

Implementation of Stryker® Pay to Minimize Check Fraud and Improve Check Printing

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Abstract — *The intent of the project, Stryker® Pay, was to replace the check printing process in Stryker®. The application will be capable of converting the check information obtained from the ERP system into a PayBase (off the shelf application selected by Stryker® to print the checks) system input file, store the checks data in a database, print the checks for the desired period of time and send the positive payment information to the bank (CFA process). After successful application implementation Stryker® was able to replace the plotter printer with a laser jet printer, reducing the working area by 50% or more. Also, Stryker was able to reduce the headcount required to execute the task by 50% (from two employees to one) and the inclusion of the electronic signature in the check printing process eliminating the need of a director to sign all checks at the end of the run. Finally, the application reduced the time to execute the process by more than 80% (from eight hours to one hour).*

Key Terms — *CFA, Digital Check Printing, Electronic Check Signature, Parser, Stryker® Pay.*

INTRODUCTION

Check Fraud Avoidance (CFA) process is commonly used by industry to minimize the possibilities of a user creating a new check using the companies account (fraud) and ultimately, stealing money from the company. Another way is to manipulate or change the amount written in the checks. In previous years, this was a common issue observed by large companies and the banks decided to provide some mechanisms to ensure that if a check was cashed, the company already authorized it.

This task was accomplished by creating a Check Fraud Avoidance (CFA) process. The process consists of three steps: generate checks, determine which checks must be paid, send check information

to the bank (which checks should be paid, what is the amount and the cashier of the check).

Stryker® started in Puerto Rico as a 30 people corporation. There were less than 20 suppliers and only one manufacturing line. Suppliers and some employees were paid using checks. Those checks were written by hand and signed.

As the company got more products and suppliers, a different method was needed to reduce the amount of time and work to generate all the checks. Using the ERP system, the finance team was able to generate a text file with all the checks needed and they will be printed in a plotter printer. This alleviated that check run task.

Stryker® currently generates a check run thru their ERP system and prints all checks in a plotter printer. A pre-printed paper is bought and used for the printing process. After printing all checks, the finance personnel will verify that the generated run is correct and that the information printed on the checks is correct. This is all done manually, including the signing of the checks.

The process to generate the checks is not only performed manually, there is no additional control to ensure that the payments are performed correctly. This represent a major gap in check security since any recipient could alter the checks and cash the amount without any alerts to Stryker®.

The finance and IT group decided that a new system was needed to minimize check fraud and the system should also alleviate the amount of work needed to execute a check run. Using new technologies available, the company wants to reduce the amount of people and time needed to execute the process by half. Finally, the group wants a 99% reliability that the checks paid are authorized by the company (check fraud only 1%).

CURRENT STRYKER® CHECK GENERATION PROCESS

Every month or when needed, Stryker® will execute their check printing process in order to compile, print and review all the checks needed to pay suppliers, consultants, services and other companies. This process is currently executed manually with the aid of the ERP system. In order to provide an adequate solution, process was evaluated closer. The process was divided in four steps: Setup, ERP Check Run Query, Check Printing and Check Review

Equipment Setup

All checks generated are produced on a plotter printer. The finance personnel must complete a printer setup in order to ensure printing success. The steps followed are:

- Ink/Pen review or refill - the user must review the status of the ink in order to ensure that it will last the complete run. If the ink is low, pen must be replaced/refill before printing process begins.
- Paper feed and alignment – since the paper is pre-printed, it comes in rolls and the user must feed the paper into the plotter to print all checks. User has to put the paper, hold it in place, align it inside the printer and feed a small amount to ensure that the process is correct.
- Test run –to ensure a smooth process, before executing the current check run print, a small test run is conducted by the finance employee.

ERP Check Run Query

When the equipment setup is complete, the finance employee has to determine the scope of the checks to be printed. To accomplish this task, the user logs in to the ERP system and generate a “check run query”. The query generates a text file that contains all the check information in sequential order. Figure 1 shows a section of the check run text file content.

This process must be done every time a check or multiple checks are needed.

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I#I#I#I# X DATE X AAAAAAAAAAAAAAAAAA P#P#P#P#P#P#
I#I#I#I# X DATE X AAAAAAAAAAAAAAAAAA P#P#P#P#P#P#
I#I#I#I# X DATE X AAAAAAAAAAAAAAAAAA P#P#P#P#P#P#
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I#I#I#I# X DATE X AAAAAAAAAAAAAAAAAA P#P#P#P#P#P#
PAYMENT TO THIS VENDOR IS CONTINUED ON NEXT CHECK
**V#0#I#D#** *** VOID****VOID
XXXXX NAME 1 XXXXXXXXXXXX
XXXXX NAME 2 XXXXXXXXXXXX VOID**VOID
XXXXX ADDRESS 1 XXXXXXXX VOID**VOID*****VOID**VOID
XXXXX ADDRESS 2 XXXXXXXX
XXXXX ADDRESS 3 XXXXXXXX VOID**VOID*****VOID**VOID
XXXXX ADDRESS 4 XX ZZZZZZZZZZ
*****768 DOLLARS 15 CENTS *****768.15
                260792
16506          10/02/15          156.20          .00          156.20
16507          10/02/15          611.95          .00          611.95
                11/20/15          1186          768.15
                *****768 DOLLARS 15 CENTS *****768.15
                11/20/15
CUMMINS LABEL COMPANY
2230 GLENDENING
KALAMAZOO MI 49001
*****310 DOLLARS 71 CENTS *****310.71
                260793
0839255        10/08/15          310.71          .00          310.71
                11/20/15          1582          310.71
                *****310 DOLLARS 71 CENTS *****310.71
                11/20/15
PITNEY BOWES PUERTO RICO
PO BOX 9828524
SAN JUAN PR 00902-0524
*****402 DOLLARS 17 CENTS *****402.17
                260794
552282        7/10/15          399.96          .00          399.96
554206        9/30/15          2.21          .00          2.21
                11/20/15          1609          402.17
                *****402 DOLLARS 17 CENTS *****402.17
                11/20/15

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Figure 1
Check Run Text File Screenshot

Check Printing

Check printing defines the process of physically printing the checks in the plotter printer.

After the query is complete, the file is sent to the printer and all checks will start to print. The finance employee has to wait until all checks are printed. In case that the printer runs out of paper, the user must execute the equipment setup again and feed additional paper. Once the printing is complete, the user has to separate each check manually (plotter paper comes in rolls and divided in sections; each check was printed on one section and separated afterwards).

Check Review

After separating all checks, the finance employee has to review and inspect all checks printed. He will verify the following attributes of the check: Pay to Name, Check Amount and Invoice data. If one of this attributes was incorrect, check is destroyed and printing process (from setup to check review) is repeated.

Check Signing

After all checks are printed and reviewed, checks must be signed by the controller or plant manager.

Check Fraud Avoidance Control

Stryker currently has no CFA process implemented. Checks are sent to the supplier and no additional verification is performed. If there is a large discrepancy observed between the month ends expected paid amount and the actual cashed amount, verification is performed with the bank to evaluate and determine the corrective action.

PROCESS EVALUATION

This section covers all the activities performed to understand the current process and all the opportunities associated to it.

Regulations and Laws Governing the Process

Stryker® is a Medical Device company regulated by different standards/laws. The Federal Drug Administration (FDA) is the government agency that enforces the Code of Federal Regulations (CFR) for medical device companies. 21 CFR 820 [1] defines the requirements for the company's quality system which includes all automated processes performed. Also, the company must comply with ISO 13485 [2] standard, Quality System Requirements for Medical Device Company, defined for Medical Devices. This standard also includes all automated processes. Finally, the company must ensure that their finance process comply with the Sarbanes and Oxley Act [3].

After careful review of all three standards, it is concluded that Sarbanes and Oxley Act is the only one that applies to this project. As for any other development project, regulations and laws must be clearly understood to ensure compliance. For this project, the Sarbanes-Oxley Acts governs and regulates the finance system in a corporation. The bill, which contains eleven sections, was enacted as a reaction to a number of major corporate and accounting scandals, including Enron and World-

com. The sections of the bill cover responsibilities of a public corporation's board of directors, adds criminal penalties for certain misconduct, and required the Securities and Exchange Commission to create regulations to define how public corporations are to comply with the law.

Research on this act is needed to ensure that the system to be develop complies with it and minimizes fines or observations during finance audits. Even though some tasks might be easier to accomplish in certain manners, the application development must ensure that no law or procedure is broken.

Process Opportunities

Upon deep evaluation of current process, the following opportunities were observed.

- **Large floor-space occupied by plotter printer** – current plotter printer occupies 12sqft area. This does not include the area needed for the ink and paper.
- **Check id's are given by the pre-printed paper bought** – pre-printed information on checks is expensive and the use if the paper id makes it difficult to consolidate/track the checks generated.
- **Difficulty to search and review previews checks generated** – the only way to look up information about a check is to print the check run completely and look one by one the checks until it is found. Once the file is executed and deleted, there is no record of those checks. Also, there is no way to modify the checks during the run. To modify the check, the user must wait until the run is completed, destroy the check and execute a check run again only for that check.
- **Lack of Check Fraud Avoidance process to ensure check payments are accurate** – Stryker® doesn't have any process for positive payment.
- **Excess Time/Resources spent in process**– one employee spends all day to execute the process and verify the checks. Plant Manager has to sign all checks.
- **Increased impact in run cost if issue occurs during check printing** – once the check run

starts, it can't be stopped. If an issue occurs in the middle of the run with the printer or paper, the user must start the process again by looking which was the last check printed.

As the company gets bigger, it is harder to keep track of all the checks generated which creates to additional issues:

- Increase in headcount to perform the task.
- Difficult for plant manager to sign all generated checks.
- Possible reconciliation issues that could generate an observation during an audit.

STRYKER® PAY

In an effort to eliminate the process opportunities observed, Stryker® requested the development of a system. The system should achieve the following general goals:

- Reduce working area footprint
- Reduce time to execute check printing process
- Reduce headcount required to execute check printing process
- Use new technology available for process
- Include Electronic Signature of Plant Manager on check printing process.
- Record check data on database
- Define CFA process and send information to bank.
- Reduce check run errors

System Research

In order to develop an adequate solution, additional research in the current process, regulations and system limits is needed. Also, since the Check Fraud Avoidance is not part of Stryker current process, research on it was required to understand the requirements.

- **Process Research:**

Additional research on current process was performed. Interviews to users and review of the process was performed during its execution. Through process research, no additional processes, steps or activities were found.

A new limitation was established with this review. Discussions with the ERP system owner showed that no modifications or connections will be performed to the current ERP system and queries. This meant that the new system to be developed would use the output generated by the current query.

The current query generates a text file which contains all the checks formatted to fit inside the check paper currently bought in rolls. The new application will take that text file as an input and will collect the required data. This was a clear indication that a parser was needed.

- **Regulation Research:**

Additional emphasis was given to the Sarbanes and Oxley Act. After careful review of the act, it was understood that this process is not governed by the Sarbanes and Oxley Act. With this in mind, there are no external regulations that govern this process and thus all requirements would be established by Stryker.

- **System Limits:**

An interview was performed to the IT manager to understand the current systems available and what where the system requirements for this process. Through this, the following information was obtained:

- *Off the shelf software called PayBase was already in house to print the checks securely thru the use of an HP Laser Jet printer - This application only needed a text file containing the checks information in a specific format and delimitation. The requirements were established on their user manual. Software also allowed the inclusion of an electronic signature for the checks.*
- *PayBase database must be installed on the same computer where application is running - Microsoft SQL Server was recommended.*
- *Database must be created in Microsoft SQL Server - Since the company already had an agreement with Microsoft, only Microsoft products could be used.*
- *Computer to run the application must connect to the bank thru an FTP connection using a dial-*

up modem – The bank only allowed push of the CFA file thru an FTP server that could be connected only thru the use of a dial-up connection.

- Application must run on Windows 2000 or better.
- **Check Fraud Avoidance Process:**

Check Fraud Avoidance Process requirements are established by the bank. The bank needs specific information to determine if a check can be paid or not. After review of their requirements the following item must be incorporated:

- Application must create a text file containing the checks information to be paid. Formatting and information was included in their CFA manual.
- Connection to the bank must be done thru a dial-up connection to an FTP server.
- After a check run, file must be created and push to the FTP server. The bank will use this file to determine if the check can be paid or not based on the check number, pay to and check amount information.

All of these items described above will be taken into account when developing and designing the application to ensure that it will be functional and take advantage of current items available. The intent is to make sure that all areas of improvement are covered.

System Design and Development

The first step to develop an application is to fully understand its process. To achieve this, a series of Use Case Scenarios were created that depicted the possible use of the system and the interactions between the users. Each Use Case Scenario will give us valuable information on how the system should be developed and will also allow users to provide feedback on the desired process.

The application could be defined by seven (7) general Use Case Scenarios and three actors. Figure 2 shows a UML Use Case Scenario Diagram for this:

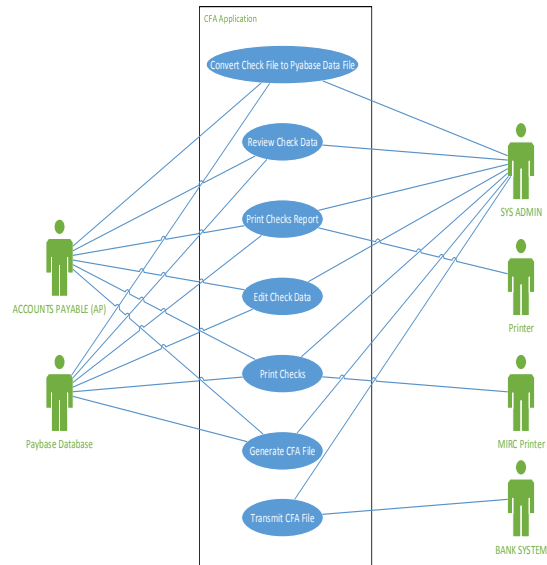


Figure 2
Use Case Diagram for the CFA Application

Use Case Scenarios

Each Use Case was defined to understand the needs of the client. A standard Use Case Scenario template was used which contained the Use Case Name, Participating Actors, Entry Condition, Flow of Events, Exit Condition and any other Special Requirements. Figure 3 - 5 are examples of the Use Case generated for this project.

Use Case: Convert Check File to Paybase Data File

Use Case Name: Convert Check File to Paybase Data File

Participating Actors: Accounts Payable Clerk or Sys Admin and Paybase Database

Entry Condition: User clicks the **Convert Check File to Paybase Data File** button

Flow of Events:

1. The OPEN File window appear asking the user to select the Checks Data File to be converted.
2. User Clerk select the Data File and clicks the Open Button.
3. The Application converts the Checks Data File to the Paybase Data File Format.

Exit Condition: The User receives the acknowledgement if the conversion was successful or not.

Special Requirements: N/A

Figure 3
Convert Check File to Paybase Data File Use Case

Use Case: Edit Check Data

Use Case Name: Edit Check Data
Participating Actors: Accounts Payable Clerk or Sys Admin and Paybase Database
Entry Condition: After performing the Review Check Data use case, the user selects the record (row) to be modified.
Flow of Events:

1. User selects the specific data that must be modified.
2. User updates the attribute selected
3. User clicks the *SAVE CHANGES* button

Exit Condition: User is alerted with a window indicating if the changes were completed or if an error occurred during save.
Special Requirements: Data entered must comply with database structure and settings.

Figure 4
Edit Check Data Use Case

Use Case: Generate CFA File (Scenario 1)

Use Case Name: Generate CFA File (Scenario 1 – Complete Check List)
Participating Actors: Accounts Payable Clerk or Sys Admin and Paybase Database
Entry Condition: After performing the Review Check Data use case and editing any needed record, user clicks the generate CFA File
Flow of Events:

1. The tab presents the fields necessary to complete this action.
2. User selects the *FROM* and *TO* dates needed to generate the CFA File.
3. The *ONLY VOID CHECKS* checkbox is not checked.
4. User clicks on the *Generate CFA File* button.
5. A new window alerts the user if the process was completed successfully

Exit Condition: User clicks on the close button of the window.
Special Requirements: Connection to the Paybase Database must be active to collect all the data.

Figure 5
Generate CFA File (Scenario 1) Use Case

Database Design

A database diagram was developed to define the information needed to be stored from the check runs. These data will be used to generate the CFA File and also to generate the file for the PayBase application.

The following information must be recorded in the database to accomplish the tasks at hand:

- CFA File Information– for the CFA file, the bank provided a list of the information required by check. Some of the information required by the bank was: account number, check number, payTo, check amount, flag of check void.
- Check Printing Process – the check printing process required additional information that was provided by the PayBase application. Stryker decided to buy a software called PayBase, from Bottomline technologies, that will be used to print all the checks. The application requires as an input a text file containing the checks information. Some of the information for the file are: checks total amount, payTo, check date, check invoices amount and others.

Database design was simple since the information required was minimal. The only relationship [4] in the database developed was between the checks and the invoices. A check could have multiple invoices but an invoice can only be related to once specific check. For that reason, there is a foreign key on the invoices table pointing to the check in belongs to. Figure 6 is the UML database diagram for the database generated.

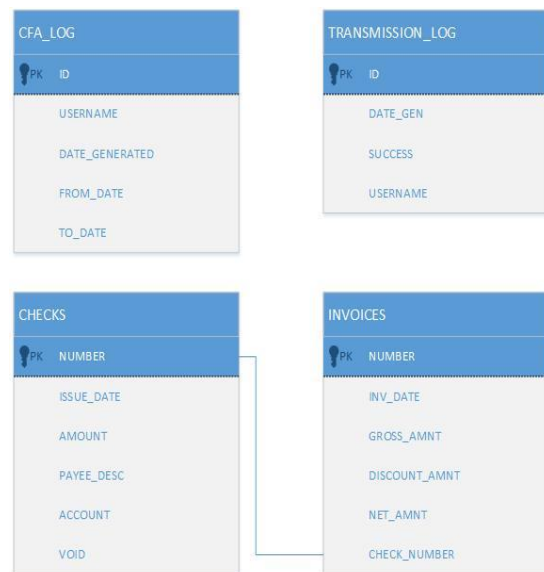


Figure 6
Database Design Diagram

Application Design

After evaluation of use case scenarios, a user requirement specification document was generated. The idea was to provide a baseline on what the system must be capable of doing. The user requirement document was completed and signed by all parties involved in this project. This was all the information required to develop the application.

The Laser Check Printing is the Solution created in Visual Studio and all classes were developed in C#. It was decided to follow object oriented design [5] to complete the application and ensure that some of the design patterns [6] were applied for proper communication and integration of the different classes. The solution is composed of two different NameSpaces:

- **Laser Check** – Contains all the classes developed to populate the Paybase Database from the Check File, convert the data from the Paybase Database to the CFA File format, Check Printing and all the forms created.
- **FTPLib** – Contains the class used for FTP communications.

Some of the classes have dependencies between each other, the LaserCheckApp class uses the CheckConversion class (see Figure 7 for details). The CheckConversion class is a static class and thus can be used by anyone without the need of instantiation. This is one of the cores of the application since it will take the Check File and parse it to generate the PayBase input file for check printing. Since this is just a tool, it was decided to create this class as static and thus there is no need to create a new instance of the object. At the same time, the CheckConversion class owns an instance of the Check class as shown in Figure 7 and thus an aggregation connection is created.

This class will read each line of the check text file and parse its content. It will collect the required data from each line while detecting when a new check or invoice starts. Since a check could contain multiple invoices, special rules were created to detect when a check started and ended.

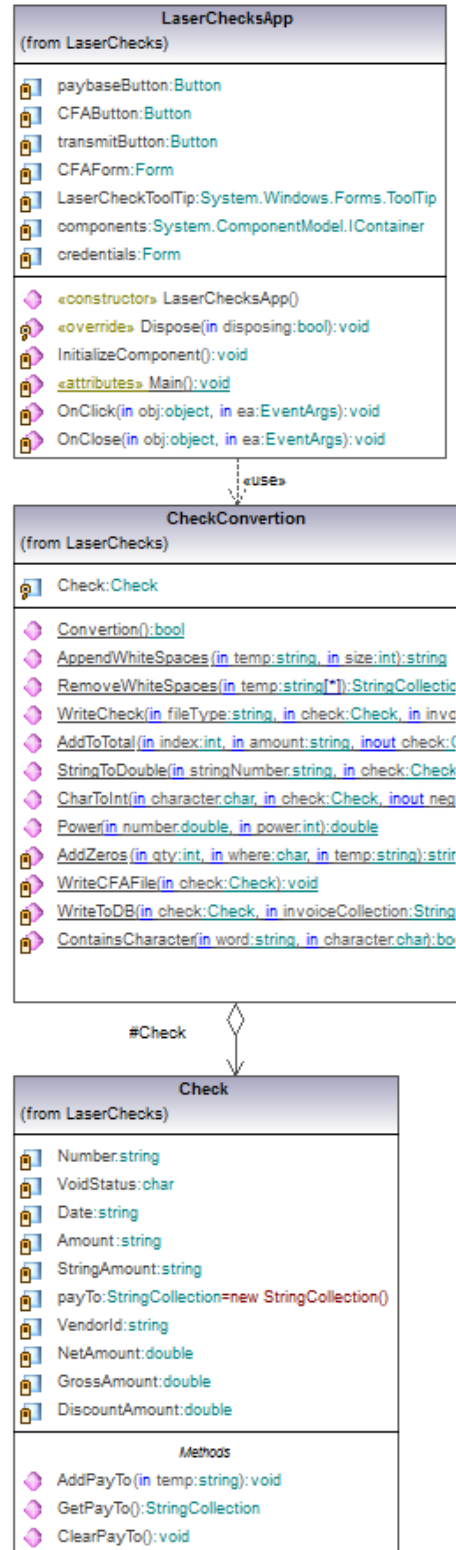


Figure 7

Class Diagram: LaserCheckApp with CheckConversion

The other core part of this application is the CFAFileGenerator (see Figure 8). This is a form that shows all the checks available in the database and also allows the user to edit the data. The data is obtained by using the ChecksData object.

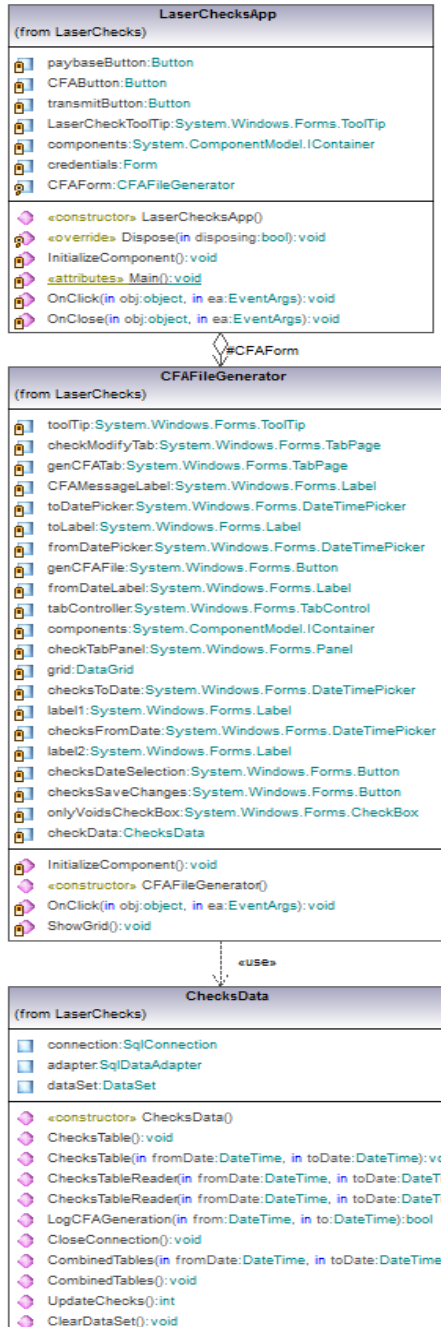


Figure 8
Class Diagram: LaserCheckApp with CFAFileGenerator

A second tab is available which allows the user to create the CFA File. This is achieved by using both classes: GenerateCFAFile static class and the ChecksData class as shown in Figure 9. The ChecksData class provides a connection to the checks database and the GenerateCFAFile will take that data and create a new text file with the needed format for the bank.

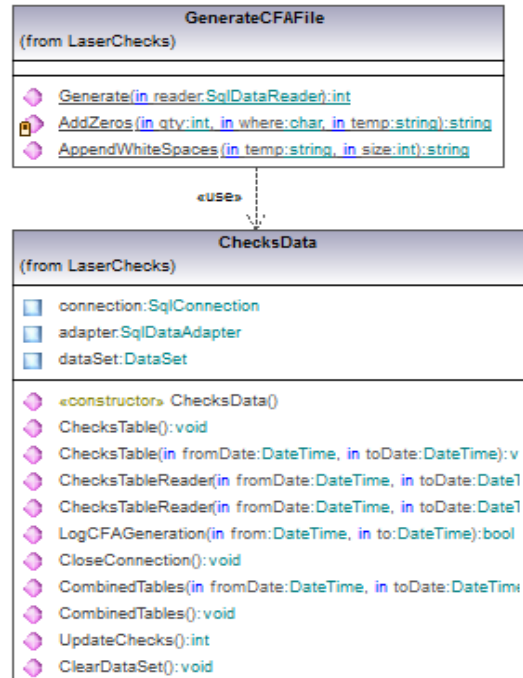


Figure 9
Class Diagram: GenerateCFA with ChecksData

The LaserCheckApp has a UserPass Object and thus and aggregation was created between them. The UserPass class also has an aggregation to the FTPFactory which is used to communicate with the bank using FTP communications. The diagram in Figure 10 shows the interconnections between each classes.

The class diagrams where generated to understand how the different classes will interact and to ensure that the connections defined inside each one were adequate. This should ensure proper transfer of data and actions between objects.

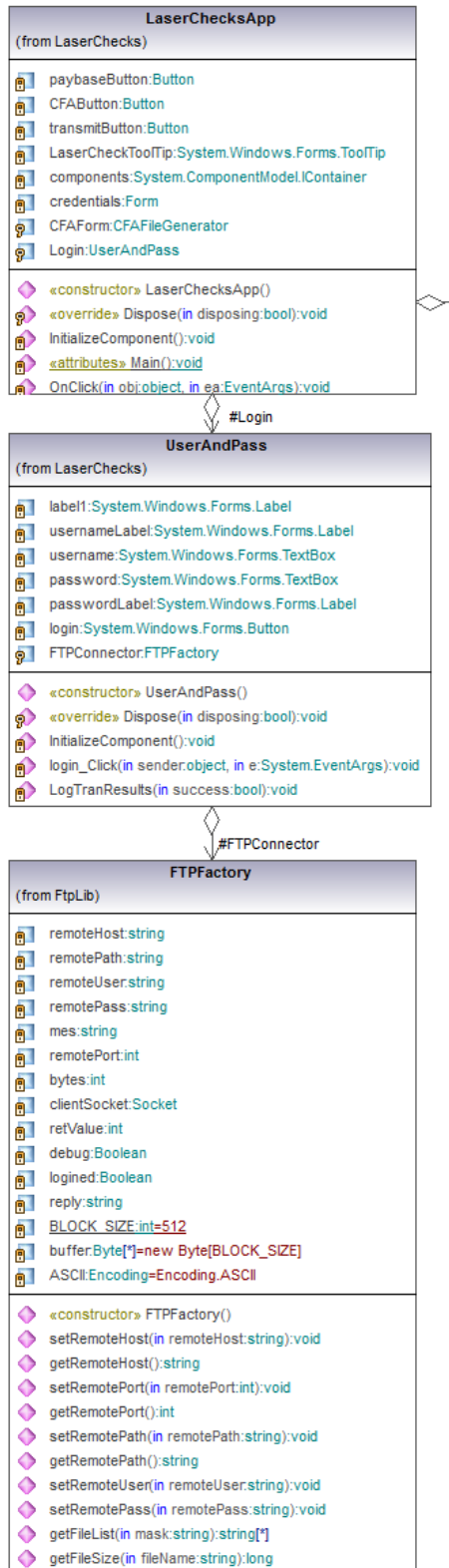


Figure 10
Class Diagram: LaserCheckApp with UserPass

Application user interface is simple in order to minimize errors by the user.

- **Home Screen** – Contains the three main buttons of this application. Figure 11 shows how the home screen looks like.

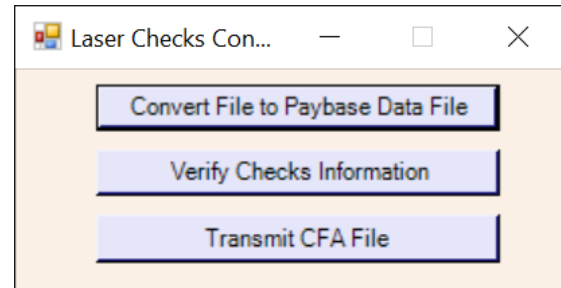


Figure 11
Home Screen

- **Checks Data** – Provide graphical view of the checks generated and allows the user to flag the checks that should not be paid (see Figure 12). In this same window, the user can select the date range for the CFA File and generate it for the bank (see Figure 13).

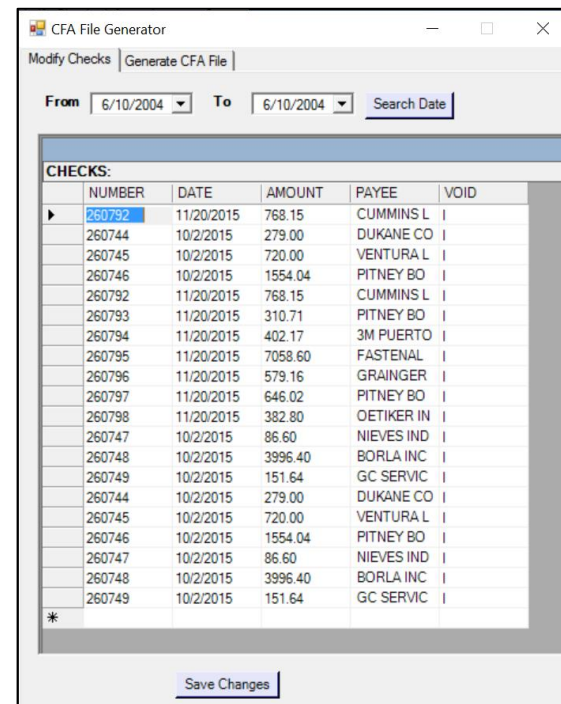


Figure 12
Checks Data Window



Figure 13
CFA File Generator Window

- **FTP Login** – simple window that requires the user to input the username and password for the bank FTP server (see Figure 14). This way, only authorize personnel can connect to the server.

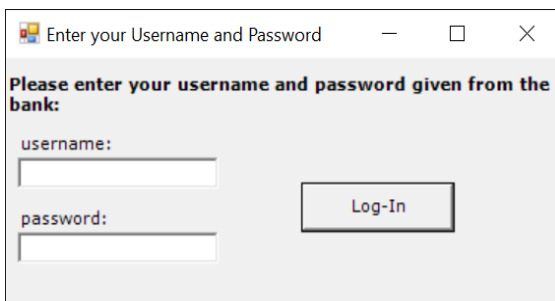


Figure 14
FTP Login Window

System Review and Verification

As with any other system, before production use the system was tested to ensure compliance with all requirements and that all user requirements were met.

Computer with application installed was setup and more than fifty check runs were used on the system. The application was capable of parsing thru the text file, generate the PayBase system file, generate the CFA file for the bank and push the file to the FTP. Confirmation from the bank was obtained indicating that the CFA file was uploaded correctly and that the data inside was correct.

System Implementation

System was implemented at Stryker on November 2015. A total of ten check runs were performed between November and January. No major bugs or failures were observed during that time. The following results were obtained:

- The working area was reduced to 9 square feet.

- The time required to execute a check run was reduced to 1hr in average depending on the quantity of checks to be printed
- Personnel to execute a check run was reduced to one.
- Check printing and CFA file process showed a reliability of 99.99%.

SUMMARY

This paper presented the process to develop the Stryker® Pay application. During this process we understood the requirements to establish a new electronic check printing system and the processes involved to minimize the possibilities of fraud. We also go the opportunity to increase the efficiencies of the company by reducing the headcount required to execute the task, the time needed and the floor-space allocated. System provided a robust process to print checks while alleviating the need of additional headcounts as the company keeps growing.

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