

2nd Anniversary Celebration

Bangladesh Automated Clearing House (BACH)

October 2012

2nd Anniversary Celebration



Payment System Department
Bangladesh Bank

Message from

GOVERNOR Bangladesh Bank



A modern payment system is essential for economic growth and development of a country. Electronic payment system is the most sophisticated and advanced part of a modern financial infrastructure. Implementation of Bangladesh Automated Clearing House is an appropriate and timely initiative of Bangladesh Bank to enhance the quality of banking services along with ensuring integrity and effectiveness of the new payment methods. This initiative of modernizing payment and settlement system has changed the payments landscape of the country.

To ensure a modern payment and settlement system infrastructure for the country Bangladesh Automated Clearing House (BACH), the first ever electronic clearing house of Bangladesh, with its two components - the Automated Cheque Processing System (BACPS) and the Electronic Funds Transfer (EFT) a state-of-the art technology went on live on 07 October 2010.

Bangladesh Bank is also keen to ensure common people's access to the financial services in all forms of payment systems. In the way of developing Bangladesh Automated Clearing House (BACH), an electronic payment infrastructure has been developed for the banking sector of the country. This has opened the horizon of electronic funds transfer, e-commerce, mobile financial services, e-payment gateway and m-commerce for Bangladesh.

I am really proud that BACH is celebrating its 2nd anniversary this year. I believe that BACH will continue to prove its excellence by making substantial contribution towards overall economic growth.

Message from

Executive Director, BB & Project Director, RPP



Implementing a National Payment System is not an ordinary task; this requires special set of skills. A multidiscipline complex system like ACH has never been implemented in a country of this size in such rapid deployment with precision. This has been possible because of the inspiration of senior management of Bangladesh Bank and participating bank with their commitment, leadership and positive intentions. BB project Implementation team work closely with consultants, banks and the solution providers set about common agenda move towards common objective that is the setting up Nation's best payment system. Strategically formulated project teams monitored and guided each sector such as banks, vendors for implementation of technological aspects and setting up rules and operation procedures towards successful completion. By the end of the project, the PSD core cadre had successfully handled many challenges on their own thereby proving the ability to independently operate the systems. The successful completion of BACH project has changed the attitudes and now it has been proven that Bangladesh makes things happen beyond others imagination, this is a success story for not just about Bangladesh Bank but the Banking Industry of Bangladesh as a whole.

BACH Milestones

Sl.	Milestone	Date
01.	Signing of TPP	Nov. 2006
02.	Tender Floating	June 2007
03.	Tender awarding	22 Sep. 2008
04.	System Setup	Aug. 2009
05.	User Acceptance Testing	Sep. 2009
06.	System Integration Testing	Jan. 2009
07.	Live Simulation Test	July 2010
08.	Live Day Simulation	Aug.4 to Sep.23
09.	Go Live at Dhaka	07 Oct. 2010
10.	Go Live at Sylhet	20 Jan. 2011
11.	Extend the Jurisdiction for High Value Clearing	Feb. 2011
11.	Go Live at Chittagong	03 Feb. 2011
12.	Go Live of EFT (Only Credit entries)	28 Feb. 2011
13.	Go Live at Rajshahi	08 April 2011
14.	Go Live at Barisal	07 May 2011
15.	Go Live at Khulna	27 July 2011
16.	Go Live at Bogra	25 Oct. 2011
17.	Go Live at Rangpur	24 Oct. 2011
18.	Go Live EFT Debits	15 Sep. 2011
19.	Go Live to other District Clearing Houses Within	Dec. 6, 2012

Introduction

Today, Bangladesh proudly prevails among front runners, by automating the payment systems of both cheque truncation and electronic fund transfers. Though it was not long ago, Bangladesh was very far from other countries in the region, that took weeks to obtain payment. Cheques come on in various sizes, soaked with moisture, were carried in bulk from branches to banks and bundled up at clearing house to go through manual clearing, nevertheless time consuming, natural human error contributed at best, suffering our society and went through anonymous delay in getting a payment. Neutrally thinking for a re-engineering would have been everyone's imagination, knowing the fact that Bangladesh Bank had to play the vital role in developing the country's payment system.

The modernization of the payments and settlement system had been always one of the core objectives of Bangladesh Bank. In November 2006, BB with the financial assistance from the United Kingdom Department for International Development (DFID), commenced a project called the Remittance and Payments Partnership (RPP), with the objective of promoting a 'pro-poor' economic growth in the country. RPP consisted of several outputs, output 1 of the project was to implement an Automated Clearing House (ACH) in the country, which will in-turn expedite the delivery of expatriates' remittances. Nearly twenty (20) BB officials were selected from different departments of the bank to implement the project. These employees were brought-in to the Department of Currency Management and Payment Systems during the period Nov. 2006 and June 2007. According to the advice received from the consultants the BB team was divided into four working groups, these were: Strategy, Regulatory, Legal and ACH Working Group. These working groups did the ground work for implementing an Automated Clearing House in the country. Stocktaking of the existing system, developing strategy and implementation plan for the ACH, finalizing the new cheque design standard, formation of the 'National Payment Systems Council' and reviewing the existing legal and regulatory framework were the main tasks performed in this period.

Implementation of an ACH involved many technical and regulatory issues in addition to its business objective and hence DFID hired a consulting firm called Emerging Markets Group (EMG) to implement the project. EMG employed a number of consultants (both foreign and local), these consultants started working in Bangladesh from Nov. 2006. In March 15, 2007 the then Finance Adviser of the caretaker govt. Dr. Mirza A B M Azizur Rahman formally inaugurated the project.

According to the original MoU, the project cost was estimated at GBP 7.5 million which was increased to 10.7 million in the revision made by DFID during Oct. 2008. Such increase in Grant was to cover the additional costs of the contract for the Automated Clearing House for Bangladesh, one of the components of the programme, as laid out in the Project Memorandum.

The primary challenges were to direct the participating banks in the procedure for printing and issuing MICR encoded clearing house instruments, schedule the activities chronologically and strictly monitor the same to attain the launching of the project (GO Live). In early 2009, the cheque design specification was finalized with active participation from the consultants and the BACH vendor(s). The functional specifications for both Bangladesh Automated Cheque Processing System (BACPS) and Bangladesh Electronic Funds Transfer Network (BEFTN) were finalized within mid 2009, and specific time lines were published to the participating banks to develop/install their system accordingly.

Initially the project was designed to complete an Automated Clearing House only for paper-based instrument clearing but later the project was re-defined to an Electronic Fund Transfer facility was on November 12, 2009 implementation Department for International Development

(DFID) agreed to extend the time up to October 2010. Such extension of time has been agreed by the Project Oversight board (POB) on its 5th meeting held on April 12, 2010. Later on DFID vide their letter dated June 8, 2010, informed the Bangladesh Bank that RPP Programme has been extended by another six months, to 31 March 2011. It may be mentioned here that, this extension was essentially aimed mainly at enabling the disbursement of grant payments under the 4th round of Remittances and Payments Challenge Fund (RPP Output:3).

As per the signed TPP the procurement of the project funds handling was administrated by the 'Crown Agents' (CA) who is responsible to monitor-----British Govt. purchases. Accordingly during June 2007 an international tender was called for the Automated Clearing House. Subsequent to accomplishing competitive bidding, CA signed the contract with the successful bidder/vendor dataedge Limited who is local ICT service and solution provider (as the prime contractor) on 22 September 2008.

The broad objective of the contract was to establish international standard payment system which created avenues for the participants to make faster and cheaper way of making payments. To attain the objective several renowned consultants were hired to primarily contribute to the vendor selection and project implementation process. Along with the consultants the dedicated Bangladesh Bank team was working to assist the whole process of implementing the project. The total project covered end-end solution known as turnkey project, the deliverables included the technical design, to build physical infrastructure, IT environment utilities, supply and implementation of IT system infrastructure, deployment of software, secured communication infrastructure and system instigation.

The BB team was vested with the responsibilities of monitoring the progress of the project implementation for the central system (BACH) as well as the systems required for each participating bank. To enhance the capability and understanding about the automated systems the BB team were being sent abroad for gathering experience and education in the relevant field. The team went to many automated clearing houses in Asia and in the Middle East. These trips gave them an understanding of how these systems work in different jurisdiction and made them grow in stature and confidence resulting in BACH having a core group of officers who were extremely competent in carrying out the responsibilities of the BACH implementation. After successful integration with the participating bank's system and after completion of multiple level of testing, the BACPS went for production on October 7, 2010.

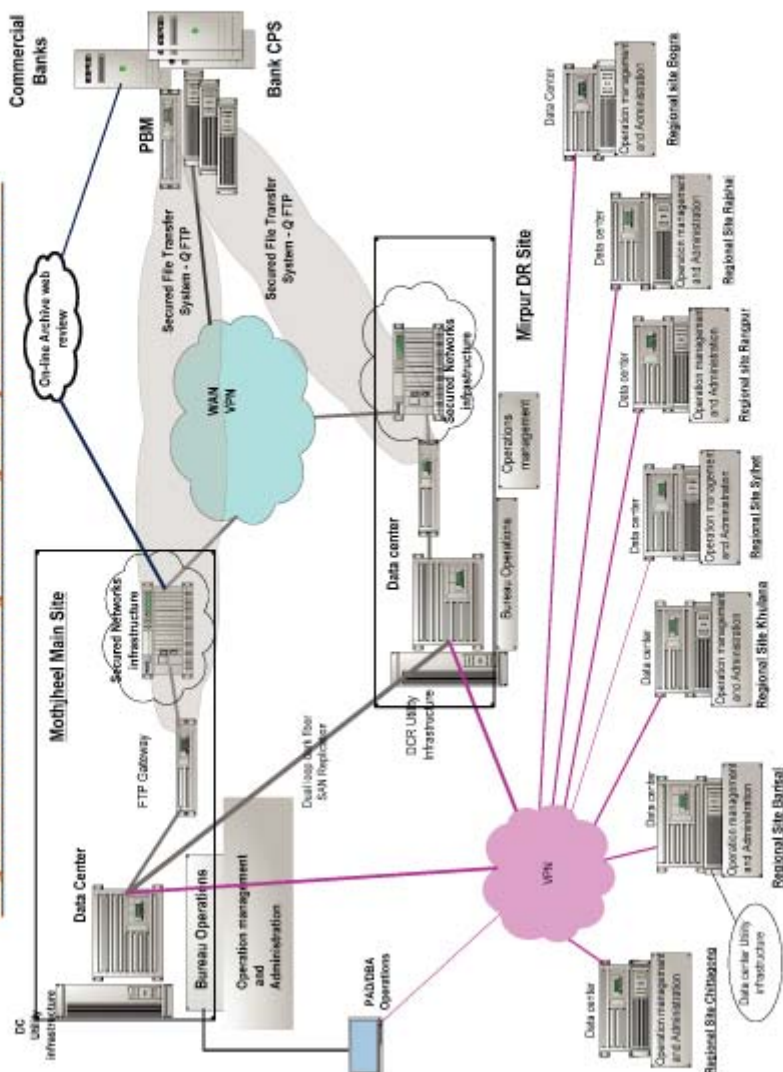
The second component of BACH, Bangladesh Electronic Funds Transfer Network (BEFTN), for which software was installed in the fourth quarter of 2010. The same BB team carried out the User Acceptance Test of the system and according to the plan the SIT was performed with the participating banks. In case of EFT system no LSD/LDS was performed as there were no live data available. The system went into production on Feb.28,2011 with 40 commercial banks technically ready.

BACH Technical Design

The ICT infrastructure of Bangladesh Automated Clearing system is geographically distributed across the country to accommodate country wide payment clearing based on both cheque image clearing and electronic fund transfer. The system consists of main clearing site, disaster recovery site and seven regional sites located at Bangladesh Bank regional offices. The Main Site is located at BB head office in Motijheel, Dhaka whereas the Disaster Recovery Site (DRS) is located at Mirpur. Cheque processing bureau is attached to the main clearing site is equipped with heavy duty cheque scanners that can provide bulk cheque processing for participating banks whenever it is necessary, whilst DR site and other regional sites have medium scale cheque scanning systems.

DR Center site provides backup to recover the operations including the bureau service in case of main site is inoperative. Essentially the Cheque Processing System (CPS) at the participating bank enables the bank to initiate Outward Cheque Envelop (OCE) consist of cheque images and MICR data and send these files to the Clearing Host (CH) via participant Bank Module (PBM). BACPS prepares the net settlement position of each participating bank based on these images and data. On the other hand BEFTN operates as a processing and delivery centre to provide the distribution and settlement of electronic debit and credit entries among the participating banks. When bank process the clearing data of both cheque and electronic funds transfers, it is effectively received by PBM. PBM consists of a server, security hardware and application software that performs multiple tasks in order to sustain the safety and integrity of clearing data. PBM resides at commercial banks, and primarily acts as a gateway to BACH. When banks send clearing data, PBM processes each and every item and validates against operating parameters and rules to ensure the integrity of clearing files before passing through to the next level which is the hybrid data encryption that encapsulate the data files with highly integrated cryptographic algorithms. Similarly, when encrypted data is received by the PBM, then it is decrypted and presented to CPS of the receiving bank. PBMs and BACH system (both Main data center and Disaster recovery data center) is connected via secured communication links provided by local ISPs. These links connect the participating banks and BACH system with substantially secured network layer using standard network security apparatus. Over this network layer, a bespoke designed secured quick file transfer protocol (Q-FTP) has been deployed, it channels bidirectional data between commercial banks and BACH allows each bank to independently perform the clearing data file transfer. Data is accepted and encrypted at bank's PBM as per the clearing parameters. Upon receiving clearing data at Central clearing system, the data instantly goes through clearing & settlement process and simultaneously the clearing data files are extracted and exchange between BACH and PBMs at banks, whereas payment transactions data presented to BACH is stored at on-line archive. Archived data can be retrieved by commercial banks via web browser.

Bangladesh Automated Clearing House Integrated System Infrastructure



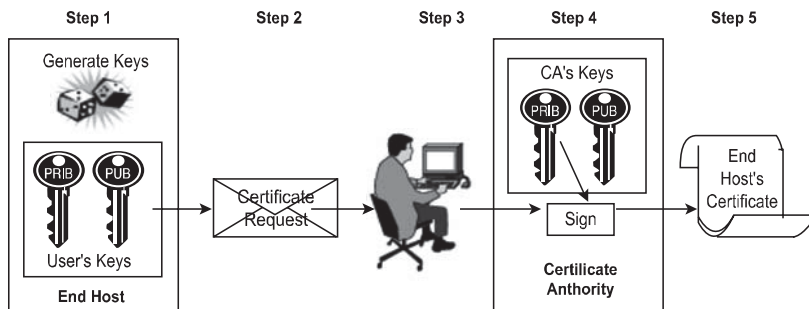
BACH Data Center operations are backed by Disaster Recovery Site which sustains continuous 24x7 data replication between Storage Area Network (SAN) devices allowing to recover the data from DRS in case of a disaster situations. PAD/DAB departments of BB at each region have access to the system through dedicated links and is incorporated with bureau operations. The bureau at Motijheel Main Site is centralized and has its own CPS that allows BB regional offices to process the images & data by itself. The regional centers are connected with secured VPN that can be switched over either to DC or DRS. Physical security and utility infrastructure for each center is provided with three tier protection, and the critical utilities such as electricity are backed up by dual power generators. The electricity supplied to the Data centers is equipped with parallel redundant (Dual) uninterrupted power source (UPS). Dual Cooling and air conditioning is provided to control the heat and relative humidity. CCTV and control access systems provide the physical security monitoring. Datacenters are equipped with fire detections and protections systems.

Security Mechanisms used in BACH

Security is the prime concern for payment systems operated in an automated environment. BACH has adopted state-of-the-art multi layer security architecture. Files (with cheque images and data) sent from bank to bank via BACH are protected using Cryptographic functions in software and in a special Hardware Security Modules (HSMs) installed at the banks and at BACH. The Public Key Infrastructure (PKI) is used to generate certificates required by the Cryptographic system to digitally sign/verify or in other words encrypt/decrypt files. The PKI model used in BACH is depicted below:

1. The Sender and Receiver exchange Certificates

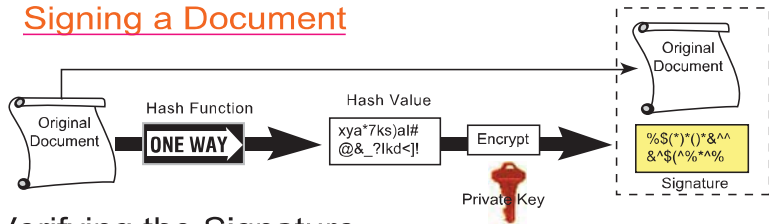
2. Preparation for BB as Participant



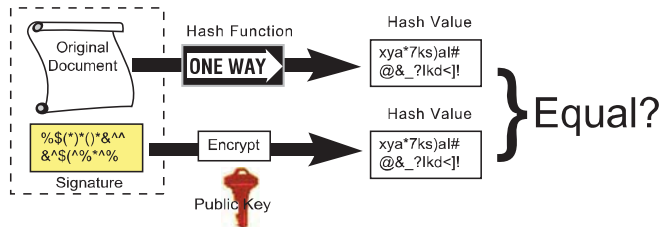
3. The Sender uses keys related to its own Certificates to sign its data

4. The Receiver uses the Sender's Certificate to verify the data

Signing a Document



Verifying the Signature



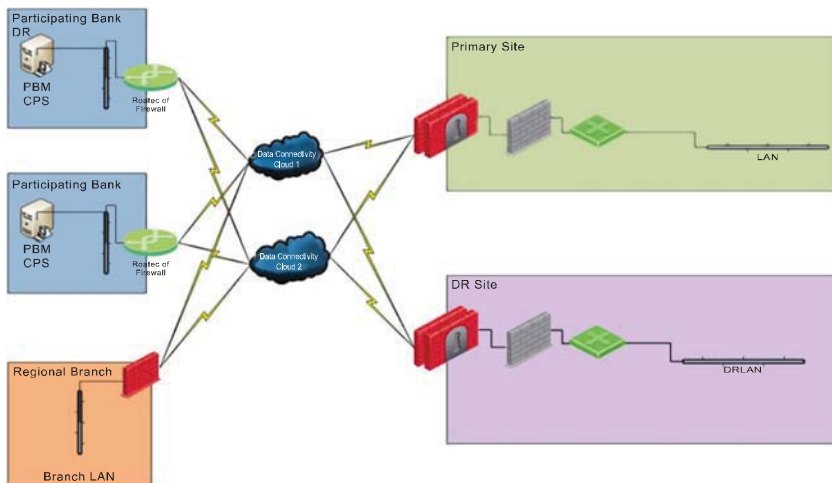
This Model of Data Exchange practically eliminates the Risks related to electronic Transaction because of the following reasons:

1. **Authenticity** (meaning: No participant should impersonate others he doesn't is) Identity can be proved
2. **Integrity** (meaning: A file cannot be falsified unnoticed) Participants are sure that, the file received is the same that was sent, and that no hacker had changed it
3. **Non-Repudiation** (meaning: The sender cannot deny having sending the file) As it is digitally signed
4. **Confidentiality** (meaning: No participant except the appropriate receiver should be able to open the file) Not guaranteed by digital signature itself, but ensured by encryption

Communication Infrastructure

Highly reliable and efficient data connectivity between BACH and the participating banks need to be established for sending and receiving Payment information data and cheque images. BACH Data Center at Motijheel and DR site at Mirpur also required to be connected through dedicated duct fiber for real time data synchronization. Moreover, BB regional sites also need to be connected with BACH Data Center and DR Site through fibre optic cable.

For ease of control and manageability as well as the global industry trend, BB has not allowed every bank to have its own direct link to Bangladesh Bank site. Instead, banks are to connect to production site and DR site through Service Providers who can offer reliable communication links backed by strong support system. Based on the track record, four ISPs were selected to provide the connectivity between BACH and participating banks. Each selected Vendors had sort of a "Communication Cloud" connecting to BACH Production and DR. The banks were asked to get two links from two different vendors with BACH. Each and every participating banks are connected with BACH at a single point (i.e. either at Head Office or Local Office), and with their DR through VPN. The communication topology used in BACH is a layer-2, MPLS technology with BGP configuration. To ensure the maximum data security, for the first time in Bangladesh, Public Key Infrastructure (PKI) and digital signature were used in BACH. Following diagram represents the BACPS connectivity architecture:



BACH Communication Architecture

Each selected Vendor established a "Communication Cloud" connecting to Central Bank sites (both DC and DR), these clouds are reliable, secured, based on modern technology, fail-safe ensuring high availability. The following responsibilities are ensured by the commercial banks' for the smooth exchange of data:

- From each data connectivity cloud there will be a link to the production site perimeter firewall as well as DR site of BACH.
- Banks having a backup or DR Processing Centre will require similar connectivity with the Bangladesh Bank Production and DR sites.
- The VPN topology of BACH to commercial banks will be Hub-and-Spoke topology. All commercial banks will connect to BACH through IPSec VPN client.
- Perimeter level firewall will handles all Firewall/VPN and DDoS prevention.
- Secondary firewall will act as IPS and Virus Wall (in transparent mode)
- Participating Banks are connected to the Data Clouds through a firewall.
- When a participating bank initiates a VPN connection to BACH with VPN client, it will get an IP from BACH perimeter firewall VPN server.
- The node that host PBM and also the nodes that use Archive system will connect only through the VPN client.
- The VPN clients will be provided to the participating banks.
- While a PBM or Archive access node is connected to BACH network, they will be isolated from all other networks. This will be enforced by the VPN client.

BACPS Functional Overview

BACPS was aimed to modernize the traditional cheque clearing system by introducing 'cheque imaging and truncation' (CIT) technology. CIT will enable the users to stop the movement of physical cheques, instead 'Electronic Presentment and Payment' of Cheques will be possible. The payment will be made based on these 'electronic cheques' while multilateral net settlement will take place by adjusting the participating banks' account maintained at BB.

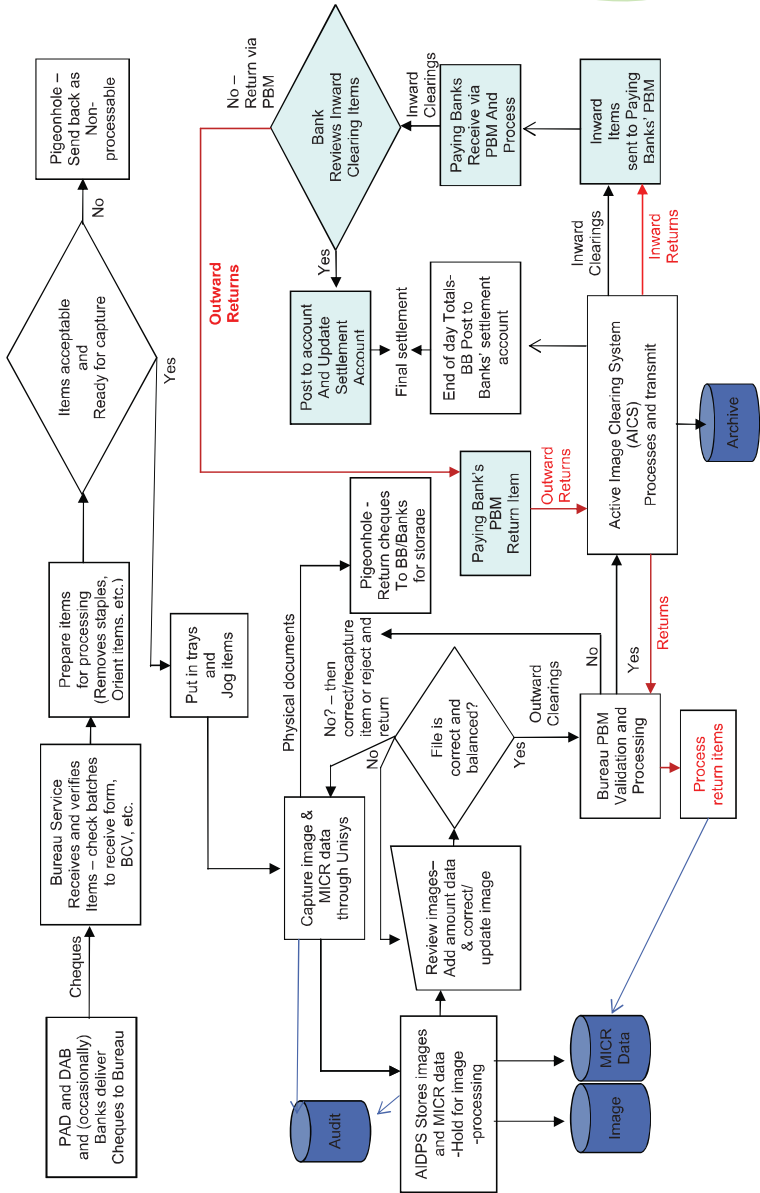
The central cheque processing software (AICS) developed by the vendor (Aperta) has been deployed at BB Motijheel site while all the participating banks (except for two sub-member banks) have acquired/developed CPS software for integrating with the central system. Two redundant communication links have been established between BB and the participating banks. To make the integration seamless all the participating banks have been provided with a middleware called PBM, which works as the gateway to BACH.

Apart from doing the central clearing function BB was planned to offer outward clearing facility to the participating banks as 'Bureau Service'. Software called AiDPS (Active Image Document Processing System) has been deployed to do this function at BACH. There is another application called 'Web Review' which was deployed at BACH for enabling BB to handle their inward clearing functions, attached workflow defines the functions done under the BACPS. BB Bureau service facility at Motijheel is not used by the participating banks frequently rather it is an occasional event, however, concern departments of Bangladesh Bank is using this facility on a regular basis.

BB Departments send physical cheques to bureau for processing, these cheques are presented in batches of 50 instruments each. There is a MICR encoded batch voucher on the top of each batch which identifies the cheque presenting department of BB, no. of items and total value of that batch. After receiving batches, bureau employee scrutinizes the cheques by removing foreign particles like staples and makes proper orientation etc. These batches are then sent to the tracks (Unisys Document Processors) for capturing data and images of the instruments. The amount field needs to be key-entered by bureau operators, balanced batches are automatically forwarded to BACPS while the unbalanced batched are sent to supervisor for rectification and balancing. Each participating bank's CPS software does the same function and outward cheques are presented in the same manner.

Inward cheques of each bank are sent to the respective bank's PBM via the communication links. Receiving Bank PBM validates the inward files and send to the bank's CPS for processing. CPS (with conjunction with CBS) verifies the signature, funds availability and thereby make the 'Pay'/'No-Pay' decision and only dishonoured cheques are sent back to the BACPS via PBM with a return reason code attached.

BACPS Cheque Processing and Settlement Workflow



BEFTN Functional Overview

The Bangladesh Electronic Funds Transfer Network (BEFTN) is a multilateral electronic clearing system which operates as a processing and delivery centre providing for the distribution and settlement of electronic credit and debit transactions among the participating banks. This Network operates in a real-time batch processing mode. Transactions received from the banks during the day will be processed in a real-time batches, accounting is performed resulting in a single multilateral netting figure for each individual bank to be settled in the books of accounts of concerned banks maintaining with BB. There are several parties involved in an EFT transaction, they are:

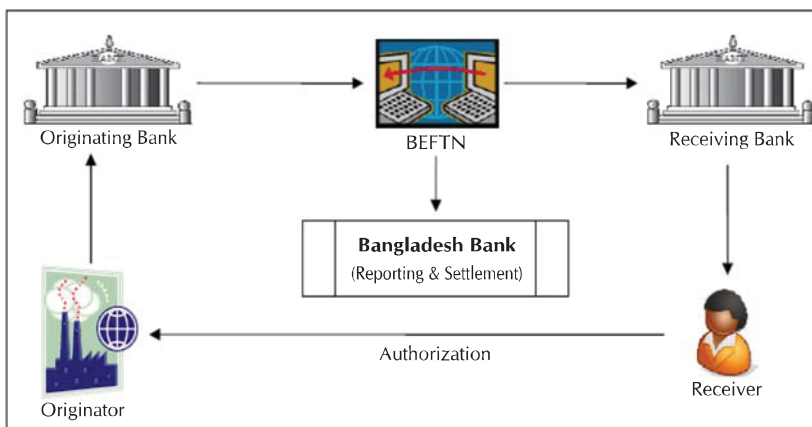
Originator : The client of a bank that agrees to initiate EFT entries into the system according to an arrangement with a receiver. The originator is usually a company, government agency or an individual directing a transfer of funds to or from a consumer's or a company's account. An originator executes an EFT fund transfer entry through an Originating Bank (OB).

Originating Bank (OB) : is the bank which receives payment instructions from its client (the originator) and forwards the entry to the BEFTN.

EFT Operator : Bangladesh Bank Operates the central clearing facility (BEFTN), that receives entries from OBs, distributes the entries to appropriate RBs, and effects the settlement figure to the banks concerned.

Receiving Bank (RB) : is the bank that receives EFT entries from BEFTN and post the same to the account of its client (Receiver).

Receiver : is a person/organization who has authorized an Originator to transmit an EFT entry to his/her/it's account maintained with the Receiving Bank.



BEFTN: Process Flow

EFT TRANSACTION TYPES

In EFT terminology, Originator and Receiver refer to the participants that originate and receive EFT entries rather than the funds. Unlike a check, which is always a debit instrument, an EFT entry may either be a credit or a debit. By examining what happens to the receiver's account, one can distinguish between an EFT Credit and EFT Debit transaction. If the receiver's account is debited, the entry is an EFT debit, on the other hand, if the receiver's account is credited, the entry is an EFT credit.

Examples of EFT Credits

- Payroll (Govt./Private)
- Domestic remittances
- Dividends/Interest/Refunds of IPO
- Business to business payments (B2B)
- Government tax payments
- Government vendor payments
- Customer initiated transactions (online payments)

Examples of EFT Debits

- Utility bill payments
- Loan repayments (EMI)
- Insurance premium
- Mortgage payments
- Government tax payments
- Government license fees
- Club/Association subscriptions

The EFT process operates from the beginning to end through a series of legal agreements. Each and every participating bank has already signed agreement with Bangladesh Bank to comply with and be subject to the BEFTN Operating Rules. Before any transaction is initiated via EFT network, the originator and OB execute an agreement which among other things, bind the originating company or individual to the BEFTN Rules. BEFTN Operating Rules define the parameters of the relationship between the two parties, and identify processing requirements for the specific application(s), and establish liability and accountability for procedures related to certain application(s).


Cheque Design Specifications

The primary feature of the new cheque design for BACPS was the inclusion of Magnetic Ink Character Recognition (MICR) code line and "Image Friendly" features. The specifications were drafted after studying the composite experience of Central Banks and Clearing House organizations around the world especially of Singapore, the United States, Canada, the United Kingdom, India, Australia and Malaysia. Accordingly the preliminary cheque design specification document was circulated vide BB letter no. IAS: 26-B (Clearing)/2006-894-942 dated: May 23, 2006. Later, the Cheque Design Standards were revised and were finalized by BB officials in consultation with the foreign experts and vendor during early 2009. The specification document titled as "HANDBOOK for Cheque Design Standard's Specifications for Imageable MICR Encoded Cheques" was circulated on February 24, 2009. BB subsequently published design and specification for Dividend/Refund Warrants and Foreign taka Drafts on April, 2009 and July, 2009 respectively.

New Cheque specification defines the design, physical security, MICR composition and other conventions for the purpose of initiating the design and printing of cheques by participants. The design standards are equally applicable for personal, business and government cheques and include designs for both the front and back. Physical security has been addressed through the adoption of a set of minimum standards that will be required for use in all cheques, which is briefly noted as under:

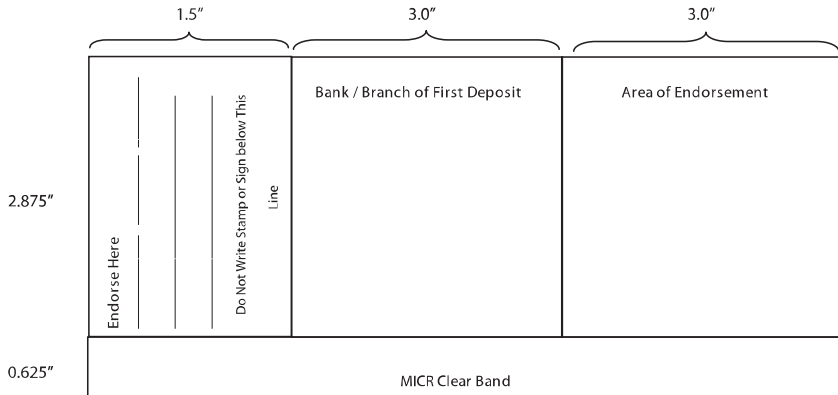
DESIGN SPECIFICATIONS

The purpose of the cheque design process are to ensure a design that not only incorporates the Magnetic Ink Character Recognition (MICR) symbols but also to ensure a design that is 'image friendly' to allow the use of cheque imaging technology from the beginning of the introduction of BACPS. The design for the front of the cheques will allow a clean image to be taken from the cheque during the scanning process. The back of the cheque will be used for endorsement.

 Bank 123 Mot Dhaka - 1000. 014134011		Payor Institution Area	Cheque Number & Date Area 014134011
Anwar Printing Press	Pay To _____ The Sum of Tal _____		Or Bearer Convenience Amount Area
	Clie Clie Account Title Area Clie	Signature Area Please Sign Above This Line	
	MICR Area 1 4 1 2 3 8 1 8 1 1 4 8 4 7 6 2 7 8		

Front-Side of Standardized Cheque

Back side of the cheque was designed to incorporate the beneficiary details in section I, section II is allocated to be used by the presenting bank for putting stamp and the third section is to be used by the scanner for printing a unique 23 digit identification number on the instrument.



Back-Side of Standardized Cheque

MICR PRINTING SPECIFICATIONS

The area containing the MICR band measures .625 inches (1.59 cm) from the bottom edge of the document. No informational printing shall appear anywhere in this area on the face of the document other than the prescribed MICR E-13B characters. No magnetic ink printing should appear on the reverse side of the document. Below is a detailed diagram of the MICR area :



SECURITY FEATURES

In the new cheque design, some mandatory physical security features has been incorporated for the clearing instruments, the primary security was the use of CBS 1 paper in all instruments, other securities are:

- **Watermark** : is a design formed among the fibres of a sheet during the papermaking process. This design can be a graphic image, text, or portrait. The paper becomes more or less translucent, in areas where the fibres are displaced or deposited during the formation of the wet paper web. The Watermarked CBS1 paper is acceptable provided that the watermark is applied by the Fourdrinier process and consists of at least three levels, i.e. the base paper thickness, and thinner (lighter) and thicker (darker) parts in the design.

- **Microprint** : is text set in very small letters (less than 0.010 of an inch tall) that can be easily read through a magnifying glass, but which appear to the unaided eye to be dashed or solid lines. Microprint provides protection against reproduction by scanners and office copiers because these cannot successfully print the tiny letters used. Microprint will be required on all lines on the face of the cheque. The payee and legal amount area and signature areas.
- **Magnetic Ink** : is ink that contains an amount of iron sufficient enough to magnetize the print when exposed to a strong magnetic field. This is the principle used to support all high-speed cheque processing around the globe. Failure to detect magnetic ink in the MICR codeline may mean that the cheque is a counterfeit.
- **Erasable Inks** : series of inks easily removed from the substrate through mechanical abrasion. Used as an authentication and verification feature on the instruments, at risk of duplication and counterfeit. This is particularly effective against alteration and must cover the vulnerable areas of the instrument specially the signature and amount areas. This ink in combination with the covert erasable UV fluorescent ink described below presents a formidable protection against alteration which is a major concern in Bangladesh.
- **Invisible UV Fluorescent** : is a colour less transparent ink system, which fluoresces under a UV light source. Used as a covert authentication and verification feature on new instruments able to detect duplication and counterfeit. As is the case with the erasable background, the invisible erasable fluorescent obviates attempts at mechanical erasure. The fluorescent substantially reduces the possibility of alteration on the major areas of sensitivity specifically: Payee Name, signature area, Convenience Amount Box and the Amount in Words areas.
- **Chemical Sensitivity** : Application of this security causes a colour change or a hidden message to appear on the surface of the cheque if any chemical substances is used to remove writing from the cheque. This protection is added at the paper mill when the paper is being made. Chemical sensitivity can be associated with one (single stain) or a number of (multistain) chemical solvents or eradicators. The most commonly used chemically sensitive papers are protected against bleach (ink eradicator) and sometimes other organic solvents such as strong acids and alkalis.

Routing Number

The 'Routing Number' is a key element of the MICR cheque design and payment processing. Routing Number (RN) is a 9 digit unique identification number assigned to each individual CH participating bank branches. RN is the destination for each Clearing House Instrument to be routed for payment. BB has issued RN for each and every bank branches (8000 plus) and participating BB offices. Bangladesh Bank has published a book on March 31, 2009 named 'Bank-Branches Routing Number' which contains RNs of bank branches in Bangladesh. After March 2009 BB use to issue RN for new bank branches as and when required. Small software was developed to allocated RNs to the bank branches. Routing Number consists of 03 digit Bank Code, 02 digit District Code, 03 digit Branch Code and a Check Digit. For example: Bangladesh Krishi Bank, Agrabad Branch is allocated with the routing number of '035150138'.

Preparation for BB as a participant

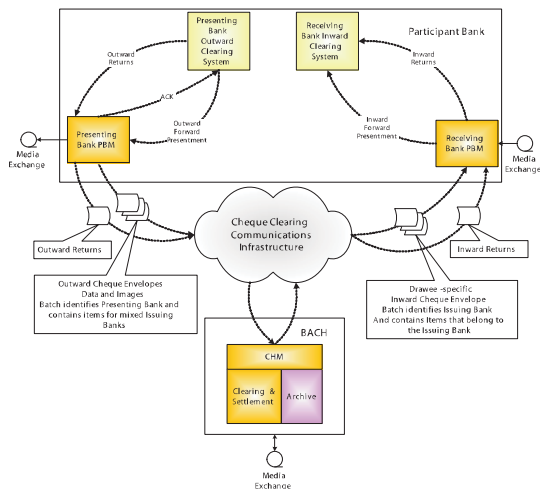
Beside's install and test the central clearing facility Bangladesh Bank also needed to get prepared to act as a participant in the BACPS under automated processing environment. Public Accounts Department (PAD) and Deposit Accounts Bivag (DAB) of BB motijheel office participate in the CH like any other participating banks. PAD and DAB payment sections works as the paying authority for Govt. Cheques and BB cheques respectively while PAD and DAB receipt sections presents cheques received against govt. Chalan and BB staffs cheques respectively. Hardware and software installation, testing and train concern officials of these sections were critical for the implementation of BACH.

The bureau service facility was developed under BACH to assist participating banks (including BB) to process their outward cheques. BB outward cheques are handled by BACH staffs through this facility. Requirad number of employees were posted to BACH to handle huge number of govt. Cheques received on a regular basis. These BACH officials were trained to handle the CPS operation including the track application, amount entry, correction and balancing functions, deletion and adjustment of items, outward cheque processing in both high value and regular value sessions. These officials were also trained to process other banks items (as and when required) and item send by different BB offices under BACPS umbrella. The core BACH operation team use to supervise the functions of these staffs including Report generation and viewing, session activities monitoring and acknowledgement testing.

For inward cheque processing, separate work stations were installed at PAD and DAB sections of BB. Inward Cheque processing software (Aperta web review) were installed and tested. Several phases of theoretical and hands-on training were rendered to the concern officials. Govt. Cheques were issued by Controller General of Accounts (CGA) and side-by-side they use to issue online instructions (via FMRP) to BB. Integration between BACH and FMRP was not included under the project scope for these reason difficulties were faced by both PAD payment and PSD officials in the live environment to reconcile the govt transaction accurately. Therefore, from 08 Nov. 2010, one month after the Go Live date. Clearing of Govt. Cheques were excluded from BACPS. However, PAD receipt and DAB payment & receipt were participating successfully in the BACH. Efforts are underway by BB Core Banking vandor to accommodate govt. chque under BACPS operation.

Participating Bank Module (PBM)

Introduction of PBM was an excellent strategy towards the implementation of BACH. PBM is the gateway software, given free to all banks, for exchanging files between participating bank and the CH. PBM is the logical extension of the clearing house under participating bank's control. Aperta, the software vendor for BACH, has taken praise worthy approach to put this software in place which was not used in their other similar projects. The functionality of PBM includes verifying each individual files it gets with a pre-fixed format and eliminated erroneous files being sent through to the BACH. PBM use to encrypt each valid file with 1024 bit RSA encryption technology and digitally signed and then send it to the CH (through link). On the other hand on each incoming files, PBM use to decrypt and then verify whether the formats are in line with the prescribed specification and then it is imported to the bank's host system (Cheque Processing System). Thus PBM plays a critical role in BACH operation. The diagram below shoes the function of PBM and related components:



System Testing and Integration

User Acceptance Test (UAT): System installed by the vendor needed to be tested before it opens for the participating banks for integration. This internal testing is termed as User acceptance Test (UAT). Selected (05) PSD officers were assigned to carry out the test. UAT is meant to ensure the system's performance in line with the functional specification. Special hands-on training was rendered by the vendor to the BB team which made themselves familiar with the functionality of BACH and taught them how to operate the same. These training include operation of CPS, PBM, BACPS & BEFTN and for handling of inward cheques received by DAB & PAD.

Each individual test scripts were prepared carefully while going through the system functional specification. Fault Reports were prepared to inform the vendor about any discrepancy with the

spec. While, the incident reports and Change Requests were submitted for the customization that are required in the system. Each discrepancy had to go through a change control procedure and all tasks had to be re-tested with each new version released. Regular meetings were held with the vendor representative worked on-site to inform the test results and ask for their suggestions.

System Integration Test (SIT): While BB was testing the central system the participating banks were developing/deploying their own CPS in line with the published time frame. PBM was handed over to the participating banks on Sep.27,2009 and communication links were established by this time. In the early stage of SIT commercial banks sent files in offline media (via CD/DVD) to BACH. BB team tests those files (.xml and img) with help from vendor and reports were send to concern bank accordingly. The first online SIT started on Nov. 08,2009, only three commercial banks (Dutch-Bangla Bank Ltd. Eastern Bank Ltd. and Janata Bank Ltd.) were successfully participated on that day. Series of meeting were arranged with Banks and their vendors to communicate the changes that need to be done for proper integration.

Live Simulation Test (LST): LST is aimed at passing high volumes of data via the communication channels and test BACPS's capacity to handle the same while the output data/reports will be compared with the existing manual system to verify the integrity and fitness of BACH. LST started on 03 May, 2010 and continued till the GO LIVE. LST includes testing of the central clearing system and, more importantly, each participating bank's cheque processing systems. Each participating bank needs to successfully pass the LST to participate in the LIVE operation. Before Going into production there were another faze of testing called Live Day simulation.

Live Day Simulation (LDS): Before going into production it was necessary for the system to go for a one-day trail production termed as 'Live Day Simulation'. LDS was aimed to access the readiness of the participants. First LDS for BACH was performed only for regular value cheques on Aug. 04, 2010. BB implementation team members were assigned with several commercial banks for all kind of communication and supports to make the LDS a success. In spite of all the prior tests the LDS confronted the Banks with many operational issues. These tests were carried out through the Disaster Recovery site as well. After successfully completion of first LSD, BB team announced several other LDSs between 26 August to 01 September 2010 and a third weeklong LDS was executed from 19-23 September, 2010. After all these testing being done properly, BSCPS went live on October 7, 2010.

Education and Training

Modern Payment System was a new concept for Bangladesh, thus the implementation of such system was heavily depended on proper understanding of such system. The PSD officials were accumulated from different department and have no prior knowledge, thus knowledge and understanding about the modern payment system were a must for them, while training and education for the officials of each participating banks were equally important. BB officials were trained both in-house and abroad under the guidance of foreign experts of RPP project on the other hand several awareness sessions were hosted by BB to educate the officials of participating commercial bank. Undoubtedly, education, training and capacity building played a vital role towards the success of the project. Project's training budgets were spendend logically to train PSD staff, BB top management and representatives from the participating banks. The training render to the BB officials may segregated in three categories,

- **In-house Knowledge Sharing:** in this category PSD officials are divided into teams and are allocated with topic for preparing essays and make presentation on the same before other groups. Unlimited internet access was arranged by project funding for all the PSD staffs which enable them to gather knowledge from around the globe by surfing the net.
- **Local Training:** Project consultants used to train PSD staffs through presenting their experience, while Electronic Payment Network (EPN), a US based payments company, was hired for rendering training in Bangladesh. EPN arrange several training and awareness sessions where PSD officials, officials from other BB departments and commercial banks were trained. There were different sessions for commercial banks officials while BB team was provided with in-depth training by the EPN. After extensive training, selected BB officials were allowed to sit for a professional exam called AAP (Accredited ACH Professional). Eight out of twenty two officials sat for the exam successfully passed and received a certificate from National Automated Clearing House Association (NACHA), USA.
- **Foreign Trainings:** Several foreign training sessions were attended by BB officials within the tenure of the project. Foreign training sessions consisted of conferences, class room training, specific operational training and onsite visits to the central banks and payment systems operators of different countries. Onsite visits were comparatively helpful as first-hand knowledge and experiences of other countries could be gathered through these visits. After completion of each training sessions, the participants were required to submit a report of the visit and share the knowledge and experienced they have learned as a result of the training.
- **Training for Commercial Banks:** BACH Programme Manager from each of the commercial banks were trained by both foreign consultants and by trained PSD personnel. Several day-long training sessions were conducted by Electronic Payments Network (EPN) for BACH Managers' on BACPS and BEFTN. Besides these training sessions, PSD team members went to each participating banks to ensure that they understand the concept and implementation phases of BACH. Several hands-on training sessions were also rendered to the concern personnel of the commercial bank for familiarization with the functions of the software and the operation of the same. Besides these trainings PSD team also arranged meetings, presentations before the trade bodies, govt. entities, regulators and with other stakeholder/users of payment systems.

As part of the learning process, PSD officials gained first-hand knowledge about the aspects of modern payment systems and how they were being implemented in various countries worldwide. This knowledge and experience made it possible for BB officials to be able to design a suitable automated payment system infrastructure. Well trained human resources of BB is now handling the day to day operation and deal with any contingency proves that there has been a knowledge transfer and Bangladesh Bank now possesses the skilled resources to run the new system properly.

System Operation and Maintenance

A highly sophisticated system like BACH requires proper maintenance for smooth operation. Well trained human resources of BB is handling the day to day operation, User Administration, Certification Issuance, Backup and recovery management of the system and related administrative tasks, while Data edge(DE) technical support is provided onsite for looking after the function of the system. Under BACH contract, Service Level Agreement (SLA) was signed between BB and DE to provide support for 2 years for all deliverable products. The locations covered are Main Production Centre at Motijheel, Disaster site at Mirpur and seven regional sites at Chittagong, Sylhet, Rangpur, Bogra, Rajshai, Khulna and Barisal. Vendor's role here is to provide technical support in trouble-shooting, repairs, parts replacements, bug-fixing for BACH application, systems hardware and network infrastructure. dataedge is also ensures the back-to-back support from their partners like Aperta, HP, Unisys and others where applicable.

The technical support from vendor is planned out to achieve less operational disruptions and provide workaround when it is necessary. Onsite engineers are assigned to BACH DC to report on daily basis during business days. Backup engineers are assigned off site to be stand-by for on-site engineers; backup engineers are to cover Server/OS, Unisys, Aperta, Network infrastructure and UPSs.

Plan-Do-Check-Act quality cycle adopted on services by dataedge ensures improvement of support services and sufficient resources Upon notification of system malfunction, dataedge has its own escalation process to alert expert support groups and obtain support from their partners;

- Application software - Aperta Plc
- Network and Security - Juniper, Extreme and Cyberoam,
- Servers and operating software - HP
- Sorter, scanner - Unisys (Burroughs)
- UPS and electrical infrastructure - Powerware,

Legal Framework

The Payment System of the country was governed under the Bangladesh Bank Order (BBO), 1972, and the Banking Companies Act, 1991, Negotiable Instruments Act, 1881, The Insolvency Act, 1920, the Financial Institution Act, 1993, the Foreign Exchange Regulation Act, 1947, the Banking Department (BD) Manual, and the Dhaka Bankers Clearing House Rules.

The BBO empowers Bangladesh Bank to promote, oversee and regulate payment systems. Specifically Section 7 A (e) of the BBO mandates one of the BB's functions shall be "to promote, regulate and ensure a secure and efficient payment system, including the issue of bank notes". Article 82 (1) of the BBO stipulates that the Board of Directors of Bangladesh Bank may make regulations to provide for all matters for which provision is necessary or convenient for the purpose of giving effect to the provisions of the Order. Article 82 (2) (i) and (k) of BBO, 1972 includes the supervision and oversight of the payment systems and clearing and settlement functions.

Under the authority rendered in BBO, Bangladesh Bank Board adopted the Bangladesh payment and Settlement Systems Regulations 2009 (BPSSR 2009), during April 2009, giving it effect from April 27, 2009. BPSSR 2009 has comprehensively provided the regulatory authority in promoting and regulating various payment systems, channels and instruments. It has also provided broad legal guidelines for the banks, payment system providers and operators.

Both BACPS and BEFTN operate in a real-time batch processing mode, transactions received from the banks during the day are processed as they are received and will be settled through a single multilateral netting figure for each individual bank's respective books maintained with BB. BACPS adopted the 'cheque imaging and truncation' for automated cheque clearing and settlement while BEFTN is a paper-less payment platform operates on the basis of customer instruction.

Both these payment systems were new to the country thus operating rules and procedures relating to the system were needed to be adopted. Likewise, 'BACPS operating Rules and Procedures' and 'BEFTN Operating Rules' were prepared by PSD officials with active participation from consultants. BACPS Operating Rules and procedures defines the roles and responsibilities of all the parties involved in the electronic cheque presentation and settlement process while the BEFTN Operating Rules define the parameters of the relationship between the two parties, and identify processing requirements for the specific application(s), and establish liability and accountability for procedures related to certain application(s).

the 'BACPS operating Rules and Procedures' and 'BEFTN Operating Rules' were approved by the Board of Directors of BB on 11 January, 2010 and on 06 April, 2011 respectively. Each participating bank signed a contractual agreement that binds them to comply and adhere to the system rules completing the underpinning of the systems.

BACH Project Management

The success of the project depended on 1. how BB carried out their responsibilities and 2. how each of the 47 banks fulfilled their responsibilities. While item 1 was a big task to be carried out by BB staff who had no prior experience, item 2 was even a bigger challenge as no banks in Bangladesh had the exposure to such systems.

Very early in the project implementation BB selected a special team of young talented officers and assigned them to the payments system division (PSD) under DCMPS. A BACH program manager was appointed at each of the commercial banks and s/he was expected to coordinate the project at their Bank and liaise with the BB. The BB management was given progress reports every month and it was followed up with meetings with the top management of all banks to highlight road blocks and set time frames and targets for tasks to be performed.

It is worth mentioning that setting up communication infrastructure and ensure the required security was a critical issue. The need for a reliable and secured file transfer system was acknowledged by concern parties. The team had to go through many cycles of evaluation with application provider and security hardware suppliers to ensure for most appropriate design meet local conditions. Likewise, the vendor deployed resources to design and develop tightly coupled File Transfer System between participating banks and BACH. This highly customized secured FTP system delivers all financial information of participating banking across BACPS and BEFTN network.

PSD Team was vested with the responsibility to implement the central system and integrate that with the participating commercial banks. PSD officials perform the task of UAT and then the integration with participating banks' system. The BACH then moved to Live Simulation Testing (LST) and compared the figures with the same days manual clearing. This task was a difficult one for the commercial bank's staff as they had to go through two cycles for the same day. It also helps to identify faulty operational procedures done by bank staff. The system had to go through many changes/modifications in order to address requirements/issues found out when implementation was on progress.

We would like to make note on a decision making, it was about the decision to go for live operation. Although there had been many test cycles and practices, the fear & reluctance was in the air to go for own live run. It was one fine day at project meeting, the Executive Director Mr. Dasgupta Asim Kumar sensed this dead-lock and said let's do it for just one day as a starter. We believe it made the change to remove the fear and forced to go for live operations.

BACH project required tremendous effort in coordination with all parties and keep the accuracy of the deployment. One of the reasons behind the success of the project is the level of cooperation between BB management, the consultant, BB implementation team and the vendors. The project was like a 'bubble' inside which all were one team, and merit mattered more than seniority. It's easy for others to look on now and take what's been achieved for granted, or even appreciate it but underestimate what it took to get here. Without the vision, leadership and complete commitment on the part of BB personnel, this would've likely been just another failed or half-done project.

Conclusion

The Solution of BACH provides state of the art software with features and functionality which can be rated equivalent to the best available in the market. The hardware environment, the network and security also meet international standards. The software provider Aperta of Scotland and very specially their local partner and the prime vendor data edge limited has provided services beyond their call of duty.

It should be placed on record that the project was made possible due to the unflinching and very interactive support from the BB management including the Governor, Deputy Governor the 3 Project directors and the Five the then Assistant Directors who were involved in the implementation from the start of the project and others who were deployed subsequently too made a significant contribution. It is worth mentioning that the pivotal role played by the Governor Dr. Atiur Rahman in achieving the goals of the project. His personal involvement and attention to need of the project including having regular meeting with the MD/CEOs of all commercial banks and pushing them towards published targets made it possible for this project to achieve the great success it has.

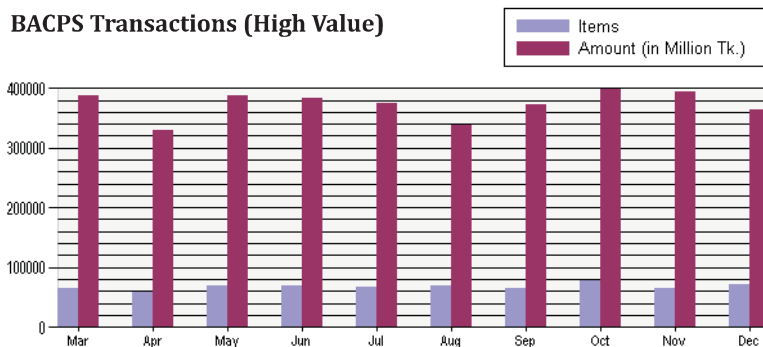
With the fast and efficient implementation of this project the whole payment systems environment in the Country has changed. This project and the BB directives pushed the Banks to install core banking and thereby upgrade their own internal operation. Thirty-one banks now have their core banking system installed the other remaining banks (except for a couple) banks are at different stage of moving towards implementing their CBS. The BACH provided a streamlined efficient and secure system for cheque processing and EFT transactions. With the implementation of BACH and considering all the features of the system, Bangladesh is now at par with some of the developed countries and ahead of many countries in the region.

Finally, the DFID supported by all the eminent EMG consultants, . Mr. Randy Kahn (USA), Mr. Craig Balance (Canada), Mr. George Thomas (USA) and Ms. Nayeni Fernando (Sri Lanka)] under RPP project headed by Richard Moss, has contributed significantly to achieved this milestone, which will go down in the history of the development and modernization of the banking environment in Bangladesh.

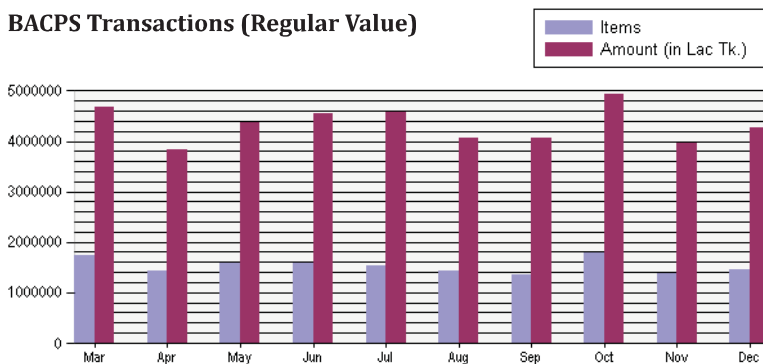
Bangladesh Automated Clearing House

Statistics of Transaction Processed During March, 2011 to December, 2011

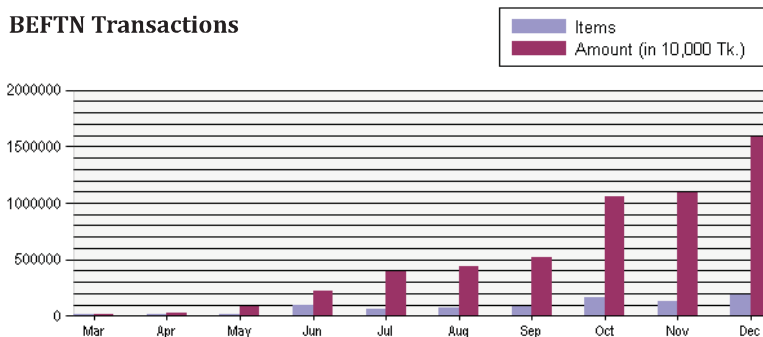
BACPS Transactions (High Value)



BACPS Transactions (Regular Value)



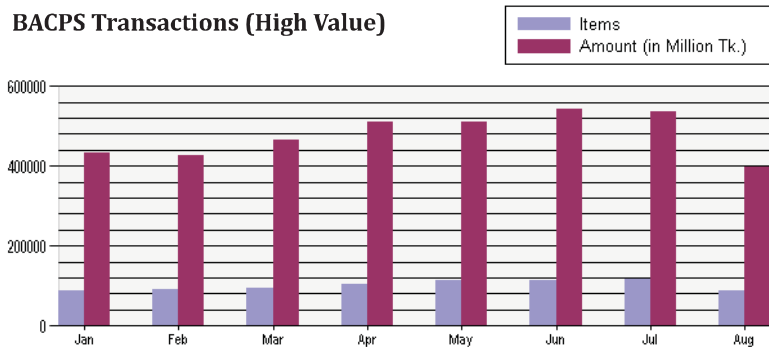
BEFTN Transactions



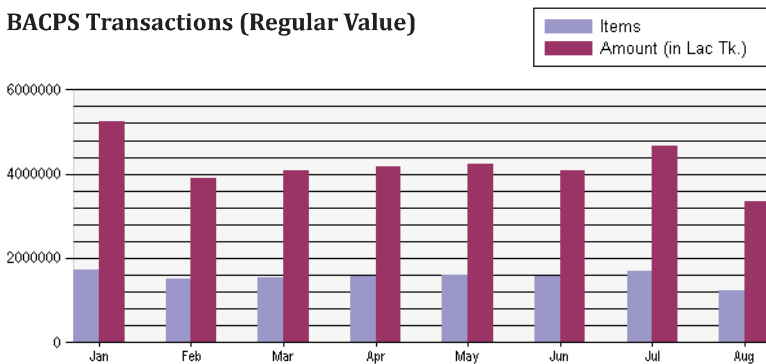
Bangladesh Automated Clearing House

Statistics of Transaction Processed During January, 2012 to August, 2012

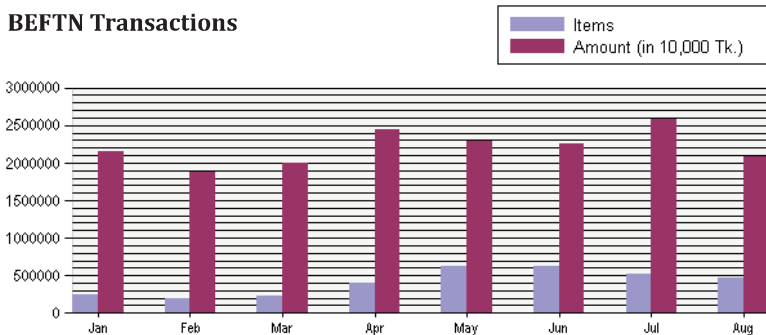
BACPS Transactions (High Value)



BACPS Transactions (Regular Value)



BEFTN Transactions



GLOSSARY

	Abbreviation	Meaning
A	AAP	Accredited ACH Professional
	ACH	Automated Clearing House
	AICS	Active Image Clearing System
	AIDPS	Active Image Document Processing System
	AML	Anti-money laundering
	ASP	Application service provider
B	ATM	Automated teller machine
	BACH	Bangladesh Automated Clearing House
	BASC	Business Advisory Service Centre
	BASIS	Bangladesh Association of Software and Information Services
	BB	Bangladesh Bank
	BBO	Bangladesh Bank Order 1972
	BEFTN	Bangladesh Electronic Funds Transfer Network
	BIS	Bank for International settlement
	BPO	Bangladesh Post Office
	BRAC	Bangladesh Rural Advancement Committee
	BGP	Border Gateway Protocol
	BTRC	Bangladesh Telecommunications Regulatory Authority
	RPCF	Remittance and Payments Challenge fund
C	CBS	Core Banking Solution
	CGA	Controller General of Accounts
	CGDF	Controller General Defence Finance
	CN	Concept note
	CFT	Countering finance for terrorism
	CPS	Cheque Processing System
	DC	Data Centre

Abbreviation		Meaning
	DCMPS	Department for Currency Management and Payment Systems
	DE	Data edge(the Prime Vendor for BACH)
	DECO	Data Entry Control Operator
	DFID	Department for International Development, UK
	DG	Deputy Governor, Bangladesh Bank
	DMD	Deputy Managing Director
E	EBL	Eastern Bank Ltd.
	EC	European Commission
	EFT	Electronic Funds Transfer
	E- payment	Electronic payment
	EPN	Electronic Payment Network (New York Clearing House)
F	FB	Foreign bank
	FMRP	Financial Management Reform Programme
	FSA	UK Financial Services Authority
	FTP	File Transfer Protocol
	FX	Foreign exchange
G	GCC	Governors' in Council
	GM	General Manager
	GP	Grameenphone Ltd
H,I	HSM	Hardware Security Module
	IBBL	Islami Bank Bangladesh Ltd
	ICE	Inward Cheque Envelop
	ICT	Information and Communications Technology
	IRE	Inward Return Envelop
	ISP	Internet Service Provider
	IFTAB	Inter Bank Fund Transfer Association of Bangladesh
	INAFI	International Network of Alternative Financial Institutions
	IPO	Initial public offering

	Abbreviation	Meaning
J,K	KSA	Kingdom of Saudi Arabia
	KYC	Know your customer
L	Lac	100,000 Taka
M	MD	Managing Director
	m-banking	Banking using a mobile phone
	MFI	Microfinance institution
	MICR	Magnetic Ink Character Recognition
	MNO	Mobile network operator
	M payment	A payment initiated by mobile phone
	MPLS	Multiple layer Protocol Switching
	MTO	Money transfer operator
	m-wallet	Money wallet operated through a mobile phone
	NACHA	The Electronic Payments Association
	NCCBL	National Credit and Commerce Bank
N	NGO	Non-governmental organisation
	NRB	Non-resident Bangladeshi
	OCE	Outward Cheque Envelop
	ORE	Outward Return Envelop
	OS	Operating System
	PAD	Public Accounts Department
	PB	Private bank
O,P	PBM	Participating Bank Module
	PCR	Project completion report
	PF	Prime Finance and Investment Ltd
	PKI	Public Key Infrastructure
	PKSF	Palli-Karma Sahayek Foundation
	POS	Point of sale
	PSD	Payment Systems Division

	Abbreviation	Meaning
QR	QFTP	Quick File Transfer Protocol
	Robi	Trade name of Axiata Bangladesh Ltd (Mobile oprator)
	RN	Routing Number
	RPCF	Remittances and Payments Challenge Fund
S	SAN	Storage Area Network
	SB	Specialised bank
	SEC	Securities and Exchange Commission of Bangladesh
	SLA	Service Level Agreement
	SME	Small and medium size enterprise
	SMS	Short Message Service
	SSS	Society for Social Service
T	TBD	To be decided
	TAN	Trusted agent network
	TC	Technical Committee
	Tk.	Bangladeshi currency
	TMSS	Thengamara Mohila Sabuj Sangha
	TTBC	Trade Textiles Bangladesh.com Ltd
U	UAE	United Arab Emirates
	UAT	User Acceptance Test
	UN	United Nations
	Upazila	A political administrative sub-unit
V-Z	XML	Extendable Mark-up Language
	VISA	Trade name of a world-wide card network
	VPN	Virtual Private Network



Participants of the workshop on Project Management at BCDM, Rajendrapur



Demonstration of BACH operation to Governor and MD's of all commercial Banks.



Review meeting of RPP Project with PSD Team & consultants headed by Deputy Governor Ziaul Hasan Siddiqi



Deputy Governor Mr. Ziaul Hasan Siddiqi with AAP certificate holders on the AAP certificate distribution Program



PSD team's visit in Lankaclear at Colombo, Sri Lanka



PSD Team's visit in the State Bank of Pakistan Head office



Speech by project Director Mr. Dasgupta Asim Kumar at Go Life of Bangladesh Bank, Rajshahi.



PSD Team's visit at Banko Central NG. Philipinas at Manila, Philippines



Training for the participating banks' Officials



Executives BACH Managers' Workshop.



PSD Team's visit to the Central Bank of the UAE.



PSD Team on Picnic at Jamuna Resort.

