Model for Tracing of Stolen or Lost Mobile Phone Station

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ABSTRACT
Adoption of Mobile phone by young people has been a global phenomenon in recent years and its thefts have increased enormously over the past few years, not just in INDIA but around the world. Mobile phone coupled with internet has brought remote geographical location to single point for common person. In India with the increased penetration of mobile services, (theft) is becoming an issue especially in urban areas where market place, malls, cinema halls, buses, trains and metro stations have become some of the hunting grounds for mobile phone lifters. In this paper we will focus on the issue and consequences of mobile phone being stolen and lost. We also underline some of the anti theft measure and propose a model to trace a mobile station in case of lost and theft. The Model will reduce the workload for mobile operators and also help the investigating department to work with ease and without wastage of time.

KEYWORDS
MSC, IMEI, Stolen Phone, Phone Tracing, EIR Register, mobile switch center, IMSI, Blacklisted

1. INTRODUCTION
Technology has made the life of the humans comfortable by adding more and more electronics gadgets in the human life. One of these gadgets is a wounded full scientific invention call mobile phone. This equipment has reduced the distance and almost shrinked the all the surrounding of person to a single point. On one side the small equipment has made the human life comfortable at the same time had added some extra points. On one side the small equipment has made the human life comfortable at the same time had added some extra extra points. On one side the small equipment has made the human life comfortable at the same time had added some extra extra points. On one side the small equipment has made the human life comfortable at the same time had added some extra extra points. On one side the small equipment has made the human life comfortable at the same time had added some extra extra points. 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Earlier it was possible to have working mobile phone with a invalid IMEI numbers. But the situation has changed since 2008 when the telecom department asked mobile operators to disconnect mobile phones which do not have valid IMEI numbers as they could be misused by terrorists or criminals. Thereafter telecom service providers put Equipment Identity Register (EIR) in their systems so that calls from mobile handsets without IMEI are rejected.

2. IMEI FORMAT
The Equipment Identity Register (EIR) is a database that stores the International Mobile station Equipment Identity (IMEI) for each MS (mobile station/Phone) equipment. IMEI number is of 15 digits. The format of this number is shown below.

<table>
<thead>
<tr>
<th>3</th>
<th>5</th>
<th>6</th>
<th>2</th>
<th>8</th>
<th>3</th>
<th>0</th>
<th>1</th>
<th>8</th>
<th>4</th>
<th>9</th>
<th>7</th>
<th>3</th>
<th>0</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAC</td>
<td>FAC</td>
<td>SNR</td>
<td>SP</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

TAC : Type Approval Code
FAC : Final Assembly Code
SNR : Serial Number
SP : Spare

3. BLACKLISTED PHONES
[1]A phone may be blacklisted (or barred) for many different reasons, but the most common reason is that it has been reported either lost or stolen! It is only the networks some networks provide this facility to blacklist a handset. If some one is unfortunate enough to either lose or even worse have your phone stolen you should report it to your service provider (your network) immediately! Your service provider can then blacklist the handset so that it can no longer be used to make or receive any calls. The networks do this by adding your phones serial number onto a national blacklist database (Central Equipment Identity Register). Effectively the handset becomes absolutely useless and the thief is in possession of a pretty paper weight:

Each time user switch his/her phone on or attempt to make a call the network systems check the IMEI number of the handset being used. At this point the IMEI number of the handset is cross referenced with the Central Equipment Identity Register. If the IMEI number of your handset is on the Central Equipment identity Registrar (CEIR) then the network will either:

Refuse to send a signal to your phone. Or will supply a signal but will not allow any outgoing or incoming calls.

If phone IMEI number is on the CEIR handset is blacklisted and therefore useless.
The network rejects any access attempt if the equipment is classified as "black-listed" or "unknown".

The steps to know IMEI number from mobile equipment are given below.

- Open the battery cover on your mobile phone and remove the battery. The IMEI number should be located on the white label under the battery. It will be 15 to 17 digits long with no letters or slashes. You only need the first 15 numbers.
- Enter *#06# on your phone’s key pad. When the final # is entered, a 15-digit number with the title "IMEI number" will appear. Copy the number down and keep it for future reference.

During any MS access (except in the case of IMSI-detach), the MSC/VLR may verify the IMEI. When necessary, the EIR is requested by the MSC/VLR to check the IMEI. The main objective is to ensure that the equipment is not stolen or faulty. Equipment can be classified as:

- white listed (permitted for use)
- gray listed (should be tracked for evaluation)
- black listed (barred)
- unknown equipment

4. USER ANTI-THEFT SOLUTIONS

Network Operators, Police and other agencies throughout the world are now working together to crack down on mobile phone theft. The removal of handset subsidies and the new release almost monthly of new feature rich handsets continues to make these appealing to thieves.

Some recommendations for mobile phone users to reduce their risk of becoming a victim of theft include,

- Record your handset’s IMEI number so that this can be provided to Police if the phone is stolen.
- Always use your phone’s security lock code or PIN number.
- Security mark the battery and phone with a unique identifier, such as your initials.
- When using your phone, remain aware of your surroundings and be aware of ‘phone snatchers’
- Avoid displaying your phone in public view, such as sticking out of your bag or leaving in on the seat of your car.
- If your mobile phone is stolen, report this to the Police and your Mobile Network provider immediately. In most cases the phone owner will be responsible for any call charges made from the phone up until the time it is reported stolen.
- If you take the risk and purchase a second hand mobile phone, from an unknown person at a heavily discounted price, then do not be surprised if you find that it will not work because it is blacklisted from network access because it is stolen.

4.1 IMEI TRACING

In the case of stolen Mobile station, If we want trace that stolen Mobile station than the only way to trace it by its IMEI number only.

5. EXISTING TRACKING PROCEDURE

The flow of this procedure is given in below diagram.

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OPERATOR – I

OPERATOR – II

The steps are given below.

The person whose Mobile equipment is stolen informs that IMEI number to the concerned Police station. Now, the police department have to consult all operators of mobile services and will give that IMEI number. The reason behind that is only the operators have the rights to access their EIR registers which contain the whole IMEI database. Each operator has its own legal department which communicates with police department. Now legal department has that IMEI number. It will check that IMEI number in all existing EIR registers of concerned operator whether it is present in the database or not. Each EIR is connected with MSC. Now in the case of GRAY listing or BLACK listing of IMEI number, the legal department will inform the network service department to do that so. If IMEI number is present in any of the EIRs of that operator, the legal department will inform police department and will trace that IMEI if necessary.

From the last access of that operator’s SIM in the network the police department will try to identify the location of that stolen Mobile equipment.

6.1 PROBLEMS IN EXISTING PROCEDURE

- [2]Currently, there are around 15 mobile services providers across India. Each operator has around 20 EIRs.
So, the police department has to communicate with many legal departments as each legal department is connected with only one EIR.

- Also, each legal department has to complete the procedure mentioned above & reply to police department.
- So, the process becomes complex. And the main disadvantage of this is that it consumes more time (around 2 months).
- So, it is not feasible for common men to wait such a long time.

7. PROPOSED IMEI TRACING PROCEDURE

In current procedure, the police department must contact to each operator separately. So, it consumes much time in communication.

To make this procedure time efficient, we have introduced the "CENTRAL SERVER"

7.1 FUNCTIONS OF CENTRAL SERVER

The connectivity of Central Server is between all EIRs of different operators & Police department.

The central server will periodically fetch the IMEI, IMSI and address from the EIRs of the mobile operators. The fetched data would be used to update the database of the central server. The central data base would have the details like IMEI numbers & address corresponding to the IMSI of relative operators. Updating of the database can be periodically weekly or fortnightly. Since frequent update or update after a very short period of time would burden the equipments of the mobile operator. Make the efficiency to compromise.

This process is done by Central Server periodically. The flow of this procedure is given in below diagram.

**OPERATOR – I**  **OPERATOR – II**  **OPERATOR–III**

`\[\text{MSC} \quad \text{EIR} \quad \text{MSC} \quad \text{EIR} \quad \text{MSC} \quad \text{EIR} \]`

**Central Server**

**Police Dept.**

**PROPOSED IMEI TRACING PROCEDURE**

The steps for tracking of IMEI are given below in this proposed procedure:

- The person whose Mobile equipment is stolen informs that IMEI number to the concerned Police station.
- Now, the police department will access the Central server.
- The police department can know the all details of SIM of different operators used in that mobile equipment.
- So, they can track that IMEI number easily.

7.2 ADVANTAGES

- The main advantage of this method is time efficient.
- Accessing from one place we can get all information related to mobile user. Relatively very easy method to trace IMEI than existing per here.

8. FUTURE SCOPE

In India EIR of different mobile a operator is not compatible making it difficult to search a stolen or lost phone. However If the proposed model is put in place it will not only make the problem of tracing easier but will also help in reducing the crime, burden of police, save time, mobile company work load. But at the same, to put such a system in place need coordination of number of different Government and private machinery and involves the capital and the operating expenditure. The IMEI numbers are software based which can be easily reprogrammed thus assigning new IMEI for mobile phone. This nullifies the effectiveness of whole system. Therefore, to ensure the effectiveness of process, reprogramming of the mobile phones has to be banned as is done in many other countries like in Europe, Australia. These countries have laws which treat reprogramming of the mobile phones as a crime and ban anything related with reprogramming of mobile handsets.

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