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Chapter 1 : Personal rapid transit - Wikipedia

This assessment of advanced group rapid transit (AGRT) was made in response to a request of the House Committee on Appropriations to evaluate the need for this technology and its relationship to national mass transportation goals.

In this five-part series , Government Technology examines the present impact of technology on transit systems and what that can mean for the future of urban transportation. When it comes to public transit, the city of Portland, Ore. Despite having a metro population ranked 24th in the country, the city has the 11th largest transit system, when measured by passenger trips. Besides bus service, the city has, over the years, invested in an extensive light rail system, a downtown streetcar line as well as commuter rail. Add it all up and Portland has a robust transit network that is the envy of many American cities. It also gets high marks for how it uses technology. The agency was an early leader in the use of smartphone apps for trip planning. It was also one of the first transit agencies in the country to let riders use their smartphones to pay fares. Like a growing number of transit systems, TriMet transmits bus location information in real time. Need another minute to finish that cup of coffee before starting your commute? In Portland, riders can find out on their phone, tablet or computer when the next bus will arrive at their stop within a five-minute window. While transit agencies always have used technology, most of the focus and spending has been directed toward infrastructure â€" the buses, trains and rails â€" as well as significant labor costs. Information technology has played a relatively quiet role as a tool rather than as an overall strategy. But that thinking is beginning to change as mobile computing, social media, GPS, data analytics â€" as well as other forms of automation â€" have opened up new ways to improve service and, hopefully, attract more riders. Transit agencies are using advances in technology in three broad areas. This is what Terry C. Bills, global transportation industry manager of Esri, calls the Madison Avenue approach, where transit agencies use data and cool technology to market transit so that it appeals to urban professionals and to better understand their needs. Second, agencies are increasing the use of intelligent systems to streamline and improve fare collection, scheduling and routing of transit services. Agencies can track not just where their buses and trains are in real time, but they can also know exactly how many people are riding a particular vehicle at a particular time. When this information is put into a database and analyzed, transit officials can better predict how many buses are needed on given routes at different times of the day and can control when they arrive at a stop, so fewer are too late or too early. Intelligent transportation systems can help control light rail and subway trains, allowing more on the tracks during rush hour, without risk of an accident. The goal is to keep riders well informed and to also mine social media for ways to improve services. Twitter, Facebook, Instagram and other social media platforms have become essential tools for customer-focused transit agencies. Still, a number of cash-strapped agencies, such as TriMet, continue to adopt new technologies, especially those that have an impact on services. He is now a senior editor for Government Technology.

Chapter 2 : Catalog Record: Impact of a Department of Education on | Hathi Trust Digital Library

Mobility strategies provide a powerful framework for policymakers to achieve employment opportunities and positive economic outcomes for low income and low skilled workers.

In , Fichter published a book [32] which proposed an automated public transit system for areas of medium to low population density. Several other urban and transit planners also wrote on the topic and some early experimentation followed, but PRT remained relatively unknown. Around the same time, Edward Haltom was studying monorail systems. Haltom noticed that the time to start and stop a conventional large monorail train, like those of the Wuppertal Schwebebahn , meant that a single line could only support between 20 and 40 vehicles an hour. In order to get reasonable passenger movements on such a system, the trains had to be large enough to carry hundreds of passengers see headway for a general discussion. This, in turn, demanded large guideways that could support the weight of these large vehicles, driving up capital costs to the point where he considered them unattractive. Smaller cars would mean less weight at any given point, which meant smaller and less expensive guideways. To eliminate the backup at stations, the system used "offline" stations that allowed the mainline traffic to bypass the stopped vehicles. He designed the Monocab system using six-passenger cars suspended on wheels from an overhead guideway. Like most suspended systems, it suffered from the problem of difficult switching arrangements. Since the car rode on a rail, switching from one path to another required the rail to be moved, a slow process that limited the possible headways. When cities improved roads and the transit times were lowered, suburbs developed at ever increasing distances from the city cores, and people moved out of the downtown areas. Lacking pollution control systems, the rapid rise in car ownership and the longer trips to and from work were causing significant air quality problems. Additionally, movement to the suburbs led to a flight of capital from the downtown areas, one cause of the rapid urban decay seen in the US. Mass transit systems were one way to combat these problems. Yet during this period, the federal government was feeding the problems by funding the development of the Interstate Highway System , while at the same time funding for mass transit was being rapidly scaled back. Public transit ridership in most cities plummeted. Kennedy charged Congress with the task of addressing these problems. These plans came to fruition in , when President Lyndon B. That is, UMTA would help cover the capital costs of building out new infrastructure. PRT research starts[edit] However, planners who were aware of the PRT concept were worried that building more systems based on existing technologies would not help the problem, as Fitcher had earlier noted. Proponents suggested that systems would have to offer the flexibility of a car: The reason for the sad state of public transit is a very basic one - the transit systems just do not offer a service which will attract people away from their automobiles. Consequently, their patronage comes very largely from those who cannot drive, either because they are too young, too old, or because they are too poor to own and operate an automobile. Look at it from the standpoint of a commuter who lives in a suburb and is trying to get to work in the central business district CBD. If he is going to go by transit, a typical scenario might be the following: When it arrives, he may have to stand unless he is lucky enough to find a seat. The bus will be caught up in street congestion and move slowly, and it will make many stops completely unrelated to his trip objective. The bus may then let him off at a terminal to a suburban train. Again he must wait, and, after boarding the train, again experience a number of stops on the way to the CBD, and possibly again he may have to stand in the aisle. He will get off at the station most convenient to his destination and possibly have to transfer again onto a distribution system. It is no wonder that in those cities where ample inexpensive parking is available, most of those who can drive do drive. In the late s, the Aerospace Corporation , an independent non-profit corporation set up by the US Congress, spent substantial time and money on PRT, and performed much of the early theoretical and systems analysis. However, this corporation is not allowed to sell to non-federal government customers. In , members of the study team published the first widely publicized description of PRT in Scientific American. The oil crisis of made vehicle fuels more expensive, which naturally interested people in alternative transportation. System developments[edit] In , aerospace giant Matra started the Aramis project in Paris. After spending about million francs , the project was canceled when it failed its qualification trials in November The designers tried to make Aramis work like a "virtual train", but control software issues caused cars to bump unacceptably. The project ultimately failed. In a full-scale test facility, 84 vehicles operated at speeds up to 60 kilometres per hour Another version of CVS was in public operation for six months from â€” This system had 12 single-mode vehicles and four dual-mode vehicles on a 1. This version carried over , passengers. On March 23, , U. Edward Anderson , this was "because of heavy lobbying from interests fearful of becoming irrelevant if a genuine PRT program became visible. It has five off-line stations that enable non-stop, individually programmed trips along an 8. This is a crucial characteristic of PRT. However, it is not considered a PRT system because its vehicles are too heavy and carry too many people. When it carries many people, it operates in a point-to-point fashion, instead of running like an automated people mover from one end of the line to the other. During periods of low usage all cars make a full circuit stopping at every station in both directions. Together the firms formed the Cabintaxi Joint Venture. They created an extensive PRT technology that was considered fully developed by the German government and its safety authorities. The system was to have been installed in Hamburg , but budget cuts stopped the proposed project before the start of construction. With no other potential projects on the horizon, the joint venture disbanded, and the fully developed PRT technology was never installed. Cabintaxi Corporation, a US-based company, obtained the technology in , and remains active in the private-sector market for transportation systems. The system was closed in to allow for expansion of the hospital. Later developments[edit] In the s, Raytheon invested heavily in a system called PRT , based on technology developed by J. Edward Anderson at the University of Minnesota. In , rights to the technology reverted to the University of Minnesota, and were subsequently purchased by Taxi The system was extended in and new second-generation vehicles introduced to serve five stations over 1. Operation is scheduled in peak periods and on demand at other times. These transported passengers along a track spiraling up to the summit of Big Spotters Hill. The six-month operation was intended to research the public acceptance of PRT-like systems. In a vehicle four seats each , two station 2getthere system was opened to connect a parking lot to the main area at Masdar City , UAE. The systems runs in an undercroft beneath the city and was supposed to be a pilot project for a much larger network, which would also have included transport of freight. Expansion of the system was cancelled just after the pilot scheme opened due to the cost of constructing the undercroft and since then other electric vehicles have been proposed. The proposal was not included in the final plan due to spending priority given to other capital projects and has been deferred. This was further developed and became the Modutram [53] system and a full-scale test track was built in Guadalajara , which was operational by Larger vehicles are more expensive to produce, require larger and more expensive guideways, and use more energy to start and stop. If vehicles are too large, point-to-point routing also becomes more expensive. Against this, smaller vehicles have more surface area per passenger thus have higher total air resistance which dominates the energy cost of keeping vehicles moving at speed , and larger motors are generally more efficient than smaller ones. The number of riders who will share a vehicle is a key unknown. Based on these figures, some have suggested that two passengers per vehicle such as with UniModal , or even a single passenger per vehicle is optimum. Other designs use a car for a model, and choose larger vehicles, making it possible to accommodate families with small children, riders with bicycles, disabled passengers with wheelchairs, or a pallet or two of freight. Propulsion[edit] All current designs except for the human-powered Shweeb are powered by electricity. In order to reduce vehicle weight, power is generally transmitted via lineside conductors rather than using on-board batteries. Edward Anderson , the lightest system is a linear induction motor LIM on the car, with a stationary conductive rail for both propulsion and braking. LIMs are used in a small number of rapid transit applications, but most designs use rotary motors. Most such systems retain a small on-board battery to reach the next stop after a power failure. ULTra uses on-board batteries, recharged at stops. This increases the safety, and reduces the complexity, cost and maintenance of the guideway. As a result, a street-level ULTRa guideway resembles a sidewalk with curbs and is very inexpensive to construct. ULTRa resembles a small automated electric car, and uses similar components. Switching[edit] Most designers avoid track switching , instead advocating vehicle-mounted switches or conventional steering. Those designers say that vehicle-switching permits faster switching, so vehicles can be closer together. It also simplifies the guideway, makes junctions less visually obtrusive and reduces the impact of malfunctions, because a failed switch on one vehicle is less likely to affect other vehicles. Other designers point out that track-switching simplifies the vehicles, reducing the number of small moving parts in each car. Track-switching replaces in-vehicle mechanisms with larger track-moving components, that can be designed for durability with little regard for weight or size. Track switching greatly increases headway distance. A vehicle must wait for the previous vehicle to clear the track, for the track to switch and for the switch to be verified. If the track switching is faulty, vehicles must be able to stop before reaching the switch, and all vehicles approaching the failed junction would be affected. Mechanical vehicle switching minimizes inter-vehicle spacing or headway distance, but it also increases the minimum distances between consecutive junctions. A mechanically switching vehicle, maneuvering between two adjacent junctions with different switch settings, cannot proceed from one junction to the next. If the vehicle switching is faulty, that vehicle must be able to stop before reaching the next switch, and all vehicles approaching the failed vehicle would be affected. Switching would be accomplished by the vehicle following the appropriate reference line- maintaining a set distance from the left roadway edge would cause the vehicle to diverge left at a junction, for example. Infrastructure design[edit] Simplified depiction of a possible PRT network. The blue rectangles indicate stations. The enlarged portion illustrates a station off-ramp.

Chapter 3 : Group Rapid Transit - 2getthere

Ch Vâ€"impacts of Advanced Group Rapid Transit Technology 33 feature absentfrom most transit systems www.nxgvision.com from continuing to drive, AGRT should Thus, for those auto users who would wish tobe more attractive than conventional modes if.

Personal use only; commercial use is strictly prohibited for details see Privacy Policy and Legal Notice. Mass Transit in 19th- and 20th-Century Urban America Summary and Keywords Mass transit has been part of the urban scene in the United States since the early 19th century. Regular steam ferry service began in New York City in the early s and horse-drawn omnibuses plied city streets starting in the late s. Expanding networks of horse railways emerged by the midth century. The electric streetcar became the dominant mass transit vehicle a half century later. During this era, mass transit had a significant impact on American urban development. In the s, congressional subsidies began to reinvigorate mass transit and heavy-rail systems opened in several cities, followed by light rail systems in several others in the next decades. Today concerns about environmental sustainability and urban revitalization have stimulated renewed interest in the benefits of mass transit. Regular steam ferry service connected Brooklyn and New Jersey to Manhattan in the early s and horse-drawn omnibuses plied city streets starting in the late s. A half century later, technological innovation and urban industrialization enabled the electric streetcar to become the dominant mass transit vehicle. During this era, mass transit had a significant impact on American urban development, suburbanization, the rise of technological networks, consumerism, and even race and gender relations. In the s, when congressional subsidies began to reinvigorate mass transit, heavy-rail systems opened in cities such as San Francisco and Washington D. As the 21st century approached, concern about environmental sustainability and urban revitalization stimulated renewed interest in the benefits of mass transit. Transit history in American cities is rooted in different phases of urbanization, the rise of large corporate entities during the industrial era, the relationship between technology and society, and other broad themes within American history. At the same time, mass transit history shows the value of emphasizing local contexts, as the details of urban transit unfolded differently across the United States based on municipal traditions, environments, economies, and phases of growth. Ferry Boats, Omnibuses, and the Beginnings of Mass Transit in the Early 19th Century The ferry boats that regularly crossed the waters of a few American cities in the early 19th century provided an important precedent to the mass transit industry that emerged later in the century. Before the age of industrialization, the cities of the American merchant economy were primarily sites of commercial exchange of goods and services. Boston, New York, Philadelphia, and most other urban centers were dense, port cities located along rivers, bays, and other bodies of water. And while this geography facilitated the transshipment of goods, it also impeded the expansion of urban settlement. During the early s, Robert Fulton, an engineer and inventor, established a regular ferry service using steam power. The service linked lower Manhattan with Jersey City over the Hudson River, as well as the village of Brooklyn , at the time a small suburban settlement across the East River. Ferries also demonstrate the early connections between transit and urban expansion, as the service allowed commuters living in areas such as the newly subdivided Brooklyn Heights neighborhood to overcome obstacles for continuous settlement posed by bodies of water. Typically, regular users of this service enjoyed above-average incomes and social positions. Unlike most working people, they could afford the expense of a daily fare. Thirteen companies employed seventy steamboats for more than twenty different ferry routes. Ferry service is still an integral part of daily commuting in some cities today. Despite its success, however, ferry boat service could do little to improve transportation over land. This operationâ€"a large horse-drawn wheeled carriage similar to a stagecoach yet open for service to the general public at a set fareâ€"originated in Nantes, France, in Omnibus service spread to Paris two years later and to other French cities as well as London by It spread from larger to smaller cities in subsequent decades. Since most vehicles featured unpadded seats and typically travelled on uneven cobblestone roads if paved at all , passengers experienced an uncomfortable ride. This growing demographic found private stagecoaches too expensive, but they had the affluence and desire to commute to work instead of walking. Horse streetcarsâ€"commonly known as horsecars â€"traveled on rail instead of road, and had numerous advantages over the omnibus. The use of rails provided a faster, quieter, more comfortable ride, while enabling a more efficient use of horse power. This fact allowed for larger cars that carried approximately three times as many riders as the omnibus. Following a slow start, other American cities adopted horsecars by the s, part of the wider context of rampant urbanization during the second half of the 19th century. Typically, a private company ran lines under a franchise awarded by the municipality that outlined the public roads on which the company could build rails and operate routes, along with other stipulations. Further expansion developed during the s. The franchise owners, including banker John Mason, intended the line to serve as the first stage of a passenger steam railway linking lower Manhattan to Harlem. However, fears of noise, smoke, and boiler explosions from those living along the right-of-way prompted the city to prohibit the railroad from operating steam engines within the built-up area south of Twenty-Seventh Street, so the company relied upon horse power within the restricted area. This phenomenon reinforced the value of local contexts, as horsecar lines developed differently in each city based on factors such as local politics, geography, and population density. Horsecarsâ€"and the rails upon which they travelledâ€"began a process of redefining the meaning of city streets that continued with electric streetcars and automobiles. The street became more a place for mobility, diminishing the centrality of sociability, recreation, and other traditional street uses. Initially, popular sentiment opposed the placement of rails along streets, especially since rails were not flush with the street surface and impeded cross movement until the invention of grooved rails in That same year, New York saw its first horsecar operation distinct from steam railroads, and the service soon spread to many other American locales. Ironically, steam power, an essential component of the first Industrial Revolution, created a greater demand for this older form of energy in industrial cities. Horses were expensive to maintain. They ate their value in feed each year, required large stables and care from veterinarians, stablehands, and blacksmiths, and their average work life lasted less than five years. And once horses met their ultimate fate, their bodies had to be removed. New York alone disposed of fifteen thousand horse carcasses annually. Thousands of horses died during the epidemic, which created operational upheaval for the horsecar industry. Not surprisingly, the event further reinforced the need for cheaper, more reliable forms of transit power. It had provided power for ferry services since the s and passenger railways two decades later. By the midth century, commuter railways using steam locomotives essentially short-haul passenger rail connected affluent residents living in small suburban areas to places of work and entertainment in large cities. Many city dwellers living along crowded streets considered the noise, pollution, and other dangers associated with the technology to be nuisances. Steam operation also generally cost more than horse power until the s. A few New York companies gambled on steam-powered conveyances during the s, but they all soon ceased their experiments. This proved to be among the earliest forms of rapid transit, since vehicles operated on their own right-of-way, not in mixed traffic. Once electricity became a possible power source by the s, city dwellers clamored for rapid transit to burrow underground. Power generated from a stationary central sourceâ€"rather than within a moving locomotiveâ€"offered another alternative. Cable cars traveled on rail, similar to horsecars and steam railways, but these vehicles clasped on a moving cable within a street conduit. This feature eliminated much of the noise, smoke, and danger of boiler explosions that plagued urban steam locomotives although such nuisances were still present at the stationary power source. Cables had advantages over horse power, but they also carried particular weaknesses. Cables were always under the threat of snapping. Maintenance and replacement constituted a complex, expensive process that negatively affected service. Ice buildup produced issues in colder cities. The cable had to run at the same capacity no matter the service level, which meant power generation could not diminish at off-peak times. But numbers declined soon after electric streetcar operation became practical in the s. By , only twenty miles of cable car track were still in use. Transit Becomes Electric Technological innovations, demand from the transit industry for improved operations, and a desire for mobility enabled the electric streetcar to become the dominant mass transit vehicle in the United States by the turn of the 20th century. Experiments with battery power also failed in terms of feasible, everyday operation. Rather, as transit historian Brian J. Twelve years later, 90 percent of all streetcars in the United States relied on his patents, and few horsecars were still in operation. Often, they used existing rails and even former horsecar vehicles. New forms of expertise related to electricity replaced veterinarians, blacksmiths, and other horse-related professions. The new technology also generated mergers with large companies swallowing up smaller enterprises, monopolizing service in urban areas, and employing corporate business forms in order to raise capital needed for investment in electricity infrastructure in some cases, electrical utility companies were also transit providers. Transit remained within the private market in most American cities until the second half of the 20th century, but the organizational structure of the industry became more complex. Like horsecars decades earlier, electric streetcars accommodated heavier passenger loads compared to predecessors. This reduced passenger cost per mile, lowered fares, and stimulated greater transit use by wider segments of society. The London Underground had operated steam-powered trains when it opened in , but most commentators believed Americans would avoid smoke-filled subway tunnels. The massive construction cost also impeded subway building. In , the Massachusetts legislature authorized Boston to build the first subway in the United States. The line, which was completed four years later, buried 1. The Boston Transit Commission, a public body, financed construction, while the private West End Street Railway operated the line and serviced its debt. In many cases, the technology exacerbated trends that began with the horsecar. In essence, this entailed the general separation between major commercial activities in the downtown and districts of residence and other activities, such as manufacturing, in less dense areas surrounding the core and along the urban fringe. The American walking cityâ€"in which the dominant mode for the journey to work was by footâ€"came to an end, although many workers still walked to their places of employment. The many streetcar lines that radiated from central business districts across the United States increased accessibility to and from downtown. Electric traction had a centralizing effect by increasing land values in the core and creating the economy of large buildings and places of entertainment during the late 19th and early 20th centuries. These attractions relied upon other technologies such as the elevator, telephone, and electric light, yet the rise of skyscrapers and other iconic elements of the modern urban landscape would have been unlikely without streetcars. Unlike the natural limits of horsecars, electric streetcars could journey well beyond the existing city once trackage was laid. In Boston, for example, the area of urban settlement expanded from two miles outside the old walking city core during the horsecar era to four miles during the first decade of electric streetcar service. Those who worked within the older city but could not afford the daily ten-cent round trip fare were forced to stay or walk long distances from the urban fringe. For example, accessible, cheap land enabled suburban residential developments of semi-detached or detached dwellings set back from the street and surrounded by a yard apartments also existed. Walkability remained important for at least some daily tasks and, of course, for the journey to the nearby streetcar stop. Thus, on the whole, streetcar suburbs had fairly compact forms and high population densities compared to the automobile-centric suburbs that developed later in the 20th century, although such forms and densities varied based on local influences, levels of affluence, and other factors. Real estate speculators knew the value of streetcar service to their developments. In many cases, transit companies held real estate interests along the urban fringe, which they connected via streetcar to spur development, even if the line itself was unprofitable. Yet the many streetcar suburbs that still dot the American landscape today were not simply the result of ambitious developers, but also the desires and actions of many people, from local politicians to the varied residents who made such places home.

Chapter 4 : Bombardier Advanced Rapid Transit (ART) Rail Technology Hits Major Milestone - Bombardier

Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.

Monocab[edit] Monocab is one of the earliest PRT designs, dating from It was originally developed by Edward Haltom who was studying monorail systems. Haltom noticed that the time to start and stop a conventional large monorail train, like those of the Wuppertal Schwebebahn , meant that a single line could only support between 20 and 40 vehicles an hour. In order to get reasonable passenger movements on such a system, the trains had to be large enough to carry hundreds of passengers see headway for a general discussion. This, in turn, demanded large guideways that could support the weight of these large vehicles, driving up capital costs to the point where he considered them unattractive. Smaller cars would mean less weight at any given point, which meant smaller and less expensive guideways. To eliminate the backup at stations, the system used "offline" stations that allowed the mainline traffic to bypass the stopped vehicles. He designed the Monocab system using six-passenger cars suspended on wheels from an overhead guideway. Like most suspended systems, it suffered from the problem of difficult switching arrangements; since the car rode on a rail, switching from one path to another required the rail to be moved, a slow process that limited the possible headways. Vero developed a new switching system with no moving parts, and started development of a test track at their headquarters, which opened in At the time the Apollo Program was winding down and Richard Nixon was in the process of extracting the country from the Vietnam War. There was considerable concern about the health of the aerospace industry, which would be losing two of its major funding sources at the same time. Many aviation companies attempted to rapidly diversify, and a number started mass transit programs as a way of doing so. One such company was Rohr, Inc. ROMAG used the same basic conceptual design with offline stations and centralized routing, but replaced the wheeled suspension with a magnetic levitation and the conventional electric motors with a linear induction motor LIM. As the system did not depend on physical contact for traction, it would operate with equal effectiveness when covered with rain or snow, and could climb steeper grades and turn sharper corners. They developed different versions of the vehicle that could run over or under a single rail, allowing bi-directional travel on a single guideway. This reduces the trackage, otherwise considered an eyesore. The Ontario government demanded considerable Made in Ontario content, which led to most of the projects being eliminated with the exception of a design from Hawker Siddeley Canada of Thunder Bay, Ontario , and an entry from Krauss-Maffei who agreed to local production and the stipulation that the local factory would be sole bidder on any North American sales. Rohr decided to sell the system to Boeing at this point, a sale that went through on 3 February

Chapter 5 : Advanced Transit - Comparison of Personal Rapid Transit (PRT) Systems - ATRA

*Impact of advanced group rapid transit technology: summary [United States. Congress. Office of Technology Assessment.] on www.nxgvision.com *FREE* shipping on qualifying offers.*

Chapter 6 : Vehicle Types - 2getthere

An assessment by the Office of Technology Assessment (OTA) of advanced group rapid transit (AGRT) that looks at possibilities for "further advances in automated guideway transit (AGT) technology, and evaluates their potential impacts on various stakeholder groups" (p. iii).Original is missing vi, 1.

Chapter 7 : ROMAG - Wikipedia

Impact of Advanced Group Rapid Transit Technology. Title: Impact of Advanced Group Rapid Transit Technology: Author: United States. Congress. Office of Technology.

Chapter 8 : 3 Advances in Transit Technology

Impact of advanced group rapid transit technology. By United States. Congress. Office of Technology Assessment. Abstract. viii, 58 p. Personal rapid transit.

Chapter 9 : Impact of Advanced Group Rapid Transit Technology - CORE

Portland, Ore.'s transit agency gets high marks for how it uses technology -- it was an early leader in the use of smartphone apps for trip planning, and one of the first transit agencies in the.