Johannesburg Metropolitan Police Department (JMPD) Mobile Law Enforcement System

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Abstract : *As part of the execution of its Vision 2030 document, the City of Johannesburg has embarked on a zero tolerance campaign for law enforcement and traffic violations. A major problem is the large number of open warrants of arrest and stagnated cases in the traffic fines prosecutions database. A solution had to be developed that would make it easy for a Metropolitan Police Officer (MPO) to execute a query on whether a motorist, that has been stopped, has open warrants of arrest and/or stagnated cases listed against his/her name. A solution based on GPRS equipped mobile phones was developed with an open source platform to facilitate queries to the prosecutions database. Results so far indicate that the project has been a success.*

Keywords: mobile solution, GPRS, open source, law enforcement, Johannesburg, South Africa.

1. Introduction

The city of Johannesburg, the largest metropolitan area in South Africa, with a population of 3,2 million people, recently developed their "Johannesburg 2030" vision for the city. The introductory section of the "Johannesburg 2030" document mentions the following: "Crime, as we all know, is probably the biggest problem we face in Johannesburg". Solving the Johannesburg crime problem is a major part of the strategy implemented by the metropolitan council to ensure that Johannesburg will be a "world class city" by 2030.

The first step in the process of tackling the crime problem is to intensify the zero-tolerance campaign with respect to law enforcement and traffic violations by the JMPD (Johannesburg Metropolitan Police Department). When the Traffic Department became the JMPD, it widened its focus on three aspects, namely traffic, municipal by-laws and crime.

A major part of this campaign is to look at the closure of all outstanding warrants of arrests and stagnated cases for traffic violations. There are more than 700 000 open warrants worth more than R180 000 000 (about £16 000 000), in the city's prosecutions system database! A prime contributor is the "just ignore traffic offence summonses" culture that developed and grew in the minds of the Johannesburg motoring public. Up to now, insufficient staff and the lack of efficient access to the warrants database hampered efforts to execute these warrants of arrest. In addition there are about 625 000 stagnated cases with a value of about R150 000 000 (about £13 000 000) where the summons could not be served in the hands of the offender. Derek Masoek, Director: Operations and Programs, of the JMPD, says the main aim of the system is not to collect money, but to change driver behaviour.

A solution was sought, that would enable a JMPD officer in the field, to quickly determine if there are outstanding warrants of arrest or stagnated cases on record, when a motorist or vehicle is stopped on the road.

2. Background

The prosecutions system, containing the information on outstanding warrants of arrest and stagnated cases, runs on an antiquated mainframe system, where the data is stored in flat files. Multiple legacy interfaces with processing of payments and other judicial systems, as well as complex legal processing rules embedded in this system, precludes the replacement of this system. A solution thus had to be developed that would make use of the information in the existing prosecutions system, while also providing open interfaces to new sub-systems (also including management reporting).

Some basic background details about the legal process of handling traffic offences in South Africa is necessary to understand the solution that has been developed. See the simplified process diagram in Figure 1.
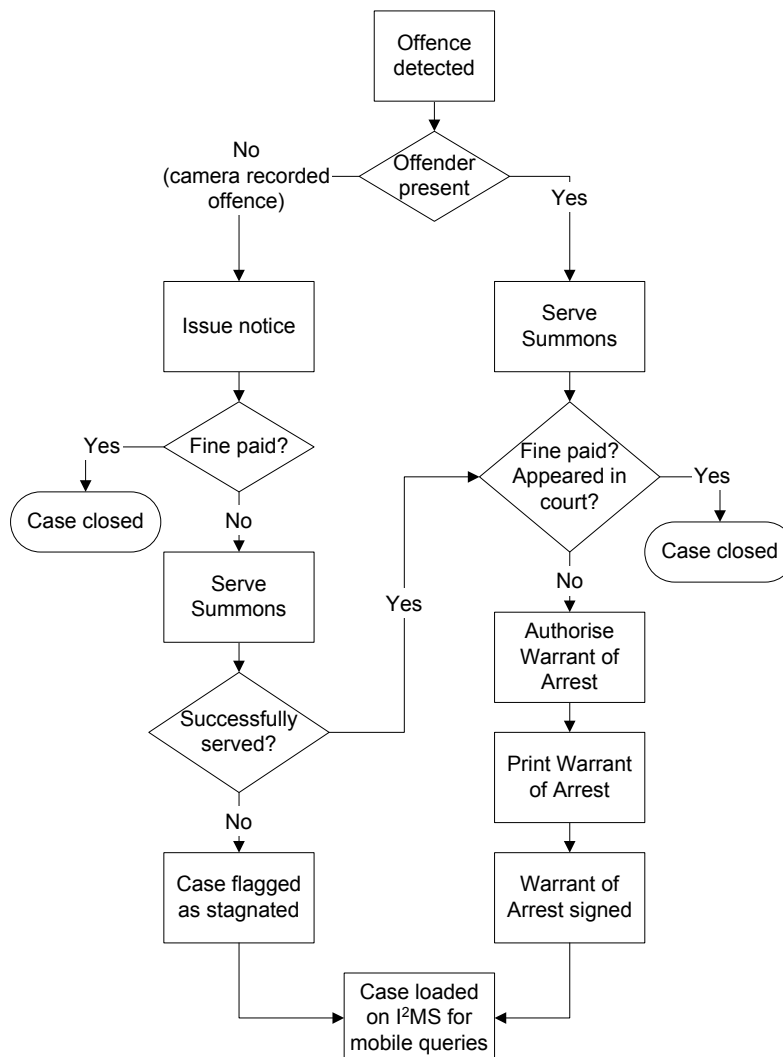
Figure 1: Offence process: Offence, Notice, Summons, Warrant of Arrest and Stagnated cases

Once a traffic offence has been detected, a summons is served on the motorist in cases where the motorist is present. In the case of camera detected offences, a notice is issued and sent by mail.

This notice notifies the motorist that he/she has to appear in a court on a date and time specified, unless an admission of guilt fine is paid. If the notice is ignored (i.e. fine not paid or fail to appear in court), a summons has to be served. The summons must be physically delivered to the motorist's address and accepted either by the accused motorist or by an adult at that address who can testify that the motorist lives there. If this summons is ignored by the motorist (i.e. fine not paid or fail to appear in court), a warrant of arrest is authorised, printed and signed by a magistrate. If it was not possible to physically deliver the summons, this case is now labelled as a stagnated case. A signed warrant of arrest can be executed by tracing the offender.

As has been described in the introduction, there was an urgent need to enable the JMPD Metropolitan Police Officers (MPO) to efficiently collect these outstanding fines. A facility that would enable a mobile online query function, to ascertain whether a motorist has outstanding open warrants or stagnated cases would facilitate this process. This system must also be able to report on suspended vehicles and report on MPO performance.

3. Technical Solution

A high level system block diagram of the system architecture is shown in Figure 2. The heart of the solution that was developed is the Integrated Information Management System (I^2MS). This system enabled access to the legacy flat file systems and also enabled integration with various presentation layers and user interfaces.

An MPO can now, through the simple entry into a mobile phone of a motor vehicle registration number or motorist identity number get immediate feedback on whether the motorist, or vehicle owner, has open warrants or stagnated cases logged in the prosecutions system. The entry process on the mobile phone is done through the use of a WAP interface. In both cases the GPRS data channel in the mobile network is utilised for the data communication. In the near future, automated number plate reading systems will be integrated with the system enabling an efficient filtering mechanism to pick those cars whose owners have been involved in offences.

When a query results in a response indicating that there are open warrants or stagnated cases listed against the vehicle owner (and the owner is present) or motorist, an arrest could be made. At the moment this process of executing an arrest is dependant on being able to produce a physical signed paper warrant from the court with jurisdiction over that area. In the future this will be made much more efficient with electronic processing of scanned warrants of arrest (see Figure 2). The fact that an arrest has been made is indicated as such on the mobile device to be logged on the system. If an arrest is not made, the MPO must indicate the reason by selecting an appropriate outcome code on the mobile phone.

After roll-out of the next phase of the system, the motorist will be able to pay the amounts outstanding through a mobile payment terminal, equipped with credit card processing facilities, using the GPRS data channel for online queries and authorisation from the banking systems. Payments are also possible at retail payment centres (e.g. local retail stores, bank ATM's and cash kiosks) as well as through a secure web site.
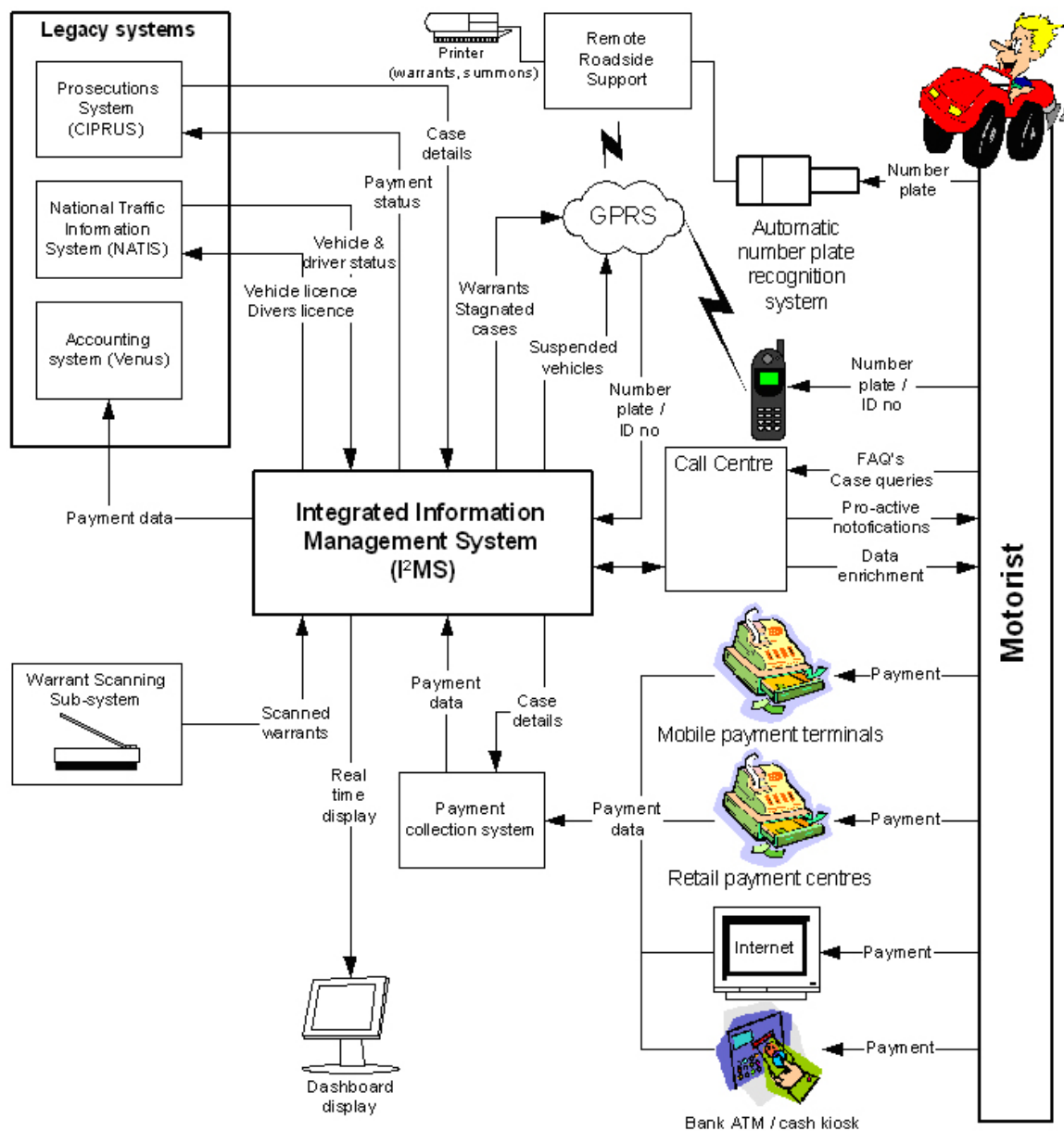
Figure 2: JMPD Mobile Law Enforcement System – System Block diagram

An important issue that has to be addressed, from a legal point of view is being able to prove to the motorist, unequivocally, that a physical warrant of arrest, with a judge's signature exists and is on file. This will be addressed through a scanning process through which digital images of warrants will be stored in the I^{2}MS and be available for display by the MPO on a display device.

The solution that was developed for the JMPD was completely based on Open Source Software. A stable platform with the accompanying tools was thus available for the development team without any

of the usual licensing costs associated with proprietary software solutions. The solution has been developed on a LAMP (Linux, Apache, MySQL and PHP) architecture.

4. Management Information and Reporting

Being able to monitor the success of this project was an important requirement by the JMPD HQ. A real-time dashboard reporting system was developed, where information is displayed on several plasma screens and PC's in the JMPD HQ. These screens show graphic representations of the number of mobile queries, number of offenders located, number and value of open warrants and stagnated cases for these offenders, number of arrests as well as payment information. The dashboard displays have been developed with a web interface and can be monitored by any member of the JMPD executive team. The display format and scales are individually configurable by the user through a web based control menu.

Other reports that have been developed include individual MPO efficiency reports, where the number of queries executed by each MPO is reported together with figures for the number offenders they located, the number of arrests they executed, reasons, when an arrest was not made, etc.

The I2MS system, coupled with a sophisticated web based reporting engine, could also be used to publish content from other sources and assist in the evaluation of other targeted JMPD campaigns.
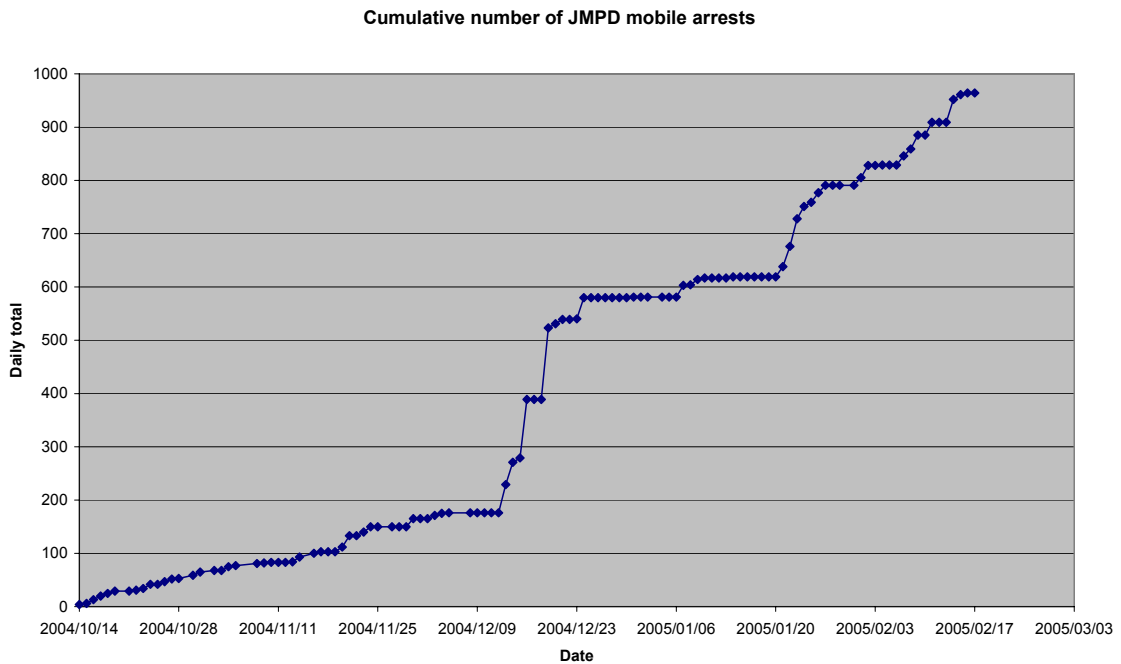
5. Results

An example of the results achieved by the system is shown in Figure 3. The cumulative daily figures for the number of queries made through the I^2MS by MPO's are shown. A number of trends can clearly be seen. During the pilot phase, until early December 2004, only 8 phones, equipped with the necessary functionality and software was used by MPO's. This period is reflected in the relatively low daily rate of mobile queries from the middle of October until early December. This was followed by a number days with very high query volumes as a result of concerted campaigns, including roadblocks, at the start of the heavy summer school holiday period. Towards the end of January 2005 another intensive campaign was executed followed by a new trend of higher daily query volumes as a result of a large number of new phones were issued to MPO's.

The success of these queries can be clearly seen in Figure 4, where the cumulative figures, for daily arrests made, follows the same trend as the number of queries made.

Cumulative number of JMPD mobile queries
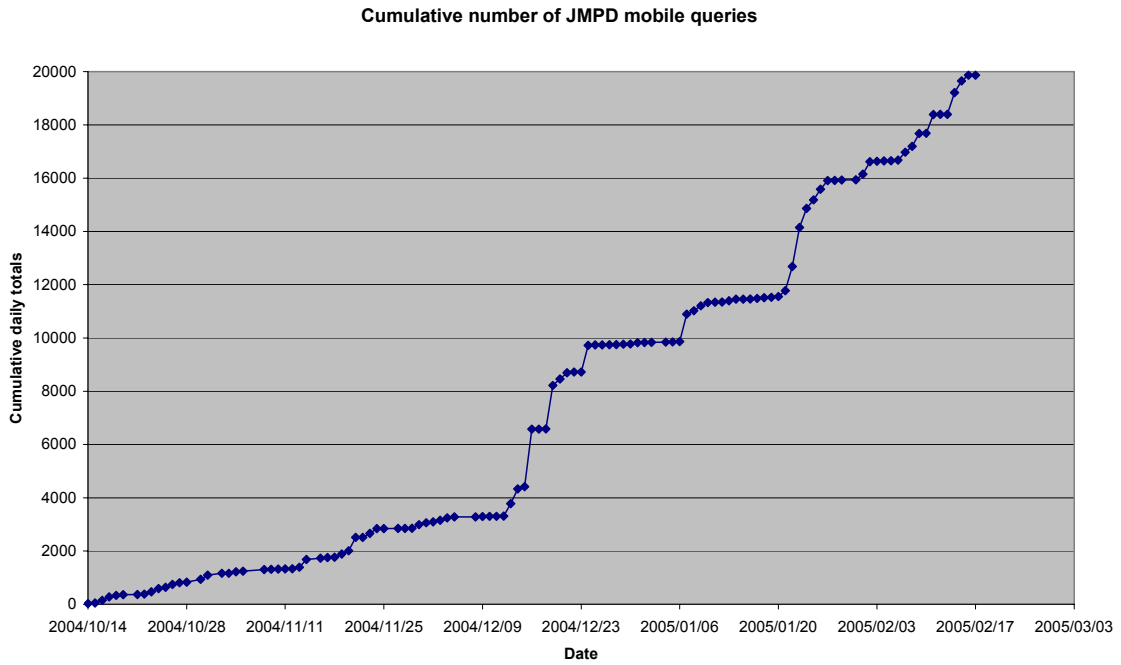
Figure 3: Cumulative number of queries by MPO's

Cumulative number of JMPD mobile arrests

Figure 4: Cumulative number of arrests as a result of mobile queries by MPO's

Since the inception of this system, as on the 17th February 2005, the following figures have been recorded by the I^{2}MS:

Number of mobile queries:	19 867
Number of offenders located:	6 846
Number of open warrants located:	14 255
Value of open warrants located:	R 3 554 600
Number of stagnated cases located:	8 198
Value of stagnated cases located:	R 1 927 400
Number of arrests:	964

Take note that, based on these almost 20 000 queries, it seems that about a third of Johannesburg motorists have either one or more open warrant or stagnated case or both logged against their names on the prosecutions database! This is another indication of the scale of the problem faced by the Johannesburg Metropolitan council.

A major discrepancy in this table of figures is the large difference between the number of offenders located and the arrests executed. This is most probably the result of the MPO's not logging the execution of the arrest on the mobile device. The user interface has been changed to simplify this, also forcing the MPO to enter a reason code if an arrest is not being done after an offender has been located. The individual MPO efficiency reports should also assist in improving this situation.

6. Future Developments

Future additions to this project include the following:

- Integration of a Call Centre with the I^{2}MS to enable the public to phone with queries about traffic offence cases, fines due, FAQ's, etc.
- This same Call Centre can be used as an outbound centre, during off-peak inbound times, for data enrichment of the I^{2}MS database by getting updated information on motorist's contact information. Another outbound function in the Call Centre would be pro-active notification of impending expiry dates on summonses to pay fines.
- Payments of fines have always been problematic, since these could only be done at municipal or judiciary offices, which are only open in weekdays during office hours. The I2MS could also facilitate the use of bank ATM's, retail outlet payment points, cash kiosks as well as mobile pay points at JMPD remote roadside support sites, for fine payments.
- Other system changes, mentioned in paragraph 3, such as the digital processing of warrants, integration with automatic number plate recognition systems, additions to the current management reporting, etc.

On a more strategic level, this system could become a platform for mobile command and control and operational support to enhance the efficiency of the JMPD. The use of real-time location information, made available in a central system using GPRS and GPS technology, could enable the JMPD to respond very efficiently to situations requiring its attention.

7. Conclusions

The I^{2}MS has, during the few months that it has been operational, made a major impact on the mindsets of the Johannesburg motoring public. The system has received wide media coverage in the local press and on national television, with live broadcasts from road blocks and interviews with the chief executive of the JMPD. During International Software Freedom Day, an Open Source Software exhibition was hosted in Johannesburg, where the I2MS was also exhibited with JMPD officers doing mobile queries for attendees (they agreed not to execute any arrests!).

The I2MS is positioned to play a significant role in assisting the Johannesburg City Council to achieve its Johannesburg 2030 vision.

This solution illustrates how the use of mobile technology integrated with an appropriate open system, can solve a real time data access problem that was simply impossible just a few years ago. The fact that a JMPD police officer can stop a vehicle on the road and execute a database query to a legacy mainframe and receive a query result within seconds is a step forward. In the future many similar solutions, for business and governmental use, will be developed based on the same concept. This solution has already attracted the attention of other government agencies in South Africa and 2BiG Mobile Solutions have been involved in numerous discussions about the wider application of this technology. Implementation of pilot projects of similar nature has already been started in some of these agencies.

The implementation of this solution has also demonstrated the maturity and effectiveness of the use of an Open Source software architecture platform for the implementation of a business critical application.

References

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