



ATM Card Tracking Using GPS System

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Abstract: *In this paper, A new technique is deployed to track the location of ATM card. Till now, there is no way to get back ATM card if it's lost. A new model is devised that shows how to keep track of locations of ATM card. GPS system is used to keep track the locations of card. A database is maintained and GPS satellite is connected to the Internet Service Provider. A new entry in Passbook fields is there. The new field added will show the locations of ATM card. This new field will be updated time to time as the database maintained by GPS is updated.*

Keywords: GPS, ATM, DoD, Satellite, Segments, 2D, 3D

I. INTRODUCTION

Fundamental information about GPS system must be there. What is GPS and how it works. How GPS tracks the locations. This all is explained below [1].

GPS: Global Positioning System

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways, such as:

- To determine position locations; for example, you need to radio a helicopter pilot the coordinates of your position location so the pilot can pick you up.
- To navigate from one location to another; for example, you need to travel from a lookout to the fire perimeter.
- To create digitized maps; for example, you are assigned to plot the fire perimeter and hot spots.
- To determine distance between two points or how far you are from another location.

II. How the Global Positioning System Works

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information. The radio signals from the satellites, which are monitored and corrected by control stations, are picked up by the GPS receiver. A GPS receiver needs only three satellites to plot a rough, 2D position, which will not be very accurate. Ideally, four or more satellites are needed to plot a 3D position, which is much more accurate.

Three Segments of GPS

The three segments of GPS are the space, control, and user (Figure 1).

1. Space Segment — Satellites orbiting the earth The space segment consists of 29 satellites circling the earth every 12 hours at 12,000 miles in altitude. This high altitude allows the signals to cover a greater area. The satellites are arranged in their orbits so a GPS receiver on earth can receive a signal from at least four satellites at any given time. Each satellite contains several atomic clocks. The satellites transmit low radio signals with a unique code on different frequencies, allowing the GPS receiver to identify the signals. The main purpose of these coded signals is to allow the GPS receiver to calculate travel time of the radio signal from the satellite to the receiver. The travel time multiplied by the speed of light equals the distance from the satellite to the GPS receiver.
2. Control Segment — The control and monitoring stations The control segment tracks the satellites and then provides them with corrected orbital and time information. The control segment consists of five unmanned monitor stations and one Master Control Station. The five unmanned stations monitor GPS satellite signals and then send that information to the Master Control Station where anomalies are corrected and sent back to the GPS satellites through ground antennas.
3. User Segment — The GPS receivers owned by civilians and military The user segment consists of the users and their GPS receivers. The number of simultaneous users is limitless.

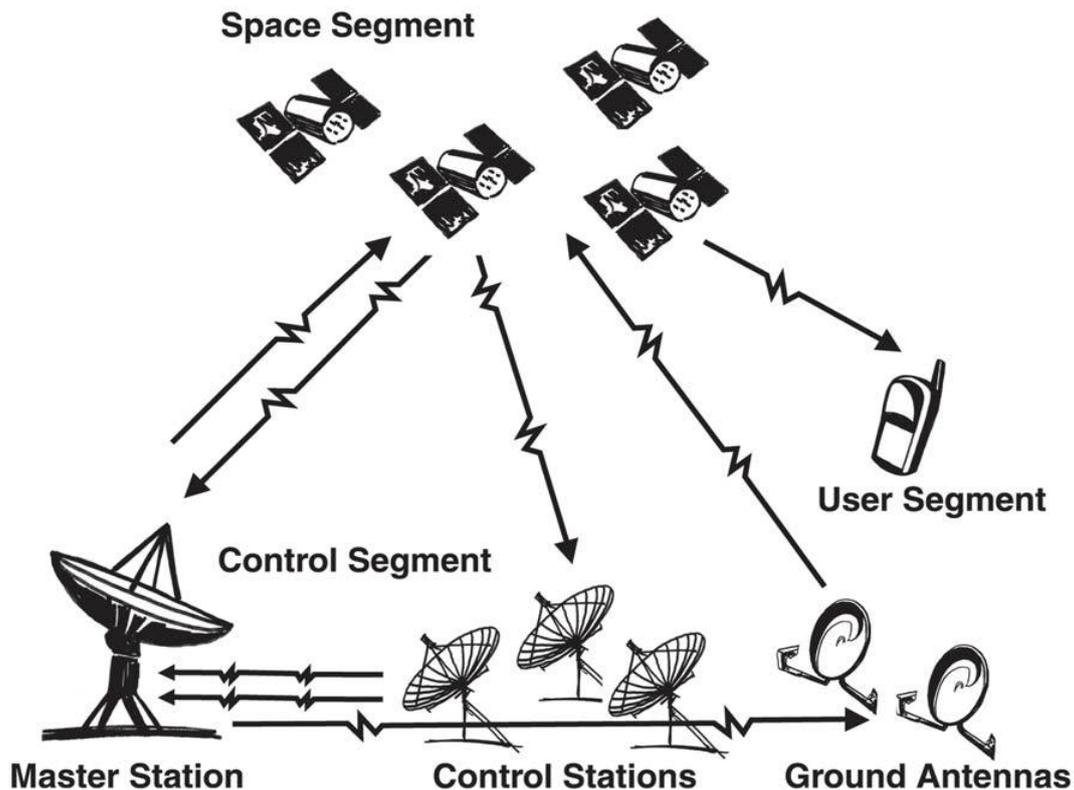


Figure 1: Three Segments of GPS.

How GPS Determines a Position

The GPS receiver uses the following information to determine a position.

- Precise location of satellites

When a GPS receiver is first turned on, it downloads orbit information from all the satellites called an almanac. This process, the first time, can take as long as 12 minutes; but once this information is downloaded; it is stored in the receiver's memory for future use.

- Distance from each satellite

The GPS receiver calculates the distance from each satellite to the receiver by using the distance formula: distance = velocity x time. The receiver already knows the velocity, which is the speed of a radio wave or 186,000 miles per second (the speed of light). To determine the time part of the formula, the receiver times how long it takes for a signal from the satellite to arrive at the receiver. The GPS receiver multiplies the velocity of the transmitted signal by the time it takes the signal to reach the receiver to determine distance.

- Triangulation to determine position

The receiver determines position by using triangulation. When it receives signals from at least three satellites the receiver should be able to calculate its approximate position (a 2D position). The receiver needs at least four or more satellites to calculate a more accurate 3D position. The position can be reported in latitude/longitude, UTM, or other coordinate system.

Now a Detailed Information about ATM and ATM card is explained below.

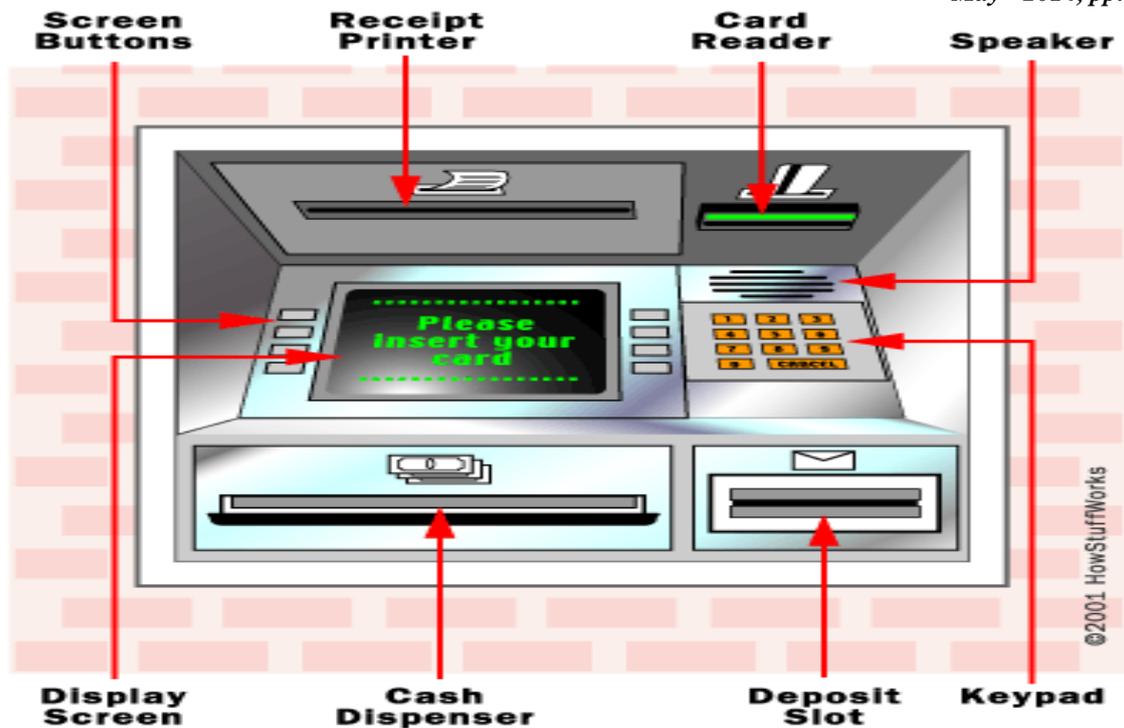
III. ATM: Automated Teller Machine

An **ATM card** (also known as a **bank card**, **client card**, **key card**, or **cash card**) is a payment card provided by a financial institution to its customers which enables the customer to use an automated teller machine (ATM) for transactions such as: deposits, cash withdrawals, obtaining account information, and other types of banking transactions, often through interbank networks.

How Do ATMs Work?

An ATM is simply a **data terminal** with two input and four output devices. Like any other data terminal, the ATM has to connect to, and communicate through, a **host processor**. The host processor is analogous to an Internet service provider (ISP) in that it is the gateway through which all the various ATM networks become available to the cardholder (the person wanting the cash).

Most host processors can support either **leased-line** or **dial-up** machines. Leased-line machines connect directly to the host processor through a four-wire, point-to-point, and dedicated telephone line. Dial-up ATMs connect to the host processor through a normal phone line using a modem and a toll-free number, or through an Internet service provider using a local access number dialed by modem.



Leased-line ATMs are preferred for very high-volume locations because of their **thru-put** capability and dial-up ATMs are preferred for retail merchant locations where cost is a greater factor than thru-put. The initial cost for a dial-up machine is less than half that for a leased-line machine. The monthly operating costs for dial-up are only a fraction of the costs for leased-line.

The host processor may be owned by a bank or financial institution, or it may be owned by an independent service provider. Bank-owned processors normally support only bank-owned machines, whereas the independent processors support merchant-owned machines.

Dimensions

The size of ATM cards is 85.60×53.98 mm (3.370×2.125 in) and rounded corners with a radius of 2.88–3.48 mm, in accordance with [ISO/IEC 7810#ID-1](#), the same size as other payment cards, such as credit, debit and other cards.

A **credit card** is a payment card issued to users as a system of payment. It allows the cardholder to pay for goods and services based on the holder's promise to pay for them.^[1] The issuer of the card creates a revolving account and grants a line of credit to the consumer (or the user) from which the user can borrow money for payment to a merchant or as a cash advance to the user.

A **debit card** (also known as a **bank card** or **check card**) is a plastic payment card that provides the cardholder electronic access to his or her bank account(s) at a financial institution. Some cards have a stored value with which a payment is made, while most relay a message to the cardholder's bank to withdraw funds from a payer's designated bank account. The card, where accepted, can be used instead of cash when making purchases. In some cases, the primary account number is assigned exclusively for use on the Internet and there is no physical card.

Unlike credit and charge cards, payments using a debit card are immediately transferred from the cardholder's designated bank account, instead of them paying the money back at a later date.

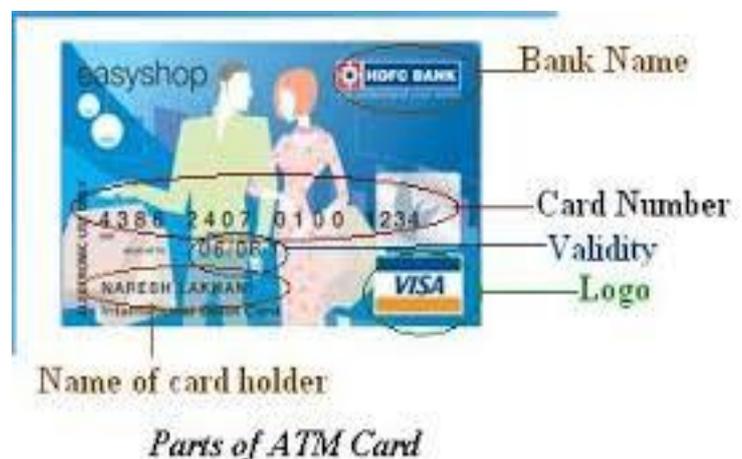
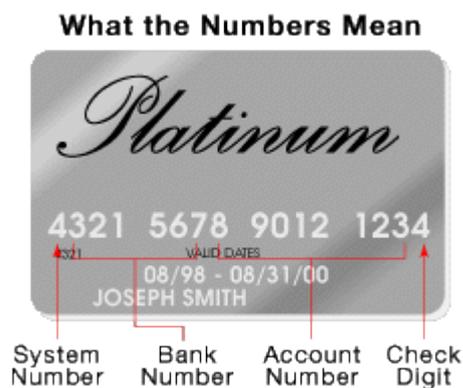


Figure 2: numbers on ATM Card Figure 3: Parts of ATM card

Now the matter came, what the numbers on ATM card means. (Figure 2)

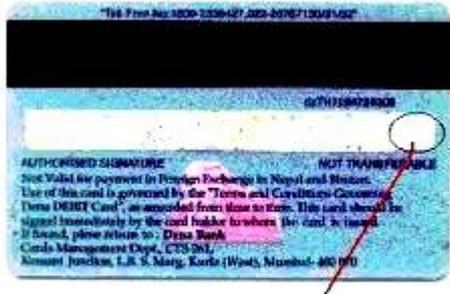
- 1st digit shows the System Number
- 2-7 digits shows the Bank Number
- 8-15 digits shows the Account number
- And Last 16th digit is the Check Digit.

ATM Cards Parts (Figure 3)

An ATM card Contains the Name of Bank, Card Number, Validity, Logo, AS well as the name of the Card Holder.

Methodology:

A chip will be embedded on ATM card.



chip embedded here

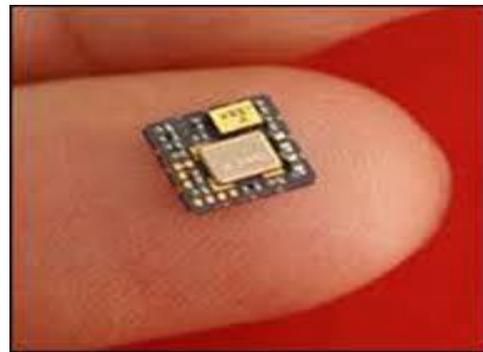


Figure 5: Small GPS Chip

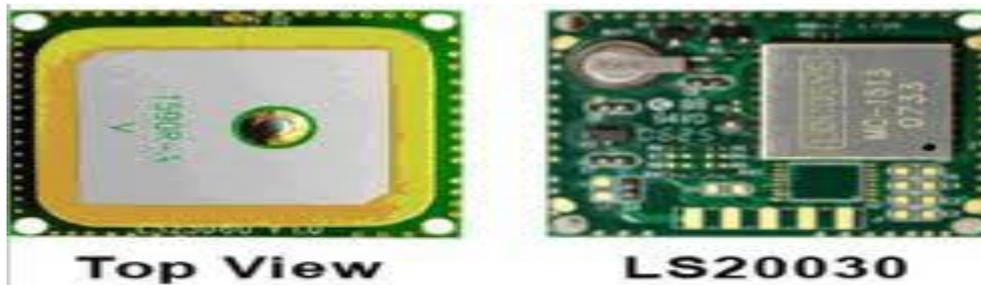


Figure 6: Wiring circuit of GPS chip. Its Top View and layout

This GPS Chip will keep track the location of ATM card and store them in a file. Locations will be updated time to time as the ATM card will moves from one location to other. As the passbook contain fields about all credits and debits.

Table 1: Shows the fields of a Passbook

DATE	PARTICULARS	CHEQUE NO.	DEBIT	CREDIT	BALANCE
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DATE	PARTICULARS	CHEQUE NO.	DEBIT	CREDIT	BALANCE
01-01-2000	By Cash			1000.00	1000.00
01-02-2000	By Cash			500.00	1500.00
01-03-2000	By Cash			250.00	2000.00
01-04-2000	By Cash			100.00	2100.00
01-05-2000	By Cash			50.00	2150.00
01-06-2000	By Cash			25.00	2175.00
01-07-2000	By Cash			12.50	2187.50
01-08-2000	By Cash			6.25	2193.75
01-09-2000	By Cash			3.125	2196.875
01-10-2000	By Cash			1.5625	2198.4375
01-11-2000	By Cash			0.78125	2199.21875
01-12-2000	By Cash			0.390625	2199.609375
02-01-2001	By Cash			0.1953125	2199.8046875
02-02-2001	By Cash			0.09765625	2199.90703125
02-03-2001	By Cash			0.048828125	2199.95625
02-04-2001	By Cash			0.0244140625	2199.9808640625
02-05-2001	By Cash			0.01220703125	2199.99303125
02-06-2001	By Cash			0.006103515625	2199.999125
02-07-2001	By Cash			0.0030517578125	2199.9995625
02-08-2001	By Cash			0.00152587890625	2199.99978125
02-09-2001	By Cash			0.000762939453125	2199.999921875
02-10-2001	By Cash			0.0003814697265625	2199.9999784375
02-11-2001	By Cash			0.00019073486328125	2199.99999421875
02-12-2001	By Cash			0.000095367431640625	2199.999997109375
03-01-2002	By Cash			0.0000476837158203125	2199.9999985546875
03-02-2002	By Cash			0.00002384185791015625	2199.99999927709375
03-03-2002	By Cash			0.000011920928955078125	2199.999999638546875
03-04-2002	By Cash			0.0000059604644775390625	2199.9999998192709375
03-05-2002	By Cash			0.00000298023223876953125	2199.99999990963546875
03-06-2002	By Cash			0.000001490116119384765625	2199.9999999548171875
03-07-2002	By Cash			0.0000007450580596923828125	2199.999999977408640625
03-08-2002	By Cash			0.00000037252902984619140625	2199.9999999887043125
03-09-2002	By Cash			0.000000186264514923095703125	2199.99999999435215625
03-10-2002	By Cash			0.000000093132257461547890625	2199.99999999717609375
03-11-2002	By Cash			0.000000046566128730773928125	2199.999999998588046875
03-12-2002	By Cash			0.0000000232830643653869640625	2199.99999999929401875
04-01-2003	By Cash			0.0000000116415321826934765625	2199.999999999647009375
04-02-2003	By Cash			0.00000000582076609134673828125	2199.999999999823515625
04-03-2003	By Cash			0.000000002910383045673369140625	2199.99999999991176875
04-04-2003	By Cash			0.0000000014551915228366845703125	2199.999999999955884375
04-05-2003	By Cash			0.00000000072759576141834228515625	2199.9999999999779421875
04-06-2003	By Cash			0.0000000003637978807091711176953125	2199.99999999998897109375
04-07-2003	By Cash			0.00000000018189894035458555884375	2199.999999999994485546875
04-08-2003	By Cash			0.000000000090949470177272779421875	2199.9999999999972428125
04-09-2003	By Cash			0.0000000000454747350886363896923828125	2199.99999999999862140625
04-10-2003	By Cash			0.00000000002273736754431819484619140625	2199.999999999999310703125
04-11-2003	By Cash			0.00000000001136868377215909242423095703125	2199.9999999999996553515625
04-12-2003	By Cash			0.0000000000056843418860795462121176953125	2199.99999999999982768125
05-01-2004	By Cash			0.000000000002842170943039773105884375	2199.999999999999913840625
05-02-2004	By Cash			0.0000000000014210854715198865529421875	2199.999999999999956921875
05-03-2004	By Cash			0.0000000000007105427357599277761176953125	2199.9999999999999784609375
05-04-2004	By Cash			0.00000000000035527136787996388805884375	2199.99999999999998923046875
05-05-2004	By Cash			0.000000000000177635683939981944029421875	2199.9999999999999946151875
05-06-2004	By Cash			0.000000000000088817841969990972014703125	2199.999999999999997307640625
05-07-2004	By Cash			0.0000000000000444089209849954860073515625	2199.9999999999999986538125
05-08-2004	By Cash			0.000000000000022204460492497743003676953125	2199.99999999999999932690625
05-09-2004	By Cash			0.00000000000001110223024624887150183828125	2199.999999999999999663451875
05-10-2004	By Cash			0.000000000000005551115123124435750919140625	2199.99999999999999983172609375
05-11-2004	By Cash			0.000000000000002775557561562217875455884375	2199.999999999999999915863125
05-12-2004	By Cash			0.0000000000000013877787807811093772779421875	2199.9999999999999999579315625
06-01-2005	By Cash			0.00000000000000069388939039055468863828125	2199.99999999999999997896609375
06-02-2005	By Cash			0.0000000000000003469446951952773443169140625	2199.999999999999999989483046875
06-03-2005	By Cash			0.00000000000000017347234759763672218455884375	2199.99999999999999999474151875
06-04-2005	By Cash			0.0000000000000000867361737988183610923095703125	2199.9999999999999999973707640625
06-05-2005	By Cash			0.0000000000000000433680868994091805455884375	2199.99999999999999999868538125
06-06-2005	By Cash			0.000000000000000021684043449704590272779421875	2199.999999999999999999342690625
06-07-2005	By Cash			0.0000000000000000108420217248522951363828125	2199.9999999999999999996713451875
06-08-2005	By Cash			0.00000000000000000542101086242614756819140625	2199.999999999999999999835690625
06-09-2005	By Cash			0.00000000000000000271050543121307378405884375	2199.9999999999999999999178451875
06-10-2005	By Cash			0.0000000000000000013552527156065368923095703125	2199.99999999999999999995892140625
06-11-2005	By Cash			0.00000000000000000067762635780326844619140625	2199.9999999999999999999794609375
06-12-2005	By Cash			0.000000000000000000338813178901634223095703125	2199.99999999999999999998973046875
07-01-2006	By Cash			0.00000000000000000016940658945081711176953125	2199.9999999999999999999948651875
07-02-2006	By Cash			0.000000000000000000084703294725408555884375	2199.99999999999999999999743046875
07-03-2006	By Cash			0.0000000000000000000423516473627042779421875	2199.9999999999999999999987151875
07-04-2006	By Cash			0.00000000000000000002117582368135213896923095703125	2199.99999999999999999999935690625
07-05-2006	By Cash			0.0000000000000000000105879118406762694819140625	2199.999999999999999999999683451875
07-06-2006	By Cash			0.000000000000000000005293955920338134727279421875	2199.99999999999999999999984172609375
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07-08-2006	By Cash			0.0000000000000000000013234889800845336819140625	2199.99999999999999999999996043046875
07-09-2006	By Cash			0.000000000000000000000661744490042268923095703125	2199.9999999999999999999999802140625
07-10-2006	By Cash			0.0000000000000000000003308722450211344619140625	2199.999999999999999999999990109375
07-11-2006	By Cash			0.00000000000000000000016543612251057223095703125	2199.9999999999999999999999950546875
07-12-2006	By Cash			0.0000000000000000000000827180612528611176953125	2199.9999999999999999999999975271875
08-01-2007	By Cash			0.0000000000000000000000413590306264305884375	2199.999999999999999999999998763828125
08-02-2007	By Cash			0.000000000000000000000020679515313219421875	2199.9999999999999999999999993819140625
08-03-2007	By Cash			0.0000000000000000000000103397576566097109375	2199.99999999999999999999999969096923095703125
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08-05-2007	By Cash			0.000000000000000000000002584939414152344619140625	2199.99999999999999999999999992271875
08-06-2007	By Cash			0.0000000000000000000000012924697070761176953125	2199.9999999999999999999999999613451875
08-07-2007	By Cash			0.0000000000000000000000006462348535380884375	2199.999999999999999999999999980690625
08-08-2007	By Cash			0.00000000000000000000000032311742676904421875	2199.9999999999999999999999999903451875
08-09-2007	By Cash			0.00000000000000000000000016155871338452109375	2199.999999999999999999999999995172609375
08-10-2007	By Cash			0.000000000000000000000000080779356692254619140625	2199.9999999999999999999999999975863125
08-11-2007	By Cash			0.0000000000000000000000000403896783461176953125	2199.999999999999999999999999998793046875
08-12-2007	By Cash			0.00000000000000000000000002019483917305884375	2199.99999999999999999999999999940151875
09-01-2008	By Cash			0.000000000000000000000000010097419586529421875	2199.99999999999999999999999999970096923095703125
09-02-2008	By Cash			0.0000000000000000000000000050487097932619421875	2199.99999999999999999999999999985046875
09-03-2008	By Cash			0.00000000000000000000000000252435489663097109375	2199.99999999999999999999999999992546875
09-04-2008	By Cash			0.0000000000000000000000000012621774483154619140625	2199.99999999999999999999999999996271875
09-05-					

The GPS chip is connected GPS Satellite. And GPS satellite is connected to the Internet Service Provider. That makes the file as stored in cloud computing. When the associated bank updates or maintains the passbook. It will take the record from the database and the new field LOCATIONS gets updated. If someone has lost its ATM card then he can take the card from the latest location.

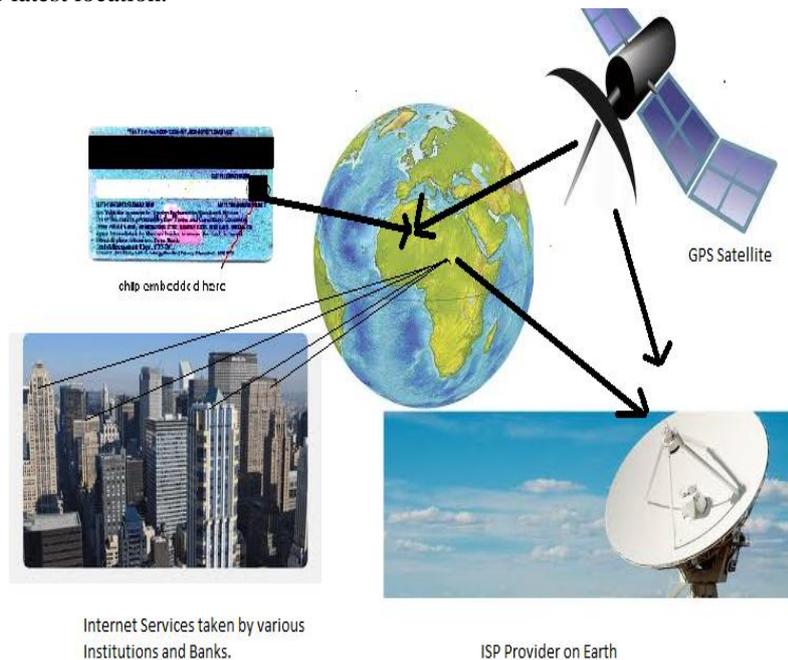


Figure 8: Connections Between GPS and ISP.

Figure 8 describes the whole procedure. Firstly location of AM card having GPS chip is tracked by GPS satellite and then GPS satellite is connected with the ISP on earth, which will make a file of the locations of the ATM card. Then effect of Cloud Computing the file of location will be taken from any Bank as the field of LOCATIONS is updated automatically.

So at last there is less chance of get stolen anyone's ATM card. Or if someone forgets where he has placed his ATM card mistakenly, he can easily track the location of its ATM card.

IV. Future Scope:

This model will give very accurate result about the location of ATM card.

A lot of work can be performed on this, as this is a new model and a wide range of functionalities can be added to this model to enhance the performance of the model.

A charging system to GPS chip can be added.

V. Conclusion:

A very helpful model in finding the location of ATM card if it's lost or if stolen by someone. If the exact location is tracked then it can be safely taken back. If someone forgets after placing it somewhere it can be tracked using GPS tracker

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