



GOVERNMENT OF SINDH
SERVICES, GENERAL ADMINISTRATION
AND CO-ORDINATION DEPARTMENT

Karachi dated the 30th January, 2017.

NOTIFICATION

No.SOII(S&GAD) 6-75/2015: The Government of Sindh is pleased to constitute a Technical & Financial Evaluation Committee (TFEC) on Integrated Intelligent Transportation System (IITS) with following composition and terms of reference (ToRs):-

1.	Additional Chief Secretary (Dev), P&D Department, Government of Sindh	Chairman
2.	Secretary, Finance Department, Government of Sindh	Member
3.	Secretary, Transport and Mass Transit Department, Government of Sindh	Member
4.	Director General, Sindh Mass Transit Cell. Transport & Mass Transit Department	Member
5.	Director General, PPP Unit, Finance Department, Government of Sindh	Member
6.	Deputy Secretary (Regulation), Law Department, Government of Sindh	Member
7.	Prof. Dr. Mir Shabbar Ali, Department of Urban & Infrastructure Engineering, NED University Karachi.	Member

Terms of Reference:

- I. The committee would evaluate the technical proposal submitted by IITS consultants in response to the RFP floated jointly by T&MTD and KIDCL, in term of Public Procurement Rules, 2010.
- II. The committee shall review and approve the system specification for ITS components and various reports submitted by the Consultant and bidders.
- III. The committee shall be responsible for the technical and financial evaluation of the Proposals / bids.
- IV. The committee or its authorize representative may, if the need be, hold pre-bid conference and address queries of the bidders leading to finalization of the RFP and bidding document.
- V. The Committee shall approve the preferred bidder for issuance of letter of Intent (LOI) by the procuring agency for contract negotiations.
- VI. The committee shall recommend the preferred bidders to the PPP Policy Board for award of the contract and signing of the Concession Agreement by the procuring agency under the applicable Rules and Acts.
- VII. Any other task as deem appropriate by the Committee, and or assigned by the Government.

RIZWAN MEMON
CHIEF SECRETARY SINDH

No. SOII (S&GAD) 6-75/2015,

Karachi dated the 30th January, 2017

A copy is forwarded for information and necessary action to:

1. The Principal Secretary to Chief Minister Sindh, Karachi.
2. The Additional Chief Secretary (Dev), P&D Department, Govt. of Sindh, Karachi.
3. The Secretary, Finance Department, Government of Sindh, Karachi.
4. The Secretary, Transport & Mass Department, Government of Sindh, Karachi
5. The Chairman / Members (all) of the Committee.
6. The Deputy Secretary (Staff) to Chief Secretary Sindh, Karachi.
7. P.S to Secretary T&MT Department, Government of Sindh, Karachi.
8. Office order file.

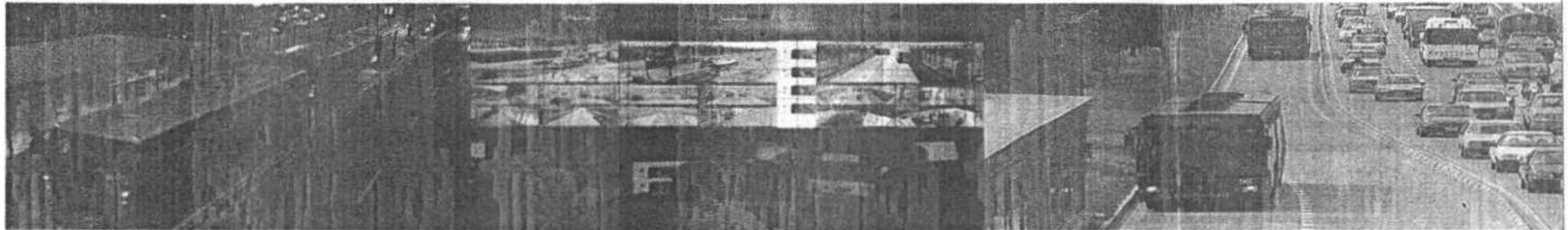

(ABDUL REHMAN KHASKHELI)
SECTION OFFICER-II



TRANSPORT AND MASS TRANSIT DEPARTMENT, GOS SINDH MASS TRANSIT CELL



REQUEST FOR QUALIFICATION BUS RAPID TRANSIT SYSTEM "GREEN & ORANGE LINE" Integrated Intelligent Transport System - IITS



The Assignment

Sindh Mass Transit Cell (SMTC), Transport and Mass Transit Department (TMTD), Government of Sindh ("Authority"), assisted by Public Private Partnership Unit ("PPP Unit") Finance Department, GoS, hereby invites request for qualification ("RFQ") proposals from reputable and experienced firms (local and international consortia or Joint Ventures) to finance, procure, operate, maintain and transfer Integrated Intelligent Transport Systems - IITS for BUS RAPID TRANSIT SYSTEM 'GREEN & ORANGE LINE' under Public Private Partnership Mode for Operator system.

Route Alignment of the BRT Green line from Surjani Town to Municipal Park, likely to be extended upto tower and within Central Business District (CBD) for around 7 kms, and Orange line from Board Office to TMA may be extended upto Islam chowk.

In this regard, SMTC, TMTD, GoS intends to prequalify potential firms/consortia for issuing Request For Proposal (RFP) document. Interested firms/consortia would need to furnish relevant documents to demonstrate experience and expertise to undertake the above project.

Firms/Consortia may participate either any one or multiple Packages of the scope as defined in the RFQ document.

Scope of Work

The detailed scope of work to undertake the project is provided in the RFQ Document.

Submission and Opening of Proposals

The Request for Qualification (RFQ) document for submission of proposals may be downloaded from www.pppunitsindh.gov.pk and www.pprasindh.gov.pk from **25th February, 2017**.

Duly filled in Proposal documents must reach SMTC, TMTD, GoS office located at F-34/1, Block 7 Clifton, Near Teen Talwar, Karachi, not later than 03:00 p.m. on **Tuesday, 28 March, 2017**. Opening of the bids will be on the same day and address at 3:30 pm.

Director (Bus Operation / ITS)

Sindh Mass Transit Cell, TMTD,
Government of Sindh
F-34/1, Block 7 Clifton, Near Teen Talwar, Karachi, Sindh
Email: smtc.tmtd@gmail.com

Director, Public Private Partnership (PPP) Unit,

Finance Department, GoS
7th Floor, AK Lodhi Complex, Sindh Secretariat No.6,
Shahra-e-Kamal Atta-Turk Road, Karachi, Pakistan
Email: danish.pppgos@gmail.com

*Daily Dawn and Jang
Thursday 16, Feb. 2017*

PREQUALIFICATION FOR THE INTEGRATED INTELLIGENT TRANSPORT SYSTEM (IITS)
FOR THE KARACHI BUS MASS TRANSIT SYSTEM



Transport & Mass
Transit Department
Government of Sindh



PPP Unit,
Finance Department,
Government of Sindh

**INVITATION FOR SUBMISSION
of
PREQUALIFICATION TO TENDER
for
INTEGRATED
INTELLIGENT TRANSPORT SYSTEM
of
KARACHI GREEN & ORANGE LINE BUS
RAPID TRANSIT SYSTEM**

PPP MODE OF PROCUREMENT

FEBRUARY 2017

0.1 LETTER OF INVITATION

Reference: Bus Rapid Transit Systems (BRT) – Green and Orange Lines'

Dear Prequalification Applicant

The Transport & Mass Transit Department, Government of Sindh (the "TMTD"), in assistance with the Public Private Partnership Unit, Finance Department, Government of Sindh (the "PPP Unit") hereby issues this invitation (the "RFQ") for submission of prequalification applications (the "Prequalification Applications") from interested companies or consortia (the "Prospective Bidders") to be qualified to bid on a Public Private Partnership ("PPP") tender for the finance, procurement, installation, testing, commissioning, operation and maintenance of Integrated Intelligent Transport Systems (the "IITS") to be implemented on BRT Green & Orange Line (the "Project"). The PPP contract (the "Concession Agreement") will be awarded through a competitive bidding process (the "Bidding Process") open to both local and international firms in accordance with provisions of Sindh Public Procurement Rules, 2010 (as amended from time to time).

The following prequalification procedure will be adopted:

1. This RFQ contains preliminary information (which gives Prospective Bidders an overview of the Project).
2. Following the submission of the Prequalification Applications, the Prospective Bidders will be evaluated based on the requirements and criteria set forth herein.
3. Prequalification Applications shall be evaluated by a procurement committee (the "Procurement Committee"). Prospective Bidders whose Prequalification Application is determined by the Procurement Committee to be responsive to the requirements and fulfilled criteria of the prequalification process shall be designated as "Qualified Bidders".
4. Qualified Bidders shall be invited to participate in the bidding process for the Project.

Prequalification Applications must be delivered not later 3.00 PM, 28th March 2017, at following address. Incomplete bids and late submitted by other than specified mode will not be considered.

Director General

Sindh Mass Transit Cell (SMTC)

Transport & Mass Transit Department, Government of Sindh

F-34/1, Block 7 Clifton, Near Teen Talwar,

Karachi, Sindh

Ph: +92-21-35865391-2 Fax: +92-21-3586392

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Disclaimer

This RFQ is provided to the recipient solely for use in preparing and submitting applications for prequalification in connection with the Project. This RFQ is being issued by the TMTD solely for use by Prospective Bidders in considering the Project.

The evaluation criteria were determined by Procurement Committee. The TMTD, nor its consultants, advisors, employees, personnel, agents, make any representation (expressed or implied) or warranties as to the accuracy or completeness of the information contained herein, or in any other document made available to a person in connection with the tender process for the Project and the same shall have no liability for this RFQ or for any other written or oral communication transmitted to the recipient in the course of the recipient's evaluation of the Project. The TMTD, nor its employees, personnel, agents, consultants, advisors and contractors etc. will be liable to reimburse or compensate the recipient for any costs, fees, damages or expenses incurred by the recipient in evaluating or acting upon this RFQ or otherwise in connection with the Project as contemplated herein.

The Prequalification Applications submitted in response to this RFQ by any of the Prospective Bidders shall be upon the full understanding and agreement of any and all terms of this RFQ and such submission shall be deemed as an acceptance to all the terms and conditions stated in this RFQ.

Any Prequalification Applications in response to this RFQ submitted by any of the Prospective Bidder shall be construed based on the understanding that the Prospective Bidder has done a complete and careful examination of this RFQ and has independently verified all the information received (whether written or oral) from the TMTD (including from its employees, personnel, agents, consultants, advisors and contractors etc.).

This RFQ shall neither constitute a solicitation to invest, or otherwise participate, in the Project, nor shall it constitute a guarantee or commitment of any manner on the part of the TMTD that the Project will be awarded. The TMTD reserves its right, in its full discretion, to modify the RFQ and/or the Project at any time to the fullest extent permitted by law, and shall not be liable to reimburse or compensate the recipient for any costs, taxes, expenses or damages incurred by the recipient in such an event.

1. GENERAL INFORMATION AND INSTRUCTIONS

1.1. INSTRUCTIONS TO PROSPECTIVE BIDDERS

The TMTD, in assistance with the PPP Unit, hereby invites Prospective Bidders through this RFQ to submit their Prequalification Application for the Project. The Project involves design, finance, procurement, installation, operation, maintain and Transfer IITS for Bus Rapid Transit System (BRT) for Karachi with the focus on:

BRT Green Line: From Abdullah Chowrangi, Surjani Town to Municipal Park via Power House, Nagan Chowrangi, Sakhi Hassan Chowrangi, Board Office, Nazimabad Petrol Pump, Golimar Chowrangi, Lesbella Chowk, Gurumandir, Numaish, Tibet Centre, Municipal Park

BRT Green Line extension to Central Business District (CBD) as option.

BRT Orange Line: from TMA Office to Board Office Chowrangi via Orangi No. 5, Banaras Chowk, Abdullah College Chowrangi.

BRT Line	Number of stations	Length of the Line [km]	Stations types	Buses Number and Types
Green Line	25	21.7	Median and Separated Stations	100 Buses, Low floor and low entry
Green Line extension	10	~10	Median and Separated Stations	50 Buses, Low floor and low entry
Orange Line	4	~5	Median and Separated Stations	50 Buses, Low floor and low entry

As L4 systems will be used for other BRTs services as well, the system scale and design must be capable and expandable as following:

BRT Line	Number of stations	Length of the Line [km]	Ridership [per day]	Buses Number and Types
Future expansion	>100	>150	>5 million	> 500 vehicles

The Project will be structured as a Concession / Contact Agreement between the TMTD and preferred bidder. The Project will be awarded through a Competitive Bidding Process open to local and international Qualified Bidders.

1.2. PROJECT BACKGROUND

A detailed Karachi Transportation Improvement Project (KTIP) has been completed by Japan International Cooperation Agency (JICA) led team. Based on a comprehensive study, the plan integrates roads and Mass Transit related project into Transport Master Plan.

JICA funded KTIP study finalized 2 Mass Rapid Transit (MRT) and 6 BRTS lines besides Revitalization of Karachi Circular Railway (KCR) on modern lines. The feasibility and detailed design of BRT Green Line infrastructure project was funded by the Government of Pakistan (GOP) through Karachi Infrastructure Development Company Limited (KIDCL). The BRT Orange Line was initiated under GOS funding through ADP provision.

The City of Karachi represents the commercial capital of the Islamic Republic of Pakistan. The city has grown rapidly ever since with the population now estimated to exceed 20,000,000 and still expanding rapidly.

To cope with the modern mobility demands of the society, to reduce the pollution, increase the quality of life in the city further with a cost effective and reliable transport service, a comprehensive, integrated Public Transport System will be implemented in the City, which is presently dominated by the individual car traffic, private buses or Rikshaws and bikes.

In the long run Karachi Public Transport shall incorporate a public transport system based on integrated modes such as:

- > Existing Heavy Rail network
- > Several Bus Rapid Transit (BRT) services under implementation
- > Future Feeder Bus services

In respect of the BRT system the road infrastructure such as elevation, bus lanes, stops, stations, transfer terminals as well as Park & Ride facilities will be constructed.

At the same time the system scale itself will be gradually extended till 2030 along with the development of new city areas.

The Sindh Mass Transit Authority (SMTA) is the government body responsible for all development activities in the city of Karachi in relation to the mass transit system(s), with an appointed Project Manager, the Karachi Infrastructure Development Company (KIDCL) specifically tasked to develop the IITS integration requirements and system and the first BRT Services, the Green Line and Orange Line.

Besides the construction of the physical infrastructure, an integrated unified solution for Intelligent Transportation Systems (ITS) including centralized Operation Control Center (OCC), network-wide Automated Fare Collection (AFC) system, Real-Time Passenger Information (RTPI), CCTV System and other applications will be installed in Karachi.

Several BRT Lines are under various stages of implementation presently in Karachi. These are considered under various financing arrangements. Additionally, some of these lines are

physically sharing BRT infrastructure or planned to have transfer stations for better citywide BRT patronage. For instance, BRT Green Line is physically merging with Blue Line at Gurumandir and BRT Red Line and BRT Yellow Line are having transfer station with Blue Line at Numash. Additionally, BRT Orange Line physically meets BRT Green Line at Board Office. In future, these lines will have passenger transfers with other BRT Lines as well as KCR and other proposed rail based mass transit systems.

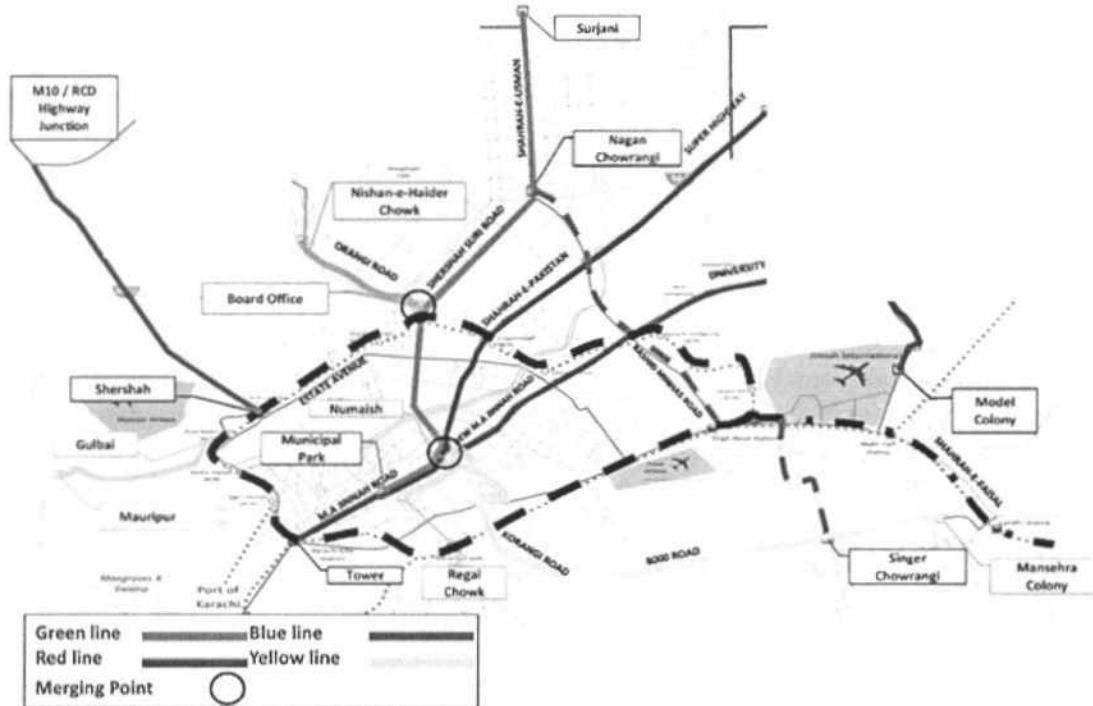


Figure 1: Karachi Rapid Transit System

The physical integration of these lines would also require integration / interoperability of ITS infrastructure in terms of data sharing standards and administrative controls of the government over key operations and revenue sharing mechanisms among various operators and fare collectors. The overall passenger handling capacity of an integrated and interoperable mass transit system increases many folds.

ITS in particular refers to a broad range of technologies based on three core features i.e. Information, Communication & Integration. ITS helps operators and travellers making better and coordinated decisions resulting in improved system performance in terms of passenger handling. Besides, ITS includes application of advance information processing, communications and management strategies in an integrated manner to improve the functioning of the transportation system.

IITS maximizes the number of commuters using the BRT - system and assists in providing secure and reliable means of public commute that is both cost effective and decreases traffic congestion on the roads. To achieve this objective, IITS solution should seek to minimize passenger on/off boarding time, improve vehicle and personnel efficiency, and provide adequate tools for revenue generation while minimizing revenue leakage. Furthermore, any proposed IITS for the BRT should enable real-time monitoring of events and also provide robust security systems for surveillance and a rapid response to emergencies.

Achieving the above IITS objectives will provide the following expected benefits for the Public Transport in Karachi:

Benefits to Rapid Transits Implementing Agency:

- > Fast, efficient & easy fare collection & management
- > Improved Planning
- > Optimization of Operations
- > Effective enforcement with minimizing chances of error
- > Better & efficient multi-agency coordination
- > Improved fuel efficiency
- > Improved security and safety of system and users
- > Potential for enhancing non-fare revenues resulting in decreased operational subsidies.

Benefits to End Users

- > Hassle free pre-boarding ticketing system
- > Profile based fare collection for various users groups
- > Fare collection integration with non BRT / MRT transport modes
- > Usability for all age groups
- > User safety by minimizing risk factors
- > Time reliability for reaching destinations
- > Appropriate information displays about buses and routes
- > Easy, fast & efficient boarding
- > Sense of security and discipline

1.3. Project Location

The Green Line BRT start point is "Abdullah Chorangi, Surjani Town", from where it runs through Shahrah-e-Usman up to Nagan Chowrangi and then it takes the Sharah e Shersah Suri upto Board Office and then it continues on Nawab Siddique Ali Khan Road and Business Recorder Road upto Gurumandar. From Gurumandar it takes Muhammad Ali Jinnah Road up till Municipal Park.

The BRT Orange Line: from TMA Office to Board Office Chowrangi via Orangin No. 5, Banaras Chowk, Abdullah College Chowrangi.

OCC building will be on Agha Khan Road (Garden).

1.4. Request for Pre- Qualification (RFQ) Purpose

The purpose of this Request for Qualification (RFQ) is to ascertain suitably competent and experienced ITSsuppliers, system integrators, manufacturers, operators to furnish, install, operate and maintain a comprehensive and integrated IITS solution for the Government of Sindh (GoS) in Karachi for the Green Line (21 Stations as mandatory), extension of the Green Line (around further 10 Stations as an Option) and Orange BRT line.

This RFQ is intended to:

- Provide interested parties with the Introduction of the Project;
- Set out the objectives, the proposed commercial principles governing the Project;
- Explain the intended procurement process;
- Outline the Pre-Qualification criteria;
- Specify the terms and conditions for participation by Bidders in this Pre-qualification stage of the procurement; and
- Elicit responses from Bidders with the skills, knowledge, experience, capability, financial resources, capacity and approach necessary to deliver, finance and maintain the Project.

Further, this RFQ is also intended to receive an overview of the capabilities of potential vendors in IITS. This RFQ is not intended for service providers to prepare detailed proposals at this Stage but rather to provide information regarding capabilities and indication as to how they would approach working with GoS to achieve the objectives.

The following list gives a general overview of the intended several packages scope:

1. Automatic Fare Collection (AFC) System
2. Fleet Management / Automatic Vehicle Location System (AVL)
3. Central Operation Command & Control Centre (OCC)
4. Real Time Passenger Information (RTPI)
5. Communication Network / Digital Transmission System
6. Business Intelligence & Analysis Software
7. Security & Surveillance System
8. Bus Depot Management System
9. Energy Management System
10. Bus Docking System

Submission of answer to this RFQis mandatory to participate in the RFP stage. Only companies that pass this RFQ technically will be eligible to receive the RFP.

1.5. THE EMPLOYER

The employer for the Project is "Sindh Mass Transit Cell, Transport and Mass Transit Department, Government of Sindh." – abbreviated as "SMTC, TMTD". The Authority's address for communication and submissions is listed below.

**Sindh Mass Transit Cell (SMTC)
Transport & Mass Transit Department (TMTD)
Government of Sindh
F-34/1, BLOCK 7 CLIFTON, NEAR TEEN TALWAR
Karachi Sindh.
Tel: +92-21-35865391-2, Fax: +92-21-35865392
Smtc.tmt@gmail.com**

1.6. Correspondence

All correspondence with the Department in connection with this RFQ must be by:

- a) email sent to smtc.tmt@gmail.com The "Subject" field of all emails must be as follows:

"PQ No. GoS/PQ/SMTC/IITS/001-IITS-GL-BRT"

And/ or

- b) post sent to

**Director General (SMTC)
Transport and Mass Transit Department
Government of Sindh
F-34/1, Block 7 Clifton, Near Teen Talwar
Karachi, Sindh.**

1.7. ELIGIBLE CONTRACTORS

Eligibility to tender is restricted to reputable and financially sound IT service providers with extensive experience in designing and implementing systems ITCS as set out below in this RFQ. The Prospective Bidder shall be willing to take over the responsibility for the success of the implementation of the complete project.

1.8. Pre - Qualification costs

The Prospective Bidder shall bear all costs (the "Prequalification Costs") associated with the preparation and submission of its Prequalification Applications, including, without

limitation, all costs and expenses related to the Prospective Bidder's preparation of responses to questions or requests for clarification.

2. Scope of Work

The main objective of this document is to shortlist thereputed companies/firms/JVs to undertake the following:

– Green Line (21 Stations Mandatory) and Orange line (6 Stations Mandatory). Commercial operations will commence one day after the issuance of final completion certificate by the independent engineer/ engineer as will be defined in the concession agreement/ traditional contract in later stage.

An Automated Fare Management Center (AFMC-L3) and a Central Clearing House (CCH-L4) will be head of the Integrated Public Transport system.

The AFC L3 will provide the Fare Management in Karachi's Public Transport and thus will determine fare strategies, criteria definitions and business rules. The AFC-L4 will be the executive tool for treasuring activities for all Lines over the whole Karachi public Transport Network (including all future systems which will be integrated).

The Central Clearing House System (L4) will be a core element of the Karachi Public transport payment system. The CCH will provide all necessary parameters and upload transaction services for clearing and settlement.

The overall AFMC (L3) /CCH (L4) should be structured into five levels, which are visualized in the following Chapters.

The communication system shall be a ruggedized Gigabit or higher Ethernetbased communication system. As part of the submission, the Bidder shall provide bandwidth calculations to support the proposed communication technology, considering the effective bandwidth of the technology. As a part of the requirements, all ITS systems shall have their respective central system hardware and software deployed at the Control Centre, and will communicate with the Control Centre location. To support communications requirements of the ITS systems, the project shall include the deployment of a communications system. This communications system shall provide connectivity along the entire corridor (using optical fiber cable (OFC backbone) and local distribution to the ITS systems.

Every bus must be equipped with on-board unit and relevant components that can gather location wise data and transmit to central servers and related software modules. Data gathered in this fashion will help monitor movement of the bus via GIS interface, in real time against bus schedule defined in the relevant software module. Distance travelled, and number of trips made by every bus, must be reported. All such buses need to be equipped with GPS enabled trackers that integrate with the relevant software proposed.

The buses will have infotainment system (on board displays) to disseminate messages. The Passenger Information System must be able to gather information from Vehicle Location system installed in the bus and display messages and play voice recordings accordingly to intimate passengers of the next approaching station/stop. RTPI system will be used to display information to passengers at each station along the corridor.

Bus Scheduling, bus tracking, and bus alert-management, as well as Passenger Information System shall be managed / monitored via the Operation & Control Center (OCC). The OCC will house large screen monitors to oversee the current situation of fleet. Current status of buses, terminal stations, CCTV images along the corridor may be selectively displayed at the OCC.

The OCC will be in a central building of SMTA and will be the main OCC for the Karachi transit Network. The OCC premises will contain the Servers room, Test Room, training and management centre.

2.1. Overview of the Scope of Work for the ITS Systems

The scope of work includes detailed engineering design, finance, procurement, installation, testing, commissioning and operation of the following three packages (which includes ten components): The scope of work may be structured either under PPP mode or Traditional mode of procurement as tentatively suggested in the Table 3 below. The pre-qualification of the prospective bidders is being conducted for both modes of procurements. However, under the RFP stage, the Projects components will either be structured as PPP or traditional procurement for which separate RFPs shall be issued to the pre-qualified contractors for PPP mode and Traditional modes of procurement separately.

Package A:

- a) Automatic Fare Collection (AFC) System
- b) Fleet Management / Automatic Vehicle Location System (AVL)
- c) Real Time Passenger Information (RTPI)
- d) Business Intelligence & Analysis Software
- e) Bus Depot Management System

Package B:

- a) Operation Control Centre (OCC)
- b) Communication Network / Digital Transmission System
- c) Security & Surveillance System

Package C:

- a) Energy Management System
- b) Bus Docking System

In case a component is structured under PPP mode, the scope shall also include operation and maintenance for a period of Ten (10) years.

The Contractor shall carry out all work in skilled and workman like manner in compliance with modern methods of engineering.

The Contractor shall take the responsibilities of general integrator for all the sub-systems and equipment within the Scope of Work, and ensure the integration of the whole System including co-ordination with contractor of infrastructure and bus operator works.

The Contractor shall conduct training of Sindh Mass Transit Cell (SMTC) staff for operation of Intelligent Transport System of SMTC ITS part.

The Contractor shall Co-ordinate with Bus Operator Contractor for installation of On Board Unit (OBU).

Parts of IITS will be procured by GoS under traditional procurement mode, and other parts will be under PPP mode. Regardless the ownership of a system or system part, the complete project with all details from commencement date until start of operation will be supervised by the Employer's consultant. Details of milestones (System design, Factory acceptance, System acceptance, etc.) will be provided in the RFP Phase.

Based on RFQ answers and evaluation, the GoS will decide and finalize the below tables regarding the ownership parts in a later stage. A draft overview how the systems procurement mode and operations might look like is illustrated in the following table.

System	Part	Scope of Contractor/Operator	Traditional Procurement (TP) OR PPP	Managing
AFC	CCH-L4	Detailed engineering design, supply, installation, testing & commissioning AFC system L4 (CCH) and all Interfaces to all related systems	TP	SMTC
AFC	AFMC-L3-L1	Detailed engineering design, supply, installation, testing & commissioning AFC system L3, L2 and L1 including Software for green& orange line BRT Stations.	PPP	Operator
AFC	L0(Medium)	Mobile ticketing incl. application, Smart Cards procurement	TP	SMTC
AFC	Collection	Collection / Deposit of daily fare	PPP	Operator
OCC	OCC	Detailed engineering design, supply, installation, testing & commissioning of dispatchers workstations in OCC and Videowall	PPP	Operator
AVM	Back office	Detailed engineering design, supply, installation, testing & commissioning of AVM system, Planning system and Interfaces to all related systems	TP	SMTC
AVM	Bus System	Detailed engineering design, supply, installation, testing & commissioning of ITS equipment (incl. OBU) for buses and Depots Dispatchers Work stations.	PPP	Operator
RTPI	Display management System	Detailed engineering design, supply, installation, testing & commissioning of RTPI management.	TP	SMTC
RTPI	Displays	Detailed engineering design, supply, installation, testing & commissioning of Station Displays, Bus Infotainments management	PPP	Operator
Network	Infrastructure	Detailed engineering design, supply, installation, testing & commissioning of Communication System comprising of Fiber Optic Cable (FOC), pipes and ducts between all the Bus Stations and OCC, Radio Network (e.g UMTS) for Buses and all AFC Devices.	PPP	Operator
CCTV	CCTV management	Detailed engineering design, supply, installation, testing & commissioning of CCTV management.	TP	SMTC
CCTV	Surveillance	Detailed engineering design, supply, installation, testing & commissioning of Security Surveillance System for BRT Stations.	PPP	Operator
ITS	Training	Design, supply, installation, testing & commissioning of training centre. And Training of SMTA staff for operation of all IITS.	PPP	Operator
ITS	Coordination	Co-ordinate with Infrastructure Concessionaire for	PPP	Operator

		installation of pipes / cables.		
ITS	Bus	Co-ordinate with Bus Operator for installation of On Board Unit (OBU) and Global Positioning System (GPS) in buses. System shall also have provision for expansion if new buses are added for BRT lines.	PPP	Operator
ITS	Maintenance	Maintenance of all ITS systems for period of 10 years.	PPP	Operator

Figure 3: IITS technical Items and Operation mode

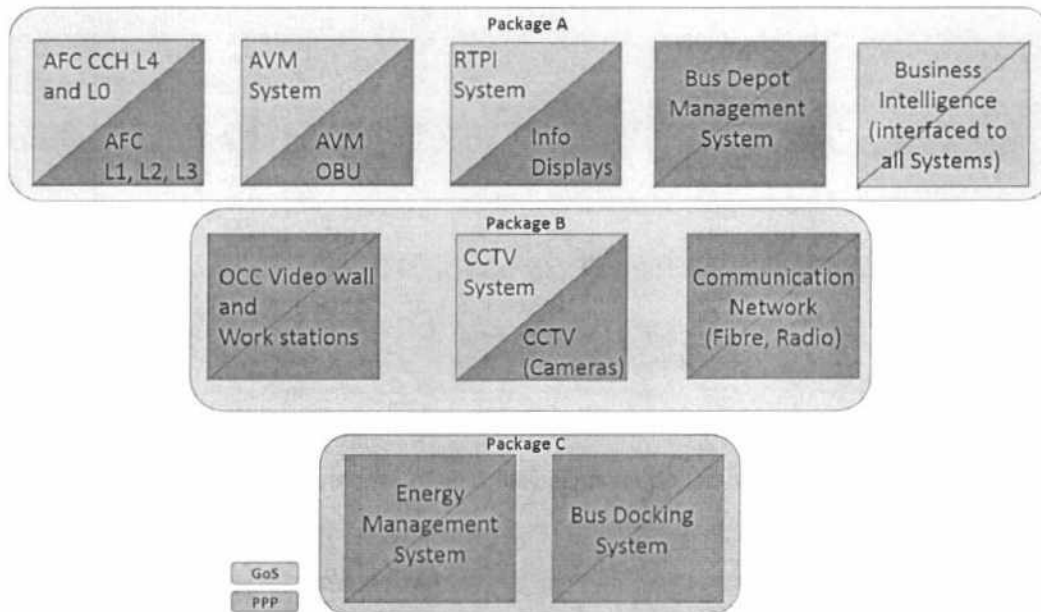


Figure 4: IITS Packages and Operation mode

The contractor may propose for one or for multiple packages!

2.2. Indicative Scope of the ITS Systems

TMTD intends to initiate ITS systems which are part of a comprehensive IITS. In a first phase Public Transport based on BRT Buses will go into operation and in future Phases, the Feeder Buses. The following figure gives a draft overview over structure and interaction of the planned IITS architecture.

Request for Qualification - Integrated Intelligent Transport System (IITS)
for the Karachi Bus Mass Transit System

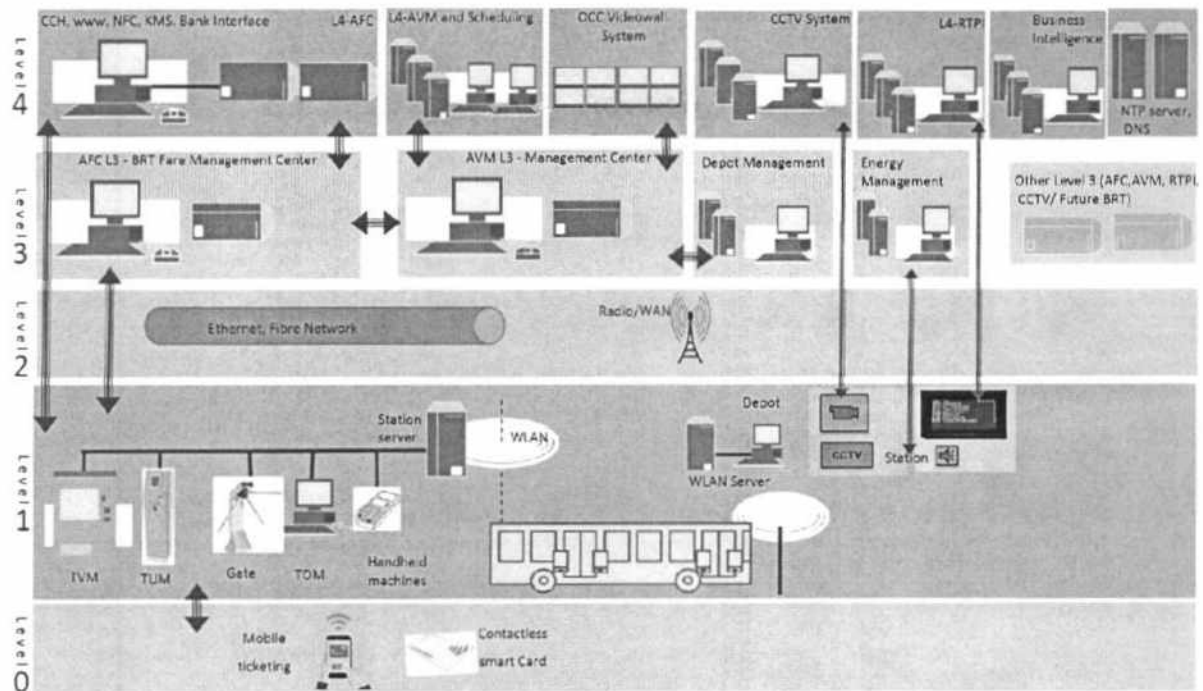


Figure 5: Overview of IITS Structure

2.3. Desired Features and Goals of the Ultimate Systems

Package A:

1. **Automated Fare Collection and Fare Policy** (Fare policy/rates shall be determined by the Government)
2. **AFC Level 0: Fare Media**
 - a. Contactless smart Card (CSC) - Plastic Card
 - b. Contactless smart Ticket (CST) - Paper Card
 - c. Mobile Application
3. **AFC Level 1: Ticket Sale/reload**
 - a. Handheld Ticket Vending Machine/ Point of Sale Machine
 - b. Ticket Vending Machine
 - c. Ticket Offices Machine
 - d. Top Up Machine
 - e. Website

AFC Level 1: Inspection/Validation

- a. Station Gates (e.g. Turnstile, Wide Gates)
- b. Handheld Validation and Inspection Machine
- c. On-board Validators for Future Feeder Buses (Option)

4. AFC Level 2: Data Concentration / Dissemination

- a. Communications System /Network

5. AFC Level 3: Operators' Administration AFMC

- a. Multi-client capability
- b. Data Management
- c. Tariff Management
- d. Accounting
- e. Reports and Statistics
- f. Support Functions
- g. Back up and Archiving
- h. Disaster (standby) System
- i. Test and Training centre

6. AFC Level 4: Central Clearing House (CCH)

- a. Card Management
- b. Smart Card Personalisation Centre
- c. Supervision electronic card stock
- d. Key Management System (KMS)
- e. Initialization electronic cards
- f. Management of Tariff
- g. Management Layout
- h. Management Revenue
- i. Marketing
- j. Customer Care
- k. Customer Database
- l. Mobile Ticketing Service
- m. Customer care Web Portal
- n. Back up and Archiving
- o. Disaster (standby) System
- p. Reports and Statistics
- q. System Support
- r. Interfaces (to L3 and to external e.g Bank)
- s. Equipment Management
- t. Test and Training centre

7. Fleet Management / Automatic Vehicle Location System (AVL)

8. AVM and Real Time Passenger Information System

9. Business Intelligence & Intelligence System

10. Bus Depot Management System

Package B:

- 1. OCC and Video Wall***
- 2. Security & Surveillance System**
- 3. Communications System /Network**

Package C:

1. Energy Management System
2. Bus Docking System

2.3.1. Automated Fare Collection and Fare Policy

The AFC should be structured into five levels, which are visualized in the following.

Level 4	Level 4 Central Clearing House	- Statistics - Tariff/Ticket Design - White/Black List - Security
Level 3	Administration Data Exchange	-Transactions - Archive - Tariff Data - System Status
Level 2	Communication	- Firewall - Network - Interface
Level 1	Validation/ Verification Activation/ Sales	-Office/Shop -Vending/ Issuing/ Inspection and validations Machines
Level 0	Tickets	- Plastic: RFID - Mobile Ticketing (NFC, BLE)

Figure 6. Overview AFC's System Levels

The required automated fare collection system:

- is based on 5 Levels-based architecture incl. CCH level
- uses contactless travel media and mobile Ticketing/NFC/BLE
- is based on cards issued by the transport Authority
- is capable of mitigating counterfeiting
- manage multiple fare structures (distance, time based Fare, etc.)
- enables Top-up value added services and supports Internet selling
- makes it possible to introduce a fare cap
- is based on automatic entry and exit gates at stations, stationary and handhelds Vending machines, Office machines, inspection and validation machines and operate them to a high standard.

- ensures effective revenue protection

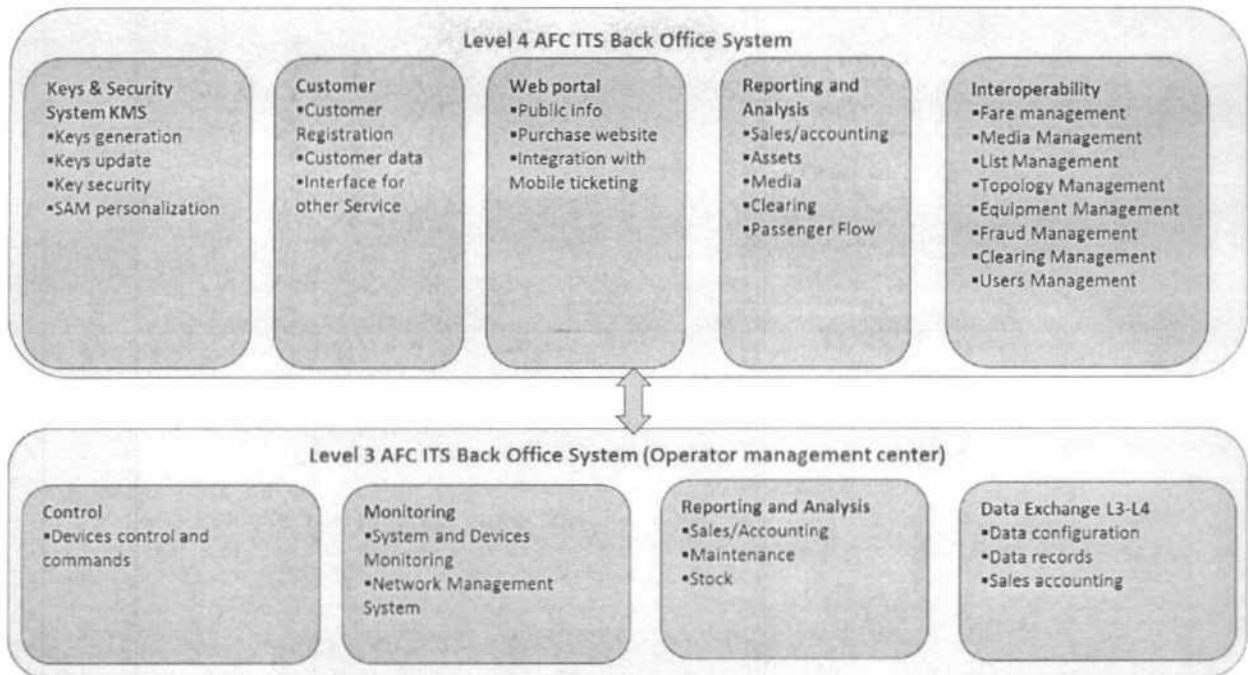


Figure 7: AFC Back Office System Functionalities

In the following a short description of all involved equipment is given.

Central Clearing House L4 (CCH): Clearing House which collects all data, calculate revenue, defines tariff and split revenue between different Public Transport Operators and monitors available cards in general stock and manages new orders.

Automatic Fare management centerL3 (AFMC): Computer center, which collects all information about sold tickets, valid E-Cards, blacklists, fare revenue and monitor overall system status etc. and manages passengers demand on cards and available cards in Sub-AFC stock.

Ticket Office Machine (TOM): TOM are installed in shops, customer care centre, sales offices or depots and operated manually by staff

- to sell tickets; TOM can handle all tariffs / products / services and provide all mode of payments.
- handling contractual / customer related issues

Ticket Vending Machines (TVM): TVM are installed in Stations. TVM can sell anonymous E-Cards, can charge any E-Card and provide different modes of payment.

Handheld Validation and Inspection Machine (H-VIM): H-VIM is with dual functions, as back-up (validator) for the gates in case of any breakdown or special cases, and as inspection machine for the Inspectors to check whether customer's E-Card held a valid contract and / or whether a virtual ticket was activated and is still valid.

The handheld Ticket Vending Machine (H-TVM) is used to sell tickets by staff e.g. at Station.

The Point of Sale Machine (PoS) is used to sell/reload tickets by Staff in Ticket office or third party shops.

Top Up Machine (TUM): will be installed in all stations to provide a fast service (reload only) for passengers who already have valid Cards/mobile ticket.

Station Gates: Gates (e.g. turnstile, Wide gates for disabled) are installed at entries/exits of the Stations to validate / verify / activate presented E-Cards while entering the Station.

Check In Terminals: These Validators are installed at entries in feeder buses (future Phase) to validate / verify / activate presented E-Cards while entering the bus (this device is out of current scope, but the proposed system should be ready for integration).

GoS/SMTA will provide to the contractor before the System Design Phase the Fare Policy to be implemented. The Fare policy proposes T-Purse (for distance-time based Fare) and pass products (flat fare within limited period on selected Network/Routes).

The following table illustrates the approximately number of devices required for the green& orange Line Project:

Device	per Station	in OCC for training	in Customer Care
AFC H-TVM/PoS	4	1	n/a
AFC H-VIM	3	1	n/a
AFC TVM	1	1	n/a
AFC TOM	n/a	1	30
AFC TUM	2	1	n/a
AFC Turnstile Gate	6	1	n/a
AFC Disable Gate	1	1	n/a

2.3.2. AFC Level 0: Fare Media

The system should manage different types of media:

- a. Contactless smart ticket (CST) - Paper Ticket ISO 14443 Type A, B (with memory at least 1K) (Option)
- b. Contactless smart Card (CSC) - Plastic Card ISO 14443 Type A, B (with memory at least 4K)
- c. Mobile Application (based on NFC and/or BLE)

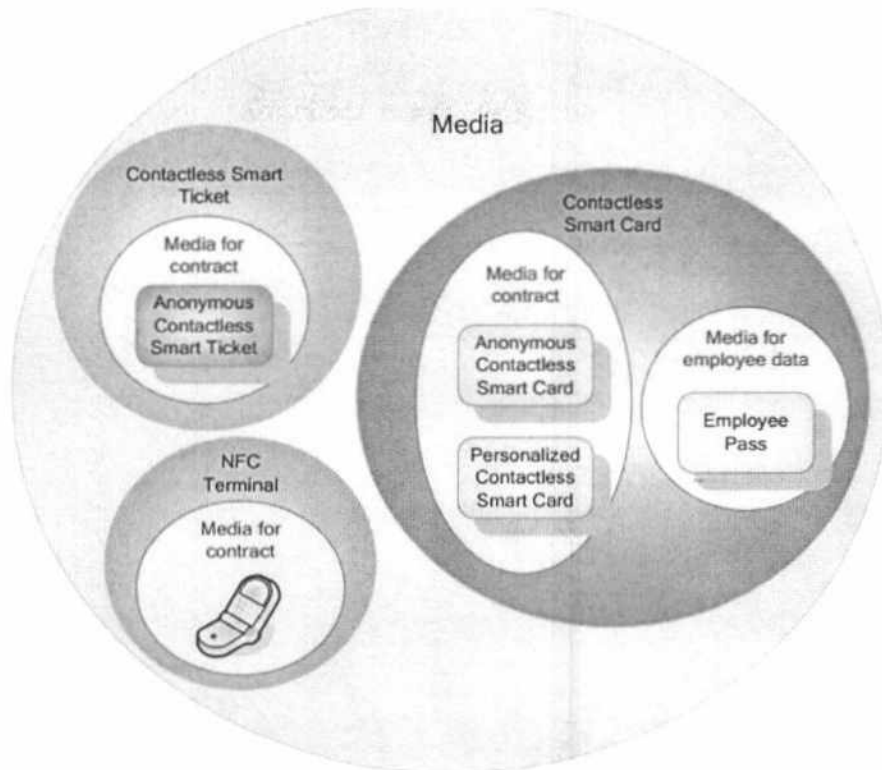


Figure 8: Media diagram

A transport media is a physical support on which one or more contracts/products are loaded.

The contract, which results from the sale of a transportation product, allows each operator to authorize the use of its transportation service according to the predefined conditions.

Media of type Contactless Smart Ticket (CST) (RF interface compliant with ISO/IEC 14443 type A/B) should only contain a single contract. Media of type Contactless Smart Card (CSC) (RF interface compliant with ISO/IEC 14443 type A/B) may contain up to 8 contracts (e.g. Weekly pass, T-Purse, Special product) and are intended for regular use.

Mobile phone equipped with NFC/BLE technology is managed by AFC ticketing system as a contactless card (CSC). So the AFC system can do the usual customization, loading and validation contract on NFC/BLE terminals/readers.

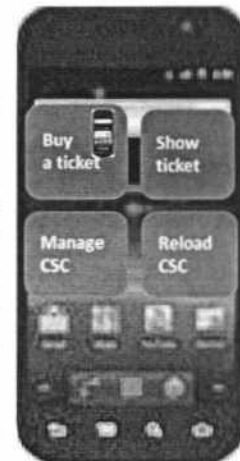


Figure 9: Mobile Ticketing Concept

There are different terms for the CSC card according to whether or not the card holds the name of the customer and is linked to a customer file in the system:

- 'Anonymous' card: Card without customer's name and not registered in a customer file,
- 'Personalized card': Card with customer's name printed on, and registered in a customer file.

the NFC/BLE terminal should be able to communicate like a contactless card (CSC), with a RF interface compliant with ISO/IEC 14443. To order a mobile device ticket, passengers should download an application to their mobile device from Department website.

It should be able for passengers to buy a mobile ticket with or without previous registration. Customers should be able to buy a ticket with

- ▶ credit card (registered customers only)
- ▶ debit card
- ▶ pay pal (registered customers only)
- ▶ telephone provider (registered customers only)

2.3.3. AFC Level 1: Ticket Sale

The sale equipments of the ticketing system are:

- a. Handheld Ticket Vending Machine (H-TVM) / Point of Sale
 - b. Ticket Vending Machine (TVM)
 - c. Ticket Offices Machine (TOM)
 - d. Top Up Machine
 - e. Website
- a. The handheld Ticket Vending Machine H-TVM is used to sell tickets by staff e.g. at Station. The contractor may propose instead of the H-TVM a different design e.g. as Point of sale machine with larger display.

This following functions should be included in the H-TVM:

- Invalidation of CSC/CST media.
- Reading of CSC/CST media.
- Delivery of anonymous CSC/CST media.
- Sale of contracts on CSC/CST media.
- The H-TVM is connected to the Central System with Ethernet LAN (docking station) and UMTS network.

- b. The automatic vending machine subsystem is made up of Ticket Vending Machine (TVM).

This subsystem includes the following functions:

- Invalidation of CSC/CST media.
- Contract remote loading on CSC/CST media.
- Reloading of contracts on CSC/CST media.
- Reading of CSC/CST media.
- Delivery of anonymous CSC/CST media.
- Sale of contracts on CSC/CST media.
- The TVM is connected to the Central System with Ethernet LAN and/or UMTS network.

- c. The Ticket Offices Machine (TOM) is used as sale Agency.

This sale agency subsystem includes the following functions:

- Delivery of Personalized Cards (CSC media).
- Delivery of anonymous CSC/CST media.
- Sale of contracts on CSC/CST media.
- Reloading of contracts on CSC/CST media.
- Reading of CSC/CST media.
- Invalidation of CSC/CST media.
- Contract remote loading on CSC/CST media.
- Delivery of Agent (Staff) cards (CSC media).
- Printing of sponsor background (if required) and customer data.
- After sale functions.
- The TOM is connected to the Central System with Ethernet LAN and/or UMTS network

d. Top Up Machine The TUM is used to reload tickets very fast and in an easy way.

This following functions should be included in the TUM:

- Invalidation of CSC/CST media.
- Reading of CSC/CST media.
- Reloading of CSC/CST media with the inserted amount (Banknote).
- Contract remote loading on CSC/CST media.

The TUM is accepting only Bank notes (cash) and reload the full amount to the CSC/CST without giving any change back. The TUM is connected to the Central System with Ethernet LAN and/or UMTS network

e. The Department requires a service to add value to the E-Card or renew products by Internet. The contractor of AFC will define, create, implement and run an internet service (mobile WAP and www support) to allow reload and renew based on E-Cards ID.

Appreciate mode of payment should be included as there are:

- credit card
- PayPal
- mobile phone provider

All successful reload / renew transaction will be transmitted to AFC administration immediately. AFC administration will distribute all online transaction cyclically (e.g. every 15 minutes to all activating devices (TOM, TVM, TUM, Gate).

AFC Level 1: Inspection/Validation

- a. Station Gates (e.g. Turnstile, Wide gates for Disabled)
 - b. Handheld Validation and Inspection Machine H-VIM
 - c. On-board Validators for Future Feeder Buses (out of scope)
-
- a. Automatic Gates should be used for Fare Control both in BRT station entrances and exits. Gates should be installed in each station such that access to platform and station exits from every possible path should be via the respective control gate (Station design will be provided to AFC Contractor).

At each station entry/exit there is at least one Gate for Disabled & Special Need passengers on Wheelchair (Station design and number of gates will be provided to AFC Contractor).

The gate shall be reversible, equipped for and capable of bi-directional operation.

The fare-gate shall process passengers from both directions after validating their entry using the fare media.

Each fare gate needs to be equipped with validator(s)/Reader(s) for each type of media to be used.

The fare-gate shall process at least 30 commuters per minute. If for any reason the fare media cannot be read automatically using the readers on the fare gate, there shall be an arrangement to manually open the fare gate.

The gate should be capable of allowing free passage (drop arm) in case of emergency.

Fare gate should be able to display the balance when a smart card is tapped against it.

The fare gate shall be able to effectively communicate using Ethernet communication with the server.

The fare gate shall be capable of working in an off- line mode in case of communication network failure.

All mechanical parts of the gate shall have a MTBF of at least 6 Million cycles.

b. Handheld Validation and Inspection Machine (H-VIM)

The H-VIM is to be used as Validation machine as well as inspection machine by mobile conductors/Inspectors, based on Agent/Staff rights.

The H-VIM will be used in the future for the Feeder Buses as Validation machine. The Feeder Bus operator will be responsible for upload/download the data.

The H-VIM is to facilitate the following tasks:

- Ticket Validation as replacement of a Gate in case of breakdown or as support.
- Ticket Balance Check
- Ticket inspection if valid products is used
- The H-VIM shall be connected to the central system through UMTS connection and LAN via Docking station to upload/download the newest parameters.
- The H-VIM shall consist of but not limited to smart card reader, receipt printer, integrated cellular modem, GPS, user interface (e.g. touch screen or screen with keypad), onboard data storage, and battery power supply.

- The handheld shall support the same concept of Check-in / Check-out functionality for the smart cards/tickets.
 - The handheld machine shall allow Authority to transmit data to the central system in real-time using the integrated cellular modem.
- c. On-board Validators or Check-in Terminal (CIT) for Future Feeder Buses (Option)

CIT are installed at the entrances of Feeder Bus to validate mobile Ticketing and electronic cards while entering the Bus.

The CIT should have an integrated customer display for contact less check in using mobile device tickets and RFID technology CSC/CST.

Data loads and unloads should take place using the AVM communication network (on-board unit).

The required performance during communication with fare media and the transaction times (including the deduction process and storage of the modified data on the CSC/CST) should be ensured and proven: Check-in: 150 ms

2.3.4. AFC Level2: Data Concentration / Dissemination

Communications System /Network

The Contractor should provide technical concept describing, in which way he intends to realize the required AFC network. The Communications System /Network Contractor should liaise with a Telecom Contractor approved by the client to ensure proper set up of the network connections.

As a whole, the communications system shall cater to the following requirements:

- Redundant communication links to interconnect
 - Operation Control Centre (OCC)
 - BRT Stations and all ITS Equipment in the station
 - UMTS Connectivity for all Stationary and mobile devices
 - Network infrastructure at all BRT Stations, PoS & OCC

All details are described in Chapter „Communications System /Network”

2.3.5. AFC Level 3: Operators' Administration AFMC

- a. Multi-client capability
- b. Data Management
- c. Tariff Management
- d. Accounting
- e. Reminder and Debt Collection System
- f. Reports and Statistics
- g. Support Functions

- h. Back up and Archiving
- i. Disaster (standby) System
- j. Training centre

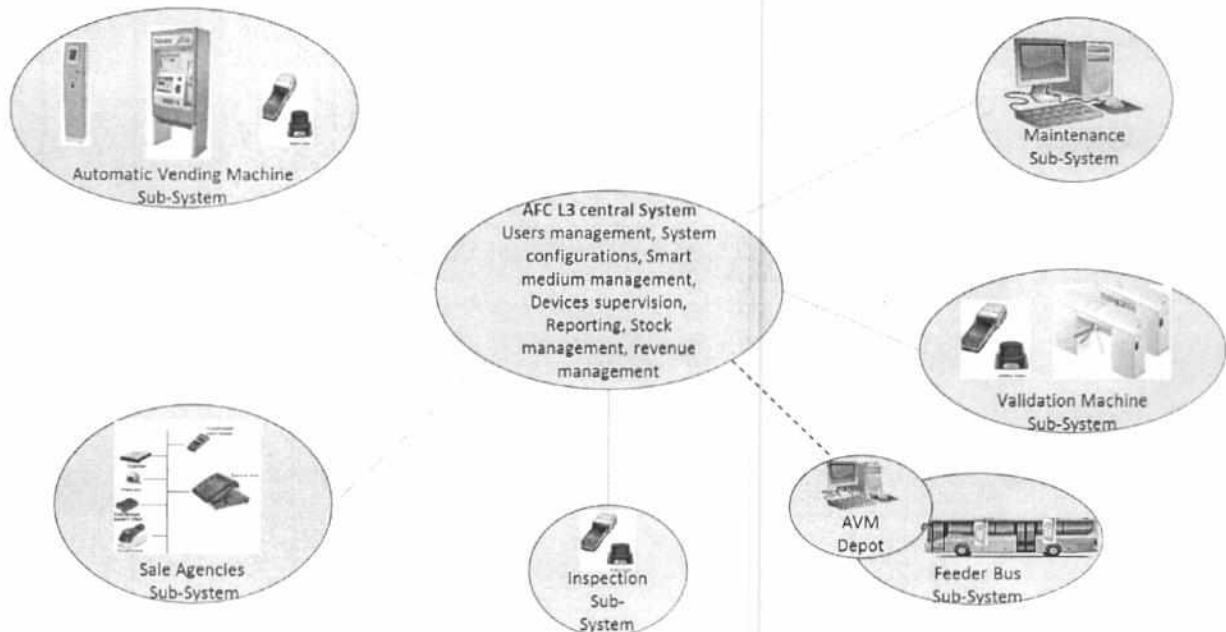


Figure 10: Global organization of the AFC L3 in different sub-system

The Automated fare managementCenter (AFMC level 3) must be designed as a stand-alone solution, independent from any superordinate CCH (level 4) hardware, which can be located at different places at any time.

The AFMC system (level 3) must provide

- exchange of data required for the Central Clearing House (Level4) from all sales Subsystems (e.g. ticket vending machine, ticket office machine, handheld machine, Top Up Machine, gates, etc) and preparation of this data
- flexibility to introduce new fare structures
- transfer of sales data to the Central Clearing House (level 4)
- organization of data exchange between level 3 to all level 1 components
- workstation to analyze AFC data:
 - revenue data (from this AFC)
 - black list data (from CCH)
 - error messages

As part of the Contractor Scope, all Interfaces with AFC L4 and other systems should be well defined, designed and documented in order to be used as standard for future systems.

a) Multi-client capability

The system must be set up for at least 20 clients (e.g. further BRT operators, Feeder Bus operators). It must be possible to add further clients at a later stage.

All data and objects must be stored client-specific in the system. This means that every client should have his own data which cannot be viewed by another client. This should ensure that every client can perform version control for his data independently from other clients.

The client system should allow that each client can configure "his" system independently within the preset options. Within his "own" system clients should be able to manage the privileges for his own employees. The initial parameterization should be specified separately for each client as part of the specification.

b) Data Management

It should be possible to organize and monitor data feeds to the level 1 devices from and within the administration system. It should be possible for each of the below data type to compress the data and to send update data only, e.g. when a new stop element has been added, only this element should be submitted and be added in the data supply of the dedicated component.

It must be possible for each of the below data type to send a new version of each data type separately, e.g. when tariff data has been updated, only tariff data must be sent.

Data feeds to all online sales components should take place via a network connection (level 2) and the AFMC server.

Data flows AFMC to sales sub-systems

- ▶ forwarding data received from CCH
- ▶ tariff data
- ▶ ticket design
- ▶ receipt design
- ▶ white / blacklist
- ▶ personnel list
- ▶ software and parameters

Data flows sales sub-system to AFMC system and CCH

- ▶ sales data (transactions)
- ▶ list of used electronic cards

Data flows sales sub-system to AFMC system only

- ▶ software version data

- ▶ tariff version data
- ▶ error messages and operational logs

Data flow AVM on-board unit to AFC on-board CIT (option for feeder buses for future)

- ▶ status request (heartbeat)
- ▶ IP address onboard computer
- ▶ time stamp
- ▶ vehicle ID
- ▶ current block ID
- ▶ tariff
- ▶ current trip ID (line number, trip number)
- ▶ ID of next station

Data flow AFC CIT to AVM on-board unit (option for feeder buses for future)

- ▶ current state (heartbeat telegram)
- ▶ number of transactions
- ▶ number of verified electronic tickets at each stop/station

Data flow AFC on-board components to AFMC (option for feeder buses for future)

- ▶ check-in transaction data (date, time, ID vehicle, ID block, ID trip, ID Stop, type of ticket, ID ticket, result of verification/validation)
- ▶ software version data
- ▶ error messages and operational logs

c) Management Tariff

The tariff data (e.g. layout, prices) of other transport modes should be imported via the Central Clearing House (level 4) pre-processed (if necessary) and distributed to all level 1 components of the AFC system, automatically.

The proposed interface should allow repeated imports of tariff data. It should be possible for the system to handle at least two sets of tariff data and to distribute these to the points of sale.

d) Accounting

Sales accounting must cover both material and financial data for each point of sale:

The financial accounting process should be able to provide separate figures for the different forms of payment (e.g. cash, electronic payments (e.g. pay with CSC from existing T-purse balance at TVM and TOM), virtual payments (e.g. credit card)).

It should be possible to administrate different thresholds for

- ▶ ticket vending Machines in sales offices
- ▶ ticket office machine in authorized shops
- ▶ Top Up Machines
- ▶ handheld ticket vending machines

An authorized user should be able to view the sales accounting data of certain individual points of sale or sellers/re-sellers at any time.

There should also be auxiliary sales book-keeping for the retail points of sale and for contract customers. The debit entries from deliveries and sales should be balanced against the credit entries from takings that have been paid in and from returned cards. Any differences between the debit and credit entries should be reported as open items.

Open items should be reported to the CCH for reminder / debt collection.

e) Reminder and Debt Collection System

Each client of the AFC should be responsible for payment reminders and debt collection related to

- ▶ client's costumers
- ▶ client's re-sellers.

Accounting for Electronic Payment Systems

Standard Accounting

Journeys made using prepaid electronic cards (T-Purse) should be paid for as they are taken (deduction from the card).

Clearing for Electronic Means of Payment

Debits from credit, debit or ATM cards should be possible at shops, sales offices, internet or ticket vending machines. They should be collected by AFMC system and passed on to a clearing service.

f) Reports and Statistics

The reporting functionalities should allow reports customized by each client with its client's data. See requirements mentioned in CCH (level 4).

g) Support Functions

Data Exchange with External Systems

Data export to external systems should take place via a separate relational database providing a SQL interface. This should allow at corporation level for visibility for all data.

Tariff Data Maintenance

The tariffs and prices should be defined in cooperation with all partners within the client and be implemented by CCH. Tariff data should be imported from there.

At the System and Data Maintenance Workstation, it should be possible to define which paper / mobile device ticket tariffs / electronic card types can be sold at each type of point of sale.

The current definitions should not limit the scope for future decisions.

Technical Statistics

The Client must be able to define groups of devices and errors (e.g. malfunction of TVMs) and assign actions to them:

- ▶ generate SMS
- ▶ generate e-mail

to initialize system maintenance support automatically.

System Support

Layouts of Text Templates

A suitable text editor should be provided for processing text templates (e.g. for invoices, payment reminders and payment demands), to allow authorized users to modify the templates to meet changed requirements. It should be possible to import text templates from Microsoft Word.

User Administration

The user administration functions should allow the system support staff to create, modify and delete user IDs for all users including but not limited to sales and service personnel.

Management of Blacklist

The blacklist must be shared with CCH. The blacklist issued by the CCH should be imported and used at all points of sales (sales sub-systems including ticket inspection machines).

Online points of sale should always have access to the most up-to-date version of the blacklist.

Management of Personnel List

It should be possible for the users to enter names and PIN of staff into personnel list.

h) Back up and Archiving

See requirements mentioned in CCH (level 4)

i) Disaster (standby) System

A fully functional second server (disaster) system must be provided as a 'warm' standby solution which will be installed at a separate place.

The Contractor must deliver all hardware components needed (e.g. server, router, cabling, UPS, software, communication) and achieve the functionality of both the production system and the Disaster Recovery System.

The client will provide an appropriate space in a building (the requirements to be specified by Contractor) and the communication net needed.

As a minimum the following functionalities must be included:

- ▶ disaster server in warm standby
- ▶ data synchronization every hour
- ▶ manually switch to realize failover
- ▶ all connections will be re-routed automatically and are available without rebooting affected devices

All servers must synchronize their clocks cyclically.

j) Test and Trainingcentre

The contractor shall propose On-the-Job training covering all ITS system including the subject of installation, operation, assembly, troubleshooting and maintenance of hardware and software.

Such training program must include theoretical and practical parts. Respective administrative, operational, maintenance and repair manuals for components together with system operating manuals must be submitted to Department.

All manuals, operation instructions and training materials for administrative and sales staff and service staff at bus depots / workshops must describe the processes so extensively and in such detail, that they can serve as a basis for development of computer based training programs.

Hardware and Software for testing of equipment and system components, is included in the scope of delivery:

1. Test system Standard-Server for testing new software before installation in the Production System.
2. Static ITS Test area

The Contractor must supply a test station at Department for the testing of system components functions, especially the central system functionalities. This test station will simulate a component logged in / onto the system and can be used to install new software for tests before installation in the production system. This station must enable connection to test the correct functioning of the logged-in system components. Regarding test of subcomponents (e.g. all ITS equipments and interfaces), there will be a connected ITS Test area including all components.

In addition to the Testsystem Standard-Server, there will be an ITS Test area in Department including all components of all ITS systems:

- to test software and hardware of components before delivery in the production system
- to test functionalities and errors of the system
- to have additional training facilities

It must be possible to operate the components of the ITS Test area in the production system.

2.3.6. AFC Level4:Central Clearing House (CCH)

- a. Card Management
- b. Smart Card Personalisation Centre
- c. Supervision electronic card stock
- d. Key Management System (KMS)
- e. Initialization electronic cards
- f. Management of Tariff
- g. Management Layout
- h. Management Revenue
- i. Marketing
- j. Customer Care
- k. Customer Database
- l. Mobile Ticketing Service
- m. Customer care Web Portal
- n. Back up and Archiving
- o. Disaster (standby) System
- p. Reports and Statistics
- q. System Support
- r. Interfaces
- s. Equipment Management
- t. Test and Training centre

The CCH defines the businessrules that will be valid for all AFMC L3 systems under its umbrella. The businessrules will manage aspects such as

- ▶ Definition of roles
- ▶ Definition of actors
- ▶ Definition of processes
- ▶ Definition of Business cases
- ▶ Debit management
- ▶ Authentication rules for clients and users
- ▶ Customer service processes
- ▶ Dunning regulations

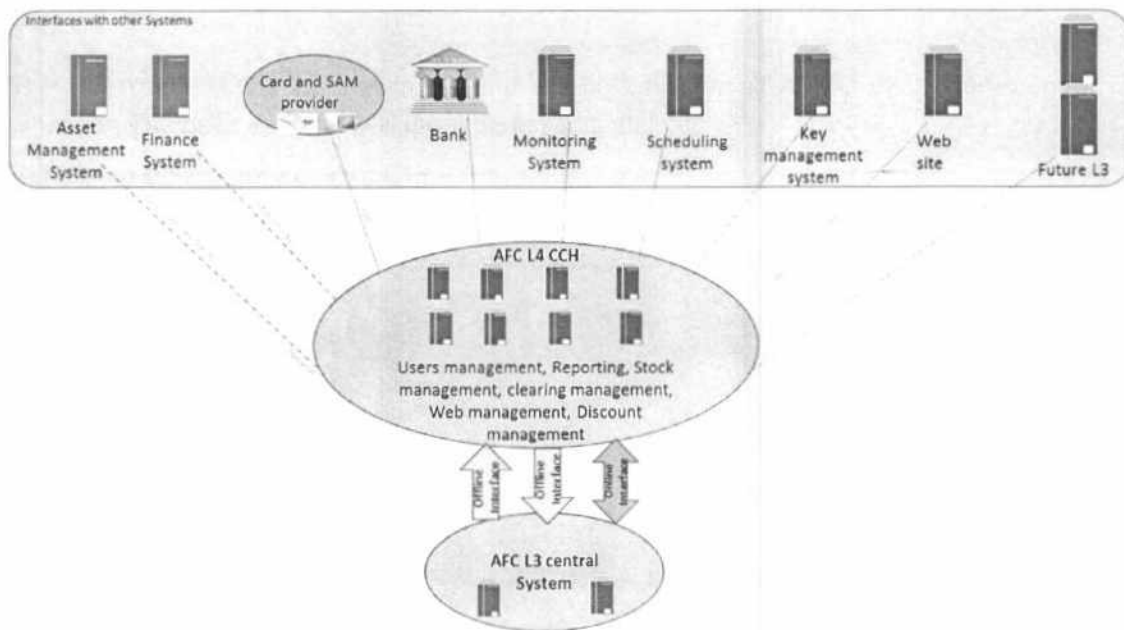


Figure 11: Global organization of the AFC L4 and the external system

The Central Clearing House System (CCH) will be a core element of the Karachi Public Transport (PT) payment system. The CCH must provide all necessary parameters and upload transaction services for clearing and settlement. This way the department is convinced that a smooth growth can be realized even if new Public Transport Operators will play an active part in Karachi's Public Transport Service. The CCH should work like a bracket around all participating Public Transport Operators. It will be located in the Operation Control Center building (OCC).

The CCH must support the following main functions:

- ▶ CCH interfaces
- ▶ Transaction Management
- ▶ Card Tracking Management

- ▶ White-List / Black-List Management
- ▶ Media Stock Management
- ▶ Parameter Management
- ▶ Product Management
- ▶ End of day Management
- ▶ Report Management
- ▶ Security Management
- ▶ Equipment Management
- ▶ Backup and Archival
- ▶ Network Management
- ▶ Clock Synchronization
- ▶ Bank Top-up
- ▶ Clearing and Settlement
- ▶ Operator / Service Provider Management
- ▶ Tariff
- ▶ Patron Management
- ▶ Customer Care
- ▶ Marketing

In the following the required hard- and software elements and functionalities needed are described.

a) Card Management

The CCH should contain the master database of all cards available in the system. Each individual card should have a unique identity and be tracked from its initialization till its termination whereby it is deactivated in the database.

The CCH should create the master record upon initialization and update the status of the cards including the purse value/loaded products, status and other information using transactions that is uploaded to it (e.g. transaction sequence number, last date and time used).

b) Smart Card Personalisation Centre

The smart card personalisation centres shall be used to personalise CSC using the AFC system application.

Smart Cards shall be issued using the Smart Card Personalization Work-station setup (if required).

The software interface shall be such that all accessories connected to the set-up shall work

as an integrated module capable of performing all smartcard functions. The Smart Card Personalization Workstation shall be integrated with the following minimum accessories:

1. Camera for taking photo of customer
2. Smart Card Personalization Printer
3. Document scanner to scan back-up documents which shall be tied to the account
4. Smart card revaluing device for updating details on smart card
5. Digital pen for capturing signature of the user
6. Display Unit for the user

All accessories shall be integrated with a software interface and activated through this interface only.

c) Supervision electronic card stock

The CCH should be equipped with a stock management utility which helps the CCH Operator to track smart Cards/tickets stock movements in the system from the point where a CST/CSC is purchased, prior to the initialization to its issue to patrons.

d) Key Management System (KMS)

To secure revenue all transaction data must be encrypted. The CCH should provide a Key management system (KMS) which is responsible for the generation, maintenance and secured storage of all cryptographic keys, system key materials and security variables. The system should be provided including the management of keys and certificates from its birth to death. It should also handle the initialization (including key injections) of security components of the system such as Secure Access Module (SAM). Every involved device (data centers, TOM, TVM, H-TVM, H-VIM, TUP, Gate, C/T) must be equipped with a SAM.

All keys should be managed in a Key Management System (KMS). This KMS must be designed as a stand-alone system (not included in any network). The KMS should preferably be a standalone sub-system located at a physically secured area. The injection of all new SAM chips should be done in the KMS before they are deployed to the CSC/CST equipment.

e) Initialization electronic cards

Electronic cards must be initialized before being issued to the participating Public Transport Operators.

In standard cases, the mass initialization and mass personalization should be managed by the card manufacturer.

But the AFC contractor should provide three Card Printers including Initialization and Personalization Unit additionally to the one to be integrated in the Development and Training Centre, which can be used to produce CSC and Drivers/Staff ID cards.

f) Management of Tariff

The CCH should be equipped to manage all interoperable products, the corresponding parameters and allocation of Product IDs among product owners.

The CCH should allow configuration of each product according to the requirements agreed by the CCH Operator and corresponding Operator.

Tariff Structure

The CCH system to be provided should facilitate modification of system operating parameters that can be subject to a future change, allowing the Employer to change their fare policy in an easy and secure way. The CCH to be delivered must cover the following features to ensure smooth integration of the dedicated or future tariff system:

- ▶ It must be possible to realize a kilometer based tariff (planned distance between stop and stop or distance Bands (e.g. a Band is 10km) which cover different stops) or to combine a tariff structure with a time criteria (e.g. trip covers a distance of different distance bands but not longer than 30 minutes).
- ▶ It must be possible to realize a time based tariff (e.g. time elapsed) or to combine a tariff structure with a time criteria (e.g. short trip covers a distance of one stop point but may not take longer than 15 minutes).
- ▶ It must be taken in to account that – especially if different Public Transport Modes are involved – transition times must be included to check validity of tickets.
- ▶ The fare system should be extendable to both based on stop/station to stop/station and zonal system with provision for direction based issuance for each type of ticket.
- ▶ The fare may derive from
 - Time period: Peak and Off-Peak periods
 - Days of the week should be classified
 - Assigned fare for a particular journey

Tariff Database

The tariff should be stored in a database in a structured form. At least it must be possible to store up to 10 versions of tariffs.

CCH should distribute tariff data to all participating AFCs.

Products

It should be possible to sell all fare products defined in the interoperable system (passengers can freely change between different operators and modes of transport).

All types of tickets should be sold at full price as well as at reduced price (e.g. children, special needs or retirees). There should also be a chance to offer special fare tickets to special client groups (e.g. soldiers, workers, students).

For internal use, a Staff/Employee Pass and a Test Pass (with production key) should be available.

g) Management Layout

A suitable graphic editor should be provided for the design and processing of the layouts of the printed receipts or electronic card layouts.

It should be possible to process and manage several different layouts including a Staff/Employee Pass, Test Ticket, reduced price CSC layout. It should be possible to import logos and pictures (at least in standard formats like GIF, TIFF, JPEG) and to combine this with text. It should be possible to use different fonts in one layout.

h) Management Revenue

Supervision Collection Revenue

CCH should become the central node for all incoming revenue. A detailed reporting system regarding revenue from the different sources should be delivered, as there are:

- ▶ AFMC systems (PT operators)
- ▶ CCH's own internet portal
- ▶ Re-sellers or similar

Supervision Collection Transactions

Reported transaction from the participating AFMC systems/PT operators should give a clear picture which role a Public Transport Operator, a Public Transport Mode or a route plays related to the overall Public Transport performance in Karachi.

Supervision Performance Criteria

Reported transactions and additional data as performed Public Transport performance, timeliness, soft quality parameter as customers' satisfaction and / or cleanliness should be available to be used to define a Performance Criteria to measure Public Transport Operator performance and to compare from check to check his effort to increase his performance.

Calculation Split of Revenue

CCH must be able to split revenue between operators based on the following parameters at minimum:

- ▶ revenue captured per each partner of the department AFC concept in their own point of sales
- ▶ revenue captured by common portals (e.g. mobile device ticket or internet)
- ▶ revenue captured by re-sellers
- ▶ common costs
- ▶ performance indicator per each PT operator
- ▶ adjustment factors to compensate special efforts
- ▶ by line e.g. 11, 12, 13

- ▶ by Mode e.g. BRT, Community, Circular, Feeder
- ▶ by product e.g. T-purse, weekly pass, monthly pass
- ▶ by number of passengers
- ▶ by validation and check In/Check out (balance, distance, etc.)

The CCH should also be responsible for collating and maintaining daily position with each individual account.

To be able to clear between different Operators of different Lines, there must be a tool to calculate, which exact trip has been chosen:

- ▶ Input: Check-In Station X and Check-Out Station Y from Gates
- ▶ Output: Trip Line A from Station X to Station Z and Line B from Station Z to Station Y

i) Marketing

CCH supports marketing with statistics regarding Public Transport request. A differentiation regarding

- ▶ Mode of Transport
- ▶ Routes
- ▶ Regions
- ▶ Products, Tariffs, Services used
- ▶ Relation between received revenue and performed Public Transport Service should be possible.

Especially statistics before and after activation of e.g. a new route or tariff must be provided.

j) Customer Care

The OCC will include the central point for managing customer contacts, which must be delivered by the Contractor. Contacts will be done by:

- ▶ Telephone, Internet Enquiries, E-mail
- ▶ SMS, Facebook & Twitter
- ▶ Written comments and complaints
- ▶ Customer Relationship Management

The Customer Contact Center should manage the flow of information into and out of this unit so that:

- ▶ The most up to date service information of the whole PT systems is available to customers e.g. by web access
- ▶ Individual complaints can be investigated and resolved

- ▶ Customer contact trends can be identified and acted upon

The Customer Contact Center should consist of information workstations where all Information (BRT, relevant other information such as Airport information, some Touristic information) should be available. The access should also be possible via web access.

k) Customer Database

Data entered into the customer database should immediately be made available for all other transport modes and partners in Automatic Fare Management Center (AFMC) via CCH.

All users should be able to process customer data independently. When a record is being modified by a user, this record must be locked for all other users of the CCH customer database.

Reminder and Debt Collection System

CCH should manage payment reminders and debt collection to

- ▶ CCH's customers
- ▶ CCH's resellers

l) Mobile Ticketing Service

The department intends to offer a Mobile Ticketing service for the passengers. Therefore, the AFC system must provide a Mobile Device ticket system. The Contractor must design, develop, coordinate, integrate and operate the Mobile Ticketing. Detailed concept and study should be delivered by the Contractor during the System Design Phase.

The back office Mobile Ticketing Service should

- ▶ be able to search for various customers according to search criteria
- ▶ Display invoices, sales, history of activities (e.g. blocked numbers, change password)
- ▶ Receiving feedback (e.g., by phone or email)
- ▶ Resubmit contacts
- ▶ Temporary deactivation, activation of a customer account
- ▶ Transmission of software or unlock codes to customers
- ▶ Processing of claims and payments including Preparation of letter of formal notice
- ▶ Cancellation of tickets (prior to settlement)

m) Operation Customer Portals (Customer Web Portal)

The department requires a service that customers can add value to the CSC (T-Purse) or renew products (Time Range pass products) by Internet.

The AFC Contractor should define, create, implement and run an internet service to allow reload of 'T Purse' or renew 'Time Range' based on CSC's ID only, which also should be available in a user friendly way on smart phones.

Appropriate mode of payment should be included as there are:

- ▶ Credit card
- ▶ PayPal
- ▶ Mobile phone provider (which are available in the market)

All successful reload/renew transaction should be transmitted to AFC administration immediately. AFC administration should distribute all online transaction cyclically (e.g. every 15 minutes to all activating devices (e.g TOM,TVM, TUM).

n) Back up and Archiving

A suitable backup and archiving program should be available for all data in the system, and should be installed at least at 2 workstations (system and data maintenance workstations). If certain data and/or data of a certain time period should be played back, the tool should support the user (operating personnel) to locate the files which need to be played back. With the help of the tool it should be ensured that always a complete and consistent database will be restored.

The tool ensures a user-friendly operation.

Back up

The Contractor should supply the CCH with sufficient resources (e.g. hard disk, tapes) for performing disk-to-disk backup on a daily basis. The online database backup should be done within one hour.

The Contractor should ensure that a complete restoration from this backup is possible within one hour.

On-line data should be stored for at least 30 days.

Archiving

It should always be possible to move data and associated protocols (archive) to avoid an overflow of the database. When archiving data, the data is deleted from the database and archived accordingly. Archiving of data should be structured as in the form of full versions or in the form of time slices.

It should be possible to archive the data in addition to supply all types of data, such as,

- ▶ Data Supplies
- ▶ Current data (recorded data)
- ▶ Raw and evaluation data
- ▶ System Logs

There should be an automatic warning message if the database is threatening to fill up. With the warning threshold and the type of message should be possible to establish parameters.

It should always be possible to restore archived data by specifying a time period and data type e.g. run further analysis. During replay, the data from the current database should not

be deleted. The recovery of the data should be structured. It should be possible to identify the played back data and to remove it completely after use.

Off-line data should be stored for at least 5 years.

o) Disaster (standby) System

A data and application server for a client / server system should be installed that fulfills the functional requirements. This server should have a communications interface that includes all the components needed for safe transmissions and for the requirements of the customer database.

A fully functional second server (disaster) system must be provided as a 'warm' standby solution which will be installed at a separate place.

The department will provide an appropriate space in a building (the requirements to be specified by Contractor) and the communication net needed.

At least following functionalities must be included:

- ▶ disaster server in warm standby
- ▶ data synchronization every hour
- ▶ manual switch to overcome the failure
- ▶ all connections will be re-routed automatically and are to be available without re-booting affected devices (e.g. AFC, internet services, bank interface)

All servers must synchronize their clocks cyclically.

p) Reports and Statistics

The reporting functionalities must allow reports customization by selecting the data captured in the sales system (e.g. Public Transport Operator, point of sale, sales transactions, customers) according to a variety of criteria (e.g. date, type of ticket, type of customer, point of sale), to sort it, to export it into files and to print it out in form of lists and diagrams.

In minimum, the level of reporting functionalities for the AFC system must include the following reports per every defined period of time (e.g. it should be possible to group or summarize results by days or weeks) but not limited to

- ▶ revenue report (e.g. per point of sale, per type of vending equipment)
- ▶ transaction reports (e.g. customer transactions related to electronic card)
- ▶ cash collection / sales report based on
 - ▶ type
 - electronic cards (issued by CCH)
 - mobile device tickets
 - ▶ per device and groups of devices
 - per location (and groups of locations)
 - per Point of Sales (and groups of Point of Sales)
- ▶ asset report based on

- ▶ Electronic cards (issued by CCH)
 - e.g. BRT (and groups of operators)
 - per reseller (and groups of resellers)
 - per Point of Sales (and groups of Point of Sales)
 - and free configurable sets
- ▶ inspector activities report
- ▶ Passengers Origin / Destination Matrix Report

The reporting / statistic tool must be able to handle different tariff data in parallel

- ▶ to compare revenue before and after update of tariff
- ▶ to calculate revenue in the past (last year)
- ▶ to calculate revenue correctly even when a tariff was changed within the report required time period

The CCH should be designed to operate, accept and process sales, refund and usage transactions even during its End-of-day process.

q) System Support

Data Exchange with External Systems

Data export to external systems should take place via a separate relational database providing a SQL interface. This should allow at corporation level for visibility for all data.

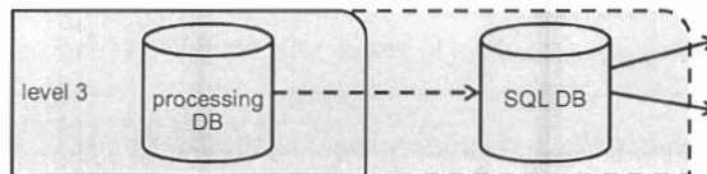


Figure 12: Exchange of data through separate SQL DB

▶ Microsoft Office

It should be possible to export the accounting data (reports and statistics) to Microsoft Excel and further Finance software.

It should be possible to import text templates (e.g. for invoices, payment reminders and payment demands) from Microsoft Word.

▶ **Administration and Reporting System (ARS)**

All data, reports and statistics should be exported to a central ARS (e.g. Crystal Reports or similar).

▶ **Finance System**

The possibility to integrate the AFC system with the department PT Finance must be possible.

► **Central Clearing House**

CCH should cover all independent AFC, maintaining all personalized customers, splitting revenue, if intermodal journey were undertaken and more.

r) **Interfaces**

The CCH will be interfacing with each Level 3 system (AFC) of operator or PT system with AFC-Central Systems (AFMC) and Finance Institutions.

Through the interface with AFMCs, the CCH should:

- Gather CSC/CST usage transaction
- Provide system or global parameters
- Provide date / time information for synchronization
- Response to TOM requests for refund and replacement
- Response to TOM/TVM requests for Bank Top-Up

Through the interface with TOM, the CCH should provide information for processing CSC refund, replacement and top-up request

Network Management

The CCH should be equipped with the necessary network equipment and peripherals to establish a Virtual Private Network (VPN) with the Operator AFMCs.

Transaction Management

The CCH should only process ticket usage transactions uploaded to it by AFMCs. The Contractor should design and propose the format and content of the transactions including the protocol to ensure that there is no loss of data during the transfer and recovery of data if there is corruption during the transmission.

CCH should validate each uploaded transaction to ensure its validity, authenticity and accuracy.

In degraded mode CCH should be able to manually import transaction files as an alternative means of placing transaction files into the CCH.

CCH should also receive summarized usage information from the AFMC and it should consolidate the summaries from all AFMCs.

Bank Top-up

Part of the contractor scope to build, manage and maintain a Bank Interface.

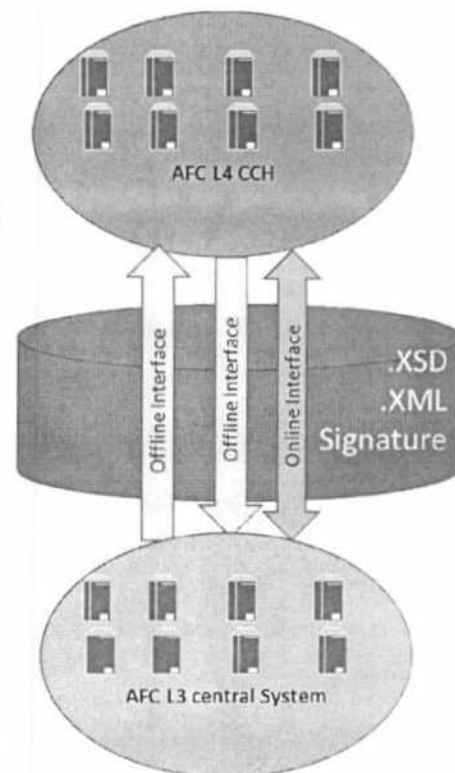


Figure 13: L4-L3 Interface

The CCH should provide a Bank Top-up feature. In essence, the customer should be able to apply for such feature to be incorporated into his card.

Upon approval by the bank, the customer should be able to configure his card in order to be able to top-up his card by presenting it to a TOM/TVM.

The system should allow the creation, deletion, modification of accounts that link the bank account with the card. The data captured should be agreed with the bank in order to allow debits from the bank account.

Through the interface with Banks, the CCH should:

- ▶ Send Bank Top-up application requests
- ▶ Receive Bank Top-up application response
- ▶ Send Bank Top-up debit requests
- ▶ Receive Bank Top-up debit response

s) Equipment Management

The Equipment management at the CCH should allow the CCH operator to define new equipment type and new owners for the system. The CCH should manage and initialize all equipment IDs and associated SAMs for BRT and other public transport equipment.

t) Test and Training centre

Hardware and Software for testing of equipment and system components, is included in the scope of delivery:

1. Test system Standard-Server for testing new software before installation in the Production System.
2. Static ITS Test area

The Contractor must supply a test station at Department for the testing of system components functions, especially the central system functionalities. This test station will simulate a component logged in / onto the system and can be used to install new software for tests before installation in the production system. This station must enable connection to test the correct functioning of the logged-in system components

In addition to the Test System Standard-Server, there will be an ITS Test area in Department including all components of all ITS systems:

- to test software and hardware of components before delivery in the production system
- to test functionalities and errors of the system
- to have additional training facilities

It must be possible to operate the components of the ITS Test area in the production system.

2.3.7. Bus Operation Management System: AVM

2.3.7.1. Planned Network and operational data management

Allowing the AVM, AFC and other ITS bus operational systems to work, requires an accurate data provision of network data. Sample of data required (but not limited to):

- operating calendar and day-types,
- route definitions & precise route alignment,
- precise stop and operating point definitions with internal and external (public) names

Further common data is required to be defined centrally, like:

- definition of on-time/late/early in the system
- headway parameters,
- dwell times parameters
- passenger announcements parameters and contents,
- operational layovers parameters
- legislative restrictions
- Depot data
- Vehicle Data
- Driver data

Most of the data is typically geo-referenced, so the potential bidder needs to provide editing and planning tools along with visualization tools and required base data, allowing to edit & present the data, to several stakeholders.

As a matter of fact the provided solution shall be able to report the planned schedule and KPIs for approval processes, before the export to the test and operational environment will be initiated, so the export process is a managed process.

Local special situation should be covered, e.g. the short notice shifting of holidays or special events.

The System must support to plan service replacement services and detours to maintain several operational scenarios in the database, following international best practice setups.

In view of the Karachi Mass Transit network the overall capabilities should allow the system to segregate the different operators responsible for the individual BRT corridors in matter of data entry, distribution and management.

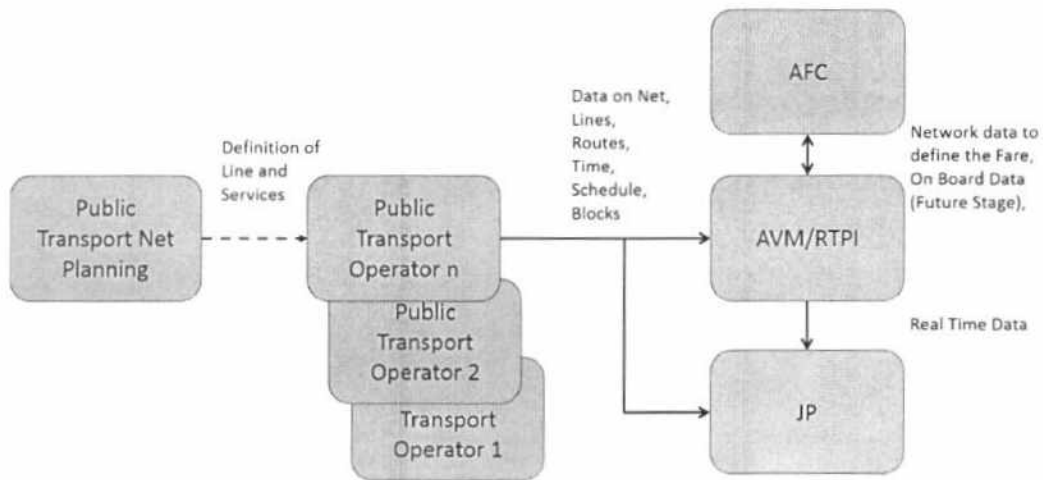
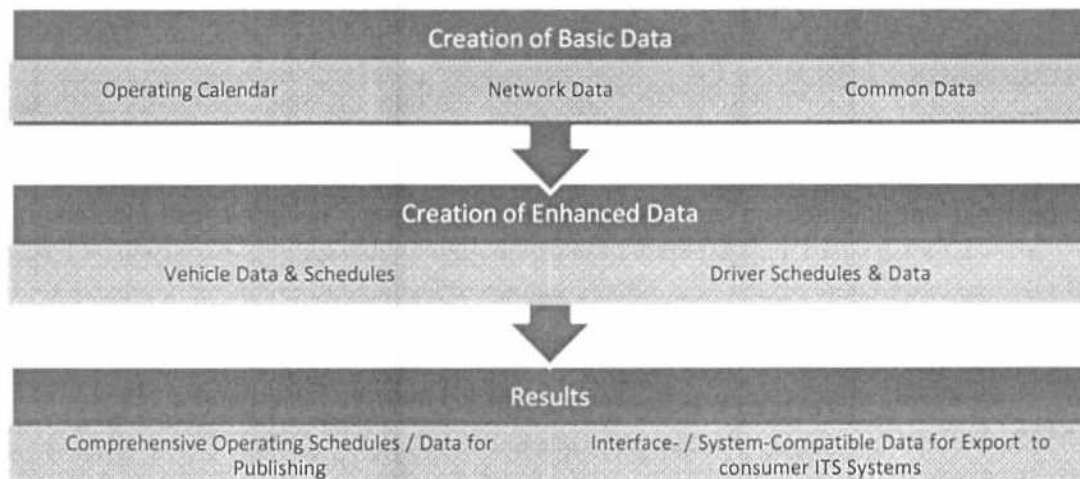


Figure 14: Central Role of Public Transport Net planning

As the department aims to operate one comprehensive Public Transport (PT) system covering different modes of transportation possibly using several Public Transport Operators (PTOs), several systems will exchange data online and in real-time to ensure a smooth and comfortable transportation service. This includes services provided by the planning tools, which is interfaced with the Automatic Vehicle Management, Automatic Fare Collection, Real Time passenger and the Business Intelligence System.

The department plans to establish one planning center for all Public Transport modes

- ▶ to define the Public Transport Network
- ▶ to provide combined Public Transport Net, time tables and blocks to all involved ITS subsystems.



Part of the contractor Scope is to define, develop, document and maintain the Planning interfaces for data import and export which will be standardized to be used all future services & modes, allowing the expansion of the network smoothly.

The Journey Planner (JP) is out of scope of the Contractor.

2.3.7.2. AVM and Real Time Passenger Information System

The AVM & RTPPI system will be the tool used by Bus, ITS operators and the department to central and decentralise monitor and manage the bus operations. This includes features for manually or automatically actively influence the operation instruction & information systems to drivers and passengers allowing maintaining or restoring the service quality, reliability and information and identify and resolve operational exceptions in an easy manner.

The components of the system are summarized as following:

- a. Central System Hardware and Software
- b. Real time passenger information central software and Hardware
- c. Visualization Systems GIS based
- d. Automated and Manual Reports- and Statistics system
- e. Smart Bus / Vehicle on-board unit connected via radio to the central systems
- f. on board passenger information displays
- g. on-board interface to the announcement, vehicle and CCTV system for remote control

The System should be scalable to match increased future Operational Requirement for the whole city of Karachi.

The AVM system follows a "levelled" architecture, similar to the AFC system mentioned above:

- ▶ Level 0: Basic Equipment including all pre-installed equipment in the vehicles and further devices to be controlled and interfaced by the AVM on-board unit controller.
- ▶ Level 1: AVM on-board unit including all additional parts required and all functionalities to control Level 0. The onboard unit will be the communication tool of the driver with the Central Dispatching and provide all necessary real-time information and services to ensure service continuity, quality and safety
- ▶ Level 2: Communication between AVM on-board unit and OCC, communication between RTPPI server and RTPPI displays, communication between all central units (AVM server, RTPPI server, workstations), communication via interfaces (e.g. AFC). Communication between central units (AVM server, RTPPI server) and client units (Vehicles AVM on-board unit, RTPPI displays) is based on GSM/GPRS/UMTS/LTE, WLAN and optical fibre LAN communication.
- ▶ Level 3: Back-office hardware and software to manage Level 0-2 devices and services. As in future different L3 can be integrated from multiple vendors, open interfaced with Level 4 need to be provided to ensure unification of services. This includes professional, workstations for L3 data management, dispatching and passenger information.
- ▶ Level 4: Hard-, Software and services to realize the centralized operational control in the Operation Control Center (OCC). This includes, professional workstations for L4 data management, dispatching and passenger information. As well extensive data management applications, import and export interfaces, real-time interfaces with multiple L3 systems and other Level 4 systems, a real-time data platform to perform the unified

passenger information and overall intermodal and inter BRT-service operational alignment, as well as a significant statistics back-office.

- ▶ As communication medium between the Vehicles and the central side, the vehicles and the depot (depot management) and the vehicle and the stations (passenger information) standard radio network such as WLAN, 3/4G should be used, alternative options can be evaluated. The contractor needs to build up the communication network in coordination with the GOS IT Network provider and needs to follow latest international standards in regard of data security, performance and reliability.
- ▶ The RTPI system needs to include follow common standards from other installations worldwide and use suitable displays and other technologies to inform the passengers, automatically and manually from the central system. It should use audio and visual announcements. As an option a web-based service needs to be provided to publish real-time arrival & departure information externally. The variety of display to be available should include station overview displays, gate and signage displays.

The following table illustrates the approximately number of devices required for the green& orange Line Project:

Device	per Station	Per Bus	in OCC for test
RTPI displays (LED, LCD)	3	n/a	1
RTPI On-board displays	n/a	2	n/a

The proposed AVM system needs to represent a system which is characterized by an appropriate command structure with a high degree of integration, and with a minimized number of interfaces.

The AVM package should include all AVM hardware and software components in the OCC and in the vehicles (as an option) and the Real-Time Passenger Information System with its back-office and the displays as a scalable option.

Furthermore, this package should include the communication and the data management for the AVM system.

The system has interfaces to be delivered to the Automated Fare Collection system (AFC). The functional and technical aspects of all these interfaces have to be taken into account in the AVM concept.

As an additional main component (as an option for Future) a BRT Prioritization system (BP) at junctions needs to be integrated into the AVM System.

The AVM system will provide the necessary control instruments for the daily operations at Supervision & Management level. The system must be of a modular structure to allow phased introduction and to ensure that the system is open for expansion as well as for the implementation of new developments.

To facilitate communication with other applications within the Karachi IITS environment, the AVM must be able to integrate with the other solutions easily. For this, it is important to have a system with integration architecture based on open interfaces or standard interfaces serving the purpose and user-friendly user interfaces.

The characteristics of such an AVM System are:

- ▶ functional, user-friendly and well-arranged overviews for the dispatchers
- ▶ fast and easy automated functionalities for the drivers including communication
- ▶ reliable passenger information
- ▶ open interfaces for further supplemental systems and operators
- ▶ integration of and interfaces to other ITS systems
- ▶ easy integration in future traffic management for BRT Prioritization (interface)
- ▶ variable statistics on AVM data base
- ▶ Ease of data and content creation in a multicultural environment
- ▶ Central identification of system malfunctions and operational issue tracking

The GOS is looking for a future proof solution which can serve as a backbone for the overall PT network of Karachi in regard service quality control & improvement, of real-time data management and passenger information for many years to come.

It is essential to remark that the potential contractor needs to provide extensive knowledge transfer & training services to ensure the system is used in the appropriate manner.

Further he has to create the first data supplies for the system including operational data setup, so the testing, start of operation and operations in the first 6 months of operation is fully covered by the contractor. GOS might decide to include the L4 system operation, which include data provision and management under the scope of the ITS contractor.

The contractor under this contract will be in charge to provide all devices form L0 to L4 for the green line and orange line.

2.3.8. Business Intelligence and Analysis System (BIAS)

The Business Intelligence and Analysis Software will provide an invaluable tool for management planning, monitoring and improving efficiency of operations and planning for expansion.

1. BIAS will provide tools for:
 - a. Developing most efficient bus schedules based on historical data
 - b. Planning for changes in fare policy
 - c. Planning and improving efficiency of maintenance programs
 - d. Forecasting revenues and expenses
 - e. Monitoring Key Performance Indicators (KPIs) for monitoring the performance of contractors and service providers in the BRTS operation.
2. BIAS will be a software system based on advance machine learning and statistical analysis algorithms. It will interface with multiple elements of IITS to gather large amounts of data for analysis.

As part of the assignment, the Contractors are to undertake, but not limited to, following activities related to Business Intelligence and Analysis Software development:

- a. Analysis of BRTS Business processes for data gathering
- b. Identification and selection of key data elements
- c. Identification of key Data Sources
- d. Identification and selection of Machine Data Sources to be recorded by BIAS
- e. Identification and selection of Enterprise Data sources to be recorded by BIAS
- f. Identification and selection of Transactions to be recorded by BIAS
- g. Development of interfaces with other elements of IITS for data gathering
- h. Design of Analysis Reports
- i. Design of Visualization tools and graphical reports
- j. Selection of state of the art BIA algorithms according to the specific need of IITS
- k. The overall design of the BIA software.
- l. Hardware procurement and installation at OCC for BIAS.
- m. Deployment of BIAS at OCC.

2.3.9. Bus Depot Management System

The Bus Depot Management System aims to facilitate efficient operation of Bus fleet by providing IT tools that enable effective maintenance and operation control at Bus Depot. The Bus Depot Management system is supposed to facilitate the following:

1. Parking Management
2. Maintenance Planning
3. Refuelling Management
4. Inventory Management
5. Bus Depot Human Resource Management
6. Driver Training

The Bus Depot Management system will work in close coordination with the OCC and have defined links and interfaces with the OCC software.

As part of the assignment, the Contractors are to undertake, but not limited to, following activities related to Bus Depot Management System:

- a. Develop an efficient parking management system with occupancy sensors, indication boards, and parking space & route allocation algorithms. The parking management system should be able to handle one bus leaving and entering the depot every minute or even less.
- b. Develop Refueling Management system: To manage the refueling of a fleet of about 200 buses. Develop refueling schedules under normal and exigency situations. Occupancy management of refueling stations. Communication of refueling instructions to drivers.
- c. Develop a Maintenance Management System which will generate routine maintenance schedules, lube and filter change schedules, manage the maintenance resources (maintenance bays, human resources). Record and report breakdown instances.

- d. Develop Inventory Management System: Manage inventory of fuel and other consumables. Manage spare parts inventory. The inventory management system may be developed for mobile devices and may allow inventory management through mobile interface.
- e. Functional and performance testing of all the above modules.
- f. Interfacing of Bus Depot Management System with OCC and BIAS for reporting and analysis.
- g. Establishing driver training center

Package B

2.3.10. OCC and Visualization System

The GOS is constructing in parallel to this project a new Operation Control Center (OCC) facility. As this facility will serve multiple stakeholders and services the contractor needs to provide the following deliverables to provide a unified integration:

1. Quality IT furniture to serve the operational requirements on reliability, ergonomics and safety for the OCC room and adjacent operational offices.
2. Design, Electrical & IT Integration of an Audio & Video visualization system
 - a. Based on 2 videowalls and up to 10 TFT/OLED flat screens to be installed in the building
 - b. To visualize and manage the following contents on
 - i. From any CCTV camera connected to the ITS network, using standard protocols and integration
 - ii. Information available on the desktop of any selected workstation within the ITS network in the OCC
 - iii. from any web-based service provider (internet pages, streaming, RSS, twitter, facebook, google, etc.)
 - iv. IP based, satellite and terrestrial television
 - v. in an appropriate visual speed and quality with extensive flexibility on security access levels and formatting of the layout.
3. Security Control System & Access Control System to prevent unauthorized access to building and its facilities with user management software and hardware based on smart cards and biometric detection.
4. Public/Building Announcement System for all offices for Emergency procedures or Special Events
5. VoIP based PBX / Intercom System with desktop and mobile units for the OCC, which will be interlinked with the GOS PBX and the ITS systems if applicable.

The contractor will require to liaise with the OCC building contractor to provide a smooth integration of all required systems and furniture in the architectural design and perform all necessary task to complete the setup.

The following table illustrates the approximately number of devices required for the green & orange Line Project:

Device	in OCC	Per Depot
OCC Dispatcher Workstation	> 30 dispatchers	2 dispatchers

OCC Videowall	One system	n/a
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2.3.11. Security & Surveillance System

The Safety, Security and Surveillance System should be designed to accomplish the vitally important objective of Safety and Security of travelling citizens through computerized and human surveillance. And also to ensure the safety and security of BRTS Staff and assets. The safety and security system must ensure the following:

1. Assets Security
2. System for coping with threat situations
3. A security system to cope with emergency situations like fire in bus or at stations, extreme weather conditions and other uncertain situations
4. Emergency alarm system
5. Integration with security agencies like police and other law enforcement agencies
6. Communication link and interfaces with other security agencies
7. Voice communication system for ITS security staff
8. CCTV camera recording and display system

As part of the assignment, the Contractors are to undertake, but not limited to, following activities related to Safety, Security & Surveillance System development:

- a. Supply and installation of surveillance cameras at
 1. Each of the stations
 2. Bus Depot
 3. OCC
- b. Integration of Cameras with OCC for centralized monitoring
- c. Recommend design criteria for safety and security at stations, bus depot and OCC.
- d. Deploy communication and interface linkages with other security agencies
- e. Develop safety plan and procure and deploy firefighting and emergency coping equipment at stations, OCC and Bus Depot
- f. Recommend safety and security equipment and measures for buses
- g. Deploy safety and security equipment for buses
- h. Develop plans and SOPs for safety and security
- i. Deploy wireless communication equipment for local voice communication at stations.
- j. Installation of Electronic Screening Gates at each station
- k. Real time surveillance of Bus through an independent wireless unit:
 - l. The bus video may also be saved on Bus On Board Unit
- m. Software that will enable crowded degree analysis for Bus

2.3.12. Communication System/ Network

The Communication Network / Digital Transmission system will provide the foundational infrastructure on which the whole IITS will run. The network will link the low level devices such as AFC terminals, RTPI within a station. It will also link each station and device with the OCC for real time monitoring, recording and analysis through broadband backbone network. The whole network will comprise of the following segments:

1. **Backbone Communication Infrastructure:** This the high bandwidth data highway linking all elements of IITS with the OCC and with each other. This is the core layer of the network and must provide sufficient bandwidth for all elements of IITS to seamlessly work together. High availability and redundancy must also be the key consideration in the design of this part of network.
2. **Local Area Network for Bus Station:** This part will link the devices such AFC devices, Security cameras, Ticketing Booths, AMR meters, RTPI devices and other IT elements within a stations with each other and to the aggregation layer above in network hierarchy. This will be the access layer of the network. Continuous availability is a key consideration for connectivity of AFC elements. LAN will be installed at each station of Green& Orange Line BRTS. All AFC Devices should have Radio communication (e.g UMTS) as alternative Network for communication with the back office. The Communications System /Network Contractor should liaise with a Telecom Contractor approved by the client to ensure proper set up of the network connections.
3. **Command & Control Centre Campus LAN:** The OCC will house the data centre, the monitoring workstations, and security monitoring stations, the RTPI management, the bus depot management and all other central elements of IITS. It will also have the Local Area Network among all the workstations and between the servers and the backbone network elements.
4. **Bus to OCC communication:** The Automated Vehicle Location system and the intelligent bus monitoring system will require real time communication of data from Bus during its run on the BRTS corridor to the OCC.
5. **Bus Depot Campus LAN:** Bus Depot Management system will require a campus wide network for its elements. Various security and monitoring devices in Bus Depot will also need network links. Bus depot management system comprising of multiple modules including parking management, maintenance planning, and refuel management will also be installed at the Depot. There will also be a backup and recovery data centre housed at Bus Depot. All these elements will also need to be linked with OCC over the backbone network. All these requirements are to be addressed in the Bus Depot Campus Network.

2.3.12.1. Backbone Communication Infrastructure detailed features

1. **The Backbone Communication Infrastructure:**
 - a. Will be Based on high capacity Optical Fibre link running through the length of the BRT corridor
 - b. Will be either AON or PON based or a mix of both
 - c. Will provide enough bandwidth to link all the security cameras, AFC units, Ticketing system and other elements at each station with the OCC.
 - d. Will also link the Bus Depot with OCC.
 - e. Will have provision to link AVL and other mobile bus data to OCC.
 - f. Provide connectivity to IP PABX & IP Telephony System
 - g. Will have redundant network links in case of primary media failure.

2. The backbone network will have the core network switching elements (switches, routers) along with all the related security elements to provide the connectivity to each location.

2.3.12.2. Local Area Network for Bus Station

The Local Area Network for Bus Station will:

- a. Connect all the security cameras at station with the OCC
- b. Connect all AFC elements including automated fare collection units, ticketing booths, ticket vending machines and others within a substation to a local control unit.
- c. Connect to the backbone network for real time provision of related data to OCC.
- d. Will provide enough bandwidth to link all the security cameras, AFC units, Ticketing system and other elements at each station.
- e. Be able to accommodate POE devices at station if required.
- f. CAT6 or CAT7
- g. Have the switches to provide connectivity to all elements at bus station.

2.3.12.3. Command & Control Centre Campus LAN

The Command & Control Centre Campus LAN will:

- a. Connect all the application and data servers at OCC to the backbone network
- b. Provide connectivity to all workstations at OCC.
- c. House the network management centre.
- d. Will have redundant link for the backbone network.
- e. Will have the connectivity of the video wall and the security monitoring software with the security cameras through the backbone network.

2.3.12.4. Bus to OCC communication

The Bus to OCC communication link will:

- a. Provide connectivity to the bus while it is moving on the BRTS corridor
- b. Link the automated vehicle location system to the OCC for real time data of bus position.
- c. May also collect data from on the bus sensors and other elements and send it to OCC.
- d. Will provide connectivity to the "Driver Dashboard" with the OCC for realtime updates to driver.
- e. May also connect the on bus cameras with the OCC.

2.3.12.5. Bus Depot Campus LAN

The Bus Depot Campus LAN will:

- a. Link together all the IT elements at Bus Depot
- b. Link the Bus depot to OCC.
- c. Link security cameras and other security elements to Bus Depot Management System.
- d. Link the Backup and recovery centre to OCC
- e. The Bus depot may comprise of multiple buildings and installation, the Bus Depot Campus LAN will link together all the elements and locations within Bus Depot.

As part of the assignment, the Contractors are to undertake, but not limited to, following activities related to Communication Network / Digital Transmission System development:

- a. Providing an overall plan and working of the communication network / digital transmission system to be developed identifying the system to be implemented and its major components.
- b. Details with drawings/network diagrams showing the network architecture.
- c. Providing specifications and selection of the core switching elements for the backbone network.
- d. Providing specifications and selection of the switching elements for the
 1. OCC LAN
 2. Bus Station LAN
 3. Bus Depot LAN.
- e. Providing specifications and selection of the mobile Bus network link devices.
- f. Procurement and installation of all the network devices mentioned at c, d and e above.
- g. Providing detailed network layout for each component including the physical network deployment diagram and logical network design diagrams for each section of the network as described in Introduction part of this document.
- h. Procurement and laying of the backbone fiber cable for the length of the BRTS corridor and from Corridor to OCC and Bus Depot.
- i. Deployment installation and testing of all the networking devices for each component of the communication network.
- j. Deployment of network cabling infrastructure to link all elements of IITS at each station.
- k. Deployment of network cabling infrastructure to link all elements of IITS at OCC.
- l. Deployment of network cabling infrastructure to link all elements of IITS at Bus Depot.
- m. Functional and performance testing of each component and of the complete network for satisfactory performance as per parameters laid out in RFP document.
- n. Devising and implementing network security plan
- o. Identifying the limitations of the system.
- p. Providing operation and maintenance manuals for the complete network.
- q. Devising and implementing network security

Package C:

2.3.13. Energy Management System

The Energy Management System will provide transparency in energy usage across the BRTS hence reducing operating expenses, increasing efficiency and removing pilferages. Energy Management system must ensure the following:

1. Transparency and accountability in use of energy and fuel.
2. Finer Level management of energy consumption for energy conservation
3. Identifying areas for further improvement in energy usage by providing time based energy consumption at key points.

The above objectives can be achieved by an Energy Management System which provides:

1. Monitoring and recording of energy consumption at key points using AMR meters
2. Energy Management Software for recording energy data from AMR
3. Granular energy flow monitoring to identify areas to reduce energy consumption.
4. Monitoring of electricity quality by continually monitoring and logging key electrical parameters.
5. Prevent fuel pilferage by monitoring energy consumption from generators and alternate energy sources

As part of the assignment, the Contractors are to undertake, but not limited to, following activities related to Energy Management System development:

- a. Supply and installation of Automated Meter Reading (AMR) Enabled Electronic Energy Meters at stations, OCC and Bus Depot along with telemetry devices for remote data collection.
- b. Supply and installation of Centralized Energy Management Software for Data Acquisition, Storage, & Reporting for Energy Management with the following features:
 1. Provide a dashboard from where the energy flow across the BRT can be monitored in near real time.
 2. Have daily, weekly and monthly graphical and textual reports
 3. Report alarms for exceptional conditions by monitoring thresholds for consumption and other electrical parameters
 4. Provide comparative reports for energy consumption at stations to identify exceptional energy usage and hence help identify pilferage
 5. Provide reports for generator operating times and energy usage from generators and other sources and provide fuel consumption estimates and comparisons to monitor fuel pilferage
- c. Functional and performance testing of the complete Energy Management System.
- d. Interfacing of Energy Management System with OCC and BIAS for reporting and analysis.

2.3.14. Bus Docking System

A bus docking system includes assistance/automation for bus docking, coordination of the bus with the platform doors and the station. Bus docking refers to the stopping of the bus at the station, and aligning of the bus doors with the platform doors at the station to allow safe and efficient alighting and boarding of passengers.

The following are the main desired features of the bus docking system.

1. **Docking assistance/automation**

Driver assistance or automation system to park the bus at a laterally and longitudinally accurate position relative to the platform doors.

2. Docking consistency

- a. Short and consistent docking time and dwell times (that is, the time the vehicle must spend waiting at a station for all passengers to board and exit).
- b. Precise and consistent docking displacement.

3. Synchronisation with Station

Synchronisation with the platform doors, i.e., the platform doors open automatically when the bus is properly docked and the bus doors are open, and the doors close when the bus doors close and the bus is about to depart from the station.

4. Notification/Warning

Signals for the driver, passengers and station, conveying the status of docking and, platform and bus doors.

5. Safety and security measures

Safety and security checks to prevent any accident, injury or property damage

As part of the assignment, the contractors are to undertake, but not limited to, following activities related to bus docking system development:

- a. Providing an overall plan and working of the system to be developed identifying the system to be implemented and its major components.
- b. Details with drawings/computer graphics visualizations showing the modifications, attachments and additions done to the bus, station, platform doors and, if applicable, the road.
- c. Identifying any changes that need to be made catering to specific stations.
- d. Determining and suggesting the most efficient number and structure of bus doorways.
- e. Testing to determine the mean and variance of the time taken for docking, alighting and boarding at each stop.
- f. Testing to determine mean and variance error in the lateral and longitudinal displacement of docking.
- g. Choosing appropriate and dependable hardware.
- h. Setting up suitable and reliable notifications and triggers for the driver, passengers, bus doorways, platform doorways and the station.
- i. Developing safety and security features with audio and visual alarms in the system to prevent accident and injury.
- j. Establishing standard operating procedures (SOPs) in case of emergencies and failure of the system.
- k. Identifying the limitations of the system.
- l. Devising a daily safety check procedure for the system.
- m. Establishing the maintenance requirements and procedure for the system

3. PROCUREMENT PROCESS

3.1. Intended Process

The intended Bidding Process for the selection of the successful Bidder is set out below.

Stage 1 – Prequalification

At the Prequalification stage, Prospective Bidders will submit Prequalification Applications to demonstrate their capabilities to fulfill the roles and responsibilities of the private sector partner for the Project.

Stage 2 – Request for Proposal (RFP)

Successful Prequalified Bidders will be issued the respective RFP (either traditional or PPP) for the respective components of the Scope of Work.

Finalization of Project Documentation

The TMTD and the Successful Bidder will work towards finalization of the Contract/Concession Agreement and associated contracts.

3.2. Indicative Timeline

Issuance of Expression of Interest ("EOI")	February 16, 2017
Issuance of Pre-Qualification Documents and Project Brief	February 25, 2017
Pre-Bid Meeting	March 7, 2017
Deadline for Submission and Opening of Proposals	March 28, 2017
Anticipated selection of Prequalified Bidders	To be Notified

The above steps and timelines are tentative.** From the date of Issuance of EOI.

TMTD reserves the right to amend the scope & timing during the RFQ process, if it deems necessary.

3.3. Pre Bid Meeting: The deadline for questions on the RFQ is March 7, 2017

Answers to received queries will be circulated by email to all the Prospective Bidders. Queries must be submitted in a MS-Excel data file, following the form specified below

Nr.	Reference to RFQdocument (Annex, chapter, section / page)	Question	Answer by GoS/KIDCL <i>(please leave empty)</i>
1.			
2.			

Pre-Bid Meeting shall be conducted at the office of Sindh Mass Transit Cell.

3.4. Prequalification - Basic Information in response to RFQ

This Section sets out the minimum information requirements for responses to the RFQ. Prospective Bidders should support their submissions with other information where they believe it is essential to their RFQ response.

The minimum list of information to be submitted is set out below. Each Prequalification Application should also be accompanied by the Prequalification Forms attached in Section 6, completed as required. Failure to respond to any of these elements may result in the Prospective Bidder's submission being non-responsive/disqualified from the Prequalification process. Prospective Bidders should use the list of requirements in this section as the framework for their responses to assist the evaluation of their Prequalification Applications.

Applicants are advised that the Employer contemplates applying the following criteria in the selection of the Applicants who will be invited to tender for the Project:

- ▶ 10 years and above experience in IT services in urban transit systems, especially AFC systems, of similar scope and complexity
- ▶ Local know-how and understanding based on experience in Pakistan and other countries of similar environment.
- ▶ Must have provided similar services to different clients in or outside Pakistan
- ▶ Financial strength & reliability of the Applicant
- ▶ Average annual turnover during the last 3 years of the Applicant should be PKR 500 Million or more (Attach audited Income statement/ Balance sheet).
- ▶ Sufficient staff and human resource to undertake the Project;
- ▶ Quality assurance/control, safety and security shall be of international standards;
- ▶ Each submission should also be accompanied by the Pre-Qualification Document Forms listed at section 6 (Annexures) below, completed as required. A failure to respond to any of these elements may result in the Bidder's submission being disqualified from the Pre-qualification process.

Basic Information

Prospective Bidders must provide, using Section 6 (Annexures: Basic Information Form) information on the identity, management structure and organization of the consortium or

organization in the case where the Prospective Bidder is a sole organization, including as a minimum, an outline summary of::

- a) Corporate structure, shareholdings;
- b) Consortium, joint venture or subcontractor agreements;
- c) Lead partner identity and nomination with contact information;
- d) Roles and responsibilities of each partner and main subcontractors in the Consortium or organization; and
- e) Letter of Association (in case of Consortium)

Prospective Bidders must provide, using Section 6 (Annexures: List of Key Personnel) details of key team describing their involvement with management and operations of the Project.

In case of a Consortium, the Consortium Members shall enter into a Consortium Agreement in the form provided herein in Section 6 (Annexures: Format of Consortium Agreement). Further, each of the Consortium Member shall execute a power of attorney authorizing the lead member in the form provided herein in Section 6 (Annexures: Authorization of Lead Member).

Financial Information

Prospective Bidders must provide evidence of financial strength of the consortium or organization by providing:

- a) The audited accounts for the last 3 years for each of the consortium members;
- b) Where an equity provider and / or any other key subcontractor intends to procure a corporate guarantee from a parent company or other entities, the audited accounts for the last 3 years of that parent company or other entities; and
- c) Any other information for the equity provider or any other subcontractor needed to demonstrate financial capacity to provide the relevant service to the Project over the relevant time period.

Experience in Similar Projects

Prospective Bidders are required to identify, using Section 6 (Annexures: Current Contract Commitments) potential liabilities and/ or guarantees which may arise from other projects which the Prospective Bidder is committed to, or are at the bidding stage on, which are not covered by any financial reporting disclosure requirements included in the information requested above.

History of Litigation, Bankruptcy and Blacklisting

The Prospective Bidder, or if the Prospective Bidder is a Consortium, each Consortium member, shall not be subject to any bankruptcy or liquidation proceedings.

The Prospective Bidder, or if the Prospective Bidder is a Consortium, each Consortium member, shall not have been convicted of fraud, corruption, or money laundering.

If the TMTD determines that the bidder, sub-contractors, sub-consultants, services providers and suppliers has engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices, in competing for this Project, then the TMTD may blacklist /disqualify the prospective bidder in accordance with the SPPRA Rules (as amended from time to time). Any personnel of the bidder, who engages in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Project, shall be removed in accordance with SPPRA Rules (as amended from time to time).

The Prospective Bidder, or if the Prospective Bidder is a Consortium, each Consortium member, shall not have been previous blacklisted by any provincial government or federal government in any country

The Prospective Bidder, or if the Prospective Bidder is a Consortium, each Consortium member, shall not have any directors or senior personnel who is or has been previously placed on the exit control list

The Prospective Bidder, or if the Prospective Bidder is a Consortium, each Consortium member, shall not have any directors or senior personnel who is or has been disqualified from holding any public or private office.

PREQUALIFICATION FORMS

The Prospective Bidder shall submit the following forms in relation to the Prequalification Application:

3.4.1. Evaluation Criteria

Basic Eligibility Criteria

The Prospective Bidders are required to evaluate themselves under the following "BASIC ELIGIBILITY CRITERIA" as to whether they are an "eligible bidder" or not. Ineligibility with the same would make the Prequalification Application non-compliant.

An eligible bidder is a Bidder who:

1. Is a local or an internationally registered entity in accordance with the applicable laws.
2. Must not be from a country that is not proscribed under the laws of Pakistan.
3. Has valid registration certificate for Income Tax, Sales Tax (on goods and services where applicable) or possesses corresponding equivalent certificate from the country of origin, if applicable. (In case of Consortium, Applicable to all members)

Prequalification Evaluation Criteria

In case of Consortium/JV, marks shall be evaluated jointly for all members unless stated otherwise. References and supporting documentation required as evidence for each.

After the initial screening of all Bidders, a detailed evaluation of the Bidders shall be undertaken using the following criteria based on the following scoring system:

ID	Category	Points	
		Maximum	Minimum Acceptable
1	Company Profile (Personal, equipment and History)	25	17.5
2	Financial Soundness /Status	20	14
3	General Experience Record (References)	30	21

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4	Availability of Products and services	20	14
5	Litigation History	05	3.5
		Sum: 100	Sum: 70

To qualify, Bidders must receive not less than the specified minimum acceptable points for each category and an aggregate **70%** points of maximum **100** points.

Package (A, B, C)		Category 1- Company Profile (Personal, equipment and History)		
Sr#	Criteria	Marks	Comment/Description	Documents Required
1	Period since Firm is in IT Business, intelligent transport system	5	Up to 5 years = 1 Up to 10 years = 3 Above 10 years = 5	Valid evidence to be provided
2	Project Managers with at least 7 years of Project Management Experience.	10	1 to 4 = 4 Points 5 to 9 = 7 Points 10 or Greater = 10 Points	Detailed corporate profile of Project Managers Employed
3	Staff, Equipment and office	10	Own Production: +2 Points Own Research: +2 Points Own Engineering +2 Points Local Office: + 2 points Size of company: >= 500 Employee: +2 Points	

Package A		Category 2- Financial Soundness /Status		
Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
1	Financial Strength of the bidder Average Annual Turnover of Business in last three years in Rs. 500 Million (~ US \$ 5Million) (in case of consortium or JV accumulated value for all bidders for the requested scope)	20	<Rs. 100 million = 0 Points <Rs. 250 million = 5 Points <Rs. 500 million =10 Points Above Rs. 500million = 20 Points	the applicants may berequired to submitAudited financial statements for the last three years or any other document which verifies their Financial Status

Package B		Category 2- Financial Soundness /Status		
Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
1	Financial Strength of the bidder Average Annual Turnover of Business in last three years in Rs. 500 Million (~ US \$ 5 Million) (in case of consortium or JV accumulated value for all bidders for the requested scope)	20	<Rs. 100 million = 0 Points <Rs. 250 million = 5 Points <Rs. 500 million =10 Points Above Rs. 500million = 20 Points	the applicants may berequired to submitAudited financial statements for the last three years or any other document which verifies their Financial Status

Package C		Category 2- Financial Soundness /Status		
Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
1	Financial Strength of the bidder Average Annual Turnover of Business in last three years in Rs.500Million (~ US \$ 5 Million) (in case of consortium or JV accumulated value for all bidders for the requested scope)	20	<Rs. 100 million = 0 Points <Rs. 250 million = 5 Points <Rs. 500 million =10 Points Above Rs. 500million = 20 Points	the applicants may berequired to submitAudited financial statements for the last threeyears or any other document which verifies their Financial Status

Package A		Category 3- General Experience Record (References)		
Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
1	References requirements of successful Projects of similar nature and complexity completed over last 10 years. (pls use relevant Project reference sheet for each Project/Package). Full Marks are achieved if at least 80% of <u>System Deliverable or Service Provided</u> are successfully implemented in similar projects.	10	Less than 25% of "System Deliverable or Service Provided" in each project = 0 Point <60% of "System Deliverable or Service Provided" at least in each project = 5 Points <80% of "System Deliverable or Service Provided" in in similar nature projects= 8 Points 80% to 100% of "System Deliverable or Service Provided" in similar nature projects = 10	User AcceptanceTest (UAT) Sign OffCertificate or Anyother valid evidenceof project completion
2	Number of Projects of similar nature and complexity in hand	5	<2 = 0 Point >2 to 5 = 3 Points >6 = 5 Points	Attach copies of workorders

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3	References with maximum passengers per day that the System can handle in thousands.	10	<200 = 0 Points 200 to 1000 = 5 Points >1000 = 10 Points	valid documentor proof
4	Number of projects greater than Rs. One billion in value, over last 10 years	5	< 5 = 0 Point 5 to 15= 2 Points 16 and above = 5 Points	valid documentor proof

Package B Category 3- General Experience Record (References)

Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
1	References requirements of successful Projects of similar nature and complexity completed over last 10 years. (pls use relevant Project reference sheet for each Project/Package). Full Marks are achieved if at least 80% of <u>System Deliverable or Service Provided</u> are successfully implemented in similar projects.	10	Less than 25% of "System Deliverable or Service Provided" in each project = 0 Point <60% of "System Deliverable or Service Provided" at least in each project = 5 Points <80% of "System Deliverable or Service Provided" in in similar nature projects = 8 Points 80% to 100% of "System Deliverable or Service Provided" in similar nature projects = 10 Points	User AcceptanceTest (UAT) Sign OffCertificate or Anyother valid evidenceof project completion
2	Projects of similar nature and complexity in hand	10	<2 = 0 Point >2 to 5 = 5 Points >6 = 10 Points	Attach copies of workorders
3	Number of projects greater than Rs. 0.5 billion in value, over last 10 years	10	< 5 = 0 Point 5 to 10= 3 Points 11 to 20= 6 Points 21 and above = 10 Points	valid documentor proof

Package C Category 3- General Experience Record (References)

Sr#	Criteria	Marks	Comment/Description	DocumentsRequired
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1	References requirements of successful Projects of similar nature and complexity completed over last 10 years. (pls use relevant Project reference sheet for each Project/Package). Full Marks are achieved if at least 80% of <u>System Deliverable or Service Provided</u> are successfully implemented in similar projects.	10	Less than 25% of "System Deliverable or Service Provided" in each project = 0 Point <60% of "System Deliverable or Service Provided" at least in each project = 5 Points <80% of "System Deliverable or Service Provided" in in similar nature projects = 8 Points 80% to 100% of "System Deliverable or Service Provided" in similar nature projects = 10 Points	User Acceptance Test (UAT) Sign Off Certificate or Any other valid evidence of project completion
2	Projects of similar nature and complexity in hand	10	<2 = 0 Point >2 to 5 = 5 Points >6 = 10 Points	Attach copies of work orders
3	Number of projects greater than Rs. 50 million in value, over last 10 years	10	< 5 = 0 Point 5 to 10= 3 Points 11 to 20= 6 Points 21 and above = 10 Points	valid document or proof

Package (A,B,C)		Category 4 - Availability of Products and services		
Sr#	Criteria	Marks	Comment/Description	Documents Required
1	HW (Devices and System) and SW requirement are available and being deployed in Projects. Devices are still under development. Innovation and advanced Features. <u>Pls provide all your products/services (related to this RFQ) brochures with specifications summary.</u>	20	< 50% of the main requirements = 0 Point Innovation= 5 Points 50% to 70%of the main requirements = 10 Points Above 70% and innovations = 20 Points	Official documents and Brochures

Package (A,B,C)		Category 5- Litigation History		
Sr#	Criteria	Marks	Comment/Description	DocumentsRequired

1	any litigation or arbitration	05	5 Points for successful History	The Applicant should provide accurate information on any litigation or arbitration resulting from contracts completed or under execution over the last five years. A consistent history (50% or more) of award against the Applicant or any partner of a joint venture may result in rejection of the application.
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3.5. REJECTION

The Employer may reject any Application if the RFQs are not, in the reasonable opinion of the Employer, completed satisfactorily.

4. THE PREQUALIFICATION DOCUMENTS

The submission must be performed using the provided templates.

The Prequalification Documents have been designed to provide maximum Prospective Bidder's information to the Employer in order that the Employer may properly assess each Prospective Bidder's capability to provide the full project scope in highly qualified and reliable manner.

The Prequalification Documents consist of the following documents.

- > Section 1: Application Form
- > Section 2: Statement on Subcontractors
- > Section 3: Statement on Exclusion Grounds
- > Section 4: Financial Position, Economic Situation and Operating Performance
- > Section 5: Relevant Project Experience
- > Section 6: Annex

All information must be provided in the specified formats.

Only the information within the text boxes in the Prequalification Documents and the required documents will be the basis for evaluation of prequalification. Brochures and other publications will be considered for the evaluation for available & implemented products and services only. Please observe additional instructions in each section.

Applicants who are currently or previously employed on projects in Pakistan must submit soft copies of the documents mentioned in the ANNEX: "Pakistan Information".

All of the foregoing documents are collectively referred to as the 'Prequalification Documents'.

4.1. FINANCIAL DATA

All financial data are to be given in Pakistani Rupees (PKR).

4.2. LANGUAGE

The Prequalification Documents and all supporting information must be submitted in English language.

Any statements, certificates, confirmations, affidavits or any further supporting documentation which cannot be acquired in English must be provided in original language together with its certified translation into English language.

4.3. FORM OF PREQUALIFICATION DOCUMENTS

Every question must be answered by inserting the Prospective Bidder's response into the soft version of the Prequalification Documents provided herein, and in the spaces following the text of each section.

The Prequalification Documents must be signed, dated and stamped by the Prospective Bidder (in case of Consortium, the Lead Member). The following chapters must be completed as instructed therein. The application will be considered void if any of the queried information will not be provided, except those particularly noted.

The completed Prequalification Documents together with all supporting documents must be submitted in one original hard copy and in one soft copy on CD to the designated address by the specified submission time and date.

4.4. MANNER OF SUBMISSION

The Prequalification Documents and all supporting documents must be submitted in one sealed envelope marked as:

CONFIDENTIAL

PREQUALIFICATION DOCUMENTS

FOR AN INTEGRATED INTELLIGENCE TRANSPORT SYSTEM (IITS)

FOR KARACHI BUS RAPID TRANSIT SYSTEM

The Prequalification Documents must be delivered personally or by registered post to

DIRECTOR GENERAL (SINDHMASS TRANSIT CELL)

TRANSPORT & MASS TRANSIT DEPARTMENT

GOVERNMENT OF SINDH

F-34/1, BLOCK 7 CLIFTON

NEAR TEEN TALWAR

Karachi, Sindh

Tel: +92-21-35865391, Fax: +92-21-35865392

Smtc.tmt@gmail.com

Submissions by e-mail or fax will not be accepted.

4.5. SUBMISSION TIME & DATE

The Prequalification Documents must reach the specified address not later than 3.00 PM, 28th March 2017 and will be opened on the same day and address at 3:30 PM.

Late submissions will not be accepted.

5. EXAMINATION AND SELECTION

5.1. EXAMINATION

The Prequalification Documents will be examined by the Employer. Information contained in the Documents will be treated as strictly confidential.

5.2. CLARIFICATIONS

The Employer may request Prospective Bidders by email to provide any clarification considered necessary for the proper analysis of the submitted Prequalification Documents. Failure to comply with such a request may result in disqualification.

5.3. SUCCESSFUL APPLICANTS

The Employer will advise Prospective Bidders of their inclusion in the list of Prospective Bidders prequalified to tender on the Project.

5.4. SELECTION

The Employer does not bind itself to select any Prospective Bidder and will not assign any reason for the selection or rejection of any Prospective Bidder.

6. Prequalification Forms

PREQUALIFICATION DOCUMENTS

Templates

APPLICATION FORM

To: DIRECTOR GENERAL (SINDH MASS TRANSIT AUTHORITY)
TRANSPORT & MASS TRANSIT DEPARTMENT
GOVERNMENT OF SINDH
F-34/1, BLOCK 7 CLIFTON
NEAR TEEN TALWAR
KARACHI, SINDH
Tel: +92-21-35865391, Fax: +92-21-35865392
Smtc.tmt@gmail.com

Gentlemen,

We, the undersigned

NAME AND STAMP OF FIRM

Postal Address

Telephone:

Email:

Website:

submit herewith our Application for Prequalification for Tender for an **IITS of Karachi Bus Rapid Transit System**.

The submitted Prequalification Documents have been completed to the best of our knowledge and signed as instructed.

We understand that the submission of the Prequalification Documents does not obligate you towards us nor to any party associated with or related to us.

We also understand that you will be the sole judge in the assessment of the information presented.

We further understand that you will treat the information as strictly confidential and will not make it available to any third party except to your Technical, Financial and Legal Advisors, Consultants and financing agencies as applicable.

Furthermore, we understand that you will not be responsible for, nor pay any expense which we may incur in the preparation and submission of the Prequalification Documents.

We confirm that in case of Contract Award we will be jointly and severally responsible for the fulfillment of the specified project scope.

We undertake to supply any clarification requested.

SIGNATURES

Dated this day of
in the capacity of
duly authorized to sign for and on behalf of:

Statement on SUBCONTRACTORS

Under this section the Prime Contractor must provide information about targeted subcontractors.

Major Subcontractors

The Prime Contractor must list all his major subcontractors in the following table.

Nr	Name	Postal Address	Field of work within the project
1			
2			
3			
4			
5			
6			

Additional Subcontractors

In the following table the Prime Contractor must list all his additional subcontractors, which are not Major Subcontractors but referred within the reference list in previous section.

Nr	Name	Postal Address	Field of work within the project
1			
2			
3			
4			
5			
6			

STATEMENT ON EXCLUSION GROUNDS

Applicants must repeat under this section the following duly signed statement for the Prime Contractor and each Major Subcontractor.

Statement on Exclusion Grounds

I, Name of the authorized signatory, in my position as position, being the authorized signatory for name of entity confirm that none of the following exclusion grounds apply for name of entity, unless specified below:

- ▶ Being bankrupt, or insolvent, or being wound up, or having its affairs administered or conducted by any court, administrator, receiver, administrative receiver or other insolvency practitioner or any analogous situation arising from a similar procedure under national laws or regulations;
- ▶ Having been declared by a court or other competent authority; unable to pay its debts, or having made any composition or arrangements with creditors or having had the repayment of its debts suspended or any analogous situation arising from a similar procedure under national laws or regulations;
- ▶ Being the subject of proceedings for a declaration of bankruptcy, compulsory winding up or administration or any similar proceedings under national laws or regulations or any analogous situation arising from a similar procedure under national laws or regulations;
- ▶ Having been convicted or otherwise found responsible (or having any of its current or prospective directors, officers or other senior managers convicted or found responsible) by any court, tribunal or regulatory, public or other competent authority for any breach of criminal, administrative or civil law or regulations which:
 - a related to any act of fraud or dishonesty for which a fine, penalty, damages, compensation or other payment was levied against the Bidder or Member, any such directors, officers or managers; or
 - b resulted in the imprisonment of any current or prospective director, other officer or senior manager of the Bidder or Member; or
 - c resulted in the disqualification of any such director or other officer from acting as such; or
 - d resulted in the permanent or temporary suspension of the rights of the Bidder or Member to operate any types of business, operation, service or network; or
- ▶ Any other matter which is tantamount to any of the issues referred to in (a) to (d) above in any jurisdiction or which it could reasonably be expected would be pertinent to be known by the KIDCL in the context of the award of the *Automated Fare Collection System* contracts.

One or more of the above circumstances apply with details provided below:

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► (please provide details on each single circumstance, if any)

I acknowledge that our Application can be excluded from the pre-qualification process if any of the conditions or circumstances specified above apply.

Name of Entity:

Name of Authorized Signatory:

Date / Signature:

FINANCIAL POSITION, economic situation AND Operating performance

This section has to be edited by each Contractor.

TURNOVER

	20	20	20
Annual Turnover for the last three financial years	PKR	PKR	PKR

Insurance

Without limiting his responsibilities, obligations and liabilities under the provisions of the Contract, the Prime Contractor must provide for the whole Contract duration period professional liability insurance with adequate insurance coverage. Minimum insurance coverage must include the amount equivalent to PKR 20 Mio for personal damages as well as PKR 5 Mio for property damages.

A copy of an insurance certificate must be submitted together with this documentation in the annex.

Quality system certifications

The Prime Contractor, the Prime Contractor's production facilities and organization must be certified to the appropriate prevailing QS-9000 / ISO 9000 series of standards. The production, delivery and service under the contract must be carried out in compliance with the quality management system.

Please enclose a valid quality system certifications in the Annex.

MANPOWER

Indicate the complete number of persons permanently employed at the Prime Contractor's.

	2014	2015	at present
Worldwide Total			
Worldwide except Pakistan			
Total			

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Management			
Technical			
Other			
Pakistan			
Total			
Management			
Technical			
Other			

Indicate number of persons permanently employed with expertise in engineering and construction of AFC Systems.

	2014	2015	at present
Total			
Technical			
Other, please specify:			

RELEVANT PROJECT EXPERIENCE

The Applicant must repeat under this section the following information referring to the prime contractor's own references. To fulfill relevant project experience the Prime Contractor may also use suitable references of his subcontractors but must indicate the sub-contractor.

With the following references the Applicant verifies his suitability for the contract. Minimum requirements are imposed on the references, which must be demonstrated in at least one completed project, whereas a maximum of three references will be evaluated for each criterion. The application will be considered void if evidence will not be provided.

Furthermore, additional requirements are imposed, which must be demonstrated in at least one completed project, whereas a maximum of three references will be evaluated for each criterion. The non-fulfillment of these requirements does not lead to exclusion and seeks to identify the performance of the Applicant.

Applicant must focus in particular on relevant projects executed over the past 7 years, which are most similar in nature to the present Project and the role of each contractor in the project:

Please use the Reference Matrix attached with the Compliance Matrix document for each Project as per selected Package (A, B, C).

Each reference listed in the reference matrix must have a referred detailed reference sheet based on the following template:

Reference for Package:	(A, B or C)
Ref.-No. (Details in reference matrix)	(please use this reference number in the reference sheet summary)
Project partner (prime's or subcontractor's name)	
Project name	
Country and City of Project	
Employer/Client	
Employer's reference (Name, Position, Role in the Project, Contact Data including E-Mail, Fax & Phone Numbers)	
Project status	<input type="checkbox"/> completed (Contractor has finalized the work (contract ended)) <input type="checkbox"/> in Operation (Contractor operates the system, contract is ongoing) <input type="checkbox"/> Maintenance (System implementation completed. Operation by client ongoing) <input type="checkbox"/> Expansion (First Contract Scope completed, System expansion ongoing)
Date commenced	/ /
Date of completion (actual or scheduled)	/ /
Value of Project	PKR
Status of Entity	
a. Prime Contractor (Name Subs)	<input type="checkbox"/>
b. Joint Venture (Name Partners)	<input type="checkbox"/>
c. Member of Consortium (Name Members)	<input type="checkbox"/>

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d. Sub-Contractor (Name Prime Contractor)	<input type="checkbox"/>
AFC, AVM, BI: Ridership per month	(Please provide details if AFC, AVM, BI reference)
AFC, AVM, BI, Depot: Fleet Size	(Please provide details if AFC, AVM, BI, depot reference)
AFC, RTPI, CCTV, Depot, Bus Docking, Energy Management, Network/IT: Sites Equipped:	(Please provide details if AFC, RTPI, CCTV, Depot, Bus Docking, Energy Management, Network/IT reference)
Percentage participation of Entity in project	%
Additional Information and Details	(to be provided here or as an annex to this sheet)

PAKISTAN INFORMATION

Applicants who are currently or previously employed on projects in Pakistan must submit soft copies of the following additional documents, which must be attached under this section:

- ▶ Copy of Applicant's Pakistani Commercial Registration.
- ▶ Copy of Applicant's Pakistani Income Certificate.
- ▶ Copy of Applicant's PEC Qualification Certificate or other countries qualification registration

List below the title of each attached document.

Insurance Documents

(insert copy of insurance certificate)

Quality Management Documents

(insert copy of Quality System Certifications)

7. Annex (Other documents)

Please add any valuable information here.