

AN INTEGRATED FEEDER BUS SERVICE FOR JANMARG-BRTS IN THE CITY OF AHMEDABAD

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PROJECT BRIEF

This document is a compilation and presentation of work done as a part of system design project. I am a student of Furniture and Interior Design in National Institute of Design, Ahmedabad. This project understands the possibilities and opportunities for effective use of Ahmedabad Municipal Transport Service buses as the efficient feeder bus system for the much acclaimed and successful Bus Rapid Transit Service model in Ahmedabad.

This document constitutes the very basics of Feeder bus systems in different cities' mass and rapid transit systems, its history, its impact and Analysing the factors that makes or breaks such systems, comparing those factors in Ahmedabad context in order to identify and study factors effecting Feeder bus systems in India. Finding intervention areas and providing a design solution for AMTS to be used as an effective feeder bus system for the Janmarg BRTS, and a solution for reducing the congestion keeping in mind the upcoming Ahmedabad Metro, Trends in BRT (worldwide&India). An emphasis has been given on the operations of similar agencies to AMTS.

This project helped me to understand how BRTS can depend on its subsystems to connect the deeper parts and congested areas of the city to bring out the maximum efficiency in the service. This project was important as it comes as a strong platform for future innovation of Public transport in Ahmedabad city.

This project understands the possibilities and opportunities for how BRTS can depend on its subsystems to connect the deeper parts and congested areas of the city to bring out the maximum efficiency in the service. This project is important as it comes as a strong platform for future innovation in effective use of Ahmedabad Municipal Transport Service buses as the efficient feeder bus system for the much acclaimed and successful Bus Rapid Transit Service model as well as the MRT in Ahmedabad city.

SCOPE FOR THE PROJECT

India is one of the most rapidly urbanizing developing nations. With the growth of urban population estimated to be 40% by 2030 from 28% in 2001, the number of million plus cities is set to rise to 68 by 2030 from the present 35. Economic growth is the driving force behind urbanization. But unfortunately this growth is largely unplanned, creating a high risk of unsustainable sprawl.

In the last ten years, bus rapid transit (BRT) systems have been widely recognized by planners and transport specialists as a viable mass transport alternative for a rapidly urbanizing India. BRT is a high-quality customer-oriented public transport system that delivers fast, comfortable, and low-cost urban mobility.

Accessibility to BRT can be vastly improved Expanding the BRT network and operating feeder connections to BRT trunk line will also make the system more accessible to everyone, especially senior and people with disabilities.

A household study conducted by the Centre for Environmental Planning and Technology (Cept) for a dissertation states that 38% of private vehicle owners (around 11 lakh) are willing to shift to public transport if they get integrated transport - BRTS and feeder buses from near their doorstep. According to the statistics available public transport contributes to only 12% in modal split usage of type of vehicles for transport.

METHODOLOGY

Studying basics public transport around the world

Case studies around india

Types of feeder services

Understanding BRTS

Understanding Urban transport development trends and initiatives in Indian context

Studying challenges of feeder bus services for Various Indian citys' Public transport

Observations and analysis

Understanding the possibilities having a feeder service in Ahmedabad city context

Studying different levels of integration implemented in feeder services for Janmarg

Field study of the existing feeder services

Studying types of existing feeder services

Field study of integrated feeder service on BRTS lane

Comparison of feeder services

Observations and analysis

Identifying areas of design intervention

Proposal

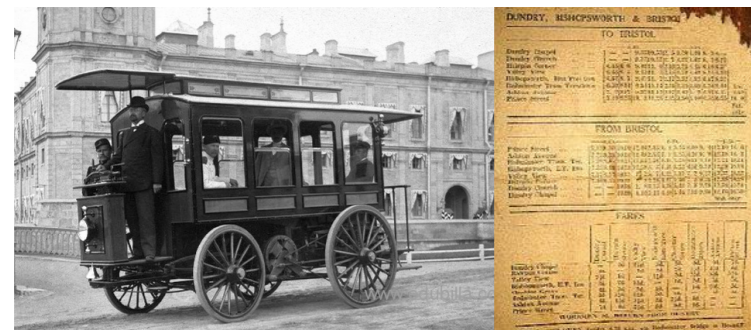
Impact of the proposal

PUBLIC TRANSPORT : A brief history

Public transport bus services are generally based on regular operation of transit buses along a route calling at agreed bus stops according to a published public transport timetable.

While there are indications of experiments with public transport in Paris as early as 1662, there is evidence of a scheduled “bus route” from Market Street in Manchester to Pendleton in Salford UK which was started by John Greenwood in 1824.

Another claim for the first public transport system for general use originated in Nantes, France in 1826. Stanislas Baudry, a retired army officer who had built public baths using the surplus heat from his flour mill on the city’s edge, set up a short route between the center of town and his baths.



Parisian Omnibus, France, Early nineteenth century.

A public transport timetable, London, 19th century.

In 1828, Baudry went to Paris where he founded a company under the name *Entreprise générale des omnibus de Paris*, while his son Edmond Baudry founded two similar companies in Bordeaux and in Lyon. The omnibuses circulated between seven in the morning and seven in the evening; each omnibus could carry between twelve and eighteen passengers. The busiest line was that along the Grand Boulevards; it ran from eight in the morning until midnight. Horse buses were chiefly used from the 1820s until the early 20th century.

The first omnibus service in New York began in 1829, when Abraham Brower, an entrepreneur who had organized volunteer fire companies, established a route along Broadway starting at Bowling Green. Other American cities soon followed suit: Philadelphia in 1831, Boston in 1835 and Baltimore in 1844.



Parisian Omnibus, France, Early nineteenth century.

Horsebus, Copenhagen, Late 19th century.

In Britain, John Greenwood opened the first bus line in Britain in Manchester in 1824. His pioneering idea was anywhere on request. The public transport system of Berlin is the oldest one in Germany. It started in 1825.

Ownership

Public transport bus operation is differentiated from other bus operation by the fact the owner or driver of a bus is employed by or contracted to an organisation whose main public duty or commercial interest is to provide a public transport service for passengers to turn up and use, rather than fulfilling private contracts between the bus operator and user. Public transport buses are operated as a common carrier under a contract of carriage between the passenger and the operator.

Ownership/operation of public transport buses can also take the form of a charitable operation or not for profit social enterprises.

Andhra Pradesh State Road Transport Corporation holds the Guinness world record of having largest fleet of buses with 22,555 buses.

Fixed infrastructure

Bus services have led to the implementation of various types of infrastructure now common in many urban and suburban settings. Large interchanges have required the building of bus stations. In roads and streets,

infrastructure for buses has resulted in modifications to the kerb line such as protrusions and indentations, and even special kerb stones. Entire lanes or roads have been reserved for buses in bus lanes or busways. Bus fleets require large storage premises often located in urban areas, and may also make use of central works facilities.

Regulation

Public transport bus services are usually subject to some form of legal control in terms of vehicle safety standards and method of operation, and possibly the level of fares charged and routes operated. Increasingly bus services are being made accessible, often in response to regulations and recommendations laid out in disability discrimination laws. This has resulted in the introduction of flexible bus services, and the introduction of Low-floor buses with features aimed at helping elderly, disabled or impaired passengers.

PUBLIC TRANSPORT IN INDIA

Introduction

The transport system in India is dependent on the old model of transportation planning and development established during the colonial era. Being the second most populous country in the world today, it is expected to take over the title from China in the upcoming future. The economy of a country is influenced by its people. The work which they perform everyday add up to the benefit of the country as a whole. Transportation in its very essence has been developed over the years to reflect the changing nature of the needs of people. It is transportation which facilitates for the easy and convenient movement of both the people and goods-effectively.

Transport situation in most Indian metropolitan cities is rapidly deteriorating because of the increasing travel demand and inadequate transportation system. Indian cities of all sizes are facing the crisis of urban transport. Despite investments in road infrastructure and plans for landuse and transport development, all face the problem of congestion traffic accidents and air pollution and the problems continue to grow. Large cities are facing an unprecedented growth of personal vehicles (two wheelers and cars) and in medium and small cities different forms of intermediate public trans

port provided by informal sector are struggling to meet the mobility demands of city resident. Growing number of vehicular trips by cars and two wheelers which result in traffic congestion, air pollution and traffic accidents has become a major concern in urban areas. Investments in high capacity rail and based mass transit systems are being promoted to arrest this trend.

Multi modal transportation network

This calls for the need to have a well developed and efficient transportation system which can cater to the needs of its growing population with much ease. An efficient system is characterized by its ability to perform even under adverse circumstances. It comprises of not only one but a complete network of well devised subsidiary systems. Multi modal transportation provides a framework of transportation facilities to meet the demands of the public which consist of-a primary transportation and paratransit system. Primary transportation comprises of the major transit facilities including Bus Rapid Transport (BRTS), Light Rail Transport (LRT), Metro Rail Transit (MRT), etc. Paratransit system is the intermediary network of transportation which serves as a feeder to the main system

Public transportation is characterized by its efficiency, dependency and an effective mobility. The term mobility, from the perspective of transportation geography,

refers to the ability to move between different activity sites (Hanson 1995). According to Liu (2011), the human mobility within an urban area actually always happens in a multimodal transportation network.

In addition, problems encountered in a single mode network can be solved by considering the benefits of a multi modal one. While commuting in a dense area having traffic congestion and inadequate lanes to carry private vehicles at peak hours, a person faces a problem to reach his destination without much hassle. The solution lies in an outreach to the services of multi modal transportation which includes car sharing, taxi pools, minibuses and others collectively referred to as the paratransit system.

Robert Cervero (1997) viewed paratransit as having the potential to produce substantial mobility and environmental benefits by attracting large numbers of urban trips that otherwise would be made by private automobile. The role which it plays in providing an effective alternative to private modes along with its ability to mitigate traffic congestion is remarkable in the context of transportation . The dependency of this system, however, is influenced by a range of factors

including its fare, timely availability and the ease of access and egress. A systematic monitoring of these factors is a prerequisite to provide a robust framework.

To tackle the problem of public transportation, we need to lay emphasis on the better implementation of the services of paratransit system along with proper operation and maintenance.



A crowded local train, Mumbai



Last Mile Connectivity - Concept

As the name signifies, last mile connectivity implies connecting services to the end point. The phrase has originally been used in the telecommunications and technology industries.

It is the final leg of delivering connectivity from a communications provider to a customer. Although the term reads `mile`, the actual distance of this leg may be considerably more than a mile, especially in urban areas.

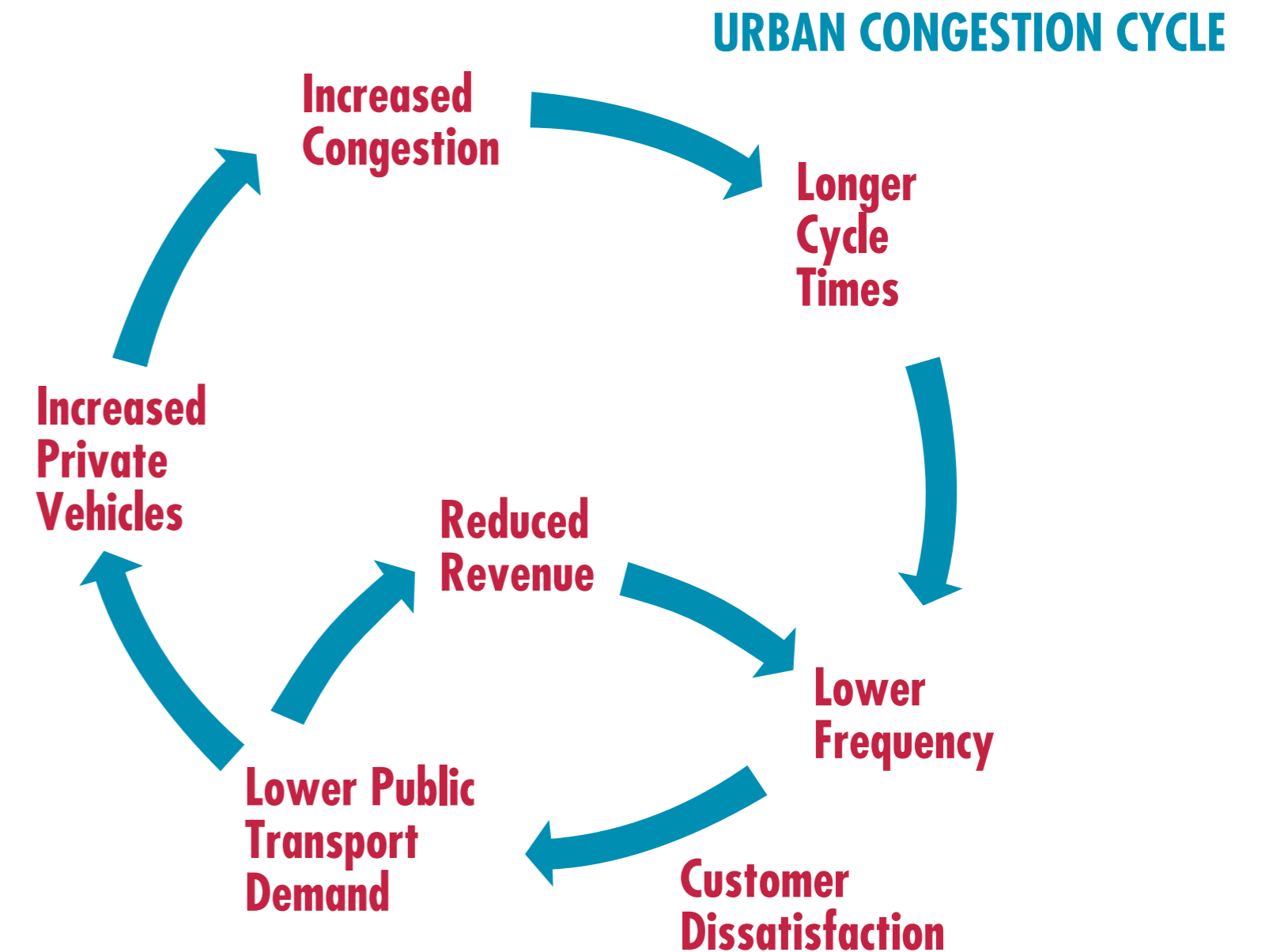
In the context of urban transport, the term finds relevance in public transit systems where it is referred to as both the initial and final leg of delivering connectivity - from origin to transit system and from transit system to destination. Last mile connecting services enable commuters to easily connect or transfer to mainline: rail / bus lines either at the commencement or the end of their trips. They are important because they complement rapid transit services by offering commuters the complete trip they need. The person's reverse trip is also an important aspect of last mile connectivity. A reverse trip can vary from the initial trip because of time of day, traffic, time of year and several other factors.

Often last mile connectivity is read synonymous with feeder services. However, it implies much more than just a feeder service; it incorporates:

- Easy availability of mode and options
- The time and cost incurred in the last mile
- Ease of changing between modes
- Ease of walking/cycling to/from stops/ stations.

A certain part of the demand is met through para-transit modes such as autorickshaws. Auto rickshaws supply in particular in Indian cities indicate that major metro cities exhibit a higher share of auto rickshaws.

For a larger mass cycling and walking are the only solutions for negotiating the final stretch that public transport doesn't reach. A report drafted in 2008 by Mirabilis Advisory says, "In bigger cities, the proportion of people using conventional public transport was high, and consequently commuters walked the last mile". "For instance, in cities with more than 8 million population: 22 percent walked all the way, 8 percent used cycles and 44 percent used public transport. This adds up to 74 percent of people who rely on non-motorized transport for at least part of the commute," the report says.



TYPES OF SERVICES

The names of different types of bus services vary according to local tradition or marketing, although services can be classified into basic types based on route length, frequency, purpose of use and type of bus used.

Urban or suburban services is the most common type of public transport bus service, and is used to transport large numbers of people in urban areas, or to and from the suburbs to population centres.

Park and ride bus services are designed to provide an onward passenger journey from a parking lot. These may be branded as shuttle or express services, or part of the standard bus network.

Express bus services are services that are intended to run faster than normal bus services, by either operating as a "limited stop" service missing out less busy stops, and or travelling on faster roads such as freeways rather than slower moving local roads.

Bus rapid transit (BRT) is the application of a range of infrastructure and marketing measures to produce public transport bus services that approach the operating characteristics and capacity of rapid transit systems.

Feeder bus services are designed to pick up passengers in a certain locality, and take them to a transfer point where they make an onward journey on a trunk service. This can be another bus, or a rail based service such as a tram, rapid transit or train. Feeder buses may act as part of a wider local network, or a regional coach network.

Shuttle buses are any type of bus service intended primarily to shuttle passengers between two fixed points. These can be bus or coach operated, but are usually short or medium distance journeys taking less than an hour. Shuttle buses will usually link with other transport hubs, such as airport shuttle buses. A common use of a shuttle bus is in towns or cities with multiple terminal train stations or bus stations, for passenger interconnections.

RAPID TRANSIT: BUS RAPID TRANSIT

BUS RAPID TRANSIT

Context

Bus Rapid Transit (BRT) is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. As BRT contains features similar to a light rail or metro system, it is much more reliable, convenient and faster than regular bus services. With the right features, BRT is able to avoid the causes of delay that typically slow regular bus services, like being stuck in traffic and queuing to pay on board. Sometimes described as a “surface subway”, BRT aims to combine the capacity and speed of light rail or metro with the flexibility, lower cost and simplicity of a bus system.

‘BRT’

The expression “BRT” is mainly used in the Americas and China; in India, it is called “BRTS”; in Europe, it is often called a “busway”; in Australia it is often called a “T-Way” (short for Transit Way); while in Ireland, it may be called a “quality bus”.

The first BRT system in the world was the Rede Integrada de Transporte implemented in Curitiba, Brazil, in 1974. Most of the elements that have become associated with BRT were innovations first suggested by Curitiba Mayor

Architect Jaime Lerner. Initially just dedicated bus lanes in the center of major arterial roads, in 1980 the Curitiba system added a feeder bus network and inter-zone connections, and in 1992 introduced off-board fare collection, enclosed stations, and platform-level boarding. Other systems made further innovations, including platooning (three buses entering and leaving bus stops and traffic signals at once) in Porto Alegre, and passing lanes and express service in São Paulo.



Rede Integrada de Transporte, Curitiba, Brazil



Martin Luther King Jr. East Busway, USA

Pittsburgh Penn station

BRT offers fast, reliable transportation to riders, reduced emissions and congestion for cities, and increased economic opportunities for residents and businesses along the corridor.

Americas

US BRT began in 1977, with Pittsburgh's South Busway, operating on 4.3 miles of exclusive lanes. Its success led to the 1983 Martin Luther King Jr. East Busway, a fuller BRT deployment including a dedicated busway, traffic signal preemption, and peak service headway as low as two minutes. New Orleans ran buses on Canal Street in a dedicated right of way beginning in the 1960's.

1995, Quito, Ecuador, opened trolleybus BRT. The Transmilenio in Bogotá, Colombia, opening in 2000, was the first BRT system to combine the best elements of Curitiba's BRT with other BRT advances, and achieved the highest capacity and highest speed BRT system in the world. The success of TransMilenio spurred other cities to develop high quality BRT systems.

Asia

The first BRT in Asia, TransJakarta, opened in Jakarta, Indonesia, in January 2004. At 210.31 km (2015) it is the longest BRT system in the world.

The city of Guangzhou, China, officially opened the 22.5-kilometer Guangzhou bus rapid transit system, known as GBRT. The GBRT is a system of firsts: it is the first BRT to directly connect to a metro system, the first BRT system in China to include bike parking in its station design, it has the world's highest number of passenger boardings at



Peak hour rush, Tianhe road, Ghangzhou Bikeparking, Guangzhou BRT



Rea Vaya, Johannesburg, South Africa



Dedicated lanes in TransJakarta, Indonesia

BRT stations, highest BRT bus frequency, and longest BRT stations. Station operation is impressive, and its ridership levels are second only to Bogotá's Transmilenio.

Africa

Johannesburg's BRT, Rea Vaya, was the first true BRT in Africa, in August 2009, carrying 42,000 daily passengers. Rea Vaya and Mio (BRT in Cali, Colombia, opened 2009) were the first two systems to combine full BRT with some services that also operated in mixed traffic, then joined the BRT trunk infrastructure.

Around the world

Roughly four decades after the first BRT system was deployed, 186 cities in all continents have implemented BRT systems as of October 2014, accounting for 4,757 km (2,956 mi) of BRT lanes. It is estimated that about 31.7 million passengers use BRT worldwide everyday, of which, about 19.7 million passengers ride BRT daily in Latin America(62.4%), 8.5 million in Asia (26.9%) and 1.8 million in Europe (5.7%). Latin America is also the region with the most cities with BRT systems, with 60, of which, Brazil with 33 cities. Europe ranks second with 53, Asia with 38, and the United States and Canada with 26.

When a BRT system is built in a city, a functioning public transport network often already exists, be it rail, bus, or minibus. The BRT corridor should integrate into the rest of the public transport network, saving time and providing a seamless, high-quality experience.

Main features

Off-board fare collection

Fare prepayment at the station, instead of on board the bus, eliminates the delay caused by passengers paying on board.

Intersection treatment

Bus priority will often be provided at signalized intersections to reduce delays by extending the green phase or reducing the red phase in the required direction compared to the normal sequence.

High capacity vehicles

High-capacity vehicles such bi-articulated buses may be used, typically with multiple doors to speed entry and exit. Double-decker buses or Guided buses may also be used. Advanced powertrain control may be used for a smoother ride.

Prominent brand or identity

A unique and distinctive identity can contribute to BRT's attractiveness as an alternative to driving cars, marking stops and stations as well as the buses. By identifying the main bus lines having high-frequency service, with a special brand and separate maps, it is easier to understand the entire network.

Quality stations

BRT systems typically feature significant investment in enclosed stations which may incorporate attractive sliding glass doors, staffed ticket booths, information booths, and other more standard features

listed above. They will often include level boarding, using either low-floor buses or higher boarding platforms level, and multiple doors.

Busway alignment

TransJakarta buses use separate lanes to avoid congested roads. Centre of roadway or bus-only corridor keeps buses away from the busy curb-side, where cars and trucks are parking, standing and turning.

Platform-level boarding

Station platforms should be level with the bus floor for quick and easy boarding, making it fully accessible for wheelchairs, disabled passengers and baby strollers, with minimal delays.

BENEFITS

Short Term Benefits of BRT

Efficient, reliable and frequent public transport services
Affordable fares
A safe and secure public transport system
Accessible public transport for people with disabilities
A decrease in traffic congestion
A decrease in energy consumption and vehicle emissions
An enhanced urban environment
Recapitalisation of the public transport fleet.

Medium Term Benefits of BRT

Containing urban sprawl (spread of settlements) and promoting densification
Promoting social inclusion instead of isolation
Job creation

Long Term Benefits of BRT

Better economic development at and around the nodes as well as along the mobility spines.
Land use change along the route as well as the nodes, which will result in densification.
Sustainable and frequent peak and off-peak public transportation system.
Improved journey times for all public transport users
Reduction in pollution
A world class public transport system which the City can be proud of.

The BRT Standard

The BRT Standard evaluates BRT corridors based on a wide range of metrics to establish a common definition of BRT through the BRT Basics, and recognizes particularly high-quality corridors with either Bronze, Silver, or Gold rankings.

Integration with Other Public Transport

There are two components to BRT integration:

Physical transfer points: Physical transfer points should minimize walking between modes, be well-sized, and not require passengers to exit one system and enter another;

Fare payment: The fare system should be integrated so that one fare card may be used for all modes.

Scoring In-Depth:

Integration with other transport	Points
Integration of both physical design and fare payment	3
Integration of both physical design or fare payment only	2
No integration	0



Gold BRT : 85 points or above



These systems achieve the highest level of operational performance and efficiency while providing a high quality of service

Silver BRT : 70-84 points



These systems include most of the elements of international best practice and are likely to be cost-effective on any corridor with sufficient demand to justify BRT.

Bronze BRT : 55-69 points



These systems meet the definition of BRT and are mostly consistent with international best practice.

Basic BRT : 55-69 points



These systems meet the minimum subset of the elements that has been deemed essential to the definition of BRT.

What's New in 2016?

Trends in BRT

Focus on Safety

The Pedestrian Access and Safety section now requires more safety features, such as safe and frequent pedestrian crossings in built-up areas. In addition, new operations deductions have been added, including a deduction for excessive pedestrian wait times and poor maintenance of pedestrian and bicycle facilities;

Increased Focus on Operations

New operations deduction elements have been added for numerous issues that have been encountered on BRT corridors, which significantly degrade corridor quality, even on corridors with excellent design. These include deductions for bus bunching, permitting unsafe bicycle use, lack of traffic safety data, and buses running parallel to the BRT corridor;

Separate Design Score and Full Score (Design + Operations) Options

A separate Design Score is now allowed for assessing the design elements of an operational BRT corridor, indicating the potential performance. This can be assessed when a corridor launches. The Full Score (Design + Operations),

combining the Design Score and operations deductions, can be assessed six months after commercial operations have begun, allowing usage and operations to stabilize. This provides a full indication of performance based on both design and operations.

Improved Dedicated Right-of-Way Definition

The dedicated right-of-way element has been modified to create a simpler and more effective means of assessing exclusive bus lanes. More emphasis has been placed on physical separation, which reduces the need for enforcement;

New Busway Alignments

The busway alignments element has been expanded to include 4 points (out of 8) for two types of alignments that are increasingly common; both alignments are for busways on boulevard-type streets with both a central/express roadway and service roads on the sides separated by a median;

Onboard Fare Validation

The BRT Standard now allocates some points for onboard fare validation of tickets purchased off-board. This type of system is in use in many cities in Europe and is being implemented in other places as well, and can provide significant time savings when combined with all-door boarding.

Integration with various feeder modes

Ease of access to the system not only increases the catchment area of the system but also determines the willingness of people to use the system. Four levels of integration can be identified that are necessary for the efficient operation of the planned system. The first level of integration lies with pedestrians as they are the primary users of the system, the second level is with cycles and cycle rickshaws. Cycle rickshaws are very commonly used in Indian cities which are the energy efficient forms of para-transit modes. The next level is integration of the system with auto-rickshaws and the last being with personal motorized vehicles that can help users to shift to private transport.

FEEDER SERVICES : CHARACTERISTICS

FEEDER SYSTEM

Designed to pick up passengers and take them to a transfer point where they make an onward journey on a trunk service

Trunk services can be a BRT, metro, tram or train

A key part of a wider local network or a regional network

Feeder Service Modes

Non-Motorised Transport : Bicycles and Pedestrians

Shared Services : shared cycles

Intermediate Public Transport : Autorickshaws and Taxis Buses

Intermediate Public Transport : Buses



Feeder bus for MTR, Hongkong

TYPICAL FEEDER CHARACTERISTICS

Typical Characteristic	Examples in Metropolitan Areas
Serve short distances	4 - 6 Kms / 7-12 Kms
High frequency service	5 - 10 minutes
Connects commercial, residential nodes to the trunk corridor or major destinations	feeders to the CBDs/stations
Requires a transfer at the end of the journey	feeder stop should be located within 50-100m walking distance
Provides first / last mile connectivity	
Extend the trunk corridor's area of influence	
Operates amongst mixed traffic, without priority infrastructure or space	
Bus stops are generally spaced within walking distance of each other	300 - 400m apart



MTR double decker feeder bus, Hongkong



A feeder bus in Citra Indah, Indonesia

Traditional Approach to Feeder Design

The provision of transport services between residential areas and train stations, where further connections to a place of employment is typically undertaken.

A growing urban population and expanding cityscape resulted in residential zones being created further away from the local train

Ad-hoc planning lead to feeder services being replicated, lengthened and urgently created to enable transit to cover more areas



Feeder buses for Cape town BRT, Cape town



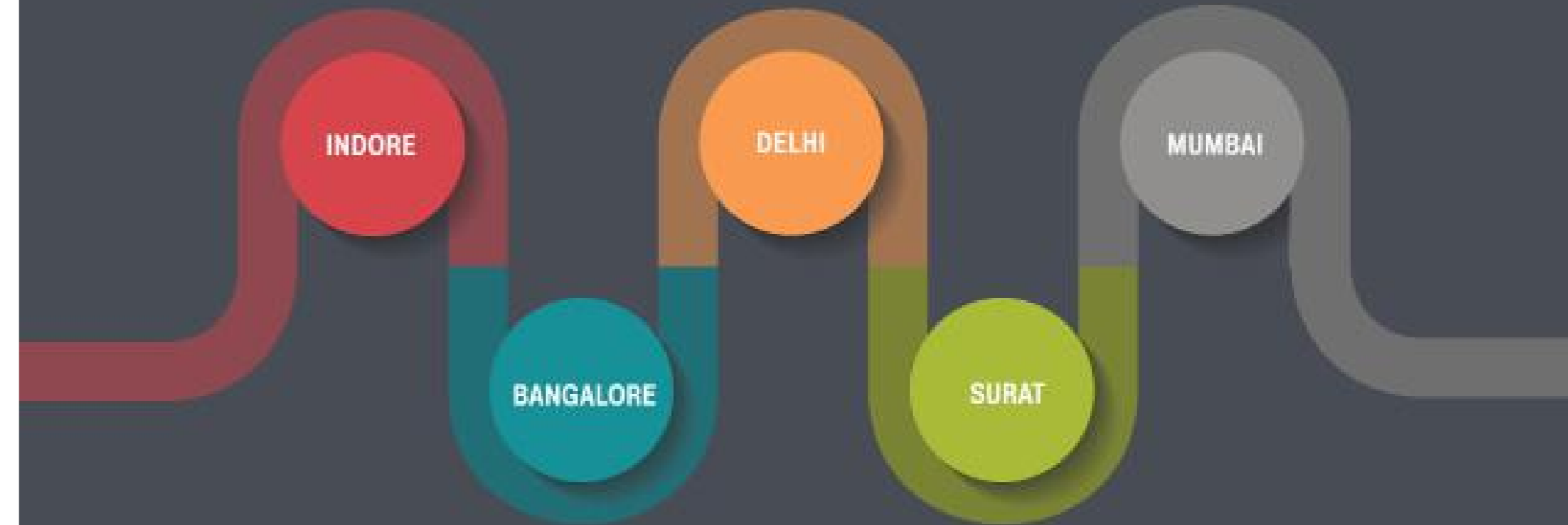
Porttram feeder bus, Toyama

FEEDER SERVICES: CASE STUDIES

Complementing Mass Transit Systems through Feeder Services

In the last decade, the implementation of mass transit systems has become more prominent, with several cities deciding to build metro and Bus Rapid Transit (BRT) systems. Chennai, Mumbai, Delhi and Bangalore are in the midst of metro construction projects, while Pune and Bangalore are in the planning phases for their BRT systems, and the country's first monorail recently began operations in Mumbai. With the escalation of such mass transit projects, there is a need to plan for last-mile connectivity and to expand the influence of trunk corridors. This places pressure on city agencies to use a coordinated approach and simultaneously plan for feeder systems.

In general, there are four distinct types of feeder modes in Indian cities: non-motorised modes (i.e. walking, cycling), intermediate public transport (i.e. auto-rickshaws, taxis), shared-ride services (i.e. shared taxis, shared auto-rickshaws) and buses.



INITIATIVES IN URBAN PUBLIC TRANSPORT IN INDIA

Pilot initiatives and bus reforms in recent years reinforce that city bus systems will continue to be the backbone of urban mobility in India. It is therefore imperative that cities across India focus on sustainable transport and set targets to achieve a higher modal share of public transport. Buses take up over 90% of public transport in Indian cities (Pucher, Korattyswaroopam and Ittyerah 2004), and serve as an economical and convenient mode of transport for all classes of society. There are approximately 35,000 buses operational in urban areas. Of this, eight of the bigger cities - Delhi, Kolkata, Mumbai, Chennai, Bangalore, Hyderabad, Ahmedabad, and Pune - account for 80 percent of all buses.

JnNURM Funding Programme

With the intention of providing an economic stimulus to heavy industry, the Ministry of Urban Development (MoUD) initiated a bus procurement programme for city bus operations, under the Jawaharlal Nehru National Urban Renewal Mission (JnNURM). The mission combines an offer of financial support for infrastructure projects under a cost-sharing arrangement with state and local governments.

The Global Environment Facility (GEF) Funding

The GEF is a partnership for international cooperation, aimed to assist in the protection of the global environment and to promote ecological sustainable development (Global Environment Facility n.d.). Under the GEF, the MoUD and the World Bank, proposed the promotion of efficient and sustainable bus transport systems in India. The purpose of the fifth round of the GEF programme is to encourage private to public transit mode shift, through focus on the operational, financial, regulatory and fiscal constraints of city bus systems.

Urban Bus Specifications (UBS) II

The MoUD created an Urban Bus Committee in March 2012, to work towards revising the existing urban bus specifications and implement uniformity in the bus manufacturing industry.

The guidelines were aimed to shift from the use of truck-chassis and to establish bus-based designs. Program objectives include driver and passenger comfort, enhanced safety, universal design, in-built ITS components, etc. The specifications are also aimed at achieving lower pollution and higher fuel economy. In addition, new bus types to include BRTS applications were also introduced. The UBS-II with all these characteristics was published as a reference to the city authorities.

City context :
INDORE



INDORE

Indore, a historical city is the largest city in Madhya Pradesh. It is the nerve centre of the economic activities of the state. Indore is spread across an area of more than 3,500 sq. km.

It accounts for more than 4.5% of the population of the state. As per Census 2011, the population of Indore was around 3 million with a growth rate of 32.88 percent. The city of Indore is well connected to the rest of the country by road, rail and air. Rapid industrial and commercial development has been coupled with a rapid rise

in population.

Indore is a tier-2 city in central India. Rapid industrial development in past decade has earned it a name of 'Mini Mumbai'



Public transport in Indore

Travel needs in the city are catered to/by a variety of transport modes. They include city buses and BRTS operated by Atal Indore City Transport Services Limited (AiCTSL), mini buses run by private operators, auto-rickshaws, and in the form of Intermediate Public Transport and personalized modes such as cars, two-wheelers and cycles. In Indore, maruti vans and tata magic serve as an important part of the paratransit system.

Present research paper shows the characteristics of the multi modal network of transportation of Indore city. The system is analyzed for its share of the different modes of transport. The importance will be laid on assessing the role of paratransit to supplement the primary mode of transport.

Multiple mobility solution

City buses	Buses being operated in City limit.
Ibus	BRTS is operational within 11.5 kms
Tele-Rickshaw	On demand Auto services.
Feeder buses	10 kms feeder for Ibus
Iride	2 Wheeler rental services.
Metro Taxi	On call taxi services.
Ibike	Public bicycle sharing system.

City Buses

- > 35 routes.
 - Avg ridership of 45,000
 - > 81 buses are operational covering the 80 % of the area.
- GPS control system for the entire fleet with speed and other information.
- PIS with real time display in the city bus stops.



iBus

In 2013, the first pilot corridor of iBUS was launched in Indore. The 11.45-km corridor running along AB Road from Rajiv Gandhi to Niranjapur is functional, with 20 median bus stations and a daily ridership of 40,000 passengers. The system includes off-board payment facilities, a segregated corridor, dual-entry buses, and one of the most advanced ITS systems in India, used for tracking buses. The proposal is to build a network of 120kms of BRTS for the city.

Started	2006
Number of routes	15
Average route length	18 km
Number of bus stops	210
Fleet Size	110 bus
Operating frequency	8 – 26 minutes
Avg. daily ridership	100,000 pax
Ridership per bus	910 pax/bus/day
Ridership	45,500 pax/day (avg)
System type	• Closed • Median stations

Changing Trends - Indore
Current efforts are towards the improvement of physical, fare and identity integration between the trunk and feeders

Component Agency Responsible
Corridor IDA
Stations IMC
ITMS AICTSL
Traffic Signals AICTSL
Depot / Workshop IMC
Fleet AICTSL
Control Centre IDA
Enforcement Traffic Police / IMC
Permits RTO

Planning city wide and for intermodal Connectivity

- BRTS – Further action plan is being prepared to increase the length of BRTS.
- City buses: New city bus routes have been planned.
- Midi buses: Smaller buses have been planned for interior areas of Indore.
- Other IPT modes have been planned to feed the trunk routes.



Feeder buses for iBus, Indore



Feeder buses for iBus, Indore

Tele-Rickshaw

- Organizing an unorganized sector of Urban Transport.
- Tele Rickshaw is an Auto Rickshaw Aggregator (ARA).
- Use of modern technology to enhance the safety.

GPS in Auto-Rickshaws

- Panic buttons
- Route Deviation Alerts
- GPS Antenna Cut Alarm
- Power backup
- Monitor GSM/GPS Signal Strength

Control with the Mobile Application

- Mobile Application for booking and Rickshaw tracking.
- The pre-booking of the Auto is possible online

I Ride – Rent a bike service

GPS/ GPRS controlled

The 2 wheeler motor bikes are incorporated with the advanced GPS/GPRS based feature which enables the location tracking of the vehicle. Controlling with an mobile application



Autorickshaw as a part of tele-rickshaw, Indore

SWOT ANALYSIS Feeder buses for IBus

STRENGTHS

- Smart ITS - includes GPS/GPRS/PIS
- Real time displays in the Bus stops
- Attractive looking buses
- Attractive bus identity

WEAKNESS

- Doesn't connect to the inner parts of the city
- No co-ordination with the other feeder sub systems ex. IBike, Ibus
- High bus fare - minimum Rs. 8

OPPORTUNITY

- A well sustainable system
- Website/ ticket integration with IBus

THREATS

- Multimodal feeder systems without co-ordination turns into competition

City context :
DELHI



Delhi is the capital territory of the Republic of India. It is the most populous city in India—about 1,484 square kilometres (573 sq mi). It has a population of about 25 million, making it the most populous city and most populous urban agglomeration in India and 2nd largest urban area in the world. Such is the nature of urban expansion in Delhi that its growth has expanded beyond the NCT to incorporate towns in neighbouring states and at its largest extent can count a population of about 25 million residents as of 2014.

Delhi is the largest commercial centre in northern India; Delhi has the second largest slum population after Mumbai in India.



DELHI METRO

The Delhi Metro is a metro system serving Delhi and its satellite cities of Faridabad, Gurgaon, Noida and Ghaziabad in National Capital Region in India. Delhi Metro is the world's 12th largest metro system in terms of both length and number of stations, the network consists of five colour-coded regular lines and the faster Airport Express line. The system has a mix of underground, at-grade, and elevated stations. DMRC operates around 2000 trips daily between 05:30 till 00:00 . The metro has an average daily ridership of 2.4 million passengers, and, as of August 2010, had already carried over 1.25 billion passengers since its inception. [a total length of 213 kilometres (132 mi) serving 160 stations. DMRC named second best metro in world.

Delhi Metro Rail Corporation Limited (DMRC), a state-owned company with equal equity participation from Government of India and Government of Delhi, built and operates the Delhi Metro. The Delhi Metro Rail Corporation has been certified by the United Nations as the first metro rail and rail-based system in the world to get “carbon credits for reducing greenhouse gas emissions” and helping in reducing pollution levels in the city by 630,000 tonnes every year.

The area within 500 m from the metro corridor is 31% (198.5 sq.km. out of the 640 sq.km. of total urban area) of Delhi thus, after the implementation of the complete system 69% area of Delhi will remain beyond walking distance of metro.

Feeder modal share for metro

Origin to metro :
 2 wheeler - 17%
 autorickshaw -8%
 Rickshaw -37%
 Walk – 36%
 Feeder – 2%



INTEGRATION WITH BUSES

- Route rationalisation of DTC routes to serve as feeder to DMRC
- Integration at Bus terminals:, Kashmere Gate, Anand Vihar – CTST
- Bus lanes/Stops at Metro stations

INTEGRATION WITH BRT

- At Moolchand
- At Lajpat Nagar



Airline information at Metro station

INTEGRATED TICKETING

- Common Mobility Card
- With DTC
- With Airport Line
- With Parking
- With vendors at metro stations
- With rapid Metro

ANNOUNCEMENTS IN TRAINS

- Feeder Services
- Indian Railway stations
- Airport Line
- ISBT



Bicycle sharing connected at metro, Delhi

FEEDER BUS SERVICES

Expansion of metro influence zone beyond 31% will have to rely on feeder system. This is not easy because of the inherent transfer costs and wait times at interchanges. Delhi Metro’s feeder bus system, which was lauded as a unique feature designed to enable commuters to conveniently interchange from one mode to another.

The buses operate from 72 State Transport Authority approved routes and cover nearly 60 metro stations with a seating capacity of up to 30 people.

Total routes	23
Total buses	170
Total passengers/day	1,20,000
New routes	81(planning)
New buses	350(planning)

Features of the Feeder Buses (117 Old Non-AC MINI Buses)

These buses are operating on 21 STA approved routes. The buses can seat 18 to 20 people with 10 persons standing. They are environment friendly with CNG engine. First Aid Box and Fire Extinguisher are provided in the buses. SMS based alert service for the information related to operation of Metro Feeder Buses is available.



New Feeder Buses

300 Low floor buses of 650mm floor height with 25+2 seater. Presently 127 buses are inducted and are in operation.

100 Standard floor buses of 900mm floor height with 25+2 seater. Presently 25 buses are inducted and are in operation.

These buses are operating on 21 STA approved routes

Fare Structure for Metro Feeder Buses

Upto to 4 Kms : Rs 5.00

From 4 kms to 10 Kms : Rs 10.00

Above 10 Kms : Rs 15.00

Timings of Feeder Bus operation:

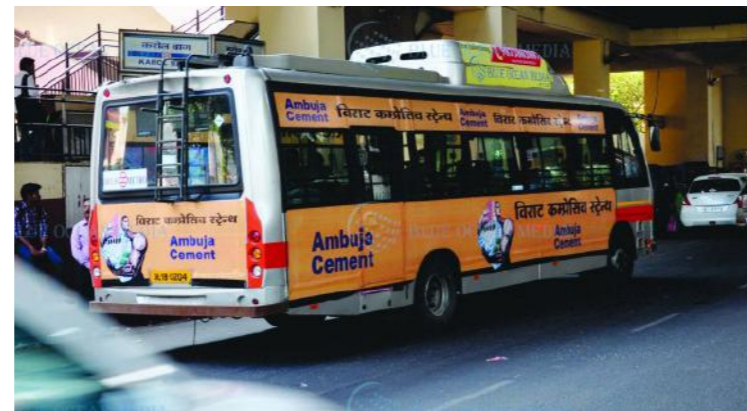
08:00 Hrs to 20:00 Hrs at a frequency of 10 to 15 min depending upon Road Traffic density. However if operator wishes he can operate before /beyond these hours.

An integrated ticket

DMRC is planning for an integrated ticket. If the integration works out, the same ticket will be valid in metro trains as well as buses. However, this will translate to higher rider-ship only if commuters are willing to accept the added transfer time and transfer costs.



A mini feeder bus for Delhi metro



A Midi feeder bus for delhi metro

SWOT ANALYSIS FEEDER BUSES FOR DELHI METRO

STRENGTHS

Good coverage

Low cost

small buses for a city with road congestion

Visually unique-size and colour

WEAKNESS

Less capacity to be feeder for big capacity metro.

Over crowded-private contractors

No use of ITS

Poor service quality

Poor bus infrastructure

Not disabled friendly

OPPORTUNITY

Integrated ticket with metro

Environmental friendly Cng buses

THREATS

Adding transfer times for different forms of transport.

City context :
BANGALORE



BANGALORE

Bangalore is the capital of the Indian state of Karnataka. Bangalore is India's third most populous city and fifth-most populous urban agglomeration. Bangalore is known as the Silicon Valley of India because of its position as the nation's leading hub for IT business. Bangalore is a major economic and cultural hub and the fastest growing major metropolis in India. Numerous public sector heavy industries, software companies, aerospace, telecommunications, and defence organisations are also located in the city.

Bangalore has a population of 5.4 million in 2010 at an annual growth rate of 2.6%. The extent of developed area has also increased from 174.7 sq.kms in 1971 to 437 sq.kms. today



BMTS

Bangalore has one of the most extensive networks of public bus transport in India. The Bangalore Metropolitan Transport Corporation (BMTS) is the sole provider of public transport services, including bus services, in the city. BMTS owns their entire bus fleet.

In the last 5 years, they have increased the number of scheduled services by 140%, thereby doubling their daily revenue. Ridership has been increasing at a steady 10% per year. BMTS also boasts of being the safest bus transport system in India with an average of 267 accidents per year. To simplify bus routes and improve coverage, BMTS started direction based services marketed as 'Big10' in February 2010. The high frequency, green and blue colour Big10 buses run on 12 major radial roads in and out of the city. 'Kendra Sarige' buses were introduced to operate in a circular route on the ring roads around the city.

Fleet size	5593
No. of routes	2368
route (km)	13,00,000
Average passengers per day	4,00,000

Vajra

'Vajra' services are premium services operated by BMTS. Also known as 'BMTS IT services', they provide premium transportation in the hi-tech corridor in order to attract people who would otherwise use cars or two-wheelers. These are also high-frequency buses, with a bus every 15 minutes. Fares start at Rs 4 for the first 2 km and go up to a maximum of Rs 16.

Suvarna

Suvarna' is a newly introduced service with a fleet comprising of air-suspension and high comfort (without A/C) buses.

Atal Sarige

'Atal Sarige' services, operated through branded buses, are aimed at providing direct connectivity at cheaper rates to areas populated by economically



Img 1.1 BMTS's Vajra. 'Vajra' services are premium services operated by BMTS.

Img 1.2 BMTS's B10. These buses are popularly known as 'BigCircle'



weaker sections. The service was introduced as a pro-poor measure and to make public transport more equitable.

B10

Since February 2009, BMTC has been steadily introducing “Direction-based” bus services, which are easy for customers to understand and use. These buses, popularly known as ‘Big10’ and ‘BigCircle’ buses, run on main roads and together form a simple grid. There are 12 major roads in and out of the city, and on each of these a Big10 route is operated.

Rebranding the Bangalore City bus Service

In 2009, the Bangalore Integrated Grid, or BIG Network lead to the rebranding of BMTC’s services, which created a distinct identity for the service. The new brand enables users to understand a simple route structure and identify with a visually-uniform bus system. With attractive livery schemes, the bus system gained popularity among users.

key-features of ITS in BMTC

GPS-enabled Vehicle Tracking System (VTM), Electronic Ticketing Machines (ETM), Passenger Information System (PIS), control room and data centre, BMTC mobile application.

Reform Efforts in Bangalore

Reforms have focused on the following areas:

Infrastructure Development

BMTC has been building additional depots, modern bus stations and parking facilities at bus stations.

They have added new routes, new buses and increase service kilometres consistently every year

They have added non-stop services, direction-based services, services on ring roads and night services to cater to customer’s growing needs

They have introduced special services to cater to comfort and convenience of commuters

They have modernized their fleet in recent years. They added over 4000 high-quality buses, replaced 1700 old buses and added 48 Volvo Low Floor buses (2006 data).

Their fleet is the youngest in the country.

Revenue Mobilization Measures – Introduced various weekly and monthly passes. ‘Rainbow benefits’ from these monthly passes provide limited medical and life insurance coverage.

NAMMA METRO

Namma Metro (literally “Our Metro”), also known as Bangalore Metro, is a metro system serving the city of Bangalore in Karnataka, India. Namma Metro is India’s second largest metro system in terms of both length and number of stations, after the Delhi Metro. On the other hand, Namma Metro ranked world’s 99th largest metro system in terms of length and 92nd largest metro network in terms of number of operating stations. The metro network consists of two colour-coded lines, . The system has a mix of underground, at-grade, and elevated stations using standard-gauge tracks. In just two days, the purple line saw almost 2.5 lakh footfalls, generating revenue of more than Rs 70 lakh. By 10 pm, more than 1.25 lakh people had tried the purple line metro. Namma Metro stand for, then well “Namma” in Kannada (language of Karnataka) means OUR. So the name stands for “Our Metro”.

It also contains the first underground metro line in South India.

A total length of 31.52 kilometres serving 30 stations

The metro has an average daily ridership of 140,000 passengers.

A frequency of 10-15mins depending on the time you opt to travel

Services operate daily between 06:00 and 22:00 running



with a headway varying between 8–10 minutes.

With Namma Metro changing the way many Bengalureans travel, the Bangalore Metropolitan Transport Corporation (BMTC) is looking at augmenting feeder services to some stations. Its internal surveys have indicated viability of services and also a demand to connect more areas to the nearest metro stations.

Feeder services to metro stations began from the time the completed Purple Line to Mysore Road station was thrown open. BMTC had painted 10 mini buses and 30-odd Suvarna buses — in the colours of Namma Metro coaches.



A feeder bus for Namma metro, Bangalore



A feeder bus for Namma metro, Bangalore

Feeder buses identity

They are identified through the unique colour, as well as markings and the display panels.

Ticket prices for feeder buses

The ticket price is equivalent to regular bus tickets.

Feeder buses stops

They will stop at the designated busstops. There will not be special busstops for feeder buses, but the route will connect to particular metro stations.

Renting a bike

Bike hire companies are stepping in to address this class of commuters. There has been an initial plan of offering around 30 vehicles per station. These will be a mix of electric, motorcycles, bicycles and mopeds. The vehicles can be hired through a kiosk, which will be placed in the station by providing a copy of the user's driving licence and address proof.

They are planning to offer an app which can be used to pre-book vehicles. These vehicles will have several drop-off points so that customers can drop the vehicle at their destination.

In a bid to encourage motorists in Bangalore to travel by metro, BMRCL plans to allow third parties to rent out motorcycles outside



nine stations to ensure last-mile connectivity. The BMRCL's earlier plans of renting out bicycles or starting feeder bus services have fizzled out because of lack of commuter response.

Metro-transit pass

The Bangalore Metropolitan Transport Corporation (BMTC) and the Bangalore Metro Rail Corporation Limited (BMRCL) are collectively launching a common day pass called Metro Bus Transit Pass that can be used in both metro and BMTC buses

Metro-bus ticket

Metro-Bus Ticket (Brand Name : SARAL & SARAAG) A commuter who wishes to travel unlimited throughout the day on BMTC Bus and Metro can load this Metro-Bus Day pass on the card.

Axis Bank BMTC Smart card'

The card offers integrated services to the commuters by offering them cashless bus travel; The card is interoperable in nature, while customized for use at BMTC. The card can be used at any Rupay enabled merchant terminal in the country for a purchase transaction. The commuter has to merely 'Tap' on the ETM held by the conductor to 'Pay' for his ticket.

Changing Trends – Bangalore

BIG (Bangalore Intra- City Grid) Network has upgraded with high-frequency trunk routes, serviced by feeder routes for peripheral areas have been designed.

SWOT ANALYSIS FEEDER FOR NAMMA METRO

STRENGTHS

Good Service

Low cost

Good frequency

Visually unique buses-branding

WEAKNESS

Not disabled friendly - Bus stops & Bus design

OPPORTUNITY

Integrated ticket with Namma metro

Parking facilities at bus stops

THREATS

Unpredictable travel times - Congested city

City context :
MUMBAI



MUMBAI

Mumbai is India's most populous city and the second most populous city in the world. The city is the commercial and entertainment centre of India and contributes to 5% of India's GDP. Several financial institutions such as the National Stock Exchange of India, Bombay Stock Exchange, Reserve Bank of India are located in the financial district in Mumbai. India's Hindi Film and television industry is also located here. Because of its numerous work opportunities, Mumbai attracts migrants from all over India. One of the biggest contradictions in Mumbai is

that the richest city in India also accounts for the highest percentage of urban poor. About 47% of the population in the Mumbai Metropolitan Region live in slums.



Public Transportation

Public transport in Mumbai involves the transport of millions of its citizens by train, road and water. Over 88% of the commuters in Mumbai use public transport. Mumbai has the largest organised bus transport network among major Indian cities. Mumbai's public transport consists primarily of rapid transit on exclusive suburban railway lines augmented by commuter rail on main lines serving outlying suburbs, the bus services of the three municipalities making up the metropolitan area, public taxis and auto rickshaws, as well as ferry services. A metro and a monorail system have recently been inaugurated.

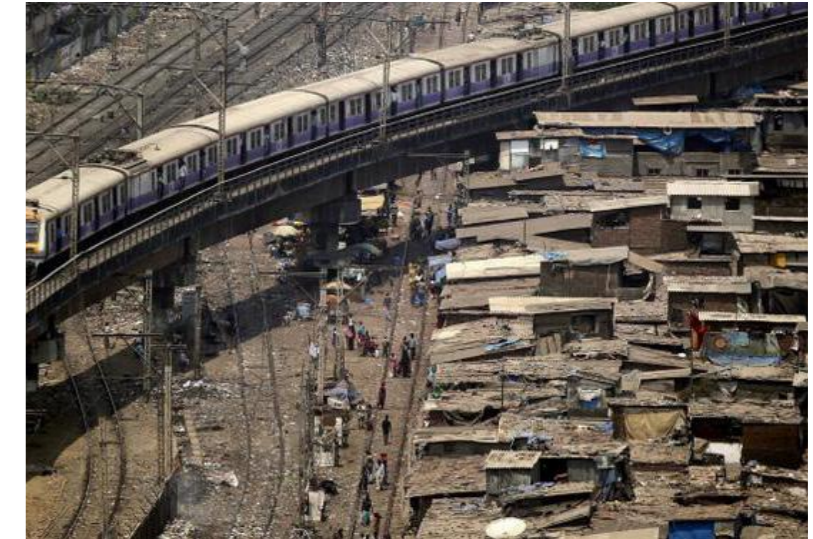
The city has had strong public transport services since the eighteenth century. There are two national rail lines serving Mumbai – the Western Railway (WR) and Central Railway (CR) – which also provide suburban commuter rail services. The Mumbai Suburban railway currently operates 2,099 scheduled services per weekday (1,186 by Central Railway and 913 by Western Railway) covering a route network over 400 km in length.

The Mumbai Suburban Railway is an offshoot of the first railway to be built by the British in India, and is also the oldest railway system in Asia. Since 1991, it has been expanded rapidly.

slow local stops at every station.
fast local runs express (skipping stops) until a certain station, and from that station onward runs like a local fast, superfast, double-fast run express for various lengths of route.

There are also women-only cars (termed ladies) Mumbai Suburban Railway services have various such designations in wide use by Mumbaikars as well as official use:

In 2005, average weekday suburban rail travel demand was estimated to be 15 million passenger km with an average rail journey length of 26 km. Figure 1 shows the route map of the current system.



Walk	52
Train	25
Bus	13
Rickshaw	4
Taxi	1
two wheeler	4
Car	2

Of the 7 million journeys made by rail every day, 1.5 to 2 million journeys access stations by a BEST bus (LEA Associates 2008). These numbers indicate the significance of this system in the colossal movement of people within the Mumbai Metropolitan Region (MMR).

The suburban station areas are highly crowded due to many reasons including the number of commuters accessing the station and the vendors that operate in these areas. In addition, station access lanes are often narrow and have low capacity. In the case of feeder buses, these factors restrict the ability of a bus to turnaround or to stop for a long period of time. The physical integration of the mass transit station and feeder bus stops is needed to provide a more comprehensive public transport network. BEST capitalises on the three railway lines' zones of influence by providing the following feeder services:

Planning of Feeder Routes

A dynamic growth pattern in Mumbai requires BEST to constantly amend routes and schedules in order to remain relevant. There are three main types of feeder systems that are currently operational in Mumbai.

Neighbourhood Collector Routes

Local neighbourhood collector routes provide first and last-mile connectivity to suburban railway stations. Buses collect commuters from housing colonies and connect them to the local train station, where they connect to other parts of the city.

Long Feeder Routes

Long feeder routes are generally a combination of several routes that are merged together due to certain constraints. This results in trunk-like route lengths and operational inefficiencies.

Feeder Statistics

Total BEST Routes	4,176
Operational Buses	4,011
Total Number of Routes	506
Number of Feeder Routes	265 (52% of total)
Number of Feeder Buses	1,533 (38% of total)
Number of Passengers (daily average)	3 Million

Fare Structure

0-2 kms	Rs. 6
2-3 kms	Rs. 8
3-5 kms	Rs. 10
5-7 kms	Rs. 12
7-10 kms	Rs. 15

Returns are high for short-distance trips

0 – 2kms for Rs.6 allows buses to compete with share autos / taxis. Some routes have a flat rate of Rs. 6, like the Fort Pher



A BEST feeder bus, Mumbai



BEST feeder buses, Mumbai

Trends in Mumbai

Slow speed and traffic congestion are the biggest problems faced by buses in Mumbai, but there are no concrete plans to implement bus priority. Instead, bus reforms have focused on the following areas:

In order to raise new sources of revenue, advertisements have been placed on buses. Buses have also been leased to airlines for airport use.

In the last 5 years, BEST has added about 500 new buses including ultra low floor, double deck and air conditioned buses. They are in the process of converting a majority of their fleet to CNG.

In 2007, BEST launched the multi-application contactless smart card called Go Mumbai. This card can be used for storing season tickets, single journey and extension tickets. The Go Mumbai card can be used on the Mumbai Sub urban Railways as well.

In Mumbai, the prospect of cheaper and faster bus projects has been overshadowed by the Mumbai Metro and Mumbai Monorail projects.

SWOT ANALYSIS FEEDER FOR MUMBAI LOCAL

STRENGTHS

Good connectivity

Considerate route planning

Low fare- can compete with autos/taxi

Go Mumbai- A very helpful app to get to know the timings of the Local train

WEAKNESS

Visually hard to differentiate from regular BEST buses

No ITS application in the buses

Accessibility issues

OPPORTUNITY

CNG operated-environmental friendly

Apps integrated with other forms of public transport

THREATS

Unpredictable travel times- Slow speed of traffic

Adding transfer times between different forms of transport

Presence of shared auto/taxi makes buses less attractive

Lack of Physical infrastructure/space to integrate

City context :
SURAT



SURAT

Surat is a city in the Indian state of Gujarat. The city is located 284 kilometres (176 mi) south of the state capital, Gandhinagar; 265 kilometres (165 mi) south of Ahmedabad; and 289 kilometres (180 mi) north of Mumbai. The city centre is located 22 km (14 mi) south of the Tapi River. A moat divides the older parts of the city, with their narrow streets and historical houses, from the newer suburbs. Surat had a population of 4.5 million at the 2011 census, making it the second largest city in the state of Gujarat, after Ahmedabad. Surat has been

selected as one of twenty Indian cities to be developed as a smart city under PM Modi's flagship Smart Cities Mission. Surat city is also termed as "The Silk City", "The Diamond City"



SURAT BRTS NETWORK

Before the inauguration of the Sitilink network, Surat had no formal system of public transport. Previously, one private company owned a fleet of 70 buses, hardly enough to meet the transport demand of India's fastest growing city. Surat's informal public transport network is comprised of 30,000 rickshaws, with little regulation and inconsistent quality of service.

Surat's BRT system is the third full BRT transport system in India, after Ahmedabad's Janmarg and Indore's iBus. The introduction of Sitilink indicates that Surat, already the eighth largest city in India, is taking action towards regional leadership in sustainable transport.

Network Length	157 km.
Total PT Network Length	102 km.
Feeder Network Length:	259 km.
Built up coverage	80%
Total Built up area	166 sqkm.
Built up covered:	133 sqkm

Surat BRT system intends to provide speedy, safe, pollution-free, reliable and an efficient public transit to the citizens. Specially designed BRT Buses traversing on dedicated lanes along with a particular provision for other modes namely the cyclists, pedestrians, and mixed traffic. BRT system arterial road network have about 125 kilometers length in Surat. Already, 30 km network implementation is complete during the phase-1 of the project encompassing 41 bus stations. Three terminals, in future, will take care of transit. There are ten interchange stations proposed. On an average, around 15,000 passenger travel daily. The frequency of the bus is 5-8 minutes. The capacity of the bus is to carry 25 passengers.



Operation Plan

- Efficient, Frequent, Reliable service
- Closed System
- Operations under Single Management Control

Closed System

Moving people and not vehicles
Network and not corridors

Running ways

- Segregated bus ways
- Complete street development (PT, NMT)

Bus Stations

- Accessible, Comfortable stations – Level boarding alighting, Off board Ticketing, ITS enabled

Vehicles

- Clean buses & modern technologies • Euro III/ IV A.C high floor buses
- Trained Drivers and staff

Intelligent Transport Systems (ITS)

- Public Information System (PIS)
- Electronic Off board Ticketing, Smart Cards
- Vehicle tracking system (real time)
- Area Traffic Management for Bus Priority & Minimise wastage of GREEN TIME

An integrated transit system comprising of BRT, regular urban bus, regional bus and regional rail are envisaged to deliver the feeder services to meet with the needs of people of Surat.

S Connect – Level of Integration

- Physical
Interchange station developed for easy transfer for passengers

- Fare
Integrated fare system developed with single ticketing system

- ITS
GPS/GPRS and PIS system proposed to be installed

- Institutional Agreement between Sitilink and S-Connect

Trends

- Route Extensions : New routes to be added based on network expansions Initiaves to increase passenger ridership

- Feeder Integration : Integrated network BRT + Feeder Route rationalization plan

- Smart mobility solutions : Common ticketing , ITS smart cards

- Development of Transit Infrastructures : More workshop depots, Interchange stations to be developed

- Small Vehicle Option : TATA Magic (GOG)
Auto Rickshaw Strategy : Stop issue of licenses for new auto

- Old auto replacement – with small vehicle – TATA Magic

- Integration • Single ticket /Smart card, token

SWOT ANALYSIS FEEDER FOR SITILINK

STRENGTHS

Easy transfers
Single ticket for different travels
GPS/GPRS and PIL systems
Disabled friendly
Brading interation

WEAKNESS

None

OPPORTUNITY

Physically integrated
Fare Integration
ITS integration
Institutional integration
Integrated feeder sub system for the city bus - Tata magic

THREATS

None

FEEDER SERVICES IN INDIAN CITIES : ANALYSIS

FACTORS AFFECTING OR INFLUENCING THE SUCCESS OF INTEGRATING FEEDER SERVICES CAN BE DIVIDED INTO TWO PARTS

EXOGENOUS FACTORS: CITY SPECIFIC

Size, population and employment density, topography, climate, infrastructure, Public transport travel experience political goals

ENDOGENOUS FACTORS

Some determination factors of feeder buses success are dependent on exogenous factors, and on the actual implementation itself, therefore they are called endogenous factors

INSITUTIONAL DESIGN

Model of provision : Ownership and operator, contract details, Allocation of funds, Profitsharing, Fare Integration

PHYSICAL DESIGN

Bus stop placement, Bus stop infrastructure, Bus infrastructure, timings of the operations, Integration of ITS, Identity Integration, Integration with feeder sub-systems

SWOT ANALYSIS FOR FEEDER BUS SERVICES FOR PUBLIC TRANSPORT IN INDIA

OBSERVATIONS

As most of the Feeder bus systems in India till date have not been a completely integrated systems. However policy based initiatives by the MoUD and other agencies have brought in a fresh start for these operations in Indian cities. It is terrifying to take a look at the increase in the population, road congestion, increase in the ownership of the private vehicles, It is therefore a necessity for the Rapid transit to integrate feeder bus systems to make the connectivity and appeal of the service far reaching especially keeping in mind the rapid urbanisation in the Indian cities.

If we try to turn the feeder bus system as a integrally functioning part of the Rapid transit, there lies many uncertainties as most of the Indian cities have evolved from historic and pre-historic times -so it is practically not possible to integrate a feeder service in every case. Although a level of integration can be achieved. To come up with a unique design solution exclusive to the demands of the city, planning the very basic aspects can also create a viable means of feeder systems or subsystems.

It is a time when the government and various private organisations have shown a great attitude in coming up with initiatives for a seamless Rapid transit feeder buses. Once such systems learn from the failures and the problemfaced by different feeder bus systems, they can provide a viable, feasible, sustainable system for public

INTERNAL

POSITIVE

STRENGTHS

- Good connectivity
- Low fare
- Visually unique size and colour
- Smart application of ITS
- Good frequency 5-10mins
- Disabled-friendly
- Easy transfers
- Single ticket for the whole journey
- Branding Iterations

EXTERNAL

OPPORTUNITIES

- Parking facilities at the bus stops
- Fare Integration
- ITS integration
- Institutional integration
- Feeder subsystem Integration
- Environmental friendly buses
- Multimodal public transport option

NEGATIVE

WEAKNESS

- Lack of capacity
- Lack of connectivity to the inner parts of a city
- High bus fare
- Over crowding-private contractors
- Not disable friendly buses
- Bus infrastructure

THREATS

- Multimodal feeder systems without co-ordination turn into competition
- Adding transfer times for different forms of transport
- Unpredictable travel times
- Presence of taxi/shared auto make bus less attractive
- Lack of Physical infrastructure/ space for bus stop

POSITIVE EXTERNALS

- Parking facilities at the bus stops
- Fare integration
- ITS integration
- Institutional integration
- Feeder subsystem Integration
- Environmental friendly buses
- Multimodal public transport option

NEGATIVE INTERNALS

- Lack of connectivity to the inner parts of a city
- High bus fare
- Over crowding-private contractors
- Not disable friendly buses
- Poor bus infrastructure

From the SWOT analysis above, the factors where we can study, intervene and improve the existing systems are positive externals (opportunities) and negative internals (weakness). These factors can be further categorized into exogenous factors or endogenous (institutional and physical design)

EXOGENOUS FACTORS

Lack of connectivity to the inner parts of a city

Parking facilities at the bus stops

Lack of Physical infrastructure/ space to integrate

ENDOGENOUS FACTORS (INSTITUTIONAL)

Institutional integration

High bus fare

Over crowding-private contractors

Creating a Multi-modal public transport

Fare Integration

ENDOGENOUS FACTORS (PHYSICAL)

Not disable friendly

capacity of the bus

ITS integration

Feeder subsystem Integration

Environmental friendly buses

poor bus infrastructure

ITS

Real time info in bus/bus stop
Apps/GPS/GPRS/PIS
Use interface of ITS
User interaction with ITS

bus infrastructure

Bus design
Standing/ seating areas
User interaction
Safety issues
Branding

Environmental friendly

Pollution-Air/noise
Controlled emissions
Performance of buses
Fuel usage

Not disable friendly

Level boarding
bus station accesibility
Movement inside the bus

Feeder subsystem Integration

Integrations with bicycle sharing
Integration with auto/ taxi
Integration with motorised two wheeler

Capacity of the bus

Smaller route lengths
shorter travel times
Average per trip passenger
Peak hour rush

As all the Exogenous factors are dependant on the city. These factors changes by times according to the surrounding - Lack of availability of space for physical integration of a system

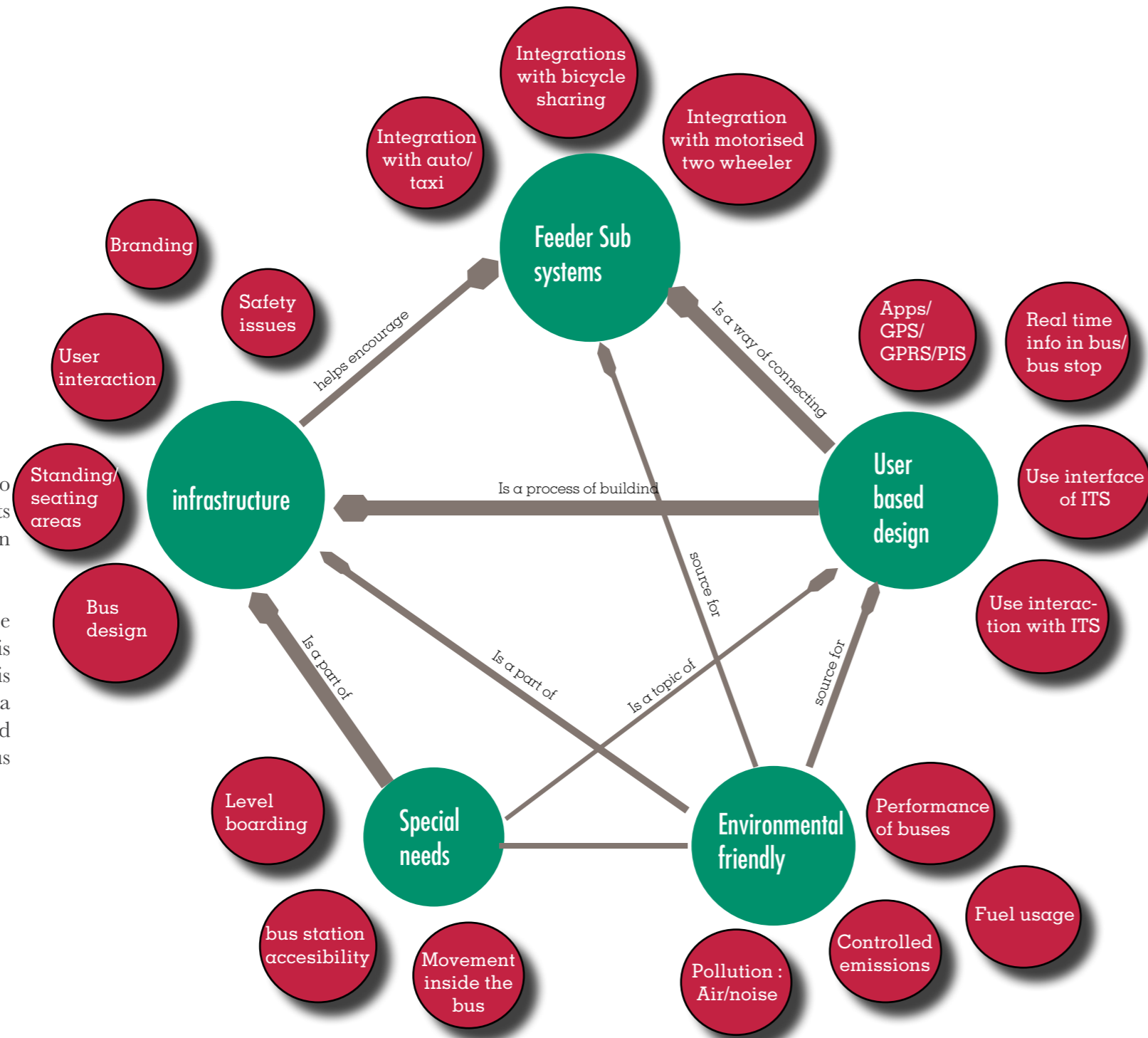
The Endogenous factors (institutional) here are the ones which can be rectified with participation of government and will be reduced with time due to development happening around.

The Endogenous factors (physical) here are the factors where we can study, intervene and provide solutions. These factors constitute all the components which are dependant on the physical design factor. Importance of these factors can be further elaborated by ERAF System Diagram.

ENTITIES RELATIONS ATTRIBUTES FLOW

ERAF diagram helps us to think about the set of elements of system and their interaction with each other.

It is synthetic in which the information through research is brought together. Through this diagram we can have an idea about any possible relation and flow between all endogenous physical design factors.



Incentives from case studies of Indian cities

From the above analysis of the attributes, relations and flow among the entities, we can clearly see a pattern as the important entity is the infrastructure among all of them as it needs to be addressed at the earliest to achieve a multi modal integrated transport in the Indian cities.

However From the above case studies we can see patterns, drawbacks, characteristics and pros and cons of a feeder service in the context peculiar to the city and the exogenous factors that govern them.

From the observation among the relations and attributes from the case studies, It can also be used as a good comparative guide for the feeder service in the city of Ahmedabad

City context:
AHMEDABAD



Ahmedabad, a commercial capital of Gujarat, is one of the key emerging urban centers of India, with a population of 5.5 million (provisional Census, 2011). Ahmedabad is located on the banks of the Sabarmati river, Ahmedabad is a compact city characterised by mixed land uses, high density development and balanced street network system with well developed 5 ring and 17 radials. Total road length is about 2400 kms. There are 7 bridges to connect the eastern part of the city with west. Sixteen rail-over/under bridges enable crossing the railway lines at

appropriate places. Ahmedabad's population is expected to grow from 5.6 million in 2010 to over 10 million by 2035. The city area is also likely to increase to 1000 sq km by 2035.



JANMARG

Given the projected increases in population and area, the city and state governments realised that no single mode can serve the mobility needs of the city and that it was best to consider both Metro rail and Bus Rapid Transport systems. The BRT concept was further boosted by a visit from the former mayor of Bogotá, Mr. Enrique Peñalosa.

In 2005, the Centre for Environmental Planning and Technology (CEPT) was awarded the contract for the development of a BRT system. Phase I was also build along some low income, low accessibility zones in an effort to bolster area development. The urban mobility plan provides choices to the people in the case of their mobility, in terms of different modes such as the AMTS, BRTS and the suburban rail or metro, all of which complement each other. The various factors which lead to the selection of Bus Rapid transit system in the city of Ahmedabad are as follows:

- No strong CBD;
- Highly randomized development with localized trips;
- Urban pull – spreading out;
- Need for decongestion;
- Flexibility in routing;
- Easily expandable;
- Scope for both low density and high density passenger movement;
- Project implementation easier;

- Wider reach;
- Leverages the full scope for public space and accessibility improvement;
- Can be operated according to the city ethos; and
- Environment friendly.

Goals

The planners envisioned the BRT system as an interconnected network and not independent corridors. Importance was given to connect key origins and destinations. The goal was to connect busy places but avoid busy roads. This was to limit disruption to normal traffic.

The BRT system was developed with the following guiding principles:

Given the present low levels of public transit patronage (7-8% mode share) the prime task of BRTS is to develop a market for public transport.

To keep a medium and long term perspective

To choose options which are technically feasible to implement (road width, corridor length, fewer bottleneck-junctions, level crossings, flyovers)

To minimize negative environmental and social adverse Issues, and

To ensure system wide impact.



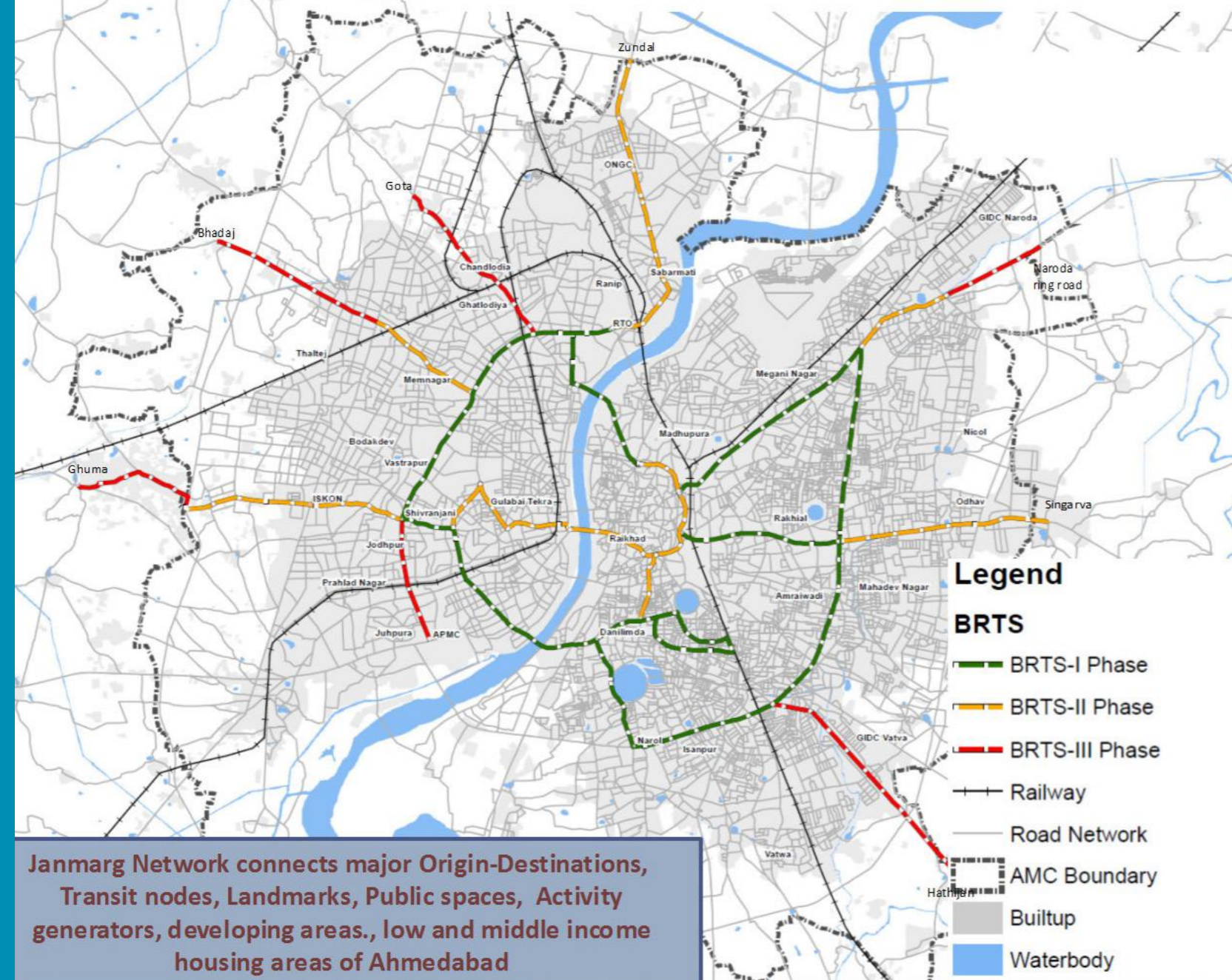
BRTS : Bus stops

Stations have been aesthetically designed and set up for level boarding. Following are the features of Janmarg stations:

- At grade boarding
- Facility for off-board fare collection
- Automated doors
- Advertising space for additional revenue
- Easy access for physically challenged
- IT applications
- Synchronizing doors and sensors
- 25m from intersection/mid block
- Two buses at each side



JANMARG Network



Janmarg Network connects major Origin-Destinations, Transit nodes, Landmarks, Public spaces, Activity generators, developing areas., low and middle income housing areas of Ahmedabad

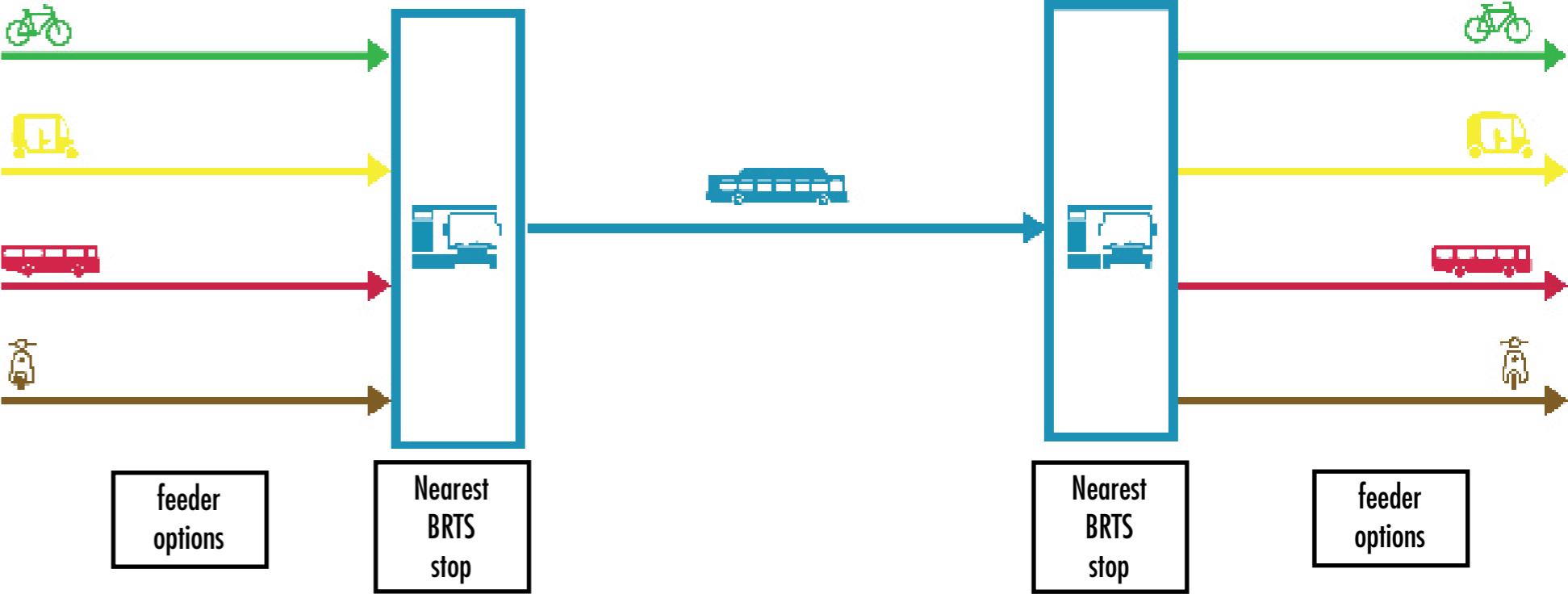
BRTS : Routes and Frequency

In 2007, Ahmedabad Municipal Corporation floated a Special Purpose Vehicle (SPV) to implement and run the BRT system. This SPV is named “Ahmedabad Janmarg Limited” (AJL). AJL is heading the planning and design of 88 km of BRT roads in Ahmedabad. Janmarg (translates to “People’s way”) is being branded as an efficient and effective public transport system

The operations plan was developed in such a way that BRT operations would work in conjunction with the existing AMTS routes. This was to ensure that the two systems complement each other rather than compete with each other. Three types of routes have been developed to operate bus transport services -
 BRT Trunk Routes
 Complementary Routes (AMTS)
 BRT Feeder Routes

Figure 8 shows the 10 routes that are proposed for BRT trunk routes in the initial year. These would be put into operations in phases as each section of the network is constructed and ready for operations.

PRESENT SYSTEM (BRTS)



AMTS : City bus

Changing Trends - Ahmedabad

High-frequency ring and radial routes

Supplemented by a feeder system

Improving transfers through wellintegrated facilities

Passengers on the rise

From 205 sq km a few years ago to 466 sq km today, Ahmedabad is growing rapidly. But the public transportation is having a hard time coping with the increasing need as the number of Ahmedabad Municipal Transport Service (AMTS) buses on road has drastically fallen. In contrast to this, people opting for AMTS buses have increased. From 2000 to 2005 there were only 300 buses in the fleet. That was the worst phase in the history of AMTS. In 2008, AMTS had around 900 buses in its fleet, with 850 buses on road.

IN 2013, AMTS had a fleet of 1,015 buses (552 self-owned, 288 on contract and 175 under Operations and Maintenance). As many as 778 of these buses were plying on 174 routes carrying seven lakh passengers daily. The Ahmedabad Municipal Transport Services (AMTS) plans to add this year 200 new buses to its existing fleet.

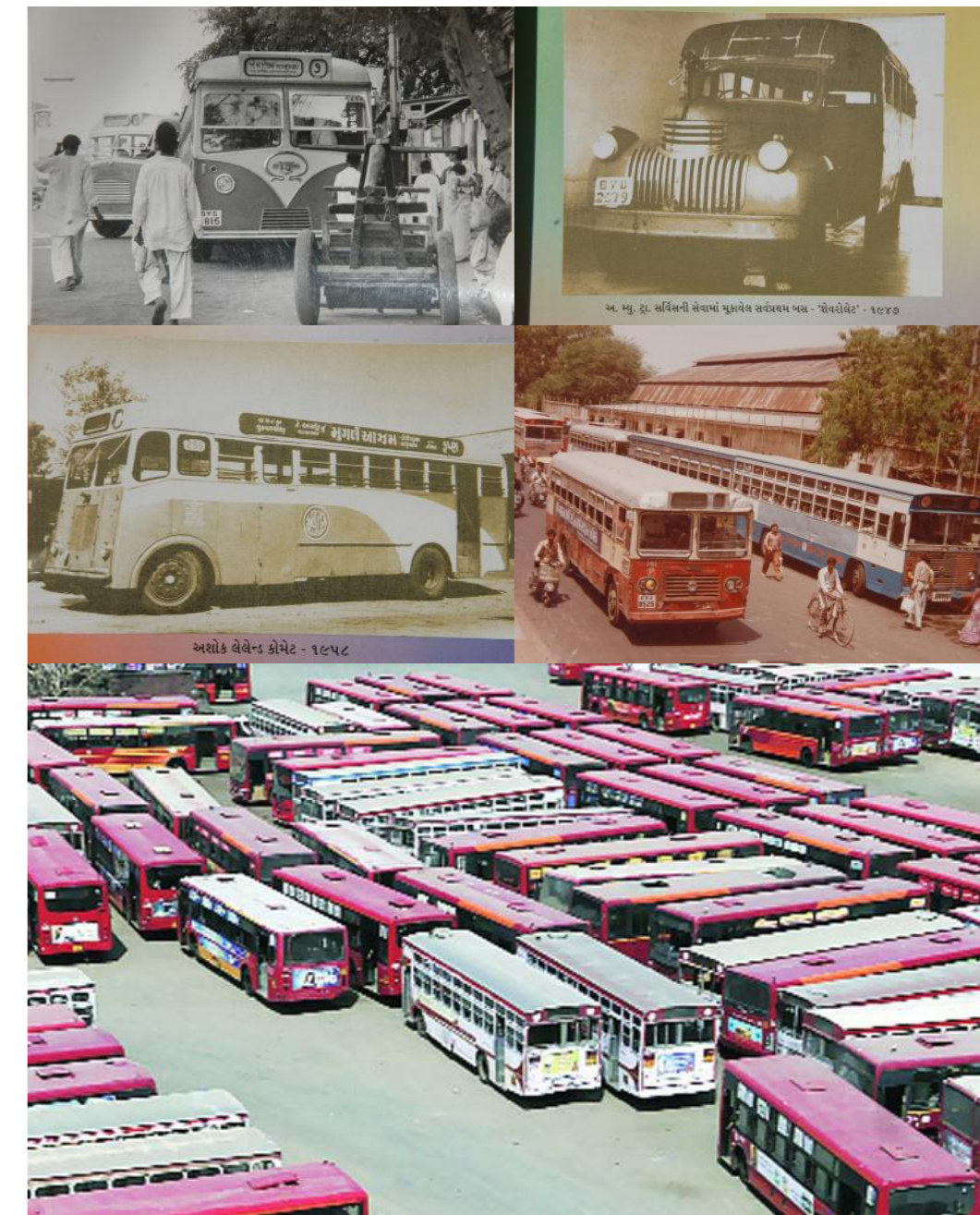
AMTS

Ahmedabad municipality started a bus service in the public sector, keeping in view the ideal to end the troubles of the people and to give them good service at reasonable rates. The public sector city bus service was the first of its kind in Ahmedabad. The Ahmedabad Municipal Transport Service (AMTS), functioning under the supervision of the Ahmedabad Municipal Corporation (AMC), is responsible for providing public transportation services in the city. AMTS is a 63 year old organization originally set up in April 1947. At the time, their fleet size was 112 buses and they operated on historic routes previously run by private operators.

The Municipal Transport service has played an important role in the development of suburbs and nearby villages. The development of remote areas has been assisted by AMTS buses. AMTS caters to 6 lakh trips every day.

Objectives and goals

AMTS has been managed by a Transport Manager under the Transport Committee and Municipal Corporation from the very inception. The organization has adopted a service-oriented attitude, so one should not consider it as a firm or a company, but as a service organization. AMTS is a voluntary service managed by Ahmedabad Municipal Corporation.

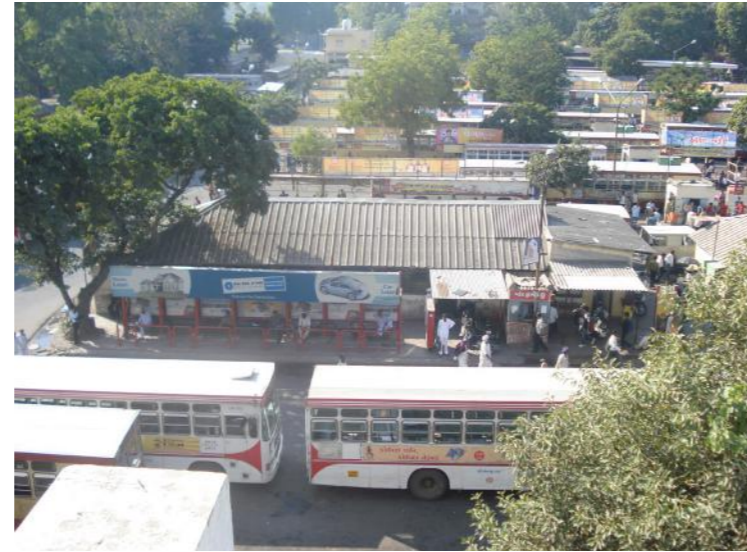


BUS STOP

At present AMTS has bus terminals at eleven locations in the city. A repair and maintenance workshop is located at Jamalpur which caters to the needs of the entire AMTS fleet. Figure 2 shows the AMTS route network. The AMTS average bus stop spacing is only 410 meters, which is convenient for passengers but results in longer travel time and delays.

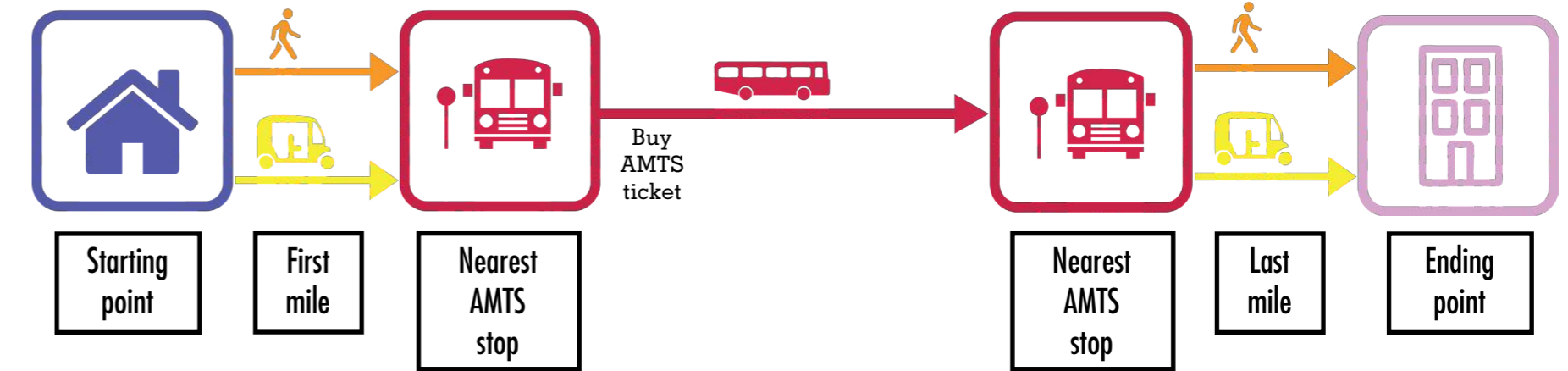


An AMTS arrives at every 10 mins at almost most of the routes. The civic transport service plans to run more than 1,000 buses to cover every part of the city at regular intervals.



Taking a cue from Mumbai's management of its public transport system, Ahmedabad Municipal Corporation has decided to increase the frequency of AMTS buses for the benefit of commuters. As per AMC's plan, a bus will arrive at the stand every 10 minutes.

AMTS : CITY BUS OPERATIONS



AMTS AS A FEEDER SERVICE TO BRTS NETWORK : PRESENT

The AMTS is being groomed to play a larger role - feeder bus service for the Bus Rapid Transit System (BRTS) and also a means to encourage more passengers to choose public transport over personal vehicle. These will run on the redesigned routes to complement the BRTS fleet.

All the routes will be bisecting BRTS corridors, so that passengers can access both public transport easily. These routes have been designed carefully, so that AMTS and BRTS can complement each other. AMTS will cover areas where BRTS is not able to go.

The civic authority has bought 400 new buses for AMTS to be used as feeder buses. These hi-tech buses will have features like built-in facilities like GPS system, pneumatic ticketing machine, LED screens, passenger information system and pneumatic doors.

The BRTS is now spreading its wing to reach out to all parts of the city. Soon more routes will be added to the existing BRTS corridor. To play an able supporting role.

AMC has initiated a proposal to buy 1,000 new buses under the Jawaharlal Nehru National Urban Rural Mission (JNNURM).

Three new routes — 106, 107 and route number 148 — were introduced in the East and all of them were successful. The income of the first day of route numbers 146 and 147 was Rs 3,200 and for route number 148 was Rs 4,000.

16 feeder route buses operated by AMTS run in BRTS lane on Narol-Naroda cross road to decrease burden of AMTS buses in normal traffic lane.

Similarly, AMTS bus route number 33, 72 and 142 – in total 35 buses will use BRTS corridor on Sarangpur-Tilakbag stretch of road. Passengers will need to use BRTS bus stand to catch these buses.

They will need to take ticket from conductor seating inside the AMTS bus. The AMTS buses will use mix traffic lane beyond Sarangpur-Tilakbag stretch.

The existing routes have been reorganized and 52 radial routes and 24 feeder routes have been introduced.

In total 248 buses are to be put on roads considering the present route of BRTS and connections to other routes. This will decrease the waiting time for bus from 8 minutes to 6 minutes.

Routes are planned in a way that maximum one change

over will be needed to reach any station.

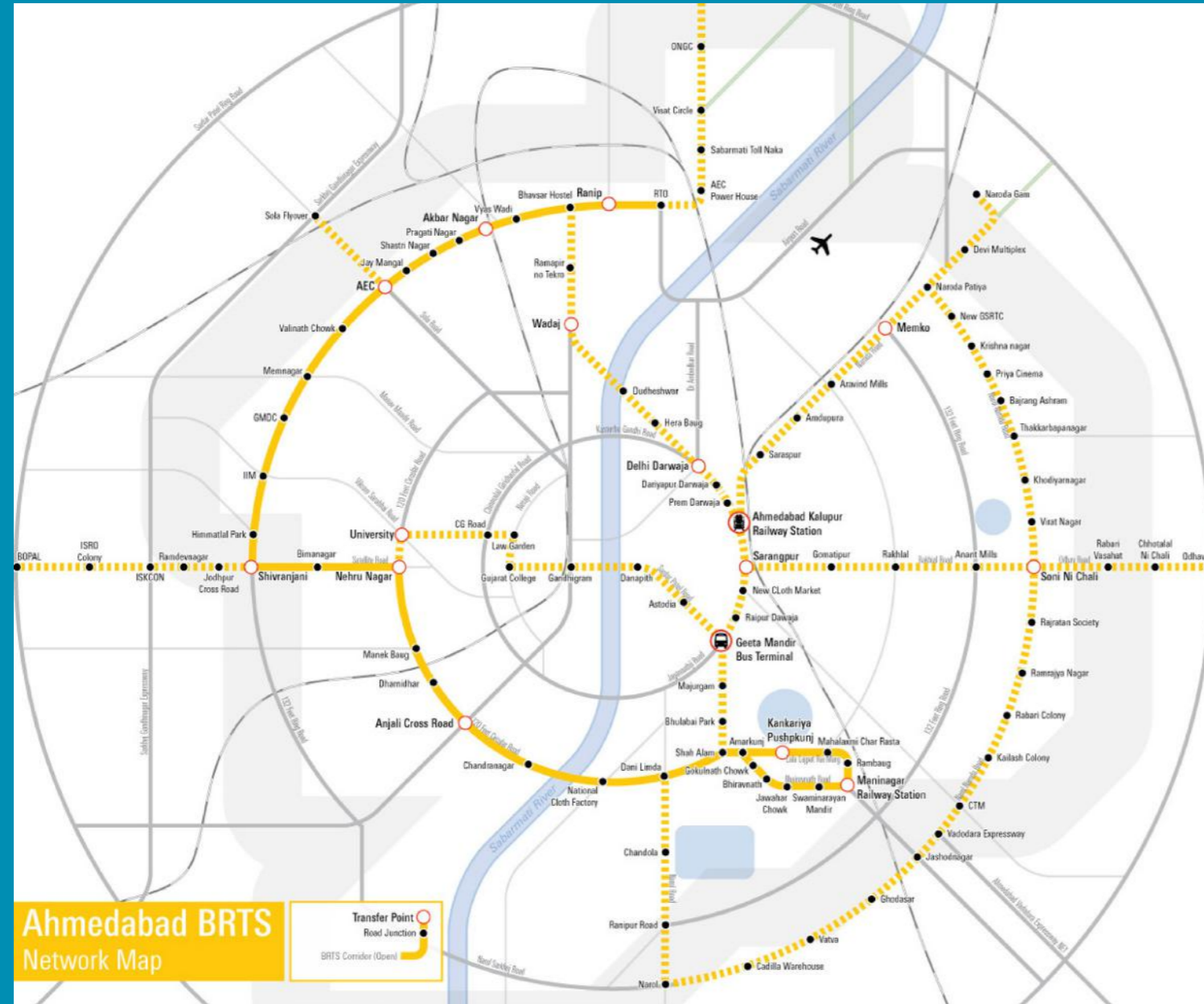
At present 127 bus stations are in operation. With 8 new bus stations and 10 cabins, total 144 bus stations will be in operation.

The Ahmedabad Municipal Transport Services (AMTS) is planning to withdraw its services from routes which run parallel to BRTS routes.

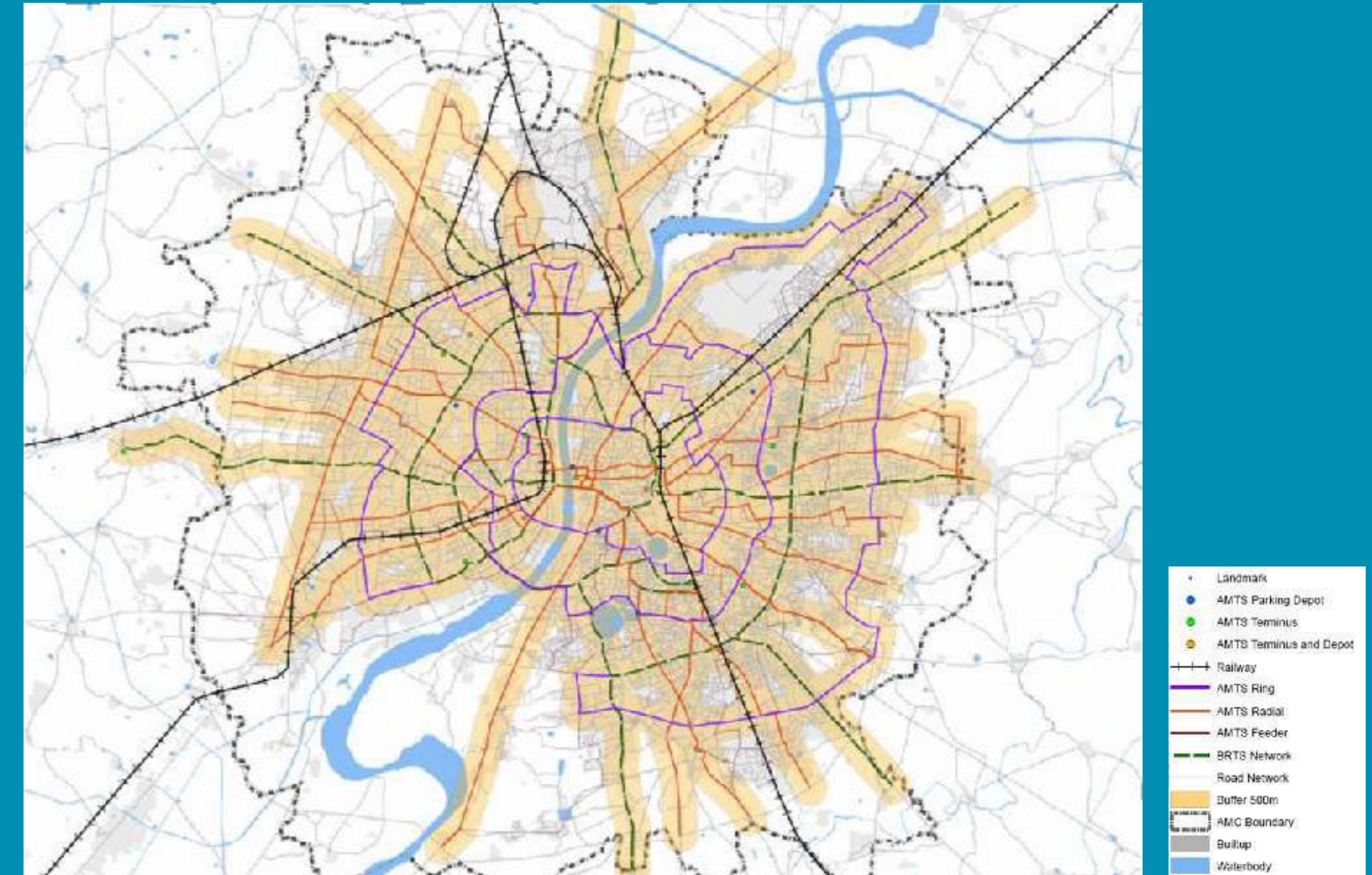
the AMTS conductors will be given new hand-held computerised ticketing machines. Instead of traditional paper tickets, the conductors will now give printed tickets.

A passenger will have to change buses and consequently will have to pay more but the AMTS plans to launch concession schemes soon.

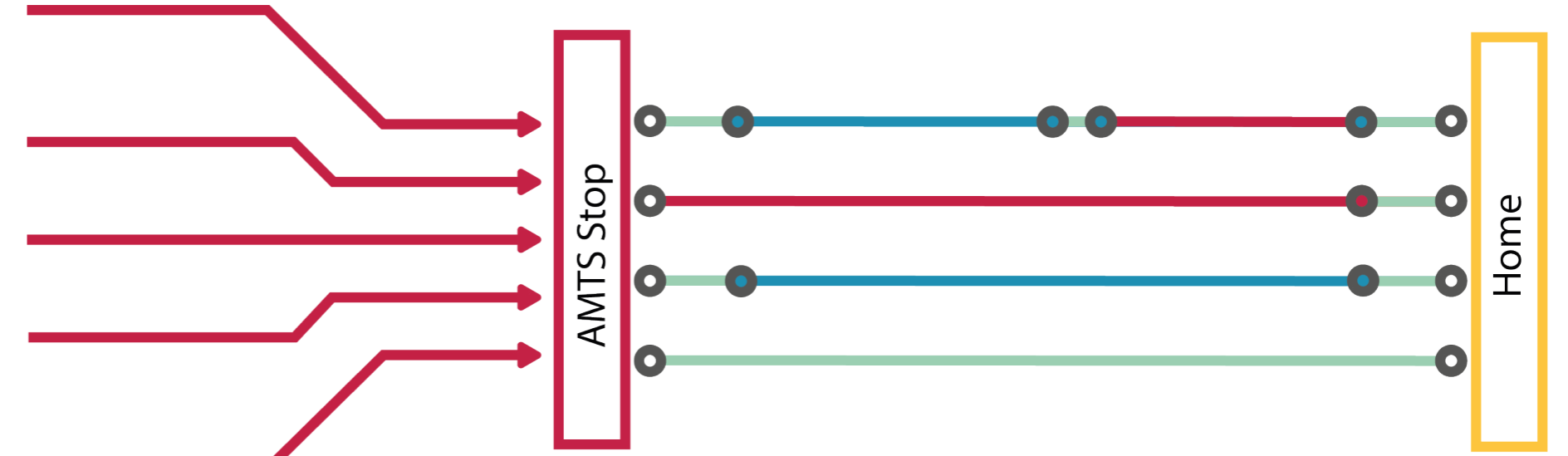
AHMEDABAD BRTS NETWORK MAP







AMTS FEEDER ROUTES



AMTS : FEEDER OPERATIONS



	By AMTS
	By BRTS
	By Motorised/non-motorised transport
	Stops

**FIELD STUDY:
INTEGRATED
FEEDER SERVICES**

AMTS FEEDER BUSES IN AHMEDABAD

TYPES OF INTEGRATION INVOLVED:

Infrastructure integration : Present in the areas towards the eastern side of the river.

Identity integration : Marked AMTS - BRTS (typical AMTS bus)

Infrastructural integration available only on the other side of the river. There are two types of feeder buses available as feeder buses.

Reasons for the partial infrastructure integration

- 1) AMTS has been working towards gradual infrastructure integration as there have been many AMTS routes that have been in use even before the integration of BRTS
 - AMTS had 158 routes and now there will be only 85 routes.
- 2) Even after the introduction of Janmarg BRTS, there hasn't been a major shift in the passengers from AMTS to BRTS
 - Only 10 percent of AMTS passengers have shifted to BRTS.
- 3) High dependency of passengers on the AMTS as it is well connected to the interior parts of the city and short distance travel, however there has been a growing trend of a shift from AMTS to BRTS.
This would ensure that the frequency of buses would be 8-10 minutes from the present 35 minutes.

4) High frequency and land use of BRTS buses on the eastern side of the river as it is the older part of the city as a result :

- Higher traffic congestion as the land availability is low
- Unpredictable travel times of AMTS buses resulting in the higher dependency on BRTS

5) Existing long routes of AMTS, where the passengers are habituated to the time table of the buses. Some of these buses run parallel to the BRTS lanes

- At present there is 26.85 % overlap of BRTS network which will now decrease to 2.41 %

6) Higher dependency on AMTS in the western parts of the city as these AMTS routes run from outer radial routes to the inner radials.



AMTS feeder bus arriving at a BRTS stop



A typical AMTS bus stop

USER INTERFACE

- Bus number information according to origin and destination
- Number of stops and names according to the route number
- Number of buses and bus numbers available at a particular stop
- Nearby bus stop location using GPS
- Bus location according to the GPS



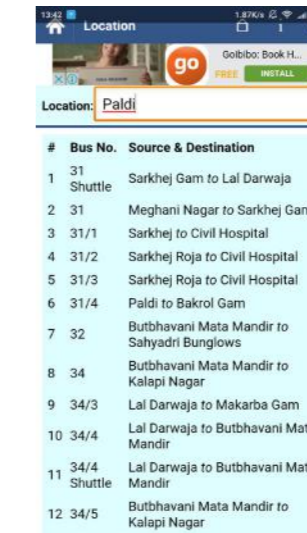
Options for bus finding acc. to different information



Find bus number from first to last points



information for stops according to the bus number



Buses available at a particular stop at Paldi



Information for the nearest bus stop using GPS

- User Comments
- dhruvimalani24(4P)56 was spotted at India Colony travelling towards Iskcon Mandir (Posted 14 hours 2 minutes 45 seconds ago)
 - dhruvimalani24(2P)35 was spotted at Lal Darwaja travelling towards Lal Darwaja (Posted 14 hours 4 minutes 35 seconds ago)
 - dakhilvaghela9093(2P)13/1 was spotted at Ranip travelling towards Ranip (Posted 22 hours 46 minutes 54 seconds ago)
 - divyabhavsar1998(4P)96 was spotted at Kalapur travelling towards Vatva Railway Colony (Posted 1 days 23 hours 49 minutes 21 seconds ago)
 - divyabhavsar1998(2P)96 was spotted at

AMTS MINI FEEDER BUS MODEL

These buses are not integrated infrastructure wise i.e they donot pick up passengers from the BRT stops rather, they pick up passengers from a nearby AMTS bus stops.
These buses run as feeder buses for the outer ring radial BRTS corridor

Capacity : 29+12
Frequency : 8-10minutes



A typical AMTS-BRTS feeder marking on a mini bus



AMTS mini feeder bus



Interior of a mini feeder bus

FEATURES OF MINI BUS FEEDER MODEL

Features present :

- a) LED info display
- b) GPS system
- c) Hand punched tickets
- d) Passenger announcement system
- e) Automated doors



LED info display



Passenger announcement system



An AMTS mini feeder bus



Automated doors



Handpunched tickets

VISUAL REPRESENTATION OF MINI BUS FEEDER MODEL



AMTS INTEGRATED FEEDER BUS MODEL

These buses are integrated infrastructure wise on the BRTS lanes i.e. they pick up passengers directly from the BRTS stops. These buses operate as feeder buses in the interior parts of the Amedabad.

- This type of feeder services are available only on the lanes extending from extending from
- 1) Lokmanya Tilak Bag to Sarangpur BRTS.
- 2) ISKON BRTS lane

Capacity of the bus

Seating : 32
Standing : 25

Frequency on lokmanya tilakbag to sarangpur BRTS : 5 - 8 minutes.

Frequency on ISKON BRTS lane : 20-30 minutes



feeder level boarding at Raikhad charrasta BRTS stop



A crowded AMTS feeder bus



Interior of a AMTS feeder bus



BRTS bus used as an AMTS feeder bus



feeder buses information in BRTS stops

FEATURES OF INTEGRATED FEEDER MODEL

Features :

- a) Automated doors
- b) LED information display board
- c) GPS system
- d) Hand-held computerised ticketing machine
- e) Passenger information system
- f) Signanges for the AMTS feeder inside BRTS stops : Absent (or) very minimal.



Passenger announcement system



Automatic doors in AMTS feeder buses



Right side door for level boarding



LED information display board

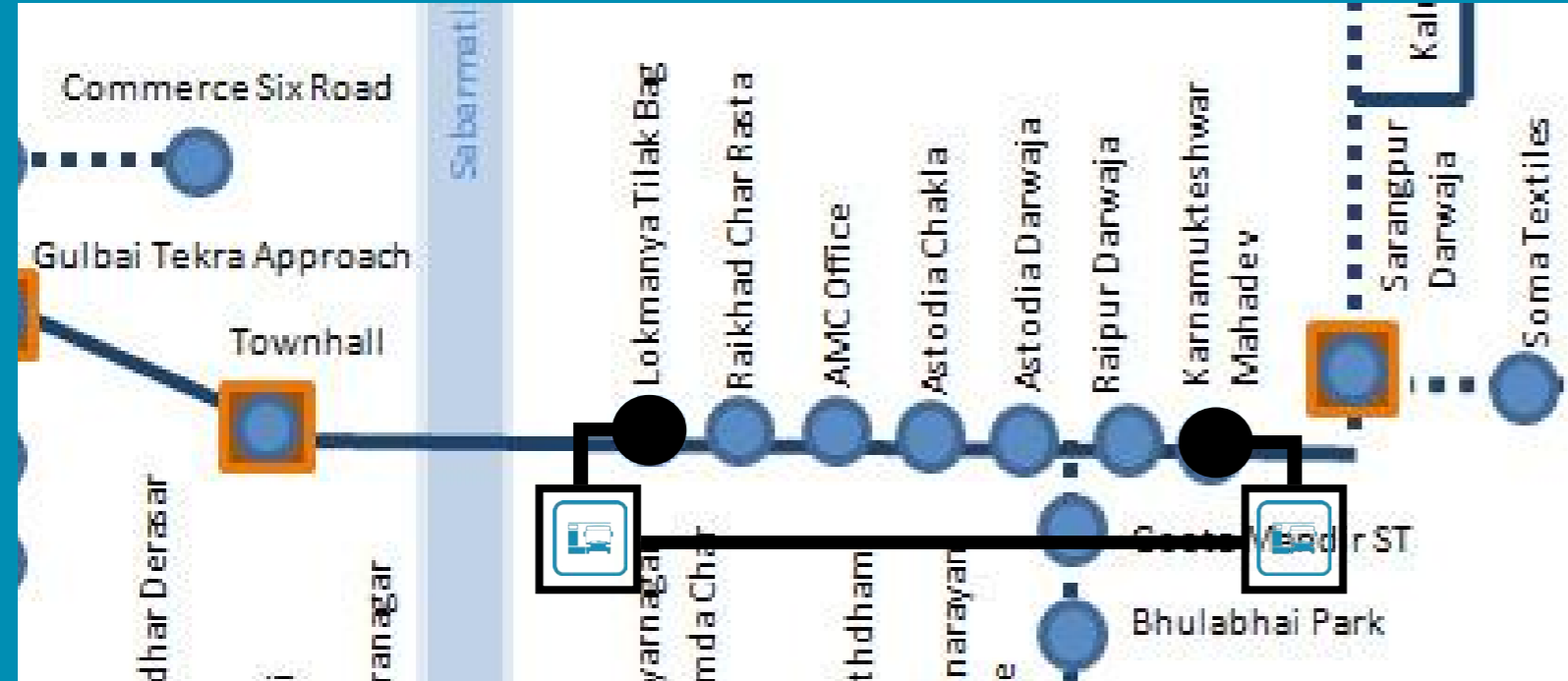


Hand-held computerized ticketing machine

VISUAL REPRESENTATION OF PRESENT INTEGRATED FEEDER MODEL



LOKMANYA TILAKBAG - KARNMUKTHESWAR MAHADEV



CHOSEN LANE LOKMANYA TILAKBAG - KARNMUKTHESWAR MAHADEV BRTS

BRTS stops :

Lokmanya tilak bag - Raikhad charrasta - AMC office -Astodia chakla
- Astodia darwaja -Raipur darwaja - K.mahadev

Reasons for selecting this lane :

- 1) Integrated infrastructure wise
- 2) High frequency of BRTS and AMTS buses on the lane
- 3) It is closest to the central ring of the BRTS line
- 4) Lane leads towards Kalupur railway station
- 5) AMTS buses run both on the BRTS lanes as well as on the mixed traffic lanes operating on the long AMTS routes.
- 6) A total of 18 feeder routes for the BRTS lines
- 7) High frequency of BRTS buses : 5-8 minutes
- 8) High frequency of AMTS buses : 8-10 minutes
- 9) High land usage and mixed land usage



AMTS buses running parallel near Mangal park BRTS



feeder buses on the Lokmanya tilak Bag BRTS stop

AMTS Feeder bus routes on each BRTS bus stop on the lane

STOPS																		
lokmanyatilakbag	33	72	142	142S	144/1	151	150Sh	151/3	52/2	13/1	13/1Sh	123Sh	-	-	-	-	-	
Raikhad	33	72	142	142S	144/1	151	150Sh	151/3	52/2	13/1	13/1Sh	123Sh	-	-	-	-	-	
AMC office	33	72	142	142S	144/1	151	150Sh	151/3	52/2	13/1	13/1Sh	123Sh	-	-	-	-	-	
Astodia chakla	33	-	142	142S	144/1	-	-	-	-	-	-	123Sh	123	150	49	49/1	151/2	
Astodia darwaja	33	72	142	142S	144/1	151	150Sh	151/3	52/2	-	-	-	123	150	49	49/1	151/2	
Raipur darwaja	33	72	142	142S	144/1	151	150Sh	151/3	52/2	-	-	123Sh	123	150	49	49/1	151/2	
K. Mahadev	33	-	142	142S	144/1	-	-	-	-	-	-	123Sh	123	150	49	-	-	

FEEDER CHARACTERISTICS ON THE SELECTED LANE

AMTS Route No.	No. of stops	starting - ending	Total distance (km)	Avg dist. / stop
33	32	Narayannagar - Manmohan park	16	0.5
72	26	Maninagar - Sahyadri bungalows	13	0.5
142	24	Vastral gam - Gujarat University	18	0.75
142 Shuttle	14	Vastral gam - Lal darwaja	13.8	1
144/1	26	Lal darwaja - Nirant cross road	12.5	0.5
151	30	Iskon mandir - Vivekanadnagar	26	1
150 Shuttle	15	Vasna - Chinubhai tower	8	0.5
151/3	20	Manipur vad - Hatkeshwar	28	1.4
52/2	31	Maninagar - Sola housing	14.6	0.4
13/1	22	Nigam society - Ranip	18	0.8
13/1 Shuttle	12	Nigam society - Lal darwaja	10.5	0.9
123	20	Vasna - Sitarambapa chowk	16	0.8
123 Shuttle	10	Lal darwaja - Krishnanagar	8	0.8
150	20	Sarkhej - Chinubhai tower	12.5	0.6
49	27	Adhinath nagar - Manipur vad	26	1
49/1	19	Sarangpur - Jodhpur gam	10	0.5
151/2	19	Lal darwaja - Nandej gam	21	1

FIELD STUDY: OBSERVATIONS

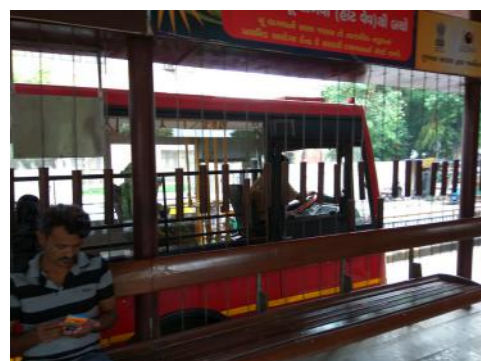


LOKMANYA TILAK BAG

Morning peak hour rush (monday, wednesday & friday)	:	8:30am - 10:30 am
Evening peak hour rush (monday, wednesday & friday)	:	5pm - 7:30 pm
Frequency of the BRTS buses (approx.)	:	3 - 5 minutes
Frequency of the AMTS buses (approx.)	:	5 minutes
Passengers / bus in peak hour (approx.)	:	60-65

RAIKHAD CHARRASTA

Morning peak hour rush (monday, wednesday & friday)	:	9 : 30am - 12pm
Evening peak hour rush (monday, wednesday & friday)	:	6pm - 7:30 pm
Frequency of the BRTS buses (approx.)	:	3 - 5 minutes
Frequency of the AMTS buses (approx.)	:	5 minutes
Passengers / bus in peak hour (approx.)	:	60-65



AMC OFFICE

Morning peak hour rush (monday, wednesday & friday)	:	10am - 12pm
Evening peak hour rush (monday, wednesday & friday)	:	5pm - 8 pm
Frequency of the BRTS buses (approx.)	:	3 - 5 minutes
Frequency of the AMTS buses (approx.)	:	5 minutes
Passengers / bus in peak hour (approx.)	:	60-65

ASTODIA CHAKLA

Morning peak hour rush (monday, wednesday & friday)	:	10am - 11 : 30Am
Evening peak hour rush (monday, wednesday & friday)	:	5pm - 7 pm
Frequency of the BRTS buses (approx.)	:	5 minutes
Frequency of the AMTS buses (approx.)	:	5-8 minutes
Passengers / bus in peak hour (approx.)	:	60-65



ASTODIA DARWAJA

Morning peak hour rush (monday, wednesday & friday)	:	8am - 12pm
Evening peak hour rush (monday, wednesday & friday)	:	4pm - 8:30 pm
Frequency of the BRTS buses (approx.)	:	8 minutes
Frequency of the AMTS buses (approx.)	:	10 - 15 minutes
Passengers / bus in peak hour (approx.)	:	60 - 70

RAIPUR DARWAJA

Morning peak hour rush (monday, wednesday & friday)	:	9 : 30am - 12pm
Evening peak hour rush (monday, wednesday & friday)	:	6pm - 7:30 pm
Frequency of the BRTS buses (approx.)	:	8 minutes
Frequency of the AMTS buses (approx.)	:	10 -20 minutes
Passengers / bus in peak hour (approx.)	:	65 - 75

KARNMUKHTESHWAR MANDIR

Morning peak hour rush (monday, wednesday & friday)	:	11 am - 12pm
Evening peak hour rush (monday, wednesday & friday)	:	6pm - 7:30 pm
Frequency of the BRTS buses (approx.)	:	10 minutes
Frequency of the AMTS buses (approx.)	:	10 -15 minutes
Passengers / bus in peak hour (approx.)	:	60 - 65

OBSERVATIONS

- 1) Mixed traffic lane running between Astodia chakla and Astodia darwaja
- 2) Morning timings between 9-11 am mostly college/school going students
- 3) Average distance between each BRTS stop : 500m
- 4) FREQUENCY of BRTS buses : 5-8 minutes
- 5) Average distance between each AMTS stop : 750m
- 6) FREQUENCY of AMTS buses : 8-10 minutes
- 7) Feeder buses don't usually play a role of feeder bus rather they are more of a shuttle bus.
- 8) Some of them cover distances greater than 20kms.
- 8) The feeder buses are usually over crowded between 8:30 am to 11:30am in the morning and 4:30pm to 8:30 pm in the evening
- 9) BRTS buses run on time, where as the AMTS feeder buses donot run on their scheduled times, as they often get caught in traffics, so the timing is unpredictable

- 10) Each AMTS feeder bus covers a minium of 3 BRTS stops before they deviate into mixed lanes.
- 11) The peak hour demand is not met even though the feeder buses boast of around 400 buses in its fleet.
- 12) It is very hard to differentiate an AMTS feeder bus from that of a regular AMTS city bus
- 13) The ratio of BRT to that of an AMTS feeder bus is around 2 : 1 on the lane
- 14) The BRTS bus has a capacity of around 60 but the capacity of an AMTS feeder bus is similar to that of an AMTS feeder bus the number of AMTS feeders operating on the lane are much lesser in number

**ANALYSIS:
INTEGRATED
FEEDER SERVICES
IN AHMEDABAD**

TYPICAL FEEDER CHARACTERISTICS COMPARISON

Typical Characteristic	Examples in Metropolitan Areas	Ahmedabad Scenario
Serve short distances	4 - 6 Kms / 7-12 Kms	16
High frequency service	5 - 10 minutes	10-15 minutes
Connects commercial, residential nodes to the trunk corridor or major destinations	feeders to the CBDs/stations	feeders to BRTS stations
Requires a transfer at the end of the journey	Stop should be located within 50-100m walking distance/integrated into the system	Integrated into the system in some parts, at a walking distance in other parts of the city
Provides first / last mile connectivity	upto 50-100m	50-100m
Extend the trunk corridor's area of influence	-	-
Operates amongst mixed traffic, without priority infrastructure or space	mixed traffic/ service lanes like BRT lanes	Mixed traffic lanes, as well as BRTS lanes
Bus stops are generally spaced within walking distance of each other	300 - 400m apart	750m

SWOT ANALYSIS : AMTS MINI FEEDER BUS

STRENGTHS

Good connectivity
Low fare
Large fleet
Good frequency
Support from the government
Small size

WEAKNESS

Low infrastructure quality
Increased transfer times
Low capacity
Over crowding
Poor service quality
Distant stops
Age old fare collecting system
Not city wide service
Lack of safety awareness

OPPORTUNITY

A trusted and experienced public service
Concession schemes
Cheaper public transport
ITS integration
Fare integration
Identity itegration
Infrastructure integration
Parking facilities at the bus stop

THREATS

No monitoring systems
Autorickshaws
Personal vehicles
Social objectives - financial strain
Traffic congestion

SWOT ANALYSIS : AMTS INTEGRATED FEEDER BUS

STRENGTHS

Decreased travel times
Large bus fleet
Low fare
A government supported service
Disabled friendly
Bus passes/ all day travel

WEAKNESS

Not a feeder - a shuttle service
Distant stops for a feeder - avg. 750m
Not a city wide service
Over crowding - peak hours
Poor bus infrastructure
Lack of safety awareness

OPPORTUNITY

Operates on BRTS lanes in some parts of the city
Concession schemes - social service
Can be expanded to the westrn part of the city
Integral part of the BRTS
A trusted pulic service
Parking facilities at the bus stop
Feeder subsystem Integration

THREATS

Increasing congestion
Autorickshaws
No monitoring system
Social objectives - financial strain
Personal vehicles

INTERNAL

POSITIVE

STRENGTHS

- Decreased travel times
- Good connectivity
- Large bus fleet
- Low fare
- A government supported service
- Disabled friendly
- Bus passes/ all day travel
- Small size
- Cheaper public transport

NEGATIVE

WEAKNESS

- Not a feeder - a shuttle service
- Distant stops for a feeder - avg. 750m
- Not a city wide service
- Over crowding - peak hours
- Lack of safety awareness
- Low infrastructure quality
- Increased transfer times
- Low capacity
- Poor service quality
- Age old fare collecting system

POSITIVE EXTERNALS

- Parking facilities at the bus stops
- Fare Integration
- ITS integration
- Feeder subsystem Integration
- A trusted and experienced public service
- Identity itegration
- Operates on BRTS lanes in some parts of the city
- Concession schemes - social service
- Can be expanded to the westrn part of the city
- Integral part of the BRTS

NEGATIVE INTERNALS

- Not a feeder - a shuttle service
- Distant stops for a feeder - avg. 750m
- Not a city wide service
- Over crowding - peak hours
- Lack of safety awareness
- Low infrastructure quality
- Increased transfer times
- Low capacity
- Poor service quality
- Age old fare collecting system

EXTERNAL

OPPORTUNITIES

- Parking facilities at the bus stops
- Fare Integration
- ITS integration
- Feeder subsystem Integration
- A trusted and experienced public service
- Identity itegration
- Operates on BRTS lanes in some parts of the city
- Concession schemes - social service
- Can be expanded to the western part of the city
- Integral part of the BRTS

THREATS

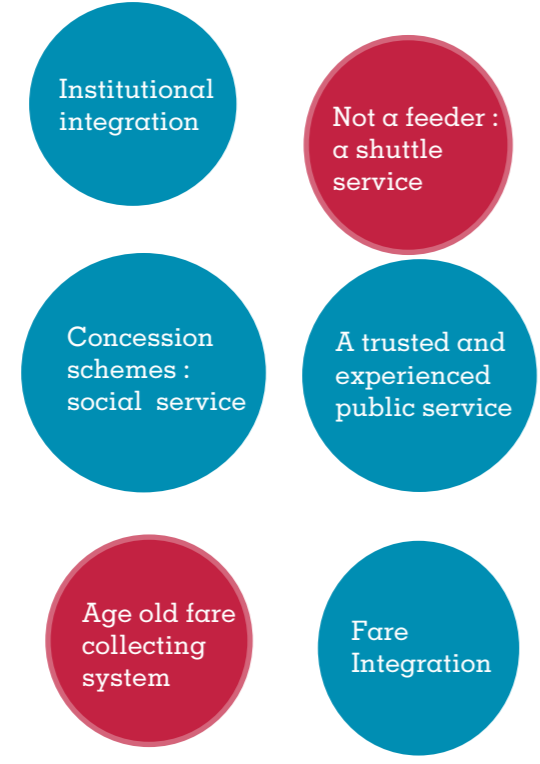
- No monitoring systems
- Autorickshaws
- Personal vehicles
- Social objectives : financial strain
- Traffic congestion

From the SWOT analysis above, the factors where we can study, intervene and improve the existing systems are positive externals (opportunities) and negative internals (weakness). These factors can be further categorized into exogenous factors or endogenous (institutional and physical design)

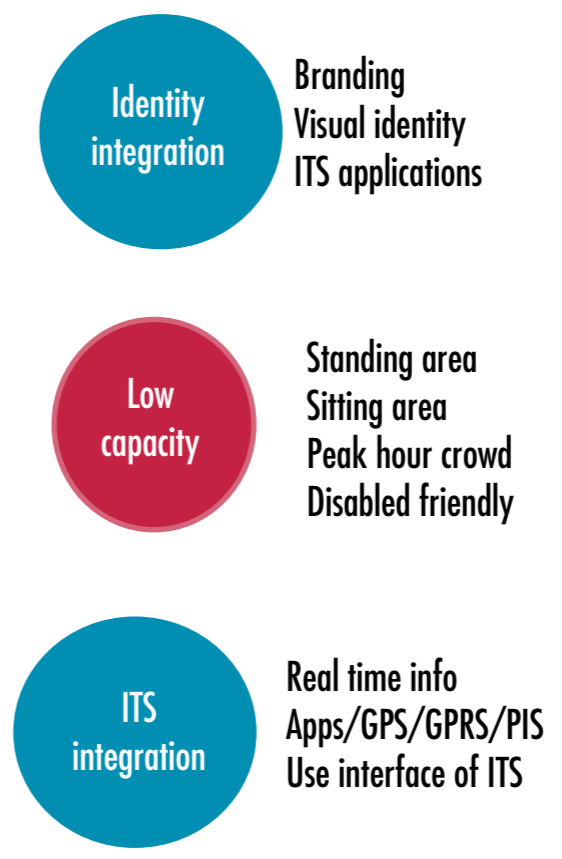
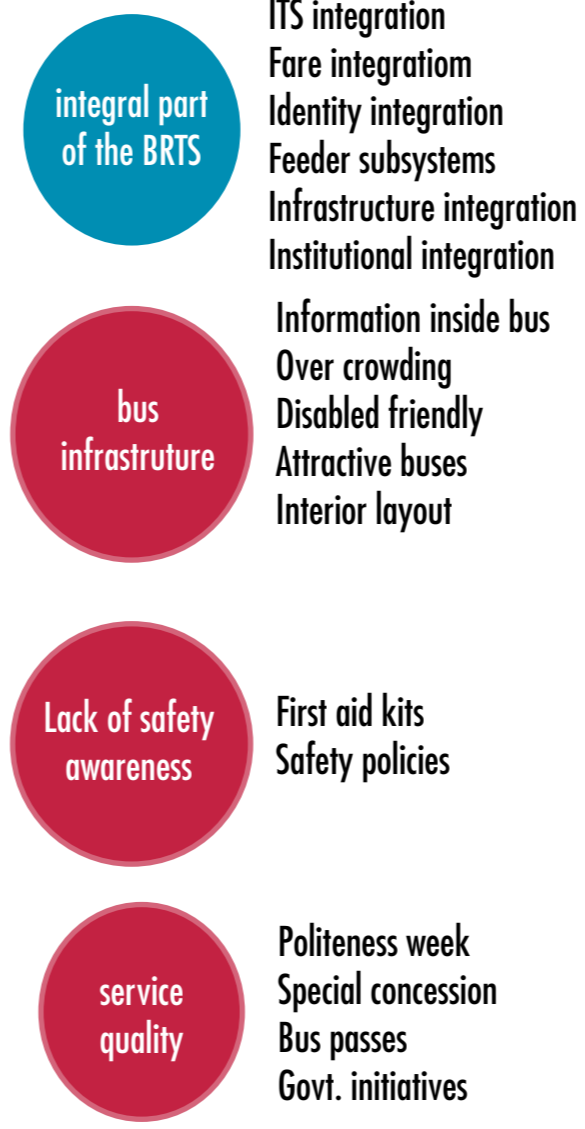
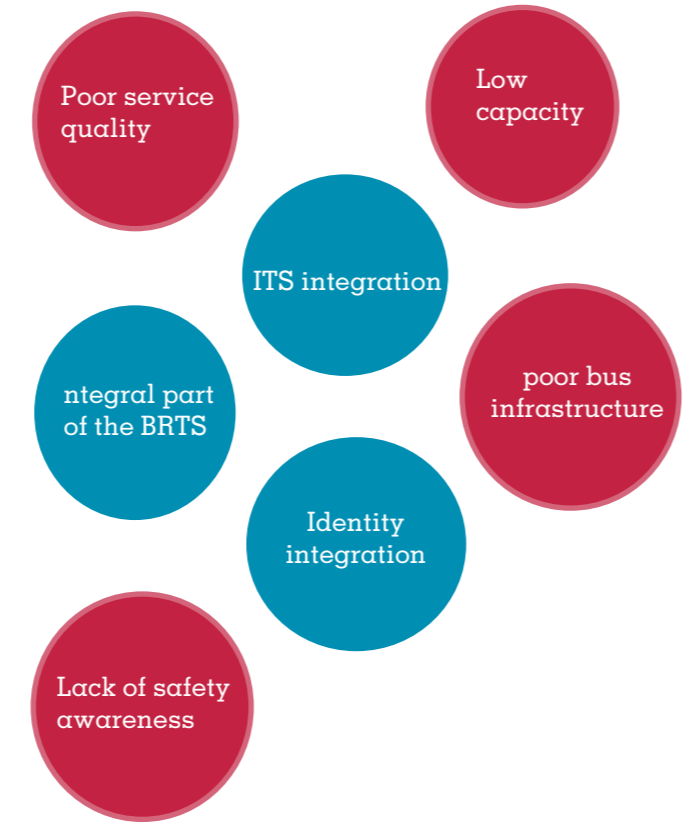
EXOGENOUS FACTORS



ENDOGENOUS FACTORS (INSTITUTIONAL)



ENDOGENOUS FACTORS (PHYSICAL)



As all the Exogenous factors are dependant on the city. These factors changes by times according to the surrounding - Lack of availability of space for physical integration of a system

The Endogenous factors (institutional) here are the ones which can be rectified with participation of government and will be reduced with time due to development happening around.

The Endogenous factors (physical) here are the factors where we can study, intervene and provide solutions. These factors constitute all the components which are dependant on the physical design factor. Importance of these factors can be further elaborated by ERAF System Diagram.

TYPES OF INTEGRATION IN FEEDER SERVICES

CONTEXT

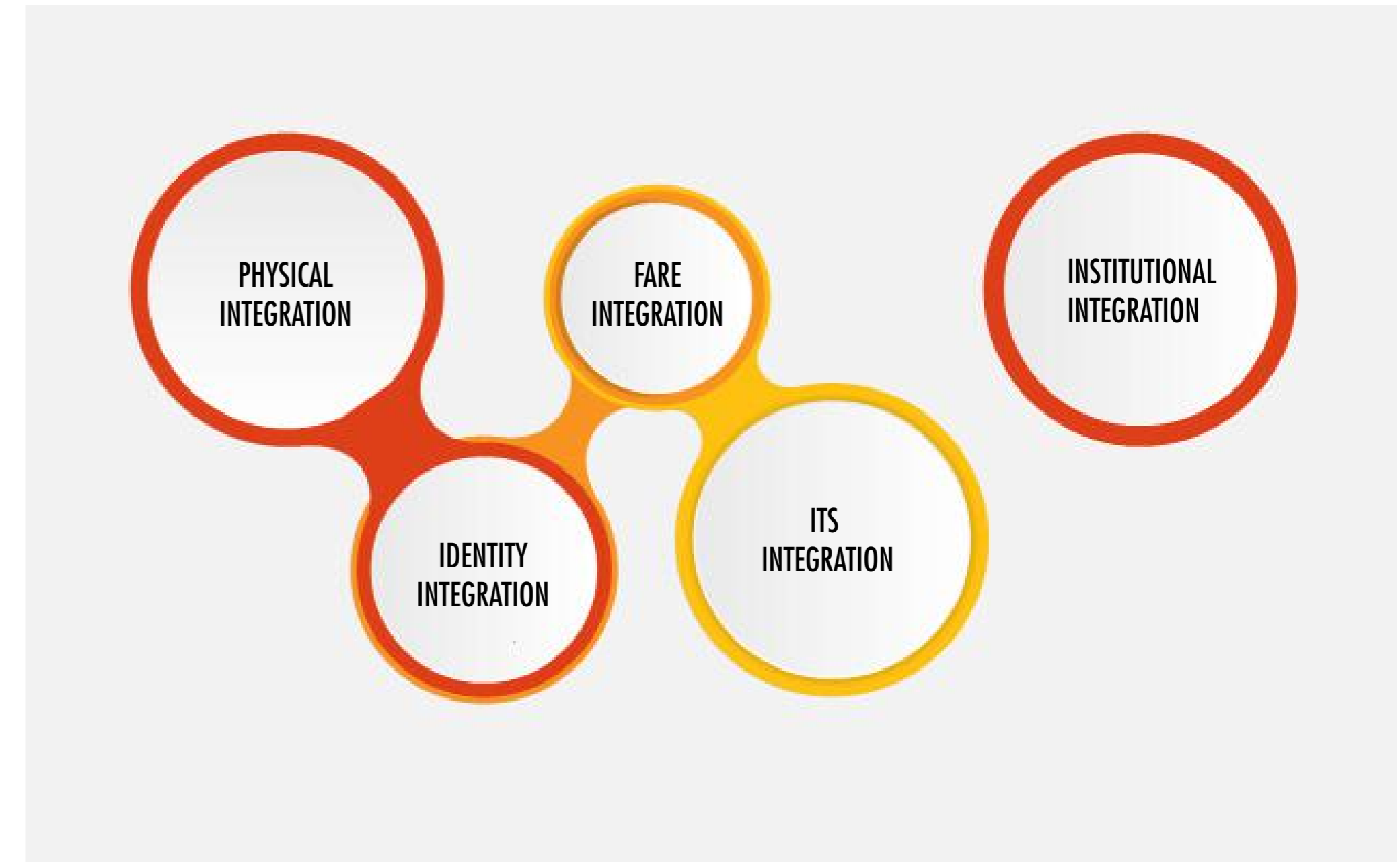
- The Transport system of a city is the sum of all means of transport
- Different modes should be complementary, not the competitors
- Seamless integration is imperative feeder bus system design must be incorporated into the planning phase, attracting ridership through high frequencies, easy visibility and access to feeder, and significant coverage huge investments in developing Metros, Mono rails, BRTS, a key component for successful implementation of these projects is multimodal integration and providing last mile connectivity through feeder bus systems. Bus priority lanes at station area will improve the operational efficiency of feeder bus systems enhance coverage and operational efficiency and should not be an afterthought.

WHY INTEGRATION?

- For a “non stop-non transfer” transport
- Transport Network consists of different modes (buses, trains, mototaxi, etc), commuters switchover between different modes, with a feeling of “time loss” and “discomfort”.
- Minimise the need to transfer but maximise the opportunity to transfer
- Making transfer seamless.

WHY INTEGRATION ?

- Rational – Seamless Integration
- Cost-effective
- Efficient Public Transport System
- Integrated & Optimized Modes
- But also Improving the passenger’s experience in PT



Institutional Integration

Building and strengthening coordination to implement a cohesive transit network to attract users

An integrated approach to ensure a better transport system.

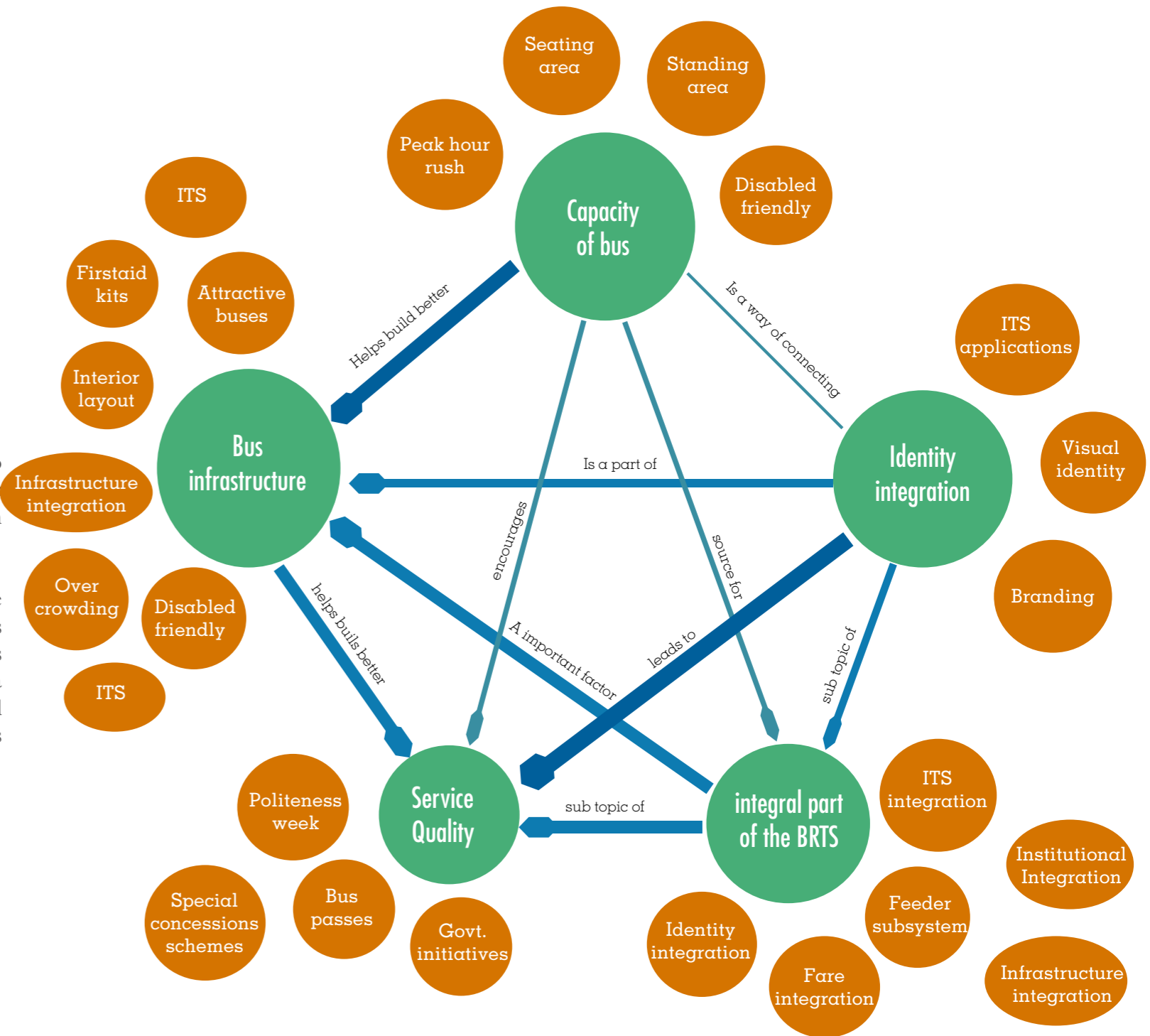
Coordination between the many entities and agencies that manage the system,

Revenue Sharing: managing revenue and implementing a cohesive approach to building a shared vision for fare and ticketing integration and revenue sharing between agencies

ENTITIES RELATIONS ATTRIBUTES FLOW

ERAF diagram helps us to think about the set of elements of system and their interaction with each other.

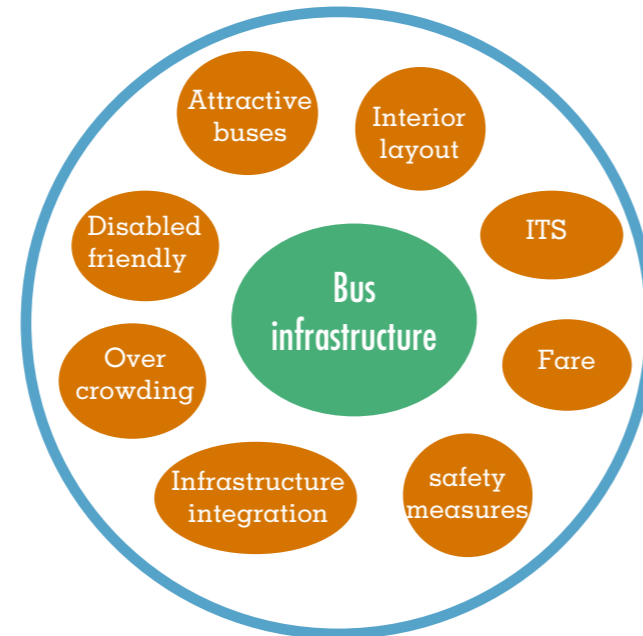
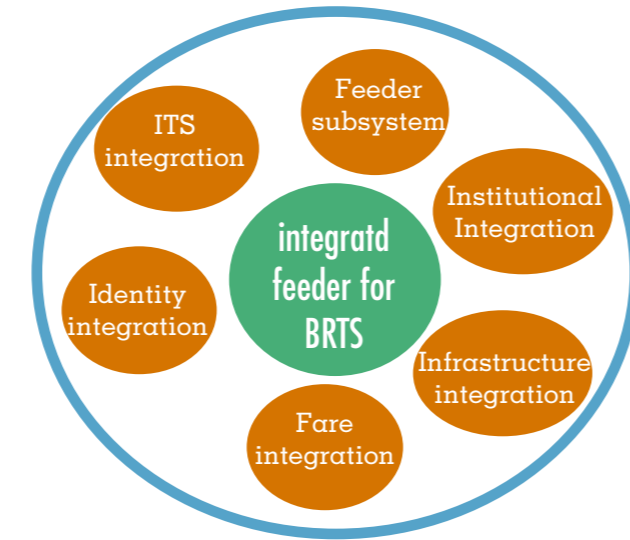
It is synthetic in which the information through research is brought together. Through this diagram we can have an idea about any possible relation and flow between all endogenous physical design factors.



As we can see from the ERAF diagram that the bus infrastructure is the factor which affects the other entities the most and help them grow and progress in achieving a complete integrated system. This factor consists attributes which are very important in order to make the feeder bus system a successful reality in India. To refine further, we can look at the attributes which positively affect bus infrastructure and other aspects in the feeder system as well.

Then we can look upon these attributes of the Bus infrastructure and provide systematic user based design to achieve an integrated feeder bus system to help grow, improve, function and adapt in the best way possible.

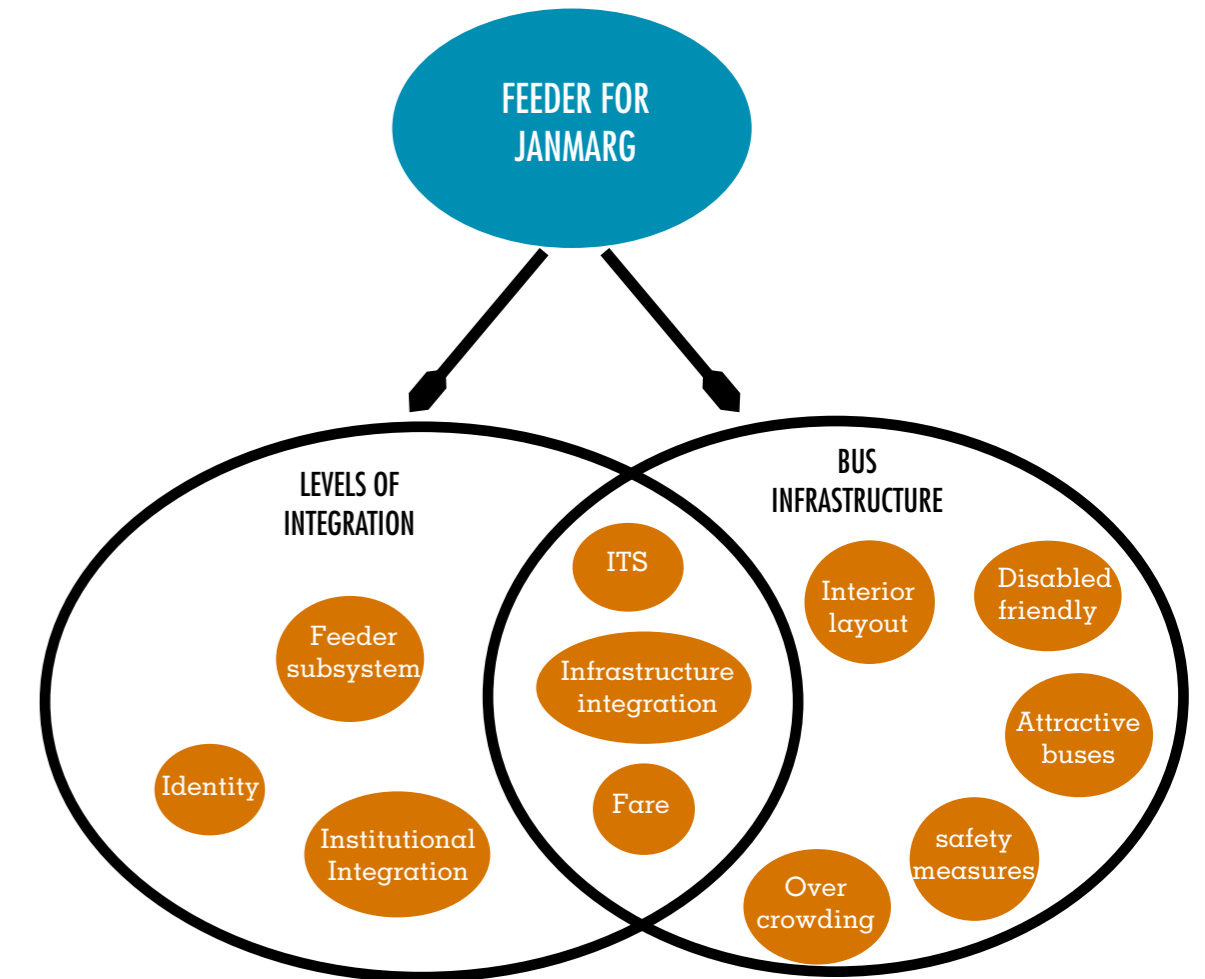
However, There are many constraints in achieving a fully integrated feeder system as the exogenous factors play a role in limiting the possibilities.



If we look at the attributes of infrastructure which provides an idea about the basic requirements for the integration as a feeder bus system in India.

From the mapping, we can understand that the immediate requirement is the infrastructure for the feeder service which can evolve further with introduction of many key aspects to achieve an efficient feeder service.

The requirements for a shorter travel like standing and seating capacities, the need to make an attractive mode of public transport, technology based services in the context of infrastructure as well as a user; and also considering people with special needs.



**INTEGRATED
FEEDER SERVICES:
PROPOSAL**

PROPOSAL

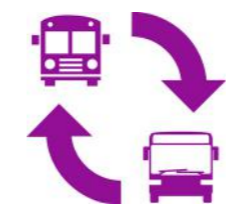
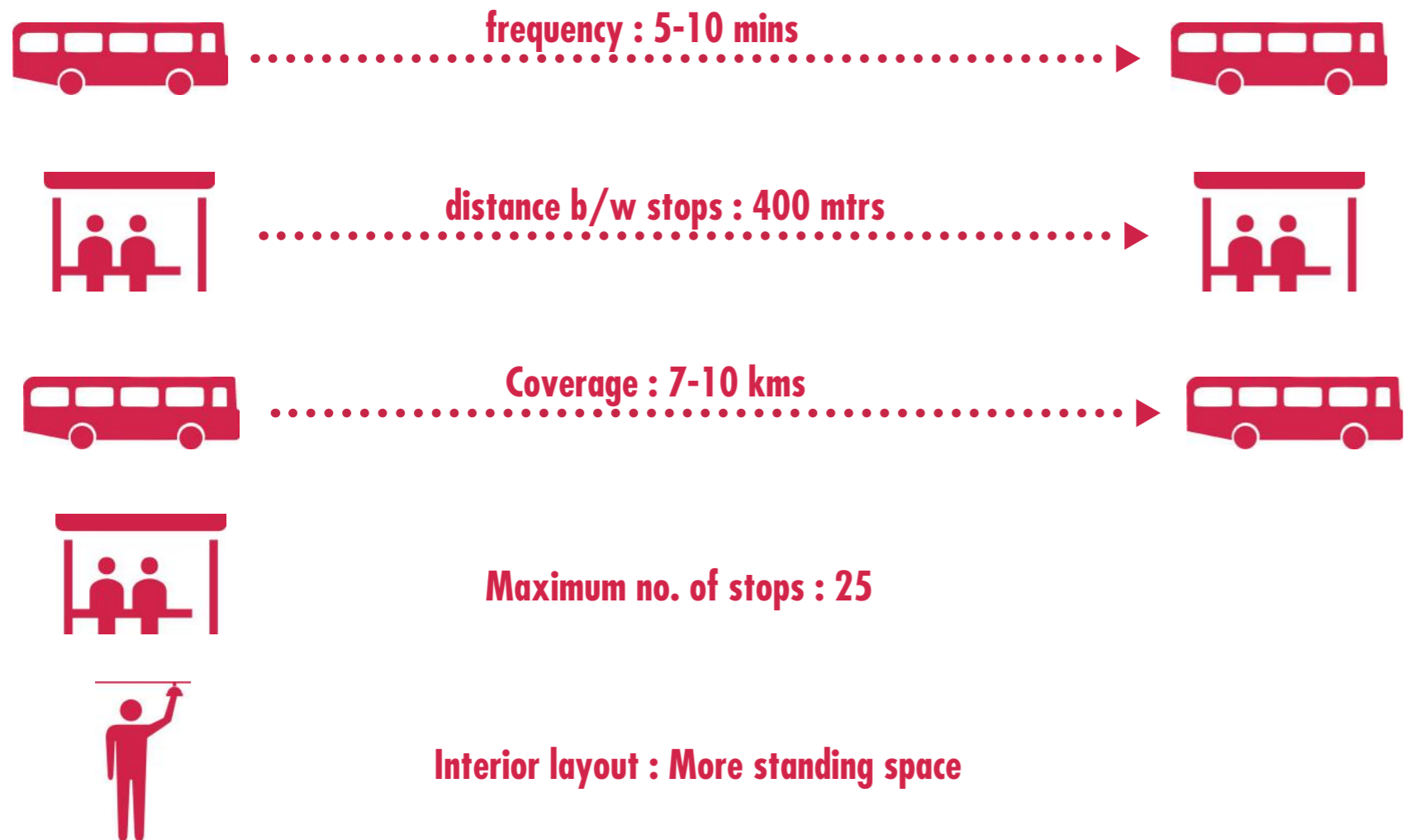
After analyzing the different aspects and attributes of a feeder service, and its implementation in different cities of Indian urban context as well as studying the context of Ahmedabad, it can be concluded that the existing feeder services for Janmarg BRTS needs to upgrade as well as implement a certain key aspects so as to obtain a optimum level of feeder bus functionality and efficiency.

The idea is to introduce the feeder services with different levels of integration with the Bus rapid transit like fare, technology, identity as well as upgrade the existing level of integration in terms of infrastructure, and different institutions that are involved in providing the commuters a safe, efficient, trustworthy and quality services.

This will enable the city of Ahmedabad and its commuters to make the existing rapid transit which has been a inspirational model for the Indian cities to look upto for the implementation of such systems, to attain a near total efficiency in its operations as well as to serve the needs of the commuters.

This model will also help in introducing and providing a good platform for the subsystems like bicycle sharing to become an integral part of the everyday travel mentality of the city and to help it to evolve and grow in the evergrowing congestion levels of the urban India.

PROPOSED FEEDER SERVICES RECOMMENDATIONS



Common exchange points : BRTS STOP



Fare integration with BRTS service : SMART CARDS



Tech integration with BRTS service : ITS

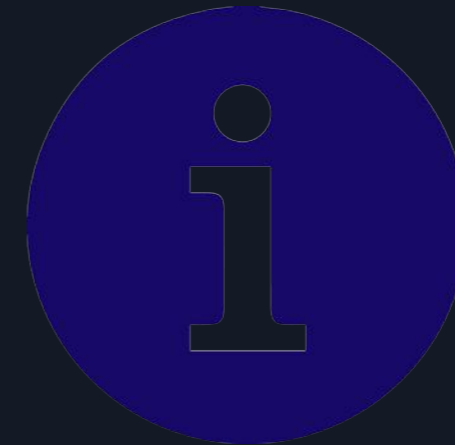


Identity integration with BRTS service : BRANDING



Integration with subsystems : BICYCLE SHARING

TECHNOLOGY IN TRANSPORT



Intelligent Transport System (ITS)



CONCEPT:

1 Service = 1 Common ITS

ITS components:



GPS



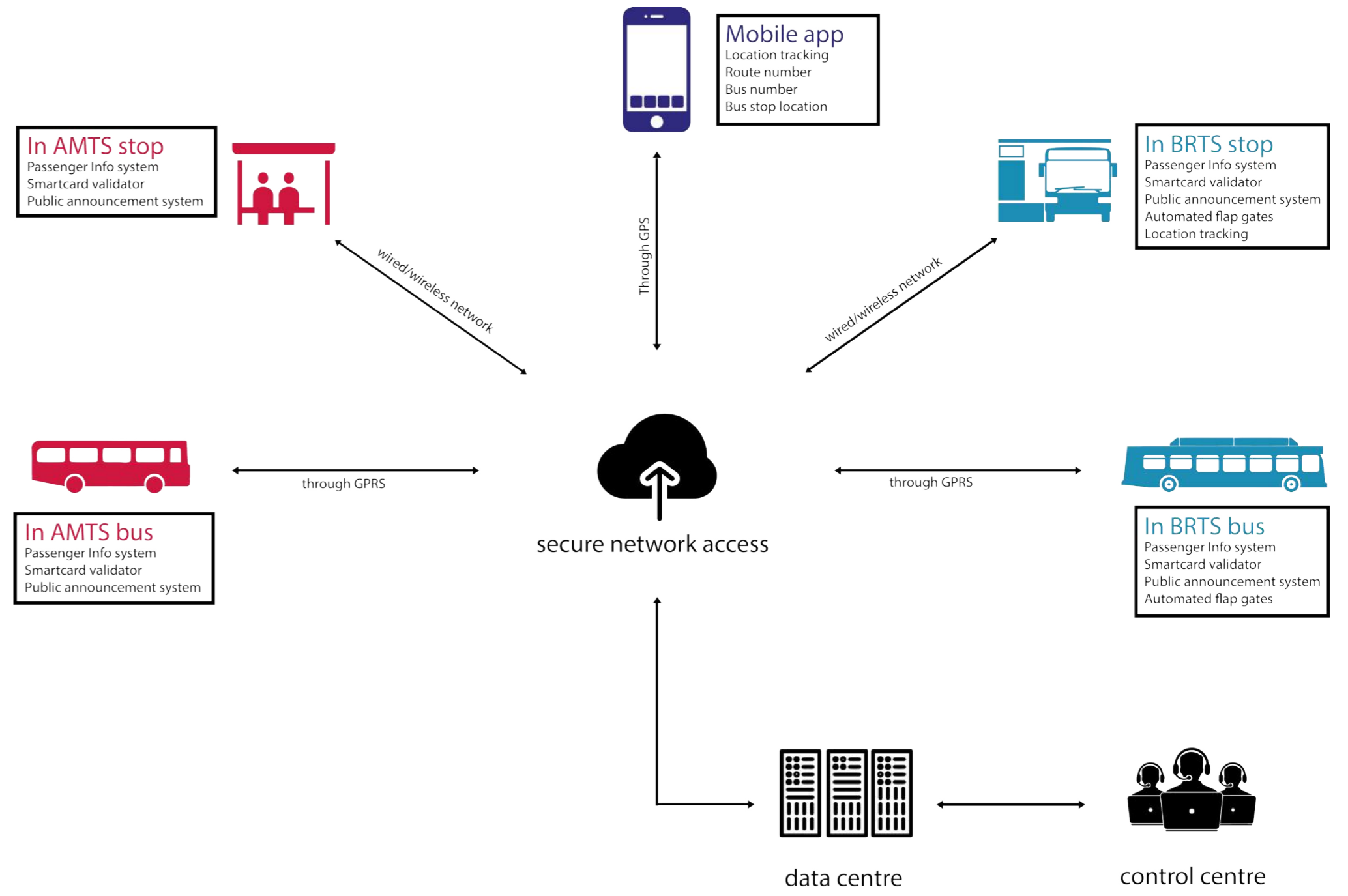
Announcement



Ticketing



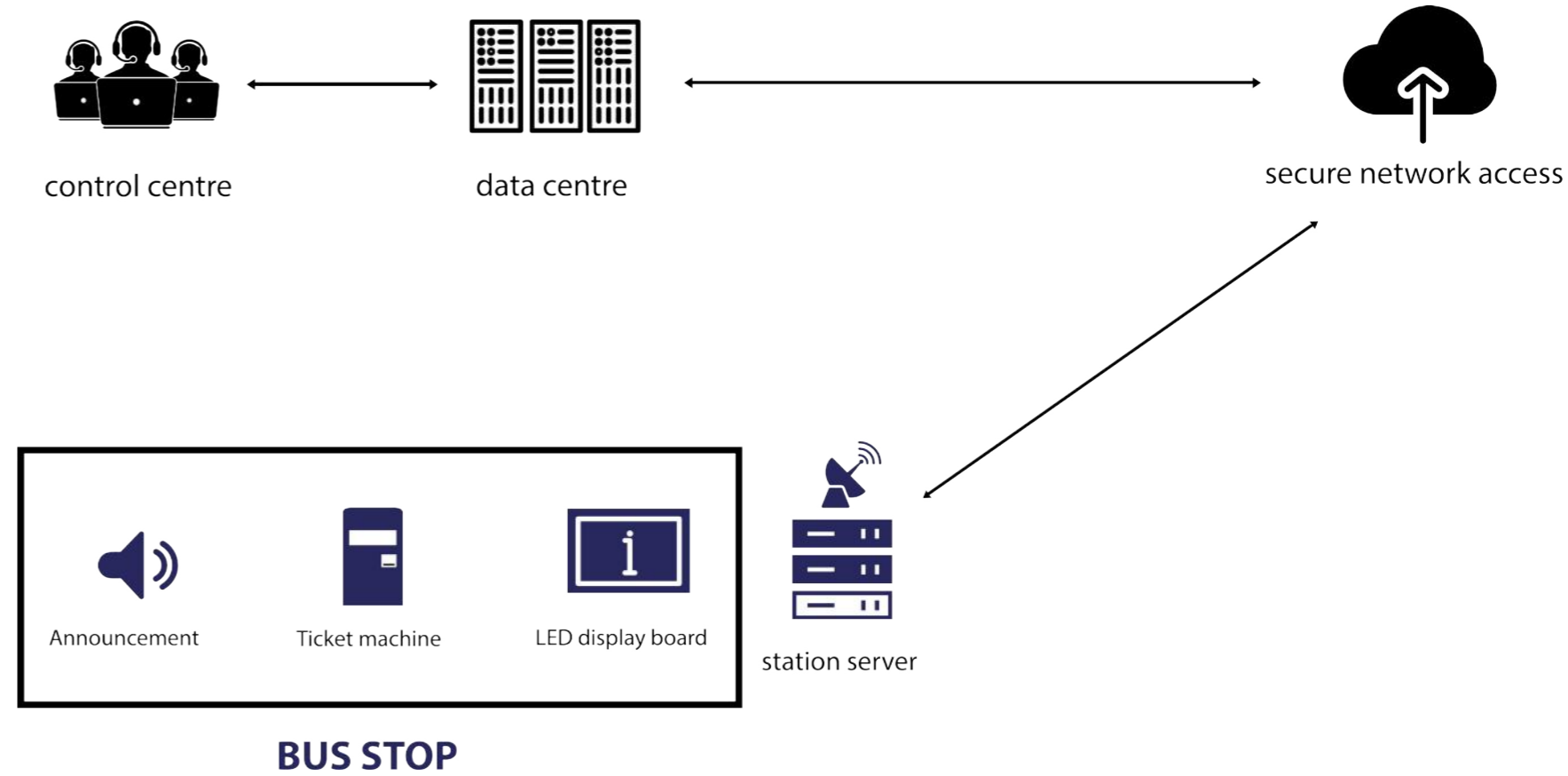
Display



LOCATION:
BUS STOPS

ITS components:
flap gates
LED display boards
Smart card validator
Station server
Ticket machine
Announcement system

ITS in BUS STOP



LOCATION:

BUS

ITS components:

flap gates

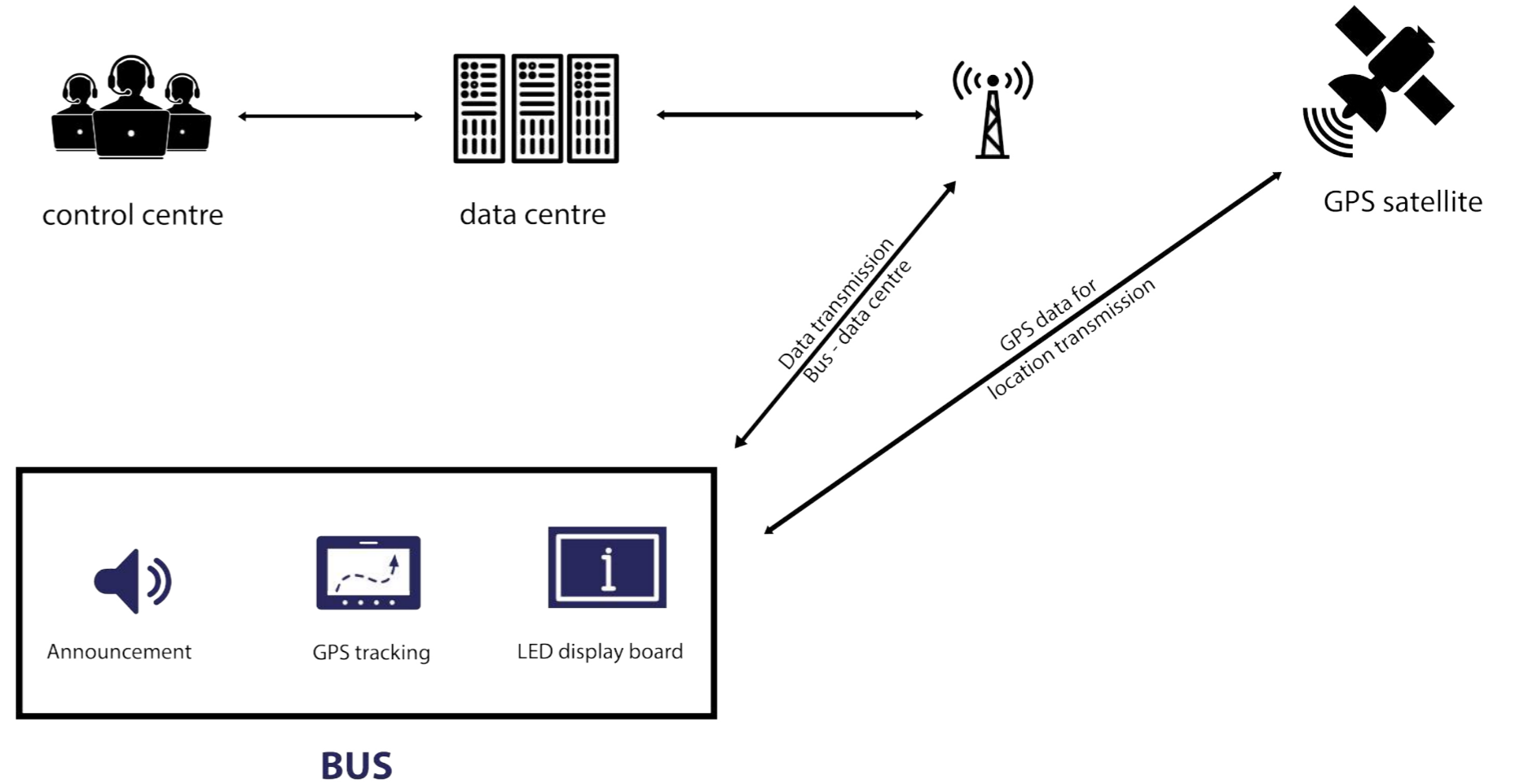
LED display boards

Smart card validator

GPS tracking

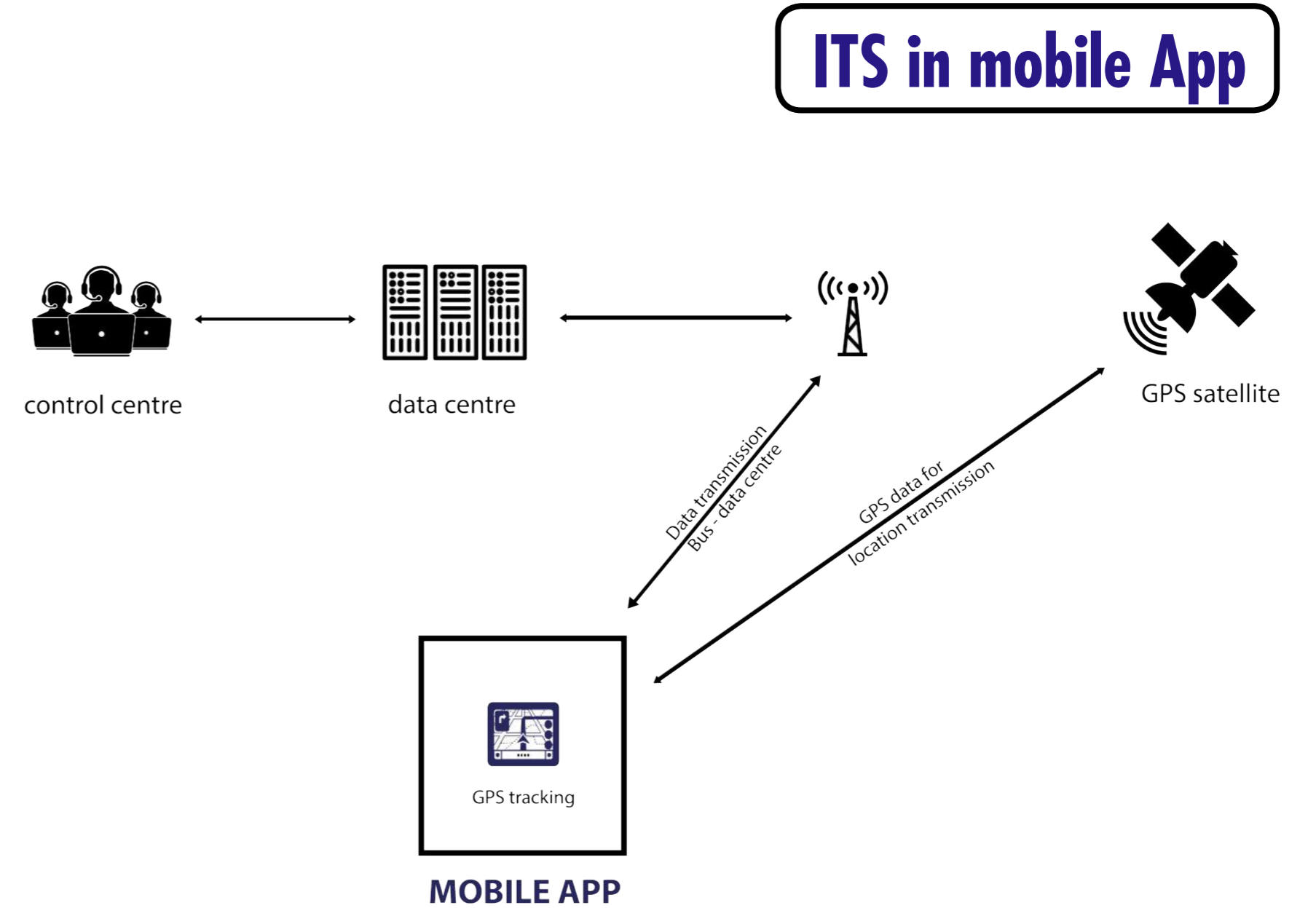
Announcement system

ITS inside the BUS



LOCATION:
Mobile App

ITS components:
GPS tracking
Route numbers
Bus numbers
Location based



ITS in Present scenario

1 Service = Limited ITS



ITS in Proposed service

1 Service = Uniform ITS



ITS : CHALLENGES

Several public transport agencies have implemented ITS technology at different scales with varying degrees of success. These systems focused on isolated deployments of several ITS components, thus not giving the complete benefit of the technology. Some of the challenges of ITS implementation include:

- lack of resources for operation and maintenance of ITS technology
- lack of in-house technical capacity to process, understand and analyse the data
- lack of advanced analytic solutions in the public transport industry
- lack of knowledge on ITS systems and capabilities to specify suitable terms when contracting ITS services to vendors
- lack of knowledge among vendors on the specific needs of public transport operations, which significantly affects the utility of the end product
- lack of understanding about the implications of procuring a certain technology in a fast-changing ecosystem
- awarding of ITS contracts purely based on the lowest costing proposals rather through a quality and cost-based criteria

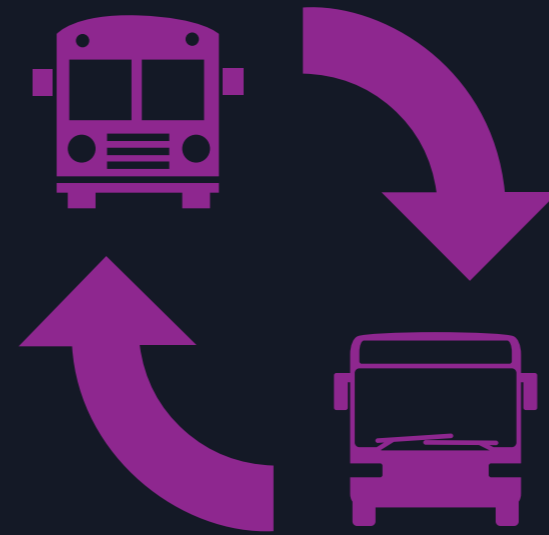
ITS : RECOMMENDATIONS

- 1)Need for a national ITS standard for different applications and components
- 2)Need for deploying a system with protocol sharing between the bus manufacturers and system vendors
- 3)Setting up fully functional Traffic Management Centres for coordinating ITS activities
- 4)Effective communication between all stakeholders

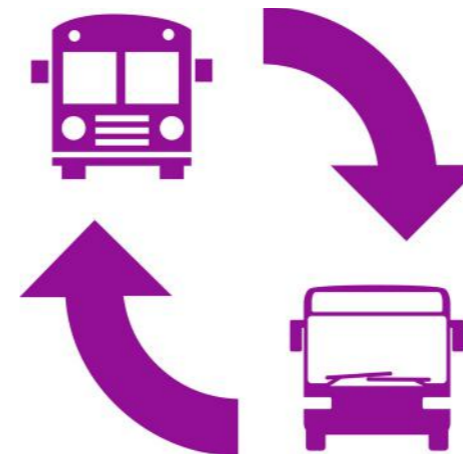
Improvements in technology such as CLOUD-computing, allow ITS solutions to be delivered as a service, rather than a product, and save on the capital costs of infrastructure.

Furthermore, a greater focus on training to use the tools, collect and gather data and to make continuous improvements to ITS applications is critical.

POINTS OF INTERCHANGE



POINT OF Interchange



CONCEPT:

Interchange = 1 common point

Interchange Mode:



BRTS Bus stops

**Points of Interchange
in present scenario**

Interchange = 1 common point



Points of Interchange in proposed scenario

Interchange = 1 common point



The integration in terms of infrastructure is already in function in a few parts of the city. The service and many of its aspects are not evenly spread across the city. On BRTS lanes like Narol- Naroda, ISKON and on the outer ring radial of the city different kind of buses are used for the feeder operations. Uniformity in service is the key for the success of such systems as well as to become popular among the commuters.

Also a good thought has to be given to the interior layout as well as the needs of the bus based infrastructure to fulfill the demands of the service.

However, it can be seen as a good starting point for the introduction of a fully integrated feeder service in the city. This can also be extended towards integration with other means of transport like bicycle sharing which is not uniform throughout the city just like the infrastructure integration.

The operational integration can open up a lot of scope and options for the multimodal integrated transport inside the city.



feeder level boarding at Raikhad charrasta BRTS stop



Interior layout of an AMTS feeder bus

**A UNIQUE
IDENTITY FOR
THE FEEDER
BUS SERVICE**

Branding
Branding of AMTS feeder buses identical to BRTS



Marketing
Serve as tools for drawing people's attention, recognition of the feeder system



IDENTITY INTEGRATION



Branding of BMTC feeder bus for Metro, Bangalore



Branding of feeder bus for MRT, Hongkong

BRANDING & MARKETING

Recognition
Enhanced public awareness
Established public perception

Study the public and market

Create a strategy for promotion of services

Draw customers

Build customer loyalty

Improve services to cater to the needs

Gather customer feedback

IDENTITY : BRANDING AND MARKETING

Branding and marketing are core components of an outreach strategy of a public transport system. They serve as tools for drawing people's attention, facilitating recognition of the transport system, providing information to users, and establishing public perception about the system.

Branding helps in building the perception of the agency and the services offered among users.

Marketing is the outreach strategy for an agency to connect with different customers to meet their needs.

An added problem in India is that private transport has an aspirational value for many Indians. Owning a personal vehicle is a status symbol and an indication of economic stability and social acceptability. In comparison, public transport, typically being erratic, infrequent, and overcrowded, carries the image as a service for the poor. With improvements of city bus services, there is a need to communicate a strong, meaningful message in order to facilitate a shift in mind set of people, to establish long-term user satisfaction, and environmental and social sustainability.

With the modernization of city bus services and the arrival of new systems such as the Bus Rapid Transit (BRT) in India, there is an increasing need for



LA's Metro Orange Line includes both a metro and a BRT corridor. Its colour scheme is highly visible, making it clear to users that they are parts of the same network



The four elements of the proposed BIG Bus Network in BMTC

proper public communication. Branding and communicating information on way-finding and orienting users to new systems is critical to the success of public transport.

FARE INTEGRATION



FARE COLLECTION



CONCEPT:

1 Journey = 1 Ticket

PAYMENT MODE:



Cash

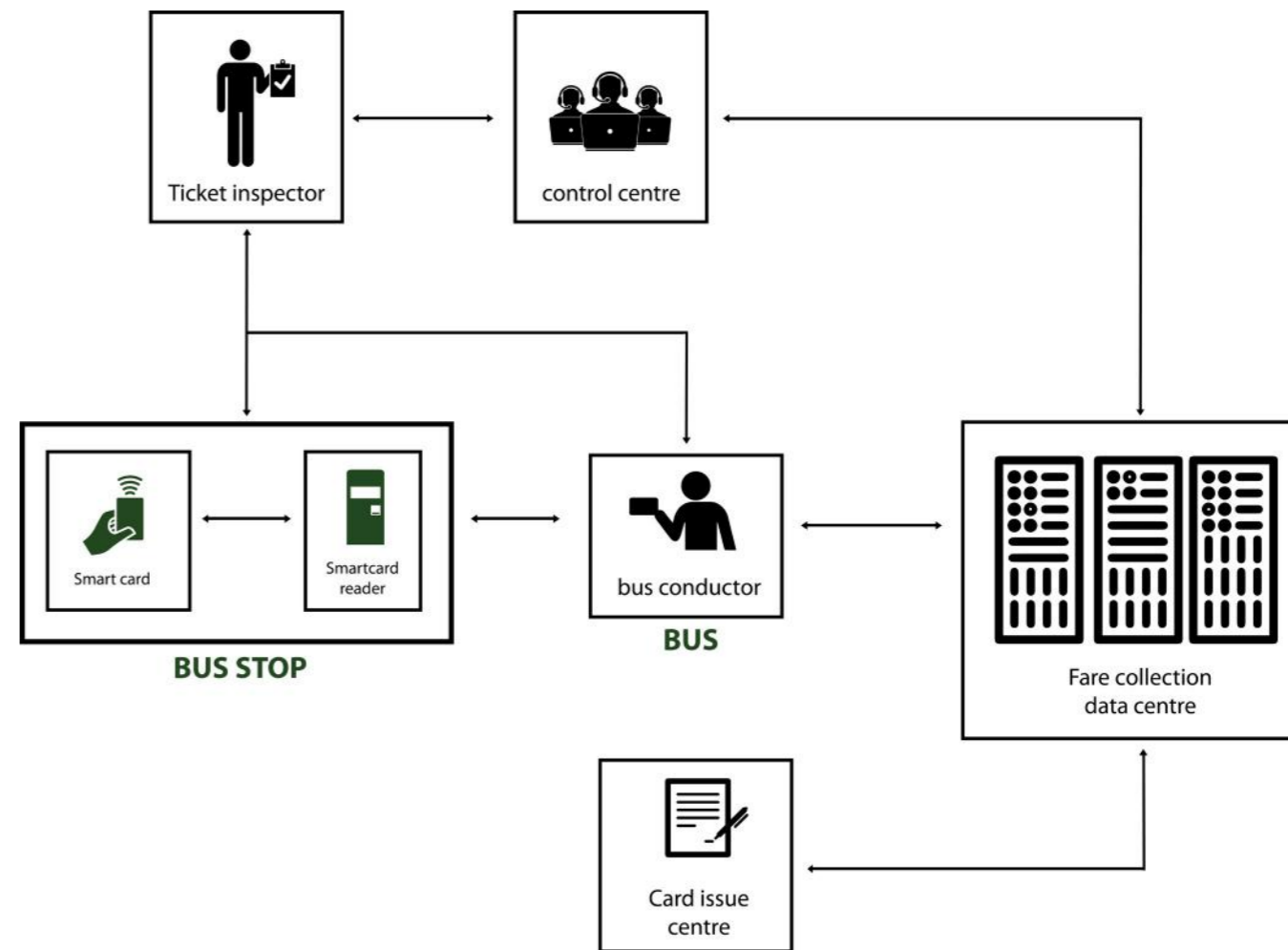


Smart card

LOCATION:
BUS STOPS

Fare components:
Smart card
Ticketing machine
Smartcard processor
Bus passes

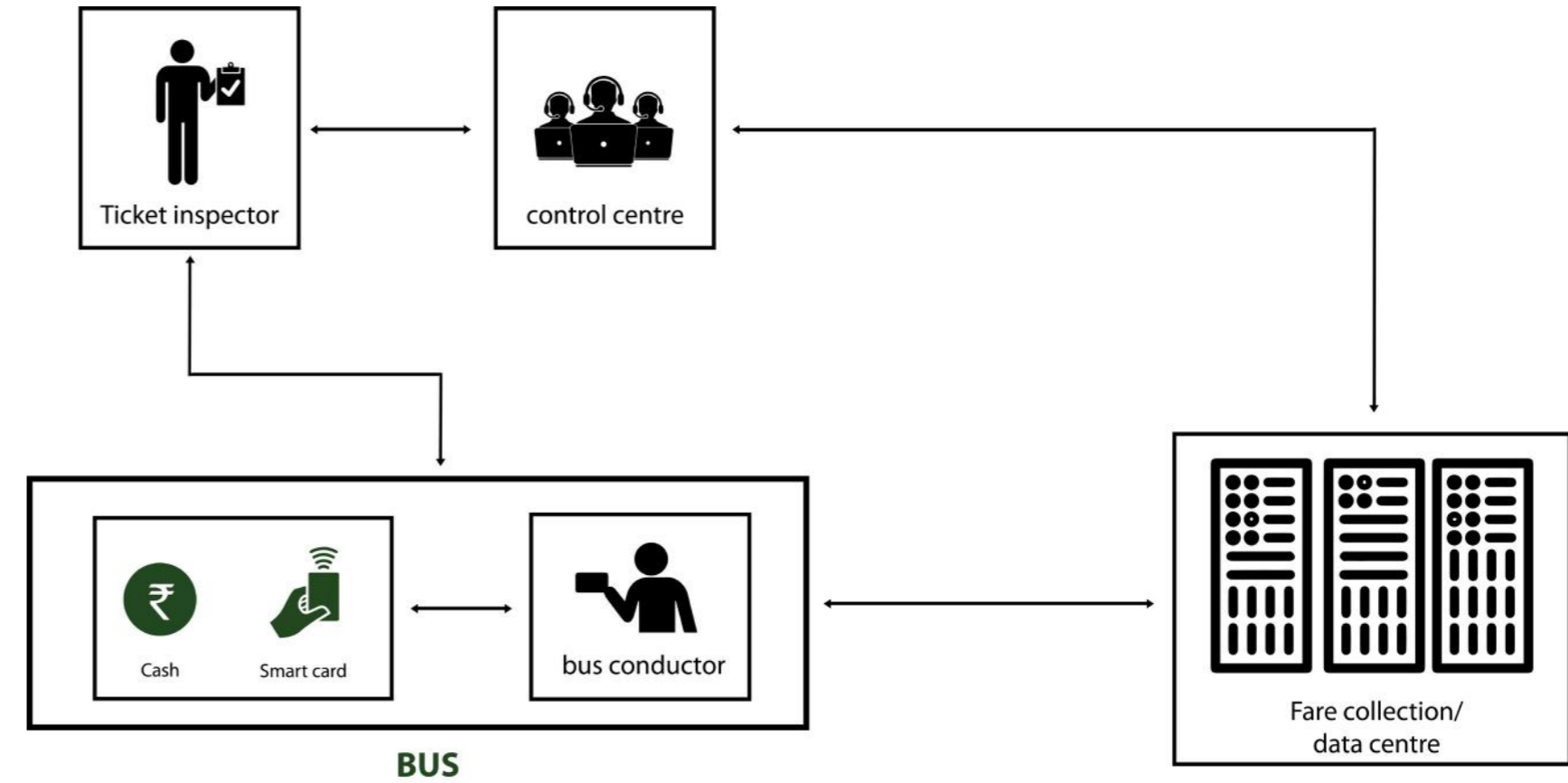
Off-board Fare collection



LOCATION:
BUS

Fare components:
Smart card
Smartcard processor
Cash transactions

On-board Fare collection



Fare collection in Present scenario

1 Journey = 3 Tickets



Proposed way of Fare Collection

1 Journey = 1 Ticket



AUTOMATED FARE COLLECTION SYSTEM (AFCS)

Automatic Fare Collection System (AFCS) is an automated revenue collection system which facilitates purchase of pre-paid tickets and their subsequent use through electronic systems to permit access to or from the transport mode. AFCS reduces on-board ticketing, helps in easy accounting of revenue collection and generates rich information for MIS purposes.

The fare collection system is a key interface between a transit agency and its passengers. It directly affects the way in which passengers experience and perceive the transit agency and its services. In general, the transit passenger expects a fare system that is:

An AFC system is usually the basis for integrated ticketing.

- Fast, easy to understand and use, with reliable fare transactions
- Offers payment options that suit their particular travel needs (frequent, infrequent, weekly, daily, cross boundary, short-distance, etc)
- Allows easy transfers between modes and different transit providers
- Provides easy access to fare media



AFCS card processor in Kiev, Ukraine

The AFCS implemented in Delhi shall comprise of the following main sub-systems:
 On-bus Sub-system
 Depot Sub-system
 Central Operations Center (COC) Sub-system
 VPN (Virtual Private Network) Sub-system
 Single-ride/ Multiple-ride Ticketing Sub-system
 Revenue Collection and Protection Sub-system

The total number of buses to be covered in the AFC System and equipped with on-bus sub-systems will be approximately 11,000.

The system will also have to be deployed in all bus depots.

The proposed AFC System will be suitable for stage-based fare structure and will accommodate various types of existing passes/tickets. In addition, it is proposed that the AFC System be flexible enough to cater to other possible fare structures/ ticketing options including flat fare, time-based fare (peak and off-peak differential fare), free transfers among various modes, etc.



An multimodal integrated AFCS in DIMTS, Delhi

WHAT IS A COMMON TRAVEL CARD?

It is a quick and easy way to pay for travel by BRTS, AMTS, Metro, autorickshaws, waterways, bicycle in the city of ahmedabad.

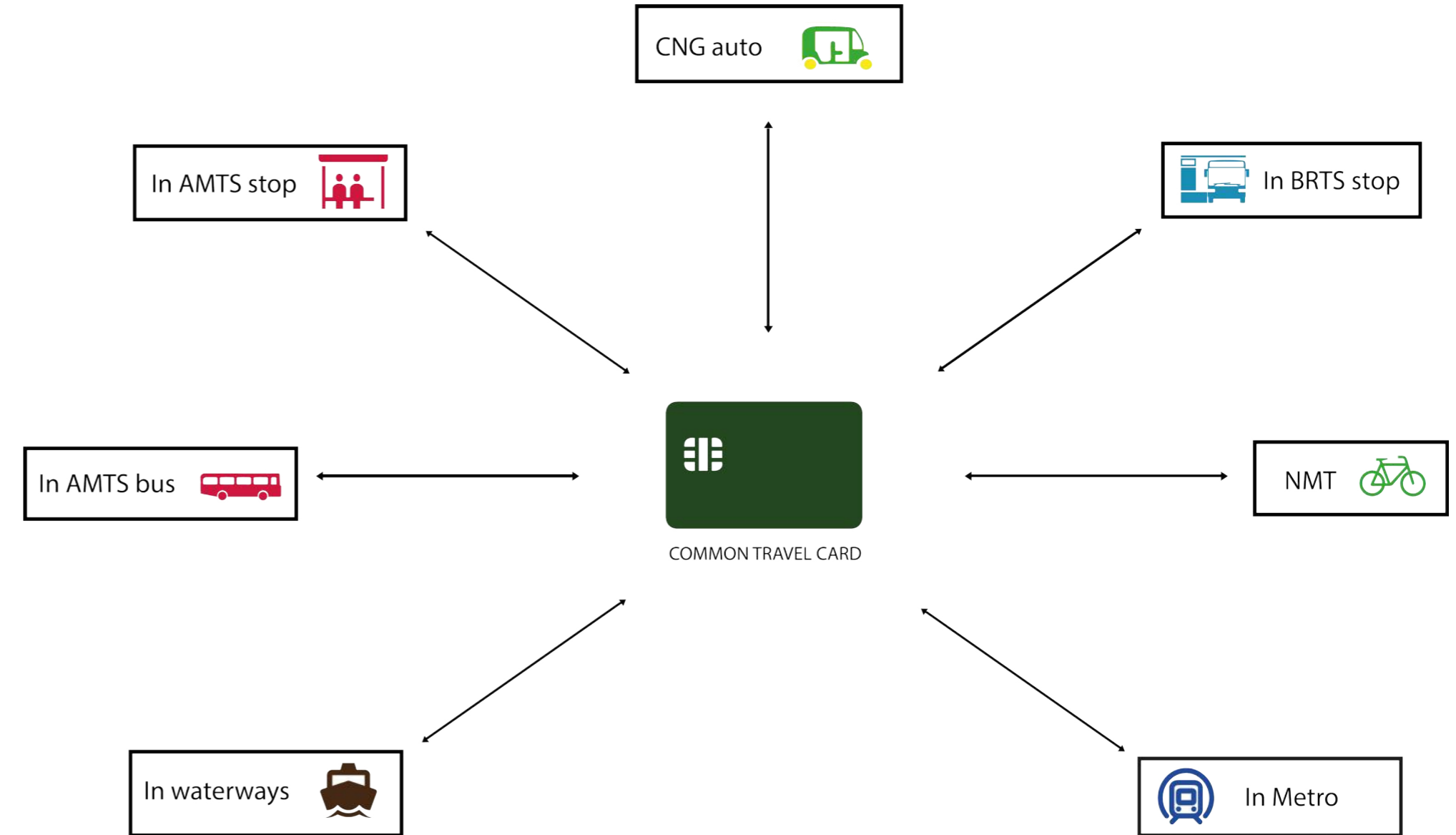
- Save time – your card is ready to use as soon as you arrive
- It's cheaper than buying a paper, passes or single tickets

A powerful symbol of multi-modal fare integration

CTC : Common travel card

- One common transaction mode for different means of transport throughout the city.

A contactless, no paper, inclusive of different schemes. All integrated into one travel card



HOW DOES A COMMON TRAVEL CARD WORK?

A CTC is a contactless smartcard which is pre-loaded with pay as you go credit that you can use to travel on BRTS, AMTS, Metro, waterways, autorickshaw, shared bicycle and has a scope to integrate with lot other means of transport.

The system automatically calculates the cost of each journey you make based on how and when you travel and by which means you travel in.

All a user has to do is confirm the starting and the ending points of the journey once he decides a mode to travel on.

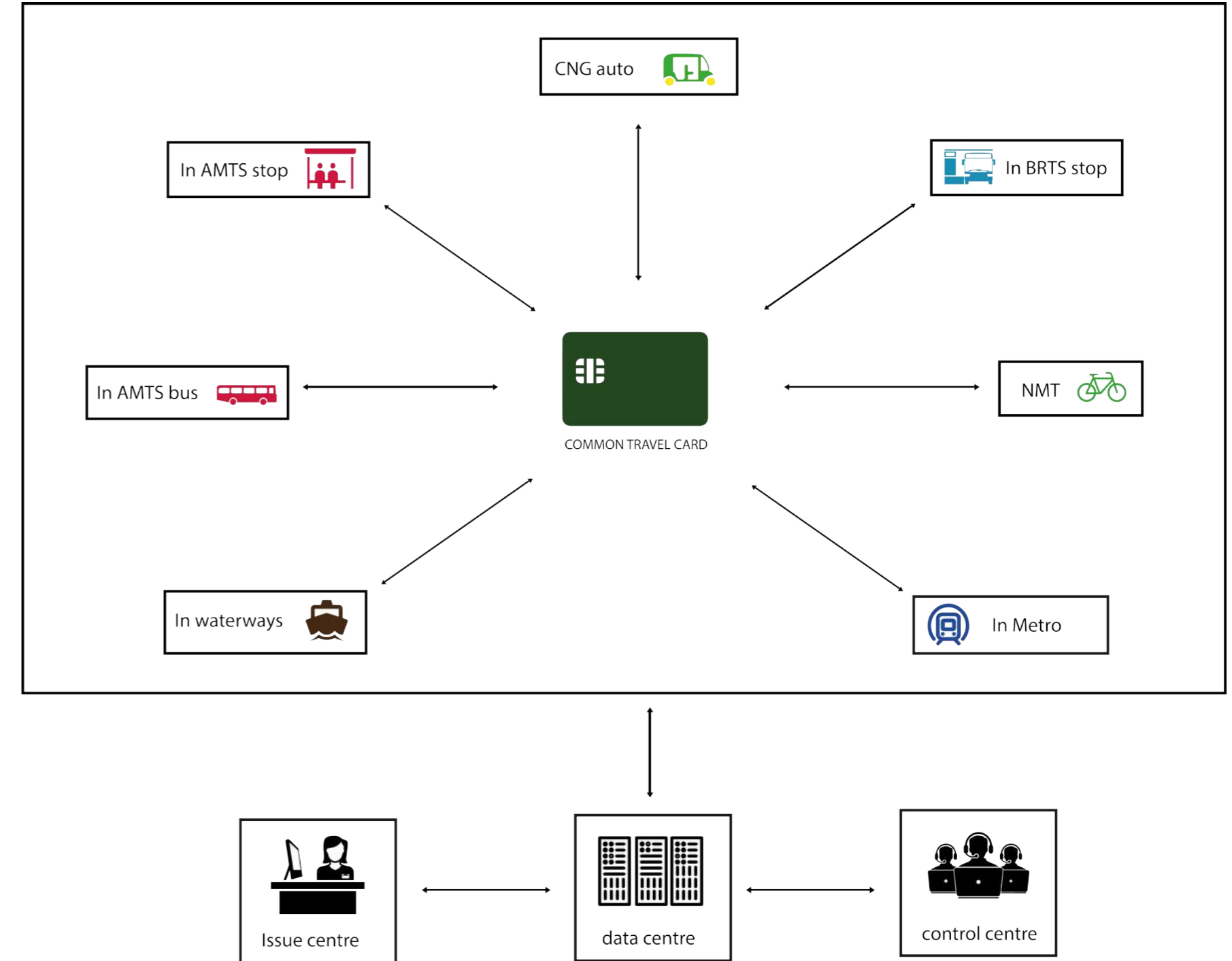
There is a daily fare cap when you use pay as you go – once you have reached this limit, you won't pay any more for that day.

CTC : Common travel card

A contactless card which when placed on a smartcard reader that are provided on different modes of transport calculates the amount and deducts it and will act as a ticket itself.

The user simply has to confirm the starting and ending points of a travel once he chooses the mode to travel on.

Autorickshaw, BRTS, AMTS, renting a bicycle. Payment mode is common.



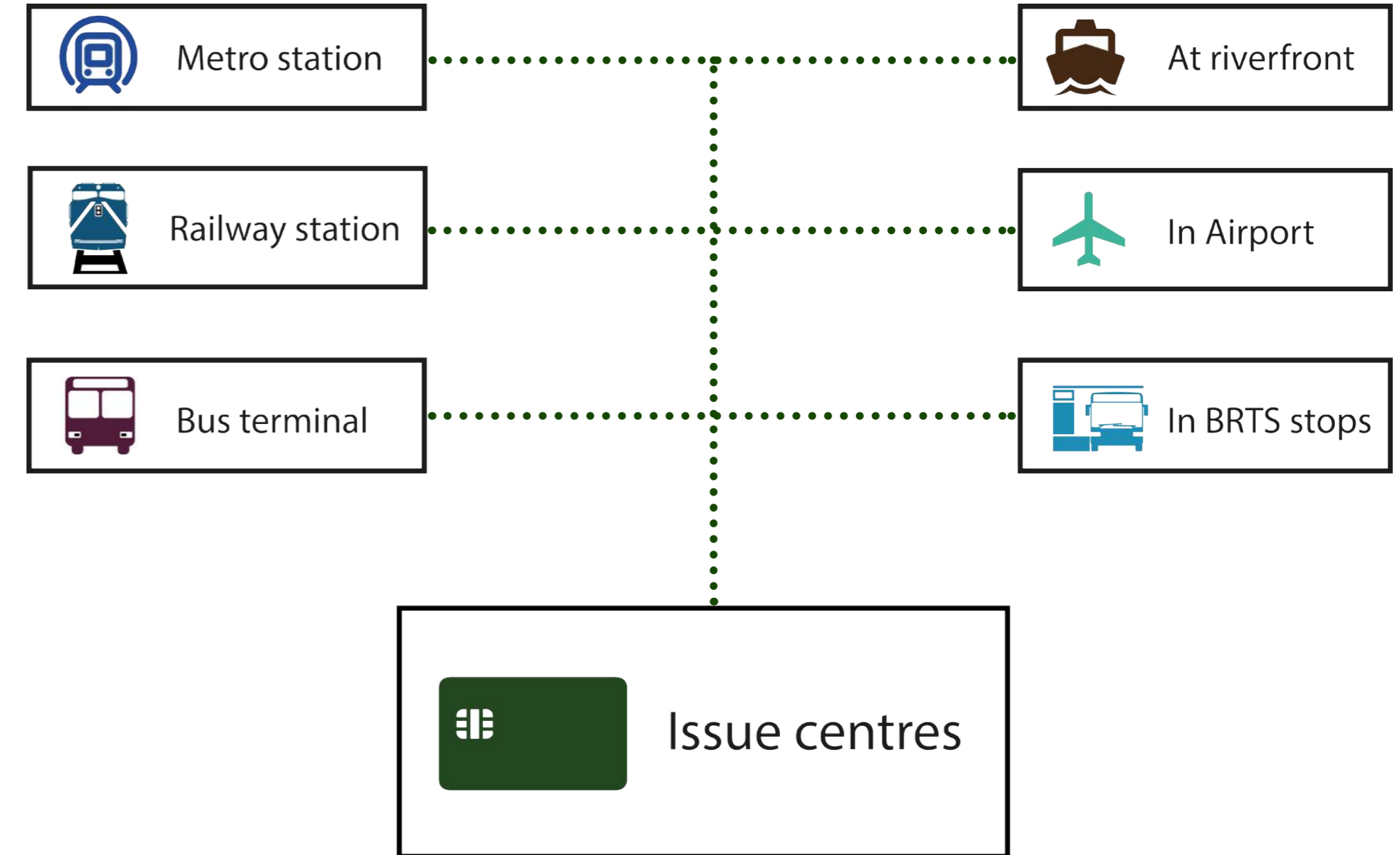
HOW TO GET A COMMON TRAVEL CARD?

A CTC which is a contactless smartcard, can be issued at all the major entry points of a city like an airport, railway station, bus stands as well as common public transport travel points like the BRTS stops, riverfront or the upcoming metro station.

A user simply has to apply for a CTC at the nearest issue centre according to their convenience. It can be issued on the go at different issue centres as well as it can be pre-booked depending on the convenience of the user and their travel habits.

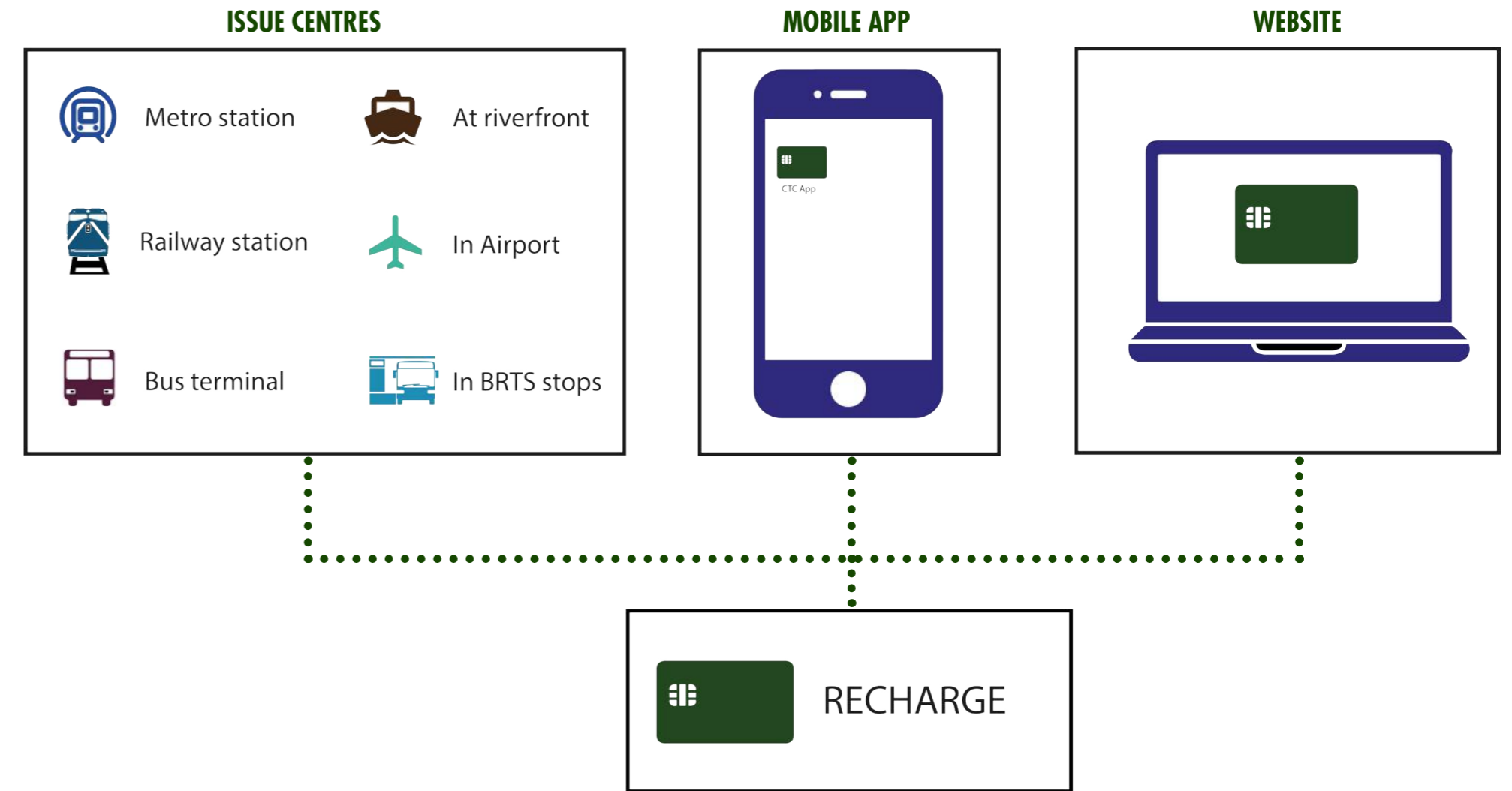
CTC : Common travel card

A CTC is issued at the CTC issue centres that are present at all the major entry points of the city like airport, railway station, bus station as well as common public transport points BRTS stops, riverfront etc.



HOW TO RECHARGE A COMMON TRAVEL CARD?

A CTC can be recharged in all the issue centres in the city in the process of travel or it can also be recharged online via a CTC app or the apps of different services provided inside the city as well as through the CTC website or the websites of any other transport services inside the city.



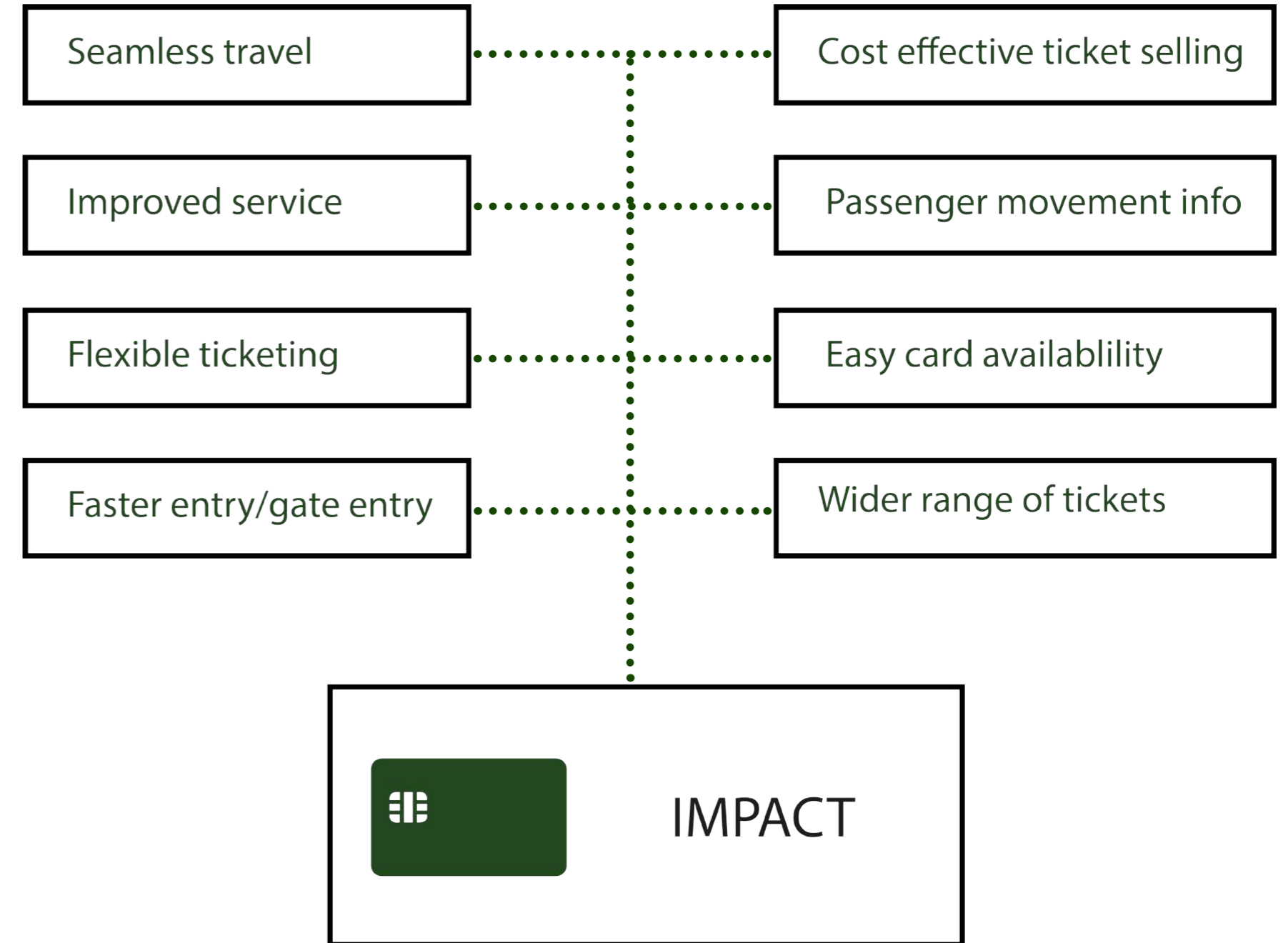
IMPACT OF COMMON TRAVEL CARD ON PUBLIC TRANSPORT

A CTC will have a major impact on the fare collection in the public transport as well as the convenience and ease that is involved in the whole process. It improves the present service of a paper based ticketing system and also the cost minimisation of the printing costs on a paper ticket.

Also not to forget the easier card availability, the faster entry and exits and an efficient way of fare collection which minimises fraud. The authorities can always have a good information about the passenger movement which in turn can help in locating passenger flow inside a city at different parts of the day. It can also help the authorities to keep a check on the security of the public transport.

It also addresses the need for a common fare solution for the public transport across the city to achieve a common integrated multimodal transport in the city.

It also has a major scope looking towards the possibilities it can open up. The CTC can also be extended to the different purchases inside the city which can use a common mode for payment, let it be electricity bills, water bills, internet bills etc.



EXAMPLES OF SIMILAR SMART CARDS USED AROUND THE WORLD

OCTOPUS CARD (HONGKONG)

The Octopus card is a reusable contactless stored value smart card for making electronic payments in online or offline systems in Hong Kong. Launched in September 1997 to collect fares for the territory's mass transit system, the Octopus card system is the second contactless smart card system in the world, after the Korean U-pass, and has since grown into a widely used payment system for all public transport in Hong Kong.

CARD USAGE

The Octopus card was originally introduced for fare payment on the MTR; however, the use of the card quickly expanded to other retail businesses in Hong Kong. The card is now commonly used in most major public transport, fast food restaurants, supermarkets, vending machines, convenience stores, photo booths, parking meters, car parks and many other retail businesses where small payments are frequently made by customers. Notable businesses that started accepting Octopus cards at a very early stage include Park n shop, Welcome, Watsons, 7-Eleven, Starbucks, McDonald's.

PAYMENTS

Making or recording a payment using the card for public transport or purchases at Octopus-enabled retailers can be done by holding the card against or waving it over an Octopus card reader from up to a few centimetres away. The reader will acknowledge payment by emitting a beep,



and displaying the amount deducted and the remaining balance of the card. Standard transaction time for readers used for public transport is 0.3 seconds, while that of readers used for retailers is 1 second.

When using the MTR system, the entry point of commuters is noted when a passenger enters, and the appropriate amount based on distance traveled will be deducted when the users validate their cards again at the exit point.

IN TAXIS

Although a popular form of transport, taxis in Hong Kong do not accept the Octopus card. On 27 June 2006, after 10 years of negotiations between Octopus Cards Limited and the taxi industry, the first trial of taxis equipped with Octopus card readers was launched in the New Territories with taxis operated by the Yellow Taxi Group.[78] But it was reported on 30 October that of the 20 taxis that participated in the trial, eight had dropped out. Part of the reason was technical—drivers must return to the office every day for accounting.

AWARDS

The Octopus card is recognised internationally, winning the Chairman's Award of the World Information Technology and Services Alliance's 2006 Global IT Excellence Award for being the world's leading complex automatic fare collection and contactless smartcard payment system.



T-MONEY (SEOUL)

T-money is an all-around transportation card used for public buses, subways, taxis, and convenience stores that accept T-money as a form of transaction (most do). The function of a T-money card is like a debit card, where money is deposited into the card and used to get around the city of Seoul.

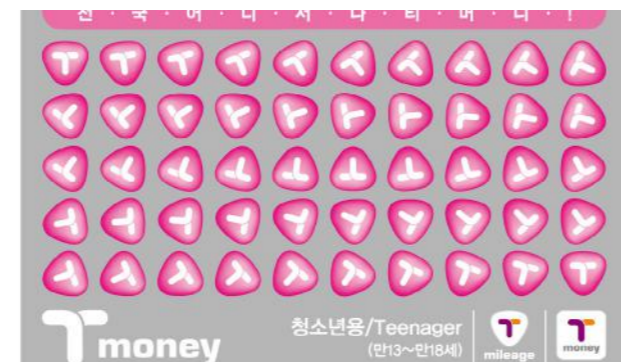
T-money Transfer System

T-money is a transportation card that can be used on public buses and subways in several different metropolitan cities and locations including Seoul, Gyeonggi-do, Daejeon, Incheon, Daegu and Busan. With this transportation card, travelers can save the hassle of purchasing single journey subway tickets for every ride and enjoy discounts on rides during transfers from one bus to another, one subway line to another, or from bus to subway or vice versa (within a transfer time limit).

Sales Locations

Convenience stores (GS 25, CU, 7-Eleven, Mini Stop, With Me, Buy The Way, Story Way) in areas mentioned above bearing the T-Money logo.

*Note: T-Money card also be purchased from ticket vending and card reload devices inside subway stations.



Recharge/Refund Locations

All sales locations and ticket vending and card reload devices inside subway stations

*Note: amount for the card price is not refundable.

How to Use

Transfer discounts are also applicable for up to 4 times a day, within a transfer time limit of 30 minutes (up to 1 hour from 9pm to 7am next day).

However, if you do not tap your card on the sensors as you get off the bus or exit the subway, you will not benefit from the transfer discounts and may be charged double the base fare the next time you use public transportation. Therefore, it is important to ensure to tap your card at all times when getting off the bus or exiting the subway.



SHORT TERM IMPACT

An attractive public transport option

Predictable travel times

Lesser transit exchange times

A technology enhanced service

Easier fare collection

An infrastructure enhanced service
A initial modal shift from private to public transport

MEDIUM TERM IMPACT

A visually uniform public transport

Predictable travel times in increased congestion levels

A shift from service centric to user centric design

A scope for non-motorised subsystem integration

Institution integration

A technology based service

An infrastructurally integrated service

LONG TERM IMPACT

A citywide integrated multimodal transport service

Last mile/door to door connectivity

A single and convenient fare collection system

Least effected transport alternative in ever growing congestion

A visually uniform public transport

Predictable travel times in increased congestion levels

Institution integration

A technology based service

An efficient public transport

CONCLUSION

Bus Rapid Transit (BRT) has increasingly become an attractive urban transit alternative in many Asian developing cities due to its cost-effective and flexible implementation. However, it still seems to be difficult to introduce BRT to these cities because almost all of their city structures have been developed under solely a road transport development city plan and weakness of land use control gives rise to many problems, such as urban sprawl, traffic congestion, and air pollution.

The Janmarg BRTS might have encouraged some Amdavadis to take advantage of public transport but the inefficient feeder bus services and unavailability of transport to the nearest bus stop has deterred many. That is the reason many Amdavadis owning vehicles have not taken to BRTS despite the skyrocketing fuel prices.

It needs to be realized that the proposal of feeder bus must be there to reduce the efforts of passenger, it consumes less time, provides safety against accidents to happen, cheaper than other mode of transport.

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