

# An Integrated Embedded System Architecture for In-Vehicle Telematics and Infotainment System

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**Abstract**—In this study, an integrated embedded system architecture for in-vehicle telematics and infotainment system (IVTIS) is proposed. A wireless communication network is utilized to provide the location-based and emergency services to the in-vehicle users, while the in-vehicle network is established to provide applications in communications and entertainment. The prototype of the system is demonstrated as well.

## I. INTRODUCTION

Traditional on-board embedded electronics systems that performing various operational functions, such as anti-lock brake, cruise control, climate control, etc... are already utilized in most of today's modern vehicle [1, 2]. Recent trend shows that more and more in-vehicle embedded system are focusing on providing better functionalities, robust operation and higher degree of convenience to the in-vehicle users. Advance of wireless communication and information technology in the digital era has promoted new killer applications to the in-vehicle drivers and occupants. Among these advanced killer applications, services provided in the area of the telematics and information/entertainment have attracted most attention in the automotive industry.

### A. Telematics Service

Telematics were considered as the system that provides location-based services for mobile vehicles over wireless communication networks. Typical example of automotive telematics services are emergency call (or *soscall*) systems, which instantly connects vehicle users to a service center for emergency assistance or roadside services while automatically reporting the vehicle's position [3]. Normally the emergency call system requires a wireless transceiver for voice and data communication and an on-board GPS (Global Positioning System) receiver for positioning. Telematics system was considered as the core technology in an Intelligent Transportation System (ITS) and applications of telematics services to ITS have been proposed recently. An integrated positioning system were developed to realize an efficient and cost-effective GPS based electronic road pricing system by He, Law, and Ling [4]. In [5], the importance of "situational awareness" in conveying the state of the automobile to other parties across a communication link was addressed and a novel

interactivity environment for integrated intelligent transportation and telematic systems was proposed.

### B. Information/Entertainment Services

As more and more people are traveling with Internet-enabled information appliances (IA) such as notebook PCs, PDAs, mobile phones, digital cameras, MP3 players, etc.... there is a desire to connect to the Internet permanently from anywhere, at anytime, without any disruption of service, particularly for those people who spend a significant amount of time in mass transportation systems in weekdays or in their own vehicle during weekend [6]. In order to access the Internet, an in-vehicle local area network or personal area network environment must be established, and the in-vehicle embedded system shall become the mobile gateway for these Internet-enabled IA. Ernst, Uehara, and Mitsuya [6], detailed the networking requirements for connecting vehicles to the Internet by displacing an entire IPv6 network and network mobility support in the InternetCAR project. In [7], the software and hardware requirements in designing human-computer interface for an in-vehicle information system were proposed such that the safety of the in-vehicle drivers is discussed. A distributed service-based architecture [8], based on the Jini middleware technology, were proposed to provide fault tolerant application services to remote in-vehicle computers and mobile devices, such as Wifi-enabled PDA and GPRS phone. It seems that research trend has shifted to providing an *infotainment server* system for the in-vehicle users such that the network-enabled IA can access the information from the in-vehicle network and also obtain the entertainment services from the entertainment server.

An integrated architecture for in-vehicle telematics and infotainment system (IVTIS) can provide the in-vehicle users value-added services compared with traditional telematics only systems. Thus, an in-vehicle telematics and infotainment system utilizing embedded system with power embedded operation system is proposed in this paper. The packet radio network was adopted to provide the telematics service to the in-vehicle users. And an in-vehicle network environment is established such that a client/server type of in-vehicle infotainment system can be developed. The detailed design and development of the IVTIS will be described as below.

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provides links not only among things but also data people and business processes The evolution of current sensor and device networks with strong interactions between people and social environments will have a dramatic impact on everything from city planning first responders the military and health Such a shared ecosystem will allow for the interaction between data sensor inputs and heterogeneous systems Semantics is a fundamental component of this since semantic technologies are able to provide the necessary bridge between different data representations and to solve terminology incongruence Integrating data from distributed devices sensor networks social networks and biomedical instruments requires first of all the systematization of the current state of the art in such fields Then it is necessary to identify a common action thread to actually merge and homogenize standards and techniques applied in such a heterogeneous field The exact requirements of an Internet of Everything environment need to be precisely identified and formally expressed and finally the role of modern computing paradigms such as Cloud and Fog Computing needs to be assessed with respect to the requirements expressed by an Internet of Everything ecosystem

**Cyber Physical Systems** Anupam Baliyan,Kuldeep Singh Kaswan,Naresh Kumar,Kamal Upreti,Ramani Kannan,2023-01-11 Cyber Physical System CPS is an integration of computation networking and physical processes the combination of several systems of different nature whose main purpose is to control a physical process and through feedback adapt itself to new conditions in real time Cyber Physical System Concepts and Applications includes an in depth coverage of the latest models and theories that unify perspectives It expresses the interacting dynamics of the computational and physical components of a system in a dynamic environment Covers automatic application of software countermeasures against physical attacks and impact of cyber physical system on industry 4 0 Explains how formal models provide mathematical abstractions to manage the complexity of a system design Offers a rigorous and comprehensive introduction to the principles of design specification modelling and analysis of cyber physical systems Discusses the multiple domains where Cyber Physical system has a vital impact and provides knowledge about different models that provide mathematical abstractions to manage the complexity of a system design Provides the rapidly expanding field of cyber physical systems with a Long needed foundational text by an established authority This book is primarily aimed at advanced undergraduates graduates of computer science Engineers will also find this book useful

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newly emerged technologies and concepts in relation to CPS like cloud computing big data fog computing and crowd sourcing Includes topics related to CPS such as architecture system networking application algorithm security and privacy

*Wireless Power/Data Transfer, Energy Harvesting System Design* Byunghun Lee,2021-08-31 This book focuses on emerging wireless power data and energy harvesting technologies and highlights their fundamental requirements followed by recent advancements It provides a various technical overview and analysis of key techniques for wireless power data and energy harvesting system design The state of the art system introduced in this book will benefit designers looking to develop wireless power transfer and energy harvesting technologies in a variety of fields such as wearable implantable devices home appliances and electric vehicles

**Parallel Computing Hits the Power Wall** Arthur Francisco Lorenzon,Antonio Carlos Schneider Beck Filho,2019-11-05 This book describes several approaches to adaptability that are applied for the optimization of parallel applications such as thread level parallelism exploitation and dynamic voltage and frequency scaling on multicore systems This book explains how software developers can apply a novel technique to adapt the number of threads at runtime without any modification in the source code nor recompilation This book is useful for software developers in general since it offers realistic examples throughout to demonstrate various techniques presented

**Proceedings of the International Conference on Information Engineering, Management and Security 2015** Vignesh Ramakrishnan,Prasanth Venugopal,Tuhin Mukherjee,2015-08-13 ICIEMS 2015 is the conference aim is to provide a platform for researchers engineers academicians as well as industrial professionals from all over the world to present their research results and development activities in Engineering Technology Industrial Engineering Application Level Security and Management Science This conference provides opportunities for the delegates to exchange new ideas and application experiences face to face to establish business or research relations and to find global partners for future collaboration

*Encyclopedia of E-Health and Telemedicine* Cruz-Cunha, Maria Manuela,Miranda, Isabel Maria,Martinho, Ricardo,Rijo, Rui,2016-05-04 Patients and medical professionals alike are slowly growing into the digital advances that are revolutionizing the ways that medical records are maintained in addition to the delivery of healthcare services As technology continues to advance so do the applications of technological innovation within the healthcare sector The Encyclopedia of E Health and Telemedicine is an authoritative reference source featuring emerging technological developments and solutions within the field of medicine Emphasizing critical research based articles on digital trends including big data mobile applications electronic records management and data privacy and how these trends are being applied within the healthcare sector this encyclopedia is a critical addition to academic and medical libraries and meets the research needs of healthcare professionals researchers and medical students

*Quantum Computing and Artificial Intelligence in Logistics and Supply Chain Management* Pushan Kumar Dutta,Pronaya Bhattacharya,Jai Prakash Verma,Ashok Chopra,Neel Kanth Kundu,Khursheed Aurangzeb,2025-07-25 This book discusses the transformative potential of quantum computing in reshaping the landscape of supply chain

management It bridges the gap between these two dynamic fields offering a comprehensive guide to the application of quantum principles in supply chain operations Through detailed examples and case studies it highlights how quantum computing can tackle industry specific issues such as managing global supply chain disruptions enhancing production schedules and enabling real time decision making This book is for researchers professionals and technologists interested in quantum computing and supply chain practices Features Provides an in depth analysis of quantum computing technologies and their capacity to solve complex optimisation problems at scales unimaginable with traditional computing Examines the impact of quantum computing on manufacturing and logistics with a focus on sectors such as automotive and aerospace Real world scenarios illustrate how quantum solutions can streamline operations and drive efficiency Explores quantum algorithms and their use in addressing challenges like route optimisation inventory management and demand forecasting offering strategies to reduce costs and improve resilience Considers the current limitations ethical implications and the path to widespread adoption of quantum computing in supply chains emphasising the need for interdisciplinary collaboration

**Technological Innovation for Cloud-Based Engineering Systems** Luis M. Camarinha-Matos, Thais A.

Baldissera, Giovanni Di Orio, Francisco Marques, 2015-03-27 This book constitutes the refereed proceedings of the 6th IFIP WG 5.5 SOCOLNET Doctoral Conference on Computing Electrical and Industrial Systems DoCEIS 2015 held in Costa de Caparica Portugal in April 2015 The 54 revised full papers were carefully reviewed and selected from 119 submissions The papers present selected results produced in engineering doctoral programs and focus on development and application of cloud based engineering systems Research results and ongoing work are presented illustrated and discussed in the following areas collaborative networks cloud based manufacturing reconfigurable manufacturing distributed computing and embedded systems perception and signal processing healthcare smart monitoring systems and renewable energy and energy related management decision support simulation and power conversion

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domain of hardware and microelectronic securities Overall throughout 11 chapters the book provides numerous frameworks countermeasures security evaluations and roadmaps for the future of hardware security     **Emerging Innovations in**

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