Dok-Ing XD

Using NVIDIA Tegra To Solve The Electric Car Power Dilemma

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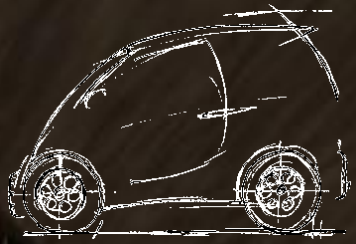

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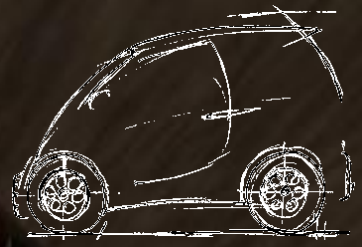
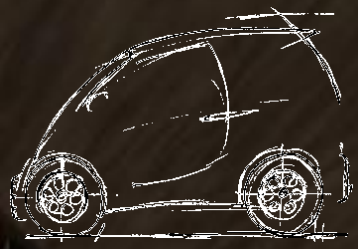
Introducing the XD Concept

What Consumers Want?

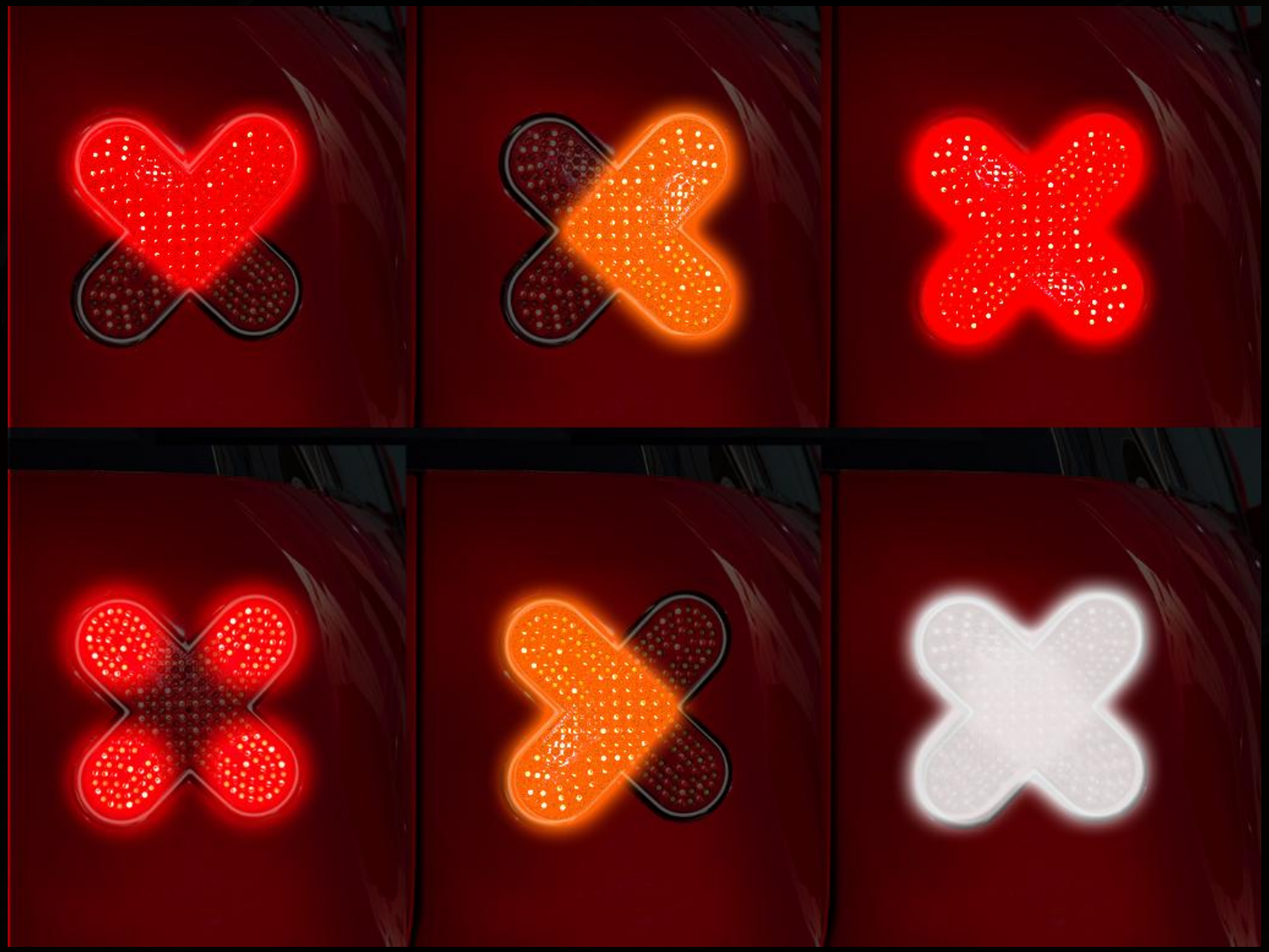


- Consumers view cars as a commodity
- Tuning companies had record growth during GFC
- Today's customers demand contemporary experience
  - Customization for each individual
  - An iPhone-like experience
  - Seamless UI
  - High-Definition screens

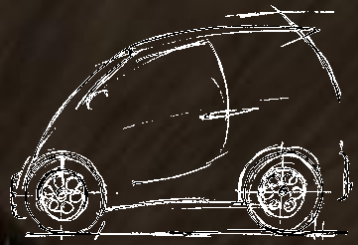


How XD Got Its Name?

Hello. I am XD.

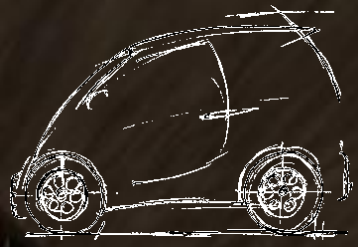


Tail Lights with a Smile

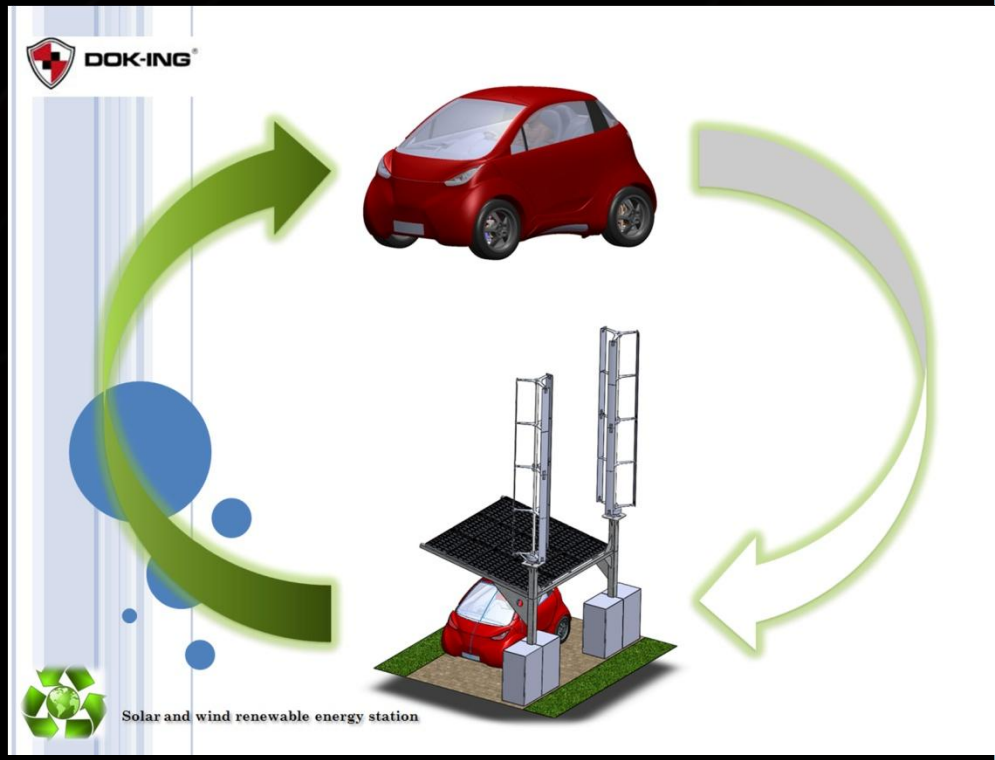


- “XD” is an everyday symbol
- Lights are adjustable via our WinPC and Android Apps
- Biggest challenge was to satisfy worldwide regulations
- Our car can be registered in all countries

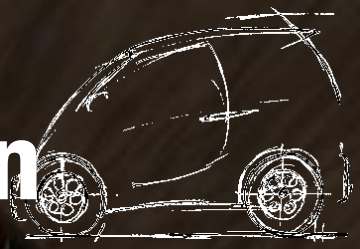
Performance



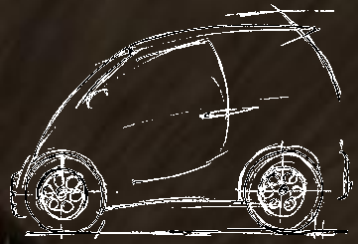
- Small, safe and sporty electric city car
- 80 kW / 107 HP
- 360 Nm / 266 lb-ft
- 0-62 mph in 7 sec [Green]
- 85 mph top speed [Limit.]
- Range up to 150 miles
- 187 MPG
- Non-flammable batteries
- Zero CO2 Emissions with Dok-Ing's Charge Station



Going Green Should be Fun



Who Are We?



- Established in 1991
- Pioneered mechanical robotic mine-clearing machines
- International leader in designing and manufacturing of multi-purpose robotic machines
- Strong internal R&D
- ISO 9001:2000 certified
- Relations with over 50 countries
- Active presence in 24 countries

Dok-Ing Product Groups

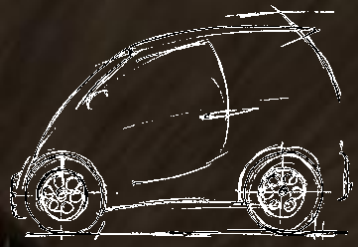
- Mine Clearance
  - MV-4
  - MV-10
- Deep mining & excavation
  - MVD
  - XLPD
- Fire-Fighting System
  - MVF-5
- New Technology Development
  - Wind Energy
  - Solar Energy
  - Recharge Stations
  - XD
- Prototyping

Power Challenges in an Electric Car

- Everything that consumes power is luxury!
- Power window - 360W (12V/30A)
- AC - 3700W
- Every motor reduces battery charge 0.1-1.0%

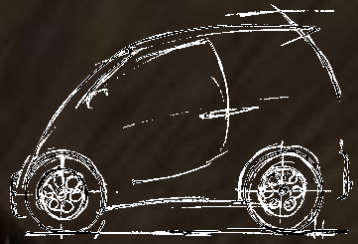
- Typical Desktop PC (single display) - 250W
- Original Electronics inside the XD - 380W
- 5 Tegra systems (three displays) - 98 Watts

Optimizing Power



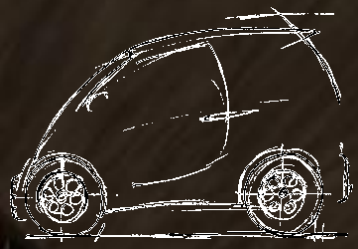
- Where can we save power?
  - Engine Cooling
  - Air Conditioning
  - Electronics
  - Lights
  - Thermal Isolation

What did we do?



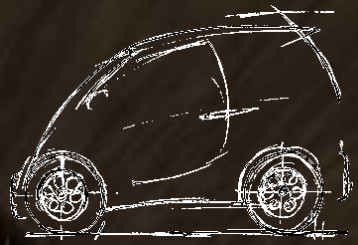
- T.E.C. based drivetrain cooling
- T.E.C. based Air Conditioning Unit
- Digital power converters for highest efficiency
- T-Amps instead of analog amplifiers for audio
- Electronics that consume up to 70% less power

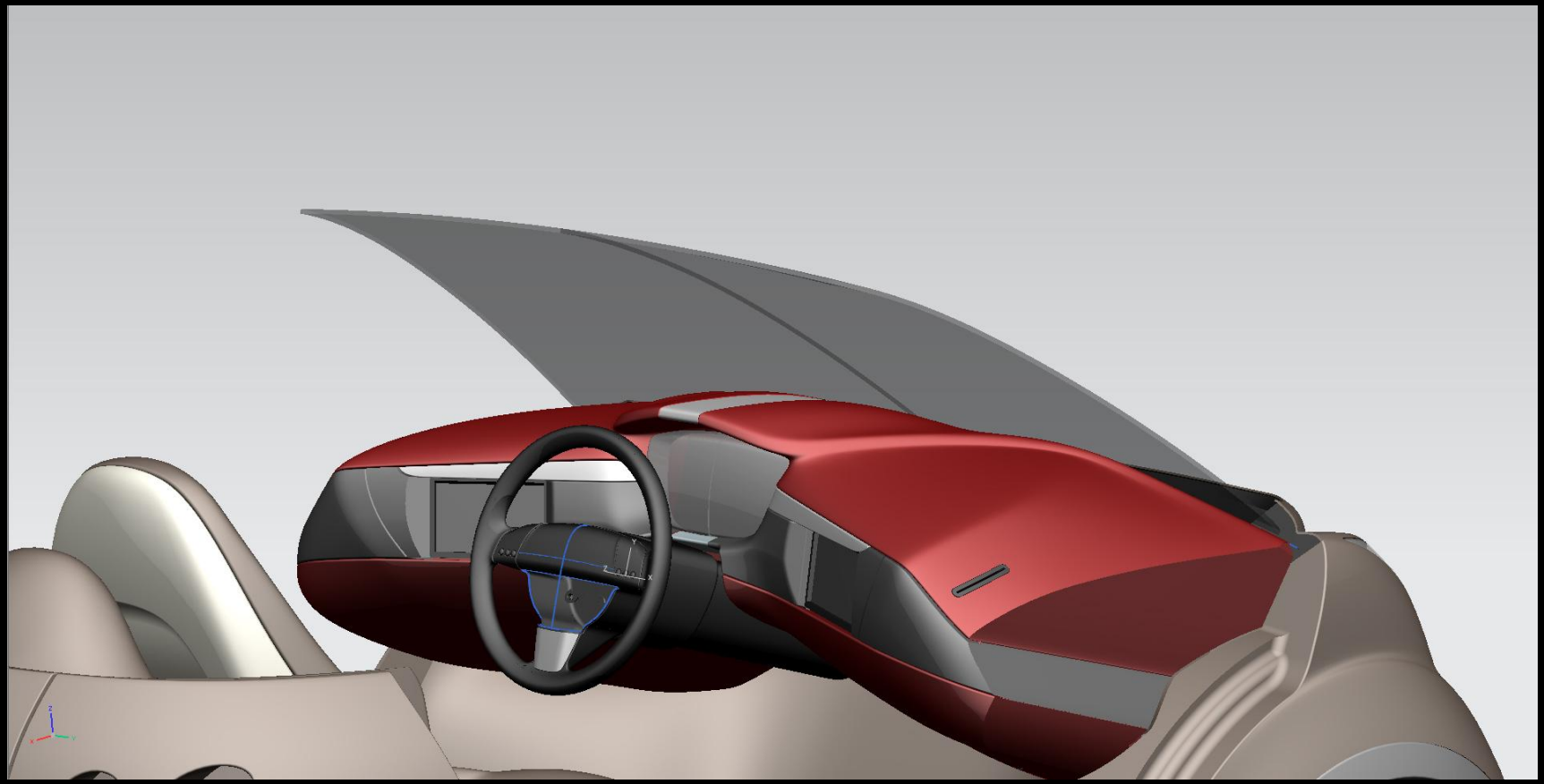
Next-Gen Seat



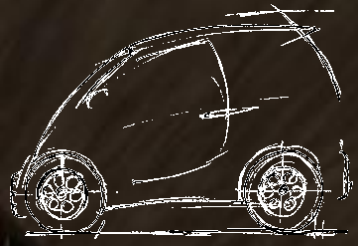
- Designed in cooperation with one of the top seat makers
- Innovative Adjustments
- Heating/Cooling capability
- Seat is controlled via Google Android Application
- Saves 20% power when compared to current high-end seats

Cockpit Concept Render



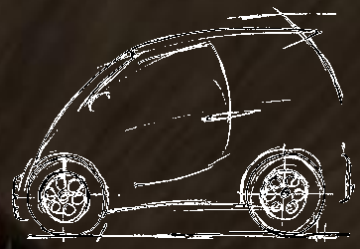


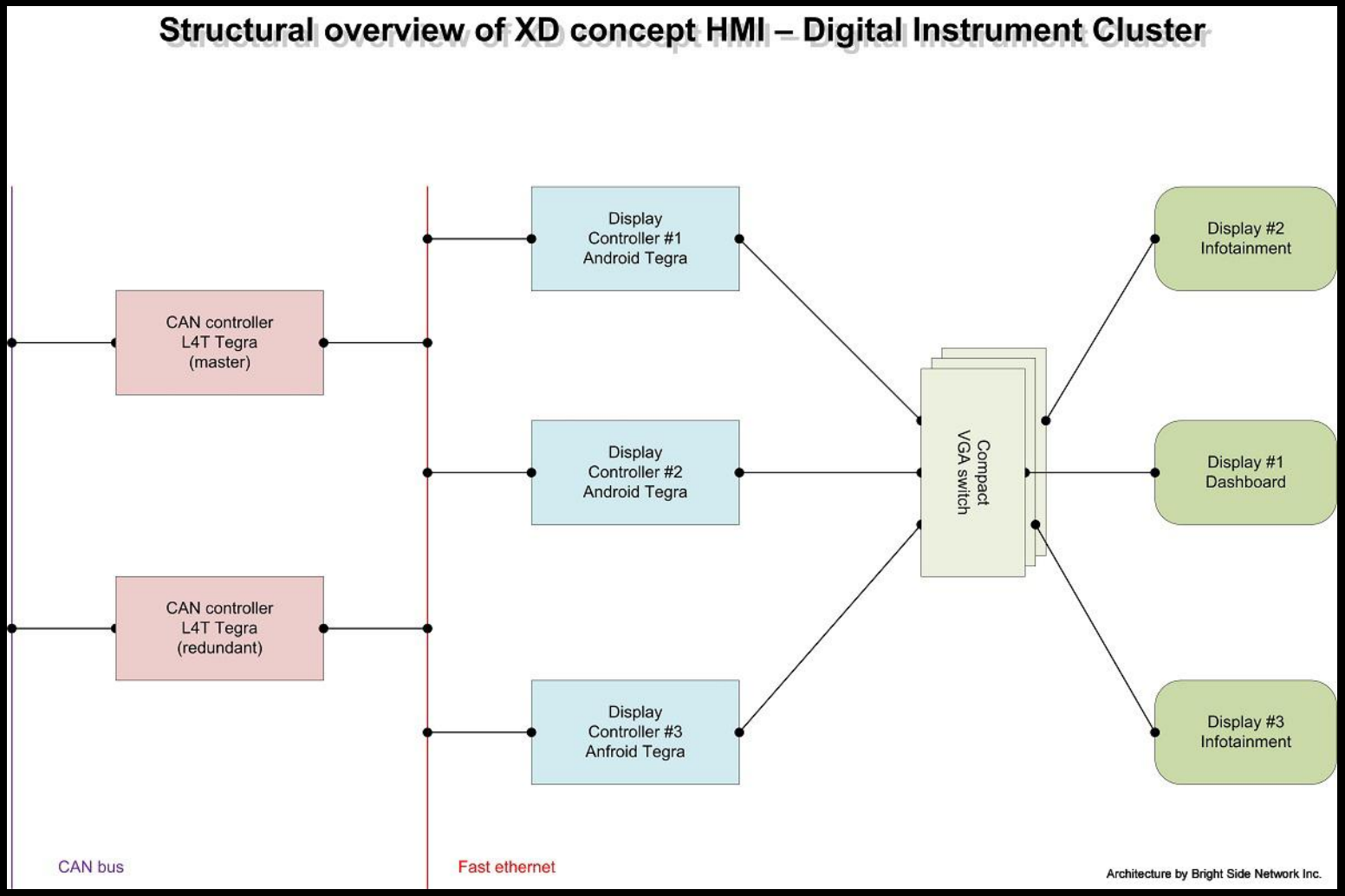
Why NVIDIA Tegra



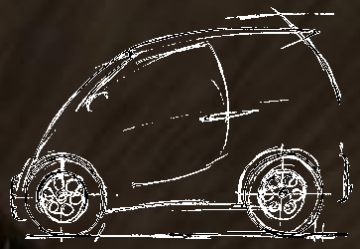
- Competing parts offered sub-standard performance
- Lack of quality customization tools
- Unsatisfactory consumer experience
- Tegra offers best “Bang For Watt”
  - 1-Chip for 1-Watt Operation
  - Dual Core Processor enabled us to reduce the number of chips and keep the redundancy requirements
  - Ease-of-use CAN / Ethernet Interface operability
  - Drives HD Resolution screens
  - Supports high-resolution cameras

XD System Architecture



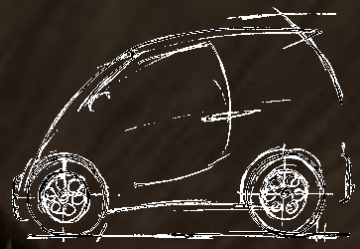


Architecture

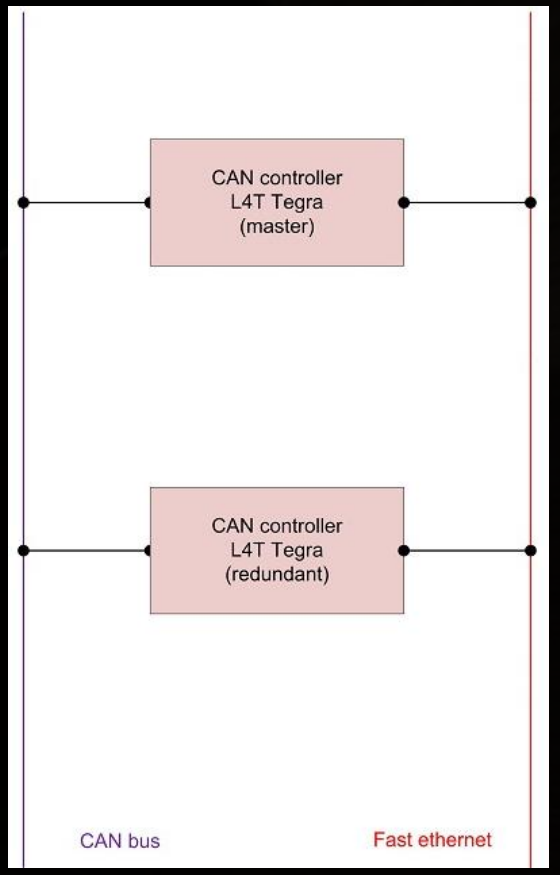


- Tegras control every aspect of the car
  - Sits on top of Microcontroller level
- Designed for easy servicing
  - All five units are identical
  - GbE Interface towards Display Units
- Fail-safe mechanisms
  - Multiple redundancy scenarios
  - Driver does not lose drivetrain

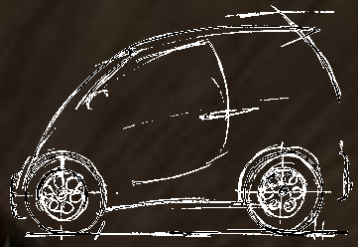
Core System



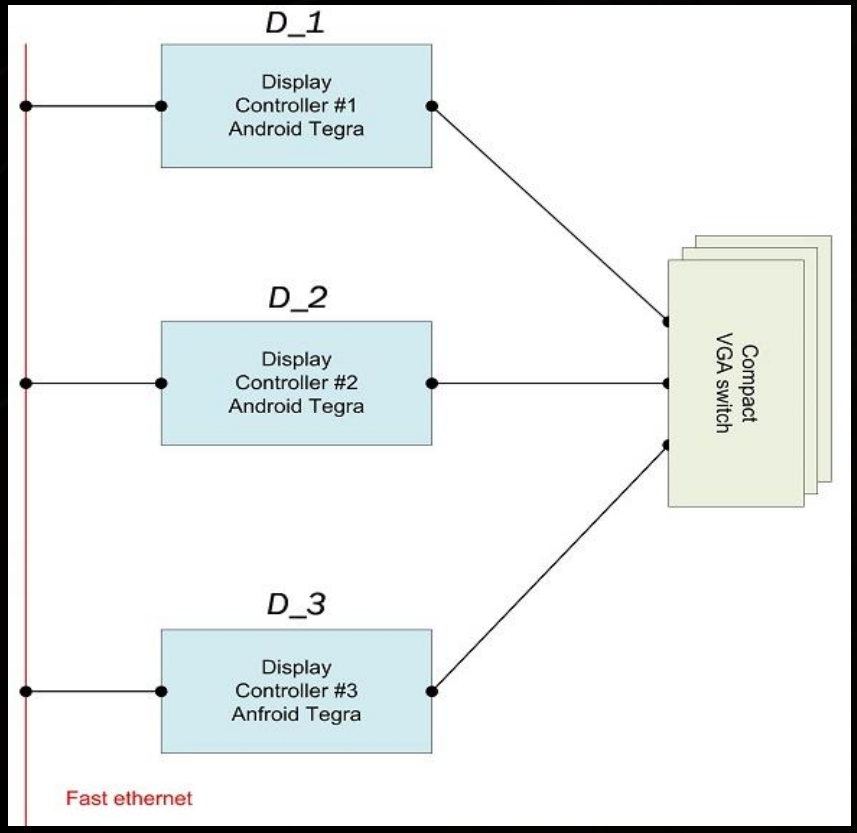
- T_0 is the core of our architecture
  - Relies on NVIDIA L4T Operating System
  - Over 100 sensors
  - Sends information to Instrument Cluster
  - Receives commands from UI Units
- T_R monitors the same bus as T_R
  - Our “black box”
  - Located at different location in the car
  - Can take over T_0 functionality



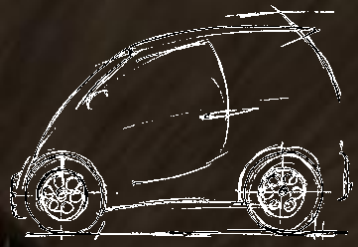
Instrument Cluster



- 11.6” HD Screen
- 1366x768 Resolution
- Drive HD Experience
- Smooth Animation
- Patent-pending innovations
- Does not distract the driver
- Built In Redundancy

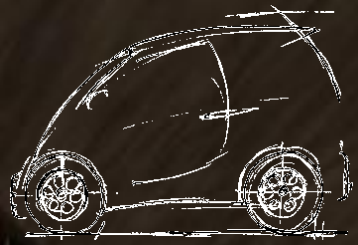


Infotainment



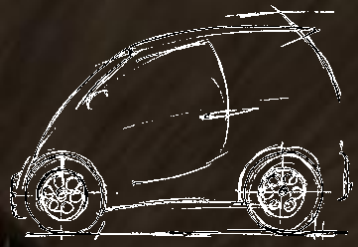
- Two 7” Multi-Touch Screens
  - World’s First Automotive-grade Multi-touch LCDs
  - 800x480 Resolution
- Controls all car features at one place
  - Switch screens depending on preference
  - Multi-zone AC
  - GPS, FM/Digital Radio, DVD Player, Games
  - Text-to-Speech
  - Speech-to-Text

User Experience



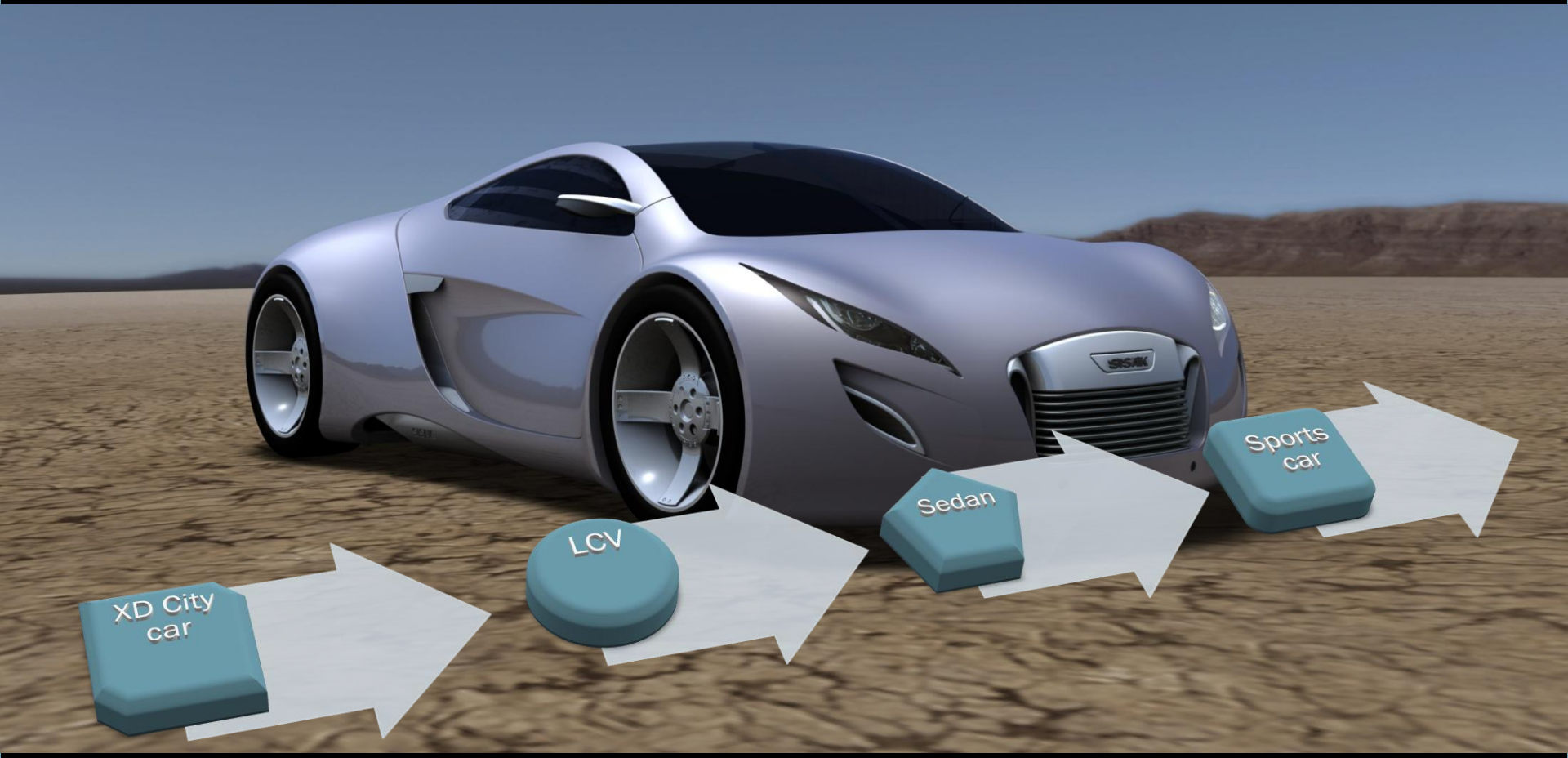
- XD is customizable via PC or Android App
  - Car Interior Lighting - up to 255 colors
  - Color of the Instrument cluster
- Google OS enabled us to enhance the user experience
  - Currently runs Android “Froyo”
  - Production version to run next-gen Google Android
  - Apps Supported via Marketplace and XD Portal
  - GPS Analysis
  - Parental Limitations

Active Protection



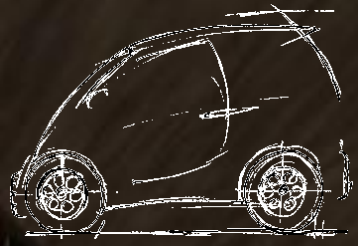
- Front and rear cameras
- Evaluating the “black box” concept
  - Record 30-60 second video in case of a car crash
  - Recording freezes if airbags deploy
- Will be implemented either in 1st or 2nd Gen Software
  - Ease the job for police, insurance companies

The Road Ahead...



Powered by NVIDIA Tegra

Conclusion



- Car is a commodity, not black magic
- Current solutions proven to result in more confusion than ease
- Electric Car = car simplification and safety increase
- NVIDIA Tegra enabled us to create a truly customizable experience and build an eco system

See You Next Year

DOK-ING AUTOMOTIVE

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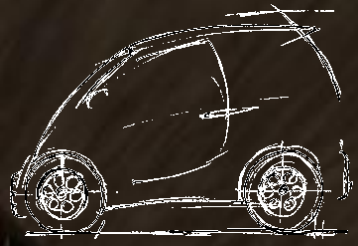

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