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Introduction to CYGNIFI software acquired by MBRM

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Introduction

This document describes the packages of software code and associated intellectual property rights that was acquired by MBRM from Cygnifi

Whilst this document is believed to be accurate, neither MBRM, nor Cygnifi, certify the accuracy or completeness of this information.

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Cygnifi Analytics Library

The Cygnifi Analytics Library is based on JP Morgan's Analytics Library, an application that represents 7 years and millions of dollars of development. The library is a fundamental building block of all applications in JPMorgan's Rates and Credit businesses. This position has been earned through its wide range of analytical functions, excellent engineering standards, high degree of interoperability and thorough documentation. The analytics library has been developed in a commercial product paradigm with high production values paid for by large numbers of clients.

The library's capability ranges from foundation date routines through to exotic tree models. Although coded in the 'C' language, the library's design approach is object-based featuring abstract data types and the functions that support them. Objects are prominent in both spreadsheet and traditional interfaces. Principal functional areas include:

Date routines including year fraction and holiday adjustment.
Probability and Statistical Functions
Convexity, Delay and Cups adjustments in many versions.
Curves including functions for bootstrapping, interpolation and extrapolation.
Bonds including function for creating, pricing, yield to maturity, option adjusted spread.
Black-Scholes Environment with skew including functions for many option products.
Generic Tree model, which can be used to product your own multi-factor valuation environment.
Credit Exposure analysis for Swaps, Swap Options, Caps, FRAs
TAM/T4M Swap Pricing
Exotic Pricing including Bermudan, IndexAm, Chooser Caps.
Distributed Computing Environment

The Analytics library is supported on all major platforms including versions for Windows 9x, Windows NT, Unix and MacOS. It provides interoperability with most popular programming environment including Excel, Applix, 'C/C++', Java, Perl, Visual Basic, and Smalltalk. The library is developed in layers which allows interfaces to new environments to be created easily by leveraging either the 'C' or the 'Excel' layers.

Some of JPMorgan's and Cygnifi's best software engineers have been involved in the production of the library. The library's high code quality has been maintained by applying rigorous coding standards and a mentoring process that promotes a consistent approach. The high quality extends to systematic testing supported by a regression test suite. The library includes this suite which can be extended easily to cover new functionality and new applications.

Effective documentation has played an important part in the Library's success. Online and paper versions of the library documentation are distributed widely within JPMorgan. The set includes an overview to financial analytics and more detailed guides for both spreadsheet and traditional language interfaces. These latter are complete guides to public functions and types including comprehensive descriptions of all parameters and members.

For the user, the Cygnifi Analytics Library is distinguished by its broad scope, excellent documentation, accessibility, and robustness. For the developer, the easy to understand, easy to extend and well tested code base makes the library a superb environment for maintenance and future development.

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Kapital Risk Management System

Kapital is a portfolio and risk management application for both vanilla and exotic interest rate and cross-asset derivatives. Over seven years of JP Morgan development went into this product, which continues to be used at the bank to manage its global interest rate derivatives and exotics trading desks.

Kapital supports trade capture, pricing, P&L, trade lifecycle management as well as sophisticated risk management functionality. Its workflows are designed to support the front and middle office responsibilities in a straight through processing environment. Kapital supports two forms of distributed computing to ensure that mission critical results are reported in a timely and reliable way.

Kapital has a rich, expressive user interface with full support for drag-and-drop. Trades are modeled as a combination of 'Streams', e.g. a fixed leg stream or a floating leg stream or a swaption stream, allowing the booking of complex deal structures. Trades can be priced interactively and the event structure of intermediate pricing information of each stream can be viewed graphically. Trades can be placed into portfolios and a nested portfolio structure can be built up. Kapital has a wide variety of tools that can be used with both trades and portfolios and can be run interactively or in batch mode. These include tools to calculate a wide range of market sensitivities, scenario analysis tools and P&L analysis tools.

Kapital is an object-oriented client-server application written in Smalltalk. It runs on both Solaris and Windows NT. It uses a Gemstone object-oriented database as its data repository.

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Aladdin

Aladdin is a spreadsheet based multi-currency pricing tool that allows pricing of both vanilla and exotic interest rate derivatives.

Aladdin is written in Excel and is controlled by VBA code. It makes use of the Excel addin interface to ALIB for pricing other financial calculations (i.e. forward rates). The spreadsheet has templates for pricing a wide variety of instruments including swaps (vanilla and CMS), caps \ floors, swaptions and sticky caps.

Aladdin splits the information necessary to price an instrument into a market workbook and a trade workbook. The market workbook contains all the currencies and rates required to price the deal and the trade workbook is where the structure of the deal is modeled.

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Sampras

Sampras is a system for monitoring counterparty credit exposure and risk in the context of collateral and netting agreements. Sampras is based on a Monte Carlo simulation engine that generates scenarios of future market moves based on today's market environment and defined volatities and correlations. The engine values many kinds of products in these environments ranging from interest rate swaps to exotic interest rate and FX derivatives. Although Monte Carlo calculations are inherently time consuming, Sampras delivers high performance by using approximations for the more complex products as well parallelization techniques.

Sampras supports the definition of hierarchies of counterparty entities and their respective collateral and netting agreements and trades. The system produces time-bucketed average and peak exposures and an expected loss for each entity. The expected and peak exposures are related to the value trades of an entity plus the value of any posted collateral. The expected loss factors in the probability of default (based by the credit worthiness of the counter-party entity) and represents the suggested credit reserve. The valuation run can be repeated in perturbed market environments to analyze the behavior of expected loss and exposure as the market moves.

Sampras provides a web-based interface for browsing valuation results and can accept trade information in FpML as well as its own native Sybase format. Sampras utilizes a Sybase database.

Sampras is written in C++ and is currently built to run on Sun Solaris.

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CollateralManager

CollateralManager is a collateral operations support system developed by Cygnifi. It includes all basic functionality required to assist collateral management practitioners to organize their collateral agreements, compute collateral calls when due, and generate collateral demands for counterparties. Support for editing of transaction values and collateral values is provided, and CollateralManager will additionally accept data feeds from external valuation sources.

CollateralManager operates with a totally thin client (i.e. nothing more than a web browser is installed on client machines); the server end comprises a Sybase database in combination with EJB and servlets.

CollateralManager is the distant cousin of JPMorgan's Corsair application, which is still being used by the bank to manage its collateralized derivative portfolio after 6 years of service. A copy of the Corsair code and data structure will be included with CollateralManager for reference.

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Collateral HeatMap

Collateral HeatMap is an applet based system that provides collateral managers with advanced tools for the detection and visualization of risk in a collateralized portfolio. Examples of these risks would include concentration in the collateral asset portfolio and correlation between collateral assets and underlying exposures.

The Collateral HeatMap is designed to receive data from an underlying collateral operations support system (such as CollateralManager, Sentry or any other similar system) and transforms this information into a special database structure known as Metropolis that permits rapid, multi-dimensional search and risk analysis. The Metropolis data is transferred into the Collateral HeatMap, where sophisticated data visualization tools are used to provide the user with an all-visual interface, plus the ability to drill down into underlying data sets on demand.

The data visualization tools included in the Collateral HeatMap have generic re-use potential beyond the field of collateral. For example, many of the visualizations are applicable to credit risk (even where collateral is not a factor); Cygnifi has deployed some of the HeatMap visualization tools for credit risk situations in the Sampras credit risk engine.

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Trinity

Trinity is a Cygnifi legal information service that couples top quality legal advice provided by a network of local law firms in over 30 countries alongside sophisticated technology that delivers the legal advice and ancillary analysis and summaries to clients.

The elements of Trinity are:

Technology platform
A web-based delivery system for legal information. Based around a world map, the Trinity technology platform allows users to select a specific country, and then drill into that country at various levels of detail, subject to content availability. As deployed by Cygnifi, Trinity typically gave access to a hierarchy of 5 different levels of content within each country. The Trinity technology platform has potential re-use in a variety of alternate situations: as a display system to deliver other types of (non-collateral) legal information to clients, for example netting information; and also as a display system to deliver entirely non-legal information in a geography-based manner, for example country credit risk information.

Content
Cygnifi owns summaries of legal opinions for over 50 jurisdictions around the world, based upon legal opinions rendered to Cygnifi or JPMorgan by some of the world's leading law firms. The underlying legal opinions are not Cygnifi property (they would need to be obtained by the buyer direct from the law firms concerned, although Cygnifi may be able to assist in expediting this). However, a buyer interested in doing this will find that the Trinity summaries and analysis offered by Cygnifi add significant value to the underlying opinions in terms of ease of use and access, focus on commercially relevant factors for the capital markets, and cross-border comparison.

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Jamshidian Swap Market Model

JSMM is a leading edge Swap Market Model developed by Farshid Jamshidian and the Cygnifi Valuations Team. The library is written in C++.

This Monte Carlo pricing engine allows the pricing of exotic single currency interest rate derivatives. The engine has been extended to price multi-currency products (i.e., cancelable turbos), however, this is not fully tested at this point. The main interface to the library is as a command line executable reading in FpML descriptions of the trade and market data, however an Excel interface exists for several products.

The library comes with an Excel based calibration tool to fit the model to current market data.

JSMM system comprises an analytics model and several packages from which it can be called e.g. XML file and Excel interfaces.

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BLUE Derivatives Pricer

BLUE is a derivatives valuation application developed over four years for the interest rate volatility traders in JPMorgan. Trades are entered by the user, market environment is read from a live rate source. The system values the trade and calculates position information. Credit exposure and reserve figures are estimated for most trade types. BLUE supports the following trade types: interest rate swaps, yield curve swaps, caps, swap options, cancelable swaps, bond forwards, options on bond forwards, options on eurodollar futures, and options on bond futures.

BLUE was designed to support market-making activities. The user interface is based on grids that allows the entry and pricing of several separate trades simultaneously. This useful for trader who has to answer many independent price requests from a group of sales and marketing people while simultaneously monitoring implied volatities of trades in the broker market and on the various exchanges. All trade types have a fixed structure and a simple, forms-based interface. For example, the interest rate swap has exactly one fixed leg, one floating leg and one or two fees.

BLUE is written in Java and C and runs entirely on a Windows client with no server components other than a rates feed. The BLUE system runs as a stand-alone client application. It does not communicates with any other system except via the "live" rates, flat files. BLUE is written in Java with a thin 'C' wrapper to the Cygnifi Analytics Library.

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Djinni Swaps Pricer

Djinni is an interest rate swap valuation application used of the last size years by the many JPMorgan staff who need to value these products. Trades are entered by the user, market environment is read from a live rate source. The system values the trade and calculates position information. Credit exposure and reserve figures are also estimated. Djinni supports the following trade types: interest rate swaps, yield curve swaps, cross currency swaps and FX forwards.

Djinni was designed to replace spreadsheets for valuing most swaps with the aim of improving productivity. Although Djinni models about 90% of traded swaps, the vast majority of people who need to price swaps will have all their valuation needs satisfied by the product. This leaves the more complex trades to be modeled by a small group of spreadsheet experts.

Trades in Djinni are composed of any number fixed, floating, cash flow and FX streams. Anyone with a basic understanding of the structure of a swap can easily to model a wide range of trades. The system has been very successful in JPMorgan and rolled out to hundreds of users with minimal training over head.

Djinni is written in C++ and runs entirely on a Windows client with no server components other than a rates feed. The Djinni system runs as a stand-alone client application. It does not communicate with any other system except via the "live" rates, flat files. Djinni is written in C++ using the Microsoft Foundation Classes.

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Derivatives Studio Web-based Derivatives Pricer

Studio is an interest rate and FX derivatives valuation system created for both buy and sell side users who frequently price these products. Studio represents a combination of the BLUE and Djinni products. The user interface has been enhanced to support portfolios and trade life cycle events and simplified with the removal many JPMorgan specific terminology and procedures. The emphasis is on ease and speed of use.

As with Djinni and BLUE, the user enters trades and the market environment is read from one of several available live rate sources. The system values the trade and calculates position information. Studio supports the following trade types: interest rate swaps, yield curve swaps, cross currency swaps, caps, swap options, FX forward and FX options (including barriers). Trades can be valued independently or combined into portfolios.

Studio can run as a standalone application in a manner similar to Djinni and BLUE. However, it was primarily designed to run as an applet with calculations taking place on a server. This latter configuration makes the tool very easy to deliver to users over the Internet using a single source of market data and centralized, secure, fault tolerant pricing.

DEPENDENCY INFORMATION

The Studio system runs as three separate components. The Client, the Server Proxy, and the Server. Build and run-time considerations are different for each component. The Client component runs as an applet in Internet Explorer. It operates by sending XML messages over HTTPS to the Server Proxy which runs as a Java Servlet in Jakarta-Tomcat which itself runs in the Apache webserver. The Server Proxy forwards these messages to one or more the Server components using the Mercury middleware
described elsewhere. The Server components run as a stand-alone processes in a Java Virtual Machine.

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Vizz Valuation Service

The Vizz Valuation Service is a web application that allows users to risk manage a portfolio of flow and exotic interest rate derivatives online. Vizz uses a risk management engine (such as Kapital) to report the MTM and sensitivities of the portfolio. Vizz also reports on the events of the portfolio, and includes a scenario tool and a FAS133 hedge effectiveness tool.

The main functions of Vizz are:

Portfolio – load and edit deals and organize into portfolios. Product coverage includes swaps, caps, knockout caps, vanilla and bermudan swaptions, quantos, basis swaps, FX outrights, options and barrier options, and several exotic products

Market – manage and edit market data. Includes yield curves, vol grids, FX spot and vol, correlations, credit and basis spread curves, exotic parameters

Events – investigate resets, exercises and cashflows of your portfolio, download to Excel.

Valuation – obtain MTM and sensitivities of your portfolio. Includes accrued interest and clean price, delta, vega and FX delta and vega positions. Download to Excel.

Scenario Tool – investigate the impact of various market moves on your portfolio

FAS133 Tool – organize your portfolio into Hedge Pairs and calculate the hedge effectiveness

Vizz is a web application developed with a multi-tier, web enabled J2EE architecture, using Java, JSP and EJB technologies. Vizz is used from the Internet Explorer or Netscape browsers. The Vizz web pages can be customized to take a different look and feel for different users. Vizz communicates with the risk management engine and the database using XML messages (FpML is used for trade data).

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Mondrian

Mondrian is a P&L and Positions consolidation system used for the last four years on JPMorgan's interest rate derivatives desk. Mondrian is based on a flexible, relational data model that accepts P&L and position feeds from Swap, Swap Derivative, Bond and exchange trading systems. The system supports the notion of a Book that contains product from any combination of these source systems. It contains the analytics required to produce a consolidated picture across product types. The system allows for manual P&L and position adjustments and produces end of day reports.

Mondarian is easily configured to accept new feeds and could be integrated into most trading systems environments in a straightforward manner.

Mondrian is a Visual Basic application built on top of ODBC/Sybase. It accepts feeds as flat files or direct connections to its database. It produces output in Excel spreadsheets.