DIGITAL TICKET APPLICATION FOR PASSENGERS

OF

METROPOLITAN TRANSPORT CORPORATIONS

AND

MONITORING APPLICATION FOR PASSENGERS

OF

METROPOLITAN TRANSPORT CORPORATIONS

At present, in every Metropolitan City or Capital Cities traffic is a big problem. Indirectly consumption of too much fuel in traffic jam which is also lot of money waste too. In general for every Capital City there is a Transport Corporation is available to passengers. Even though, problems are getting to both Passengers and Transport Corporations also.

General Problems such as:

1. Too many Buses allotment or arranged to certain routes which are having less passengers. And also there are mismatches between Bus Timings and Passengers Timings. This is a big loss to Transport Corporations and Passengers Inconvenience.
2. Too many Passengers are waiting at Bus Depos or Bus Stops but Buses frequencies are very less on certain routes. Due to this Passengers will face lot of difficulties. Especially in peak times such as general office timings. Due to this too much crowd in Buses and Bus Stops. And this will lead to lot of inconvenience to Passengers.
3. Additionally, Transport Corporations provide various types of city services. Such as Ordinary, Deluxe and luxury i.e., Air Condition buses. Depends on Passengers requirements and their financial status they choose to travel from one place to another place within cities and/or rural areas of cities outskirts. Allotting AC busses in less demand areas. If Transport Corporations don't know where, on what type and on what timings Passengers are expecting. Then both Transport Corporations and Passengers might face lot of difficulties.

Covid-19 Problems such as:

Corona Virus is one of the biggest pandemic to entire human race. We don't know when we invent the cure to this virus. We must follow the rules and regulations which are suggested by Doctors and Scientists.

Social or Physical distancing is the only weapon to us. This virus will stay in almost all types of surfaces including on Paper and on Currency notes too. This Covid -19 problems along with above general problems Transport Corporations get too much loss.

Before this pandemic passengers usually travel with too much crowded Buses also. Now this is not possible as per Covid -19 guidelines given by Government. Automatically limited passengers need to travel in buses. Otherwise this pandemic severity is increased drastically.

By using technologies we can solve these problems or at least to decrease the severity of these problems. Even though, after Covid -19 also these solutions are very much useful to MTC's and Passengers.

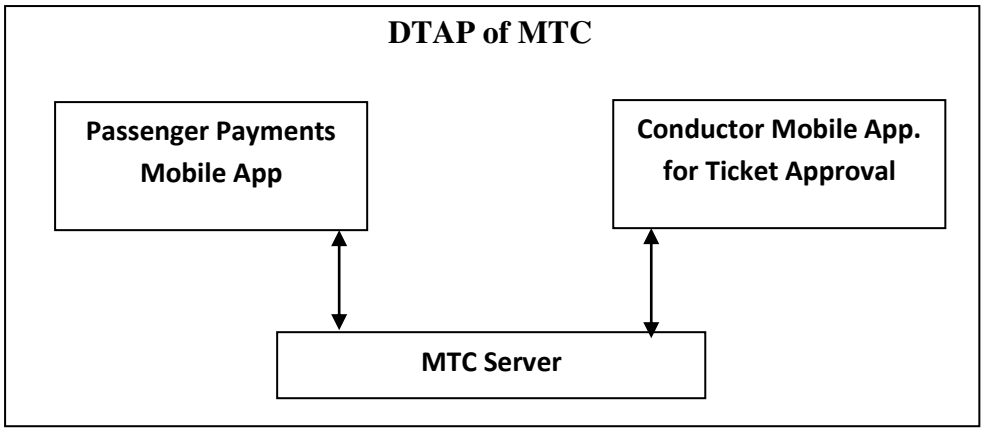
By introducing these two Applications we can address solutions to above problems.

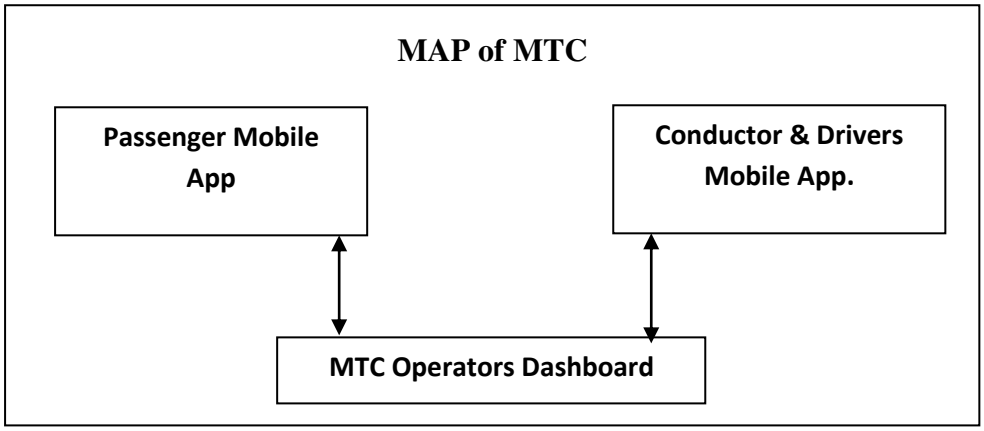
- Monitoring Application for Passengers of Metropolitan Transport Corporations. In short **MAP of MTC**.
- Digital Ticket Application for Passengers of Metropolitan Transport Corporations. In short **DTAP of MTC or Digital TAP of MTC.**

In fact these types of applications are new and it might not be created in India and in the world too.

Both applications are interconnected to each other. Also both applications can be used separately and depends on Passengers usage. Both are mostly depends on GPS. That is Latitude & Longitude. Now a day's Smart phones with internet is a basic need to every human being. Especially in cities this is main gadget to travel from one place to another place.

Broadly, there are 3 Entities or Modules in both MAP of MTC & DTAP of MTC.





Here both MAP of MTC and DTAP of MTC are developed separately. And used depends on passengers needs and usage. By using certain logic MAP of MTC is becomes a subset of DTAP of MTC.

What is the main purpose of these Innovations?

MAP of MTC: Monitoring on Passengers Movements and Requests. And MTC may organize Buses depends on Passengers Requests.

DTAP of MTC: Passengers can able to Generate Tickets anywhere. And Conductors can Approve or Reject those Generated Tickets. If Passengers not utilized those Generated Tickets then after 24 Hours automatically amount will be refunded to Passengers Account. For Basic Mobile users newly **Empty Ticket** is introduced. We'll discuss this in DTAP of MTC.

Full Forms/Abbreviations are frequently used in this document.

- **MTC**: Metropolitan Transport Corporation
- **DTAP**: Digital Ticket Application for Passengers
- **MAP**: Monitoring Application for Passengers
- **PMA**: Passengers Mobile Application
- **D&C**: Drivers and Conductors
- **ODB**: On Demand Buses.
- **DCMA**: Drivers and Conductors Mobile Application
- **PPMA**: Passengers Payments Mobile Applications
- **CMATA**: Conductors Mobile Application for Ticket Approval
- **ATIP**: Automated Tracking and Intimation Program

DIGITAL TICKET APPLICATION FOR PASSENGERS

OF

METROPOLITAN TRANSPORT CORPORATIONS

A ticket which is generated electronically is called Digital Ticket. It is a very simple Mobile Wallet Application for all kinds Public Road Transport Corporations. Such as

- Interstate Buses
- Intrastate Buses and
- Metropolitan City Buses

There is already Online Reservations facility available for only both Interstate and Intrastate Services only. At present Passengers can generate a Ticket by using

- 3rd party Mobile Applications and
- Directly from Transport Corporation Websites or Portals

These platforms also on-spot ticket generation is not available. On-spot means in presence of Conductors or Ticket Collectors. But Metropolitan City Buses these platforms might not be suitable to generate E-Ticket or Digital Ticket.

In the market already there are many 3rd party Mobile Applications. Examples: Google Pay, Phone Pay, Pay-TM, etc. These Platforms are not suitable for City Buses. Due to below reasons

- Lack of monitoring
- Chances of misuses by Conductors and Passengers.
- And all are 3rd party applications which may have a security threats to money in Conductors and Passengers Mobile Wallets.
- Money is stored in Conductors personal accounts.
- How can you generate a Ticket after money transfer from Passengers to Conductors? And again this will lead to paper ticket.
- What about Passengers who don't have Smart Phones and Mobile phones at the time of travelling?

To solve above problems Passengers need Mobile Wallet Application exclusively for MTC. That is PPMA. And **SMS Ticket** which is exclusively developed for Basic Mobile Phone Users.

There are 3 modules in DTAP of MTC. All 3 modules are communicated through Mobile Applications and Server.

1) Ticket Generation Procedure

By using PPMA Passengers follow below procedure and accordingly respective Mobile Applications are designed and developed.

1. Passenger Mobile No Automatically taking as Id or manually enters any Govt. ID Ex: Aadhaar ID
2. From Location and To Location
3. No. of Tickets by default 1.
4. After clicking Submit button all information send to MTC Server.
5. MTC Server generate a Ticket Number which is stored in "Ready To Approve List" in MTC Server Database and respective amount is deducted from Passengers Mobile Wallet i.e., PPMA

6. Passengers get a bus either from Bus Depo or Bus Stop. And Passenger gives Ticket No. xxxxxxxxx to Bus Conductor.
7. By using CMATA Conductor enter Ticket No and press "Check" Button. If Ticket No. is in Valid List i.e., "Ready to Approve List" then Conductor get below information.
   - ✓ Mobile No / Aadhaar No
   - ✓ From Location and To Location
   - ✓ Generated Date and Time
   - ✓ No. of Passenger
8. Conductor mainly refers From Location and To Location. If this data is suitable to his/her Present Service Route.
9. Then Conductor clicks on "Approve" Button in CMATA. Internally CMATA send "Ticket No", "Date & Time" and "Latitude & Longitude" of Conductor Present Location to MTC Server. Finally, MTC Server that Ticket No transferred to Approved List in its Database.
10. Immediately MTC Server gives certain acknowledgement to both Conductor and Passenger to their Mobile Applications. Or MTC Server will send an acknowledgement in the form of SMS to Passenger Mobile Number only.

2) Additional Features in DTAP of MTC

2.1) Ticket Cancellation

- Suppose, If Passenger want to Cancel the Ticket or
- Passenger didn't utilize that Ticket. Which means Passenger didn't give to any Conductor or

Then after 24 Hours from Ticket Generated Date and Time that Respective amount automatically refunded to that PPMA Account i.e., Passengers Mobile Wallet. On any case, there is no Manual Cancellation From PPMA.

If Conductor rejects that Ticket Then automatically that Ticket is cancelled. Immediately amount refunded to PPMA with Acknowledgement.

After Refunded on any above case then Server will remove that record from "Ready to Approve List" in the MTC Database.

2. 2) Ticket Sharing

Additionally in PPMA there is an Option called Ticket Sharing. Suppose Passenger want share a certain Ticket to any of their Friends, Relatives, Family members and Colleagues.

In PPMA, Passenger selects his/her Ticket and Click Share button. And enter Mobile Number to whom he/she wants to share that Ticket and press Submit.

Immediately MTC Server checks that Ticket is not approved by any of the Conductor then Server update that Mobile No. in Records w.r.t that Ticket Number. Finally an SMS will send to Updated Mobile No. And also sent certain Acknowledgement to that shared Passenger. In PPMA that Ticket is stored in Shared list.

2.3) Ticket Generation types

- Generate On Spot Ticket. Means Ticket Generated near to Bus Depo or Bus Stop.
- Generate Anywhere Ticket.

Here both are almost same. But only difference in Generate on-spot Tickets interlinked with MAP of MCB. If Passenger generate a Ticket Automatically Passenger Request is sent to Operators Dashboard Program.

Where as, Generate Anywhere Ticket Passenger can enter estimated time to reach that **From Location.** Off course these fields are optional. If Passengers fill these details Operators in MTC can get an advanced intimation and accordingly Operators plan those bus timings.

3) What about Passengers who don't have Smart Phones and even they don't have no Mobile Phones at the time of travelling?

In Fully Developed Countries almost all Passengers used Smart Phones and even these cases are very rare. Countries which are Under Developed and Developing Countries every Passenger may not use Smart Phones.

Then How to solve this main problem?

There are two Cases in this problem.

1. Passengers who have Normal (or Basic) Mobile Phones
2. Passengers who don't have Mobile Phones

3.1) Passengers who have Normal (or Basic) Mobile Phones

Solution: Using **SMS Ticket.**

Create a Passenger Account in MTC Server to implement SMS Ticket

Passengers who have Normal Mobile Phones they can create an Account in MTC Database. So MTC should maintain Passengers Accounts. Then How to implement?

Passengers should create an Account in MTC Server. And deposit in their Account. In fact Account creation is very simple. Passenger Account creation in below ways

- In MTC portal or
- In Bus Depo or
- Bus Conductors also can create accounts while travelling.

ForAccountdetailsPassengershouldfillonly3fields

1. Govt.ID proof,
2. Mobile Number and
3. How much Money to recharge?

After Successful Registration Immediately 6 to 8 digits **Empty Ticket** is generated to that Mobile Number through SMS.

What is meant by Empty Ticket?

Empty Ticket is a new Concept. Which is specially designed for this Application. It will regenerate every time after successfully utilized by Passenger. In simple words this is Advanced Ticket Generation.

In Empty Ticket there is NO "**From Location & To Location**" and Ticket fare details. But this Empty Ticket is linked with Passenger Account. If Passenger Account balance has Minimum Ticket Fare say 10/- .Then only Empty Ticket is generated to their Mobile Number. Otherwise a Warning message comes to Passenger Mobile Number. **For Example**: "You don't have enough balance for next Journey"

Procedure:

1. Passengers get the Bus and tell his/her Empty Ticket and Destination details to the Bus Conductor.
2. And Conductor enters those details and sends MTC Server.
3. Now MTC Server checks the balance in their Account. If sufficient balance is there for this Journey then respective Amount is deducted from Passenger Account.
4. Immediately Passenger get an Acknowledgement from MTC Server in the form of SMS. This is called SMS Ticket and it contains
   - ✓ Conductor ID
   - ✓ From Location & To Location
   - ✓ Ticket Fare
5. After Successful SMS Ticket. After 10 minutes another Empty Ticket is generated to Passenger Mobile Number along with their Balance.
6. SupposeIncase3, In Passenger Account insufficient balance is there for this Journey. Then it will give a Negative Reply to Conductor App.
   Now Two Options to Passenger
   - ✓ Get down at Next Bus Stop. That Ticket is utilized up to next Stop.
   - ✓ Recharge your Account through Conductor App. i.e., CMATA

   Then Passenger needs to pay money to Conductor and recharge in their Account. If Passenger wants recharge then automatically that Ticket is cancelled. As per the Concept another Ticket is generated. And continue Journey.
7. In case Passenger doesn't have Account in MTC Database. Then Passenger can create Account through Conductors Application itself i.e., CMATA. This is also depends on present situation of Conductor. And follow above Procedure.
8. In case, By Mistake already Approved Ticket is given by Passenger. Or If any discrepancies done by either Passenger or Conductor. Then Automatically CMATA give negative reply showing as invalid Ticket.
   Now Passenger have two Options
   - ✓ Get down immediately.
   - ✓ Otherwise recharge money and continue Journey.

Due to any technical reasons MTC Server didn't generate Automatic Empty Ticket to Passenger. Then Passenger send request message from his/her Registered Mobile Number. For Example: SMS "GEN EMPTY" to 12345. If minimum balance is there in PPMA account. Then Immediately MTC Server replies one Empty Ticket and Balance. Else Passenger gets Warning Message.

Chota Credit:

If any Passenger especially Ladies Passengers are Travelling at Night time. If insufficient balance in their Account. Also that Passenger doesn't have money. Then Bus Conductor able to give Chota Credit and Accept that Ticket. Immediately Passenger get Minus balance in their account. In next recharge this amount will added. But it can be done only once with this condition. That is if Account Balance is Greater than 0/-.

3.2) Passengers who don't have Mobile Phones and No Account in MTC Server.

Suppose Passengers don't have Mobile Phones as well as no Account in MTC Server.

To solve this Problems MTC should create some rules to Passengers. All Passengers should Carry Govt. ID proof. For Example: Aadhaar Card.

Conductor should enter Passenger last 4 Digits of Aadhaar Card, **Optional Mobile Number** (Friends or Relatives phone number) and Passenger Destination details. Here Ticket information is going to that Phone Number. And Aadhaar data is stored in Conductor App. i.e., CMATA.

After Ticket is generated. Passenger cans ee those details from Conductor App. In this case, if Ticket Squad came then Passenger should give Aadhaar Card and that Information is Stored in CMATA.

Ultimately, there is a Money exchange between Conductor and Passenger. But Digital Ticket Generation is Optional. Since Passenger not carrying any Mobile Phone while Travelling.

Yes. This case is the only limitation in this application.

To overcome this problem, MTC should provide Digital Ticket generation counters in all Bus Depos. And create Digital Ticket Generation Booths in Major Bus Stops.

CMATA for Agents

Create a special App for Agents which is almost similar to PPMA. And Agents get some kind of commission from MTC. And all Agents must register in MTC Portal. All Agents should be available near to Bus Stops. Agents such as Shop Keepersand retired MTC workers can sell Digital Tickets to Passengers who don't have Mobile Phones.

By providing these facilities those cases won't raise frequently at the time of travelling**. In fact there is no better solution to this problem.**

4) Advantages of Digital TAP of MTC

- No need to generate Paper Tickets with Ink Cartridges. All Those expenses will be saved.
- No need to exchange money between Passengers and Conductors. In fact this is big headache to every Bus Conductor
- Bus Conductors can monitor how many Passengers need to get down? And how many Passengers may get in from upcoming Bus Stops?
- Bus Conductors No need to write any documentation on every stage at the time of travelling
- If Passengers destination is nearby then PPMA or PMA Will raise an Alarm or Notification as a Destination Alert.

5) Case Studies on Digital TAP of MTC

Practically, how this Application works? Explained in various perspectives.

Assume here, below are the Bus Stops in the Metropolitan City.

A,B,C,D,E,F,G,H,I,J,K,L,M,N,O. So Here "A and O" are Bus Depos or Bus Stops.

Case 1: From Location Mismatched

Suppose Passenger want to go from **B Location** to **J Location**. And accordingly Passenger generates Ticket using PPMA. Due to any of reasons Passenger get the bus at **A Location** instead of **B Location.** If Conductor see that **From Locations** mismatched then Conductor will reject that Ticket. (CMATA also give a hint to Conductor if From Location is mismatched. Accordingly CMATA is developed here). Once that Ticket is rejected by any Reason from CMATA then immediately that amount is refunded to respective PPMA Account.

In this case Passenger should generate a another Ticket using Generate Anywhere Ticket option in front of the Conductor and continue his/her journey. Otherwise Passenger should get down from that Bus.

Case 2: Ticket Adjustments by Conductor only

In CMATA there is one feature called Ticket Adjustment. In above Case Passenger get a Bus at **A Location** but ticket is **From Location is B.**

Conductor can change Destination from J Location to I or H Location which is before Passenger selected Destination. After that Passenger get respective Acknowledgement from the MTC Server. But this can be done with Passenger Acceptance and/or Conductor convenient in that situation.

Case 3: Destination Alert, Conductor Monitoring and Ticket Squads

Ticket Squad

Suppose Passenger generates a Ticket from **C Location to J Location**. Here Passenger gets a Bus at **C Location**. Or Passenger may get in After "**From Location**" say **D Location**. There is no problem here.

Due to any reason (either intentionally or unintentionally) Passenger didn't to get down at J Location. And Passenger continues journey up to N Location. As usually Ticket Squads are working. If any passenger is commit such kind of cheating or malpractice. Then Squads do their Duty.

Destination Alert

If Passenger is near to their Destination then PPMA (or PMA) intimate some kind of Alarms or Notification. This feature is very useful for new Passengers to that city. Also useful in case of long journeys Passenger can take a nap or watching movie or Playing Games or talking to someone and other reasons.

Conductor Monitoring

Conductor can be able to see at any time. In upcoming Bus Stops How many Passengers should get down from that Bus? Also If CMATA is interlinked with MAP of MTC application. Then in upcoming Bus Stops. How many Passengers may get into this Bus?

Accordingly CMATA is designed and developed.

Case 4: Interconnected Ticket

Suppose Passenger want to go from **A Location** to **N Location.** But here No Direct Buses to reach that Destination. In this Case PPMA give Suggested Routes.

For example: First Passenger should take a Bus from **A Location** to **H Location** (Assume here that **H Location** is some kind of Junction in a City). And Passenger needs to take another Bus which will go to **N Location.**

PPMA automatically shows alternative Routes to reach Passenger Destination.

There are two options to Passenger. Here depends on Passenger convenient

- Generate Multiple Tickets at a time using PPMA or
- Generate First Ticket and get down at 2nd Bus Stop. And generate another ticket from 2nd Bus Stop (in above example 2nd Bus Stop is **H Location**).

Case 5: Rare or Unexpected Cases

While Conductors are in duty suddenly they may face some Technical issues in their Mobile Phones such as:

- Mobile Battery is too low
- Mobile Hardware damaged
- Even Conductor may lost their Mobile Phone

If any of above reasons occurred then alternate options to Conductor are Use Driver Mobile and Login to his/her Account and continue to work.

Final Option: This is might be very rare case. Write all Ticket Numbers from Passengers and take their respective ID carefully. ASAP go to Depo and submit all information.

Network Issues:

Suppose in case of Network Issues. By default CMATA store all Approved and Rejected Ticket details in Conductor Mobile Phones. Whenever Network Issues solved then all information automatically go to MTC Server. Still Network Issues are there then Conductor should go to Depo and submit all information through USB port to MTC Server. Since All Tickets Approval Time is 24 Hours. So Conductor can approve within 24 Hours.

6) Features of PPMA, CMATA, and MTC Server

PPMA: Passengers Payments Mobile Applications

1. Passengers Registration and Login Module.
2. Recharge Passenger Account using Payment Gateways.
3. Generate Tickets. And Automated Ticket Cancellation Program.
4. If PMA is a subset of PPMA. If Passengers near to Bus Depo or Bus Stop then Automatically Request sent to Operators Dashboard.
5. Destination Alert and Ticket Sharing.

CMATA: Conductors Mobile Application for Ticket Approval

1. Login Module contains: Username, Password, Bus No., Bus Route
2. Accept or Reject Passengers Digital Tickets.
3. Accept Empty Ticket from Normal Mobile Phone Passengers.
4. Give Chota Credit to Passengers which is depends on situation.
5. Registration of New Passengers. And Recharge Money to Passengers Account.
6. Generate Tickets using Passengers Aadhaar Card.
7. Conductors Monitoring: How Passengers might get down in upcoming Bus Stops. If DCMA is a subset of CMATA then how many Passengers may get in from upcoming Bus Stops.
8. If DCMA is a subset of CMATA then communication between Conductors and Operators Dashboard Program
9. In case of Network Issues store all Ticket Details in Mobile phone memory.

MTC Server

1. Creating and Updating all Passengers, Conductors and Drivers details.
2. Manual upload Ticket details from Conductors Mobile in case of any Technical or Network issues a raised in CMATA.
3. Storing and validating all types of Ticket details from PPMA and CMATA.

MONITORINGAPPLICATIONFORPASSENGERS

OF

METROPOLITANTRANSPORTCORPORATIONS

There are 3 main Entities or Modules in this application.

- Both Passengers and Conductors or Drivers (preferably conductors) are communicated with Operators Dashboard of Transport Corporation.
- But there is no communication between Passengers and "Conductors or Drivers".
- Mostly communication is between Passengers and Transport Corporations.

What is the main concept among those entities one by one with general example?

In city, **Bus Depos or Major Bus Stands** 100's of passengers are waiting to travel from Depo to various locations and vice versa.

Assume these are the Bus Stops in a City **A,B,C,D,E,F,G,H,I,J**. Here A is Depo and J is destination.

For example, in MTC from A to J and Bus no is 342. Suppose more than 20 to 30+ passengers are waiting for same bus or same route. Here 20 to 30+ passengers can send requests to Depo at different timestamps. Accordingly here Passengers Mobile App. **PMA** is developed. We will discuss this later.

In Depo few **Operators** are observing and working on Operators Dashboard which displays passengers request counts. In Dashboard if more than 20 to 30+ passengers are waiting for particular bus or route. Then that will highlight on operators monitor. Also some kind of beep Alarm is coming from the Dashboard.

Immediately Operators arrange or allot a new Bus to passengers who are presently waiting in Depo. As per this idea assume here few buses are always available in Depo parking area. And all these buses are also called as ODB: **On Demand Buses**. Since buses are arranged by Passengers requests.

1. How can operators know those passengers are in Depo? They may send requests from their home or other location.
2. What are the minimum passengers are required to arrange the bus? Who will decide this?
3. After passengers get the bus. How operators should know respective passengers caught the bus and they left from Bus Depo? And what about requests count?
4. Before and after arrange ODB is there any precautions need to take? What about if all ODB buses are gone from the parking area?
5. To arrange an ODB Who will instruct to Drivers and Conductors? And How to inform them?
6. Is Operators needed to send respective messages to Drivers and Conductors each and every time?
7. Passengers might wait in Bus Stops rather than Bus Depos? How operators should know and at present how many passengers are waiting on various locations in side city and city out skirts too (i.e., city rural areas)?
8. After sent a request to Operators Dashboard from PMA. Is there any response from Operators Dashboard Program?
9. If we arrange ODB to passengers. What about as usual running buses?

1) Let's see solutions to above problems one by one.

1.1) How can operators know those Passengers are in Depo? They may send requests from their home or other location.

Solution: If Passengers are near to Bus Depo then only they can send a request to Depo. Every Depo as its own Latitude & Longitude. Also called as GPS Coordinates. Similarly Passengers mobile phones have GPS. So we can calculate the distance between Passengers and Depo. Say within 200 meters then only **PMA**: **Passengers Mobile Application** can send a requests to Depo. Here that range is depends on Bus Depo area size. With this GPS logic we can determine that passengers are genuinely waiting in Bus Depo. Accordingly that PMA is designed and developed.

1.2) What is the minimum passengers are required to arrange the bus? Who will decide this?

Solution: Management will decide. Generally the maximum capacity of the bus is 30 to 40+. So management will decide minimum passengers count and accordingly Operators Dashboard is programmed.

Importantly, Additional condition should satisfy to arrange or allot ODB to passengers.

If 20 to 30+ Passengers are waiting for same Bus. Then that bus is running at a distance of say more than 5 km. Or estimated time is more than say 40+ minutes. Then only Operators are proceed to arrange the ODB to passengers.

In this condition also both distance and estimated time is decided by management. Accordingly Operators Dashboard is programmed. In fact Operators can't apply their own decisions on arranging or allot an ODB to passengers.

Technically we can apply all these conditions on Operators Dashboard. If all respective conditions are satisfied then only certain elements or buttons are enabled on Operators Dashboard. Finally Operators proceed to further steps.

1.3) After passengers get the bus. How operators should know respective passengers caught the bus and they left from Bus Depo? And what about requests count?

Solution: After arrange an ODB to passengers. Now bus will move ASAP say within 5 to 10 mins. Every **Request contains:** Req.ID, To Location, Timestamp, and How Many Passengers?

By using PMA Passenger send request to Operators Dashboard from that Timestamp for every 2 mins of interval PMA checking the distance or range between Passenger location and Depo location.

If the Passenger is out of range then only PMA send intimation message say "0" (0 means out of range) to Operators Dashboard and respective request count is removed after 1 min.

And another condition for every 8^{th} cycle (or loop) of interval that is after sending a requests from PMA. If the Passenger is inside the Depo then PMA send an intimation message say "1" (1 means passenger is inside the Depo) to Operators Dashboard. If passenger is out of range then intimation message is "0". So Operators Dashboard is expected re-intimation 'message for every 16 minutes from PMA. Is Passengers are inside the Depo or not? This entire process is an automation program is called ATIP.

1.4) Before and After arrange ODB, Is there any precautions need to take by Operators? What about if all ODB buses are gone from the parking area?

Solution: Operators need to check on their Dashboard are there any buses available in parking area. This is also an Automated Program. And is there any D&C are available in inside Depo or not? In general few Conductors and Drivers and few extra buses are always available in Depo. If no such rules then Transport Corporations should maintain for ODB passengers.

Before arrange an ODB bus to Passengers here Operators send an intimation message to **D&C: Drivers and Conductors.** How can operators know both D&C are inside the Depo. All D&C must install **DCMA: "Drivers and Conductors Mobile Application"**. They should login into their account before they enter in duty and logout once they complete their duty. From this Operators know how many people are working and where they are working with exact location. Accordingly Mobile App. is developed for D&C.

If ODB is required then they will get Message to D&C Mobile phones from Operators Dashboard Program. That message contains below information.

"**ODB details to D&C:**

Bus Service No: xxx, Route No: xxxxxx,

Route Name: xxxxxxxxxxx and Platform No: xx"

From above information both D&C know everything. And both will accept it. Once they accept it then Operators know on their Dashboard and immediately send an intimation message to the Passengers those who are waiting in Bus Depo. This message contains below information.

"**ODB details to Passengers:**

Platform No: xx, Route No: xxxxxx,

Route Name: xxxxxxxxxxx"

This entire process may take Max 5 to 10 mins.

1.5) Who will instruct to Drivers and Conductors? And How to intimate them? ODB parking area is acts like a Inventory Management System.

Solution: Then How Operators can add a busses in ODB parking area. After arrange a Bus. No say "123A" from ODB one bus is decreased from ODB count. A bus(es) no "123A" which is/are running towards bus Depo that Bus going to ODB parking area.

How Operators to intimate to that D&C of Bus No "123A" which is running towards Bus Depo? Now Bus No is "124A" because it is returning to Depo.

After ODB is arranged by Operators. Automatically **Operators Dashboard Program (not by Operators)** sends an intimation message to D&C of the nearest Bus. No "124A" which is coming to Bus Depo.

Message to D&C: "Park your Bus in ODB parking area. And go to waiting hall".

1.6) Is Operators need to send respective messages to Drivers and Conductors each and everytime?

Solution: Usually Drivers and Conductors are busy on their Duty they may not see those messages from Operators Dashboard. In fact this intimation is stored in their App. But it will give an Alarm to D&C Whenever that Bus.No124A is near to the Depo.

By using GPS tracking we can achieve this solution too. Why should App. Raise an Alarm near to Bus Depo? Because D&C are pretty free when bus came to Bus Depo.

This entire process is an automation program. Operators may communicate with D&C for clarification or any miscommunication happened in the process. In MAP of MTC there is no direct communication with Passengers on any case.

1.7) Passengers might wait in Bus Stops rather than Depos. How operators should know and at present how many passengers are waiting on various locations inside city and city outskirts too (i.e. city rural areas)?

Solution: Actually Passengers can send requests from Bus Stops (or Bus Stands) also. Here the distance between Passengers and Bus Stop is within 30 to 50 meters (depends on Bus Stop length). If this condition is satisfied then only Passengers can send requests from PMA. Bus Stops also have GPS coordinates which is similar to Bus Depo. Accordingly PMA is designed and developed.

Bus Stops requests also have expiration which is almost similar to Bus Depo requests. That is already explained in above. But only difference between “Bus Depo request” and “Bus Stops requests”: Operators can't arrange ODB to Passengers who are waiting at Bus Stops.

Now Operators know below information

1. At present in city, how many passengers are waiting at Bus Stops?
2. How many passengers are waiting for which Buses or Routes?
3. From which Bus Stops or Routes more requests are coming?
4. How many passengers are waiting and travelling from City rural areas to Urban areas and vice versa

After few months MTC Operators get to know how many passengers are raising requests at what time and on which locations. From this data MTC can escalate Bus Timings.

1.8) After sent a requests to Operators Dashboard from PMA. Is there any response from Operators Dashboard Program?

Solution: Yes. Operators Dashboard Program sent Automatic standard reply to every requests which are coming from PMA. And Reply is coming in Tabular format.

Bus No's	Distance	Estimated time to reach your position

In PMA, Passengers can able to Select only "To Location" here "From Location" is automatically selected by PMA. Because PMA works only near to Bus Stops & Bus Depos. PMA doesn't work at other than these locations.

1.9) If we arrange ODB to passengers. What about as usual running buses?

Solution: As usually all Buses are running on general timings which are decided by MTC management. But after few months Operators get data from Operators Dashboard Program. Here MTC provides different types of services. Such as Ordinary, Deluxe and Air Condition buses.

Now operators get a clear picture on Passengers timings and their needs. Passengers may choose the Bus types depends on their financial status too. Accordingly Operators and management can decide the timings and Bus types on certain routes.

2) Features of PMA, DCMA and MTC Operators Dashboard

2.1) PMA: Passengers Mobile Application

1. Passengers Send Requests to Operators Dashboard Program
2. Every Request contains
   - ✓ Request ID:
   - ✓ To Location:
   - ✓ No. of Passengers:
3. After Request sent from PMA which contains ATIP: Automated Tracking and Intimation Program which is working internally.
4. Automated Response from Operators Dashboard Program.

2.2) DCMA: Drivers and Conductors Mobile Application

1. Login Module contains: Username, Password, Bus No. and Bus Route.
2. An Intimation messages may come from Operators Dashboard.
3. Accept or Reject Operators Dashboard Instructions.
4. In DCMA also contains ATIP which is almost similar to PMA.

2.3) MTC Operators Dashboard Program:

1. Receiving Requests and Re-intimation messages from ATIP in PMA.
2. Sending an Automated Reply to PMA.
3. Graphical Information about Passengers Requests count and ODB Buses count in Depo Parking area.
4. Sending an Automated Intimation Messages to DCMA. That is after arranging ODB to Passengers.
5. Receiving Acceptance or Rejection Messages from DCMA.
6. If all Conditions are satisfied then arranging ODB to Passengers.

3) Importance and Uses of Bus Stop/Bus Stands Requests from PMA

Primarily, 95% entire process is fully automated only in MAP of MTC. Only 5% rare Manual Interaction between C&D and MTC Operators.

3.1) Ladies Passengers

Starring, Teasing, Commenting, Abusing, Chain snatching, Kidnapping, Rapes and Murders.

These are the problems and threats experienced by Ladies Passengers and Students in their daily life. Because of these threats most of the female passengers are not interested to work or travel in evening and night shifts.

Some people can bare expenses using Auto, Cab or Taxi. What about middle class people? And especially with late nights charges. In fact safety is also less in nights.

In most of the cases Ladies Passengers are waiting at Bus Stops if no bus came to their timings and/or to those locations. Then they may experience above problems. Until to reach their destinations. Passengers Parents also facing lot of tensions.

Most of the Passengers don't know when last bus went from their position. And passengers are simply waiting at Bus Stops.

In some cases Passengers might get the buses at right time. But when they reach to their destinations? And how to solve these problems?

3.2) How about providing Special Buses for Female Passengers only? Which are starts from daily 7 PM to 1 AM?

How can MTC know, Where Ladies passengers are waiting, How many Passengers are waiting, mostly on what timings they are waiting??

Yes. It's highly impossible to arrange buses to each and every female passenger. But if Passenger registered then we can solve these problems.

3.3) Registration on PMA

Primarily, all Female Passengers must register in PMA with all basic details and along with emergency contact details. Additionally their timings and Routes also need to enter in that form. Where there are regularly working. From these features Operators can figure it out and accordingly arrange and plan buses as per passengers needs. **Here Busses are not waiting for Passengers at any Bus Stops. MTC simply arrange the buses to cover those timings.**

After few months of observations MTC Operators get the clear picture on passengers' movements. Accordingly Government will arrange She Team patrols and arrange CCTV Cameras especially in remote areas.

3.4) Too many Passengers movement on certain Occasions

Events, Festivals, Students Examinations, Public Rallys, Public Holidays, Unexpected strikes, Cricket Matches, etc.,

Due to these reasons Requests from PMA might more than usual. Operators can observe live data on their Dashboard they can arrange buses accordingly.

3.5) Criminal Investigation Department

In broadly, Passengers Information and their travel history is useful to solve some kind of criminal cases. CID can see When, How and which locations Passengers (such as: Accused, Victims and Witnesses People) are moving in cities. Because Govt.ID proof is Mandatory. We discussed in DTAP of MTC.

3.6) Interconnectivity among Bus Depos. Time and Distance.

In every Metropolitan or Capital Cities Bus Depos are located in various locations which are depends on Population and other factors.

In rare cases Due to some occasions Passengers Requests at one Bus Stop(s) count might be raised more than 50+ requests. Here Passengers are waiting for same Bus or same route. If that running Bus estimated

time is more than one hour to reach Passengers location. And if any Bus Depos are near to that Bus Stop(s). Then Operators can arrange ODB accordingly.

3.7) Traffic Issues in Metropolitan Cities and City Pollution

A passenger waiting time is one hour and travelling time is more than one hour. Every day for travelling it takes around 3 to 4 Hours.

Due to these reasons Passengers are choose to Travel in private transport such as Auto, Taxi, Cab and other.

Yes. Passengers are expecting buses with these features **ABCS:** Accuracy, Budget, Convenient and Safety.

If too many private transport services increased then ultimately that City becomes a **Traffic Jungle.** This is not only loss to MTC. This will also seriously impact on City Pollution.

4. Important Points in both MAP of MTC and DTAP of MTC.

MAP of MTC	**DTAP of MTC**
Purpose: Monitoring on Passengers movements and their Requests. And MTC Operators Organizing Buses depends on Passengers Requests.	Purpose: Passengers can able to Generate Tickets anywhere. And Conductors Approve or Reject those Generated Tickets.
Passengers Registration is Optional	Passengers Registration is Mandatory
No such Payment Gateways.	Payment Gateway is required to recharge in Passengers Mobile Wallet i.e., PPMA Account
Communication through Apps: There is no communication between Passenger and Conductor. There is a frequent communication between Passengers and Automation program i.e., Operators Dashboard Program There is a rare communication between "Conductors/Drivers" and MTC Operators.	**Communication through Apps:** There is frequent communication between PPMA and MTC Server as well as CMATA and MTC Server. But There is a verbal communication between Passengers and Conductors in a Bus.
This is an independent application.	This is an independent application. But MAP of MTC is a subset of DTAP of MTC.
Request is not a Seat Reservation.	Ticket Generation is not a Seat Reservation.
Passengers can raise Requests only near to Bus Depos and Bus Stops	Passengers can generate Tickets Anywhere even while Travelling too. By interconnecting the MAP of MTC if Passenger generates a Ticket near to Bus Depo or Bus Stop. Automatically it raise respective Requests and sent to Operators Dashboard
Raising Requests is not a mandatory. But it acts like intimation to Operators Dashboard. If so many Requests are coming for one Bus or one route then Operators may try to arrange separate Bus to that route.	Ticket is a mandatory to travel in any City Buses. If Passengers generate Ticket in advance then his/her journey is in very convenient and easy.
Very useful to Ladies Passengers and City New Comers too.	Very useful to Ladies Passengers, City New Comers and Students also.
Passengers Requests come from using Smart Phones Only.	Passengers Ticket Generation with Smart Phones as well as Normal Mobile Phones also. By using this Application from CMATA data: MTC Operators and Management can organize city buses accordingly.

4.1) Awareness is the Key role to both Applications.

By applying some marketing tactics. All Passengers interested to use these Mobile Applications. Such as providing offers to Passengers. First 3 or 5 trips are free after successful installation in Passengers Mobile phones. If a Passenger recharge with 1000 /- then they will earn some kind of discounts.

4.2) Information or Data Size

In Map of MTC and DTAP of MTC both Applications all Messages length is very short. Maximum Message length is Max 10kb only. Now a day's Passengers are watching movies while travelling. So 10 kb is not a big deal.

5) Is these Applications are helpful in this Covid -19 Pandemic crisis? And Is these Applications are helpful after this Pandemic? How?

Corona Virus is one of the biggest pandemic to entire human race. We don't know when we invent the cure to this virus. But until we must follow the rules & regulations which are suggested by Doctors & Scientists.

5.1) In Covid -19 Crisis What are the problems in Transportation especially in MTC.

- ✓ **Bus Conductors become a Super Spreaders. How?**
  Generally while Travelling all Passengers and Conductors are exchanging money. And Conductors give a Ticket to Passengers. In this process so many people are touching Currency Notes and Tickets. So in this Process Bus Conductors become a Super Spreaders.
  How about using Gloves?
  No use because they are contacting Asymptotic Patients Currency. On Gloves also Virus is hide.
  How about Using Credit cards and Debit cards?
  In foreign countries they may use this method usually. But this Virus can live in plastic also.
- ✓ **Applying Social Distancing rule half of city buses are empty.**
  Before Covid -19 itself most of the times Passengers are partially filled in City Buses. Due to this Pandemic crisis Passengers are in fear to travel in City Buses. Then financially double impact on MTC.
- ✓ **If we Apply above rule what about financial impact on MTC.**
  If MTC run the Buses in this Pandemic without knowing Passengers movements in cities. Then Due to this crisis MTC will face lot of financial loss.
- ✓ **Don't know when vaccine came and end this threat to all Human beings.**
  How many days Passengers and Conductors are applying those Sanitizers and Gloves. This is practically not workout in this type of crisis.

5.2) After Covid-19 Crisis what are the Advantages and uses of these two Applications: MAP of MTC and DTAP of MTC

1. Digital India
2. These Applications are good gadget to Passengers and especially Ladies Passengers.
3. Buses Conductors work become smooth and easy.
4. MTC Operators can observe live data and after few months MTC Operators can organize city buses as per Passengers needs& Timings.
5. By Applying Govt. ID proof is Mandatory in travelling. MTC Operators can see Passengers live movements. In fact this is a Good Practice to all MTC's in every Nation.
6. In case of emergency we can identify Passengers Information such as Addresses and Emergency Contact numbers.

7. Helpful to solve Criminal Cases. Police men can solve Criminal Cases. And if any emergency cases Police can easily identify the Criminals.
8. Passengers who are new comers to City these Applications are very much useful to travel in cities.

6) Special Option for Covid-19 in Passenger Application.

By using technologies we can address a solution to both Passengers problems as well as MTC problems of Covid -19 crisis.

In Passenger Mobile Application MTC need to provide Covid-19 Form. This is a Special form which contains basic information of Passengers needs and their Timings.

In every Metropolitan city different types of Passengers are daily travelling in various routes and different timings. Passengers such as:

Employees, Workers, Students, Home Keepers, Labors and Businessmen.

All people need to fill below details

- ✓ Basic Details and importantly Aadhaar Card as well as Mobile No.
- ✓ From Location and To Location details,
- ✓ Estimated Journey timings and
- ✓ Estimated Return Journey timings also

With these details MTC Operators can get the Passengers data. That is on What timings? And on Which Locations? Passengers are looking for MTC services. And Accordingly MTC Operators can plan the Bus Timings. Here Buses are not waiting at Bus Stops for Passengers. Just plan the Buses accordingly.

This Information is useful **In Covid -19 crisis** as well as **After Covid-19 crisis.**

7) Technical Feasibility:

As a Software Developer both MAP of MTC and DTAP of MTC feasibility is more than 95%. The rest is depends on that respective MTC Structure and its Management.

Technically, Here MAP of MTC is little bit difficult than DTAP of MTC. But both are easy to use. And GPS plays vital role in both Applications.

Incase as soon as possible to solve the problems of Covid -19. Then First Implement DTAP of MTC and later prefer MAP of MTC.

Conclusion

Public Transportation is very important to every Nation. Without proper Public Transportation services to People then slowly Nation becomes Economically Handicapped

Passengers, Government officials and Metropolitan Transport Corporations need to work together to solve the problems. We don't know what kind of Challenges are in future? And this is the right time to go towards **Digital India.**

By using technologies and these Innovations **"MAP of MTC** and **DTAP of MTC"** we can address a solutions to present and future problems of Public Road Transportation Sector.