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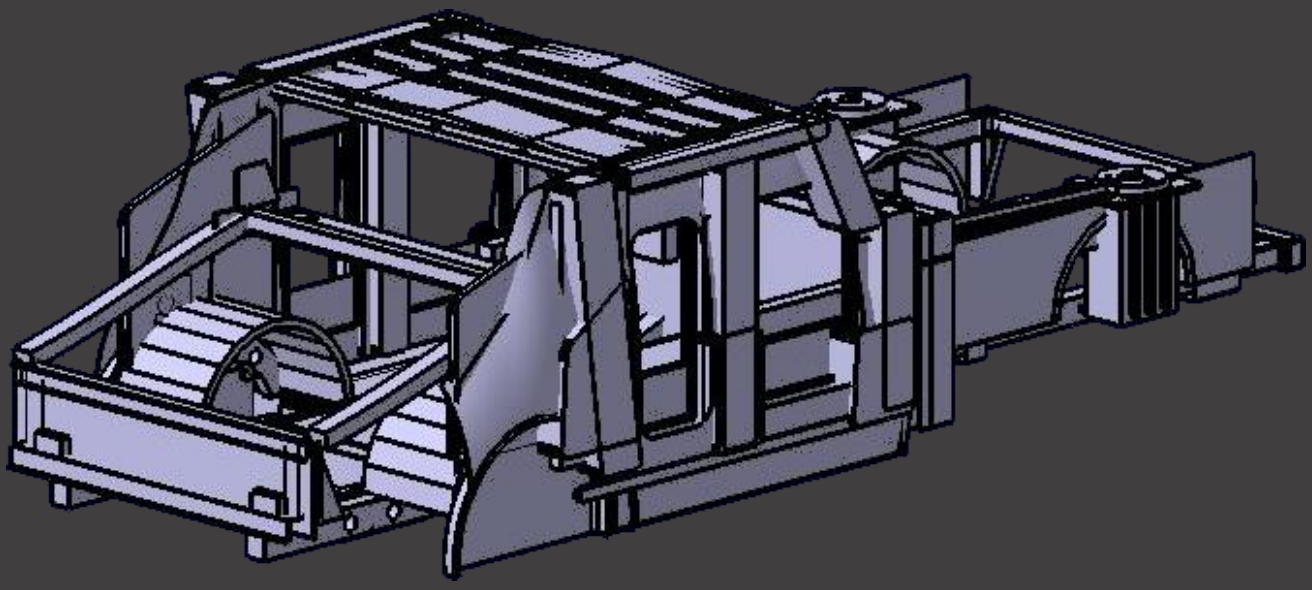
CASE STUDY · AUTOMOTIVE

A COMPLETE BODY-IN-WHITE, GENERATED

CONCEPTUAL STRUCTURAL FRAME GENERATION
USING NEXUS AND CATIA

Tools Nexus · CATIA
Outcome Complete concept BIW from 3–5 days in 8–10 h



WHAT'S INSIDE

A walk-through of how Nexus, engineering AI agent, took a sedan Body-In-White from a one-line brief to a complete concept frame in CATIA, decomposing the vehicle, building each subsystem, and turning 3–5 engineer-days into 8–10 hours.

SUMMARY

A complete concept Body-In-White, built from a one-line brief. Decomposed, generated, and refined in 8–10 hours.

Working from high-level engineering prompts, Nexus and the CAD engineer worked to build a complete concept structural BIW for a sedan. The engineer steered the AI agent by describing the engineering intent and objectives through natural-language prompting, while the agent decomposed the vehicle into five subsystems and held a clean CAD structure. What typically takes a senior engineer **3–5 days** was done in **8–10 hours**.

8–10 hrs
COMPLETE CONCEPT BIW, START TO FINISH

5
SUBSYSTEMS GENERATED FROM DESCRIBING THE INTENT ALONE

1
CLEAN PRODUCT TREE

PROBLEM

A Body-In-White is one of the most coupled structures in engineering: five subsystems carrying one load path, too interdependent to rush and too slow to rebuild. Most of the effort goes into building and rebuilding geometry, not the design decisions that matter.

01 **Interdependent architecture**

The underbody, front-end, bodyside, roof and rear-end are one load-carrying system. Move a single interface and the load path shifts across the whole body, so every subsystem has to be reconciled before the frame settles.

02 **Fragile to edit**

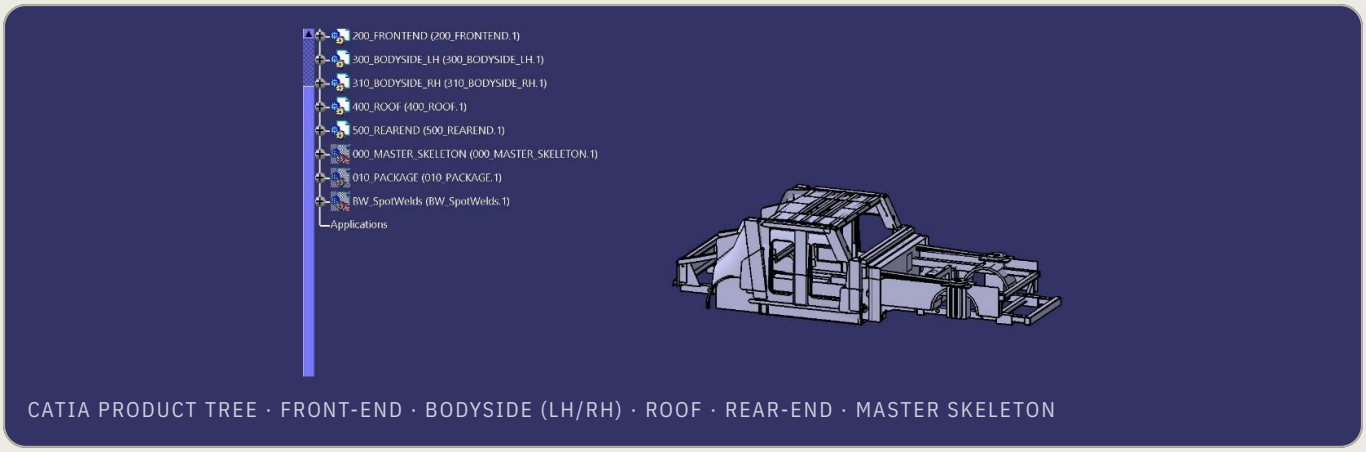
Editing a large CAD model is brittle: change one feature and references downstream break, forcing slow rebuilds.

+ **Benefit to engineer**

Nexus keeps the architecture intact as the design changes, so reworking the body stays low-effort and the engineer is free to explore, not locked into the first version that holds.

METHODOLOGY

The engineer worked in high-level prompts, rather than feature-by-feature CAD, giving Nexus objectives like “develop the bodyside” or “complete the roof assembly.” Nexus interpreted the intent, decomposed the vehicle into logical subsystems, and generated each assembly while maintaining the product structure. The more descriptive the engineer’s intent, the more detailed and realistic the result Nexus yielded.



CATIA PRODUCT TREE · FRONT-END · BODYSIDE (LH/RH) · ROOF · REAR-END · MASTER SKELETON

PROMPT DEPTH · OUTPUT SCALES WITH CLEARER, MORE DESCRIPTIVE ENGINEERING INTENT

#	PROMPT DETAIL	RESULT
1	High-level intent only	Complete concept BIW generated end-to-end
2	+ ask for OEM-style stamped sheet-metal assemblies (not just structural members)	Noticeably more realistic BIW
3	**+ production-intent refinement**	**Further gains in fidelity and completeness**

+ Nexus decomposed the vehicle

The agent understood the overall BIW architecture and split it into underbody, front-end, bodyside, roof and rear-end, generating complete subsystem assemblies from intent alone.

+ The engineer controls the fidelity

Output scaled directly with prompt depth; richer engineering intent produced a richer body, so the engineer dials in detail exactly where it matters.

RESULTS

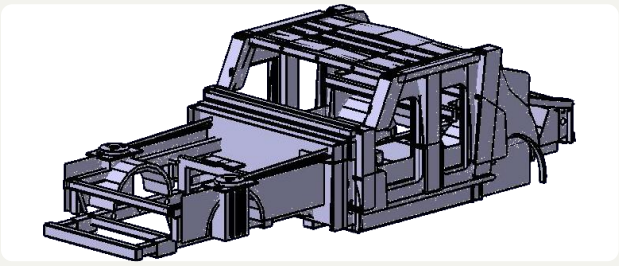
Whereas previously the engineer would have been building the CAD feature by feature, and rebuilding the subsystems as interdependencies broke, now the engineer spends more time thinking through the engineering intent.

TIME COMPARISON · MANUAL VS NEXUS, BY WORKFLOW

WORKFLOW	MANUAL	WITH NEXUS
CAD modeling	26 hr	5.5 hr
Engineering decisions	5 hr	3 hr
Review & refinement	3 hr	1.5 hr
Total	**34 hr**	**10 hr**

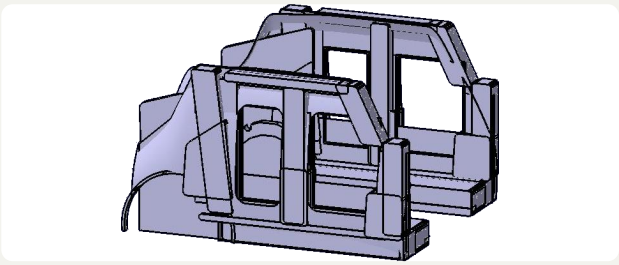
Manual times are the report author’s experience-based estimates; the comparison is concept-to-concept.

Every frame below was generated by Nexus in CATIA during the session, one coherent body whose proportions and load paths read as a real structural frame.



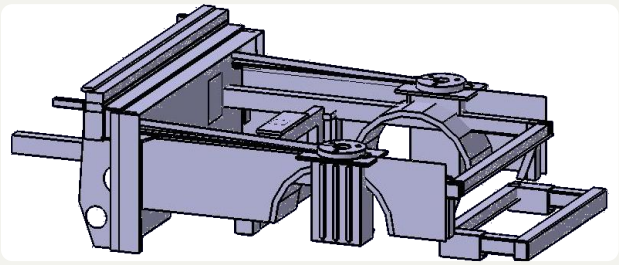
Full assembly

Underbody, front-end, bodyside, roof and rear-end resolved into one product structure with sedan proportions.



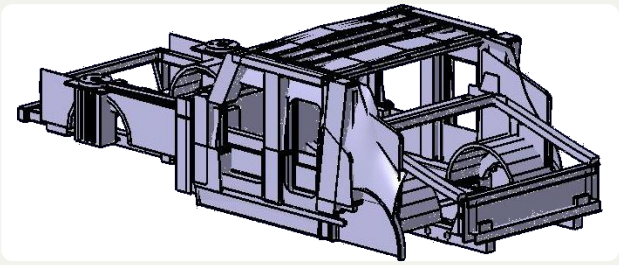
Bodyside

A/B/C-pillar structure and roof rail framing the door apertures, from a “develop the bodyside” instruction.



Front-end

Strut/shock towers and cross-car members carrying the load path forward into the underbody.



Roof & rear-end

Roof bows and rails tying into the rear-end structure, complete subsystem assemblies built from high-level intent.

HUMAN-AGENT COLLABORATION

Nexus built the concept BIW from the engineer's high-level intent. This page covers what it worked out unprompted, and how it kept the build on track on its own.

The high-value calls are made in collaboration with the engineer

With Nexus doing the modeling, the engineer's attention moves to what judgment decides: that load paths connect, interfaces close and the assembly is physically real. Nexus does not self-check these; it is designed to make sure the review stays engineer-validated, which is what makes the agent unique.

Where the value compounds

The effort goes into building the first concept. After that, the model and the prompts that shaped it are a reusable starting point: every variant, and the next program, begins from a working structure instead of a blank CATIA file.

Automated Engineering Validations

Nexus collaborates with engineers to run engineering validations, such as verifying the structural load paths, confirming interfaces close, and catching disconnected members, turning manual review time into a directed, automated pass. The engineer defines what to verify and Nexus does the checking.

A **The agent worked out the architecture**

Given a one-line brief, Nexus decided how to break the vehicle into subsystems and how they tie together, working out the breakdown itself instead of being handed one.

B **The agent keeps a record**

Nexus keeps a clear trace of what it builds in the CATIA structure. Because it records each step it performs, the engineer can modify or roll back anything the agent did and restore any earlier working version.

→ Next steps, with Nexus

From here the engineer pushes the concept further and generates variants, with Nexus editing the existing model in place rather than rebuilding it, so each pass is a fast edit, not a fresh start. With richer intent each time, the report points to a path toward production-ready bodies with less human guidance.

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Think through > click through. Let Nexus handle the rest.

YOUR AI AGENT FOR ENGINEERING WORKFLOWS

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