Dok-Ing XD
Using NVIDIA Tegra To Solve The Electric Car Power Dilemma
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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

Structural overview of XD concept HMI – Digital Instrument Cluster

- CAN controller L4T Tegra (master)
- CAN controller L4T Tegra (redundant)
- Display Controller #1 Android Tegra
- Display Controller #2 Android Tegra
- Display Controller #3 Android Tegra
- Compact VGA switch
- Display #1 Infotainment
- Display #2 Infotainment
- Display #3 Infotainment
- CAN bus
- Fast ethernet

Architecture by Bright Side Network Inc.
Architecture

- Tegra controls every aspect of the car
  - Sits on top of the 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

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