

Catch a Ride on the Intelligent Bus

Pioneering Standards of Excellence with Advantech

If you haven't ridden a city bus lately, you might be surprised at just how convenient they've become. Bus Rapid Transit (BRT) systems are springing up in crowded urban cities where other forms of transport are much too expensive to implement. To be successful in a project of this scope requires a careful planning and strategic partnerships. Intelligent bus solutions are comprised of components that create systems that interconnect and communicate, and they're all designed to make management and ridership easy while saving cost. This article will exam the major components of intelligent bus solutions: fleet management, surveillance, ticketing, and advertising, as well as take a look at data handling and hardware design. Hop aboard, the journey is about to begin.

Trends in Bus Rapid Transit Systems

If you're a city planner, or a transportation system integrator, listen up, there are opportunities for building efficient, wide-reaching and cost-effective BRTs with amenities that boost ridership, create multiple revenue streams, and provide safety and security, all while reducing congestion in the city.

Mega-cities with the highest populations, especially those in the developing world may not have the space or financial resources to build MRTs, subways, light-rail or other forms of urban transit. But BRTs are within reach, and so, the market is booming in developing countries. If well-thought out, BRTs bring many benefits: they fit within the



Figure 1 - An Intelligent Bus on Route

boundaries of existing infrastructure using HOV lanes to reduce the overall impact of traffic in congested corridors; they encourage ridership, as it is faster for passengers to get from point A to point B via the BRT; they alleviate points of congestion and queuing; they are safe and comfortable giving passengers an incident-free experience, and they are cost-effective, both for riders and city budgets.

Teaming up with the right technology partners will help smooth out bumps along the way. A Tier 1 provider and an experienced integration team go a long way to getting the bus out of the terminal station and in service. Advantech knows the intelligent bus better than anyone. Not just an expert in the field, but a true pioneer, Advantech has written the standard, a standard of excellence and best practices, and implemented in the world's largest BRT project in the world. Advantech's success in the field has already led to sales of some 50,000 component pieces, 20,000 in the LATAM market alone, and many more in the queue.

Building the Intelligent Bus

As mentioned, comprehensive planning is the key to success. Advantech and its partners help city planners, government agencies, and system integrators in a consulting role—for planning, advising, influencing and collaborating. BRT systems are cost-effective when done properly; using newer buses, hiring certified drivers, and designing solid solutions give projects a head start to success. There are many factors to consider when designing an intelligent bus solution. Let's take a look at a few of the most important ones:

- Fleet Management
- Surveillance
- Ticketing
- Advertising

Fleet Management

Proper fleet management tools assure managers and drivers know what is happening on the bus. GPS tracks bus location; this data is fed to ETA displays at bus stops, and to central dispatch so they can schedule according to road and traffic conditions. Many key engine metrics can be monitored as well, helping with maintenance planning and reducing breakdowns. In mixed fleets (fleets comprised of older and newer vehicles), using technology that can connect to the sensors of different vehicle types is important. CAN Bus message-based communications allow metrics to be gathered in newer buses (less than 10 years old). For older buses, the J1708 protocol allows serial communications between ECUs to take place. Temperatures, fuel and oil levels, acceleration and braking are all examples of data that can be collected. For even older buses, intelligent connectivity may not be possible, but these buses

can still be placed on low traffic, predictable routes until time to upgrade.

One of the most important things to monitor on a bus fleet is tire pressure. A tire pressure management system (TPMS) can alert managers to trouble, prevent accidents, prove warranty claims based on mileage travelled vs. adequate pressure, and in the end reduce the fleet's overall insurance liability (and cost). TPMS reads a unique ID in the tire to track each one. Since these are very costly parts of a fleet, they are very important to watch.

Surveillance

Surveillance is the next big topic. The function of some cameras on a bus may be more obvious than others, but they all work need to work together to ensure safety for passengers and the driver, and keep management in the loop. Having cameras in place also helps deter crime (assaults, thefts, fare cheating), record driver behavior, and capture accident information. The intelligent bus needs a sufficient quantity of cameras, between six and twelve, to get the job done.

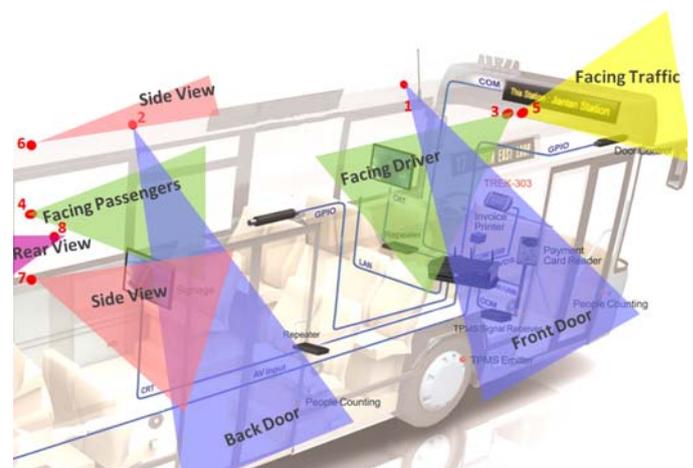
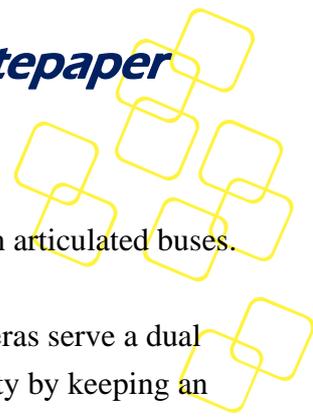


Figure 2 - Bus Surveillance



Let's take a look at how they work:

1. Facing Door
2. Facing Driver
3. Facing Traffic
4. Facing Passengers
5. Side-door View
6. Rear-cams, facing forward

A camera facing the door can count passengers as they enter or exit the bus and verify fares have been paid. It's estimated that cameras focused on fare collection can recoup 50% of the cash loss found in unequipped buses. Counting passengers can alert management to route congestion and it can tell potential passengers (via Smartphone apps) how crowded their ride may be.

A camera facing the driver serves to optimize driving behavior. Drivers are more courteous; they follow safety rules (seatbelts), and are less likely to take liberties like smoking or eating while at the wheel.

Traffic-facing cameras capture event history. In the case of an accident they can serve to prove fault, protecting the bus company in many cases, and keeping insurance premiums down.

Passenger safety and security is a foremost concern. Cameras deter crime, from petty theft to violent assault. In addition, cameras can detect whether mandatory passenger seatbelts are being used by riders, another tool to protect against insurance claims in the event of an accident.

Side-doors can be monitored as easily as the front door for fare collection, and people getting on or off

the bus. This is very important on articulated buses.

Finally, forward facing rear cameras serve a dual purpose. First, they increase safety by keeping an eye on the riders. Second, they can prove to advertisers that their display ads are running and count the number of passengers that are viewing them. This metric is useful for selling advertising space, and a way to add a revenue stream to the bus system.

Ticketing

Ticketing solutions are becoming more intelligent as well. The use of refillable debit cards is convenient, quick and prevents the bus from having to store/carry cash (a potential target for thieves). Smartphone apps can transfer fees directly from electronic wallets to NFC-equipped buses.

Advertising

Multiple revenue streams are a great way to offset operational fees. Ads displayed on digital signage displays and on bus purchases via Smartphone are a good way to start. Using location-based services (LBS) is another route operators can take, pairing up buses in proximity to business and offering push ads, coupons, map pins on the displays and other incentives to get riders off the bus and into local amenities.

Data Handling

Data that is gathered on the bus needs to be managed by central servers, available to dispatchers, managers, advertisers and other partners. Most of this data can be sent using existing cellular technologies. This is perfect for low-bandwidth vehicle data. For high-bandwidth video feeds and in the case of locations where



cellular reception is spotty, local storage comes first. Select video (or stills) can then be forwarded as needed via an SOS button under driver control, or a g-sensor triggered in an accident, optimizing bandwidth and improving efficiency. Intelligent Video Analytics can scan data looking for “people” in a rider counter application, or “buckles” (by color/shape/placement) in a seatbelt-equipped bus to audit rider compliance, and so on. This saves management precious time and money in making sense of its collected data.

Advantech and the Eco-Partner Alliance

The survivability of intelligent bus solutions requires rock solid hardware, capable of operating in the temperature extremes of a vehicle environment, capable of being subject to countless bumps and road hazards, and capable of dealing with transient power situations common in vehicles. These solutions also need to withstand being placed in public spaces. Advantech has expert knowledge in the design and use of these systems, and what’s more, Advantech’s Eco-Partner Alliance was created to foster strategic alliances with partners that share common business visions and goals, aiming to bring its solutions to new levels through mutual business cooperation. In this article we’ve touched on the in-vehicle eco-system. But the breadth of Advantech’s application-ready solutions includes everything from industrial-grade servers, intelligent networking appliances, and other components that can be used beyond the vehicle, to complete the BRT system, all the way from the bus stop, to the central office. And Advantech’s world-renowned support and manufacturing capabilities guarantee a system you can trust, and a resource you can turn to for post-sales, long-term planning and support.

The Future is Now

You may not have seen some of these technologies yet. But they are coming. And this is just the start. As Smart Cities evolve, more intelligent sensors are hitting the market; mobile devices will be in the hands of the driver and the customer; NFC, RFID and other network-aware technologies are coming online, and LBS solutions are springing up everywhere. We encourage you to board the intelligent bus: it’s fun, convenient, and a great way to reduce your stress and help the environment as well.

For more information about Advantech iService solutions and intelligent bus technologies, please visit www.advantech.com.