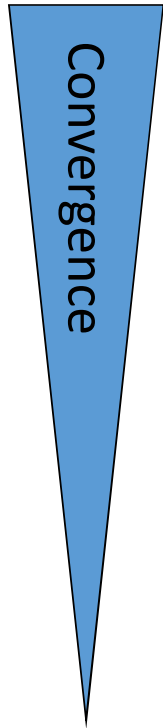
Outputs:

- 3 D & 2 D of the parts
- Parts list of all vehicle versions
- Manufacturing synopsis
- Mounting process sheet
- Logistic organisation

Components product / process design phase

General processus

Inputs: 3D outline drawings + Operational Digital Mock-up



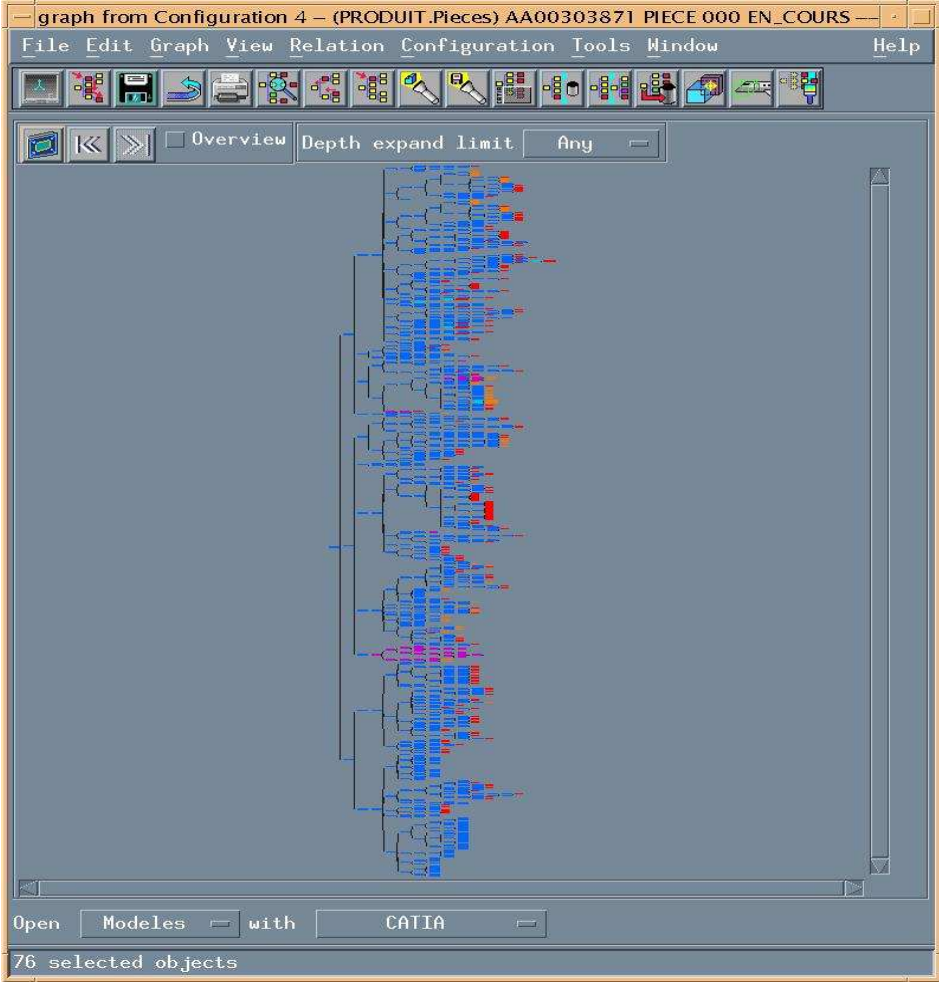
- Progressive freeze of interfaces
- Product /process co-design
- Officialization of the models and launch of tools
- Digital reassembly with parts list

Modification managment process

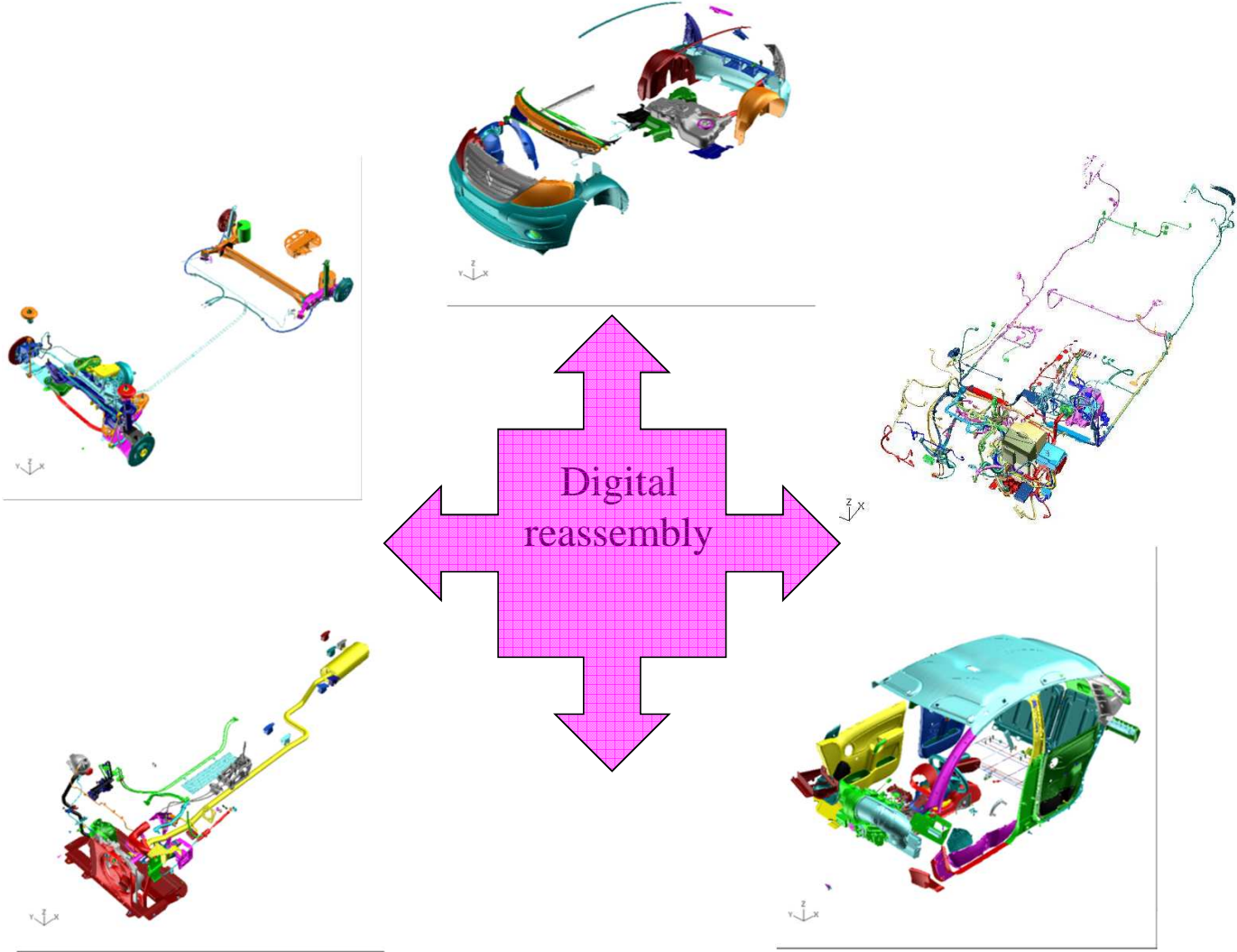
Components product / process design phase

Digital mockup

Tree table mockup

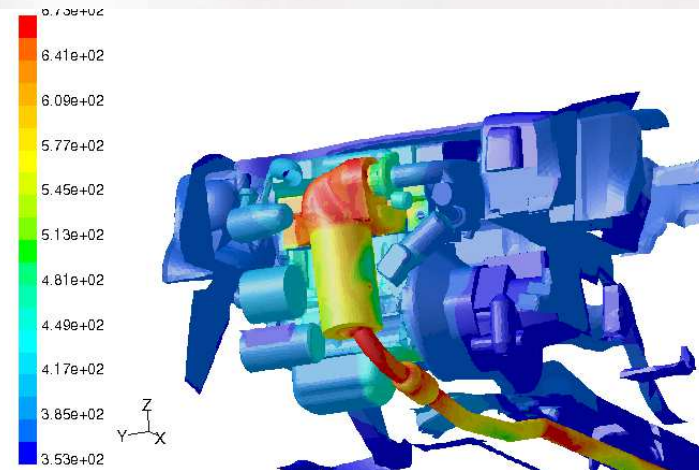
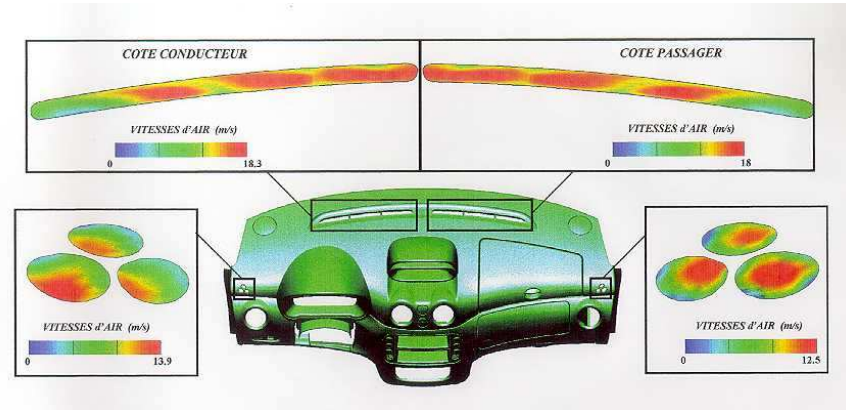
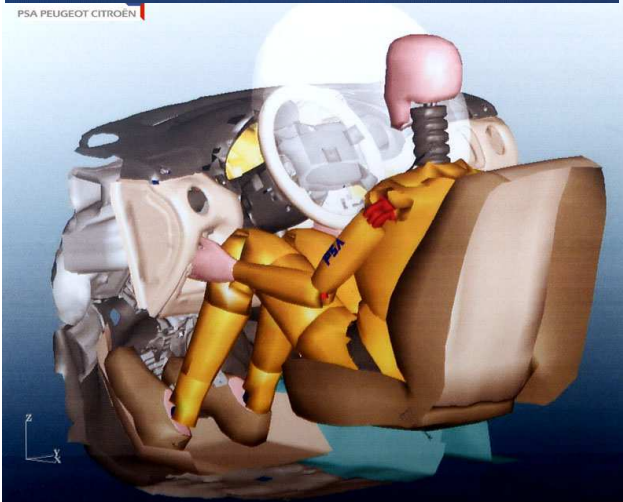
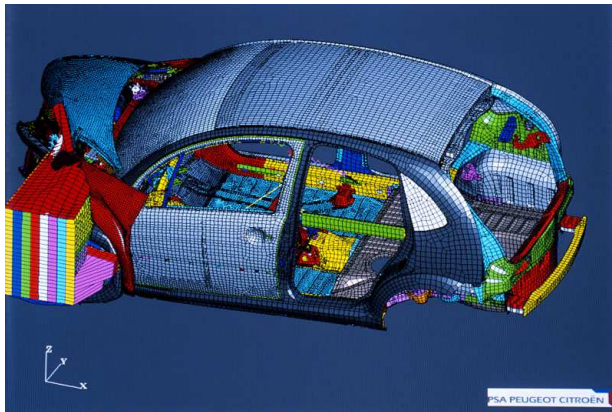


Components product / process design phase



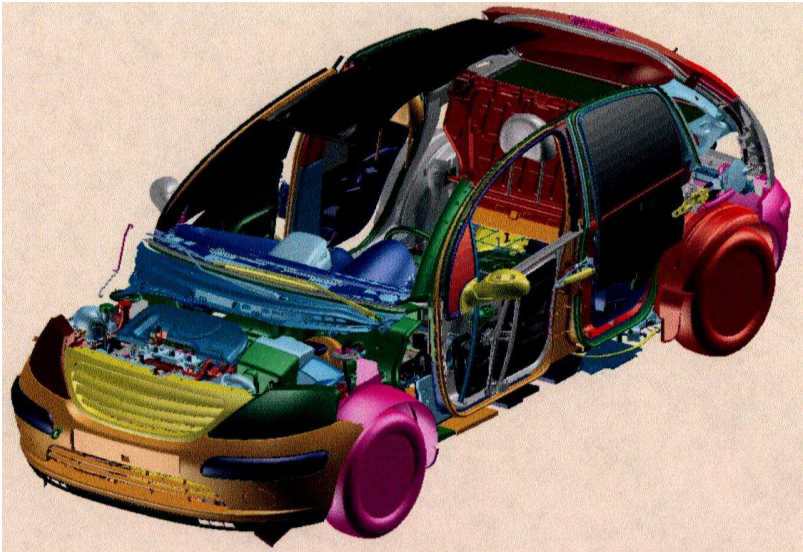
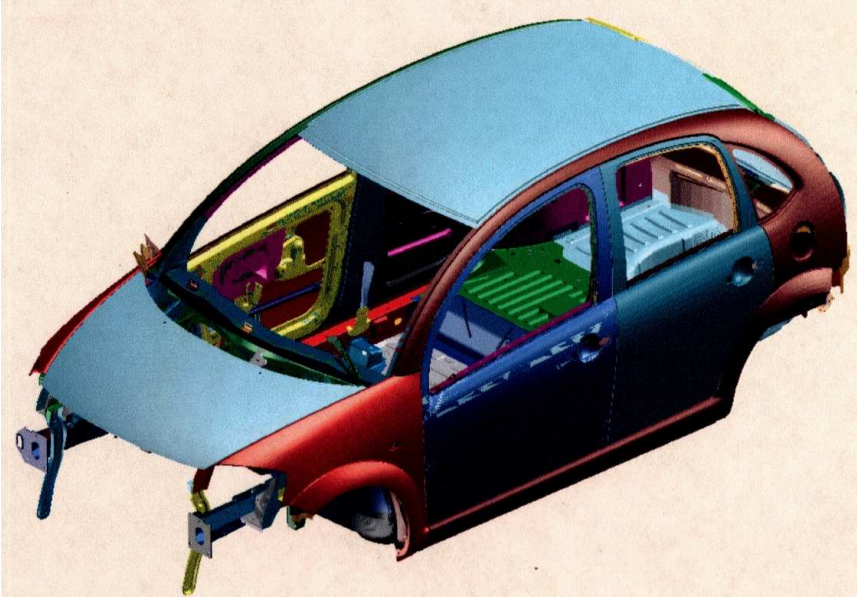
Components product / process design phase

Detailed design



Components product / process design phase

Model bundle



Parts validation phase

Contributors: Design teams, suppliers

Pilot: Product/Process Manager

Inputs: Technical specification, Engineering standards

Outputs: validation of each part and sub-system

Parts validation phase



Example : test of an anti-torque link



Example : Test of front airbags

Vehicle validation phase

Contributors: Field Manager(Safety, NVH, Dynamic, Crash, Electricity Electronic,...)

Pilots: Performances manager/ EE Architect/ Safety Manager

Inputs: Need specification, Validation plan

Outputs: Vehicle synthesis results (onboard life, NVH, dynamic, sécurité,...), homologations, quality ride, EE validation.

Vehicle validation phase

Key figures

Number of models:

39 Representative Prototypes

6 Models

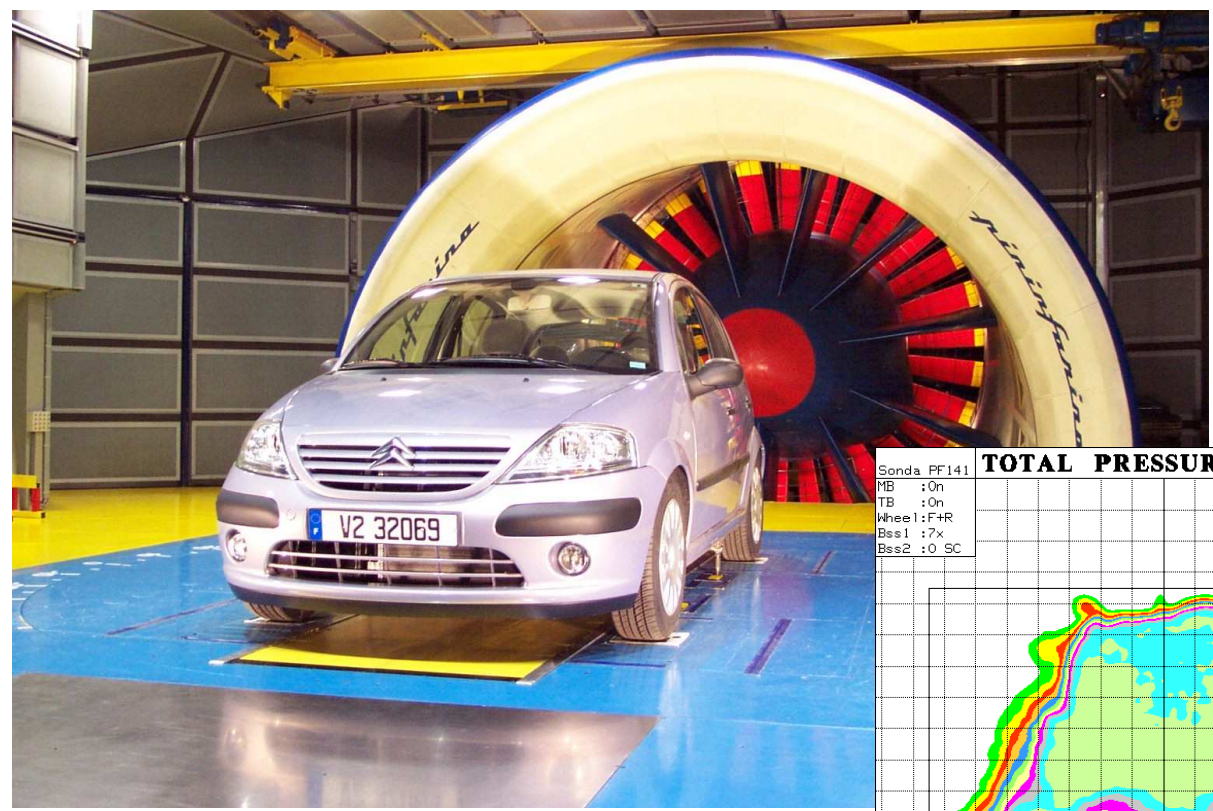
62 Test

200 partial models

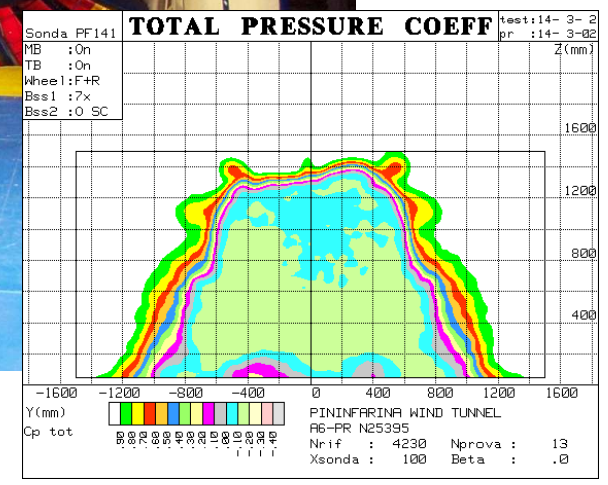
Mors than 1100 validations

Vehicle validation phase

Examples



Wind tunnel



Vehicle validation phase

Examples



Tri-axial bench for rear axle (durability)

Vehicle validation phase

Examples



Cold Mission : Snow get in engine compartment

Vehicle validation phase

Examples



Engine thermal measurement

Vehicle validation phase

Examples



Driving test

Vehicle validation phase

Examples



Industrial launch phase

Contributors : Design teams, suppliers, fitter, logistic, industrial teams.

Données d'entrée :

- Product definition
 - Model bundle
 - Parts list
- Process standard
 - Detailed synopsis
 - Assembly process
 - Technical documentation
 - Industrial facilities

Outputs :

- A vehicle and a plant matching the product/process reference system

Industrial launch phase **Quality KPI**

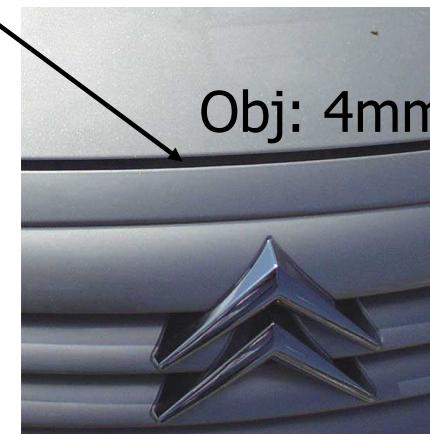
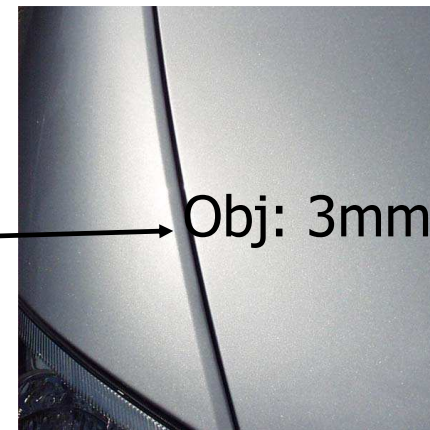
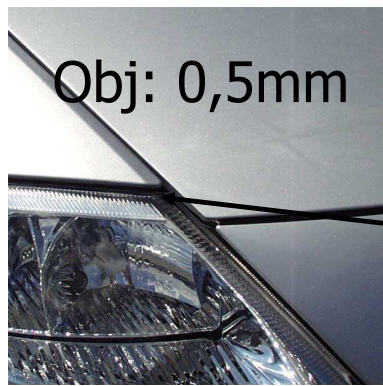
IQA : indicateur de qualité d'aspect à neuf

L'Indicateur Qualité d'Aspect (IQA) = level of quality for new vehicle coming off the plant.

An operator inspect all the aspect defaults on a new car from customer point of view.
45 minutes examination with a specific scale :

- Default A : **non acceptable** default that need an immediat job (+ 30 points)
- Default B : **Important** default the customer will criticize and ask for a repair. (+ 10 pts)
- Default C : **annoying** default the cutomer will notice and should ask for repair (+ 5 pts)
- Default D : **Anomaly** that can be notice by the customer without (+ 3 pts)

Industrial launch phase **Quality KPI : adjustment**



Industrial launch phase Quality KPI

IQF : « indicateur de qualité fonctionnel » this KPI is linked to the functional use of the new vehicle

An operator inspects all functional through 3 main tests :

- Using test(close the doors, the windows, seats settings , Steerwheel settings, engine compartment, dynamic test, ...)
- An engine drivability test
- A waterproofness test

With the following scale :

- Default S : Security default (+ 120 points)
- Default P : Breakdown (+ 100 points)
- Default t A : **non acceptable** default that need an immediat job (+ 30 points)
- Default B : **Important** default the customer will criticize and ask for a repair. (+ 10 pts)
- Default C : **annoying** default the cutomer will notice and should ask for repair (+ 5 pts)
- Default D : **Anomaly** that can be notice by the customer without (+ 3 pts)

Industrial launch phase **Tuning**



Platform zone

Welding workshop



Top hat zone

Industrial launch phase **Tuning**

Cataphorèse



Apprêt

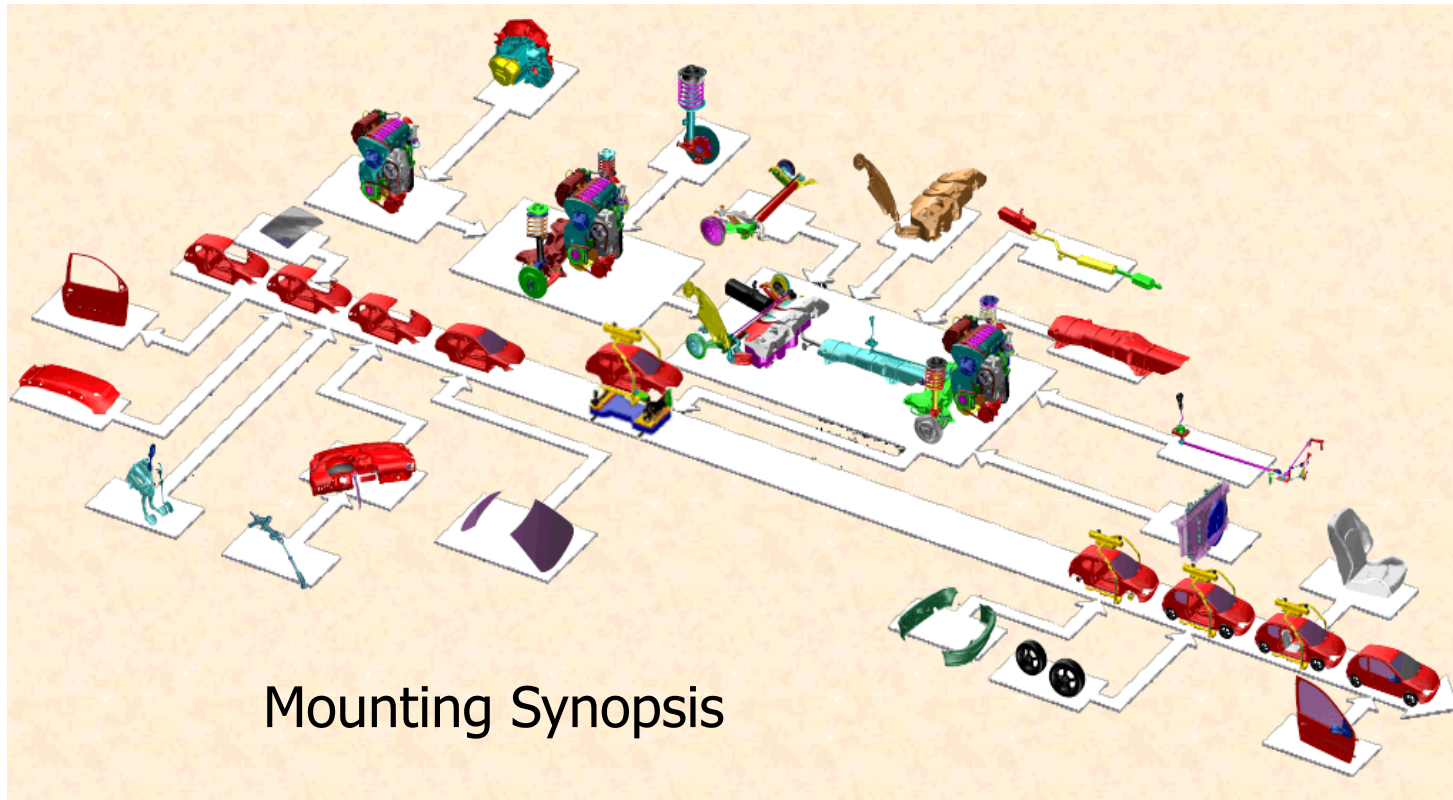


Base + Vernis



Painting workshop

Industrial launch phase Tuning



Industrial launch phase Tuning



Mechanical preparation



Skid prep



Body / chassis Marriage



Body in white prep.



Drive station preparation



Doors prep



End of plant test

Le Cycle en V De la conception	Plate forme Module	Organisation d'un projet	Les principales phases de conception d'une automobile
-----------------------------------	-----------------------	-----------------------------	--

Lancement commercial: le moment de vérité !

