Abstract—E-government, necessity for good and corruption free nation, means by using information and communication technologies, especially internet, to achieve better government by delivering public services and processing internal works in government in a much more suitable, customer leaning and cost effective. Like other e-government related services e-police system is also an e-government related service which makes the communication process a possibility, a great success for modern era with increasing the professional efficiency for the government’s police administrations. Although E-police system is not a new and original idea in context to global scenario especially in developed countries but it is new for developing countries. Our work will definitely help the police system in making the police work more efficient through equipping the police with modern ICT solutions i.e. it aims to ensure solutions and means for the police officers that support their main activity and it will be interesting for audience in the context of law and order situation in developing countries. In our paper we present all about of an e-police system as well as its steps, challenges during implementation, its necessity etc for developing countries and the ultimate goal of this paper is to upgrade the developing countries’ police administration to world standard.

Keywords- E-government, E-government Services Internet, ICT, WAN, Software Engineering,

I. INTRODUCTION

According to World Bank definition, “E-government refers to the use by government agencies of information technologies like wide area network, the internet and mobile computing that have the ability to transform relations with citizens, businesses and other arms of government” [1]. According to UNESCO definition, “E-governance is the public sector’s use of information and communication technologies with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective” [2]. E-government and E-governance related services include e-voting, e-democracy, e-information, e-consultation, e-decision making, e-procurement, e-health, e-education, e-banking, e-commerce, e-payment, e-tax systems etc. Like these e-police system is also an e-government service. According to e-government ranking released in the survey conducted by Institute of e-Government, Waseda University, Japan, United States of America, Singapore and Canada are top three e-government countries amongst 34 surveyed countries [3].

E-police system is the process where police personnel need to access information and report incidents, accidents and crimes while out on the road and their reporting involves not only data but also live images and pictures. The need of the moment is thus an effective, speedy and secure system to manage on-the-job and internal communication among the personnel. It contributes to public security as well as minimizes all kinds of crimes. The police personal would also be able to identify any criminals and this is possible if a database is available for any citizens including criminals’ and innocents’ all information. For the public safety there would be record about the wanted persons, suspected criminals’ history, wanted cars, stolen cars, cases, news and events, contact details, recommendations, airline information and so on. The objectives of this work are free access of the citizens for their queries and complain, establishing database for citizens and police personnel, operation well despite sudden weather changes and circumstances, online traffic supervision and so on. The improvement of the work environment of police officers ensures in its turn a better and quicker service to people or citizens. The home ministry would be connected with the several police units of the city in a fiber-optic based metropolitan area network and a database will be setup for warrant notices, examining the finger prints using the latest electronic device etc. There have to be set up a ‘Third Eye’ software in the special branches of the police department so that it helps the police supervisors to monitor crime and criminal records. Third-Eye software is an independent software vendor specializing in custom software application for rich media, telecommunication and other industries [4]. There have to be set up an electronic database and an interactive website which will contain daily press releases, supplement, list of top terrorists and criminals, lists of people under police custody and people injured in road or other accidents etc. In this paper we focus on the infrastructure of an e-police system as well as its steps, challenges of implementation and its necessity. For implementing the software we can use JAVA, PHP (especially AppServer) and MySQL. There are some features of general e-police system which are too much essential for improved e-government services and these are enlistting, recording and finding the cases, stolen cars, wanted cars, general diaries, criminal histories, suspected criminals, news, events, field reporting system and online traffic management system, mobile or online payment service cyber crime detection and so on.
This paper organized as follows. In section 2, 3, 4, 5 and 6 the present condition of developing countries, e-police system for developing countries, advantages of e-police system for developing countries, system software design for e-police system, implementation steps, issues and challenges, recommendations and cost analysis are described respectively and finally we go to conclusion.

II. PRESENT CONDITION IN DEVELOPING COUNTRIES

A. Police System and its Vision and Mission

A police system has been devised for the purpose of preventing evils and providing benefits. In its first meaning it protects and defends society from the dissidents, those who decline to be bound by the general standard of conduct accepted by the larger number of law abiding, in this sense it is chiefly concerned with the prevention and pursuit of crime. It has a second and more extensive meaning as applied to the regulation of public order and enforcing good environment. The police system of developing countries has some vision and mission i.e. to provide service to all citizens and make a better and safer place to live and work whilst the missions are to upload the rules and law, to ensure safety and security of citizen, to prevent and detect crime, to bring offenders to justice and to maintain peace and public order.

B. Police to People Ratio of Several Countries

The Police to People ratio of Bangladesh, India, Philippines, Pakistan, Japan, New Zealand etc [5] is shown in Table II.

<table>
<thead>
<tr>
<th>Serial No</th>
<th>Country</th>
<th>Police-People Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bangladesh</td>
<td>1:1,138</td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td>1:728</td>
</tr>
<tr>
<td>3</td>
<td>Philippines</td>
<td>1:565</td>
</tr>
<tr>
<td>4</td>
<td>Pakistan</td>
<td>1:625</td>
</tr>
<tr>
<td>5</td>
<td>Japan</td>
<td>1:563</td>
</tr>
<tr>
<td>6</td>
<td>New Zealand</td>
<td>1:416</td>
</tr>
<tr>
<td>7</td>
<td>Singapore</td>
<td>1:295</td>
</tr>
<tr>
<td>8</td>
<td>Malaysia</td>
<td>1:249</td>
</tr>
<tr>
<td>9</td>
<td>Thailand</td>
<td>1:228</td>
</tr>
<tr>
<td>10</td>
<td>Hong Kong</td>
<td>1:220</td>
</tr>
</tbody>
</table>

III. E-POLICE SYSTEM FOR DEVELOPING COUNTRIES

With the onset of information and communication revolution many developed countries developed e-police system to make their countries world standard police administration. E-police system is to make the police security and safety of country’s people as well as decrease crimes in all section of the country and also ensure free access of the citizens to the security apparatus.

A. Overview of E-Police System

The overview of e-police system is described in this section and figure 1 and 2 represents the block diagram representation of our system and transferring information respectively.

This section is very important for e-police system. E-police system can be described as following.

1) There are two parts in e-police system. First one is the local police stations, special branches, detective branches, prisons, traffic systems etc are interconnected as a Metropolitan Area Network (MAN) topologies and these MAN connections are interconnected which is called Wide Area Network (WAN) topology. Second one is the home security department which is connected with the district police, intelligent software, government website and electronic database where citizens’ documents, general documents and police personals’ documents exist.

2) The police station only can share the database but can’t make any change and they can only send any information about citizen and personnel.
3) The district police only can share the database and provide information about citizen and personnel document.
4) Intelligent software helps the police supervisor to monitor criminal and criminals record and sent any massage to home security department and the intended police station through internet or mobile phone.
5) During working on the field the police personnel can store real-time data and still or moving images at the time of incident about any crime done by any criminal and they can send massage by E-mail, Short Message Service (SMS), Multimedia Message Service (MMS) to the police divisional headquarter and then that massage send to the home security police for the proper action to the crime and the criminal could be identified by the intelligent software since all the records about him are stored in the electronic database.
6) Since the citizens can access and use the website by free they could be able to make a diary about any criminal, case etc. by using the government interactive website.
7) The respective police officers upload the data about wanted persons, suspected persons, criminal history, news etc and update timely.
8) The police department can handle all types of cases all time using electronic database and they can also help from the third eye software.
9) As all traffic police stations of a city are internally connected it is easy to manage the whole traffic system as well as to monitor the road accidents. It performs a part to lead comfortable traffic culture by dissolving traffic jam caused by sudden increase in vehicle volume. Here at emergency the communication between traffic polices to traffic police stations by Short Message services or cell phones. But if the Wireless Sensor Networks are used the system will be efficient.
10) As every citizen has a web account they can pay their fines trough internet or cell phone.
11) Cyber crime detection cell detects the cyber crime through internet.
12) To recognize a fingerprint at first features are extracted from scanned fingerprints and they are saved into system database and this phase is known as enrollment. If the fingerprint is compared with stored feature of the same fingerprint it is called fingerprint verification. But in case of identification a sample fingerprint is compared with the entire stored fingerprints it is called fingerprint identification [6], [7] and [8]. The block diagram representations of fingerprint enrollment, verification and identification are shown in figure 3, 4 and 5 respectively.

IV. ADVANTAGES OF E-POLICE SYSTEM FOR DEVELOPING COUNTRIES

There are some advantages of e-police system in developing countries and these are given below.

1) Establishment of E-government: The Police to People ratio of developing countries is not good at all, therefore, that is not sufficient for public security and safety, that means on the perspective of people the police personnel is too much less, that is why the police can not handle everything always and the general citizen feel insecure always. So the ratio problem may be decease if the government follows the e-police system.
2) Public Accessibility: Since e-police system is the world standards that follow the e-technology as well as m-technology the citizen of the country has the free accessibility, they could make a diary about any criminal as well send any information about any matter by e-mail or SMS but in the normal police system.
3) Secure Data Communication: Since the whole police system is interconnected as a Wide Area Network (WAN) topology and this not connected to internet anyone can not hack or access illegally.
4) Crime Reduction: It is possible to reduce any types of crime in any section of the country where police personnel could be able to interfere the police administration can and handle this but in normal police system is seemingly impossible.
5) Safety and Security Incretion: For incretion of the country and country citizens’ safety and security any kinds of the section our system plays an important role but if the system is the normal police system than that is not absolutely possible.
6) Standardization: In order to making the countries police administration world standard the e-police system must be essential but that is completely quite impossible by follow the normal police system.

V. SOFTWARE DESIGN FOR E-POLICE SYSTEM

A. Methodology

If we want to develop software, we need to follow a certain methodology in order to ensure its consistency. The entire software is being developed in a step-by-step procedure, which is called methodology [9].
B. Entity Relation Diagram and Context Diagram

An Entity Relation (E-R) diagram can express the overall logical structure of a database graphically. The context diagram and E-R diagram is given in figure 7 and 8 respectively.

C. Data Flow Diagrams for E-police System

Data flow diagram (DFD) is concerned with understanding the processing within an organization and the relationship those processes. The DFD graphically illustrates movement of data between external entities and the processes and data stores within a system. Here some DFD levels are shown and Figure 9 and 10 represents the DFD level 1and DFD level 2 respectively.
D. Data Dictionary

Data dictionary is an organized listing for all data elements that are pertinent to the system with precise, rigorous definitions so that both users and system analysts will have a common understanding of inputs, outputs, components of stores and event intermediate calculation.

<table>
<thead>
<tr>
<th>Column name</th>
<th>Data type</th>
<th>Key</th>
<th>Null</th>
</tr>
</thead>
<tbody>
<tr>
<td>User name</td>
<td>VARCHAR(20)</td>
<td>Primary key</td>
<td>No</td>
</tr>
<tr>
<td>password</td>
<td>VARCHAR(20)</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Column name</th>
<th>Data type</th>
<th>Key</th>
<th>Null</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>INT (10)</td>
<td>Primary key</td>
<td>No</td>
</tr>
<tr>
<td>Name</td>
<td>VARCHAR(50)</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Designation</td>
<td>VARCHAR(50)</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Rank</td>
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<td></td>
<td>No</td>
</tr>
<tr>
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<td>No</td>
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<tr>
<td>posting</td>
<td>VARCHAR(15)</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

VI. IMPLEMENTATION STEPS, CHALLENGES AND COST

In this section we describe about implementation, issues, challenges and recommendations during implementation of the e-police system in developing countries. To develop e-police system it is badly in need of electronic government directorate (EGD) like developed countries will be established as a cell within Ministry of Science and Information & Communication Technology of developing countries. To establish e-police system Ministry of Science and Information & Communication Technology should implement our following proposed steps.

A. Implementation Steps for E-police System

There are several steps during implementation of e-police system and followings are the implementation steps of e-police system.

1) Installation of Local Area Networks (LAN) at different locations including Police stations, Central police offices, Traffic police, Traffic monitoring station, Prisons etc.
2) Installation of Metropolitan Area Networks (MAN) of all LANs in all cities.
3) Secure Internet Access for Police stations covered in the whole project.
4) Establishment of a Data centre for hosting of Web applications and databases.
5) Development and implementation of internal Police Portal for quick and focused information delivery.
7) Development and implementation of an internal police portal, which will be accessed by Police, Prison, Traffic offices.
8) Installation and Training on office productivity software to Police personnel.
9) Establishment of Cyber Crime Detection Cell and developing harmonious cyber laws/ regulatory framework as early as possible.
10) Scanning of all previous records of all police stations, prisons, traffic police stations etc., collecting the citizen’s data and entry the data into databases.
11) Installation, Configuration and Training of networking devices to Network system administrators.
13) Providing helpdesk facility to citizens.

B. Issues and Challenges

As the e-police system is new in the perspective of developing countries there are several issues and challenges related to implementation. Followings are the challenges which are faced during implementation of e-police system in developing countries.

1) Inadequate Information and Communication Technology Infrastructure within the government as well as across the nation.
2) Inadequate access to Information and Communication Technology by government officials, police personnel and by citizens.
3) Lack of awareness of police personnel and citizens about Information and Communication Technology.
4) Lack of adequate training programs in developing countries.
5) Non acceptability of Information and Communication Technology.
6) Lack of incentive structure for police personnel and other government officials.
7) Inadequate Information and Communication Technology training programs.
8) Inadequate Information and Communication Technology trained people.
9) Lack of necessary regulatory or legal framework.
10) Inadequate human resource capacity.
11) Lack of ownership of Information and Communication Technology systems.
12) Preparedness of local software companies.
13) Lack of reliable maintenance and sustainability of Information and Communication Technology.
14) Lack of mother language standardization.
15) Insufficient of electricity across the developing countries’ nation.
16) High cost and low reliability of Internet access.
17) Lack of awareness about future development.

C. Recommendations
Here we propose some recommendations and the followings are the possible steps towards solution.
1) Building the Information and Communication Technology infrastructure throughout the government and across the nation.
2) Stress on awareness before Information and Communication Technology training.
3) Creating and retaining adequate Information and Communication Technology human recourse.
4) Providing networked computers to mid-to-lower level police officers as well as high-level officers.
5) Creating incentive structure for usage of Information and Communication Technology.
6) Investing in and for reliable supply of electricity.
7) Encouraging the local software companies for preparing themselves.
8) Organizing public awareness programs on Information and Communication Technology.
9) Giving importance to regular training.
10) Making plans for reliable maintenance.
11) Considering the issues and challenges of interoperability and interconnectivity.
12) Updating the database regularly.
13) Appointing officers e.g. Chief Information Officer.
14) Try to extend the connectivity of internet outside the cities.
15) Building sustainable models for e-government.
16) Standardization of mother languages.
17) Creating online access point at public places.
18) Extending connectivity outside cities.
19) Organizing public awareness programs on ICT.
20) Investing in reliable supply of electricity.

D. Cost Estimation
To complete the project it may be expensed approximately 1,323.066 US million dollar including customized software, hardware and general software, training, maintenance etc. and its may vary from one country to another. The cost with items is given in Table 3.

### Table 3. Approximate Cost Estimation

<table>
<thead>
<tr>
<th>Item</th>
<th>Costs Million Dollar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customization of Software</td>
<td>0.125</td>
</tr>
<tr>
<td>Hardware and General Software</td>
<td>2.065</td>
</tr>
<tr>
<td>Data Entry</td>
<td>0.188</td>
</tr>
<tr>
<td>Training</td>
<td>0.500</td>
</tr>
<tr>
<td>Server and Connectivity</td>
<td>1,320</td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.188</td>
</tr>
<tr>
<td>Total</td>
<td>1,323.066</td>
</tr>
</tbody>
</table>

VII. Conclusion
As e-government is a necessity for good and corruption free nation it is very important to provide e-government related service i.e. e-police to citizens for getting better and secure e-government services. In our paper we have focused about e-police system for developing countries where the police to people ratio are unacceptable, therefore, the citizens of these countries have been sufferer. The main intent of this paper is to upgrade the developing countries’ police administration to the world standard by using modern information and communication technologies. At last we recommend to developing countries that to take necessary steps for upgrading the present police system to e-police system by overcoming the issues and challenges. In future we can add and use new technologies, wireless communication systems, modern IP networks [10] etc.

REFERENCES