



Rugged Solutions for Real World Applications

White Paper

Overcoming ITS Integration Challenges on Road Transit Vehicles

INTRODUCTION

The number of electronic subsystems on the modern road transit vehicle is increasing by the day. The variety of communication mediums used by subsystems continues to grow and now extends into the wireless world. In 1997 futurist Frank Feather stated “... In this new society, transit isn’t about moving people. Now it’s about managing and moving information about moving people”

(1). Today the technology is available to network every electronic device on a transit vehicle, and by the end of this decade bus operations will require this level of integration as standard.

The high demand by bus operations for fully integrated Intelligent Transportation Systems (ITS) poses a complex set of challenges for systems integrators. The variance in the ITS requirements specified by both public and private agencies force systems integrators to modify their ITS offering so that each vehicle category requires a unique set of devices. For systems integrators who find it difficult to connect the multitude of electronic subsystems found on the modern ITS vehicle, the solution lies in a flexible subsystem management and application platform that enables rapid configuration and deployment of an integrated, vehicle-borne solution.

THE CHALLENGES OF ITS INTEGRATION ON ROAD TRANSIT VEHICLES

Systems integrators deploying ITS for bus operations face significant, costly challenges that distract from their core focus of

improving transportation operational efficiencies. These challenges include integration of multiple subsystems, variation of customer requirements, connection of multiple mediums and operation in the harsh vehicle environment.

Multiple Subsystems

Modern road transit vehicles have many subsystems, most with the ability to communicate over data networks. The Transportation Research Board stated “a data network provides a framework whereby all components linked to the system speak and understand the same electronic language” (2). The

challenge for systems integrators is to gain access to the data from each subsystem required to enable an effective ITS deployment. Subsystems are typically made by different manufacturers (i.e. engine and fare collection), and each subsystem is typically designed to operate independently of others. When challenges are faced with subsystem integration, valuable time is lost and overall ITS integration activities are affected.

Variation of Requirements

Since no two bus operations are identical, no two ITS implementations are equal. ITS requirements vary from operation to operation, and thus the vehicle types and subsystems vary as well. The challenge for systems integrators is to be competitive in the marketplace, yet offer a flexible solution that considers the variable nature of ITS requirements. Without a flexible platform for subsystem integration, vehicle-borne equipment will vary widely from one deployment to the next,

“... In this new society, transit isn’t about moving people. Now it’s about managing and moving information about moving people,” - Frank Feather

subsequently increasing maintenance and lifecycle costs.

Multiple Mediums

Many types of data networking protocols exist on road transit vehicles today. Each subsystem may have the ability to communicate over a data network, but this ability ranges from low speed serial data protocols to high speed wireless technologies. The challenge for systems integrators is to bring together critical data from multiple subsystems that communicate over disparate communication mediums. Many systems integrators are faced with the tough decision to choose to communicate with one subsystem over another, limiting the overall functionality of their ITS deployment.

Harsh Environment

Road transit is a dirty business – literally. Bus operations run vehicles many hours per day and subject the vehicle electronics to substantial abuse. Dirt and grime are commonplace around vehicle-borne systems, and equipment must tolerate extreme levels of shock, vibration and thermal cycling. Systems integrators are challenged to implement robust data networks in a very hostile environment, often sacrificing performance by opting for outdated but more rugged technology.

THE VEHICLE-BORNE SOLUTION PLATFORM FOR SYSTEMS INTEGRATORS

A flexible solution platform connects multiple subsystems together and gives the systems integrator the flexibility to support any standards-based vehicle communication protocol. The platform connects to legacy data buses as well as high speed and wireless mediums. A single solution platform allows a systems integrator to respond to varied customer requirements without sacrificing functionality and to standardize on a platform so technology and knowledge can be applied to future system implementations. Finally, the solution platform

is purpose-built for the harsh environment and offers high-performance without compromise for reliability.

THE BENEFITS OF A FLEXIBLE PLATFORM

A flexible solution platform allows systems integrators to overcome the challenges presented by ITS integration on road transit vehicles and to focus on their core business of improving efficiency for bus operations. The benefits of this platform include an improved time to market, reusable technology, and cost-effective features.

Time to Market Considerations

Time is always a risk factor in ITS implementations and schedule overruns are costly for systems integrators. A flexible solution platform enables systems integrators to quickly and efficiently deploy a vehicle-borne solution with minimal hardware and operating system configuration; the flexible solution platform allows systems integrators to focus on configuration of their application.

Reuse of Technology

Since each bus operation has a unique set of requirements for an ITS implementation, the systems integrator is challenged to meet a variety of requirements from project to project but to reuse as much technology as possible to contain costs. A flexible solution platform gives systems integrators the tools needed to integrate a multitude of disparate subsystems for a particular project's requirements, and then leverage the same basic solution to meet the requirements of the next project or bid. By lessening the "learning curve" required for each project, a systems integrator can reduce costs and lower the technical risks associated with vehicle-borne systems implementation.

Make Versus Buy

Systems integrators understand the challenges of con-

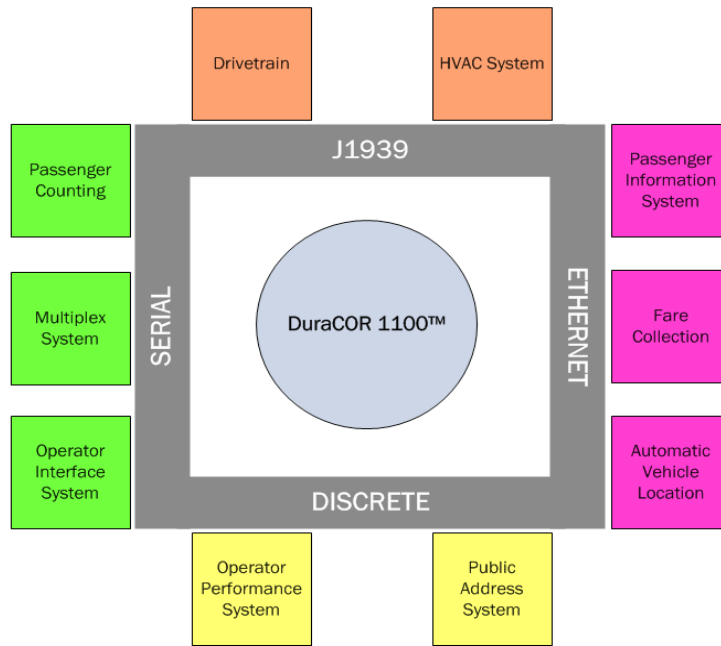


Figure 1 Multiple subsystems communicate over multiple mediums

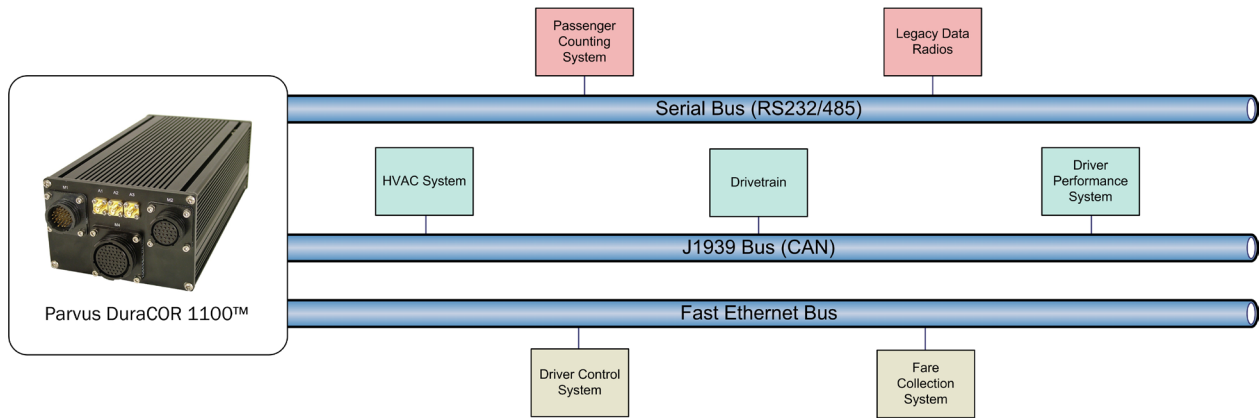


Figure 2 Communication interface example

necting vehicle subsystems, and out of necessity, many have designed and produced their own vehicle-borne platforms. These platforms are typically built from off-the-shelf components and vary slightly from project-to-project. Often, these solutions are composed of individual components that meet the technical and environmental requirements, but the overall platform is not designed with the overall application in mind. A flexible solution platform is designed to meet the requirements of systems integrators and it brings together features that are not achievable in an off-the-shelf solution, both in cost and in functionality.

THE PARVUS SOLUTION: DuraCOR 1100™

Parvus’ flexible solution platform, or DuraCOR 1100™, is designed and built for the ITS integrator. The DuraCOR 1100™ is the result of over 20 years of embedded computing experience in the mobile environment and it leverages the component-level and systems engineering capabilities of the market-leader in rugged computing.

The DuraCOR 1100™

The DuraCOR 1100™ is a turn-key solution for systems integrators which enables rapid configuration and deployment of the vehicle-borne component of the integrated ITS. The DuraCOR 1100™ is a combination of rugged vehicle logic unit hardware and supporting software, providing the developer with an out-of-the-box solution to support the application software layer.

The DuraCOR 1100™ features many communication interfaces including discrete I/O, RS232/485 serial, J1708, J1939 (CAN), Fast Ethernet, and 802.11g wireless. This al-

lows the systems integrator to connect a variety of legacy and modern vehicle subsystems, all with standard communication networks or buses.

The DuraCOR 1100™ is designed with transit bus operations in mind and features a system monitor with voltage and temperature sensors, programmable status LEDs, and intelligent shutdown. The 12/24 VDC vehicle power supply offers protection for transients and over-voltage, and a Global Positioning System (GPS) is available as a standard option.

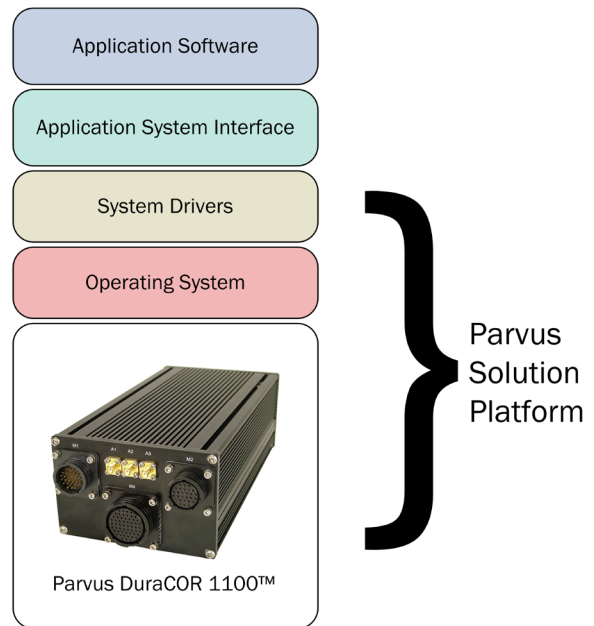


Figure 3 Parvus DuraCOR 1100™ solution architecture

The DuraCOR 1100™ is designed, tested and qualified to SAE J1455 environmental standards for road vehicles.

Extending the Solution Further

The DuraCOR 1100™ is part of a family of products for the transportation market. All Parvus transportation products are designed for the ITS integrator and connect together as a rugged mobile network, allowing ITS integrators to make the mobile enterprise a reality for their customers. At the heart of this network is the Parvus DuraMAR™, a Mobile IP router system that leverages the best-in-class Cisco™ 3200 platform.

CONCLUSION

The Transportation Research Board concluded that “of all the challenges facing transit today, converting the vast amount of data produced by onboard electronic equipment into useful information is arguably the most significant.” On the same note the board said, “using electronics to combine or “integrate” components has the potential to help revitalize bus transit by offering passengers an enhanced level of service to compete with other transportation modes” (2).

For systems integrators deploying Intelligent Transportation Systems for bus operations, Parvus’ DuraCOR 1100™ enables the integrator to overcome the inherent challenges with vehicle subsystems integration. The DuraCOR 1100™ shortens time-to-market, enables technology to be leveraged to multiple projects, and allows systems integrators to focus on their core business of improving transportation operational efficiencies. Parvus is changing the way ITS integrators think about vehicle integration, and Parvus is putting more Intelligence in Transit™.

REFERENCES

1. “Transit Urged to Embrace Quickly Evolving Technology.” Passenger Transport, September 29, 1997
2. “Understanding and Applying Advanced On-Board Bus Electronics.” Transportation Research Board National Research Council, John J. Schiavone, 1999, page 1, 4