



# Transformación TECNOLÓGICA

REQUEST FOR INFORMATION

## **TECHNOLOGICAL SERVICES FOR SANTIAGO'S PUBLIC TRANSPORT SYSTEM**

System Description and Vision

June 2022

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## 1 GLOSSARY

The words used in this document shall have the meaning indicated below, regardless of whether they are used in singular or plural, in masculine or feminine, in upper or lower case, or whatever their grammatical form, in order to correctly understand and interpret this document:

Term	Abbreviation	Description
<i>Administrador Financiero Transantiago</i>	AFT	Entity responsible for managing the economic resources collected from passengers using various payment methods, and subsequently distributing them among all the system providers.
Regulated Area		The Province of Santiago and the municipalities of Puente Alto and San Bernardo, the urban radius of the city of Santiago, hereinafter "Greater Santiago", as established in Resolution 106 dated 1995 issued by the <i>Secretaría Regional Ministerial de Transportes y Telecomunicaciones de la Región Metropolitana (SEREMITT RM)</i> , or by any entity that modifies or replaces it. Also, extensions to those areas offering fare or operational integration with major public transport services that originate in neighboring municipalities or regions.
bip!		The commercial name of the System's smartcard used to access any of the transport modes (contactless card). It works based on stored value accounts that need to be charged in advance.
bip!QR		The commercial name of the System's two-dimensional bar code system (also known as QR) to access any of the transport modes. It works based on ABT (account-based ticketing) accounts that need to be charged in advance.
Buses		Vehicles used for urban public transport services, as defined in Supreme Decree 122 dated 1991 issued by the Ministry of Transport and Telecommunications, and which are registered in the National Registry of Passenger Transport Services.
Bus Depots		Place where buses are parked when off-duty. In some cases, start or end point of a service.
Bus Dispatch		Process of assigning a bus and driver to carry out an expedition on a defined route and schedule. This process usually follows the operational programming, which can be assigned automatically, through a platform that optimizes dispatch management, or manually.

Bus Monitoring Center	BMC	Center operated by DTPM personnel, in charge of monitoring and controlling the daily operation of the buses, ensuring that the System performs correctly.
Fleet Operations Center	FOC	These centers belong to Bus Public Transport Operators and their function is to manage and supervise the operation of bus fleets.
<i>Directorio de Transporte Público Metropolitano</i>	DTPM	It is the Transit authority of Santiago and represent the Ministry (MTT), through the Executive Director.
Frequency		Number of buses per hour.
Transfer		Is the whole process of a passenger moving (and waiting) from one vehicle to another of the MPTS to connect consecutive stages of a trip.
Interoperability		Interaction and integration of various tools used to operate the system.
Public Transport Operator	PTO	Companies that operate the modes of transport that form part of the Metropolitan Public Transport System, which in Santiago are currently bus, subway and train operators.
Central System (Fleet Management and Passenger Information System)		All the equipment and software used to operate the Fleet Management and Passenger Information System other than the onboard equipment and workstations. This includes the central data flow from operating and managing the fleet within the MPTS.
Fleet Management and Passenger Information System	FMPIS	Service that allows global and integral management of the operation of the MPTS. It contemplates the necessary hardware and software so that the system can capture and process the operational information coming from the buses and then display it to PTOs and DTPM to manage and supervise the operation. In addition, it is the system responsible for generating precise dynamic information to passengers.
Metropolitan Public Transport System	MPTS	Is the urban public transport system for the Regulated Area of Santiago. It operates with private concessionaires who provide passenger transport services, service providers authorized for such purposes by the MTT through an administrative deed, complementary service providers and any other Public Transport

		Operator integrated into the System through the fare collection media. It includes the financial resources administration performed by the AFT or its legal successor.
<i>Ministerio de Transporte y Telecomunicaciones</i>	MTT	Is the Ministry of State of Chile in charge of directing, supervising, coordinating and promoting laws on transportation and telecommunications; as well as coordinate and promote the development of these activities and control compliance with relevant laws, regulations and standards.
Prepaid Zones	PZ	Areas defined by the Ministry, where Validators are installed at transport access points that deduct fares prior to boarding the vehicles.
Terminals		Physical point of start or end of a bus route according to direction
<i>Unidad de Fomento</i>	UF	It is a readjustability index, calculated and authorized by the Central Bank of Chile (Bank), for money credit operations in national currency carried out by banking companies and savings and credit cooperatives.

## 2 BACKGROUND INFORMATION ON SANTIAGO'S PUBLIC TRANSPORT SYSTEM

### 2.1 Context

#### 2.1.1 Characteristics of the Metropolitan Public Transport System

The Metropolitan Public Transport System, hereinafter MPTS is a regulated system that works based on concessions for the operation, through Public Transport Operators, PTO, which currently operate different transport modes: bus, subway and train. The system is fare-integrated between the different modes and has a state subsidy for its operation.

With the aim of offering the best possible public transport service to passengers and a high quality operation between all the related actors, changes have been introduced to the business model of the System. From the year 2023, two business models will coexist in the operation, which are described below and represented in Figure 1.

##### Business Model 1

This model began operations in February 2007, after a successful international tender. In the business model, the operators have full responsibility for the provision of the public transport service. For this, the operator is in charge of executing the daily operation of the service and ensuring that it has all the appropriate elements to carry it out: the ownership of vehicles and depots, the maintenance of the fleet, the hiring of drivers, among others.

##### Business Model 2

In 2019, changes were introduced to Business Model 1, seeking to separate the strategic assets and the operation of the transportation system for the bus operators. Thus, through Tenders No. LP CUV 001/2019 and LP SB 001/2019, a new model was established in which the assets (bus fleet and bus depots) are provided by the System and the Bus Supply Companies, in such way that that the PTO, are only in charge of the operation, through Service Units composed of fleets of around 400 buses each. This model will define the operation of over 2,500 buses (around 35% of the fleet).

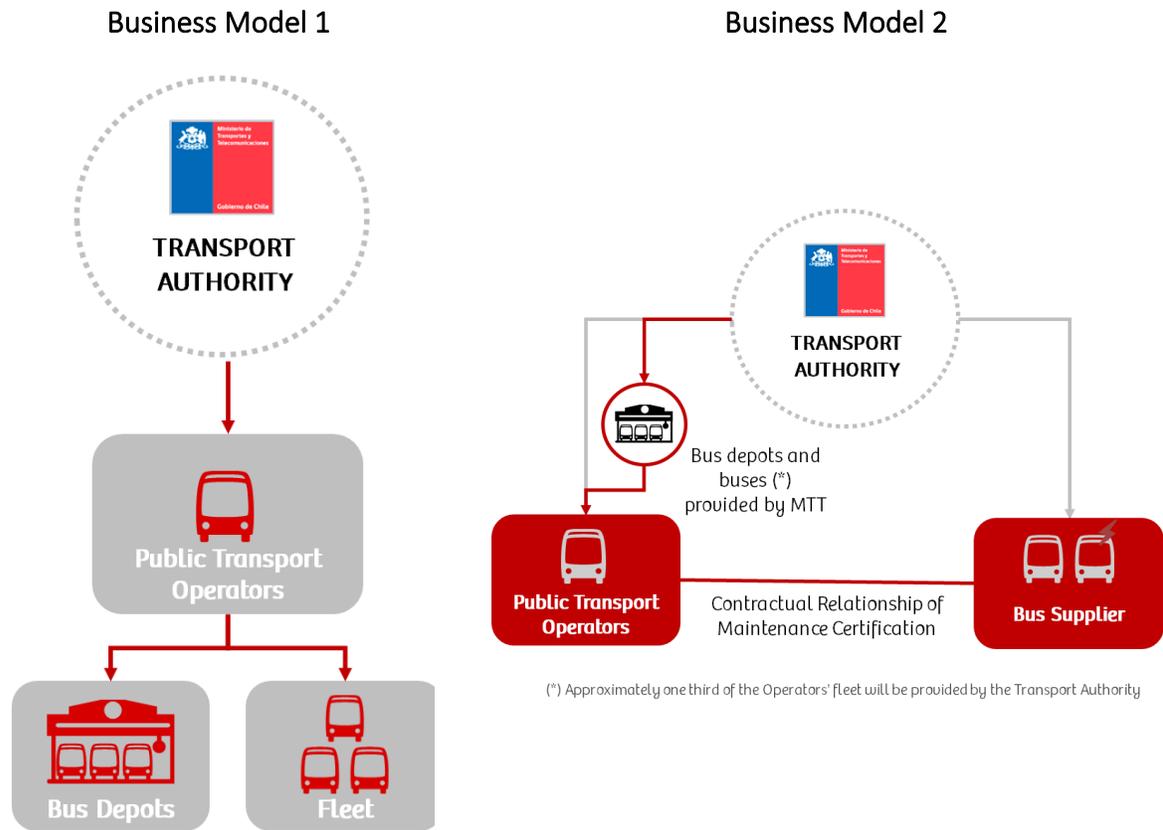


Figure 1: MPTS models

As a result of these changes, the transport system will have a fleet of buses with different standards, and the previous system (Business Model 1) will be simultaneously in operation alongside the new one (Business Model 2). Anyone interested in responding to this consultation must be aware of these circumstances, since it affects the overall characteristics of the System operation.

Within the framework of the design of the new model of the System, DTPM will provide a network of technological services to support the System operation, in order to provide citizens with an accessible, reliable, high-quality and resilient public transport system. The *Ministerio de Transporte y Telecomunicaciones* aims to attract service providers that meet world-class standards and with proven experience, to provide the technological tools required to correctly operate and manage the MPTS.

The main characteristics of the MPTS, as of March 2022, are as follows:

Description	Number
Number of routes	378
Number of bus stops	11,829
Number of passenger trips per working day	2,820,000 <sup>1</sup>
Number of buses	7,000
Number of bus service operators (PTOs)	6
Number of depots	71
Number of bus terminals	330
Prepaid zones	120
Number of operator workstations supplied by FMPIS	1 for every 200 buses
Number of Bus Monitoring Center (BMC) workstations	17
Metro: number of lines	6
Metro: number of stations	136
Metro: longitude	140 km
Train: number of tracks	2
Train: number of stations	10
Train: longitude	20.8 km

The MPTS is a multimodal system where the bus, subway and train networks are operationally and technologically integrated. Fare integration is achieved through contactless payments (the "bip!" fare collection card) and payment applications based on two-dimensional barcodes (also known as QR). that use QR codes. The geographical area covered by the system is approximately 680 km<sup>2</sup>.

Each PTO has a Fleet Operation Center (hereinafter FOC), with approximately 20 workstations. Each bus depot has approximately 3 workstations for service dispatch and bus maintenance control, and there is usually 1 fixed or mobile workstation for bus dispatch and coordination with FOCs at bus terminals.

Finally, a Bus Monitoring Center (hereinafter BMC) is responsible for monitoring bus services, which is operated by the Public Transport Authority.

#### 2.1.4 Governance Model

The defined governance model is similar to the current model, where contracts are signed between the State of Chile (represented by the MTT as the Public Transport Authority) and the

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<sup>1</sup> There were around 3.6 million trips per office day before the pandemic.

service provider that is awarded the contract. The MTT is responsible for managing all contracts. The obligations and responsibilities of the PTOs and the Fleet Supply, Technological, Financial and Administration Service Providers will be determined by the care and conservation of rolling stock, the equipment on board and the bus depots, as well as problem resolution response times.

### 2.1.5 Responsibility for managing the transport service

The PTOs are responsible for managing transport services, which covers fleet, maintenance, human resources, on-route management and dispatch decision making. Quality indicators will be defined for the contracts between the MTT and PTOs, where the compliance level results in extra payments, discounts or penalties that directly impact the remuneration received by the transport provider.

The Ministry is required to supervise and inspect these services, and it therefore requires specific technological devices to be installed on buses and at terminals, which will be under the custody of the transport service provider.

## 2.2 Parties involved in the Metropolitan Public Transport System

### 2.2.1 Ministry of Transport and Telecommunications

It is the Transport Authority and the government body that regulates, inspects and coordinates the Metropolitan Public Transport System, through the Executive Secretary of the *Directorio de Transporte Público Metropolitano* (hereinafter DTPM). It tenders the transport service and recognizes that specific complementary services are necessary in order for it to operate, which are contracted through an open and competitive tender process that involves private companies. The parties involved in the MPTS are the following:

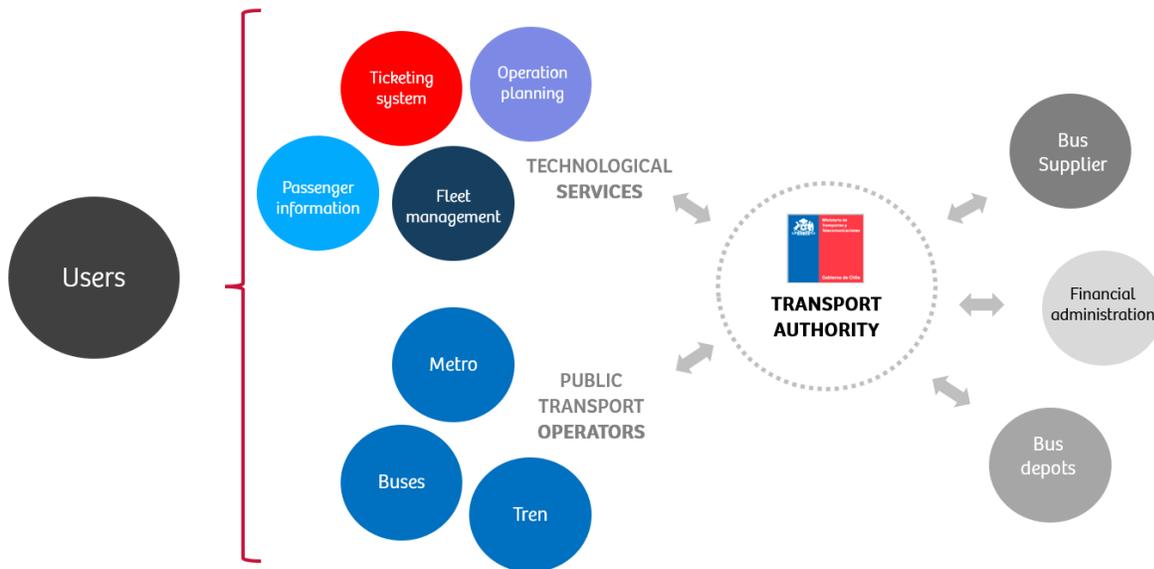


Figure 2: Parties involved in the Metropolitan Public Transport System

## 2.2.2 Public Transport Operators

The system currently has the following Public Transport Operators:

- *Metro de Santiago*: Metro is the Santiago subway transport operator and the structural backbone of the Metropolitan Transport System, with lines 1, 2, 3, 4, 5 and 6, and 136 stations. Three future lines are planned: line 7, with 9 stations, line 8 with 14 station and line 9, with 13 stations.
- *Estación Central to Nos Train Service*: This train service between *Estación Central* and *San Bernardo* began operating in March 2017., with 10 stations in total. Two future services are planned: *Santiago-Batuco* Train, with 8 stations and *Melipilla-Estación Central* Train, with 11 stations.
- Public Transport Operators:

Currently the following Transport Service Providers operate buses:

- *Subus Chile S.A.*; Business Unit 2.
- *Buses Vule S.A.*; Business Unit 3.
- *Voy Santiago SpA*; Business Unit 4.
- *Metbus S.A.*; Business Unit 5.
- *Redbus Urbano S.A.*; Business Unit 6.
- *Servicio de Transporte de Personas S.A.*; Business Unit 7.

It is expected that the operators which awarded contracts under the LP CUV 001/2019 tender will start operating during the first half of next year, as previously mentioned:

- *Buses Alfa S.A.*; Service Unit 1.
- *Buses Omega S.A.*; Service Unit 2.
- *Santiago Transporte Urbano S.A.*; Service Units 3 and 5.
- *RBU S.A.*; Service Units 4 and 6.

By 2023, the system's fleet is expected to be around 7,000 buses with a total of 9 different companies operating buses.

## 2.2.3 Complementary Service Providers

A series of complementary services are available to assist the Ministry, the Transport Service Providers and passengers in performing essential tasks to operate the system.

The contractual architecture was redesigned during 2011 and 2012 and the contract with the *Administrador Financiero Transantiago* (hereinafter AFT) was amended. This led to the MTT establishing contractual links with each complementary service provider, in order to interact directly with them.

There was a contractual change in the technological services for buses in 2019, which separated the Fare Collection Service from the Fleet Management Service.

The various complementary services are as follows:

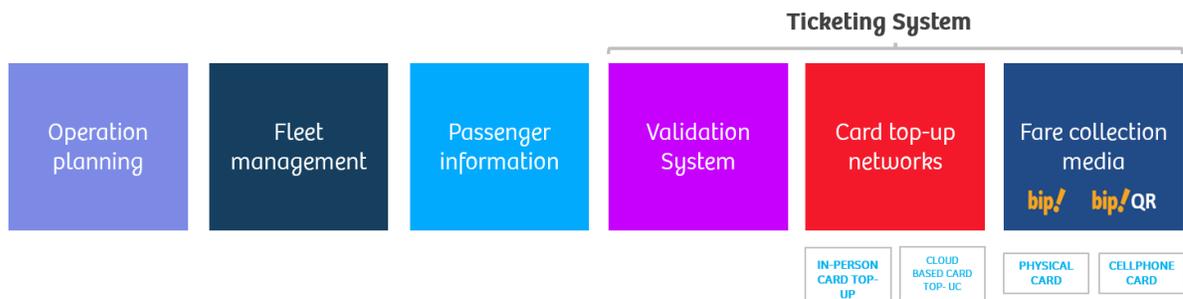


Figure 3: Complementary services

The complementary services and the companies that provide these services<sup>2</sup> are as follows:

- Operation planning: This service creates operating schedules and calculates bus flows, to ensure that services and routes are efficiently scheduled, in accordance with service and quality standards, thus meeting the Santiago Transport System’s passenger demand. It is currently provided as part of the contract with SONDA S.A.
- Fleet management: This service provides overall and integrated MPTS management. It is currently provided as part of the contract with SONDA S.A., who is responsible for technological services.
- Passenger information: Service focused on making data and online information available to citizens. Such information focuses on arrival prediction, system status and constant communication.
- Validation System: Service that facilitates the registration of trips, which allows system users to access by using the transport they occupy. It is currently provided as part of the contract with SONDA S.A. for buses and INDRA S.A. for Metro de Santiago and Train Nos-Central Station.
- Card Top-up Networks: This service provides all the physical and digital infrastructure for the sale and contactless card top-up services that enable people to access the system. It is divided in a physical network (surface and underground) and a digital network (web-based and apps). Metro S.A. provides the Complementary Services for Underground and Surface Card Top-up Networks, while the digital top-up network services are provided by Cloud-based Card Top-up Network Operators (CCTNOs). There are currently two CCTNOs: Globe S.A. and Empresa Transaccional de Recaudo y Desarrollo de Plataformas Digitales de Transporte e Industria Prepago SpA. (Movired).
- Fare collection Media: based on physical contactless cards or cell phones using QR codes, grant access to the MPTS.. Metro S.A. is non-exclusively responsible for issuing, marketing and supporting post-sale physical access means, such as the Bip! card. There are two methods for issuing virtual access using QR codes. Pre-payment through CCTNOs, and post-payment through Direct Payment contracts.

<sup>2</sup> The contracts for each of these companies can be found on the DTPM website, <https://www.dtpm.cl/index.php/documentos/contratos>

## 2.3 Description of the main transport processes

The four main transport processes are as follows in Figure 4 :

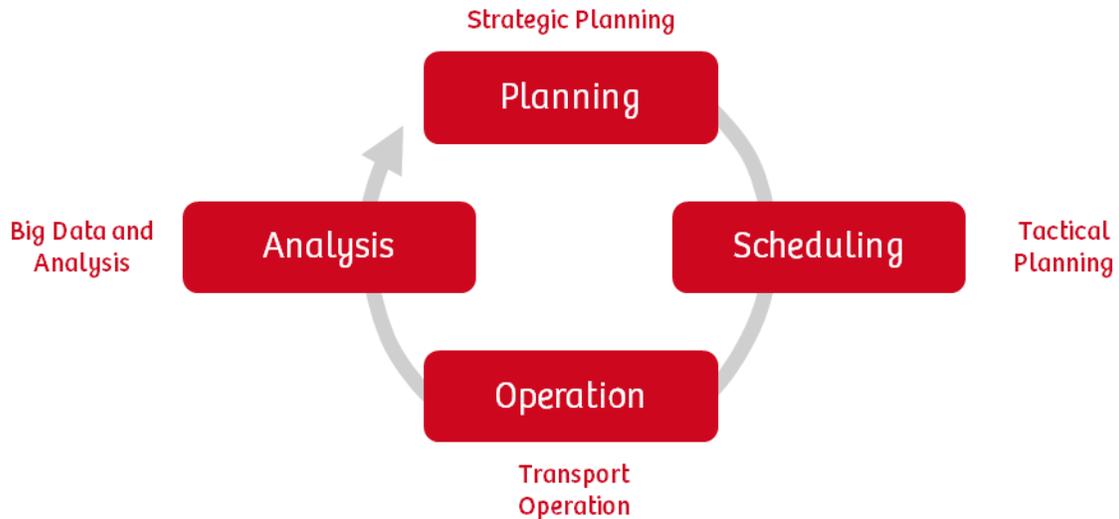


Figure 4 : Transport processes

### 2.3.1 Planning process

The DTPM is responsible for planning and its objective is to plan the transport system development over the medium and long term, in areas such as designing new services, amending existing services, integrating various modes of transport, and developing infrastructure.

The tools currently used for these tasks are *TransCad* for parameterization functions, and *EMME* for travel demand modeling functions and transport forecasts.

### 2.3.2 Scheduling Process

In order to meet the requirements of the planning process, and taking account of the operational variables, such as the transport network, speeds, and supply and demand, the Operating Program (OP) is generated. This instrument defines and regulates the conditions and characteristics of the transport services, which are then executed by the PTOs.

The tool currently used for this tasks is *GOAL Systems*, which estimates the fleet required for the Operating Program and its amendments.

### 2.3.3 Operating Process

The objective of the operating process is to manage transport resources, such as terminals, regulation points, scheduled and unscheduled detours, fleets and drivers, in order to comply with the Operating Program.

The DTPM is responsible for coordinating and supervising the daily operation of the public transport system, based on the current Operation Program and established service levels. This monitoring task is performed by the Bus Monitoring Center (BMC).

PTOs are responsible for managing their resources, such as buses, maintenance, personnel and dispatching, to achieve the Operating Program.

The base data and tools are provided by the Complementary Services Provider of Fleet Management and Passenger Information, currently provided by SONDA S.A..

### 2.3.4 Analysis Process

This process involves consolidating, processing, mining data and interpreting information regarding these transport services, in order to provide feedback to other processes.

The DTPM verifies compliance with the current Operating Program (OP), by calculating operating indicators and performing a general analysis.

Various tools are currently used to perform this process, which include: (i) *ADATRAP*, this software estimates trips using transactions and cross-matches this information with GPS data from buses, and other functionalities; (ii) various data mining reports provided by the Fleet Management technology provider; and (iii) modules for calculating operating indicators.

## 3 THE FUTURE FLEET MANAGEMENT AND PASSENGER INFORMATION SERVICE

### 3.1 Vision for the Service

As mentioned above, the MTT intends to initiate a new tender with the objective of ensuring the continuity and evolution of the complementary services, with the main goal of providing better services focused on the passengers, which is directly related to the commitment of DTPM to improve the quality of public transport services.

The new contracts should therefore consider the improvement and evolution of these services, with an emphasis on:

- Securing the operational continuity of current services and processes related to the regulator's role, the system's financial administrator and the Public Transport Operators.
- Ensure that the data information generated and managed by the System are valid, consistent, reliable and timely.
- Ensure that the planning, scheduling, operating and analyzing processes of the regulatory entity (DTPM) and the Public Transport Operator are coordinated and based on the same, complete, consistent and coherent information, in order to avoid controversies among the parties involved.

- Enable the operating companies to effectively manage the intervals between vehicles or scheduled stop times for each service, and deliver real-time information and recommendations to drivers. Also provide management tools to the Fleet Operating Centers of each operating company.
- Facilitate effective management and coordination in the event of contingencies and deviations, by facilitating communication between PTOs and the PTA, and providing passengers with information in an accurate and timely manner.
- Ensure that guaranteed service transfer connections can be scheduled, for example at transfer connections during the night, and automatically manage these connections. For example, this requires notifying drivers in real time of any delays to other services that form part of a guaranteed transfer, so they can wait for a specific period at that connection point.
- Design and produce reliable online and offline indicators that measure the service quality of the transport system.
- Provide all passengers with real-time relevant information regarding the status of services, traffic detours, bus positioning, arrival times at bus stops, intervals between buses, incidents and operational warnings.
- Provide real-time information inside buses regarding important events for passengers, such as notice of upcoming bus stops and transfer connections.
- Provide real-time information at bus stops, or a subset of them, that are relevant to passengers, such as arrival time of the next bus and any incidents.
- Facilitate tactical and strategic developments within the transport system to adapt it to changes within the city.
- Include functionalities to monitor in-vehicle activities and identify threats to passengers, drivers and operating staff. Provide drivers with directions on route.
- Provide facilities to manage and coordinate in-vehicle safety and emergencies.
- Manage information, that is to say obtain, process and provide information to the different system users from the scheduling, controlling and monitoring processes and the security and emergency management processes, using various technological channels.
- Provide parties involved in the system with system data.
- Verify service compliance, including any deviations, unscheduled stops, early returns, etc.
- Improve integration between fleet positioning data and the transaction validation system to obtain relevant information for decision-making by the system.
- Collect information on bus occupancy throughout each journey.
- Ensure that the current service transition can be adequately planned to ensure operational continuity for the Santiago Public Transport System, and that this will be a transparent process for users.

### **3.2 Service specification philosophy**

Service specifications will be based on the required functionalities, which will be subject to a Service Level Agreement (SLA). In general terms, the technologies or components for executing these services are not supposed to be specified and bidders will be given the

responsibility of designing solutions based on their knowledge and experience to comply with the required specifications and the Service Level Agreement.

Therefore, the contractual relationship will depend on the service characteristics and not on the technology used, in order to achieve the required service flexibility, ensure that these services can evolve over time, and to overcome any potential problems caused by technological obsolescence during the contract term.

A preferred approach is that solutions are built to industry standards using open and documented architecture, in order to ensure their evolution and interoperability with other systems and services. This will encourage competitiveness during the tender process and avoid "technological capture" by suppliers with closed systems and dominant or monopolistic services.

### **3.3 Transition phase**

The complementary technological services have been operating in the transport system since 2007, which has produced valuable lessons and experiences about their implementation and operation. Probably one of the most important lessons is to recognize the value of gradually implementing these services, and safeguarding MPTS operational continuity without losing sight of the impact on passengers. Therefore, planning and implementing the transition process are particularly important, both at the beginning and at the end of the contract.

### **3.4 Business model**

Managed Service Provider (MSP) is expected to be used for these services, which implies that the successful bidder will be responsible for investing in onboard equipment, computer platforms, central systems, licenses for operating systems and applications, as well as installing, commissioning and operating each service, and performing the associated preventive, corrective and evolutive maintenance.

A monthly fee will be paid for this service, which will be subject to fines and/or discounts for contractual breaches, such as non-compliance with the Service Level Agreement.

The process requires submitting a bid bond and a contract performance bond, which should be in the following ranges: 20,000-30,000 UF and 110,000-150,000 UF respectively.

## **4 SERVICE OBJECTIVES**

The fleet management and passenger information complementary service for the Metropolitan Public Transport System will have the following objectives:

1. Contribute to achieving an economically sustainable public transport system that ensures service quality and operational continuity.
2. Support the supervision, inspection and coordination of the transport system.
3. Support the processes that ensure service levels are met relating to the frequency, regularity and punctuality of transport services.
4. Ensure that system resources are reliably, securely and transparently managed.

5. Ensure that reliable and timely information is provided about the performance of the public transport system.
6. Provide information that helps to identify efficiencies in the public transport system.
7. Improve the travel experience for passengers, which will encourage them to use public transport.
8. Support decision making and coordination during regular operations, emergencies and large-scale events.
9. Facilitate coordination between various modes of transport to promote transfers.

## **5 FUNCIONALITIES OR MINIMUM DESIRABLE ELEMENTS TO REQUEST**

The complementary Fleet Management and Passenger Information service of the Santiago Metropolitan Public Transport System is estimated to require the following Desirable Minimum Functions or elements to be requested, which are described in the attached Questionnaire:

### **5.1 Hardware**

- Onboard equipment
- Equipment in Fleet Operation Centers, Bus Monitoring Centers, Depots, Stations, etc.
- Passenger Information Equipment at Bus Stops
- Technical support, maintenance, and other services

### **5.2 Communications**

- Communications with the buses

### **5.3 Fleet Management System**

- Online monitoring tool
- Bus dispatch tool
- Incident management tools
- Driver information tools for frequency or interval operated routes
- Driver information tools for fixed timetable operated routes.
- Operational Performance Indicators Calculation (KPIs)
- Transfers between buses and with other modes
- Systems integration

### **5.4 Passenger Information System**

- Bus Time Arrival at Stop Prediction
- Bus Onboard Passenger Information (route, next stops, etc.)
- Information on Transport System Operational State (vehicle locations, detours, etc.)
- Mobile applications (platform, APIs, web services, etc.)