



# Mainframe Modernization

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## Overview

This paper is aimed at senior business professionals (technical and non-technical) who are responsible for taking strategic decisions and steps at optimizing the IT investment of their organizations.

The reader will be provided with a clear illustration of the process of Mainframe modernization, and why this has an immediate and long term positive effect on both shareholder value and competitive position.

We will demonstrate the product suite, methodology and post implementation, competence center, employed by HTWC to analyze, convert and ultimately modernize applications and data, enabling organizations to exploit the advantages presented by modern platforms.

A deep dive into the product portfolio of HTWC, will introduce to the IT professional to the most complete suite of applications designed to streamline the modernization process for a myriad of both, "As Is" scenarios and "To Be" scenarios.

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## **High Technology World Company®**

Charles Darwin famously adapted the saying “survival of the fittest” to support his theory of evolution. One successful strategy to stand the test of time has been to adapt oneself to one’s environment.

However, as proven by mankind, the more successful approach has been to adapt the environment to one’s needs. Is it enough to merely survive? Not for HTWC®. We aspire to excel.

Adapting your IT infrastructure to your needs is our speciality since 1979.

### **We are the High Technology World Company®**

Our pragmatic, no frills approach, has resulted in the continuous adaption of IT infrastructures, allowing hundreds of our renowned clients to exploit more cost effective and agile technologies to run their applications. Like Darwin, our motto “beyond the change” is derived from the strategic evolution of our client’s architectures, central to our philosophy.

Operating globally since 1979, our experience spans a large array of specialized skills in revitalizing and modernizing otherwise ageing technologies, enabling our clients to achieve savings through more efficient technology, and to fully exploit the potential of their application investments.

Our in-house development, project management and competence centre, are perfectly complemented by an impressive network of sector and discipline specialist, fulfillment partners.

Now is the time to address unnecessarily spiraling license and maintenance costs, not to mention the “cost of doing nothing” imposed by lack of agility and scarcity of programming skills.

## Product Overview

Our product portfolio provides a complete range of modernization applications culminating in the most comprehensive platform modernization toolkit on the market, XFRAME®

XFRAME® is the only solution capable of a holistic platform modernization through the migration of Mainframe services and enterprise applications from z /OS, OS/390, MVS, and VSE® operating systems to open environments such as UNIX, Linux, and Windows.

Effectively, XFRAME® recreates your entire Mainframe, and enables the decoupling from its legacy operating system for plugging into leaner, more efficient, therefore cost effective operating systems and hardware. This results in lower license, maintenance and energy operating costs, to the tune of between 50% and 80%.

In parallel, your applications and databases are modernized, creating an environment open for application development or integration of turnkey solutions. This results in an exponential increase in developer productivity, at lower costs hence significantly raising the profile of IT organizations as major contributors to organization strategy..

XFRAME® implementations are subject to negligible impact on daily operations, and all current application logic and workflow require no changes. XFRAME consists of the following components

- XCICS/TS® – to manage the online Transaction Processing
- XVSAM® – to manage ex VSAM file in C-ISAM format
- XEBE® – XFRAME Enhanced Batch Environment
- XBM® – scheduler
- XSORT® – sort utility
- XSPOOL® – to manage the spooling system via browser
- XTND® – to manage the 3270 protocol
- XSDF® – a graphical tool to manage BMS maps (integrated in XUC)
- XUC® – XFRAME Unified Console to control XCICS, XVSAM, etc.

To provide the perfect complement to XFRAME® or indeed as standalone services, the rest of our product portfolio is made up as follows;

- **ICON®** is our automated application recognition, auditing and portfolio management application
- **H2R®** and **V2R** which are applications and services provided to convert hierarchical databases and VSAM files to a relational database management system
- **2CHANGE®** is a Service for software understanding, conversion and renovation

## Introduction

### ***“Moore” speed, power, capacity and bandwidth***

Gordon Moore famously predicted that computing power will double every 18 months. This prediction is not only relative to chip processing power, which originally inspired the discussion, but on a vast array of development and business models descending from exponential increases in processing power and bandwidth as predicted by Moore and his contemporaries.

Due to developments such as chip speed and drives for cost effectiveness, data volumes, online transaction processing and the requirement for real-time database updates, will increase exponentially throughout the 21<sup>st</sup> century in comparison with the previous one, which was by no means a slouch in terms of rapidity of development illustrated by the following examples;

- Bandwidth; In 1980, 10 **K**bit/s cost the same as 100 **M**bit/s in 2009
- Storage: in 1990, only Mainframe and Commercial computers could store 100GB of data. Today this amount of storage can be found on a teenager's PDA
- Protocols: Up to the mid 90s, entire network applications were built on propriety protocols and application embedded communication, today millions of application developers work within the realm of tiered protocol layers.
- Computing power: In the early 90s, 10 gigaflops of computing power cost in the region of U.S. \$12 million. Today, that level of computing power can be achieved by combining a few multiple-core blade servers at a cost of a few thousand dollars.

Prognosis suggests that these quantum leaps in development will be dwarfed by those which will be experienced in the 21<sup>st</sup> century. Enterprises need to embrace these developments to remain competitive, whilst recognizing the days of bottomless pits if IT investment budgets, are long gone.

There is a path forward which enables the full exploitation of state of the art technologies, whilst retaining legacy IT assets, at the same time slashing operational costs by up to 80%. Of the options to re-write, replace or migrate, the third is by far the most cost effective, leveraging off legacy IT assets, whilst zero business processing reengineering is required. The strategy has to be to free up operating budget, for investment in forward looking activities

Additionally, open systems are more compatible with new developments. Organizations can benefit from the large and growing ecosystem of third-party applications. The opportunity to replace custom applications with off-the-shelf offerings has never been greater and more cost effective.

IT system Modernization through platform, application and data migration is an increasingly emerging specialist service, charged with achieving just this. Before the roadmap towards modernization is illustrated, some of the key areas for discussion are revisited.

# Background

## Transaction Processing (TP)

At the heart of all enterprise IT systems, is a service called Transaction Processing. In simple terms, data is input (e.g. via user, batch, or web), calculations are conducted and all downstream applications and databases are run and updated respectively. Real-time Transaction processing is responsible for ensuring that all databases and flat files (e.g. VSAM) are maintained in a constant and accurate state. Transaction processing also mediates access to databases from a large number of users and batch job streams. The thousands of simultaneous transactions, across many sites, applications, databases and middleware applications, are a huge responsibility and challenge, which places the TP system and its peripheral applications at the heart of enterprise IT systems. The most widely deployed and successful TP system is CICS (Customer Information Control System) at the heart of IBM Mainframe computers.

## Mainframe computers

Mainframe refers to a class of ultra-reliable large and medium-scale servers designed for carrier-class and enterprise-class systems operations used by large organisations to process large amounts of data both in real time and using batch processing techniques.

Mainframes are typically characterised by the term RAS; *“Reliability, Availability and Serviceability”*. For many, Mainframe is also synonymous with redundancy, security, efficiency and a high degree of compatibility.

The highly redundant architecture enables maintenance work to be carried out during normal operations, meaning Mainframes tend to work for years without any disruption. Such longevity is the corner stone of many IT architectures.

The main components and functionality are as follows;

- Transaction Processing Monitor - CICS (Customer Information Control System) is the online transaction processing server. The heartbeat of the mainframe, the architecture of CICS, enables the performing of thousands of such transactions per second.
- IMS/DC is a combination of the Information management system in hierarchical tables, with in-built transaction processing capabilities DB2 is a relational database management system developed after IMS/DC
- The propriety Mainframe operating system ( z/OS, BS2000, BULL, AS400, OS/390, MVS, and VSE) with embedded application interfaces, manages the HW resources in accordance with the requirements of the service and application layers.

## The Mainframe Conundrum

Already, Mainframes process trillions of online transactions each year. Indeed, a clear majority of all worldwide transactions are conducted, whilst a huge amount of the world's data is stored, upon Mainframe platforms.

The market makes it very clear that there is no great desire to change this in the foreseeable future, as IT professionals underline their satisfaction with the RAS offered by Mainframe, and are reluctant to entertain a move to other architectures. Mainframe is generally viewed as an indispensable resource for IT organizations.

**So where's the issue?** There are question marks with regards to the sustainability of the underlying operating systems in terms of economical feasibility and agility. Additionally, Mainframe expertise for system administration and further development is quickly becoming a priceless resource, which is starting to expose shop owners to a dwindling pool of qualified personnel. This issue will become more acute in the coming years. Both of these challenges equate to rising costs and the compromise of quality.

The conundrum is; ***"One cannot live with it ... nor can one live without it"***.

## Mainframe modernization through Platform and Data Modernization

Addressing this conundrum, Mainframe modernization enables organizations to tap into the potential and most importantly, the cost effectiveness derived from modern operating system architectures whilst retaining their tried and trusted Mainframe environment.

Mainframe modernization does not imply the decommissioning of your Mainframe, the re-engineering of applications or workflow or any organizational upheaval either during or post modernization project, but means taking your current applications and services, and running them on a leaner, more efficient platform and increasing the compatibility with international standards which are central to achieving economies of scale in application development.

As well as the economical benefits, other disadvantages & threats can be addressed;

- Escalating Workloads: With the amount of data measured in bytes being stored, accessed and exchanged, doubling every three years, demands on legacy applications and infrastructures are reaching unprecedented, and more importantly, unattainable levels.
- Expertise scarcity: Finding experienced mainframe personnel is difficult and costly, and vendor support for mainframes continues to decrease
- The operational efficiency of applications and databases improves
- software stack is considerably more complex and outdated than modern architectures
- Compared to TCP/IP, the mainframe Systems Network Architecture (SNA) is disconnected in today's world of internet and application interoperability, requiring additional interface layers which are costly in terms of acquisition, maintenance and power.

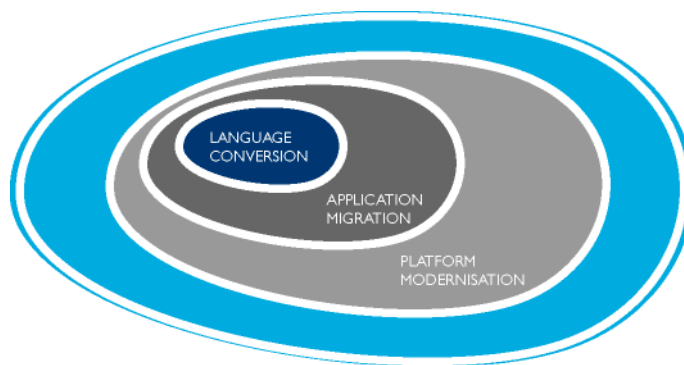
## Modernization

The Mainframe has been successively developed for over 40 years, and as we have seen, is the corner stone of the world's IT. True, Mainframe's continue to deliver first class RAS to mission critical applications in demanding environments, but issues such as cost, retired knowledge and vendor erosion, deem it not only beneficial to modernize, but an obligation towards organization shareholders.

In 1979, an average family car required over 12 liters of fuel, for 100 KM. The corresponding car in 2009, needs 6,5 liters of cleaner and cheaper fuel. Why? Leveraging off new technologies and improved infrastructures. This simple analogy to Mainframe modernization is almost correct, except Mainframe Modernization also allows the complete preservation and modernization of legacy investment, whereas modernizing a 30 year old car is hardly feasible.

Firstly it is important to properly define some of terms in the context of mainframe modernization.

There are three methodologies e Modernizing Mainframes. In All cases, a thorough application audit is required which is key for determining the sequence of activities.



### **1. Platform Modernization:**

Entails the decoupling of legacy and Mainframe applications and databases from the legacy operating systems and resources, and plugging them into open environments such as Windows, UNIX and Linux.

**2. Application Migration:** Entails the iterative transfer of enterprise applications and databases onto a more efficient environment, culminating in a platform modernization

**3. Language Conversion:** Means the recreation of applications in more modern, efficient, open and compatible development languages. For example; from PL/1 to Cobol or C or C#, from Assembler to Cobol, from RPGII to Cobol, from CSP to Cobol.

### **Pre-Modernization**

For modernization, there is no pre-defined "out of the box" solution, as each project has its unique modernization roadmap. Thus, all projects are preceded by a thorough investigation into the main drivers and the subsequent scope, rollout scale and project deliverables.

Questions to be asked include;

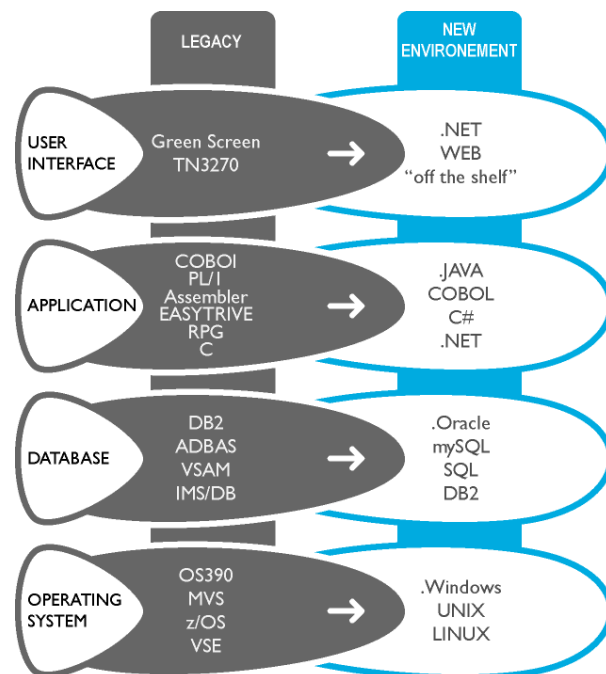
1. Are the current platform costs prohibitive, deeming platform modernization an absolute key activity?

2. Are the current applications in their current form, a key asset for the organization, therefore no modifications are desired?
3. Or do they need to be further developed, enhanced with “bolt ons”, re-engineered or indeed replaced. Do compilers exist for the languages used?
4. How large is the organization’s Mainframe?
5. Is it more realistic to conduct an audit on the current application activity with a view to selective platform migration, therefore achieving savings through reducing activities on the Mainframe?

The answers to these questions will help to determine an organization’s modernization strategy.

### A contributor to IT strategy

Modernization must always be considered as one major contributor towards the definition and



implementation of an organization’s IT strategy. Ultimately, there is one goal; achieve agility with current assets, whilst freeing up financial resources. This can be achieved via several routes, the choice of which is a strategic decision based upon project drivers and deliverables, which in turn are determined by organizational priorities.

At HTWC®, the motto “*beyond the change*” has been adapted to emphasize that this is not just a one off, “big bang” Migration, but a journey, an iterative process, which requires expert consultation on the creation and

implementation of a Modernization roadmap. The roadmap is sequenced in accordance with organizational priorities, and designed to fit into an organizations holistic IT and business strategies.

### Modernization - A closer look

Achieving RAS at the levels associated with Mainframe is complex. Replicating a Mainframe on a modern platform is also complex. Although it is beyond the scope of this paper to provide a detailed technical “deep dive” into the details of modernization, following we provide a closer look into the elements and steps involved in modernizing Mainframes. This will give the reader a background appreciation of the product suite and services provided by HTWC®.

For every level of modernization, an application assessment is highly recommended or indeed, in most cases necessary in order to understand an application environment, application activity, dependencies, interdependencies and potential paths towards efficiency.

There are three levels of Modernization, **1: Platform Modernization**, **2: Application Migration** and **3: Language Conversion**.

**1. Platform Modernization:** means to transfer all "As Is" applications to a new platform, whilst replicating the underlying Mainframe services, with services compatible to the new platform. The main elements and Mainframe services subject to platform Migration are; TRANSACTION PROCESSING, MAINFRAME BATCH PROCESSING, SPOOLING, and DATABASE /FILE MANAGEMENT SYSTEM

#### TRANSACTION PROCESSING MONITOR (TP) ((CICS) IMS/DB)

CICS/IMS DB TP is the heartbeat of Mainframe systems. It is designed for the high volume, rapid data processing, of thousands of users and batch processes across multiple sites, updating downstream databases and applications. The Mainframe CICS application written mainly in COBOL, is the data processing engine employed by the majority of organizations worldwide.

CICS interfaces with front and back end application protocols and entails an API layer enabling the development of applications.

#### BATCH PROCESSING

One of the key features of Mainframe is the automatic processing of massive amounts of data through its Batch Processing capabilities. Of course, on the new environment, the Batch environment needs to be replicated through specialized conversion tools. Additionally, the Job Completion Language (JCL) tool employed in Mainframe environments to control and maintain batch activities, needs also to be replicated on the new platform.

#### SPOOLING

The Spooling mechanism required for distributing data and information logically (e.g. to databases) and physically (e.g. as printout) to a myriad of different environments (e.g. Internet applications)

#### DATABASE /FILE MANAGEMENT SYSTEM

Mainframe data and file management systems have evolved over time in parallel to mainstream. This evolution encompasses file management systems, hierarchical database management systems, through to relational database management systems.

The most common file management system is VSAM. VSAM, which has evolved through generations of Mainframe operating systems, supports four data set organizations: Key Sequenced Data Set (KSDS), Relative Record Data Set (RRDS), Entry Sequenced Data Set (ESDS) and Linear Data Set (LDS). Both IMS/DB and DB2 are implemented on top of VSAM and use its underlying data structures.

VSAM (Virtual Storage Access Method) files and the interaction with these (e.g. through JCL, CICS and IMS/DB) needs to be replicated and compatible with the new environment.

IMS/DB is an hierarchical database management system, which contains logic with which JCL and the BATCH environment is familiar.

Finally, DB2 (1983) & Informix (2001) are relational database management systems employed by IBM and are fully compatible with Windows, UNIX and Linux environments).

An organization's Mainframe may sit on all three data management systems. In some cases, it is necessary to recreate the interfaces to all three storage systems (emulate VSAM), in other it may be more feasible to migrate all data onto one relational database management system (e.g. Oracle or SQL).

**2. Application Migration:** Is the iterative transfer of individual applications from the Mainframe environment to Windows, UNIX or Linux, culminating in the full Migration of the platform. Often over the years, applications become surplus to requirements, inefficient or redundant, or indeed are completely compatible to run outside the mainframe environment on an open system.

It is very difficult to detect such instances, but also very expensive to keep them running within the Mainframe environment.

Application audits are necessary to determine a strategy for applications. Incredibly complex, very sophisticated analytic's applications and methodologies are required where automatic software analytics tools are employed, alongside carefully structured key user/owner workshops, to elicit data, and build a comprehensive database of application attributes. These same tools are used to analyze this data, and provide a reports on the application landscape at different levels of granularity.

The strategy for applications is one of the following; *Retire, Re-engineer, Re-host, Retain, or Replace*. This approach is particularly useful in the cases dealing with large Mainframe shops (above 1000 MBIPs) where a complete platform modernization difficult or indeed not feasible. Iterative migration in applications often deliver exceptionally quick wins, with relatively low effort and risk.

**3. Language conversion:** Today's rapidly changing business environment means organizations have to be agile in their ability to adapt applications to deal with new business requirements. Often, applications developed for use in Mainframe environments, are developed in languages which are rigid and there is a scarcity of qualified staff to further develop. Mainframe is outliving the languages used to develop its applications. 80% of Mainframe based applications are developed in COBOL, still considered the best platform for business applications.

**Why Change?**

- Language is not supported by the target platform
- Skilled programmers in some legacy languages are difficult to find and are expensive
- Integration with state of the art development is difficult or impossible
- Inefficient use of resources

**What are the alternatives?**

- completely new data design
- completely new application and process development
- acquisition of new skills

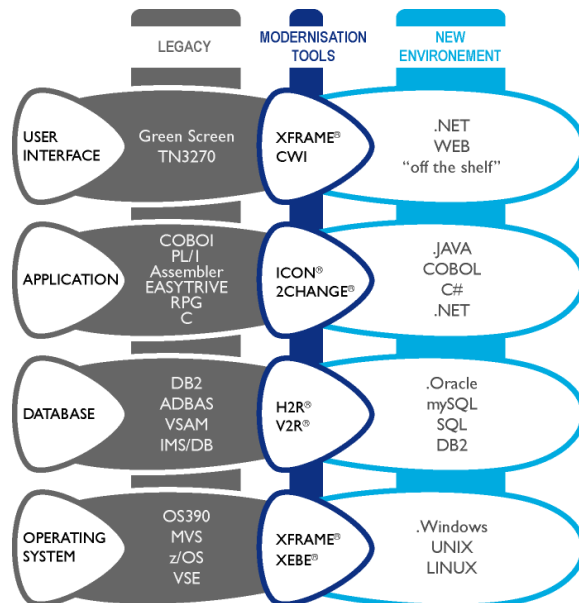
Application migration requires;

- The conversion of incompatible languages into one uniform language (COBOL)
- Engagement of compatible COBOL compilers on the new environment

For further use on UNIX and Linux environments, conversion to COBOL, and for migrating applications onto Windows environments, C#

## The HTWC® Modernization Suite

Cost is one major consideration. Additionally, modernization of legacy systems and applications is highly risky. Therefore the engagement of highly qualified, reputable, referenced and experienced



partners from the initial investigation phase, all the way through to the final steps of Modernization is absolute key. Indeed, HTWC® is experienced in consulting modernization strategies as part of a holistic IT strategy.

HTWC together with an impressive network of fulfillment partners has many references of successful modernization activities ranging from Platform Modernization, and Application Analysis and Migration through to Language Conversion.

In Europe, HTWC has successfully completed, 50 full scale Platform Modernization projects and are successively modernizing the mainframe environment of 300 clients – as mentioned, it is an ongoing relationship based on common sense – doing what is right, when it's right.

### XFRAME®

A proven, high-performance, scalable and reliable environment for running programs written in COBOL, PL/1, and C languages on Windows, UNIX, Linux and environments. It contains a transaction server to handle CICS and IMS/DC applications and a complete batch environment for mainframe batch processes. XFRAME can host +, OS/390, BS2000, BULL, MVS, and VSE mainframe environments.

The only mainframe rehosting solution that provides complete functionality across Windows, UNIX, and Linux operating systems.

A proven solution that is running successfully at more than 50 sites around the world. Features include;

- **XCICS®** With a very high degree of compatibility with IBM, CICS, XCICS® offers a high-throughput transaction processing system designed to handle thousands of connected terminals, users and remote systems. XCICS manages all the entities of the typical

mainframe environment, such as; programs, transactions, files, temporary storage, BMS and more, providing a robust and rapid application framework. Most importantly, XCICS allows mainframe applications to run with little or no code changes.

- **XEBE**<sup>®</sup> — a high performance batch transaction engine for JCL batch applications. This includes the **XJCONV**<sup>®</sup> conversion utility for generating one-to-one batch scripts in the host operation system.
- **XVSAM**<sup>®</sup> — a full VSAM emulation layer, supporting KSDS, ESDS and RSDS files. Batch programs can access XVSAM directly, offering the same functionality as the mainframe.
- **XSORT**<sup>®</sup> — a full featured, high performance sort utility that works with XVSAM and other files. It accepts the same input data cards as IBM DFSORT, offering seamless compatibility.
- **XSPPOOL**<sup>®</sup> — a web-based print deployment system that distributes the print output of batch programs directly to a user's desktop through a web interface.

### Optional Components

- **XBM**<sup>®</sup> — an enterprise-class scheduler and workload manager for XFRAME. XBM is an optional component and very cost-effective. XFRAME is also compatible with other popular scheduling applications.
- **H2R**<sup>®</sup> — an additional product that provides easy migration of IMS/DB or DL/1 data to a relational database structure. Powerful migration and runtime facilities, along with a high performing transparent gateway allows seamless integration with legacy applications.
- **XIMS Toolkit**<sup>®</sup> — this optional component allows original IMS/DC programs to run unchanged in the XCICS environment. This makes it possible to use the powerful XCICS transaction monitor to control both IMS and CICS applications.
- **2CHANGE**<sup>®</sup> **Language Conversion** Is an end-to-end service that combines three decades of migration experience with the best modernization tools on the market. 2CHANGE<sup>®</sup> is specifically designed to provide a low-risk solution for transferring legacy applications and data to systems running on Unix, Linux, or Windows. 2CHANGE<sup>®</sup> provides a fully automatic migration process between different platforms and heterogeneous programming languages and can be used 100% from remote locations.

With **2Change**, the following language conversions are possible;

### Language Transformations

- VSE/ESA to OS/390
- Assembler To COBOL, C or C#
- PL/I To COBOL, C or C#
- CSP/VAG To COBOL or C#
- CA-EasyTrieve To COBOL
- RPGII To COBOL

### Code Transformation

- VSAM to SQL for COBOL and PL/I
- BMS 2 CWI (CICS Web Interface)
- BMS 2 JSF (CICS BMS integrated with J2EE/JSF)
- Field enlargement (i.e. EURO, ZIP CODE, etc.)

- **H2R<sup>®</sup>** (Hierarchical To Relational) is a data migration tool that facilitates a move of IMS/DB (or DL/I) data structures to a relational database system (i.e. DB2, Oracle, etc.). It provides a transparent gateway to maintain data stored on the new relational organization while accessing them in the "traditional" way.

H2R<sup>®</sup> is equipped with a DL/I Data Structure Analyzer, which collects necessary information from PSB and DBD sources.

Starting from information gathered, H2R<sup>®</sup> automatically generates whatever needed to download data from IMS/DB, to create tables, indexes and constraints on the relational database and finally to reload data in the new structures. In order to leave unchanged the user interface, two different modules, with specific aims, are provided:

Standard entry points: this modules, having the same name as the IBM DB/DC standard entry point (CBLTDLI, PLITDLI), handle the parameters list prepared by the user program, and normalize it for the H2R<sup>®</sup> kernel calls.

High Level Program Interface (HLPI): this module automatically transforms all EXEC DLI statements into the corresponding Call-Level request, as expected by the standard entry point module.

Although the data structure and architecture are completely different between IMS/DB (DL/1) and Oracle<sup>™</sup> or DB2<sup>™</sup>, performances of migrated applications are normally equal or better than before. H2R<sup>®</sup> is currently available on the following platforms OS/390, UNIX and Linux

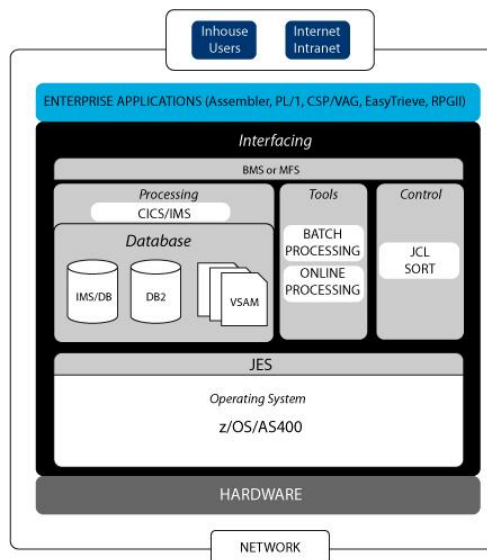
- **V2R** is a unique data and application migration tool that allows VSAM KSDS to be easily moved to a relational database system such as Oracle or IBM UDB.

For many companies, critical business information is stored in VSAM files based on legacy

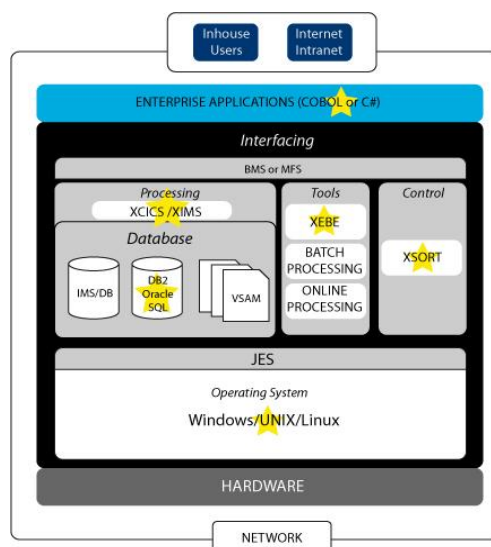
mainframe technology. Access to this information is often hindered by an inability to integrate the data with newer technologies and applications. V2R was designed to overcome this issue, unlocking new system capability while maintaining full access by existing legacy applications. Database performance is a critical issue and new solutions should not introduce new bottlenecks.

With the powerful migration and run-time capabilities of V2R, you can expect database performance that will equal or exceed that of the legacy environment. Relational organization allows for faster and easier searches, which are difficult or impossible with VSAM files. V2R utilizes robust migration and run-time facilities, along with a high-performance transparent gateway, providing the ability to maintain data in a relational organization, while offering seamless integration with legacy applications.

### BEFORE



### AFTER



## ICON<sup>®</sup> - Assessment and Discovery

ICON<sup>®</sup> is a suite of integrated tools and methodologies that will allow you to automatically gather and analyze data about legacy applications. ICON provides powerful automatic processes to conduct complex searches of source-code, to estimate software complexity, and to develop software elements with new generation editors and safe Concurrent Versions System (CVS) technology.

ICON stores the information in an easy to access SQL Repository using products such as Oracle, SQL Server, or any JDBC compatible RDBMS. A complete utility kit allows almost any type of query – predefined or self written for individual client requirements.

In essence, ICON is divided into four main modules;

- The settings module is a user friendly interface which enables the setting of **customization** parameters, thus increasing the relevance of the measurements to be carried out. Also the user and batch commands' editors, can be set up. Examples of parameters set, deal with the company and sector which the IT **organization** supports.
- The Building module initially creates an inventory repository of all applications, which are then individually scanned and **analyzed**, creating a repository of important application data. Such data includes; field definitions, Instructions, Interdependencies, Missing objects, Redundant objects, Syntax errors and indeed the complexity of the software. This repository is automatically updated as changes occur. This also entails troubleshooting facilities, enabling the user to fix any errors detected in the software – for example, the removal of syntax errors.
- To complete the database, HTWC<sup>®</sup> employs a methodology to elicit information from key users and IT administration staff. This methodology is based upon meticulously drawn up questionnaires and evaluation tools, which have been drafted over many years of experience of analyzing and assessing applications. This step serves to pick up application information not detectable within the software, and is seen as a powerful cultural change management step, obtaining buy-in from key contributors.
- The browsing module enables the client to view and **analyze** the data collected. The module enables analysis at several different levels of granularity from high level graphical illustrations, through to in depth detailed analysis of individual code objects.

## XFRAME® Feasibility Study

Mainframes typically are costly, due to the support of symmetric multiprocessing (SMP) and dozens of central processors existing within in a single system in conjunction with the pricing model chosen.

The main unit of measure for pricing Mainframes are Millions of Instructions per Second (MIPs). Mainframe pricing models tend to be based on initial up front core technology fixed cost basis, amortised over a certain number of contractual years plus IRR. These are then accompanied by a sequence of support and license addendums, the prices of which are based upon percentual uplifts of core technology prices. These charges are incurred ANNUALLY.

HTWC® adapts a different approach. The considerably lower investment cost and short payback period enable an initial one off investment, financed in general through savings achieved. Thereafter, only annual maintenance and support costs are incurred.

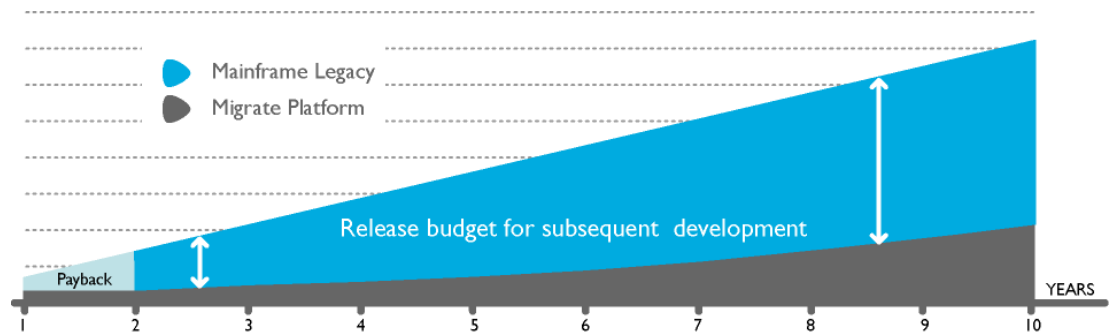
Following is a tabular illustration comparing the single units subject to pricing.

Category	Licensed Unit	Mainframe	XFRAME
Core technology & Project Management	Operating System	Initial investment amortized of contractual period @n% IRR	On off investment cost with 8 – 12 month payback
	CICS		
	Service & Maintenance	Annual Service charges	Annual Service charges
Automation (Batch Processing)	Automation tools	Annual License % uplift on core technology	NA
	CICS automation	Annual License	NA
	Job Scheduling	Annual License	NA
	Job Restart	Annual License	NA
System Monitoring	Operating system	Annual License	NA
	CICs	Annual License	NA
	DB	Annual License	NA
	MQ	Annual License	NA
Security	Operating System	Annual License	NA
	CICS	Annual License	NA
	DB	Annual License	NA
	Auditing & reporting	Annual License	NA
Capacity Planning	Operating System	Annual License	NA
	CICS	Annual License	NA
	DB	Annual License	NA
Storage Management	Storage migration	Annual License	NA
	Back-Up	Annual License	NA
	Tape management	Annual License	NA

The economic benefits of Platform Modernization are twofold;

- The base Core Technology investments are considerably lower and for these, clients incur one off cost only
- Ongoing support costs, are based upon the support of the competence centre only

As there are a myriad of case to case parameters which influence the prices (e.g. Hardware platform, processing power, target OS), it is beyond the scope of this paper to compare actual list prices. However, the following illustration is based upon realistic feasibility studies conducted between HTWC® clients and partners, and reflect a relative comparison between the costs incurred pre and post platform modernization.



The evolution of costs, starts with initial investment in core technologies, plus the costs as they accumulate over a 10 year period.

A discounted cash flow evaluation method over a period of 9 years (year 1 is written down as payback period), clearly demonstrates a phenomenal 80% saving. Such results are quite common, with the minimum savings recorded generally in the region of 50%.

Revisiting the discussion about modernization strategy within the framework of an entire IT strategy, the discussion surrounds the topic of how to reallocate the budget freed up due to platform migration.

## Conclusion

This paper illustrates to both technical and non technical business professionals the plausibility, feasibility and benefits of migrating applications and Mainframe services to a new, open platform, whilst retaining the unique features which have made Mainframe the IT architecture *par excellence*. It is also clarified that tools addressing hurdles such as application audits and application compatibility are an integral element in Mainframe modernization and indeed these activities represent some of the major benefits to be realized.

Clearly, Mainframe Modernization is one part of decomposed business and then, IT strategies. It is a double-edged sword providing the possibility to reallocate budgets for innovative developments, whilst providing the platform to make this a lot easier and cheaper.

Until recently, The Mainframe Modernization industry on the whole is a very well kept secret in terms of mainstream organizational strategy planning. However, the cumulative causation created through high profile success stories in times where every dollar counts, has ensured a greater visibility amongst boards of directors and industry analysts. The focus is growing.

Finally, to complement our best in class and most comprehensive modernization suite, we at HTWC® have been building a global infrastructure of certified fulfillment and support partners, thus ensuring the global availability of XFRAME, ICON and our conversion tools and methodologies. We and our partners have formed a very efficient network, guaranteeing first class End to End, consultation, products and project & change management throughout and organization's modernization process.

***"Beyond the change"***

## APPENDIX 1. Summary Case Study

### Cologne Chamber Of Commerce

#### Operation

- 720 Internal Users
- Host for 6 other chambers
- BS2000 System using LEASYS Database system
- In-house ERP system programmed in COBOL

#### Drivers

- Prohibitive costs
- Difficult environment for further development to ERP system

#### Solution

- Transfer all B2000 services onto Windows server
- Transfer of Database onto SQL

Part	Software elements (Outgoing)	Software elements (Incoming)
<b>Operating System</b>	BS2000/OSD V.4.0	Microsoft Windows 2008
<b>Compiler</b>	COBOL85	Net Express 5.2®
<b>TP Monitor</b>	openUTM	*XCICS®
<b>Database System</b>	LEASY	Microsoft SQL Server 2008®
<b>Spooling System</b>	RSO	*HTWC XSPool®
<b>Library Management System</b>	LMS	UltraEdit®
<b>Job Variable</b>	SDF-P	*HTWC XBM® *HTWC XFRAME® *Batch Edition®
<b>Utilities</b>	PERCON, EDT, SORT, openFT	* XBATCh, XSort, MosCON
<small>* HTWC propriety modernisation suite</small>		

#### Results

- 75% lower costs
- 8 Month pay-back period