VOLVO

Technology

Jim Rowan, President and Chief Executive Officer
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Technology

Our approach to technology is very deliberate and purposeful: we create technology that is core to us, and we couple in-house development with strategic partnerships with global tech leaders.

The idea is to always do what is best for our customers and we know our customers better than anyone else, so certain things we can do better than anyone else.

For example, we know the vehicle dynamics and ride performance our customers want, and we take full ownership of that.

That means controlling our e-motors in detail and we develop these purely in-house.

We also develop our passive and active safety tech in-house.

We've done so for nearly 100 years and we have all the competence we need, including an industry-leading safety centre.

For some other things, however, we work together with global tech leaders.

We are very proud of our partnerships with technology leaders like Google, Qualcomm, NVIDIA and Luminar and what we deliver together.

We were the first to introduce Android Automotive OS to those customers and bring embedded Google Services such as Maps and Assistant to those customers.

This allowed us to operate on the cutting edge, delivering a great customer experience, and we continue to work closely with Google, to continuously improve this experience.

Our partnership with Qualcomm and the low latency, truly seamless and responsive experience we deliver together with rich visualisation, is another great example.

We are the first legacy car maker to move to an AI-enabled core compute architecture powered by NVIDIA – which will improve customer experience immensely and enable us to improve our cars through software over time.

We were an early investor in Luminar – and are the first to introduce its lidar technology at scale, taking the safety level of our cars to an even higher level, and improving driver assistance functionality.


STOP

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So, this is how we work with vertical integration: we do what we do best, and we enable others to do what they do best.

This brings speed, nimbleness and focus.

All the work we do goes into the superset tech stack so it can be used not only on one car but our complete line-up. This approach is a true game changer.

It will enable us to improve safety for people in and around Volvo cars even more, and it will allow us to create a truly stunning customer experience that improves with time.

For the EX90. For the ES90. For the EX60 – and cars beyond. So, with that, let’s now welcome Anders on stage to explain in more detail and share more about our technology roadmap...

Technology

I am here today to share some big ideas we have with technology. Moving from cars that take you from A to B, powered by internal combustion engines, to truly global cars that are endlessly integrated into society, ecosystems, and people’s lives.

Technology that enables us to continue to lead in safety and sustainability. Technology that delivers a stunning customer experience.

Cars powered by electricity and a single superset technology stack that delivers one brand in many different product flavours.

Technology

We all know the EX90 is coming later than what was initially planned.

But it is here now; being shipped to our retailers and starting to reach customers later this month.

I personally drove the EX90 across the United States just two weeks ago. East coast to west coast.

It’s the best car we have ever made and I could not be prouder.

We have successfully made the shift to a software-defined vehicle powered by a core compute system.

Taken the leap.

Climbed the hill if you will.

And it’s a hill we will not have to climb again.

We are about to reap the benefits. With the EX90 and all the cars after it.

Now let me share with you 4 of the key building blocks for our software-defined vehicles:

- Core computing,
- 5G connection and integration to our federated cloud
- Rhe data centre
- Ecosystem integration.

Let’s look at them one by one.

First – core computing. EX90 marks the launch of Volvo Cars’ software-defined vehicles.

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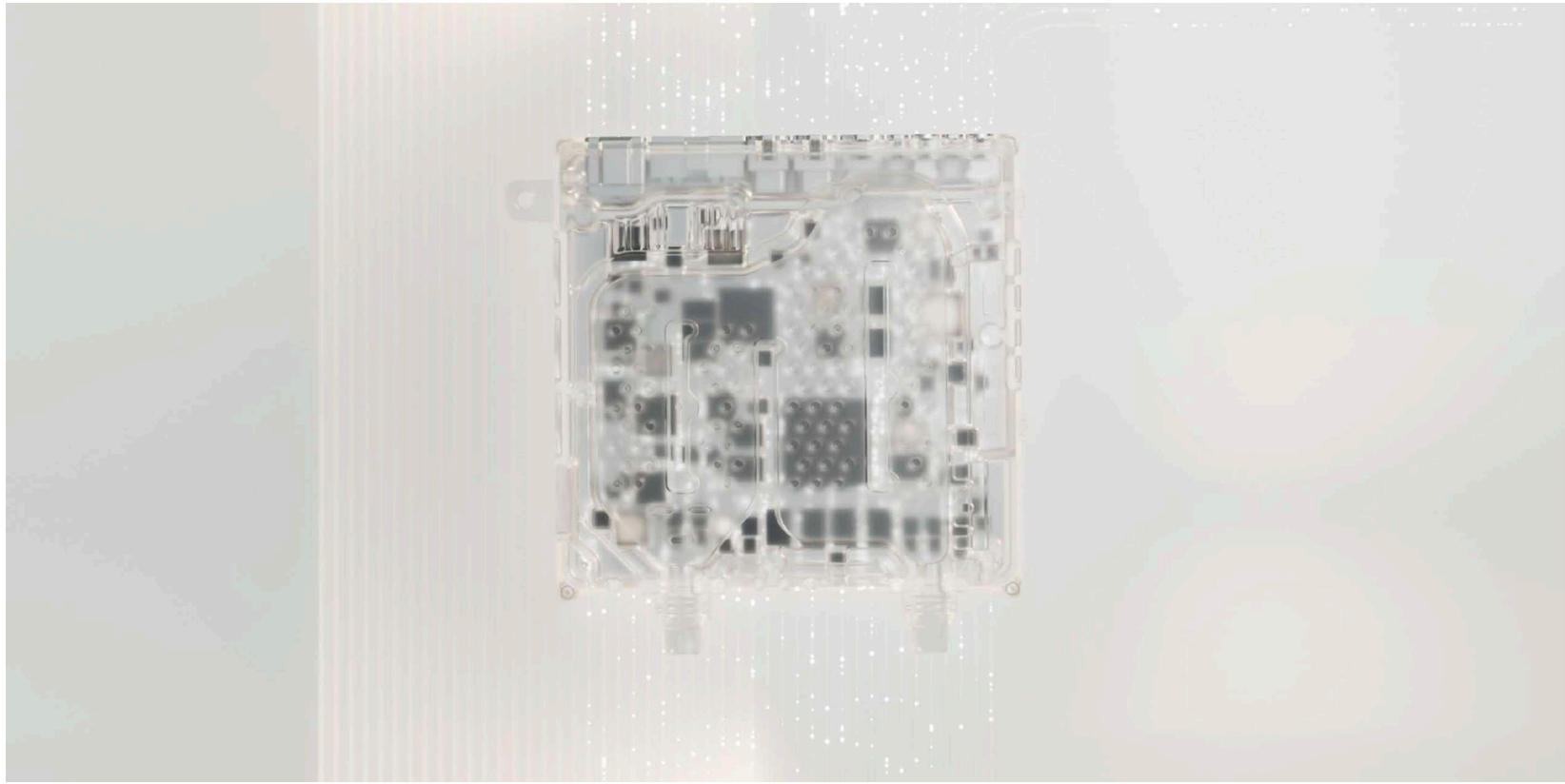
The powerful computing inside our cars represents a fundamental shift in how we design and improve our cars through software over time.

This is because we now do closed-loop development based on data, connectivity, software and core computing. If moving to electric was big, the shift to truly software-defined and a core computing system is even more massive.

Every part of the car, how it functions, what information it provides, the ability to receive new instructions is designed centrally through software.

Our capable core computing allows us to have this fast-paced, software-driven development process, and we will be able to relentlessly improve every aspect of our cars fuelled by real-time insight, and run by our talented engineers in our development centres and tech hubs around the globe.



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To fully benefit from this approach – designed to give our customers a fantastic experience and help keep them safe – we have decided what we want to do and we go all in.

That’s why electrification is so important.

And that’s why all our future electric cars will have core computing at their centre.

Enabling them to be truly software-defined.

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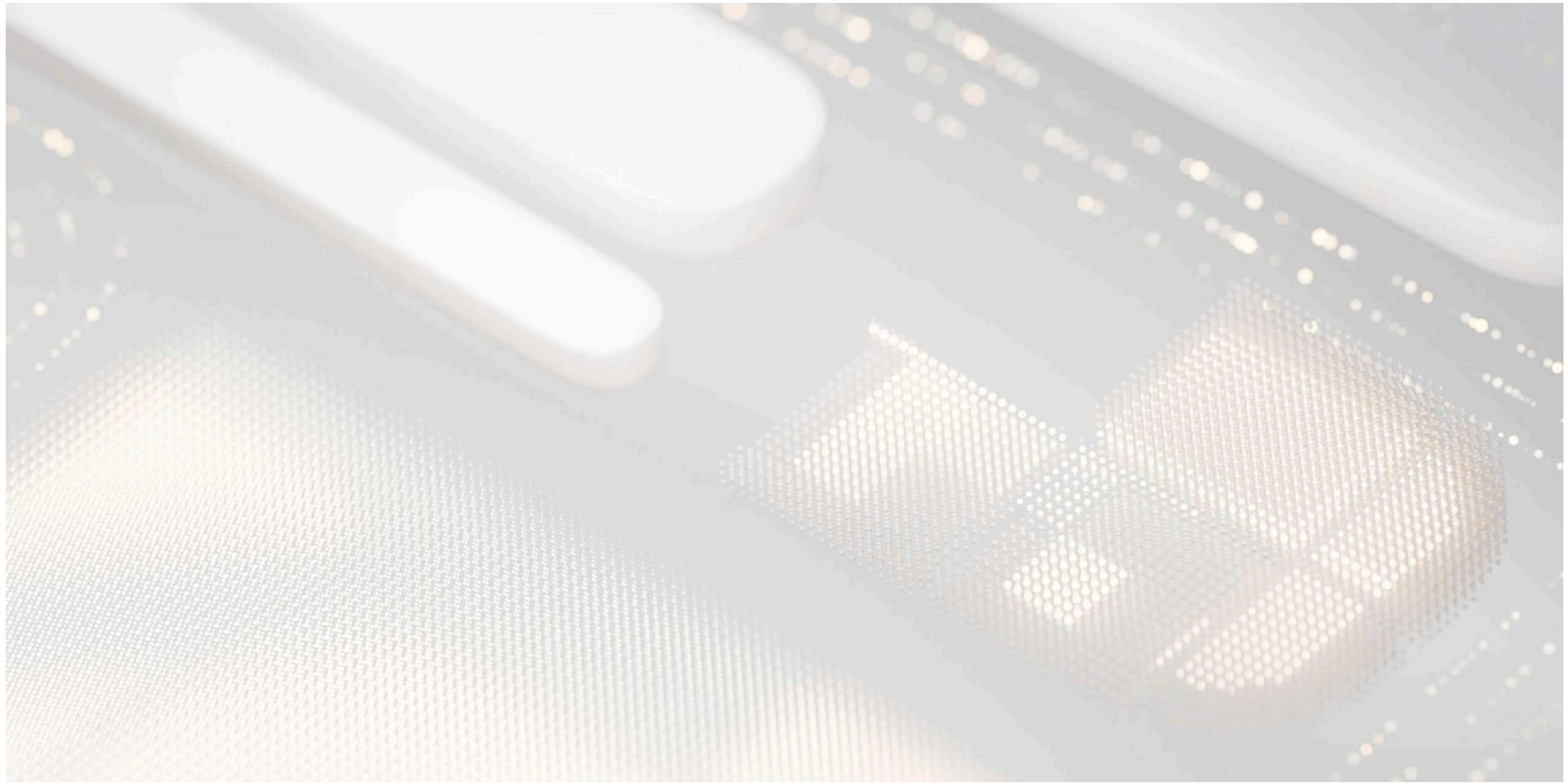
Starting with the EX90, all our electric cars will be based on the same fundamental core of systems and modules, scalable in performance, size and cost. From B to F.

This fundamental core of systems, modules, software, and hardware –

- scalable vehicle architecture
- propulsion and energy systems
- electrical and computer architecture
- integration to the cloud and ecosystem
- software that encompasses everything and all building blocks, across all engineering disciplines.



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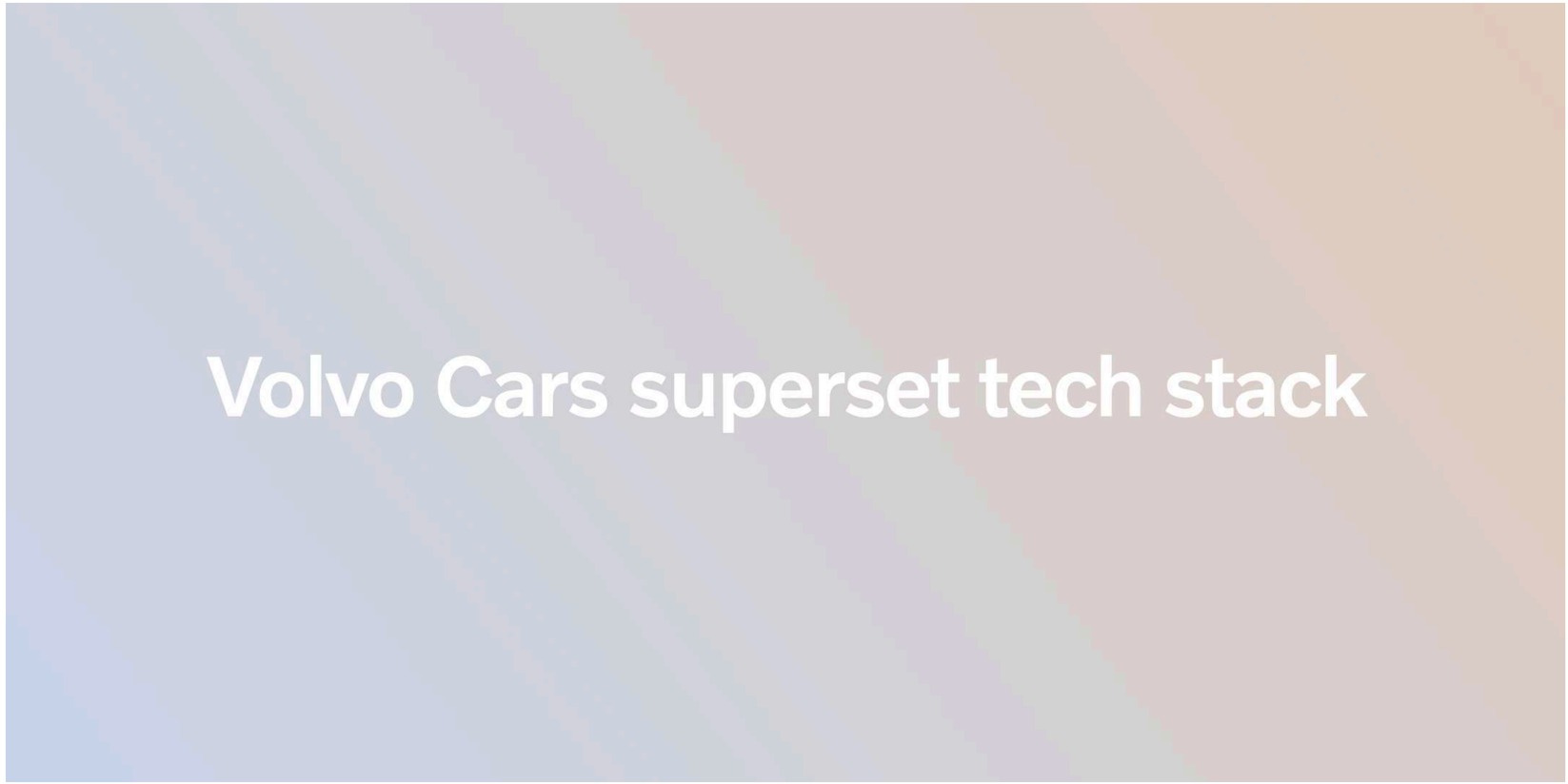
All this together is the Volvo Cars superset tech stack.



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The EX90 is a subset of this Volvo Cars superset tech stack.

A choice of software, modules and hardware systems taken from the superset.

The ES90 will be as well.

Not the same choice of software, modules and systems as the EX90, but a choice from the same superset.

The same goes for the EX60, and every new electric model after it.

The superset is like a set of building blocks, that can be configured in many different ways.

The animation behind me represents the superset.

Building blocks of software and hardware – large blocks like vehicle architecture, electric and electronic systems, and smaller blocks of individual software and AI applications as well as mechanical components.

Now – why is the convergence to single tech stack a game changer?

Because it allows all our engineering efforts towards new cars to be channelled into one single direction.

We put all our focus on relentlessly progressing and enhancing ONE tech stack, and where everything is fuelled by the same software, where all the mechanical and electrical interfaces are defined.

Improving it. Growing it. Expanding capabilities.

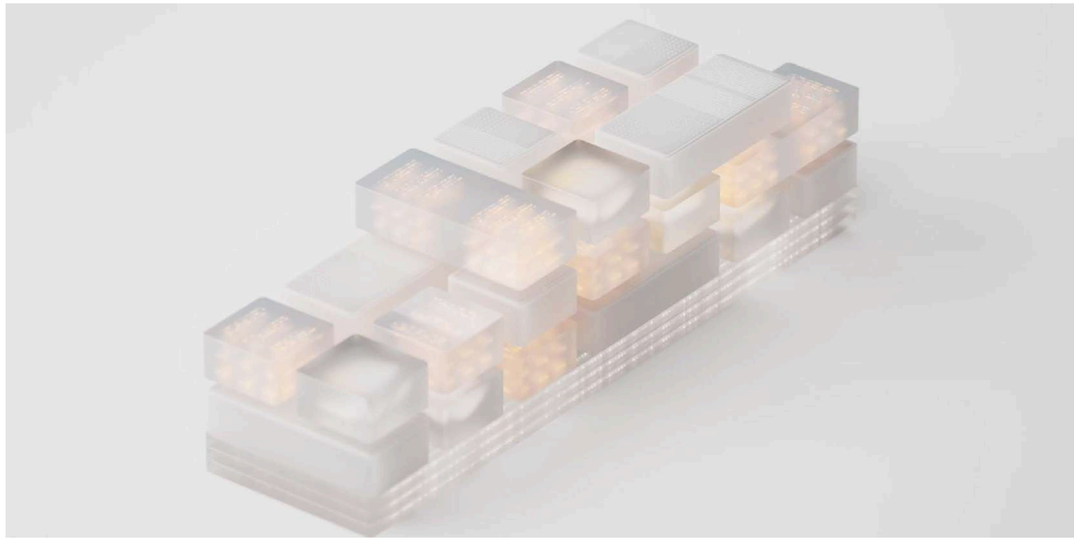
This is a recipe to combine the necessary discipline of mass production of the world’s most complex consumer product, with the desire to create a supremely powerful platform for innovation.

That means the EX90 – and its customers – will benefit from our ongoing development efforts for our future cars like ES90 and EX60.

We are converging our technology to one stack.

To allow us to move at the speed of technology.

To create one fantastic, uniform experience for all our customers across all our cars and to be efficient and deliver greatness.



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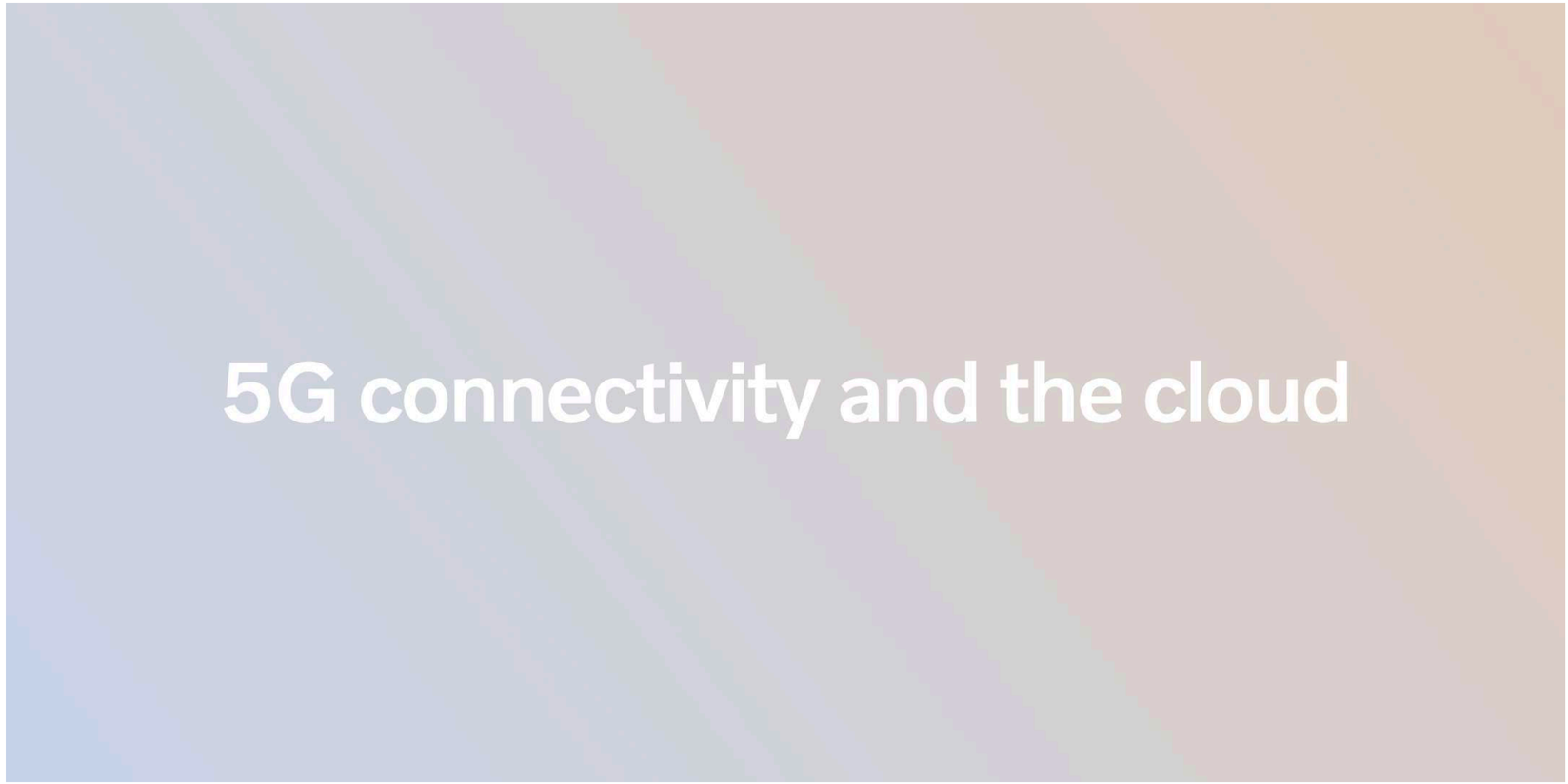
All our efforts are going into the superset tech stack, but how do we know what to improve and what additional features to develop?

We believe insights from real-world, real-time data are the answer.



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For that, all our upcoming electric cars are capable of 5G connectivity and continuous data transmission to the Volvo Cars Cloud.

So, instead of developing features based on data from hundreds of test vehicles and – to be honest, opinions, we can now continue improving them based on insights from millions of cars on the roads.

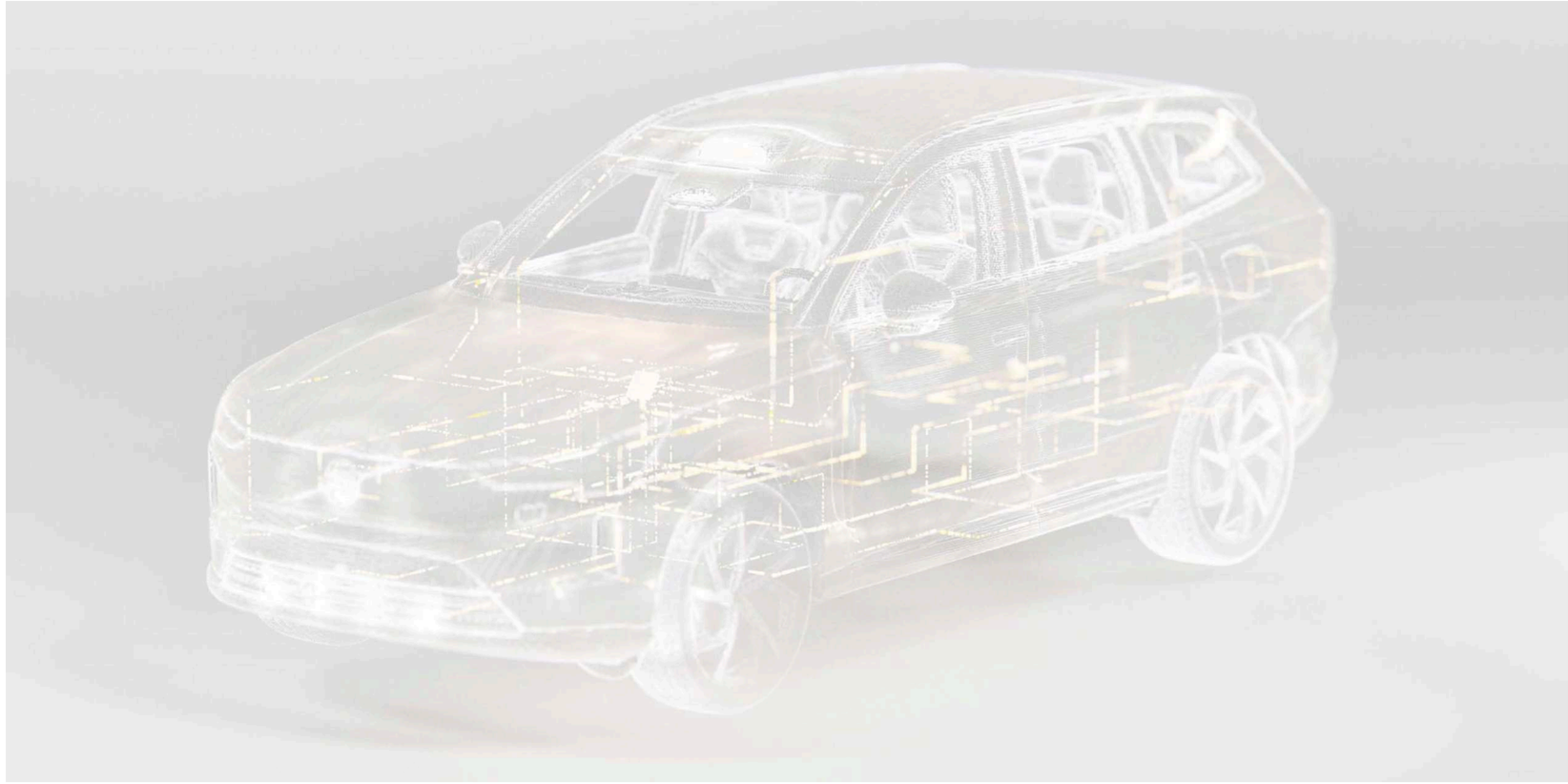
The connectivity and the flat topology – everything connected to one central hub – and the core computing architecture of our cars enable this.

We can learn about and improve every aspect of the car.

Because we can not only comprehend all the input from sensors, we can also write new instructions to the actuators – improve the car and how it operates.
Over the air.

We already do this today with 3 million over-the-air updates in 85 countries last year.

With our tech stack, starting with the EX90, we are taking it to the next level.



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The best, and of course the most important application is safety.

Real-time data; translating to insight allowing us to improve the safety levels of our cars tremendously.

Of course, with adequate safeguards for data privacy. Because data safety is also safety.

But more on that in a bit.

So, I've shared two of the major building blocks for the software defined vehicle.

The core computer in our cars is the first.

The car's 5G connectivity and integration into our federated cloud is the second.

The third is our data centre.

Safety data from our fleet will be processed and stored securely in Oden - our data warehouse, equipped with one of the largest AI supercomputers in Europe.

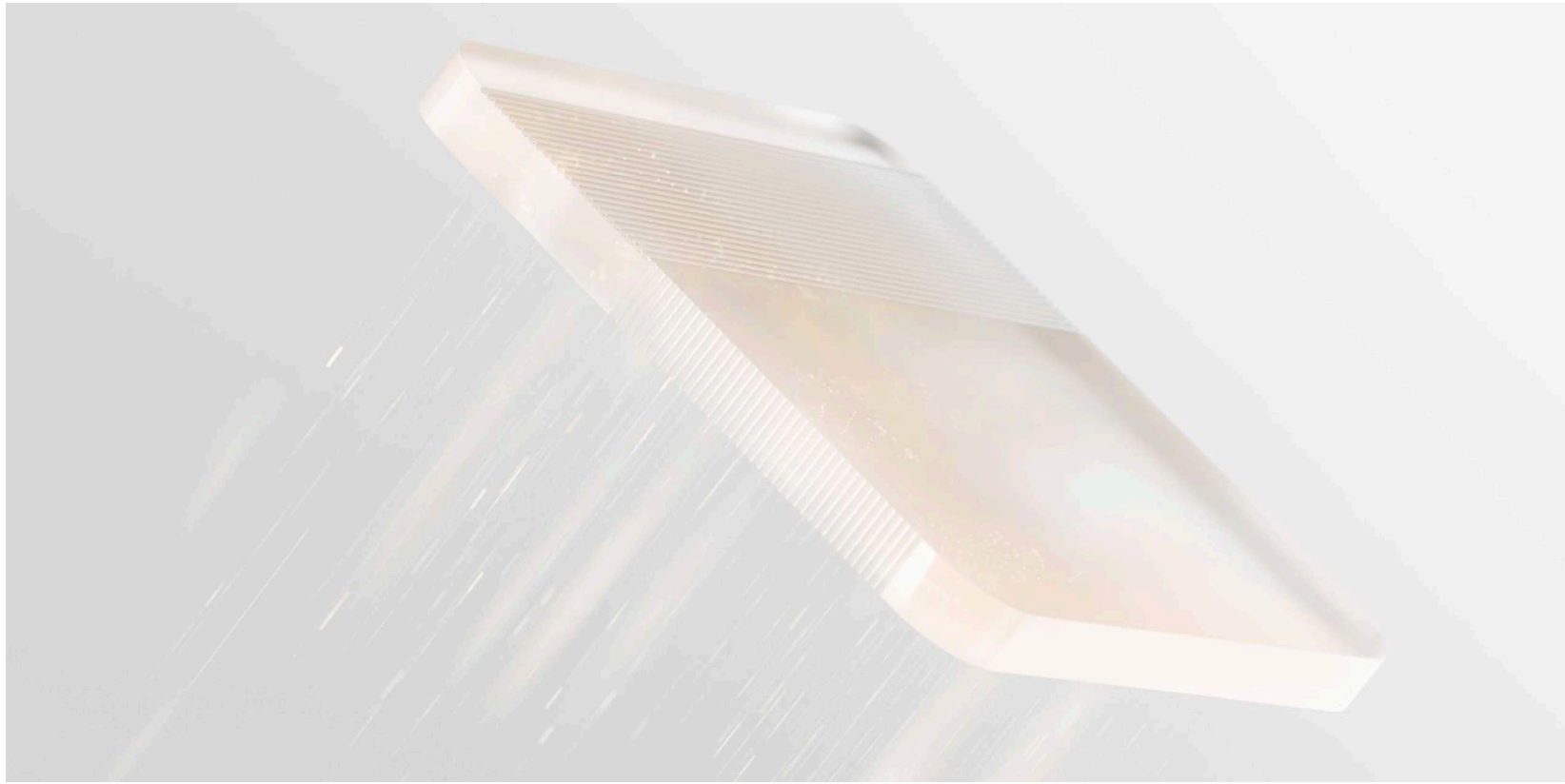
Technology

Oden´s AI infrastructure is powered by NVIDIA DGX H100 - the latest generation of AI compute by NVIDIA.

This enables our talented software engineers to facilitate the continuous learning loop based on data and allows us to use AI and machine learning capabilities to train our algorithms.

Improving the car´s capabilities in short development loops, benefits customers today and tomorrow. AI is obviously a big thing right now.

We apply AI where it matters the most – improving safety and saving lives.



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But there is of course massive potential in other areas.

The core computer in our next-generation cars is powered by the same core architecture from NVIDIA, that is used to develop and run generative AI applications like GPT-4.

Technology

That means it is possible for us to run generative AI directly in the car’s computer – dramatically reducing latency.

Technology

This is called edge computing.

We will come back to you at a later stage on how we will use it.

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Before we look closer at our next-generation cars, let’s zoom out once more for the final building block, which is ecosystem integration.

For over a century, cars have taken you from A to B as a stand-alone device, isolated from rest of the world.

Today, people are integrated into a myriad of different ecosystems, owned by Google, Apple, Amazon, Huawei in China, SK in South Korea – you name it.

But no one wants to have as many ecosystems as devices.

Our approach is to support the choices made by customers.

We aim to create APIs that third-party developers can use to build apps and services.

We do this to improve customer experience – and we know that this will contribute to customer loyalty in an increasingly connected world.

We want to be part of your ecosystem and integrate into it.

The car will become more and more integrated into your life and into society.

We are just at the beginning.

Technology

The beginning of a new era.

We have built the foundational superset tech stack.

And we have built the infrastructure to support the superset tech stack.

These are investments made that we do not have to make again.

Now we ‘just’ continue building, relentlessly iterating.

Operating more efficiently, and delivering more value over time.

Technology

Now – let’s dive into some key tech details for SPA3.

The next evolution of our electric technology base.

SPA3 is a part of the superset technology stack.

The same as SPA2 is for EX90 and ES90.

With SPA3 we are essentially just expanding the bandwidth of the continuously evolving mechanical and hardware tech stack.

All kept under the umbrella of the same software stack.

What we are doing with SPA3 is making some key upgrades to further improve customer and shareholder value.

To be clear. This is not another hill to climb – like SPA2 was from SPA1.

It’s a step and a continuation of all the work done for SPA2.

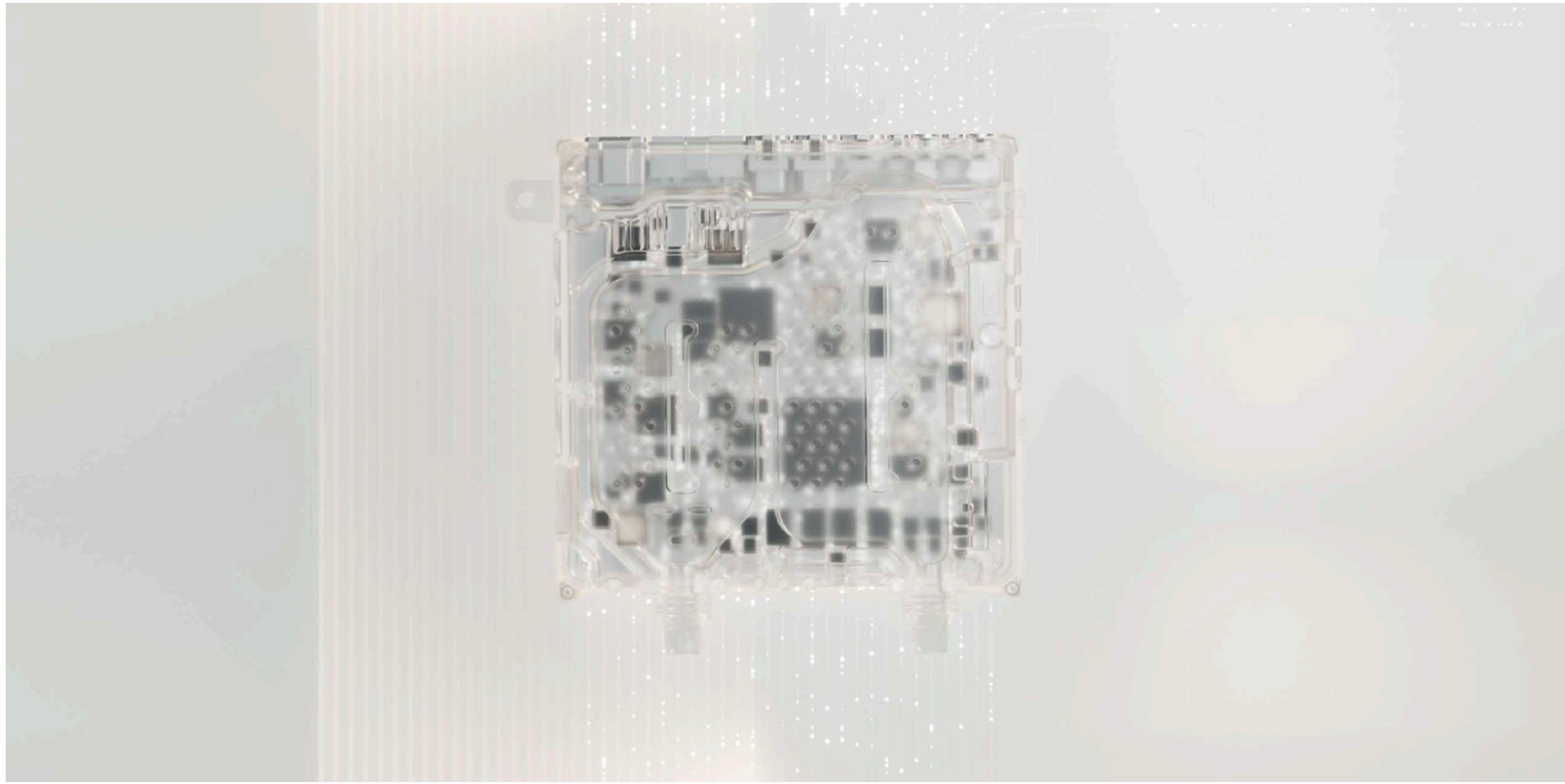
Now, let’s have a look at core computing, batteries, e-motors, mega casting, and modularity.

Technology

We're introducing the EX90 with a core system based on NVIDIA DRIVE Orin – a compute platform that secures high performance to improve features and build customer functionality over time.

The same core system based on Orin will also power the cars on SPA3.

And we are proud that we could announce today that we are continuing and deepening our partnership with NVIDIA.



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Later this decade, we will introduce core computers based on Thor – to enable the next generation of computing for our next-generation cars.

Thor is capable of up to 4 times as many operations per second as Orin, while significantly reducing the energy consumption and improve the efficiency of the vehicle.

We will offer Thor in different versions – lower performance versions for the base needs and higher performance for customers that want more advanced driver assistance systems, and eventually autonomous driving.

This shift to Thor is the next step in streamlining our offering, to improve customer experience and margins for the company.

Technology

Now let’s talk a bit about our approach to the electric powertrain.

Our first generation of electrified cars came with off-the-shelf e-motors and bought battery packs.

But to be truly competitive as an EV maker, we need to optimise end-to-end and obsess about efficiency.

In the latest EX40 and EX90 for example – we take things to another level.

We have gone from 85% efficiency on the first generation, bought motors, to a very competitive 91% on our in-house designed, generation 2, already in production.

All while going down in cost, size and weight.

We embrace technology, improve performance, and go down in cost.

We have moved from buying entire battery packs on specification, to working closely with partners in developing modules to go into our in-house designed and manufactured battery pack for the EX90. With this we have taken a huge step forward.

Making cars more efficient and competitive, enabling them to go longer with less – and making the ride more ‘Volvo’. Comfortable and responsive.

With SPA3 we are taking a further step forward.

Looking for the next few per cents of efficiency, range and performance, we are introducing our third generation of e-motors.

Designed and built in-house.

With higher efficiency and performance.

Aiming to reach 93% efficiency.

And at a lower cost.

Technology

With SPA3, we are also introducing a brand-new battery concept.

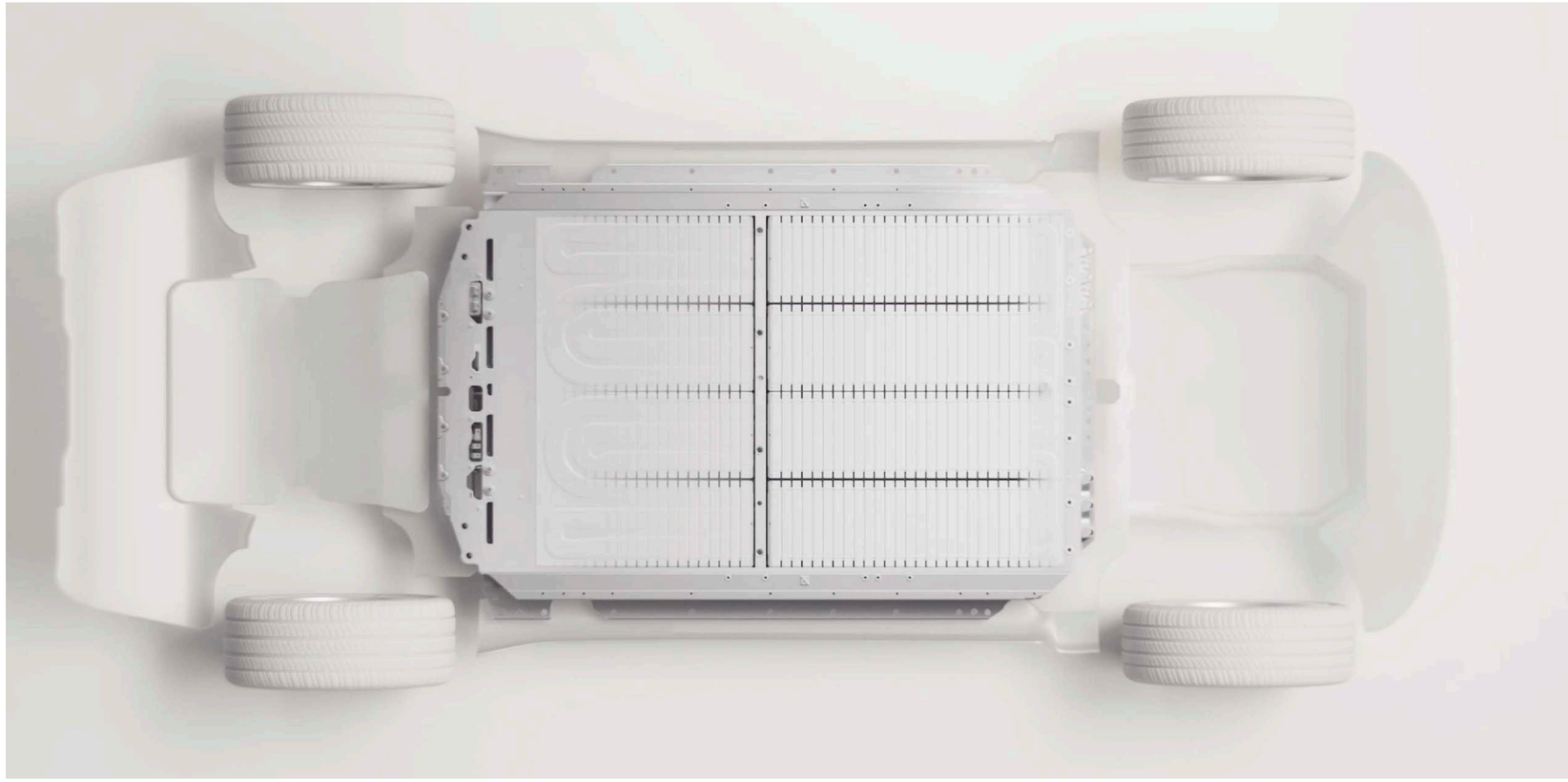
We are fusing the battery cells to the body of the car, letting the batteries become part of the body structure.

In a smart way, with serviceability in mind.

This reduces weight which enables more range, more space inside the car for the passengers, and a better experience – and of course, it reduces cost. Significantly.

We are also introducing the next generation of battery cells.

The batteries in SPA3 have an even higher energy density than SPA2 – delivering longer range at lower weight and with fewer cells.



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Finally on scalability – another key benefit of our next-generation architecture.

As part of the superset tech stack, the SPA3 architecture is designed to be upgraded over time and scalable in every dimension; size, price, performance and adaptability to region.

Software which unlocks the capabilities of the hardware.

Hardware which integrates, evolves and becomes ever more capable.

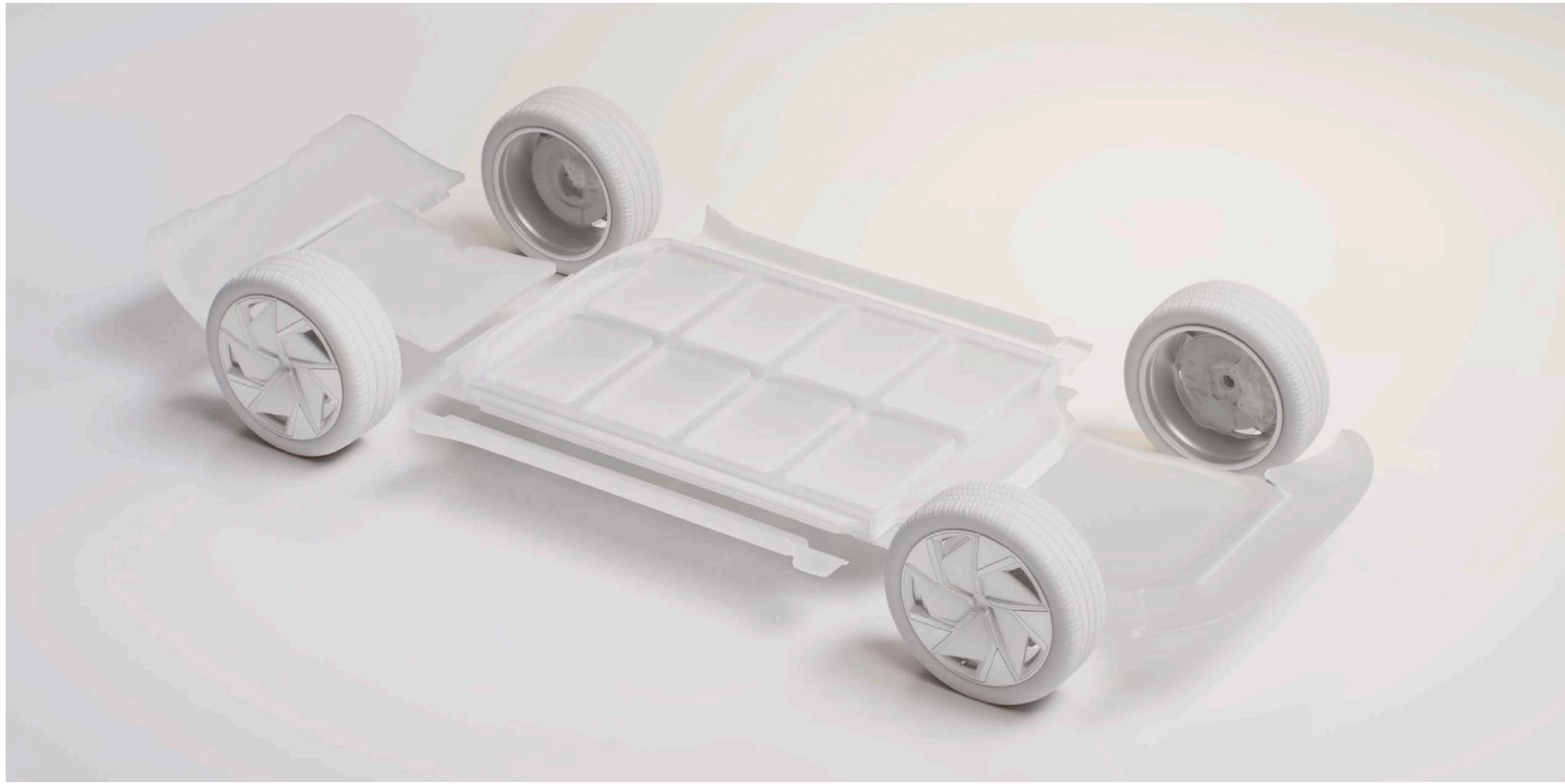
All with standardised interfaces, allowing parallel development and high-quality launches.

That means – instead of large steps between generations, we can continuously develop and build cars of all sizes on the same technology base, with the ever-evolving superset tech stack.

We will continuously update the cars in production with better and more efficient designs, as well as update the fleet on the road with the latest software.

The EX60 will make a fantastic entry in the premium electric C/D segment, but SPA3 can also create cars in many other segments should the company wish to do so.

Larger than the EX90 and smaller than the EX30 – using the same scalable tech stack, with supreme integration and with the possibility of providing great margins.



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We already today do truly global products. Not many carmakers do.

We already today do complete and deep over-the-air updates of these products, in more countries than any other carmaker, as far as we are aware.

Now add these two existing capabilities to our shift towards one single technology stack that will power all our cars going forward.

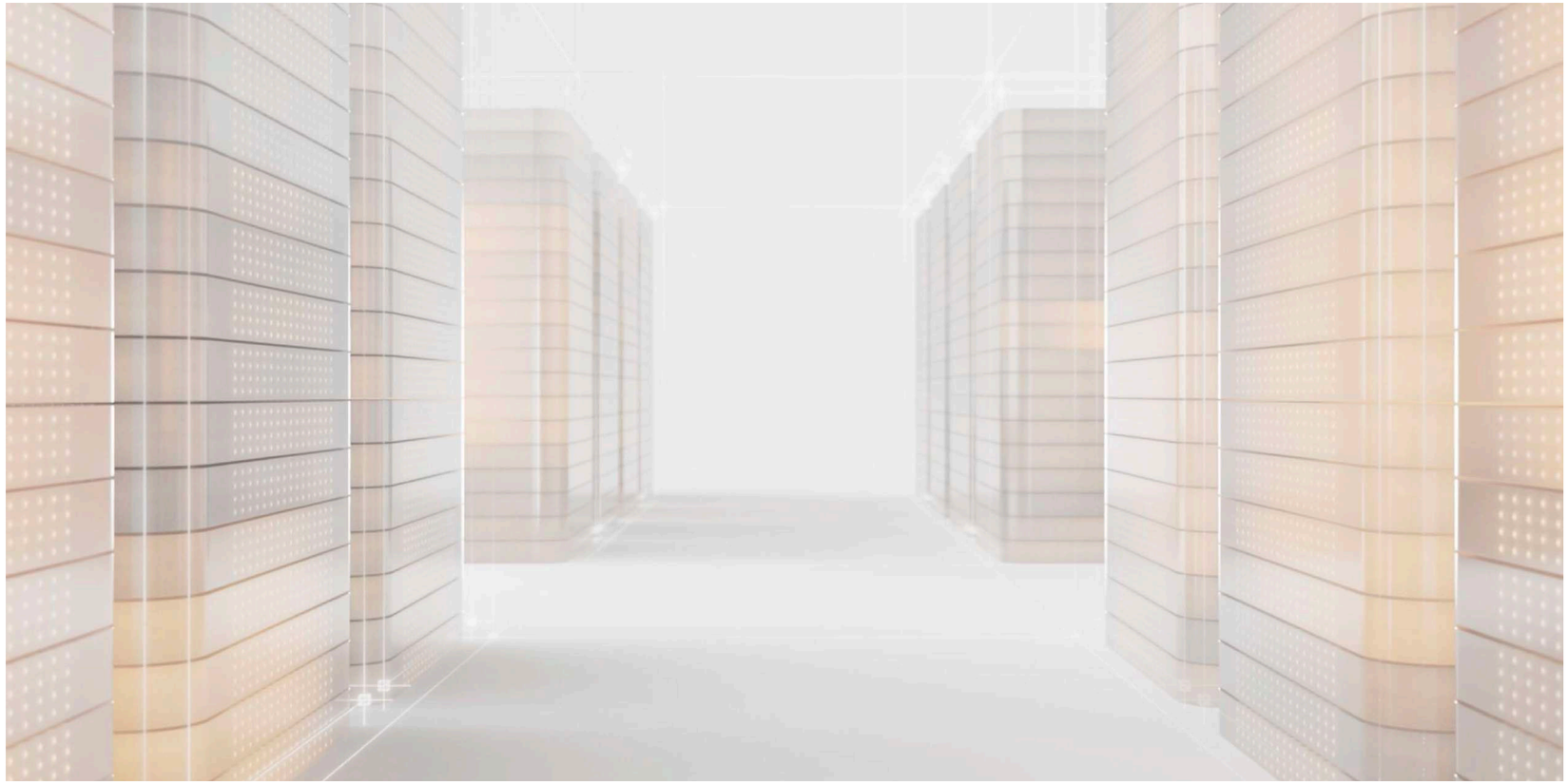
This allows us to channel all our efforts into one flow, designed for scale, that is optimised continuously over time. That goes to engineering, manufacturing, data management and more. We see this position as unique in the market.

We will be able to deliver more customer value across the complete line-up,

And, we will be able to build shareholder value through scalability, efficiency, optimisation and globalisation.

Last but perhaps most important, we have a fantastic talent base to make all these happen – not only here in Sweden, but also in our engineering centres and tech hubs around the globe. Kudos to the team!

Now we will walk you through how our unique approach and future technologies will continue to reinforce our safety leadership.



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