Concept Note

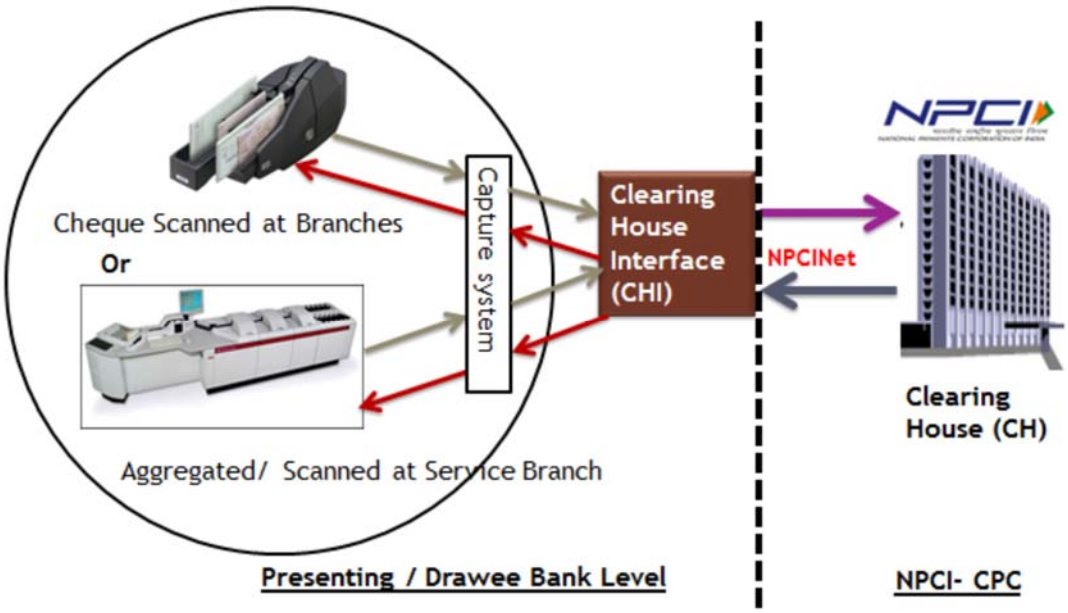
Technology refresh of Clearing House (CH) infrastructure – upgradation of ECPIX application to APTRA clear 6.0

Grid based Cheque Truncation System (CTS) is operational for the last 6 years with a processing capacity of 5.2 million instruments per day across 3 grids. The current average volume, combined for all the 3 grids, is around 4 million instruments per day.

As a part of technology refresh, NPCI is upgrading the ECPIX application as well to bring in more efficiency in processing at CH and reduce the cost burden on the CHIs.

ECPIX application upgrade: The existing ECPIX application version 4.x is getting upgraded to APTRA Clear 6.0. The upgrade will bring in host of functionalities that will help in increase of efficiency in processing.

The current architecture has got 3 major components, as follows:



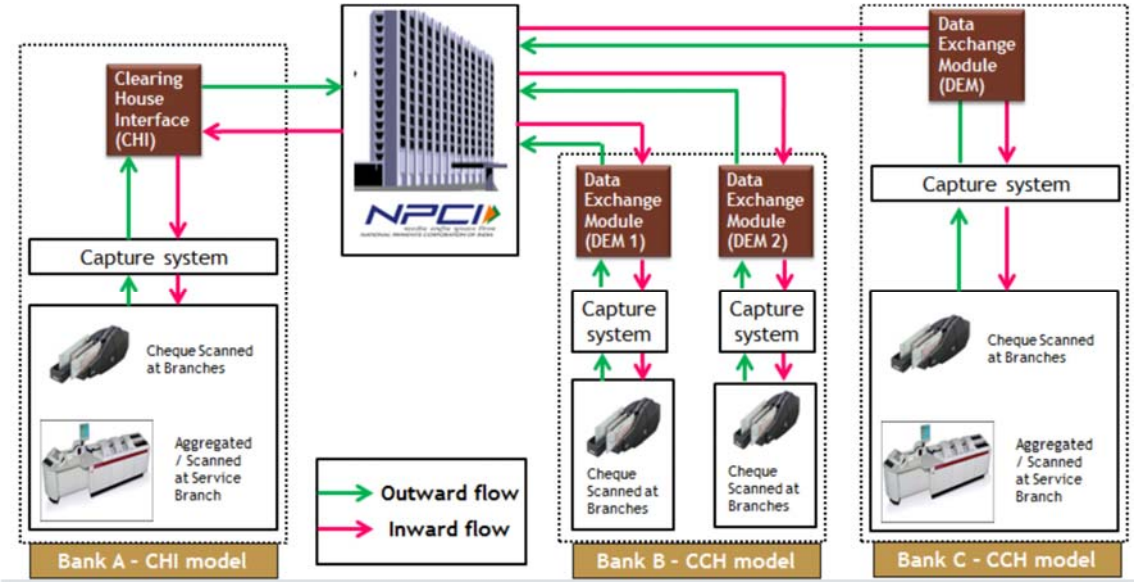
1. Capture system
2. Clearing House Interface (CHI)
3. Clearing House application (CH)

Capture System: This system is deployed by the banks for capturing the data at their end. This system can be procured by the bank from any vendor as per their choice.

Clearing House Interface: Clearing house interface module is procured by the banks from NCR. It acts as an interface between capture system and the clearing house (CH) module.

Clearing House: This is an application used at the clearing house which is the core system for clearing process. All the CHIs need to be connected to CH for data exchange, processing and settlement.

Central Clearing House (CCH): The central clearing house (CCH) will eliminate the need for dedicated CHI at the bank side. It will have 3 components, as follows:



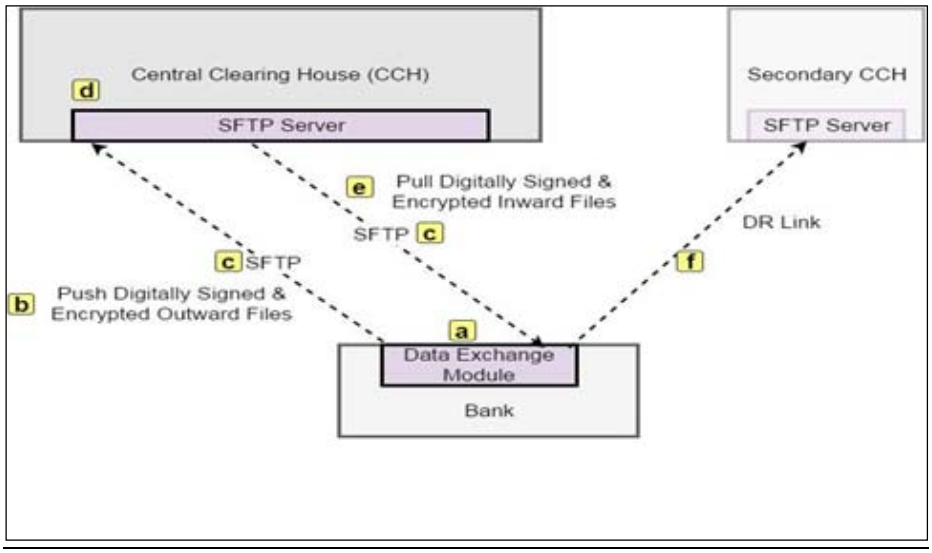
1. Capture
2. Data exchange module (DEM)
3. Central Clearing House (CCH)

The activities that are carried out at capture and the Clearing House will continue to be run the same way. However, the work flow at CHI will be divided into two parts and majority of the activities will be shifted to Clearing House with DEM acting as a tool for signing, encryption and data transmission for sending and receiving outward and inward files respectively.

Capture System: No change in the existing model. This is as per Bank's current setup.

Data exchange module (DEM) functional details: Data Exchange Module (DEM) will replace the CHI at the bank's end. Its primary purpose is to secure capture files between banks and Central CH (CCH) and perform file exchange with CCH. The DEM module can be hosted on a dedicated server or can co-exist on the capture consolidation server of a bank.

Data Exchange Module (DEM) architecture:



a) Securely communicate with CCH for exchanging data & image between Bank & CCH.
b) Push digitally signed & encrypted outward files from Bank to CCH.

c) Use Secure FTP (SFTP) for connection with CCH.
d) Pull the Digitally Signed & Encrypted Inward files.
e) It can keep secondary CCH connection open for CCH disaster check.
f) DEM Supports below mentioned ECPIX Interface file Types:

ID	Process	File Types
a.	Outward Files	CXF, CIBF, RRF, ERF
b.	Inward Files	RES, PXF, PIBF, RF, EF, OACK, EOS
c.	Master File	CHM

DEM Operations:

Outward Presentment / Returns

a) Digitally sign & encrypt the outward files.
b) Banks will be given specific folder access in CCH SFTP Server.
c) DEM will push the encrypted outward files to CCH SFTP Server.
d) CCH will pick the outward files from uploaded location & include those files in clearing process after validating PKI security.
e) After successful upload, DEM at Bank should back up local uploaded files.
f) Backup of uploaded file is used for Disaster recovery. In case of Disaster at primary CCH, DEM should be able resend the backup files to secondary CCH SFTP server.

Inward Presentment/Returns:

a) Every Bank will have a Bank specific folder access in CCH SFTP Server.
b) DEM will pull Inward Files (as and when available) from CCH SFTP Server from its bank specific folder including subfolders.
c) In the event of banks using multiple DEMs in a single grid then using CCH capability to place the inward data on the basis of city, branch and transaction code DEMs can be configured to pick the files from the respective sub-folders.

Clearing House Master (CHM) File Transfer:

a) Similar to Inward files download, DEM will download CHM file from CCH SFTP server.
b) DEM will maintain the recent copies of CHM files locally as per parameter set at CCH
c) DEM will poll the remote CHMaster Folder periodically for CHM file.

Security Standards:

a) All data interchanged between participants should be digitally signed and encrypted. The PKI infrastructure same as CHI will be used for this purpose.
b) Banks Public key will be registered at CCH during DEM registration.
c) Overall certificate management will remain unchanged from existing version
d) CCH Public key will be available to DEM application.
e) HSM will continued to be used for private key storage as today to ensure high security standards

Security Algorithms

a) Hash algorithm RSA SHA-256.

b) Triple DES (3DES, TDES) symmetric encryption with 168-bit key length.
c) RSA Asymmetric encryption with 2048-bit key length.
d) Certificates in X.509v3 format system certificate.
e) Certificates will be stored in HSM card.
f) Bank public key certificate will be shared with CCH for Digital Sign verification & Data Encryption.
g) Similarly, CCH public key will be shared with DEM.

DEM Key Exchange Mechanism:

a) DEM requires 3 keys for its operations
   i. DEM Private Key
   ii. DEM Public Key
   iii. CCH Public Key
b) At Bank, DEM Public & Private key will be store at Bank HSM Card OR at Certificate store.
c) At bank, at the start of DEM, it will connect to CCH & retrieve CCH public key related information.
d) Bank Public key will be store at CCH using DEM Registration process.
e) At CCH, Stored Bank Public keys are used for CCH PKI operations.

Advantages of DEM

1. DEM will be very cost effective for the banks in comparison to CHI. can be hosted on a dedicated server or can co-exist on the capture consolidation server of a bank.
2. NPCI will release technical specification document and it is open for the banks to procure this module from any vendor in the market or build in house. There is no dependency on single vendor.
3. The DEM licence fee and AMC being negotiated with current vendor is applicable only if the bank procure DEM from them, it is not mandatory to procure from the currently vendor only.
4. Multiple DEMs can be deployed by the banks to connect a CCH in each grid (bank has to deploy two DEMs minimum for each Grid, each Grid will be treated as separate set up) so that they can have active-active set up to handle DR scenario.
5. In case of multiple DEMs being used by a bank in a single grid then CCH provides the facility to place the inward files in separate folders on the following logic for the different DEMs to pull the inward files
   a. Combined inward
   b. City wise
   c. Branch wise
   d. Transaction code wise
6. The DEMs at the banks may be configured to pull the data as per the processing model adopted by the bank. For configuring the inward file split, the banks have to approach NPCI for configuring necessary master set up, which will be a one-time activity. Banks may, if required, approach NPCI for modification of the configuration of inward file generation logic. NPCI will provide bank level access to all registered DEMs. Individual DEM will need to be configured to look for respective folders only.

With the introduction of DEM, the activities carried out at CHI will be split between the Centralized Clearing House (CCH) and DEM. The details of the activities currently performed by CHI and the split of these activities between DEM and the CCH are as given below:

Processing Step	CHI	CH	DEM	CCH	Remark
PKI Key Management					
Key Exchange between banks and CH	✓	✓	✓	✓	CHI uses file based interface i.e. WCS. DEM uses messaging over HTTPS
Certificate Registration at CH	✓	✓	✓	✓	
Switching between certificates	×	✓	✓	✓	Access is provided for banks through DEM to perform this operation for them only. CCH can also do this operation as today. Access to banks is configurable.
Outward Processing (Presentment and Returns)					
Receiving Capture Interface files from Capture (CXF/CIBF/RRF)	✓	×	✓	×	
Signing and encryption of outward files to CH	✓	×	✓	×	FDD for CHIs and Capture interface files for DEM
Transmit outward files to CH	✓	×	✓	×	
Confirm delivery of outward files to CH	✓	×	✓	×	
Make acknowledgement available to Capture	✓	×	✓	×	
Perform instrument level business validation	✓	✓	×	✓	The business validations are repeated at CH and result at CH is the final. With CCH, it will be done only at CH hence removes duplication
Perform instrument level IQA validation	✓	×	×	✓	This facilitates central monitoring on the IQA rejections and rejection reason analysis
Performs duplicate detections based on UDK(Unique Document key)	✓	✓	×	✓	Today repeated at CH. CCH does it once.
Accept files (data and image) from the capture systems and generate acknowledgement	✓	×	×	✓	
Sorting and batching of instruments (AKA bundling)	✓	×	×	✓	
Identify appropriate session for the batches	✓	✓	×	✓	This check is repeated at CH today. Hence removes duplication
Create outward exchange files (FDD)	✓	×	×	×	FDDs are not created in CCH model, capture interface files are sent to CH as is
Reconciliation of date (files and instruments) between bank and CH	✓	✓	✓	✓	Done at both places, DEM and CCH. DEM provides local data while CCH provide access to remote data over WebUI
Inward Processing (Presentment and Returns)					
Create inward exchange files (FDD)	×	✓	×	×	FDDs are not created in CCH model, directly posting files are created at CCH
Signing of inward interface files	×	✓	×	✓	FDD for CH, Posting files (PXF/PIBF/RF) for CCH

Transmission of inward files to bank	×	✓	✓	×	Currently, CH pushes the inward files to CHIs. With CCH, DEM will pull the files pertaining to resp. bank. This is to reduce the transmission load and complexity at CH
Receive inward data from CH	✓	×	✓	×	Not required as no FDDs
Validate signature and decrypt	✓	×	✓	×	
Create inward files for Capture (Posting files)	✓	×	×	✓	PSF/PIBF are generated at CCH
Make Posting files available to Capture System	✓	×	✓	×	
DR related operations					
Identify DR switch over	×	✓	✓	×	CH sends HTTP message to CHIs and then creates reconciliation file as a separate step. CCH creates a DR data which includes reconciliation data as well which is pulled by DEM. This makes DR switchover faster
Load DR reconciliation file	✓	×	×	×	Done by DEM as a part of above step
Send missing files to secondary site	✓	×	✓	×	
Masters and User Access Management					
View access to banks	✓	✓	×	✓	Currently, data is accessed by CHI over Web Services and displayed locally. With CCH, access to CH UI is provided to Banks to view relevant data
Clearing House Table (CHT) creation	×	✓	×	×	CHT is not created with CCH
CHT loading at banks	✓	×	×	×	Not required
Creation of Clearing House Masters (CHM) for Capture System	✓	×	×	✓	CH directly creates CHM instead of CHT
Making CHM available to Capture System	✓	×	✓	×	
User access control and data filtering	✓	×	×	✓	CHI does using local Active Directory. CCH uses ADFS/SAML protocol to achieve the same using bank's local Active Directory

Centralized Clearing House Architecture and Solution Overview:

Feature: Central CH supports banks as well as CHI without investing in hardware setup and third party licenses. Banks can directly connect to Central CH and monitor their own data and extract their daily reports without depending on borrowed CHI (Another bank's CHI).

Security: The communication channel between Banks and CCH is secured with encryption and signing of data in transit.

Process Flow:

- Central CH shall process CHI specific Jobs at CCH
- Inward file shall get generate at Central CH
- 40% less number of job execution for saving overall processing time.
- Bank shall send encrypted & digitally signed CXF/RRF files directly to CCH

- CH Certificate shall be used to digitally sign inward files PXF/RF.
- User Access control with Multi-tenant WebUI
- Active Directory Federation Services (ADFS) is used for Bank user authentication.
- Bank user shall get authenticated with Banks own Active Directory (AD).

Functionality:

- **Dashboard** for Banks to view their transactions real-time
- **Session & Settlement** Information
- **Reports**
- **Response, Outward & Inward** files for Download

Data Monitoring: The banks / branches are restricted to view only their data ensuring data security in multitenant environment.
Following data can be monitored using Dashboard:

- Input file / Outward File
- Inward File
- View Session Details
- View Settlement Details

Bank User Access

- To enable Individual Banks to access screens on CCH, Bank's will be having their SAML enabled Active Directory setup which will authenticate the users.
- Only Authenticated users of the Bank will be allowed to access the above pages for that Bank.
- User's will access a particular site URL for CCH Interface and if the user is not previously authenticated, CCH will redirect to a predefined URL of Bank's Active Directory setup which will authenticate the user and send back a SAML response to CCH.
- CCH will extract the SAML response and based on the User Role, will log him/her into the CCH Interface and show screens allowed for that role.

Reports and Inward files

- Bank user can download the reports and inward files on demand.
- Banks / Branches can download their own reports directly accessing the web page.

In the architecture the roles and responsibilities of banks and NPCI will also undergo a change. The roles and responsibilities of banks and NPCI in terms of operational and technical are as given below:

Roles and responsibilities – Operational

NPCI:

1. Member bank On-boarding
2. Conducting the Paper to Follow (P2F) session
3. Session monitoring
4. Settlement generation and posting
5. Reporting
6. Extension marking
7. Bank exclusion
8. Unwinding
9. Clearing house master maintenance
10. DEM master maintenance

Banks:

1. Identification of centres to have DEM setup
2. DEM registration process at NPCI
3. Procurement/ Renewal of class 3 certificate
4. Establish network connectivity to clearing house
5. To have a DR DEM set up with similar version of PR DEM
6. Delivery of files through media during network failure
7. Scanning and processing of instruments with in stipulated session timings
8. Return marking in DEM/CCH
9. Representation of rejected instruments with necessary corrections
10. Segregation of P2F instruments and participation in P2F session
11. Reconciliation of instruments with NPCI reports on daily basis
12. Approach respective RBI RO for extension.

Roles and responsibilities – Technical

NPCI:

1. Index Rebuilding
2. REDO application DR Database
3. Archive, CPPS and BNS reconciliation
4. Server Disk space monitoring
5. Server Memory utilization monitoring
6. Server CPU utilization monitoring
7. Application SOD – EOD
8. Inward jobs monitoring
9. Archival jobs Monitoring
10. System clean-up jobs
11. Daily Backup L0 and moving to Tape
12. Application monitoring
13. Certificate trusting and mapping
14. MS Patch and Application patch update
15. Periodic & surprise DR Drills.

Banks:

1. User Access Management
2. DEM Monitoring for incoming and outgoing files.