Automotive Ethernet

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Automotive EthernetCambridge University Press

Die vorliegende Arbeit befasst sich mit dem Design einer Entwicklungsplattform für Automotive Ethernet. Konkret wird dabei aus High Level Systemanforderungen ein Detailkonzept für die Hardwareentwicklung abgeleitet, umgesetzt und getestet. Kernkomponente der Entwicklungsplattform stellt ein 5 Port Ethernet Switch Chip dar, der auf der physikalischen Schicht verschiedene Implementierungen unterstützt. Neben der Standard IEEE802.3 Ethernet Implementierung, wird eine speziell für den Automotive Bereich entwickelte Schnittstelle BroadR-Reach getestet. Angelehnt an den jeweiligen Standard, werden entsprechende Testspezifikationen erstellt und die Schnittstellen prototypenmäßig getestet und bewertet. Die Entwicklungsplattform beinhaltet neben der Ethernet Switch Funktionalität auch Standard Automotive Kommunikationsschnittstellen wie CAN und FlexRay. Des Weiteren werden Steuerungselemente High Side Ausgänge, Timer- und Analog Eingänge implementiert.*****The content of this work describes the design of a development platform for automotive Ethernet. A detailed hardware concept, derived from high level system requirements, is implemented and tested. Key component of the development platform is a 5-port Ethernet Switch chip, which supports different implementations on

the physical layer. Besides the standard IEEE802.3 Ethernet implementation, the interface BroadR-Reach is applied and tested. This interface is developed for automotive applications. Based on the respective Standard, a test specification for the different interfaces is created. The tests are executed on prototypes and the results evaluated accordingly. In addition to the Ethernet Switch functionality, the development platform contains standard automotive communication interfaces like CAN and FlexRay, as well as control elements High Side outputs, Timer- and Analog inputs. The ambitious objectives of future road mobility, i.e. fuel efficiency, reduced emissions, and zero accidents, imply a paradigm shift in the concept of the car regarding its architecture, materials, and propulsion technology, and require an intelligent integration into the systems of transportation and power. ICT, components and smart systems have been essential for a multitude of recent innovations, and are expected to be key enabling technologies for the changes ahead, both inside the vehicle and at its interfaces for the exchange of data and power with the outside world. It has been the objective of the International Forum on Advanced Microsystems for Automotive Applications (AMAA) for almost two decades to detect novel trends and to discuss technological implications and innovation potential from day one on. In 2012, the topic of the AMAA conference is "Smart Systems for Safe, Sustainable and Networked Vehicles". The conference papers selected for this book address current research, developments and innovations in the field of ICT, components and systems and other

key enabling technologies leading to the automobile and road transport of the future. The book focuses on application fields such as electrification, power train and vehicle efficiency, safety and driver assistance, networked vehicles, as well as components and systems. Additional information is available at www.amaa.de

Featuring a foreword by Bob Metcalfe, inventor of Ethernet! Ethernet, the most widely-used local area networking technology in the world, is moving from the server rooms of automobile manufacturers to their vehicles. As the quantity and variety of electronic devices in cars continues to grow, Ethernet promises to improve performance and enable increasingly powerful and useful applications in vehicles. Now, from Intrepid Control Systems (www.intrepidcs.com) - a leader in the world of automotive networking and diagnostic tools - comes the first book to describe the technology behind the biggest revolution in automotive networking since the 1980s: Automotive Ethernet - The Definitive Guide describes the fundamentals of networking, data link and physical layers of industry-standard Ethernet variants, as well as the new (one twisted pair 100Base Ethernet) 1TPCE or BroadR-Reach technology developed by Broadcom specifically for vehicle use. Topics covered include: in-vehicle networking requirements, comparing Ethernet to CAN and other existing networks (such as LIN, MOST, and FlexRay), TCP/UDP, IPv4/IPv6 and Diagnostics over IP (DoIP). Also covered are the Audio Video Bridging standards used to transport media over Ethernet: Stream Reservation Protocol or SRP (802.1Qat), Forward-Queueing and Time-Sensitive

Streams or FQTSS (802.1Qav), Timing and Synchronization for Time-Sensitive Applications or gPTP (802.1as), and Transport Protocol for Time-Sensitive Applications or AVTP (IEEE 1722), and more. Automotive Ethernet: The Definitive Guide will also be available as an ebook for your Kindle!

The automobile is now going through a period of major technological change. Uses are changing as well as technologies, and the advent of vehicles at various levels of autonomy is becoming a reality. But what technical, normative or human springs lie behind these new mobilities? After defining precisely the different levels of autonomy and the legal and regulatory contexts in which the vehicles to be in circulation from 2020 to 2035 are to be designed, this book details all the sensors (infrared, ultrasound, cameras, lidar, radar...), ADAS (Advanced Driver Assistance Systems), networks (CAN-FD, FlexRay, Backbone Ethernet...) and software (development, simulation...) that will optimally equip future autonomous vehicles , both for their safety on the road and against cyber-attacks.

This comprehensive text/reference presents an in-depth review of the state of the art of automotive connectivity and cybersecurity with regard to trends, technologies, innovations, and applications. The text describes the challenges of the global automotive market, clearly showing where the multitude of innovative activities fit within the overall effort of cutting-edge automotive innovations, and provides an ideal framework for understanding the complexity of automotive connectivity and

cybersecurity. Topics and features: discusses the automotive market, automotive research and development, and automotive electrical/electronic and software technology; examines connected cars and autonomous vehicles, and methodological approaches to cybersecurity to avoid cyber-attacks against vehicles; provides an overview on the automotive industry that introduces the trends driving the automotive industry towards smart mobility and autonomous driving; reviews automotive research and development, offering background on the complexity involved in developing new vehicle models; describes the technologies essential for the evolution of connected cars, such as cyber-physical systems and the Internet of Things; presents case studies on Car2Go and car sharing, car hailing and ridesharing, connected parking, and advanced driver assistance systems; includes review questions and exercises at the end of each chapter. The insights offered by this practical guide will be of great value to graduate students, academic researchers and professionals in industry seeking to learn about the advanced methodologies in automotive connectivity and cybersecurity. By adopting ethernet as the protocol for automotive networks, certain attack vectors are now available for black hat hackers to exploit in order to put the vehicle in an unsafe condition. I modified the CANoe network simulation platform's Ethernet demonstration environment in order to conduct a penetration test. This led to discovering attacks that pose a threat to automotive ethernet networks. These attacks strictly followed a comprehensive threat model in order to narrowly focus the attack surface, and covered

all three sides of the Condentiality, Integrity, Availability (CIA) triad. I then proposed a new and innovative mitigation strategy that can be implemented on current industry standard ECUs and run successfully under strict time and resource limitations. This new strategy can help to limit the attack surface that exists on modern day automobiles and help to protect the vehicle and its occupants from malicious adversaries. Modern cars are more computerized than ever. Infotainment and navigation systems, Wi-Fi, automatic software updates, and other innovations aim to make driving more convenient. But vehicle technologies haven't kept pace with today's more hostile security environment, leaving millions vulnerable to attack. The Car Hacker's Handbook will give you a deeper understanding of the computer systems and embedded software in modern vehicles. It begins by examining vulnerabilities and providing detailed explanations of communications over the CAN bus and between devices and systems. Then, once you have an understanding of a vehicle's communication network, you'll learn how to intercept data and perform specific hacks to track vehicles, unlock doors, glitch engines, flood communication, and more. With a focus on low-cost, open source hacking tools such as Metasploit, Wireshark, Kayak, can-utils, and ChipWhisperer, The Car Hacker's Handbook will show you how to: –Build an accurate threat model for your vehicle –Reverse engineer the CAN bus to fake engine signals –Exploit vulnerabilities in diagnostic and data-logging systems –Hack the ECU and other firmware and embedded systems –Feed exploits through

infotainment and vehicle-to-vehicle communication systems –Override factory settings with performance-tuning techniques –Build physical and virtual test benches to try out exploits safely If you're curious about automotive security and have the urge to hack a two-ton computer, make The Car Hacker's Handbook your first stop.

This edited volume presents the proceedings of the AMAA 2015 conference, Berlin, Germany. The topical focus of the 2015 conference lies on smart systems for green and automated driving. The automobile of the future has to respond to two major trends, the electrification of the drivetrain, and the automation of the transportation system. These trends will not only lead to greener and safer driving but re-define the concept of the car completely, particularly if they interact with each other in a synergetic way as for autonomous parking and charging, self-driving shuttles or mobile robots. Key functionalities like environment perception are enabled by electronic components and systems, sensors and actuators, communication nodes, cognitive systems and smart systems integration. The book will be a valuable read for research experts and professionals in the automotive industry but the book may also be beneficial for graduate students.

Learn about the latest developments in automotive Ethernet technology and implementation with this fully revised second edition. Including approximately twenty-five percent new material and greater technical detail, coverage is expanded to include: · Detailed explanations of how the 100BASE-T1 PHY and 1000 BASE-T1 PHY

technologies actually work · A step-by-step description of how the 1000BASE-T1 channel was derived · A summary of the content and uses of the new TSN standards · A framework for security in Automotive Ethernet · Discussion of the interrelation between power supply and automotive Ethernet communication Industry pioneers share the technical and non-technical decisions that have led to the success of automotive Ethernet, covering everything from electromagnetic requirements and physical layer technologies, Quality of Service, the use of VLANs, IP and Service Discovery, and network architecture and testing. This is a guide for engineers, technical managers and researchers designing components for in-car electronics, and those interested in the strategy of introducing a new technology.

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Including information on the new Fast Ethernet (100BASE T) standard, the new 802.3 fiber standards, the use of switching bridges to improve performance through traffic isolation and how to clearly identify proper settings of "heartbeat", this book answers the myriad of questions that come up after a network is installed.

- No-nonsense explanations put readers on a critical path to understanding how Ethernet technologies connect industrial-device data with manufacturing and business applications to improve productivity and create enterprise and supply-chain solutions- in-depth coverage focuses on the function of Ethernet as a next-generation fieldbus as well as the benefits of tying the factory to the enterprise over the.

Proceedings of the FISITA 2012 World Automotive Congress are selected from nearly 2,000 papers submitted to the 34th FISITA World Automotive Congress, which is held by Society of Automotive Engineers of China (SAE-China) and the International Federation of Automotive Engineering Societies (FISITA). This proceedings focus on solutions for sustainable mobility in all areas of passenger car, truck and bus transportation. Volume 6: Vehicle Electronics focuses on: •Engine/Chassis/Body Electronic Control •Electrical and Electronic System •Software and Hardware Development •Electromagnetic Compatibility (EMC) •Vehicle Sensor and Actuator •In-Vehicle Network •Multi-Media/Infotainment System Above all researchers, professional engineers and graduates in fields of automotive engineering, mechanical engineering and electronic engineering will benefit from this book. SAE-China is a national academic organization composed of enterprises and professionals who focus on research, design and education in the fields of automotive and related industries. FISITA is the umbrella organization for the national automotive societies in 37 countries around the world. It was founded in Paris in 1948 with the purpose of bringing engineers from around the world together in a spirit of cooperation to share ideas and advance the technological development of the automobile. ??,??????????;????????????????????????????;?????????????????,???????????????? Driver less vehicles has risen as another field of innovation and enthusiasm for late

years. The major vehicle producers are attempting to execute the innovations required for autonomous vehicles which in turn increases the number of application also. All these new applications includes a communication of a larger amount of data which has prompted an activity of implementing ethernet to automotive industry and the idea is being assessed. It is important to explore the present circumstance of the communication structure and topologies present in vehicles today.The primary objective of this thesis was to investigate how interface description language of current commercial solutions like protobuf, thrift, avro etc. can be adaptedto automotive.A literature study was conducted on different IDL's and the current Scania's system architecture.The study included an analysis on the expressiveness of the description languages and how it can be mapped on to the existing automotive systems. This study also involved different protocols capability in terms of getting defined without knowing the hardware interfaces. To demonstrate the feasability in using commercialIDLs in the automotive industry, a small scale demo was implemented using protobuf .The study results indicated how to define an IDL for system architecture in au-tomotive industry and also the possibility of communication between heterogeneous systems with the IDL concept. Plastic optical fiber (POF) for use in automotive applications is not a new concept and has been used in some vehicles for infotainment media distribution within the Media Oriented Systems Transport protocol. However, the use of POF for the control network's physical layer is a concept that has not been implemented in automotive

applications. Many aspects of a vehicle can be improved by implementing POF as the physical backbone for the control network. Currently, the Controller Area Network (CAN) is used as the primary backbone control network protocol for most automobiles as it is inexpensive and reliable. However, CAN is limited to 500 kbps in most vehicles and is easily accessible. Ethernet may provide the improvements of speed and security needed in today's feature rich and connected vehicles. The feasibility of implementing Ethernet over POF as the control network for automotive applications is the topic of this research investigation.

Get up to speed with the latest developments in Automotive Ethernet technology and implementation with this fully revised third edition.

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