Handbook of Travel Technology

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Table of Contents

Introduction

Travel technology is a term used to describe applications of Information Technology (IT), or Information and Communications Technology (ICT), in travel, tourism and hospitality industry. Travel technology may also be referred to as tourism technology, hospitality automation, travel tracking and flight tracking.

Definition of Travel Technology

Since travel implies locomotion, travel technology was originally associated with the computer reservations system (CRS) of the airlines industry, but now is used more inclusively, incorporating the broader tourism sector as well as its subset the hospitality industry. While travel technology includes the computer reservations system, it also represents a much broader range of applications, in fact increasingly so. Travel technology includes virtual tourism in the form of virtual tour technologies. Travel technology may also be referred to as *e-travel* / *etravel* or *e-tourism* / *etourism* (eTourism), in reference to "electronic travel" or "electronic tourism".

Travel technology is increasingly being used to describe systems for managing and monitoring travel, including travel tracking and flight tracking systems.

In other contexts, the term "travel technology" can refer to technology intended for use by travelers, such as light-weight laptop computers with universal power supplies or satellite Internet connections. That is not the sense in which it is used here.

Applications of Travel Technology

Travel technology includes many processes such as dynamic packaging which provide useful new options for consumers. Today the tour guide can be a GPS tour guide, and the guidebook could be an audioguide, podguide or I-Tours, such as City audio guides. The biometric passport may also be included as travel technology in the broad sense.

XML-based technologies have become increasingly important for the travel industry. XML can be used to support air reservation booking or to implement optional services and merchandising functions in the booking process. Another important application of XML is the establishing of direct connections between Airlines and Travel Agencies. In order to create a generally accepted XML-standard, the Open Axis Group was founded.

History of Travel Technology

Certainly travel technology was born on the coat-tails of the airline industry's use of automation and their need to extend this out to the travel agency partners. It should be kept in mind that there was an online world before the advent of the world wide web in the form of private and commercial online services, via packet switched network using X.25. Travel technology played a significant role in the so-called dot-com boom and bust, circa 1997-2001.

Chapter- 1

In-Flight Entertainment

IFE control integrated in an armrest

In-flight entertainment (**IFE**) refers to the entertainment available to aircraft passengers during a flight. (Zeppelin sightseeing flights were available in Europe before the First World War.) In 1936, the airship Hindenburg offered passengers a piano, lounge, dining room, smoking room, and bar during the 2½ day flight between Europe and America.) After the Second World War, IFE was delivered in the form of food and drink services, along with an occasional projector movie during lengthy flights. In 1985 the first personal audio player was offered to passengers, along with noise cancelling headphones in 1989. During the 1990s the demand for better IFE was a major factor in the design of aircraft cabins. Before then, the most a passenger could expect was a movie projected on a screen at the front of a cabin, which could be heard via a headphone socket at his or her seat.

The largest manufacturers of IFE systems are Panasonic Avionics Corporation, Thales Group, Rockwell Collins and LiveTV. Design issues for IFE include system safety, cost efficiency, software reliability, hardware maintenance, and user compatibility.

History

The first in-flight movie was in 1921 on Aeromarine Airways showing a film called 'Howdy Chicago' to its passengers as the amphibious airplane flew around Chicago. Eleven years later in 1932, the first in-flight television called 'media event' was shown on a Western Air Express Fokker F.10 aircraft.

However, it wasn't until the 1960s that in-flight entertainment (other than reading, sitting in a lounge and talking, or looking out the window) was becoming mainstream and popular. In 1961, David Flexer of Inflight Motion Pictures developed the 16mm film system for a wide variety of commercial aircraft. This replaced the previous 30-inch-diameter film reels. It was also in the same year when the first ever feature film titled By Love Possessed was shown on a regular commercial airline flight.

In 1963, AVID Airline Products developed and manufactured the first pneumatic headset used on-board the airlines and provided these early headsets to Trans World Airlines. These early systems consisted of in-seat audio that could be heard with hollow tube headphones. It was not until 1979 when pneumatic headsets were replaced by electronic headsets. The electronic headsets were initially available only on selected flights and premium cabins whereas economy class still had to do with the old pneumatic headsets.

In 1971, TRANS COM developed the 8mm film cassette. Flight attendants could now change movies in-flight and add short subject programming.

In 1975, Braniff International Airways introduced Atari video games to be played on-board flights.

In the late 1970s and early 1980s, CRT-based projectors began to appear on newer widebody aircraft, such as the Boeing 767. These used LaserDiscs or video cassettes for playback. Some airlines upgraded the old film IFE systems to the CRT-based systems in the late 1980s and early 1990s on some of their older widebodies. In 1985, Avicom

introduced the first audio player system, based on the Philips Tape Cassette technology. Around the same time, CRT-based displays began to appear over the aisles of narrowbody and widebody aircraft. In 1988, the Airvision company introduced the first in-seat audio/video on-demand systems using 2.7 inch LCD technology for Northwest Airlines. The trials which were run by Northwest Airlines on its Boeing 747 fleet received overwhelming positive passenger reaction. As a result, this completely replaced the CRT technology.

Today, in-flight entertainment is offered as an option on almost all wide body aircraft, while some narrow body aircraft are not equipped with any form of In-flight entertainment at all. This is mainly due to the aircraft storage and weight limits. The Boeing 757 was the first narrow body aircraft to widely feature both audio and video In-flight entertainment and today it is rare to find a Boeing 757 without an In-flight entertainment system. Most Boeing 757s feature ceiling-mounted CRT screens, although some newer 757s may feature drop-down LCDs or audio-video on demand systems in the back of each seat. Many Airbus A320 series and Boeing 737NG aircraft are also equipped with drop-down LCD screens. Some airlines, such as WestJet, Continental Airlines and Delta Air Lines, have equipped some narrow body aircraft with personal video screens at every seat. Others, such as Air Canada and JetBlue, have even equipped some regional jets with AVOD.

For the introduction of personal TVs onboard jetBlue, company management tracked that lavatory usage went way down. They originally had two planes, one with functioning IFE and one with none, the functioning one later was called "the happy plane".

System safety and regulation

One major obstacle in creating an In-flight entertainment system is system safety. With the sometimes miles of wiring involved, voltage leaks and arcing become a problem. To contain any possible issues, the in-flight entertainment system is typically isolated from the main systems of the aircraft. In the United States, in order for a product to be considered safe and reliable, it must be certified by the FAA and pass all of the applicable requirements found in the Federal Aviation Regulations. The concerning section, or title, dealing with the aviation industry and the electronic systems embedded in the aircraft, is CFR title 14 part 25. Contained inside Part 25 are rules relating to the aircraft's electronic system.

There are two major sections of the FAA"s airworthiness regulations that regulate flight entertainment systems and their safety in transport category aircraft: 14 CFR 25.1301 which approves the electronic equipment for installation and use, by assuring that the system in question is properly labeled, and that its design is appropriate to its intended function. 14 CFR 25.1309 states that the electrical equipment must not alter the safety or functionality of the aircraft upon the result of a failure. One way for the intended IFE system to meet this regulatory requirement is for it to be independent from the aircraft's main power source and processor. By separating the power supplies and data links from that of the aircraft's performance processor, in the event of a failure the system is self

sustained, and can not alter the functionality of the aircraft. Upon a showing of compliance to all of the applicable U.S. regulations the in-flight entertainment system is capable of being approved in the United States. Certain U.S. design approvals for IFE may be directly accepted in other countries, or may be capable of being validated, under existing bilateral airworthiness safety agreements.

The 1998 crash of Swissair Flight 111 is an example of an installation of an in-flight entertainment system that may have caused a disaster. The MD-11's in-flight entertainment system probably caught on fire, destroyed aircraft systems, and incapacitated the flight crew, causing the aircraft to crash into the Atlantic Ocean.

Cost efficiency

The companies involved are in a constant battle to cut costs of production, without cutting the systems quality and compatibility. Cutting production cost consists of anything from altering the housing for personal televisions, to reducing the amount of embedded software in the In-flight entertainment processor. Difficulties with cost are also present with the customers, or airlines, looking to purchase In-flight entertainment systems. Most In-flight entertainment systems are purchased by existing airlines as an upgrade package to an existing fleet of aircraft. This cost can be anywhere from $2 Million-$5 Million for a plane to be equipped with a set of seat back LCD monitors and an embedded IFE system. Some of the IFE systems are being purchased already installed in a new aircraft, such as the Airbus A320, which eliminates the possibility of having upgrade difficulties. Some airlines are passing the cost directly into the customers ticket price, while some are charging a user fee based on an individual customers use. Some are also attempting to get a majority of the cost paid for by advertisements on, around, and in their IFE.

Software reliability

Software for In-flight entertainment systems should be aesthetically pleasing, reliable, compatible, and also must be user friendly. These restrictions account for expensive engineering of individually specific software. In-flight entertainment equipment is often touch screen sensitive, allowing interaction between each seat in the aircraft and the flight attendants, which is wireless in some systems. Along with a complete aircraft intranet to deal with, the software of the In-flight entertainment system must be reliable when communicating to and from the main In-flight entertainment processor. These additional requirements not only place an additional strain on the software engineers, but also on the price. Programming errors can slip through the testing phases of the software and cause problems.

Varieties of in-flight entertainment

Audio entertainment

Audio entertainment covers music, as well as news, information and comedy. Most music channels are pre-recorded and feature their own DJs to provide chatter, song introductions and interviews with artists. In addition, there is sometimes a channel devoted to the plane's radio communications, allowing passengers to listen in on the pilot's in-flight conversations with other planes and ground stations.

In audio-video on demand (AVOD) systems, software such as MusicMatch is used to select music off the music server. Phillips Music Server is one of the most widely used servers running under Windows Media Center used to control AVOD systems.

This form of in-flight entertainment is experienced through headphones that are distributed to the passengers. The headphone plugs are usually only compatible with the audio socket on the passenger's armrest (and vice-versa), and some airlines may charge a small fee in order to obtain a pair. The headphones provided can also be used for the viewing of personal televisions.

In-flight entertainment systems have been made compatible with XM Satellite Radio, and also with iPods, allowing passengers to access their accounts, or bring their own music, along with offering libraries of full audio CDs from an assortment of artists.

Encoding Standards

Almost all systems use the MPEG technology. Depending on the bandwidth and disk space of the fixed system determines the capability to increase the streaming from MPEG 1.5 (MPEG1) to MPEG3.5 (MPEG2). MPEG4-H264 is a new standard of encoding and requires specific modern systems to decode. MPEG4-H264 quality is comparable to MPEG2, but with smaller file size. MPEG4-H264 requires a license from MPEG-LA.

Video entertainment

iQ entertainment system on a Qantas A330

Video entertainment is provided via a large video screen at the front of a cabin section, as well as smaller monitors situated every few rows above the aisles. Sound is supplied via the same headphones distributed for audio entertainment.

However, personal televisions (PTVs) for every passenger are providing passengers with channels broadcasting new and classic films, as well as comedies, documentaries, children's shows and drama series. Some airlines also present news and current affairs programming, which are often pre-recorded and delivered in the early morning before flights commence.

PTVs are operated via an In flight Management System which stores pre-recorded channels on a central server, and streams them to PTV equipped seats during flight. AVOD systems store individual programs separately, allowing a passenger to have a specific program streamed to them privately, and be able to control the playback.

Some airlines also provide video games as part of the video entertainment system. For example, Singapore Airlines passengers on some flights have access to a number of Super Nintendo games as part of its *KrisWorld* entertainment system. Also Virgin

America's and V Australia's new *RED* Entertainment System offers passengers internet gaming over a Linux-based operating system. *RED* also provides an open source gaming link, so passengers who are experienced in writing games can upload certain created games to the server.

Closed Captioning technology started in 2008. It is text streamed along with video and audio. This will enable passengers to enable or disable the subtitle/caption language. Closed Captioning is capable to stream various text languages. The technology is currently based on Scenarist file multiplexing so far; however, portable media players tend to use alternative technology. WAEA technical committee is trying to standardize the Closed Caption Specification. In 2009, US Department of Transport ruled a compulsory use of captions of all videos, DVDs and other audio-visual displays played for safety and/or informational purposes in aircraft should be high-contrast captioned (e.g., white letters on consistent black background (14 CFR Part 382/ RIN 2105–AD41 /OST Docket No. 2006–23999)).

In-flight movies

Regularly scheduled in flight movies began to premiere in 1961 on flights from New York to Los Angeles. Personal on-demand videos are stored in an aircraft main IFE computer system. From there they can be viewed on demand by the user. Along with the on-demand concept comes the ability for the user to pause, rewind, fast forward, or jump to any point in the movie. There are also the movies that are shown throughout the aircraft at one time, usually on a screen in the front of the cabin.

Personal televisions

Panasonic eFX system installed on a Delta Air Lines Boeing 737-800, branded by Delta as **Delta on Demand**

Some airlines have now installed personal televisions (otherwise known as PTVs) for every passenger on most long-haul routes. These televisions are usually located in the seat-backs or tucked away in the armrests for front row seats and first class. Some show direct broadcast satellite television which enables passengers to view live TV broadcasts. Some airlines also offer video games using PTV equipment.

Audio-video on demand (AVOD) entertainment has also been introduced. This enables passengers to pause, rewind, fast-forward or stop a program that they have been watching. This is in contrast to older entertainment systems where no interactivity is provided for. AVOD also allows the passengers to choose among movies stored in the aircraft computer system.

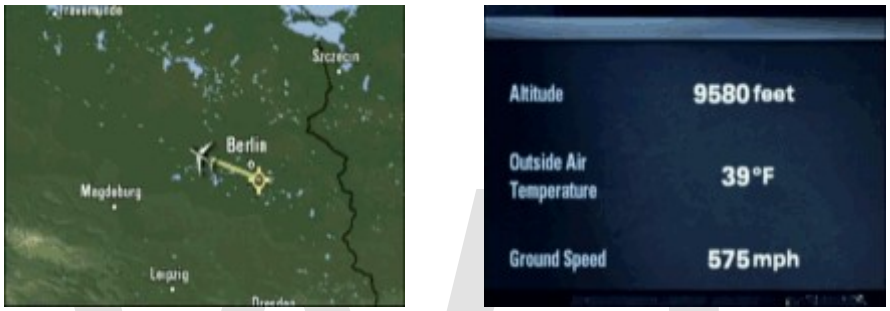
In addition to the personal televisions that are installed in the seatbacks, a new portable media player (PMP) revolution is under way. There are two types available: commercial off the shelf (COTS) based players, and proprietary players. PMPs can be handed out and collected by the cabin crew, or can be "semi-embedded" into the seatback or seat arm. In both of these scenarios, the PMP can pop in and out of an enclosure built into the seat, or an arm enclosure.

In-flight games

Video games are another emerging facet of in-flight entertainment. Some game systems are networked to allow interactive playing by multiple passengers.

Later generations of IFE games began to shift focus from pure entertainment to learning. The best example of this changing trend is Berlitz Word Traveler that allows passengers to learn a new language in their own language. Appearing as a mixture of lessons and mini games, passengers can learn the basics of a new language while being entertained. Many more learning applications continue to appear in the IFE market.

Moving-map systems



Simplified version of Airshow

A moving-map system is a real-time flight information video channel broadcast through PTVs and cabin video screens. In addition to displaying a map that illustrates the position and direction of the plane, the system gives altitude, airspeed, distance to destination, distance from origination and local time. Moving-map system information is derived from the aircraft's flight computer systems. It is often generically referred to as **Airshow**, one of the first moving-map systems now owned by Rockwell Collins. Panasonic Avionics Corporation now offers a similar product known as **iXPLOR** on their latest IFE systems. Honeywell also offers a similar product known as **JetMap**. After the attempted Christmas Day bombing of 2009, the United States Transportation Security Administration (TSA) briefly ordered the live-map shut-off on international flights landing in the United States. Some airlines complained that doing so may compel the entire IFE system to remain shut. After complaints from airlines and passengers alike, these restrictions were eased.

In-flight connectivity

In recent years, IFE has been expanded to include in-flight connectivity—services such as Internet browsing, text messaging, cell phone usage (where permitted) and emailing. In fact, some in the airline industry have begun referring to the entire in-flight-entertainment category as "IFEC" (In-Flight Entertainment and Connectivity or In-Flight Entertainment and Communication).

Airline manufacturer Boeing entered into the in-flight-connectivity industry in 2000 and 2001, with an offshoot called Connexion by Boeing. The service was designed to provide in-flight broadband service to commercial airlines, and Boeing built partnerships with United Airlines, Delta and American. By 2006, however, the company announced it was closing down its Connexion operation. Industry analysts cited technology, weight and cost issues as making the service unfeasible at the time. The Connexion hardware that needed to be installed on an aircraft, for example, weighed nearly 1,000 pounds, which added more "drag" (a force working against the forward movement of the plane) and weight than was tolerable for the airlines.

Since the shuttering of Connexion by Boeing, several new providers have emerged to deliver in-flight broadband to airlines—notably Row 44 (which offers a satellite-based solution supported by the global Hughes Network Systems satellite infrastructure) and Aircell (which offers air-to-ground connectivity via a cellular signal).

In the past two years, many US commercial airlines have begun testing and deploying in-flight connectivity for their passengers: Alaska Airlines, American, Delta, and United among them. Industry expectations are that by the end of 2011, thousands of planes flying in the US will offer some form of in-flight broadband to passengers. Airlines around the world are also beginning to test in-flight-broadband offerings as well.

Satellite and internal telephony

Some airlines provide satellite telephones integrated into their system. These are either found at strategic locations in the aircraft or integrated into the passenger remote control used for the individual in-flight entertainment. Passengers can use their credit card to make phone calls anywhere on the ground. A rate close to USD10.00/minute is usually charged regardless of where the recipient is located and a connection fee may be applied even if the recipient does not answer. These systems are usually not capable of receiving incoming calls. There are also some aircraft that allow faxes to be sent and the rate is usually the same as the call rate but it is charged per page. Some systems also allow the transmission of SMS.

More modern systems allow passengers to call fellow passengers located in another seat by simply keying-in the recipient's seat number.

Data communication

IFE producers have begun to introduce Intranet type systems. Virgin America's and V Australia's *RED* Entertainment System allows for passengers to chat amongst one another, compete against each other in the provided games, talk to the flight attendants and request, and pay for in advance, food or drinks, and have full access to the internet and email.

Wi-Fi

Several airlines are testing in-cabin wi-fi systems. In-flight internet service is provided either through a satellite network or an air-to-ground network. In the Airbus A380 aircraft, data communication via satellite system allows passengers to connect to live Internet from the individual IFE units or their laptops via the in-flight Wi-Fi access.

Boeing's cancellation of the Connexion by Boeing system caused concerns that inflight internet would not be available on next-generation aircraft such as Qantas' fleet of Airbus A380s and Boeing Dreamliner 787s. However, Qantas announced in July 2007 that all service classes in its fleet of A380s will have wireless internet access as well as seat-back access to email and cached web browsing when they start flying in October 2008. Certain elements will also be retrofitted into existing Boeing 747-400s. Qantas has not yet disclosed who will be the service provider.

Sixteen major U.S. airlines now offer Wi-Fi connectivity service on their air crafts. The majority of these airlines use the service provided by gogo Wi-Fi service. The service allows for Wi-Fi enable devices to connect to the Internet. Delta currently has the most Wi-Fi equipped fleet with 500 air crafts that now offer in-flight Wi-Fi.

Mobile phone

As a general rule, mobile phone use while airborne is usually not just prohibited by the carrier but also by regulatory agencies in the relevant jurisdiction (e.g. FAA and FCC in the US). However, with added technology, some carriers already allow the use of mobile phones on selected routes.

Emirates Airline became the first airline to allow mobile phones to be used during flight. Using the systems supplied by telecom company AeroMobile, Emirates launched the facility commercially on March 20, 2008. Installed first on an Airbus A340-300, AeroMobile is presently operating on Emirates A340, A330 and B777 aircraft. Emirates plans to roll out the system over their entire fleet by 2010.

Ryanair has previously aimed to become the first airline to enable mobile phone usage in the air, instead ended up launching its system commercially in February 2009. The system is set up on 22 737-800 jets based at Dublin Airport and will be fitted on Ryanair's 200+ fleet off 737-800 jets by Q1 2010.

Brands

Most airlines have their own brand for its in-flight entertainment system to differentiate themselves. Amongst them are:

- Air Canada: enRoute (AVOD)
- Air New Zealand: KiaOra (AVOD)
- All Nippon Airways: ANA Sky Channel (AVOD)

- American Airlines: ON (AVOD, non AVOD, Overhead)
- Asiana Airlines: Asiana In-flight Entertainment World (AVOD)
- British Airways: High Life Entertainment (AVOD)
- Cathay Pacific: Studio CX (New Long Haul: AVOD; Regional: non AVOD)
- China Airlines: Fantasy Sky (AVOD)
- Delta Air Lines: Delta on Demand (AVOD); Delta on Air (Overhead)
- Emirates: Ice Digital Widescreen and Ice (AVOD); Emirates TV&Radio (non AVOD)
- EVA Air: Sky Gallery (AVOD, non-AVOD, overhead)
- Japan Airlines: JEN Jal Entertainment Network (Magic 1-2: non AVOD in Economy; Magic 3-4: AVOD)
- Korean Air: Sky Program I (AVOD), Sky Program II (AVOD), Blue Program (AVOD), Red Program (Drop Down Screen)
- KLM: KLM's interactive entertainment system (AVOD)
- Lufthansa: Lufthansa Media World (AVOD, non AVOD and Overhead)
- Mango (airline): MangoTv (non-AVOD), drop down and bulkhead screens all Boeing 737-800's *All Mango (airline) aircraft are 737-800
- Malaysia Airlines: Select (AVOD) on Boeing 747-400 and Boeing 777-200
- LAN Airlines: IN (AVOD)
- Philippine Airlines: Flights of Fancy (AVOD, non AVOD, Overhead)
- Qantas: on:Q (iQ and Total Entertainment System: AVOD, On:Q PTV: non AVOD, On:Q Mainscreen: Overhead *On A330-300 and selected A330-200 aircraft, AVOD is used for domestic flights.)
- Qatar Airways: Oryx Entertainment (PTV AVOD; Dropdown and Bulkhead screens)
- Royal Jordanian : SiT from ZodiacAerospace (In-Seat AVOD : Airbus A340-200)
- Singapore Airlines: KrisWorld (New KrisWorld and Wiseman 3000: AVOD; Original: non AVOD)
- South African Airways: AirScape (AVOD: Airbus A340-600 A340-300. Non AVOD: Airbus A319, Boeing 737-800, Airbus A340-200.)
- TAM Airlines: TAM Nas Nuvens (AVOD in all long haul airplanes, except economy class in Boeing 767-300ER. Overheads in some A320, A321)
- Thai Airways International: Vision (AVOD, non AVOD and Overhead)
- United Airlines: United Entertainment Network (AVOD and Overhead)
- US Airways: Overture Interactive (Airbus A330-300 PTVs: AVOD), Overture (Overhead)
- V Australia: Red (AVOD)
- Virgin America: Red (AVOD)
- Virgin Atlantic Airways: V:Port (AVOD); Odyssey and Super Nova (non AVOD)

Chapter- 2

Mobile Ticketing

1. **Mobile ticketing** is the process whereby customers can order, pay for, obtain and validate tickets from any location and at any time using mobile phones or other mobile handsets. Mobile tickets reduce the production and distribution costs connected with traditional paper-based ticketing channels and increase customer convenience by providing new and simple ways to purchase tickets. Mobile ticketing is a prime example of horizontal telecommunication convergence.

2. **Mobile ticketing** is a method by which law enforcement agencies use in-car computers to create traffic citations in the field, then print a hard copy for the offender. The advantages of mobile ticketing include reduced paperwork time, reduced chance of tickets being made void by human error and immediate accessibility of citation information by other departments.

Applications for Mobile Tickets

- Mass transit.
- Airline check-in.
- Cinema ticketing.
- Concert/Event ticketing.
- Trade shows
- Consumer voucher distribution

Advantage of Mobile Tickets

- Reduced costs of ticket printing/mailing.
- Improved consumer convenience.
- Reduced infrastructure costs. (Scanners retail at 30 x that of 1d scanners)
- Increased revenue by increasing accessibility to tickets.

Using Mobile Tickets

Mobile Purchase

Over the past 10 years, e-commerce has exploded, with many consumers becoming increasingly comfortable with purchasing online. The next logical step for consumers who are looking for even more convenient methods of doing business is mobile purchase. This trend will be accelerated by the increased functionality of today's mobile devices.

The International Air Transport Association (IATA) 2007 announced a global standard that paves the way for global mobile phone check-in using two-dimensional (2D) bar codes. The industry has set a deadline of the end of 2010 to implement 100% bar coded boarding passes (BCBP). Upon full implementation, BCBP is said to be able to save the industry over US $500 million annually.

Mobile Tickets can be purchased in a variety of ways including online, via text messaging or over the phone from a voice call, WAP page, or a secure mobile application. For repeated purchases such as daily train tickets, mobile applications or text messaging are good options. The drawbacks to text message purchasing is that either the vendor loses 40% of their revenue to the mobile operator, or any credit card purchase has to be achieved through a web page as the SMS has no security suitable for credit card entry, and very few ticket choices can be easily remembered and entered by SMS.

SMS Purchase

SMS purchase is usually achieved by sending an SMS message containing a short code (e.g. GV for a single adult ticket in Gothenburg, Sweden) to a service number. A return message is sent containing the mobile ticket. Different ticket types can be ordered with a different code (e.g. GU for a youth ticket or GN as a night tariff ticket in Gothenburg). The use of different ordering codes enables creating a variety of ticket types, either time- or distance based pricing and different zone systems.

The price of the ticket can be added to the users mobile phone bill or debited from their pre-paid service using premium SMS billing. The main business limitation is that when premium SMS is used for billing, around 40% of the transaction value is retained by the mobile operator and sms aggregator, which is not viable when the ticket has a conventional profit margin. The revenue share model need to be re-negoatiated separately with teleoperators to suit for mobile ticketing. Other methods for billing include having a mobile wallet that allows the phone user to charge their credit card, but the limitation is the low usage volume of these kind of payment solutions.

Online Purchase

Online purchase is still an option for mobile tickets, allowing the user to setup an account and choosing payment options etc.

Mobile Ticket Delivery

Delivery of tickets to mobile phones can be done in a variety of ways:

- Text messaging (SMS) - visual inspection or OCR
- Text messaging with WAP Push - visual inspection or OCR
- Picture messaging (SMS, EMS, WAP Push and MMS) - usually uses a barcode
- Dedicated Mobile application - which can store and render barcodes delivered via SMS, GPRS, Bluetooth, IRDA or RFID. Barcodes rendered on the device by a dedicated application have the advantage of being full screen without clutter, meaning faster and more successful scanning. A dedicated mobile application can also help the user to organise and sort their tickets better than when an SMS or MMS inbox is full of similar tickets, which is especially useful for transport tickets.
- Device RFID - This is the method proposed under the Near Field Communication (NFC) specification but not yet in general use, except of Japanese Osaifu-Keitai.

Southend United Football Club is currently the only team in the UK to have a mobile ticketing facility offered to fans.

Very few phones outside Japan have RFID/NFC tags and so this method of delivery is largely unsupported. Picture messaging is supported by almost all phones and is generally the delivery method of choice. It usually requires the sender to know the phone model in advance so that the picture is rendered at the correct resolution. Text-only messaging is supported by all mobile phones and is the simplest method of delivery.

Mobile Ticket Scanning

Visually validated mobile tickets do not require a scan device. Most forms of mobile tickets require some form of device to read the ticket from the user's device. Picture-based messages require a laser scanner (for 1-dimensional/linear barcodes) or camera based imager (for 2-dimensional barcodes) to photograph the message and decode it into a ticket ID. Text-based codes use OCR software. Near Field Communication devices scan using an RFID reader.

Each of the above methods has its specific benefits and drawbacks. Optically reading the display of a cell phone is heavily influenced by the quality of the display (resolution, size of pixels, reflections). RFID is only supported by a very few phones yet.

Mobile Ticket Redemption

Visually validated mobile tickets are validated without connection to a back office system. Other forms of mobile ticket systems contact a server that is able to verify the ticket and record that it has been used.

New systems that make use of encryption of the data inside the barcode enable off-line scanning and validation, which is especially important if users are purchasing tickets immediately prior to use, and the portable venue or on-vehicle scanning devices cannot always have a connection to the live ticket database. (Many transport ticketing systems, such as the London Oyster card travel system and the M-PhaTic system of the Swedish state railways SJ are designed so that scanners can operate as disconnected islands when connectivity to central systems is lost.)

Chapter- 3

Car Audio

Car audio/video (car AV), auto radio, mobile audio, 12-volt and other terms are used to describe the sound or video system fitted in an automobile. While 12-volt audio and video systems are also used, marketed, or manufactured for marine, aviation, and buses, here we focuse on cars as the most common application. From the earliest days of radio, enthusiasts had adapted domestic equipment to use in their cars. In the 1960s, tape players using reel to reel equipment, Compact Cassettes, and then 8-track cartridges were introduced for in-car use.

A stock car audio system refers to the OEM application that the vehicle's manufacturer specified to be installed when the car was built. A large after market industry exists where the consumer can at their desire replace many or all components of the stock system. In modern cars, the primary control device for an audio system is commonly referred to as a head unit, and is installed in the center of the dash panel between the driver and the passenger. In older vehicles that had audio components as an option, such devices were mounted externally to the top of or underneath the dash. Car speakers often use space-saving designs such as mounting a tweeter directly over a woofer or using non-circular cone shapes. Subwoofers are a specific type of loudspeaker for low frequency reproduction. Extremely loud sound systems in automobiles, which have been nicknamed "boom cars", may violate the noise ordinance of some municipalities.

Motorcycles have been utilized with similar equipment since they also have the so-called "car audio" experience. Even pedal bicycles, as well as homemade boomboxes have utilized sealed lead-acid batteries (or 12V power supplies) for applications outside of motor vehicle use, likewise the store displays which mount in demo models prior to aftermarket purchases for installation.

History

Early 1970s tractor with a radio/8-track system

1930s

From the earliest days of radio, enthusiasts had adapted domestic equipment to use in their cars. The commercial introduction of the fitted car radio came in the 1930s from the Galvin Manufacturing Corporation. Galvin Manufacturing was owned and operated by Paul V. Galvin and his brother Joseph E. Galvin. The Galvin brothers purchased a battery eliminator business in 1928 and the corporation's first product was a battery eliminator that allowed vacuum tube battery-powered radios to run on standard household electric current. In 1930, the Galvin Corporation introduced one of the first commercial car radios, the Motorola model 5T71, which sold for between $110 and $130 (*2009: $1,700*) and could be installed in most popular automobiles. Founders Paul Galvin and Joe Galvin came up with the name 'Motorola' when his company started manufacturing car radios. A number of early companies making phonographs, radios, and other audio equipment in the early 20th century used the suffix "-ola," the most famous being Victrola; RCA made a "radiola"; there was also a company that made jukeboxes called Rock-Ola, and a film-editing device called a Moviola. The Motorola prefix "motor-" was chosen because the company's initial focus was in automotive electronics.

In Germany Blaupunkt fitted their first radio to a Studebaker in 1932 and in the United Kingdom Crossley offered a factory fitted wireless in their 10 hp models from 1933. The early car radio receivers used the battery voltage (6.3 volts at the time) to run the vacuum tube filaments, and generated the required high voltage for the plate supply using a vibrator to drive a step-up transformer. The receivers required more stages than the typical home receiver in order to ensure that enough gain was available to allow the AGC to mask signal fading as the car was driven. When cars switched to 12-volt batteries, the same arrangement was used, with tubes with 12-volt heaters. In 1952 Blaupunkt became the first maker to offer FM receivers.

1950s

A common feature of modern car radios is the "seek" function which allows tuning from one station to the next at the push of a button. This was a popular option on some Ford products in the 1950s. It was known as the "Town & Country" radio since it used a pair of switches marked "Town" and "Country." Pressing the Town button actuated a motor to rotate the tuning mechanism while the receiver sensitivity was reduced so that only local (stronger) signals would be received. When a station was tuned, the motor stopped. Pressing the Country button had the same effect except that full sensitivity was enabled so that the very next available station would be selected. In addition, for repeated seeking operations, pressing a foot switch on the driver's floor up to the left where the "dead pedal" is located on modern cars would reactivate the Seek at whatever sensitivity was last selected.

1960s-1970s

The introduction of semiconductors (transistors) allowed the output stage to change to a transistor, which soon lead to the elimination of the vibrator, and the use of "space charge" tubes that only required 12 volts on their plates without a high voltage plate power supply (typical example was the 6GM8/ECC86). Advances in electronics allowed additions to the basic radio and Motorola offered 16 2/3 rpm disc players fitted to some Chryslers known as "Hiway HI FI" from as early as 1956 and ran through 1958. Records were produced under license by Comumbia "Special Products division and sold exclusively through Chrysler dealers. The 45 rpm record player was introduced in 1959 and ran through the early 60"s under the RCA and ARC brand. Earl "Mad Man Muntz" introduced the "4 track" tape player in the early 60's using a continuous loop cartidge and was the first commercially available "car stereo. Tape players using reel to reel equipment followed, but their bulk ensured limited popularity. This changed in 1964 when Philips launched the Compact Cassette. During the '60s Lear invented and introduced the 8track cartridge in competition with the cassette system. Other early manufacturers and enthusiasts began building extra audio amplifiers to run on 12 volts (the standard voltage in automotive electrical systems). Jim Fosgate, later to become the founder of Rockford Fosgate, was one such pioneer. The company *a/d/s* also brought an amplifier to market in 1978.

1980s-1990s

In 1983, Zed Audio became the first company to build a 200 watt per channel car amplifier, which was invented by company founder Steven Mantz. At first, speakers from the home audio and professional markets were simply installed into vehicles. However, they were not well suited to the extremes of temperature and vibration which are a normal part of the environment of an automobile. Different manufacturing techniques, and different component materials were used in construction to adapt to these conditions.

Car audio competitions started in the early 1980s

The first known occurred in 1981 in Bakersfield, CA and evolved into an annual event. It was called The Summertime Car Show and Sound Off Competition, which at its height drew upwards of 300 contestants and continued into the 1990s. The Summertime Car Show and Sound Off Competition began as a promotional event for Cars on Camera, a magazine founded by owners Steve Silver and Scott Burud. Since the magazine derived a large part of its advertising revenue from local car stereo shops (TransLex, AutoSounds and others) it made sense to hold a sound off competition in order to create higher demand for magazine ad space. The original event took place in the parking lot of the local Zody's chain store on Ming Avenue, in Bakersfield, CA. However, the following year it was moved to the Kern County fairgrounds in order to accommodate the thousands of participants. By the second year, the event added a men's great legs contest and a bikini contest that attracted contestants from all over California. Cars on Camera changed its name to Camera Ads, which was then sold to Buck Owens Productions.

The most important of these were CAN (formed by Alpine) and NACA (supported by shop owners and amp manufacturers). Both organizations sanctioned countrywide regional events and hosted National Championship events in the late 1980s. They merged to form IASCA in 1990. Despite the move to "quality" based judging, volume was still a significant portion of most early 1990s competitions. Since then, the two styles—SPL vs. sound quality—have become almost mutually exclusive. The loudness competitions have become known as dB drag racing. Currently, MEASQ conducts Sound Quality Competitions nationally in Australia. This back to basics competition format was developed by Marc Rushton, the founder of one of the largest enthusiast organizations known as Mobile Electronics Australia.

Common components and terms

Stock unit

A *stock* car audio system refers to the OEM application that the vehicle's manufacturer specified to be installed when the car was built and nowadays at least includes a CD-radio, with MP3 player and an aux-in. A large after market industry exists where the consumer can at their desire replace or complement many or all components of the stock system (i.e. kits to include a USB port and A2DP bluetooth to the stock radio-CD). Nowadays, the most valued port (40% of the users) is the USB.

Head unit

A Panasonic single DIN head unit, combining radio, CD and MP3

In modern cars, the primary control device for an audio system is commonly referred to as a head unit, and is installed in the center of the dash panel between the driver and the passenger. In older vehicles that had audio components as an option, such devices were mounted externally to the top of or underneath the dash.

The headunit itself is usually a multi-purpose device that houses multiple types of components in its housing. The most common components are a radio receiver/tuner usually with AM and FM bands, and a small amplifier for driving an audio signal to speakers. Other possible components include various media devices, such as (in older vehicles) a tape player (either 8-track or cassette), CD player, DVD player, USB flash memory, and even a portable hard disk drive typically used in notebook computing. Many head units also feature a DSP component, and equalization component (such as bass and treble controls), or a control interface for another feature on the car (such as a back-up/parking camera, navigation system, trip odometer, etc.).

Due to auto manufacturing differences over the years, aftermarket headunit products are manufactured in multiple form factors. The primarily used size is mostly referred to by its legacy name of DIN, which refers to ISO 7736. DIN headunits come as single DIN or

double DIN. A third less common standard is used mostly by Chrysler group and for a time Mitsubishi in their OEM devices.

Speakers

A set of speaker drivers removed from a passenger vehicle.

Car **speakers** are largely functionally identical to any other loudspeaker design with key components specialized for use in mobile environments, and generally serve an identical purpose. One major key design difference is mult-axial mounting of different types of loudspeakers in the same footprint, such as a tweeter directly mounted over a woofer. Another key difference is non-circular cone shapes, such as square, oval, or even triangular. Both of these features reflect a significant reduction in space and size that a speaker may occupy in a vehicle cabin.

Material construction may also include more exotic and hearty components more suitable to mobile use. Marine speakers may have plating for corrosion resistance. Cones may be coated with a substance to resist expansion and contraction under high vehicle cabin temperatures, known to reach 140 °F (60 °C) in the sun. Subwoofers may also be found in mobile audio applications where a cabin speaker may lack the desired low frequency response on its own.

Before stereo radio was introduced, the most common speaker location was in the middle of the dashboard pointing through perforations towards the front windshield. In most modern applications, speakers are mounted certain common locations including the front

deck (or dash), the rear deck (or parcel shelf), the kick panel (located in the footwell below the A-pillar,) or the doors. In the case of subwoofers, mountings are usually under the seat or in the trunk. Each position has certain strengths and limitations from both a quality of sound, and a vehicle manufacturing perspective.

5.1 and even 7.1 channel surround sound systems, as well as THX II Certified, are now being integrated into some cars by both aftermarket enthusiasts and car manufacturers themselves. These systems include the full complement of front left, right and center speakers along with rear right and left surround speakers.

Amplifiers

A car audio amplifier

Blaupunkt Class T amplifier

Basically a mobile audio amplifier, a car 'amp' is a term used to refer to a dedicated electronic amplifier separated from the other components of the system. Though most head units have an amplifier, some do not, or lack the desired power or additional features (e.g., equalization controls or crossover systems). External amplification is available and most often used when existing amplification is insufficient. External amplifiers can be mounted in a different part of the car than the "head unit"; in many cases, an additional amp is mounted in the trunk. This is usually the case when powering a subwoofer, where desired wattage may be several multiples more compared to other cabin speakers.

Though less common, OEM external amplification can be found in 'premium' audio packages, or in luxury cars. More common is aftermarket amplification installed later to satisfy the expansion of an existing system in some way. During operation, it is common for a vehicle's charging system to fluctuate, so a regulated amplifier will maintain its power output regardless of voltage fluctuation. Amplifiers rated at 100 watts at 14.4 volts can not be regarded equal as to an amplifier that can maintain 100 watts at 12 volts. Outside of certain standards, it is not uncommon for manufacturers to list a 14.4 rating and not post a 12 volt value.

Subwoofers

Subwoofers are a specific type of loudspeaker for low frequency reproduction. Mobile 'subs' are not very different from any other application of sub in terms of construction. However it is more common in aftermarket that visual aesthetics take on a more significant role in design than other types of sub drivers, including high contrast paint schemes, grill covers, translucent or refractive materials. Typical subwoofer drivers range in size from an 8" diameter to 10", 12" or 15"; more rarely, some car systems may have 18", 21", 22", 24" or even 32" subwoofers.

A subwoofer is used when existing low frequency production is unsatisfactory, either in frequency range or in volume. Design goals have led to subwoofer, both driver's alone and whole packages, with some extreme difference from one another. Space conscious design has reduced some driver depth to 2" or less, or enclosure depth to 3". Pure loudness through increasing sound pressure has led to some drivers with excursions as great as 4" and vented components to cool the "motor" of the speaker. Quality and clarity has led to driver enclosures being tuned by construction to resonate or neutralize certain frequencies.

Capacitors

A powerful after-market audio system installation in a Toyota

Capacitors are used to store energy for the amplifier to draw on demand. They come in many different sizes ranging from 0.5 farad to well over 100 farads and their intended function is to temporarily cover the short-burst electrical demands of a car audio system that have exceeded the general electrical capabilities of the vehicle. There is little evidence to suggest they impart any benefit to the system, however, due to their low energy storage (compared with the battery) and exponential nature of capacitor voltage decay.

Damping

Sound deadening material is often used in the door cavities and boot/trunk area to damp excess vibration of the panels in the car in response to loud subwoofer bass tones, especially the boot/trunk. The most common type of deadening is either butyl or rubberized asphalt, a product which has an adhesive quality and can be applied by simply pressing it into place with a roller and using a heat gun (or hair dryer). Other types of deadening can be sprayed on, but they are less common because of the additional installation difficulties.

Uniden BCT-15 radio scanner installed with aftermarket head unit

Other components

Other components that make up high-end car audio installations may include:

- Multiple-CD Changer
- amplifiers
- audio processors
- cables
- crossovers
- equalizers
- mobile video (VCRs, television, DVD and navigation)

- Controls, including on steering wheel interface, as well as remote controls
- Car computer, fully functional computer (i.e. Internet, Music, games) that is operable from the interface.
- Gaming consoles – passenger entertainment

Legal problems

Extremely loud sound systems in automobiles may violate the noise ordinance of some municipalities. Some cities have even outlawed so called "boom cars", vehicles containing loud stereo systems that emit low frequency sound, usually with an intense amount of bass. A number of organizations and websites are dedicated to lobbying for tougher restrictions on boom cars, citing that they disturb the peace and cause documented health problems. Noise Free America, a 501(c)(3) non-profit group, cites boom cars as one of the most problematic sources of noise pollution. In 2007, the U.S. Department of Justice issued a guide to police officers on how to deal with problems associated with boom cars.

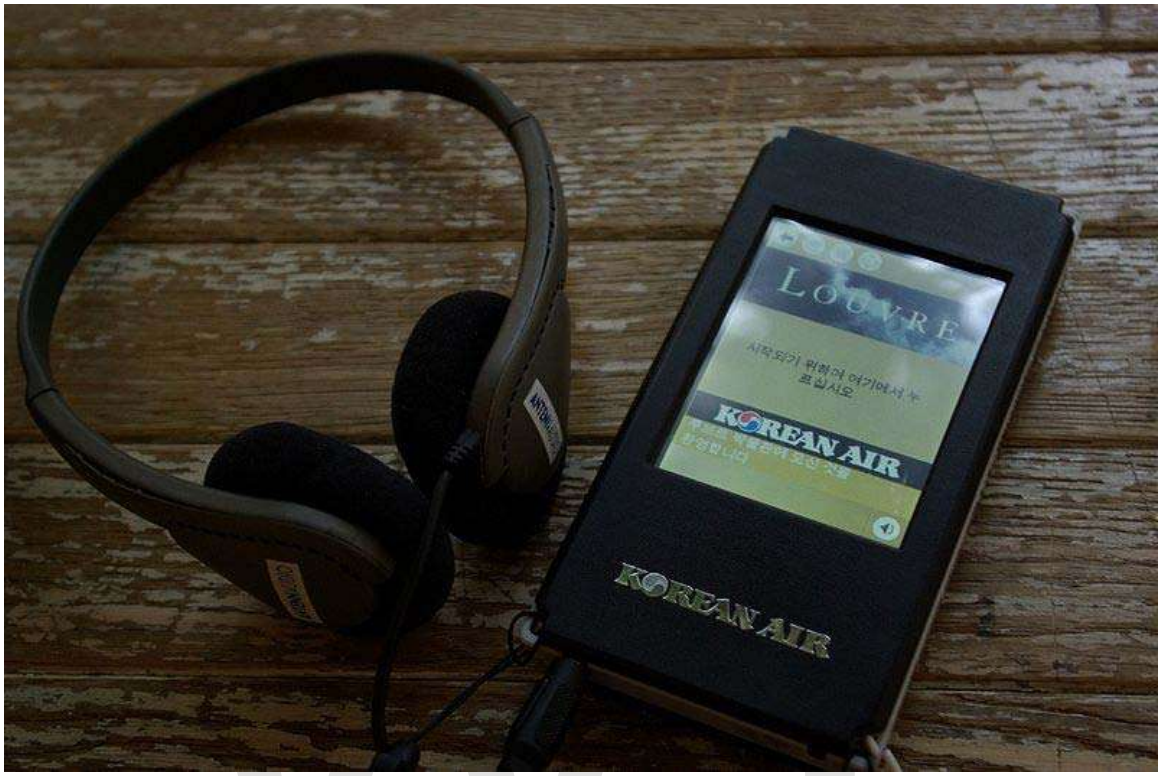
Chapter- 4

Audio Tour and Electronic Ticket

Audio tour

An **audio tour** or **audio guide** provides a recorded spoken commentary, normally through a handheld device, to a visitor attraction. They are also available for self-guided tours of outdoor locations., or as a part of an organised tour. It provides background, context, and information on the things being viewed. Audio guides are often in multilingual versions and can be made available in different ways. Some of the more elaborate tours available include original music and interviews, offering an experience more comparable to an audio documentary than to a traditional guided tour.Traditionally rented on the spot, more recently downloaded from the Internet or available via the mobile phone network. Some audio guides are free or included in the entrance fee, others have to be purchased separately.

Electronic multimedia guides



Audio guide set for Louvre tour supporting Korean language

A multimedia electronic guide is a device specially designed to provide audio, visual or textual content to museum visitors with or without user interaction. It may also provide alternative content corresponding to different personal preferences. It may include accessories such as headphones, a digital pen and displays with LEDs or LCD screens.

These smart guides may be operated to supply content in different languages and accents, with different voice alternatives like (Man/Woman/Child/Native Speaker/TV Speaker/etc.), with text, with age group specific content. They can be operated in several ways:

- Touch/push buttoned systems will be operated by the visitor. Visitor will enter the code assigned to the object to the electronic museum guide and the related content is provided.

- Location aware systems will semi automatically operate. They sense the location by several alternative technologies and provide the related content. If the sensing area is not narrow enough to detect every different object then the visitor will enter or select the content he or she wants. Location aware systems provides better quality tours to disabled people.

- Line of Sight Aware Systems will automatically operate. They sense the location and the target object and provides the related content. These systems may include an artificial intelligence that will measure the visitor aims and interest areas and may provide shallower or deeper information for the object. These systems may need special technologies for target detection.

These electronic guides can provide the museum management with useful statistics and reports, which may include tour statistics, visitor statistics, opinions, and other surveys.

Cell phone tours

A cell phone tour is an audio tour where pre-recorded or stream audio interpretation for a heritage site or a cultural exhibit is provided via a cell phone. Cell phone audio tours have the advantage that most visitors already have the equipment needed to take the audio tour, being their cell phones.

Each venue is assigned a phone number with appropriate stop numbers, displayed next the exhibit. Once a visitor has dialed in, they will be prompted and can enter the corresponding stop number of the exhibit they're viewing, to hear the recorded content. These tours also enable the visitors to: fast forward, rewind, pause, as well as leave a feedback message for each exhibit or the whole tour; simply by pressing a number. In addition to audio content, some providers are also able to stream video, and text message recent visitors with updates. This is the old-style approach, not used widely.

GPS tour

A GPS tour (using Global Positioning System) is an audio tour or a multimedia tour that provides pre-recorded spoken commentary, normally through a handheld device, for mobile applications such as walking tours, boats, buses, trolleys and trains. GPS tours can either be GPS guided or self-directed tours that provide visitors with location relevant content about points of interest along a route or within a destination or region. GPS tours are predominately for outdoor applications, but some audio guides offer the flexibility to manually continue tours indoors.

Using satellite technology (GPS), audio and/or multimedia content is triggered based on a user's location, providing location relevant information to visitors depending on who they are, where they are, and what they are viewing.

A GPS audio tour provides "background, context, and information on the works being viewed" (Fisher, 2004, p. 49). Recently, the *Economist* magazine stated that "aiming such services at tourists makes sense—since people are more likely to want information when in an unfamiliar place."

GPS Tours are often unilingual, but advances in technology have made gps tours for mobile applications available in multiple languages simultaneously. GPS tours can be

created by using a combination of software and hardware and can be downloaded from the Internet for mobile phones, often in MP3 format and are available from organizations specializing in GPS tour development. Some GPS tours are free, included in the ticket fee, others have to be purchased separately.

Electronic ticket

An **electronic ticket** or **e-ticket** is used to represent the purchase of a seat on a passenger airline, usually through a website or by telephone, or sometimes through airline ticket offices or travel agencies. This form of airline ticket rapidly replaced the older multi-layered paper tickets (from close to zero to 100% in about 10 years) and became mandatory for IATA members as from June 1, 2008. During the last few years, where paper tickets were still available, airlines frequently charged extra for issuing them. E-tickets are also available for some entertainment venues.

Once a reservation is made, an e-ticket exists only as a digital record in the airline computers. Customers usually print out a copy of their receipt which contains the record locator or reservation number and the e-ticket number.

According to critical acclaim, Joel R. Goheen is recognized as the Inventor of Electronic Ticketing in the Airline Industry, an industry where global electronic ticket sales (the industry standard) accounts for over US$400 billion a year (2007).

Electronic tickets have been introduced in road, urban or rail public transport as well.

Checking in with an e-ticket

To check in with an e-ticket, the passenger usually goes to the check-in counter and presents the e-ticket itinerary receipt which contains a confirmation or reservation code. In some airports and airlines it is not even necessary to present this document or quote the confirmation code or e-ticket number as the reservation is confirmed solely on the basis of the passenger's identity, which may be proven by a passport or the matching credit card. The rest of the check-in process remains the same as when paper tickets were the norm, that is, the passenger checks-in his/her luggage. The e-ticket is not a substitute for the boarding pass which must still be issued at the end of the check-in process.

Self-service and remote check-in

E-tickets are very popular because they allow extra services like:

- online access to a passenger's reservation which makes amendments to flight plans (such as change of flight date and refunds) possible (subject to ticket restrictions)
- online/telephone/self-service kiosk check-in (if the airline makes this option available)

- early check-in
- printing boarding passes at airport kiosks and at locations other than an airport

It is also possible to have many copies of an e-ticket, hence the "loss" of an airline ticket becomes impossible.

Several web sites exist to help people holding e-tickets accomplish online check-ins in advance of the twenty-four-hour airline restriction. These sites store a passenger's flight information and then when the airline opens up for online check-in the data is transferred to the airline and the boarding pass is emailed back to the customer.

E-ticket limitations

E-tickets are sometimes not available for some flights from an airline which usually offers them. This can be due to a number of reasons, the most common being software incompatibility. If an airline issues tickets for a codeshare flight with another company, and there is no e-ticket interlining agreement, the operating carrier would not be able to see the issuing carrier's ticket. Therefore, the carrier that books the flight needs to provide hard copy versions of the tickets so that the ticket can be processed. Similarly, if the destination airport does not have access to the airline who booked the flight, a paper ticket needs to be issued.

Currently the ticketing systems of most airlines are only able to produce e-tickets for itineraries of no more than 16 segments, including surface segments.

IATA mandated transition

As part of the IATA Simplifying the Business initiative, the association instituted a program to switch the industry to 100% electronic ticketing. The program concluded on June 1, 2008, with the association saying that the resulting industry savings were approximately US$3 billion.

In 2004, IATA Board of Governors set the end of 2007 as the deadline for airlines to make the transition to 100% electronic ticketing for tickets processed through the IATA billing and settlement plan; in June 2007, the deadline was extended to May 31, 2008.

As of June 1, 2008 paper tickets can no longer be issued on neutral stock by agencies reporting to their local BSP. Agents reporting to the ARC using company-provided stock or issuing tickets on behalf of an airline (GSAs and ticketing offices) are not subject to that restriction.

The industry was unable to comply with the IATA mandate and paper tickets remain in circulation as of February 2009.

Chapter- 5

Automotive Navigation System

A taxi equipped with GPS navigation device

An **automotive navigation system** is a satellite navigation system designed for use in automobiles. It typically uses a GPS navigation device to acquire position data to locate the user on a road in the unit's map database. Using the road database, the unit can give directions to other locations along roads also in its database. Dead reckoning using distance data from sensors attached to the drivetrain, a gyroscope and an accelerometer can be used for greater reliability, as GPS signal loss and/or multipath can occur due to urban canyons or tunnels.

Some sorts can be taken out of the car and used hand-held while walking.

History

Automotive navigation systems were the subject of extensive experimentation, including some efforts to reach mass markets, prior to the availability of commercial GPS.

Most major technologies required for modern automobile navigation were already established when the microprocessor emerged in the 1970s to support their integration and enhancement by computer software. These technologies subsequently underwent extensive refinement, and a variety of system architectures had been explored by the time practical systems reached the market in the late 1980s. Among the other enhancements of the 1980s was the development of color displays for digital maps and of CD-ROMs for digital map storage.

However, there is some question about who made the first *commercially available* automotive navigation system. There seems to be little room for doubt that Etak was first to make available a digital system that used map-matching to improve on dead reckoning instrumentation. Etak's systems, which accessed digital map information stored on standard cassette tapes, arguably made car navigation systems practical for the first time. However, Japanese efforts on both digital and analog systems predate Etak's founding.

Steven Lobbezoo developed the first commercially available satellite navigation system for cars. It was produced in Berlin from start 1984 to January 1986. Publicly presented first at the Hannover fair in 1985 in Germany, the system was shown in operation on the evening news (item in the Hannover fair) from the first German television channel in that year. It used a modified IBM PC, a large disc for map data and a flat screen, built into the glove compartment. It was called Homer (after the device from a James Bond movie).

Alpine claims to have created the first automotive navigation system in 1981. However, according to the company's own historical timeline, the company claims to have *co*-developed an analog automotive navigation product called the Electro Gyrocator, working with Honda. This engineering effort was abandoned in 1985. Although there are reports of the Electro Gyrocator being offered as a dealer option on the Honda Accord in 1981, it's not clear whether an actual product was released, whether any customers took delivery of an Electro Gyrocator-equipped Accord, or even whether the unit appeared in any dealer showrooms; Honda's own official history appears to pronounce the Electro Gyrocator as not practical.

Honda claims to have created the first navigation system starting in 1983, and culminating with general availability in the 1990 Acura Legend. The original analog Electro Gyrocator system used an accelerometer to navigate using inertial navigation, as the GPS system was not yet generally available. However, it appears from Honda's concessions in their own account of the Electro Gyrocator project that Etak actually trumped Honda's analog effort with a truly practical digital system, albeit one whose effective range of operation was limited by the availability of appropriately digitized street map data.

[...] progress in digital technology would not stop simply because Honda had turned its attention to analog. In 1985, for example, the U.S. company ETAK introduced its own digital map navigation system. Although the system's effective range-the area of geographical coverage-was limited, the announcement was a dour one for Nakamura and his staff. Therefore, ultimately the development of a practical analog system was shelved. The staff experienced indescribable feelings of disappointment. The development of [Honda's] digital map navigation system resumed in 1987, following a three-year hiatus.

Both Mitsubishi Electric and Pioneer claim to be the first with a GPS-based auto navigation system, in 1990. Also in 1990, a draft patent application was filed within Digital Equipment Co. Ltd. for a multi-function device called PageLink that had real-time maps for use in a car listed as one of its functions.

Magellan, a GPS navigation system manufacturer, claims to have created the first GPS-based vehicle navigation system in the U.S. in 1995.

In 1995, Oldsmobile introduced the first GPS navigation system available in a production car, called GuideStar. There also was an Oldsmobile navigation system available as an option as early as 1994 called the Oldsmobile Navigation/Information System. It was an option on the Oldsmobile Eighty Eight.

However it was not until 2000 that the United States made a more accurate GPS signal available for civilian use.

Technology

Visualization

Navigation systems may (or may not) use a combination of any of the following:

- top view for the map
- top view for the map with the map rotating with the automobile (so that "up" on the map always corresponds to "forward" in the vehicle)
- bird's-eye view for the map or the next curve
- linear gauge for distance, which is redundant if a rotating map is used
- numbers for distance
- schematic pictograms
- voice prompts

Road database

Contents

The road database is a vector map of some area of interest. Street names or numbers and house numbers are encoded as geographic coordinates so that the user can find some desired destination by street address.

Points of interest (waypoints) will also be stored with their geographic coordinates. Point of interest specialties include speed cameras, fuel stations, public parking, and "parked here" (or "you parked here").

Contents can be produced by the user base as their cars drive along existing streets (Wi-Fi) and communicating via the internet, yielding a free and up-to-date map.

Map formats

Formats are almost uniformly proprietary; there is no industry standard for satellite navigation maps, although NAVTEQ are currently trying to address this with S-Dal.

The map data vendors such as Tele Atlas and NAVTEQ create the base map in a standard format GDF, but each electronics manufacturer compiles it in an optimized, usually proprietary format. GDF is not a CD standard for car navigation systems. GDF is used and converted onto the CD-ROM in the internal format of the navigation system.

CARiN

CARiN Database Format (CDF) is a proprietary navigation map format created by Philips Car Systems (this branch was sold to Mannesman VDO, VDO/Dayton in 1998, to Siemens VDO in 2002, and Continental in 2007.) and is used in a number of navigation-equipped vehicles. The 'CARiN' portmanteau is derived from **Car I**nformation and **N**avigation.

S-Dal

This is a proprietary map format published by NAVTEQ, who released it royalty free in the hope that it would become an industry standard for digital navigation maps. Vendors currently using this format include:

- Microsoft
- Magellan
- Pioneer
- Panasonic
- Clarion
- InfoGation

The format has not been very widely adopted by the industry.

Physical Storage Format

The Physical Storage Format (PSF) initiative is an industry grouping of car manufacturers, navigation system suppliers and map data suppliers whose objective is the standardization of the data format used in car navigation systems, as well as allow a map update capability. Standardization would improve interoperability, specifically by

allowing the same navigation maps to be used in navigation systems from 19 manufacturers. Companies involved include BMW, Volkswagen, Daimler, Renault, ADIT, Aisin AW, Alpine Electronics, Navigon, Bosch, DENSO, Mitsubishi, Harman Becker, Panasonic, PTV, Continental AG, Clarion, NAVTEQ, Tele Atlas and Zenrin.

Media

The road database may be stored in solid state read-only memory (ROM), optical media (CD or DVD), solid state flash memory, magnetic media (hard disk), or a combination. A common scheme is to have a base map permanently stored in ROM that can be augmented with detailed information for a region the user is interested in. A ROM is always programmed at the factory; the other media may be preprogrammed, downloaded from a CD or DVD via a computer or wireless connection (bluetooth, Wi-Fi), or directly used utilizing a card reader.

Some navigation device makers provide free map updates for their customers. These updates are often obtained from the vendor's website, which is accessed by connecting the navigation device to a PC.

Real-time data

Some newer systems can not only give precise driving directions, they can also receive and display information on traffic congestion and suggest alternate routes. These may use either TMC, which delivers coded traffic information using radio RDS, or by GPRS/3G data transmission via mobile phones.

One key type of real-time data is traffic information, which includes:

- Real-time data about free/full parkings;
- Nearest public transport lines and prices, to go to a destination, when there is a jam.

Other real-time data includes weather broadcasting, etc.

Integration and other functions

- The color LCD screens on some automotive navigation systems can also be used to display television broadcasts or DVD movies.
- A few systems integrate (or communicate) with mobile phones for hands-free talking and SMS messaging (i.e., using Bluetooth or Wi-Fi).
- Automotive navigation systems can include personal information management for meetings, which can be combined with a traffic and public transport information system.

Controversy

Safety features

Vehicles produced by Subaru and Lexus, as well as Lexus' parent company, Toyota, lock out many of the features when the vehicle is in motion. The manufacturers claim this is a safety feature to avoid the driver being distracted. Many users have complained that passengers are not able to enter destinations while in motion, even though it is safe to do so. Additionally, drivers have complained that it is often more dangerous to pull off a highway and stop than it would be to enter a destination into the system.

Misdirection

A number of road accidents in the UK have been attributed to misdirection by satellite navigation systems. On May 11, 2007, a driver followed satellite navigation instructions in the dark and her car was hit by a train on a rail crossing that was not shown on the system. In Exton, Hampshire, the County Council erected a sign warning drivers to ignore their "sat nav" system and to take another route, because the street was too narrow for vehicular traffic and property damage resulted from vehicles getting stuck.

On March 25, 2009, a man drove down a steep mountain path and almost off of a cliff after he was allegedly directed by his portable GPS system. He was finally stopped by a wire fence.

Misdirection can also occur when a road is altered either permanently or temporarily, such as during road re-construction.

GPS vs speed camera accuracy

In July 2007, an Australian man successfully overturned a speeding conviction after evidence from a GPS navigational track proved that he did not exceed the speed limit.

Other functions

- Golf Carts may have integrated GPS rangefinders tailored to specific golf courses, providing interactive course maps and live readings of distance measurements to the green.
- Many systems can give information on nearby points of interest (POIs), such as restaurants, cash machines and gas stations. Some navigation devices use this feature to store the location of known speed traps or speed cameras, and can alert the driver in much the same way as a radar detector. GPS may also be integrated into actual radar detection devices to enhance accuracy, and in some cases, implement a logic system where the system only alerts if the driver is traveling above the speed limit or in the direction to be 'caught.' Unlike radar detectors, GPS-based speed trap warnings are currently legal in many countries.

- Some systems feature internet connectivity, either via Bluetooth to a mobile phone (in which case the device can typically also be used for hands-free calling), or with a built in GSM SIM card. This connectivity can be used for up-to-date traffic information, to find fuel prices, as well as to search for local distances. Such devices include the TomTom LIVE series, and the Garmin nüvi 1690.
- The radio dispatching of taxicabs have been phased out in several countries in favor of GPS technology plus some form of mobile networking with on board computers. The central dispatch computer keeps track of all vehicles in its fleet, and automatically selects the nearest cab to respond to a passenger request.
- Advanced car security vehicle tracking systems can relay the vehicle's location via cellular phone services in case of loss or theft. The technology can also be used to manage fleet vehicles, in which case it's known as automatic vehicle location.
- A very basic form of GPS navigation is used on public buses in Taipei, where the location and sequence of bus stops for a particular route are programmed. The computer announces the approaching and upcoming bus stops and repeats the information on a dot-matrix display, all without intervention from the driver. This service was once provided based on tire revolutions and odometer mileage, which is not nearly as reliable as a GPS enabled system.

Retrofitting of GPS

A vehicle can be retrofitted with a GPS navigation device unit if it did not originally have one. There are three approaches that can be taken here:

Portable GPS

This type of GPS navigation device is not permanently integrated into the vehicle, having only a simple bracket to mount the device on the surface of the dashboard and powered via the car cigarette lighter. This class of GPS unit does not require professional installation and can typically be used as handheld device, too.

Benefits of this type of GPS unit include low cost as well as the ability to move them easily to other vehicles. Their portability means they are easily stolen if left inside the vehicle. Furthermore, not having a compass, accelerometer or inputs from the vehicle's speed sensors, means that they cannot navigate as accurately by dead reckoning as some built-in devices when there's no GPS signal. More modern portable devices such as the TomTom 920, have an inbuilt accelerometer to try to address this.

A portable automotive navigation system kit generally includes:

- Mini-USB sync cable
- AC adaptor
- Car charger
- Car mount kit
- Pouch

- Wrist band
- External antenna (optional by model)
- Stylus
- Battery pack
- Document kit
- SD card with preload map (sometimes capable of shuffling MP3 playlists)
- Companion CD-ROM
- Navigation software CD-ROM

Early Factory Navigation System (as fitted to 1997 UK Specification Ford Mondeo)

Original factory equipment

Many vehicle manufacturers offer a GPS navigation device as an option in their vehicles. Customers whose vehicles did not ship with GPS can therefore purchase and retrofit the original factory-supplied GPS unit. In some cases this can be a straightforward "plug-and-play" installation if the required wiring harness is already present in the vehicle. However, with some manufacturers, new wiring is required, making the installation more complex.

Modern Factory Navigation System (as fitted to a 2009 U.S. Honda Accord)

The primary benefit of this approach an integrated and factory-standard installation. Many original systems also contain a gyrocompass or accelerometer and may accept input from the vehicle's speed sensors, thereby allowing them to navigate via dead reckoning when a GPS signal is temporarily unavailable. However, the costs can be considerably higher than other options. In some cases, it may even be more economical to buy a similar vehicle that already has a factory-fitted GPS.

Aftermarket

A number of manufacturers supply aftermarket GPS navigation devices that can be integrated permanently into the vehicle. A typical location for such an installation is the DIN slot for the radio/tape/CD. However, in extreme cases, the dashboard may also be remodeled to accommodate the unit.

This approach can be considered a trade off between the previous two options. Benefits include a more secure and better cosmetic finish than a portable device, and lower cost compared to the installation of an original factory-supplied GPS.

Alternatives

Smartphones with GPS, and other navigation devices, may also be used without installing in a car.

SMS

Establishing points of interest in real-time and transmitting them via GSM cellular telephone networks using the Short Message Service (SMS) is referred to as Gps2sms. Some vehicles and vessels are equipped with hardware that is able to automatically send an SMS text message when a particular event happens, such as theft, anchor drift or breakdown. The receiving party (e.g., a tow truck) can store the waypoint in a computer system, draw a map indicating the location, or see it in an automotive navigation system.

Example systems

Navigon

- Acer e300 series

- Clarion
- EB street director
- Garmin
- Gizmondo
- Hertz Neverlost
- iGo (software)
- MapmyIndia
- Kenwood DNX-5120
- Magellan Navigation
- Mio Technology
- Navigon
- NDrive
- Navman iCN series
- Ovi Maps
- Pioneer
- TomTom
- VDO Dayton
- Wayfinder Navigator
- Sygic Mobile Maps/Tele Atlas
- Teletype Software

Chapter- 6

Bing Maps

Bing Maps

Bing Maps

Developer(s)	Microsoft
Stable release	Final (v7) / December 5th, 2010
Type	Web mapping service Virtual globe

Bing Maps (previously *Live Search Maps*, *Windows Live Maps* and *Windows Live Local*) is a web mapping service provided as a part of Microsoft's Bing suite of search engines and powered by the Bing Maps for Enterprise framework.

Major Features

Street Maps

Users can browse and search topographically-shaded street maps for many cities worldwide. Maps include certain points of interest built-in, such as metro stations, stadiums, hospitals, and other facilities. It is also possible to browse public user-created points of interest. Searches can cover public collections, businesses or types of business, locations, or people. There are 5 primary types of street map views available to users: Road View, Aerial View, Bird's Eye View, StreetSide View, and 3D View

Road View

Road View is the default map view and displays vector imagery of roads, buildings, and geography. The data from which the default road map is rendered is licensed from Navteq. In certain parts of the world, road view maps from alternative data providers are also available. For example, when viewing a map of London, you can display road data from the Collins Bartholomew London Street Map. In all parts of the UK, you can display road data from the Ordnance Survey. A Bing Maps app is available that will display road data from Open Street Map.

Aerial View

Aerial View overlays satellite imagery onto the map and highlights roads and major landmarks to be easily identifiable amongst the satellite images.

Bird's-Eye View

Bird's-Eye View displays aerial imagery captured from low-flying aircraft. Unlike the top-down aerial view captured by satellite, Bird's-Eye images are taken at an oblique, 45-degree angle, which give the user better depth perception for buildings and geography. Bird's-Eye view is available in selected locations across the globe, including major cities in the United States, Canada, Japan and in over 80 European locations,. Bird's-Eye images for a location may be viewed from all four cardinal directions. These images are typically much more detailed than the aerial views taken from directly above. Signs, advertisements, pedestrians, and other objects are clearly visible in many Bird's Eye views.

StreetSide View

StreetSide View provides immersive, panoramic (360 degree) imagery of street-level scenes taken from special cameras mounted on moving vehicles. Launched in December 2009 it contains imagery for selected metro areas in the United States as well as selected areas in Vancouver and Whistler, British Columbia associated with the 2010 Winter Olympic Games (example: Richmond Olympic Oval).

3D Maps

The 3D Maps feature lets user see buildings in 3D, with the added ability to rotate and tilt the angle in addition to panning and zooming. To attempt to achieve near-photorealism, all 3D buildings are textured using composites of aerial photography. To view the 3D maps, users must install a plugin, then enable the "3D" option on "Bing Maps". In addition to exploring the maps using a mouse and keyboard, it is possible to navigate the 3D environment using an Xbox 360 controller or another game controller in Windows 7 , Windows Vista or Windows XP. As of April 2007, users may also use 3Dconnexion's *SpaceNavigator* input device.

Currently, roughly 68 cities worldwide may be viewed in 3D, including most of the major cities in the United States and a few cities in Canada, the United Kingdom, and France. Some additional cities have had a select few important landmarks modelled in 3D, such as the Colosseum in Rome. Terrain data is available for the entire world. It is also possible to use a 3D modelling program called 3DVIA Shape for Maps to add one's own models to the 3D map.

Driving, Walking, and Transit Directions

Users can get directions between two or more locations. In September 2010, Bing Maps added public transit directions (bus, subway, and local rail) to its available direction options. Currently transit directions are only available in 11 cities: Boston, Chicago, Los Angeles, Minneapolis, Newark Metro Area, New York Metro Area, Philadelphia, San Francisco, Seattle, Vancouver BC, and Washington DC.

Map Apps

Bing Map Apps is a collection of 1st and 3rd party applications that add additional functionality and content to Bing Maps. Examples of map apps include a parking finder, a taxi fare calculator, an app that maps out Facebook friends, and an app which lets users explore the day's newspaper front pages from around the world. These apps are only accessible through the Bing Maps Silverlight experience.

Traffic Information & Clearflow

Bing Maps shows users current traffic information for major highways and roads. The feature users 4 color codes (black, red, yellow, green) to indicate traffic volume, from heaviest traffic to lightest traffic. Microsoft announced in March 2008 that it will be releasing its latest software technology called “ClearFlow”. It is a Web-based service for traffic-based driving directions available on Bing.com in 72 cities across the U.S. The tool took five years for Microsoft’s Artificial Intelligence team to develop. ClearFlow provides real-time traffic data to help drivers avoid traffic congestion. ClearFlow gives information for alternative routes and supplies traffic conditions on city streets adjacent to highways. Clearflow anticipates traffic patterns, while taking into account sporting/arena events, time of day and weather conditions, and then reflects the back ups and their consequential spill over onto city streets. Often, ClearFlow found it may be

faster to stay on the highway instead of seeking alternative side street routes, which involve traffic lights and congestion as well.

Sharing & Embedding Maps

Bing Maps allows users to share maps and embed maps into their websites. By clicking the e-mail icon in the bottom-left corner of Bing Maps, a window will open that displays a shareable URL so others can access the map currently being viewed. This window also provides HTML code to embed a small version of the map onto any web page.

Visually Appealing Design

In August 2010, Bing Maps launched an overhauled design for its default view. The new colors create a more visually appealing backdrop for information delivery that helps content 'pop' on the map. The backdrop provides clear differentiation for pushpins, labels and red, yellow and green traffic overlays. These design principles also works well in black and white and creates differentiation for those with the most common forms of color blindness. Also, larger fonts correspond to larger roads to help customers more easily identify main roads in cities. More readable labels eliminate the need for bolding and less-attractive glows. The inclusion of neighborhood labels allows users to quickly find or convey locations in a commonly used and highly relevant format.

Other features

People, Business, and Location Search

The search box at the top of Bing Maps can be used to locate places, businesses and landmarks, and people. Search results appear both on a left-side rail and as pushpins on the map (linked together by numbers). Search results often include addresses, contact information, and reviews for businesses and landmarks. For relevant searches, the user will also see a description of the landmark or place. The search process can also be guided using local directories for numerous categories (restaurants, hotels, tourist attractions, retail stores, etc.).

User Contributions

Bing Maps users can also view and add "user contributed" entries to the map. These user-contributions must be toggled on by users. These user-contributed items can include businesses, landmarks, buildings, locations, as well as Microsoft [Photosynth]s. Users can browse user-contributions by tags and subscribe to RSS feeds to receive updates of new user-contributions to a specific area.

Dynamic Labels

In August 2010, Bing Maps added dynamic labels to its Silverlight experience. Turn on the dynamic labels beta from the map style selector on bing.com/maps/explore and the labels become clickable. This allows users to quickly zoom down to a region or location anywhere on the map with just a few clicks. Zooming back out in a single click is also possible by using the 'breadcrumb' trail at the top left of the map.

AJAX & Silverlight Versions

Bing Maps has two separate experiences for users: an AJAX version and an opt-in Silverlight version that requires Microsoft Silverlight to be installed. The Silverlight version is positioned to offer richer, more dynamic features and a smoother experience. In November 2010, the AJAX and Silverlight versions were combined into a semi-hybrid site where Silverlight features such as Map Apps and Streetside could be enabled through the Bing.com/Maps site - these features still required Silverlight to be installed, but does not require use of a separate Bing Maps site.

Shared Features

The AJAX and Silverlight site share the following features: Road View, Aerial View, Bird's-Eye View, Sharing Maps, People/Business/Location Search, Building Footprints, Driving Directions, Walking Directions.

Silverlight Only Features

Silverlight users exclusively can Map Apps, StreetSide View, Photosynths, and Dynamic Labels.

Map Apps

How to Access

Bing Map Apps are accessed either through the "Map Apps" button in the Bing Maps Explore Bar or through direct perma-links. The Map Apps button is only viewable if the user is in the Bing Maps Silverlight experience.

Bing Map Apps

There are a number of Map Apps that are developed/published by Bing, as indicated by the publisher above the map app's name in the app gallery. The following are a list of 1st party apps:

2010 Tour de France: Shows Tour de France segments and	Bing Health Maps: Displays various health	Bing Maps World Tour – Explore new

results	statistic heat maps for the US	imagery for Bing Maps
Businesses by Category: Displays businesses by various categories (Shopping, Food, Travel, etc.)	Coin Search: A game to find hidden coins in StreetSide imagery	Current Traffic
Distance Calculator: Calculate the distance between 2 points in Miles or Kilometers	Education Map	Food Cart Finder: Find the best food carts to eat at in Portland, OR
foursquare Everysquare: Integrates foursquare checkins and badges to Bing Maps	Haiti Earthquake: View before and after photos of Haiti	Home Turf Finder: Find places to watch the World Cup based on country
Hotel Finder: Find and learn about hotels	Local Events: Learn about local upcoming events	Local Lens: Keep up to date with hyperlocal information
StreetSide Photos: Explore cities and landmarks at the StreetSide level using geo-tagged Flickr images	Teach Here: Search for local teaching job opportunities	Twitter Maps
What's Nearby	World Cup: Check the latest information on the World Cup	WorldWide Telescope: Explore the skies and universe
My Friends: Map out Facebook friends	OpenStreetMap: Change the base map to OpenStreetMap	

3rd Party Map Apps

Bing Map Apps also allows 3rd parties to create and submit map apps. The following are a list of 3rd party map apps:

Destination Maps: Create a custom map to a party or place	Everyscape Eats!: Explore 360 degree views of restaurants	Gas Prices
GeoSalesTax: View a heat map of sales tax rates in the US	Global Action Atlas: View ongoing global efforts to help people in need and help the environment	DonorsChoose.org opportunities to help classrooms in need
Oodle Rentals: Find places to rent housing	ParkingFinder: Find parking and get parking rates in major cities	Random Location: Jump to a random location on the map

Ricky’s Data Viewer: Import shape files and GSS files to view on Bing Maps	Roadside Sculptures	Roadside Attractions: Learn about attractions found along US highways
Seattle Issues: Shows SeeClickFix civil issues in the Seattle area	Signs & Billboards: Unique and noteworthy signs and billboards	Taxi Fare Calculator: Estimate taxi care costs
Today’s Front Pages: View the front pages of newspapers from around the globe	TrafficLand	Travel Webcams: View webcam feeds at global attractions
Urban Graffiti: Images of graffiti from cities	Urban Murals Wall paintings from urban corridors	Wcities Events: Find local events
WCities Places Nearby: Find nearby hotels, attractions, venues, and restaurants	Weather	
World of Football		

Map Coverage

Global Ortho Program

In July 2010, Microsoft and DigitalGlobe, a leading global content provider of high-resolution earth imagery solutions, announced the collection of the first imagery from the company's Advanced Ortho Aerial Program. Through a special agreement with Microsoft, the Advanced Ortho Aerial Program will provide wall-to-wall 30 cm aerial coverage of the contiguous United States and Western Europe that DigitalGlobe has the exclusive rights to distribute beyond Bing Maps. The program's first orthophoto mosaics are of Augusta, GA, San Diego, CA and Tampa, FL, and can be viewed on DigitalGlobe's website.

History

Bing Maps was based on existing Microsoft technologies such as Microsoft MapPoint, and TerraServer. The original version lacked many of its distinguishing features, including birds' eye view and 3D maps, and the Collections functionality was limited to a single "Scratchpad" of points of interest. Upon its release in December 2005, Windows Live Local became the public face of the Virtual Earth platform. On November 6, 2006, Microsoft added the ability to view the maps in 3D using a .NET managed control and managed interfaces to Direct3D. Microsoft subsequently referred to this product officially as "*Live Search Maps*", integrating it as part of its Live Search services. On

June 3, 2009, Microsoft officially rebranded Live Search Maps as *Bing Maps*, and the Virtual Earth platform as *Bing Maps for Enterprise*.

Updates

- v1 (Beagle) (July 2005)
- v2 (Calypso) (December 2005) - "Bird's-eye imagery" released
- v2.5 (February 2006)
- v3 (Discovery) (May 2006) - Real time traffic, collections, new API
- v4 (Endeavour) (September 2006) - People search, drawing on maps, new imagery
- v5 (Spaceland) (November 2006) - 3D viewer, building models in 15 cities
- Data update (December 2006) - New 3D models and high-resolution imagery for 6 new areas
- Data update (January 2007) - Over 100 European cities with bird's-eye coverage added
- Data update (29 March 2007) - 3.8TB of bird's-eye imagery, orthophotos and 3D models of 5 British cities
- v5.5 (Falcon) (3 April 2007) VE 3D plugin for Firefox, GeoRSS support, area calculations
- v6 (Gemini) (15 October 2007) - New data, party maps, traffic based routing, v6 MapControl, Bird's Eye in 3D, etc.
- v6.1 (GoliatH) (10 April 2008) - Improved quality of 3D models, improved KML support and new export capabilities, street labels on Bird's Eye imagery, MapCruncher integration, HD filming capabilities, Clearflow traffic report system
- v6.2 (Helios) (24 September 2008) - Multi-point driving directions, landmarks in directions, weather, real stars, new data
- Data Update (29 December 2008) - 48TB of road network data
- v6.2 (Ikonos) (14 April 2009) - Performance improvements
- Bing (3 June 2009)
- Bing Maps Silverlight Beta (2 Dec 2009) - Silverlight, Twitter, Streetside
- (Oslo) (11 June 2010) - Silverlight improvements

Imagery Updates

Bing maps frequently update and expand the geographic areas covered by their imagery, with new updates being released on roughly a monthly basis. Each imagery release typically contains more than 10TB of imagery. The latest imagery releases can be seen on the Silverlight powered Bing World Tour application launched in June 2009.

However, the necessary time-lapse before images are updated means that aerial and Bird's-Eye images for a particular location can sometimes be several years out-of-date. This is particularly noticeable in locations that have undergone rapid recent development or experienced other dramatic changes since the imagery was taken, such as areas affected by natural disasters.

Compatibility

Microsoft states that Bing Maps needs the following environment:

- Windows XP with SP2 or a later version
- Microsoft .NET Framework 2.0
- Windows Imaging Component
- 250 MB or more of hard disk space
- A 1.0-gigahertz (GHz) processor (2.8 GHz or faster is recommended)
- 256 MB of system memory (1 GB is recommended)
- A 32-MB video card (256 MB is recommended) that supports Microsoft DirectX 9, with 3D hardware acceleration enabled
- A high-speed or broadband Internet connection

Compatible browsers include Windows Internet Explorer 6 or later, Mozilla Firefox 3.0 or later, or Safari 3.1 or later. Opera is stated to be usable "with some functionality limitations". Users of browsers that are not considered compatible, as well as users of versions of compatible browsers that are not supported, will be directed away from viewing the map without an error message.

The 3D Maps viewer plug-in requires Microsoft Windows XP Service Pack 2, Microsoft Windows Server 2003, Windows Vista, or Windows 7 with Internet Explorer 6/7/8 or Firefox 1.5/2.0/3.0.

Chapter- 7

Google Maps

Google Maps

Screenshot of Google Maps showing a route from San Francisco to Los Angeles on Interstate 5.

Type of site	Web mapping
Registration	Optional, included with a Google Account
Available language(s)	Multilingual
Owner	Google
Launched	February 8, 2005
Current status	Active

Google Maps (formerly **Google Local**) is a web mapping service application and technology provided by Google, free (for non-commercial use), that powers many map-based services, including the Google Maps website, Google Ride Finder, Google Transit, and maps embedded on third-party websites via the Google Maps API. It offers street maps, a route planner for traveling by foot, car, or public transport and an urban business locator for numerous countries around the world. Google Maps satellite images are not in real time; they are several months or years old.

Google Maps uses a close variant of the Mercator projection, so it cannot show areas around the poles. A related product is Google Earth, a stand-alone program which offers more globe-viewing features, including showing polar areas.

Satellite view

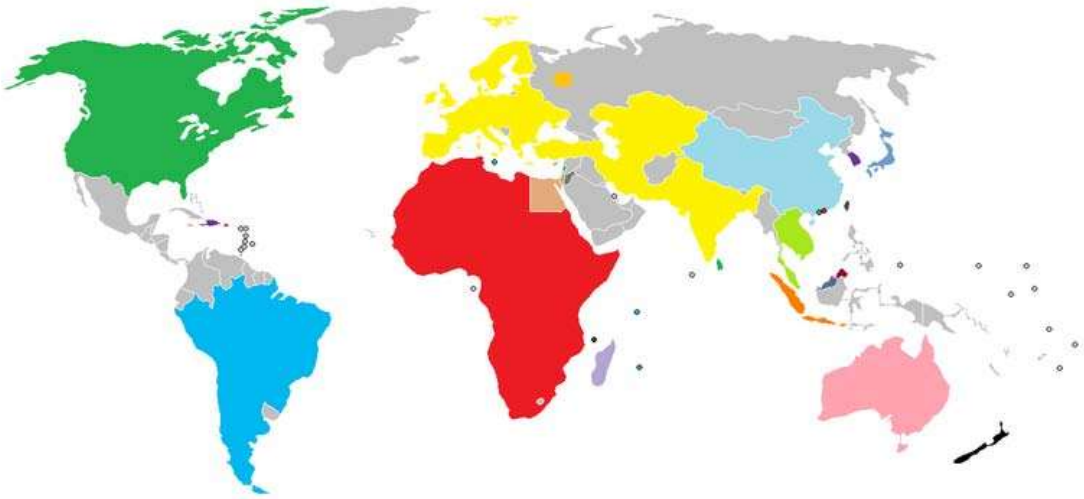
Google Maps provides high-resolution satellite images for most urban areas in the United States (including Hawaii, Alaska, Puerto Rico, and the U.S. Virgin Islands), Canada, and the United Kingdom, as well as parts of Australia and many other countries. The high-resolution imagery has been used by Google Maps to cover all of Egypt's Nile Valley, Sahara desert and Sinai. Google Maps also covers many cities in the English speaking areas. However, Google Maps is not solely an English maps service, since its service is intended to cover the world.

Various governments have complained about the potential for terrorists to use the satellite images in planning attacks. Google has blurred some areas for security (mostly in the United States), including the U.S. Naval Observatory area (where the official residence of the Vice President is located), and previously the United States Capitol and the White House. Other well-known government installations, including Area 51 in the Nevada desert, are visible. Not all areas on satellite images are covered in the same resolution; less populated areas usually get less detail. Some areas may be obscured by patches of clouds.

With the introduction of an easily pannable and searchable mapping and satellite imagery tool, Google's mapping engine prompted a surge of interest in satellite imagery. Sites were established which feature satellite images of interesting natural and man-made landmarks, including such novelties as "large type" writing visible in the imagery, as well as famous stadia and unique geological formations.

Although Google uses the word *satellite*, most of the high-resolution imagery is aerial photography taken from aircraft flying at 800–1500 feet rather than from satellites."Blurry or Outdated Imagery".

Directions



Contiguous regions on Google Maps

Google Maps directions work

- Contiguously on the African mainland, with the exception of Egypt, Lesotho and the Spanish cities of Ceuta and Melilla
- Contiguously in Europe, the Middle East and South Asia: Andorra, Albania, Armenia, Austria, Azerbaijan, Bangladesh, Belgium, Belarus, Bulgaria, Croatia, Czech Republic, Denmark (excluding the Faroe Islands), Estonia, France, Finland, Germany, Greece, Gibraltar, Hungary, India, Iran, Ireland, Italy, Kazakhstan, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, FYR Macedonia, Moldova, Monaco, Montenegro, Nepal, The Netherlands, Norway (excluding Svalbard), Pakistan, Poland, Portugal (excluding the Azores and Madeira), Romania, San Marino, Slovakia, Slovenia, Serbia, Spain (including the Canary Islands and Ceuta and Melilla), Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan, and the Vatican City
- Contiguously in North America: Canada, the United States and Mexico
- Contiguously in South America: Argentina, Bolivia, Brazil, Chile, Paraguay and Peru (most parts, except e.g. north of San Martín, Piura at the Pacific coast or Iquitos and other places in the Loreto region)
- Contiguously in Southeast Asia: Cambodia, Laos, Singapore, peninsular Malaysia, Thailand and Vietnam
- In certain noncontiguous countries and regions: Australia, China, Comoros, Costa Rica, Egypt, Hawaii, Hispaniola (the Dominican Republic and Haiti), Hong Kong, Iceland, Indonesia (Bali, Java, Madura and Sumatra only), Israel (and parts of the West Bank), Jamaica, Japan, Jordan, South Korea, Lebanon, Macau, Madagascar, Malta, Mauritius, Mexico, New Zealand, Puerto Rico, Réunion, Russia (Moscow area only), Sabah, Sarawak, Seychelles, South Korea (Transit only), Sri Lanka, Taiwan, Turks and Caicos Islands, and the US Virgin Islands.

Implementation

Like many other Google web applications, Google Maps uses JavaScript extensively. As the user drags the map, the grid squares are downloaded from the server and inserted into the page. When a user searches for a business, the results are downloaded in the background for insertion into the side panel and map; the page is not reloaded. Locations are drawn dynamically by positioning a red pin (composed of several partially-transparent PNGs) on top of the map images.

A hidden IFrame with form submission is used because it preserves browser history. The site also uses JSON for data transfer rather than XML, for performance reasons. These techniques both fall under the broad Ajax umbrella.

Extensibility and customization

As Google Maps is coded almost entirely in JavaScript and XML, some end users have reverse-engineered the tool and produced client-side scripts and server-side hooks which allowed a user or website to introduce expanded or customized features into the Google Maps interface.

Using the core engine and the map/satellite images hosted by Google, such tools can introduce custom location icons, location coordinates and metadata, and even custom map image sources into the Google Maps interface. The script-insertion tool Greasemonkey provides a large number of client-side scripts to customize Google Maps data.

Combinations with photo sharing websites, such as Flickr, are used to create "memory maps". Using copies of the Keyhole satellite photos, users have taken advantage of image annotation features to provide personal histories and information regarding particular points of the area.

Google Maps API

Google launched the **Google Maps API** in June 2005 to allow developers to integrate Google Maps into their websites. It is a free service, and currently does not contain ads, but Google states in their terms of use that they reserve the right to display ads in the future.

By using the Google Maps API, it is possible to embed Google Maps site into an external website, on to which site specific data can be overlaid. Although initially only a JavaScript API, the Maps API has since expanded to include an API for Adobe Flash applications, a service for retrieving static map images, and web services for performing geocoding, generating driving directions, and obtaining elevation profiles. Over 350,000 web sites use the Google Maps API, making it the most heavily used web application development API.

The Google Maps API is free for commercial use providing that the site on which it is being used is publicly accessible and does not charge for access. Sites that do not meet these requirements can purchase Google Maps API Premier.

The success of the Google Maps API has spawned a number of competing alternatives, including the Yahoo! Maps API, Bing Maps Platform, MapQuest Development Platform, and OpenLayers.

Google Maps for Mobile

In 2006, Google introduced a Java application called Google Maps for Mobile, intended to run on any Java-based phone or mobile device. Many of the web-based site's features are provided in the application.

On November 28, 2007, Google Maps for Mobile 2.0 was released. It introduced a GPS-like location service that does not require a GPS receiver. The "my location" feature works by utilizing the GPS location of the mobile device, if it is available. This information is supplemented by the software determining the nearest wireless networks and cell sites. The software then looks up the location of the cell site using a database of known wireless networks and cell sites. The Cell-site location method is used by triangulating the different signal strengths from different cell transmiters and then using their location property (retrieved from the online cell site database) to aid My Location in determining the user's current location. Wireless network location method is calculated by discovering the nearby WiFi hotspots and using their location property (retrieved from the online WiFi database, in the same way as the cell site database) to further discover the user's location. The order in which these take precedence is:

- GPS-based services
- WLAN-based / WiFi-based services
- Cell transmitter-based services

The software plots the streets in blue that are available with a yellow icon and a green circle around the estimated range of the cell site based on the transmitter's rated power (among other variables). The estimate is refined using the strength of the cell phone signal to estimate how close to the cell site the mobile device is.

As of December 15, 2008, this service is available for the following platforms:

- Android
- iOS (iPhone/iPod Touch/iPad)
- Windows Mobile (NOT Windows Phone 7 as of Dec 17 2010)
- Nokia/Symbian (S60 3rd edition only)
- Symbian OS (UIQ v3)
- BlackBerry
- Phones with Java-Platform (MIDP 2.0 and up), for example the Sony Ericsson K800i

- Palm OS (Centro and newer)
- Palm webOS (Palm Pre and Palm Pixi)

On November 4, 2009, Google Maps Navigation was released in conjunction with Google Android OS 2.0 Eclair on the Motorola Droid, adding voice commands, traffic reports, and street view support. The initial release is limited to the United States.

Google Maps Android 2.0.

Google Maps for Android

Cell phones are being increasingly used for navigation assistance. However, written driving instructions are sometimes very confusing to follow. While navigation devices have become a billion dollar industry, Google Maps Navigation for Android 2.0 is free.

Features Provided in the Application:

- Search in plain English
- Search by voice
- Traffic view
- Search along route
- Satellite view
- Street View
- Car dock mode

Impact
Google Maps Navigation is free. The drawback of Google Maps for Android is that an internet connection is required to get maps and related information from Google Maps, just like with iPhone's Google Maps application.

Shares of Tom-Tom, Garmin and other navigation service providers fell by almost twenty-five percent after Google's announcement of Google Maps for Navigation. The application was only available initially to Verizon users with Android 2.0 or higher.

Google's Navigation was launched in the UK on 20 April 2010 and Australia on 17 November 2010, although it is still unknown when this feature will come to the rest of the world.

Google Maps parameters

In Google Maps, URL parameters are sometimes data-driven in their limits and the user interface presented by the web may or may not reflect those limits. In particular, the zoom level (denoted by the *z* parameter) supported varies. In less populated regions, the supported zoom levels might stop at around 18. In earlier versions of the API, specifying these higher values might results in no image being displayed. In Western cities, the supported zoom level generally stops at about 20. In some isolated cases, the data supports up to 23 or greater, as in these elephants or this view of people at a well in Chad, Africa. Different versions of the API and web interfaces may or may not fully support these higher levels.

As of October 2010, the Google map viewer updates its zoom bar to allow the user to zoom all the way to when centered over areas that support higher zoom levels.

Development history

Google Maps first started as a C++ program designed to be separately downloaded by users. Lars and Jens Rasmussen at the Sydney-based company Where 2 Technologies

pitched the idea for a purely Web-based product to Google management, changing the method of distribution. In October 2004 the company was acquired by Google Inc where it transformed into the web application Google Maps. The application was first announced on the Google Blog on February 8, 2005, and was located at Google. It originally only supported users of Internet Explorer and Mozilla web browsers, but support for Opera and Safari was added on February 25, 2005, but currently Opera is removed from the system requirements list. As of December 2010 Internet Explorer 7.0+, Firefox 3.6+, Safari 3.1+, and Google Chrome are supported. It was in beta for six months before becoming part of Google Local on October 6, 2005.

In April 2005, Google created Google Ride Finder using Google Maps. In June 2005, Google released the Google Maps API. In July 2005, Google began Google Maps and Google Local services for Japan, including road maps. On July 22, 2005, Google released "Hybrid View". Together with this change, the satellite image data was converted from plate carrée to Mercator projection, which makes for a less distorted image in the temperate climes latitudes. In July 2005, in honor of the thirty-sixth anniversary of the Apollo Moon landing, Google Moon was launched. In September 2005, in the aftermath of Hurricane Katrina, Google Maps quickly updated its satellite imagery of New Orleans to allow users to view the extent of the flooding in various parts of that city. (Oddly, in March 2007, imagery showing hurricane damage was replaced with images from before the storm; this replacement was not made on Google Earth, which still uses post-Katrina imagery).

As of January 2, 2006, Google Maps featured road maps for the United States, Puerto Rico, Canada, the United Kingdom, Japan, and certain cities in the Republic of Ireland. Coverage of the area around Turin was added in time for the 2006 Winter Olympics. On January 23, 2006, Google Maps was updated to use the same satellite image database as Google Earth. On March 12, 2006, Google Mars was launched, which features a draggable map and satellite imagery of the planet Mars. In April 2006, Google Local was merged into the main Google Maps site. On April 3, 2006, version 2 of the Maps API was released. On June 11, 2006, Google added geocoding capabilities to the API, satisfying the most developer-requested feature for this service. On June 14, 2006, Google Maps for Enterprise was officially launched. As a commercial service, it features intranet and advertisement-free implementations. In July 2006 Google started including Google Maps business listings in the form of Local OneBoxes in the main Google search results. On December 9 Google integrates the PlusBox in the main search results. On December 19 Google added a feature that lets you add multiple destinations to your driving directions. Beginning in February 2007, buildings and subway stops are displayed in Google Maps "map view" for parts of New York City, Washington, D.C., London, San Francisco, and some other cities.

On January 29, 2007 Local Universal results were upgraded and more data included in the main Google results page. On February 28, 2007, Google Traffic info was officially launched to automatically include real-time traffic flow conditions to the maps of 30 major cities of the United States. On March 8, 2007, the Local Business Center was upgraded. On May 16, 2007 Google rolled out Universal search results, including more

Map information on the main Google results page. On May 18, 2007 Google added neighborhood search capabilities. On May 29, 2007, Google driving directions support was added to the Google Maps API. On May 29, 2007, *Street View* was added, giving a ground-level 360-degree view of streets in some major cities in United States. On June 19, 2007, reviews were allowed to be added directly to businesses on Google Maps. On June 28, 2007, draggable driving directions were introduced. On July 31, 2007, support for the hCard microformat was announced. Unfortunately, the implementation is broken. On August 21, 2007, Google announced a simple way to embed Google Maps into other websites. On September 13, 2007, 54 new countries were added to Google Maps in Latin America and Asia. On October 3, 2007, Google Transit was integrated into Google Maps making public transportation routing possible on Google Maps. On October 27, 2007, Google Maps started mapping the geoweb and showing the results in Google Maps. On October 27, 2007, Google Maps added a searchable interface for coupons in the business listings. On November 27, 2007, "Terrain" view showing basic topographic features was added. The button for "Hybrid" view was removed, and replaced with a "Show labels" checkbox under the "Satellite" button to switch between "Hybrid" and "Satellite" views.

On January 22, 2008, Google expanded the Local Onebox from 3 business listings to 10. On February 20, 2008, Google Maps allowed searches to be refined by User Rating & neighborhoods. On March 18, 2008, Google allowed end users to edit business listings and add new places. On March 19, 2008, Google added unlimited category options in the Local Business Center. On April 2, 2008, Google added contour lines to the Terrain view. In April 2008, a button to view recent Saved Locations was added to the right of the search field. On May 15, 2008, Google Maps was ported to Flash and ActionScript 3 as a foundation for richer internet applications. On July 15, 2008, walking directions were added. On August 4, 2008, Street View launched in Japan and Australia. On August 15, 2008, the user interface was redesigned. On August 29, 2008, Google signed a deal under which GeoEye would supply them with imagery from a satellite, and introduced the Map Maker tool for creation of map data. On September 9, 2008, a reverse business lookup feature was added. On September 23, 2008, information for the New York City Metropolitan Transit Authority was added. On October 7, 2008, GeoEye-1 took its first image, a bird's-eye view of Kutztown University in Pennsylvania. On October 26, 2008, reverse geocoding was added to the Maps API. On November 11, 2008, Street View in Spain, Italy, and France was introduced. On November 23, 2008, AIR support for the Maps API for Flash was added. On November 25, 2008, a new user interface for Street View was introduced. On November 27, 2008, maps, local business information, and local trends for China were introduced. On December 9, 2008, 2x Street View coverage was introduced.

In May, 2009, a new Google Maps logo was introduced. In early October 2009, Google replaced Tele Atlas as their primary supplier of geospatial data in the U.S. version of Maps and use their own data. In October 2009, the railroads were redone, featuring a slightly new look and updated, removing older lines. Also in the same month, maps in several areas were changed to include paper streets and other odd roads that don't exist, as well as lot lines showing up on the map interface. On February 11, 2010, Google Maps Labs was added. On March 11, 2010, Street View in the United Kingdom, Hong Kong,

Macau, and more locations in Japan were launched. On May 25, 2010, public transportation routing for Denmark was added by integrating with Rejseplanen.dk.

Google's use of Google Maps

The main Google Maps site includes a local search feature (now deprecated), which can be used to locate businesses of a certain type in a geographic area. The functionality of the deprecated Google Local Search API is now contained in the Google Places API, currently in developer preview.

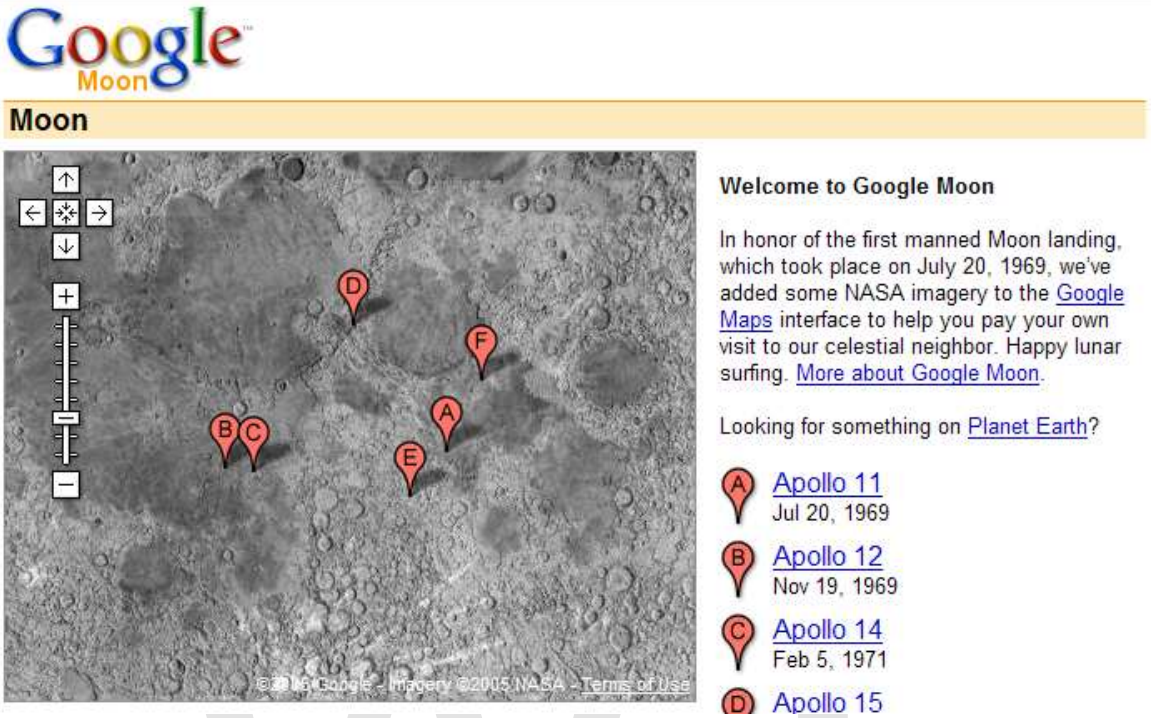
Google Ditu

Google Ditu (谷歌地图 lit. "Google Maps") was released to the public on February 9, 2007, and replaced the old Google Bendi (谷歌本地 lit. "Google Local"). This is the Chinese localized version of Google Maps and Google Local services.

In order to be compliant with the requirements of Chinese law, Google had to remove or modify some Google Maps features in Google Ditu:

- Google Ditu does not allow overlay of user-generated content from Panoramio, Youtube and webcams.
- Google Ditu shows the disputed border areas between China and India as being part of China, while on Google Maps those disputed areas are shown inside dotted lines.

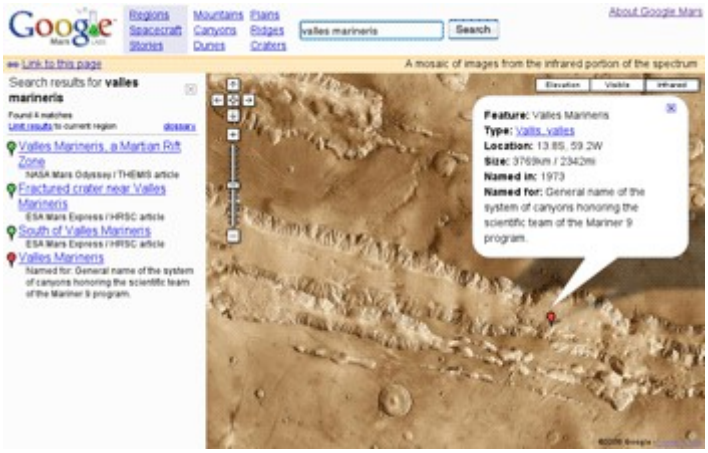
Google Moon



Google Moon

In honor of the 36th anniversary of the Apollo 11 moon landing on July 20, 1969, Google took public domain imagery of the Moon, integrated it into the Google Maps interface, and created a tool called Google Moon. By default this tool, with a reduced set of features, also displays the points of landing of all Apollo spacecraft to land on the Moon. It also included an easter egg, displaying a Swiss cheese design at the highest zoom level, which Google has since removed. A recent collaborative project between NASA Ames Research Center and Google is integrating and improving the data that is used for Google Moon. This is the Planetary Content Project. Google Moon was linked from a special commemorative version of the Google logo displayed at the top of the main Google search page for July 20, 2005 (UTC).

Google Mars



Google Mars

Google Mars provides a visible imagery view, like Google Moon, as well as infrared imagery and shaded relief (elevation) of the planet Mars. Users can toggle between the elevation, visible, and infrared data, in the same manner as switching between map, satellite, and hybrid modes of Google Maps. In collaboration with NASA scientists at the Mars Space Flight Facility located at Arizona State University, Google has provided the public with data collected from two NASA Mars missions, Mars Global Surveyor and 2001 Mars Odyssey.

Now, with Google Earth 5 it is possible to access new improved Google Mars data at a much higher resolution, as well as being able to view the terrain in 3D, and viewing panoramas from various Mars landers in a similar way to Google Street View.

Google Sky

On August 27, 2007, Google introduced Google Sky, an online space mapping tool that allows users to pan through a map of the visible universe, using photographs taken by the Hubble Space Telescope.

Google Ride Finder

Google launched an experimental Google Maps-based tool called **Ride Finder**, tapping into in-car GPS units for a selection of participating taxi and limousine services. The tool displays the current location of all supported vehicles of the participating services in major U.S. cities, including Chicago and San Francisco, on a Google Maps street map. As of 2009 the tool seems to be discontinued. Not to be confused with carpooling.

Google Transit

In December 2005, Google launched Google Transit on Google Labs, a 20% project of Chris Harrelson and Avichal Garg. Google Transit launched initially with support for

Portland, Oregon, and now includes hundreds of cities in the United States, Canada, Europe, Asia, Africa, Australia, and New Zealand. The service calculates route, transit time and cost, and can compare the trip to one using a car. In October 2007 Google Transit graduated from Google Labs and became fully integrated into Google Maps.

Coverage

The coverage of Google Transit is publicly available. It is spread worldwide, in hundreds of cities and sometimes in entire countries such as China, Japan, Switzerland. The coverage of major cities in the United States and in Canada is almost exhaustive, with a few notable exceptions (as of January 2011) such as Washington, DC.

In some areas, such as the United Kingdom, Google Transit covers only part of the transit agencies. For example Transport for London does not provide its data to Google Transit, but some bus companies do, leading to a warning "The coverage may be incomplete" when looking for transit directions in or around London.

In other areas, Google Transit does not provide public transit directions, but still provides the Transit Layer which overlays the schematic of the transit lines on the map. Notable examples include Paris, Berlin, Mexico City and many other capitals around the world.

Google Biking directions

On March 10, 2010, Google added the possibility to search for biking directions on Google Maps. Optimal routes are calculated from traffic, elevation change, bike paths, bike lanes, and preferred roads for biking. An optional layer also shows different types of biking paths, from bike-only trails to preferred roads. This service is available in the US and Canada, and is in beta testing in some other countries such as Singapore.

Google My Maps

In April 2007, My Maps was a new feature added to Google's local search maps. My Maps lets users and businesses create their own map by positioning markers, polylines and polygons onto a map. The interface is a straightforward overlay on the map. A set of eighty-four pre-designed markers is available, ranging from bars and restaurants to webcam and earthquake symbols. Polyline and Polygon color, width and opacity are selectable. Maps modified using My Maps can be saved for later viewing and made public or marked as unlisted, in which case a user will need the saved URL with a 42 character unique ID.

Each element added to a My Map has an editable tag. This tag can contain text, rich text or HTML. Embeddable video and other content can be included within the HTML tag.

Upon the launch of My Maps there was no facility to embed the created maps into a webpage or blog. A few independent websites have now produced tools to let users

embed maps and add further functionality to their maps. This has been resolved with version 2.78.

Google Street View

On May 25, 2007, Google released Street View, a new feature of Google Maps which provides 360° panoramic street-level views of various U.S. cities. On this date, the feature only included five cities, but has since expanded to thousands of locations in Australia, Canada, China, the Czech Republic, France, Germany, Hong Kong, India, Italy, Japan, Mexico, New Zealand, South Africa, Spain, Sweden, Switzerland, the Netherlands, Norway, the United Kingdom, and the United States.

In August 2008, Australia was added to the Street View feature with nearly all Australian highways, roads and streets having the feature. In addition in that month Japan was added and the Tour de France route was added on July 2 of that year. In December 2008, New Zealand was added to street view. The United Kingdom, Australia and New Zealand are the only countries to date with almost all roads and highways featured.

July 2009, Google begins mapping college campuses and surrounding paths and trails. Mexico's main cities and tourist points are added to Street View.

Street View garnered much controversy after its release because of privacy concerns about the uncensored nature of the panoramic photographs. Since then, Google has begun blurring faces through automatic face detection.

Google Aerial View

In December 2009 Google released Aerial View, consisting of angled aerial imagery, offering a "bird's eye view" of cities. The first cities available were San Jose and San Diego. This feature was available only to developers via the Google Maps API. In February 2010 it was introduced as an experimental feature in Google Maps Labs.

In July 2010 Aerial View was made available in Google Maps in select cities in the United States and worldwide.

The complete list of cities available (as of January 2011) is:

- Chile: Santiago and Valparaíso.
- Germany: Dortmund and Stuttgart.
- Hungary: Budapest.
- Italy: Venice.
- South Africa: Bloemfontein, Cape Town, Durban, Johannesburg, Nelspruit, Polokwane, Port Elizabeth, Pretoria and Rustenburg Surrounding Area.
- Spain: Seville
- United States: Albuquerque, Austin, Contra Costa County, Escondido, Long Beach, New Orleans, Norfolk, Oakland Area, Oklahoma City, Portland Area,

Sacramento Area, Salt Lake City, San Antonio, San Diego Area, San Jose Area, Santa Clara Area, Santa Cruz Area, St. Petersburg, Tucson and Van Nuys.

Google Latitude

Google Latitude is a feature from Google that lets users share their physical locations with other people. This service is based on Google Maps, specifically on mobile devices. There's an iGoogle widget for Desktops and Laptops as well. Some concerns have been expressed about the privacy issues raised by the use of the service.

Google Flu Shot Finder

Google Flu Shot Finder allows users in the United States to identify locations where both the pandemic H1N1/09 virus and seasonal flu vaccines are available near a given address or ZIP code.

Monopoly City Streets

Monopoly City Streets is a live worldwide version of the game Monopoly using Google Maps as the game board. It was created by Google and Hasbro. The game has now ended.

Copyright

The Google Maps terms and conditions state that usage of material from Google Maps is regulated by Google Terms of Service and some additional restrictions.

Errors

Street map overlays, in some areas, may not match up precisely with the corresponding satellite images. The street data may be entirely erroneous, or simply out of date: "The biggest challenge is the currency of data, the authenticity of data," said Google Earth representative Brian McLendon. As a result, in March 2008 Google added a feature to edit the locations of houses and businesses.

Restrictions have been placed on Google Maps through the apparent censoring of locations deemed potential security threats. In some cases the area of redaction is for specific buildings, but in other cases, such as Washington, D.C., the restriction is to use outdated imagery. These locations are fully listed on Satellite map images with missing or unclear data.

Google Maps has difficulty processing road data when dealing with cross-boundary situations. For example, users are unable to obtain a route from Hong Kong to Shenzhen via Shatoujiao, because Google Maps does not display and plan the road map of two overlapping places.

Sometimes objects and even regions on Google Maps are hidden by clouds. For example, the mast of Arbrå Transmitter near Bollnäs in Sweden is, as of August 25, 2010, hidden under a cloud.

Sometimes the names of geographical locations are inaccurate. An example of this type of error may be found in Google Maps Laona, Wisconsin. In this instance Google Maps identifies one of the town's two major lakes as "Dawson Lake"; the USGS, State of Wisconsin, and local government maps all identify that map feature as "Scattered Rice Lake". Another example is Samoa, labeled with "Western Samoa", accurate only as recently as 1997.

The option of Google maps has introduced interesting errors by incorporating incorrect or wildly misleading data:

- Chennai district of India found in the Arctic's Kara Sea
- Giraavaru (Kaafu Atoll) in the Arctic instead of Male' Atoll in the Indian Ocean
- South Magnetic Pole located very near the North Magnetic Pole

Google collates business listings from multiple on-line and off-line sources. To reduce duplication in the index, Google's algorithm combines listings automatically based on address, phone number, or geocode, but sometimes information for separate businesses will be inadvertently merged with each other, resulting in listings inaccurately incorporating elements from multiple businesses.

Google has also recruited volunteers to check and correct ground truth data.

There are some differences in frontier alignments between Google Ditu and Google Maps. On Google Maps, sections of the Chinese border with India and Pakistan are shown with dotted lines, indicating areas or frontiers in dispute. However, Google Ditu shows the Chinese frontier strictly according to Chinese claims with no dotted lines indicating the border with India and Pakistan. For example, the area now administered by India called Arunachal Pradesh (referred to as "South Tibet" by China) is shown inside the Chinese frontier by Google Ditu, with Indian highways ending abruptly at the Chinese claim line. Google Ditu also shows Taiwan and the South China Sea Islands as part of China. As of May 2009, Google Ditu's street map coverage of Taiwan also omits major state organs, such as the Presidential Palace, the five Yuans, and the Supreme Court.

There are some differences between ditu.google.*cn* and ditu.google.*com*. For example, the former does not feature My Maps. On the other hand, while the former displays virtually all text in Chinese, the latter displays most text (user-selectable real text as well as those on map) in English. This behavior of displaying English text is not consistent but intermittent – sometimes it is in English, sometimes it is in Chinese. The criteria for choosing which language is displayed is not known.

In October of 2010, Nicaraguan military commander Edén Pastora stationed Nicaraguan troops on the Isla Calero (in the delta of the San Juan River), justifying his action on the border delineation given by Google Maps. The island has long been disputed between Costa Rica and Nicaragua, and the incident renewed border tensions. Bing Maps depicts the island to be on the Costa Rican side of the border. Google has stated it is looking into the issue and will update its data if found to be incorrect.

Map projection

Google Maps is based on a close variant of the Mercator projection. If the earth were perfectly spherical, the projection would be the same as the Mercator. Google Maps uses the formulæ for the spherical Mercator, but the coordinates of features on Google Maps are the GPS coordinates based on the WGS 84 datum. The difference between a sphere and the WGS 84 ellipsoid causes the resultant projection not to be precisely conformal. The discrepancy is meaningless at the global scale but causes maps of local areas to deviate slightly from true ellipsoidal Mercator maps at the same scale.

Because the Mercator projects the poles at infinity, Google Maps cannot show the poles. Instead it cuts off coverage at 85° north and south. This is not considered a limitation, given the purpose of the service. There are no roads at those latitudes.

Comparable services

- Bing Maps – Microsoft's mapping service with road maps and aerial/satellite imagery
    - TerraServer-USA – Now MSRMaps.Com public domain (older than five years) satellite imagery and USGS Topographic maps via Microsoft servers
    - Bing Maps for Enterprise – formerly Microsoft Virtual Earth
- Géoportail – a French rival offering detailed aerial photographs of French territories
- MapQuest
- Multimap.com – acquired by Microsoft, and now merged in to Bing Maps.
- OpenStreetMap – a royalty free, editable map of the world
- Ovi Maps – a service offered by Nokia that allows synchronizing with user's mobile phones
- Pictometry – a birdseye imagery provider which can be integrated into all mapping programs
- Seat Pagine Gialle – an Italian competitor offering detailed satellite pictures of Italian territories and navigable street level panoramas of Rome (similar to Street View)
- Terralink International
- ViaMichelin
- Yahoo! Maps
- ABmaps

Chapter- 8

Ascom B8050 Quickfare

Ascom B8050 "Quickfare"

System information

Full name	Ascom B8050
Machine type	Self-service machine
Type of ticket stock	Continuous roll
Manufacturer	Ascom Autelca AG, Bern, Switzerland

History

First introduced	1989
Machine number range	(Numbers not shown on tickets)
Window number range	Upwards from 01
Machines in use	Approximately 60

Locations/Areas/Train Operating Companies

Current users	First Capital Connect First Great Western

	Island Line Trains
	Northern Rail
	Silverlink
Former users	All TOCs operating in the former Network SouthEast area
	TOCs in some other urban areas

Ascom B8050, usually known by the name **Quickfare**, is an early example of a passenger-operated railway ticket issuing system, consisting of a series of broadly identical machines installed at British railway stations from 1989 onwards. The machines allow passengers to buy the most popular types of ticket themselves, without having to go to a booking office, and are therefore useful at unstaffed, partly staffed or busy stations. Almost all Quickfare machines have now been replaced by more modern technology.

Origins

The system had its origins in various rudimentary computer-based systems developed for British Rail in the early and mid-1980s, both by Ascom Autelca and by other companies. These were classified by British Rail under the general acronym **POTIS** (**P**assenger **O**perated **T**icket **I**ssuing **S**ystem).

- Ascom Autelca developed the **Agiticket** in 1983; this was used for a short time at London Charing Cross
- **Crouzet** (manufacturers of the ticket machines on the Tyne and Wear Metro, and the system used until recently on the Glasgow Subway) supplied some machines for trial in 1987
- **Westinghouse** did the same in 1987
- **Thorn EMI**, makers of the APTIS and PORTIS/SPORTIS systems, tried out a passenger-operated equivalent in 1989

Illustrations of these early tickets

The tickets were printed on simple card stock with no magnetic stripe on the reverse - so data was merely printed on the front, not separately encoded as well.

Autelca AG developed the **B8011** and **B8020** machines from the Agiticket. A wider range of tickets could be purchased from these: a row of 32 buttons was programmed with various combinations of destination and ticket type (for example, "Child Single to Gatwick Airport" or "Adult Cheap Day Return to Brighton"). Coins were inserted by the passenger after the appropriate button was pressed, and tickets and change were collected from a hatch at the bottom. A separate button could be pressed to cancel the transaction at any stage. Many of these features were carried forward to the B8050 machine.

A B8011 ticket
A B8011 machine, showing many similarities to the B8050

The **B100** machine was the intermediate stage between the B8011/B8020 (which were essentially identical) and the B8050. Although most were found in the former Network SouthEast (NSE) area, a few persisted in urban areas elsewhere in England until around 2000. Such machines are believed to have been moved from NSE stations when they were supplanted by B8050s, being reprogrammed with different destination and fare information accordingly. A B100 ticket

Introduction of the B8050

A "Quickfare" machine at Wareham in Dorset. This is the version with a more limited range of destinations, selected from the 40 green buttons in the centre.

After the B8050 was developed, it was chosen by the Network SouthEast sector of British Rail as the standard self-service ticket issuing system. It was decided that a large number of machines should be provided, with almost every station having at least one and major commuter and terminal stations having many. The following stations, for example, had at least eight separate machines at some point - in some cases, for many years:

Machines	Station
16	London Victoria
10	London Liverpool Street
10	London Waterloo
10	Wimbledon
9	Reading
8	London Cannon Street
8	London Paddington
8	Walthamstow Central

Existing B100 machines at NSE stations were replaced on a rolling basis between 1990 and 1994. In some cases, usually for a short time only, both types of machine would be in place simultaneously at a given station.

Details of the machine

B8050 machines offer a wider range of journey combinations than their predecessors, as they have separate sets of buttons for destinations and ticket types. A set of machines was produced with 92 destination buttons, arranged in four columns of 23, and 18 ticket type buttons in a single column. Another set of machines was manufactured with a restricted set of destination buttons (40, in four columns of ten) but the same 18 ticket type buttons. In all cases, a "Cancel" button is available as well. Destination buttons are green, while those for the ticket type are yellow and the "Cancel" button is red.

Ticket Stock

Tickets are credit card sized with square corners. They are printed on a continuous roll of ticket stock, which is aligned within the machine by way of a rectangular notch a quarter of the way down each ticket on the left-hand side. The machine cuts off each individual ticket from the roll after the printing process finishes, after which they drop into a large plastic-fronted hatch at the bottom (along with any change).

The tickets have orange bands at the top and bottom, in common with the stock used for travel tickets in other British railway ticket issuing systems. In British Rail days, they were identified by batch reference BR 3595/3; this changed to RSP 3595/3 after privatisation, following the creation of Rail Settlement Plan Ltd to administer the ticketing and revenue allocation systems of the post-privatisation rail network. Machines

on the South West Trains network sometimes use stock with reference RSP 3595/30; a VAT number is printed on the reverse of these, above the batch reference.

Destinations

Before the machine or machines at a given station were installed, an analysis was undertaken of the most popular destinations for tickets bought from that station (or, strictly speaking, tickets issued *with that station as an origin point* - encompassing tickets bought at the station's ticket office, if applicable; those issued on trains by conductors using SPORTIS machines; and those issued remotely). It is believed that these statistics were used in conjunction with a more long-term forecast of the most likely destinations passengers would choose, in order to establish a set of destinations to be programmed into the machine. It was not straightforward to delete, add or change destinations once they had been set: as well as the manual reprogramming required, the station names were displayed to the passenger in the form of sheets of paper pre-printed with the relevant names and aligned (behind clear plastic panels) with the buttons. These had to be reprinted whenever any details changed. As a result, it was relatively rare for the range of destinations to change.

At most stations, the range provided was largely appropriate, with all nearby stations and more distant larger places being available. There was usually a reasonable balance between places served by regular direct train services and more "unusual" locations. However, this was not always the case: a notable example was Portslade, near Brighton, which offered Wimbledon, more than 50 miles and at least one change of train away, but not Fishersgate - the next stop.

At many Thameslink (now First Capital Connect) stations north of London (West Hampstead Thameslink to Bedford), the machines were installed with many destinations in the Catford/Bromley South/Orpington areas of south-east London, because at the time these places were served by direct Thameslink services running via the Catford Loop Line. Soon afterwards, in the early 1990s, the Thameslink service pattern was considerably altered, with services south of London being concentrated on south-west London and Surrey in addition to the Brighton Main Line. Machines at affected stations were not updated with more appropriate destinations (such as Sutton), and retained the incongruous south-east London destinations until the removal of the machines in late 2006.

All stations in the Network SouthEast area offered the London "station group" and the One Day Travelcard. Many also featured Gatwick Airport - an important destination throughout the year, with a larger proportion of journeys than usual happening at times such as very early morning or late evening, when booking offices are more likely to be shut.

Ticket types

Eighteen "ticket type" buttons were provided on all machines at the time of manufacture, but in most cases a number of those have been left blank and non-functioning, albeit with the ability to be programmed with a "ticket type" if necessary. Typical combinations available are:

- First Class Adult Day Single
- Standard Class Adult Day Single
- Standard Class Adult Day Return
- Standard Class Child Day Single
- Standard Class Child Day Return
- Young Persons Railcard holder Day Single
- Young Persons Railcard holder Day Return
- Senior Railcard holder Day Single
- Senior Railcard holder Day Return
- Network Railcard holder Day Single
- Network Railcard holder Day Return
- Seven Day Season Ticket

Machines are time-sensitive. Thus, all Day Return buttons issue a Cheap Day Return (reduced-fare off-peak ticket) at the appropriate times of day; and tickets with Railcard discounts do not become available until the time from which the Railcard is valid. Messages concerning the validity or otherwise of tickets appear in a green LCD panel below the "Amount to pay" display.

Other tickets

All machines offer Seven Day Season Tickets, printed on separate dedicated ticket stock (batch reference BR 3595/4, and later RSP 3595/4) with dark green upper and lower bands, a white box in which "SEASON" or "TRAVELCARD" would be printed by the machine, and an area for the passenger's Photocard number to be entered manually. Because the machines take cash only and Season Tickets are expensive compared to ordinary travel tickets, it is relatively unusual to see an issued Season Ticket.

In addition, some machines have buttons (usually in the "destinations" section) for one or more of the following:

- Daily and/or Weekly Car Park tickets
- Platform tickets (*rare, and mostly in the early years*)
- The Greater Manchester Rail Ranger, a one-day multi-journey ticket for use in the GMPTE area (*at Manchester area machines*)

Receipts are not issued in any format.

Remaining Machines

There are very few Ascom B8050 Quickfare machines left on the National Rail network. There are at least three machines still in use by Island Line Trains, on the Isle of Wight, at Ryde Pier Head, Ryde Esplanade and Shanklin. One at the back entrance to Birmingham New Street station, that had been out-of-use for at least a year, was eventually removed February 2009.

Chapter- 9

Other Travel Technologies

Passenger information system

A **passenger information [display] system (PIDS)** is an electronic information system which provides real-time passenger information. It may include both predictions about arrival and departure times, as well as information about the nature and causes of disruptions. It may be used both physically within a transportation hub and remotely using a web browser or mobile device.

Systems

Bilingual real-time information is provided on every platform in the MTR passenger railway system in Hong Kong

Current operational information on service running is collected from automatic vehicle location systems and from control systems, including incident capture systems. This information can be compared by computers with the published service timetable to generate a prediction of how services will run in the next few minutes to hours.

This may be informed by additional information: for instance, bus services will be affected by congestion on the road network, while all services may be affected by adverse weather conditions.

Channels

Information may be delivered via any electronic media, including:

- telephone (either a manned bureau service or an automated answering system)
- touch screen kiosks for self service (e.g. in customer offices)
- Internet through a website

- PDA or mobile phone (typically using SMS or WAP)
- LED displays and screens inside stations

Additional considerations include:

- How the system will present information for disabled travellers
- Whether the system will be able to provide information in multiple languages

Information

Information display in a shelter at a bus stop in downtown Portland, Oregon

The information provided by a passenger information system depends on its location, and the technical scope (e.g. how big the display screen is)

At a station or stop, it is normal to provide up to date predictions of:

- Which service is operated by the next vehicle to arrive, including its route and destination?
- When this vehicle will arrive?
- How closely it is running to timetable?
- Similar information for the following few services.
- General advice on current travel disruptions that may be useful to the passenger in understanding the implications for their travel plans.

On a vehicle, it is normal to provide up to date predictions of:

- What is the next station or stop?
- When it will arrive?
- How closely it is running to timetable?
- Advice on connecting services.

Personalised channels (web, mobile device, or kiosk) will normally be set up to mimic the view from a station or stop but may in addition be linked to journey planners. Using such systems a passenger may (re)plan his/her journey to take into account current circumstances (such as cancelled services or excessive delays).

Examples of passenger information

Passenger information systems in Germany

Deutsche Bahn AG offers a **Travel Information System** (RIS). This determines actual train positions relative to the published schedule as well as known impediments to operation and prognoses for the anticipated arrival and departure times of the trains.

This information is made available to the train conductor (via SMS) as well as to the passenger via loudspeaker in the train station or schedule boards on the internet . The VRR and VRS transportation schedule information systems also process RIS data.

Passenger information systems in the UK

National rail stations are equipped with visual platform displays which indicate the next service or services from the platform. Audio announcements are made to confirm these. Additionally, concourses and ticket offices have large screen displays which show all of the services available at the station for the next hour or more, and (at major stations) the full route of the service and any restrictions applicable (e.g. ticket types, catering services, bicycle carriage).

London Underground has “Countdown” displays on each platform at each station. These are simpler than the national rail displays as in most cases each platform serves only a single line and there are fewer variations in carriage restrictions. Audio announcements are also made regularly.

Buses are operated by local operating companies but in close partnership with local authorities. Local authorities, and ome transport operators, provide electronic versions of the bus timetables to the Traveline information service which covers all public transport modes, and from there to other information services such as Google Transit and Transport Direct.

The deployment of real-time bus information systems is a gradual process which currently extents to around half of the national fleet and a high proportion of town-centre stops, but relatively few suburban and rural stops.

The first sight of these system was in Brighton and Hove, where the counicl developed them and they were such a success that the UK government gave councils money to invest in this technology. Brighton and Hove operate the best information real time and they are viewable from a long distance - not just in the shelter where most operate from.

The Traveline NextBuses information service provides the next departures from any bus stop in the UK, and some trams as well. This information is real-time where the real-time feed has been connected in, otherwise the scheduled times are given. The convention is to show real-time information as (in x mins) and scheduled information as a time (xx.xx).

A variety of electric services are available through SMS which cover large parts of the UK's public transport network, and many web sites provide access to information from bus or train real-time systems. Most of this is single-mode.

The Government-sponsored Transport Direct project provides journey planning across all transport modes (including private car) and is increasingly linked to real-time information systems.

Audio announcement (on or off bus) is relatively rare, although London and some metropolitan areas have recently seen significant increases.

iTour

An **iTour** is an internet-enabled tour of a build, campus, region or city. Typical iTours include multimedia presentations such as interactive maps, streaming video of selected sites, immersive 360 degree panoramic photographs, audio podcast, photographs, and other media.

Types of iTours

Audio iTour

iTours typically use mp3 technology. A user, usually a tourist, visits a website on the Internet and downloads an audio tour of an area the tourist is interested in. This audio tour is loaded onto a portable electronic device, such as a digital audio player, a cell phone, or other portable electronic device. The user then listens to the audio tour while walking or driving through the area being described on the audio tour. The audio tour may also be accompanied by a downloadable map or other written explanation going with the audio tour.

The iTour media permits the user to skip ahead to other tracks if not interested in the present subject being described, or to listen to a supplementary track providing further information about the subject being described.

iTours may be accompanied by photographs, maps, or other written materials which can also be downloaded to aid the user. There are presently iTours available in Buenos Aires, Argentina, Brussels, Belgium, Glasgow, Scotland, Savannah, Georgia, New York, New York, Philadelphia, Pennsylvania, San Francisco, California, and other tourist destinations. It is believed that the iTour of Glasgow may have been the first such tour that was widely available, although audio tours on cassette tape players (and more recently CD-based tours) have been in existence since the advent of portable audio players in the 1970s. However, neither of these formats could be downloaded by the user at home before arriving at the site to be toured.

GPS-Enabled iTour

iTours are also "Location-aware", by using GPS and cell location technology, audio and video is delivered based on user location, where audio (and visual) content is triggered by a user's location, and GPS tours are transmitted to the user in "real time."

iTours that are GPS-enabled are delivered by CityTrex LLC in Savannah, GA. This is done through a strategic alliance. GPS devices are made available & content can be rented & put in your own GPS device (Garmin nuvi line currently, 350 & above, with routed tours available on the 700 & above series).

Geovative Solutions provides a web application--GeoTours--that allows people to create, share, download and experience GPS-enabled I-Tours which present audio, images, and text that are triggered by the user's location. These tours run on Garmin and TomTom devices, smartphones, PDAs, iPods, MP3 players, and other devices.

Virtual iTour

iTours may also take the form of an immerse experience via the internet and the user's computer. A typical virtual iTour consist of an interactive map (image) with hyper links to other multimedia elements, such as video, audio, or simulations (virtual reality).