Enabling the future vehicle digital platform across the supply chain

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Digital challenges in automotive

- Massive growth in software enabled electronics in automotive
- Automotive safety requirements for electronics becoming more rigorous
- Need for electronics to meet increasingly stringent environmental and energy requirements
- Expectations driven by consumer electronics

Key steps in meeting electronics challenges

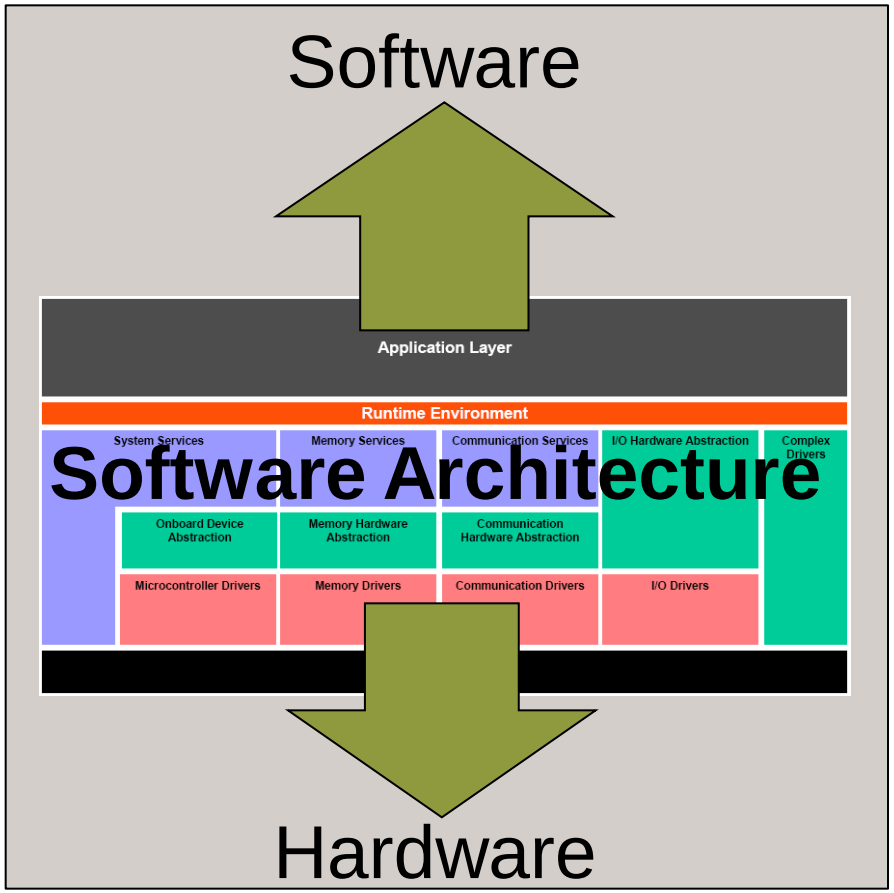
- Layered software architecture
- Increased bandwidth networks
- Rapid diagnostics
- Systems engineering

Key steps in future digital platform

Layered software architecture

AutoSAR

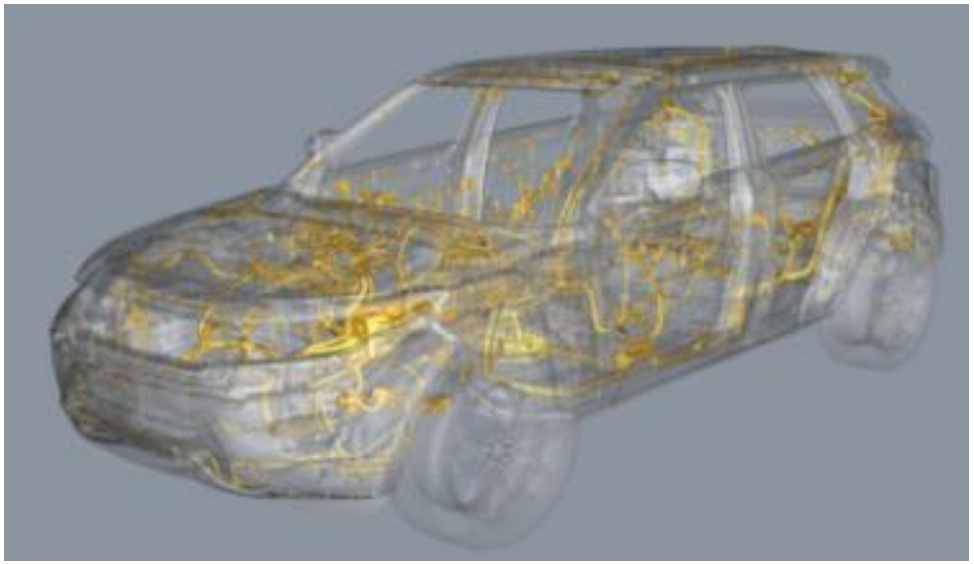
- Provides the ability to abstract hard ware from software
- Standardised communications
- Partitioned architecture to improve quality
- Re-usable components
- Industry standard



Increased bandwidth networks

Flexray

- Increased bandwidth compared with CAN
- Developed to automotive standards
- Strict timing control supporting safety critical systems
- Established standard used by key premium automotive OEMS



Rapid diagnostics

Use of IP (Internet Protocol) technology for diagnostics and software download

- Increased bandwidth connection
- Focus on key customer interface by supporting dealers
- Alignment with industry standards
- Direct connection to PC Ethernet port
- Based on ISO 13400

Systems engineering

- Electrical and software architecture managed across the whole vehicle
- Traceability through to customer and other key requirements
- Optimisation of key vehicle properties (such as weight, electrical energy and space) across the whole vehicle
- Early verification of design through modelling and simulation
- Engagement with key supply partners
- Reduced time to market

Benefits of future digital platform

- Increased focus on software enabled features
- Separation of software and hardware dependencies supporting:
  - ECU consolidation
  - Common high performance hardware platforms
  - Rapid engineering change
- Supports integration and reuse of standard components
- Technologies to increase safety, robustness and software quality
- Common, scalable physical architecture across vehicle lines
- Capacity to continually add feature content

Risks of future digital platform

- Significant changes across the vehicle
- Increased performance requirements on hardware
- Change in engineering philosophy
- Higher up front costs to support reusable components
- Supply chain impact

Supply chain impact

- Change in the relationship with traditional suppliers
  - Software bought separately from hardware (leading to new business models and opportunities)
    - E.g Supplier may need to licence software rather than selling boxes
  - Volume effects through common hardware platforms
  - Exploitation of increased performance hardware
  - Competition from pure SW houses
  - Closer engagement through Systems engineering and DV process

Conclusions

- JLR sees it adoption of emerging industry standards as supporting significant improvements in the way electronics and software are delivered to the vehicle
- New holistic approaches that provide a scalable digital platform are needed to enable continued development of effective feature content
- New engineering approaches which separate hardware and software are critical to this
- This will entail a new systems approach across the supply chain