11. G.A. Williams and M.J. Holt, "The future of vehicle electrical power systems and their impact on system design," SAE Paper 911653, *Future Transportation Technology Conference and Exposition*, Portland, Oregon, Aug. 1991.
12. M.F. Matouka, "Design considerations for higher voltage automotive electrical systems," SAE Paper 911654, *Future Transportation Technology Conference and Exposition*, Portland, Oregon, Aug. 1991.
13. C.R. Smith, "Review of heavy duty dual voltage systems," SAE Paper 911857, *International Off-Highway & Powerplant Congress and Exposition*, Milwaukee, Wisconsin, Sept. 1991.
14. S. Muller and X. Pfab, "Considerations implementing a dual voltage power network," SAE Paper 98C008, *IEEE-SAE International Conference on Transportation Electronics (Convergence)*, Dearborn, MI, Oct. 1998.
15. J. Becker, M. Pourkermani, and E. Saraie, "Dual-voltage alternators," SAE Paper 922488, *International Truck and Bus Meeting and Exposition*, Toledo, Ohio, Nov. 1992.
16. J. O'Dwyer, C. Patterson, and T. Reibe, "Dual voltage alternator," *IEE Colloquium on Machines for Automotive Applications*, London, Nov. 1996, pp. 4/1-4/5.
17. J.C. Byrum, "Comparative evaluation of dual-voltage automotive alternators," S.M. Thesis, Dept. of Electrical Engineering and Computer Science, *Massachusetts Institute of Technology*, Sept. 2000.

Open Systems a

ABSTRACT

This paper
will describe how on
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Consumer electronics products clearly have faster penetration rates reflecting both their perceived entertainment and informational value to customers. In the last 40 years, in-car entertainment systems have reflected similar shifts in priorities, as they have moved from simple radios powered by electronic tubes and providing very limited range and very poor sound quality to today's automotive CD and DVD systems offering stereo sound from multiple speakers combining with LCD displays to provide navigation and yellow page information. Tomorrow, we'll see further shifts to new features and functions embodied in increasingly software-dominated systems as shown in Figure 2.

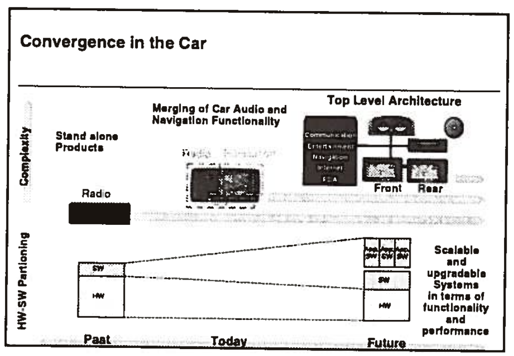

Figure 2. Convergence of entertainment, information and communications in the car.

Increasingly, automotive customer demand is created by consumer markets where new systems and services are being introduced seemingly on a daily basis. "Non-automotive" technologies and products are the first priority for customers. Examples include the following shown in Figure 3:

- New digital communications services—GPRS, UMTS, Bluetooth, etc.
- Digital broadcast systems—DAB and DVB-T
- Personal appliances—PDA, Smart Phone, Videophone

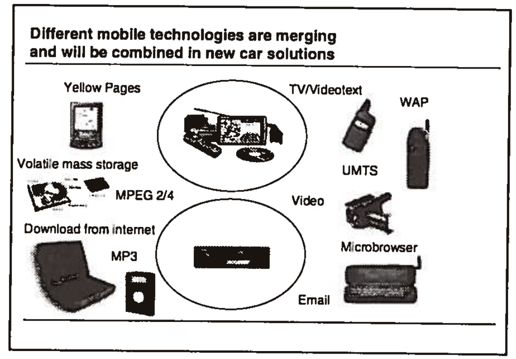

Figure 3. Automotive solutions will integrate entertainment, information and communications in new ways.

The Internet is, of course, the primary driver and carrier of many of these new services. The car is becoming an Internet device that merges systems for information, entertainment, communications, and driver assistance. The challenge for automotive electronics suppliers and OEMs is to define which services are most highly valued by the end customer and to provide them in the fastest and most efficient way. Stepping into the future of the connected automobile does not mean that a PC needs to be installed in every car. Rather, it means that the vehicle must provide PC connectivity and openness in a way that ensures drivers and passengers with desirable features and functions in the most cost effective, safe and attractive way.

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- Security
- Transparency mechanism for internationalization and localization
- Transparent input/output devices.

TLA consists of four levels of functionality: **Hardware, Resources, Services and Presentations**. Hardware is obviously the physical electronics providing the function. Resources are the hardware/software drivers that interface between the physical devices and the Services software. Services and Presentations software are described in Figure 6

Foundation - Service Concept

- Software divided into two basic types:
  - Services - components which provide a piece of functionality, e.g. route-planning - no MMI. A service may use other services to provide its functionality. For instance a route-planner would use a service exporting a map database. A service is defined by the API it exports - no coupling between implementations.
  - Presentations - a component which uses one or more services and the rendition and MMI components to provide a user interface for one or more user functions. In some cases the presentation to service mapping will be direct one-to-one, in other cases it could be fairly sophisticated.

Figure 6. Foundation software is divided into two software functions: Services and Presentations

Services are software components that provide a basic functionality, e.g., route planning or music entertainment. Services have no man-machine interface, rather they interface with Presentations via an Application Programming Interface (API). Presentations are software components that utilize Services, e.g., route planning and yellow pages or

interfaces and can be tailored to be highly user-friendly.

TLA's software will utilize a component library strategy (Figure 7).

TLA Component Strategy

- Strategy to use a component library
- Components have following characteristics:
  - Responsible for a well bounded functionality
  - Can be decomposed into sub-components
  - Fully encapsulated, minimum dependency on usage context
  - Described through APIs (industry standard where these exist)
  - Characterised for footprint and performance
- Components will interact through a single integration platform
  - Run-time integration through a client-server model which allows plug-and-play
  - Static integration for low value components (drivers, error handling, etc.) or requirements for tight coupling

Figure 7. TLA uses a library of software components.

This means that software components will have the following characteristics:

- Responsible for well-bounded functionality (e.g., audio/radio, internet interface, communications services)
- Decomposable into sub-components
- Fully encapsulated with minimal dependency on usage context
- Described through APIs
- Characterized by footprint and performance

Moreover, components will interact through a single integration platform that will provide run-time integration through a client server model which allows plug-and-play and static integration for low value components (e.g., drivers, error

The overall TLA sys
illustrated in Figure 8.

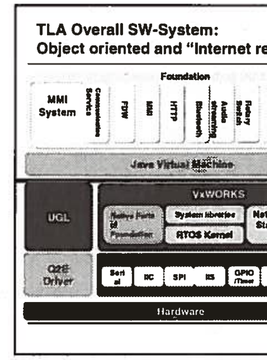

Figure 8. TLA's software
and Internet ready.

Services and Presen
contained within the
Module which utilizes
implement specific fu
9).

Foundation - Service Model

- Service installation and interaction
broker allows services and present
services they need on a as-needed
  This is the basis of the "openness
  service which needs other servi
  register itself for use and also c
  requires. This process can take
- Broker is a service which provides
in its API
  - Register Service/Lookup Servic
  Service/Unregister Service
- The service model for TLA is symm

Figure 9. Foundation Ser
a broker system, allowing

Additional Services a
can be added at w
new entertainment,
communications tech

ment technologies into the car in a cost effective and efficient manner. It addresses key challenges facing suppliers in fast-changing world of electronics where new technologies are emerging so rapidly that several product life times will occur during the life of the car. Moreover, it enables suppliers, like VDO, to partner with a broader range of suppliers from outside the automotive industry to meet and even anticipate customers' demands.

REFERENCES

[1] Gates, Bill, "Business @ The Speed of Thought" Warner Books, 1999

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ABSTRACT

The past, current and future r
reducing accidents, crash severity
is discussed. A holistic approac
crash and post-crash factors in
safety is examined and the growin
affecting the three factors is di
technology has already entered t
arena, and its utilization in the futu
rapidly towards the goal of safer ro

INTRODUCTION

The use of electronic component
been increasing steadily since
response to societal needs for fuel
environment, the vast majority of
controlled by electronic compone
reliability and miniaturizatio
Microprocessors are becoming fas
algorithms have been developed
functions. Electronics has move
automotive safety with application
System and Enhanced Stability
Early airbag systems have used
systems for crash severity
diagnostics, display and design ha
controlled. With further advance
and micro-processor technologies,
in automotive safety has increase
mid-1990's, and is expected to gro
future.

The objective of this paper is to di
future role of electronics in automo