

EAI goes Hollywood: Design of a Loosely Coupled Architecture to manage
Critical Business Data Flows at a Major Motion Picture Studio

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An often overlooked reality when implementing a major ERP system like SAP is that the new system will probably never replace all the legacy systems already in place. It generally becomes apparent pretty quickly that the new ERP system will need to share data with the legacy systems. Typically, in the past, these data flows have been managed by writing custom, point-to-point interfaces in which ASCII files are exported from one system and then imported into another for further processing.

Since the late 1990s Enterprise Application Integration (commonly known as EAI) has captured the imagination of many an IS manager. And no wonder. Its promise is to integrate into a coherent and unified data processing model all applications within an enterprise, including legacy, hand-rolled custom apps and the more powerful breed of ERP systems like SAP.

When a major Hollywood studio recently undertook a project to produce a Blueprint Design for the implementation of a new SAP system, EAI was high on their wish list of accomplishments. There were literally hundreds of legacy systems, many of them hand-rolled one job databases and spreadsheets, that could not be shut down quickly, if ever, that needed to participate in data flows with SAP. EDI was also a critical consideration. The challenge was to weave all these systems together [in a business process oriented way](#), including an existing EDI subsystem, into an EAI architecture that leveraged tools and skills that already existed within the organization.

Key Words

SAP, ERP, EAI, ARIS, Enterprise Application Integration, EDI, TrustedLink, Unified Data Model, Unified Data Processing Model, Business Process Design

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1. Project Background

1.1. Videos and DVDs: Profits that Keep on Giving

What do Hollywood blockbusters and flops have in common? They all eventually migrate from your neighborhood theater to Video and DVD, providing studios a long-lasting and steady stream of revenue. This repackaging of entertainment products -- whether movies, mini-series, TV shows, or concerts -- in video and DVD format for public consumption through retail and rental channels is a multi-billion dollar business that adds handsomely to the bottom line of many a studio.

Recently, a major Hollywood Studio decided to replace its aging and highly customized JD Edwards system with SAP to run its Home Video Division. Consultants from IDS-Scheer worked closely with business process owners from the Home Video Division to design an SAP system that would meet the Studio's business processing requirements.

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The numbers alone pointed to the complexity of the task: the Home Video business, with more than \$1 billion a year in global sales, represents more than 40% of the Studio's annual revenues.

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1.2. Managing Complexity

As the Enterprise system of record, SAP would be at the heart of the complex data flows required to support this business. It would provide an opportunity to analyze and rationalize business processes and the platform to automate them. In addition, the Home Video implementation was to be the template for a general rollout of SAP throughout the Studio's entire organization.

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A key issue that needed to be addressed in considering the implementation of the new ERP system was the integration of SAP with the numerous mission-critical systems that participated in the convoluted data flows that were the lifeblood of the Enterprise.

It was a daunting task: SAP needed to integrate effectively with at least 5 major, highly customized systems exchanging data between each other as well as with a myriad of lesser, mostly home-rolled systems that had grown on an as needed basis over at least 12 years. These lesser systems included everything from one-job Access Databases and Excel spreadsheets to complex mission-critical systems in Finance, Vendor managed inventory and customer replenishment planning.

Integration between these systems was managed entirely through individual point-to-point export and import of ASCII files.

Furthermore, the data processing that was behind the flow of product from the Studio to consumers was fed almost entirely through massive EDI data exchanges, managed 24x7 in batch schedules, with both customers and vendors.

Again, the numbers speak for themselves. The Home Video Division's billion dollar revenues were generated from about 50 customers, mainly big box stores such as Wal-Mart, Best Buy and Circuit City, in the United States and Canada, all with

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demanding and highly individual EDI requirements, and literally thousands of ship-to destinations.

The product consumed by these voracious customers was manufactured and packaged offsite by three Vendors, who also managed inventory and provided shipping and delivery services. This Vendor activity was also managed through complex EDI data flows. The new SAP system would keep track of inventory onsite, but inventory would continue to be physically maintained and managed offsite.

1.3. Integrating the Enterprise: Background

The Studio has experimented with Enterprise Application Integration (EAI) in the past and has invested both financial and human resources in Constellar Hub, a centralized interface development and management platform with a hub and spokes architecture that runs on Unix, sits on an Oracle7 database and supports PL SQL processing.

But these efforts had not gone much beyond moving exported ASCII files between directories in different operating systems.

The SAP blueprint provided a golden opportunity to begin serious analysis and design work on an integrated architecture that could eventually be rolled out to the entire Enterprise. The philosophy to be followed was that EAI was to be more than an integration platform: it was an approach to systems planning and design that included plans, methods and tools for consolidation, coordination and integration of applications across and within the Enterprise.

1.4. Business Motivation for the Integration Project

The needs and expectations of Home Video's customers are changing. They demand faster response time from the supply chain and some are moving to web-based AS2 transmission of EDI messages. They want sophisticated value added services, flexible sales programs and more direct sell-thru and rental sales. And there's also significant downward pressure on pricing.

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In short, they want more product, faster and at a cheaper price. The Studio's systems were barely keeping up with current demand and could, at some point, fail, disrupting the business. The Studio clearly needed a more responsive and agile architecture that would improve its ability to respond to its customers' current and future demands.

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1.5. Project Scope

The purpose of the project was to provide a Blueprint for the implementation of the new SAP system. As a critical part of this effort, the integration subproject would analyze all data flows impacting on SAP, whether through EDI or internal interfaces, and design an architecture that could accommodate them all in a standard and repeatable way, while leveraging existing skills and architectures.

The project would analyze and identify business processes and system requirements for the new SAP system. Deliverables would include detailed design docu-

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ments for each of the core processes identified as being necessary for running the Home Video business. These included:

- Planning
 - Trend analysis
 - Forecasts
 - Goals and Budgets
- Marketing
- Sales
 - Customer master
 - Revenue share orders
 - Invoice revenue share order
 - Forecast sales
 - Customer rebates and pricing
 - Rental sales performance
 - Sales planning and performance
 - Invoicing
- Procurement
 - Quotes
 - Contracts
 - Purchase orders
 - Purchase requisition
 - Goods receipt processing
 - Invoice receipt processing
- Logistics and distribution
 - Vendor master
 - Material master
 - BOM master
 - Inventory goods movement
 - Perpetual balancing

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- Rework
- Customer Service
 - Sales order entry
 - Pricing and promotions
 - Customer / material determination
 - Returns Credit / Debit notes
 - Delivery and Returns processing
- Financials
 - General Ledger
 - Accounts Payable
 - Accounts Receivable
 - Controlling
 - Profitability Analysis
 - Special Purpose Ledger
- Business Intelligence
 - Business content and info cubes in Finance, Sales and Marketing and Operations.

1.6. Objectives and Goals

1.6.1. Major Business Goals

The new integrated SAP system was expected to lead to common business systems for the global organization that would increase focus on revenue opportunities and support business growth. It would provide a flexible and evolving business environment and enhanced capabilities within sales pricing and order fulfillment processes.

Other expected benefits included:

- Optimized inventory management.
- Improved availability of real-time information across all systems.
- Support of information access and sharing.
- Streamlining processes and reducing waste.
- Improved ability to service customers.

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- Provide an integrated data warehouse with feeds from multiple transactional systems.
- Help the Studio better manage future mergers, acquisitions and divestitures.
- Provide faster responses to business initiatives requiring application integration as moving towards XML-based B2B sales and distribution.
- Lower or contain costs of producing, selling and distributing product.

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1.6.2. Major IT Goals

The major IT goal was to design a loosely coupled EAI architecture that would link major legacy systems to SAP, including the existing EDI subsystem, DataMirror's TrustedLink on the AS400, which would be upgraded and extended with an SAP bolt-on to handle mapping and conversion between EDI X12 and SAP's IDOC message formats.

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A common platform and set of tools for development and support of interfaces would sit at the heart of this architecture, lowering or containing critical IT costs.

This platform, built on the Constellar Hub, would manage all data flows between systems and provide a unified metadata repository that would know the data formats used by each participating system, moving the Home Video Division closer to a unified data model. Extraction, cleansing, mapping, posting and moving data between systems would all be handled by the Hub.

The standard architecture would include a central management organization and would support repeatable development methods using a much smaller, and more modern and available, 4GL catalog of programming skills than had been traditional at the Studio.

Interfaces would be built by connecting systems to the Hub and then mapping them to a target or source data model within the Hub and not directly to the partner system. This Hub and Spoke interface architecture, with its own application and database servers, would also be scalable and would grow with increased traffic by upgrading existing boxes or adding new ones.

The EAI architecture would be part of an overall approach to interfaces that includes such standard planning and organizational tools as a standard interface development project plan, common development guidelines and naming conventions, logical and technical specs, interface worksheets, EAI Knowledge Base, and change management and version control.

It was a worthy and ambitious goal that the Studio, with the support of IDS [Scheer consultants](#) and [the ARIS methodology](#), set for themselves in this project. It was no less than an attempt to transform the landscape from a largely undocumented mass of individual systems engaged in point-to-point data communications to a unified Enterprise data and business processing infrastructure that could quickly and painlessly plug in a new system by putting in a new data connector, created in a common manner, between it and the central Hub.

2. Data Arteries: Building an Integrated Data Architecture to run the Business

2.1. What we are Trying to Change: The Existing Architecture

It's difficult to speak of an existing architecture at the studio because there really isn't one. Interfaces have been added as users have discovered that data was required from another system to complete a particular process or calculation. The systems themselves were built, largely on an ad hoc basis, over at least 12 years in response to evolving requirements.

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The traditional approach to interface design at the Studio has been described as a "non-architected integration" that was inconsistent, not reusable and undocumented. It was dependent on the knowledge of specific individuals and required skills in a large number of mostly older technologies, including, among others:

- RPG and COBOL / JCL
- FTP and Email
- XCOM
- Replication Server
- SQR
- Stored Procedures and Triggers
- Unix scripting
- DataJunction
- ProComm
- OmniConnect / CIS
- BCP / Database Import/Export and ODBC
- DirectConnect / MDI
- Sybase Open Client

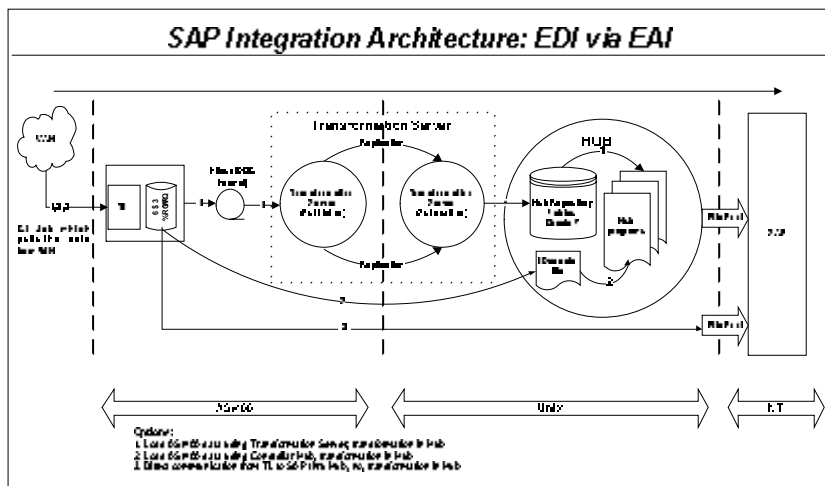
A simplified view of the interfaces between and within the major systems in the Home Video Division is in Figure 1 below.

Bear in mind that the web of individually connected systems illustrated below represents one business unit, albeit the largest single producer of revenue in the Enterprise. This network of data arteries was, in turn, connected through its individual parts to other systems at an Enterprise level, using the same kind of point to point interfaces illustrated below.

The second follows the same path that other interfaces will follow. The EDI subsystem will continue to handle mapping and conversion, but the IDOC moves into the Transformation Server for further processing in the Hub before being sent to an in-directory in the SAP environment, where standard inbound IDOC processing is kicked off by the Hub.

This process is illustrated in Figure 4 below.

Figure 4: EAI and the inbound EDI processing chain



2.3. A First Step: Looking to the Future

[Basis for the development of the EAI architecture was the ARIS framework, that structures the various views on a business process: organization, functions, data, deliverables, control. Key for this initiative was the data view on the processes.](#)

Defining this architecture begins with understanding the data requirements of SAP and the other key Enterprise systems that will remain. The Hub provides the focal point for data integration, for a unified data model that other systems will plug into it as they are brought online.

There will be a consistent and rational data model that encompasses all of the Enterprise's key business systems to serve as the foundation for business process rationalization and integration. For the first time, the Studio will begin to really know its data. This knowledge will bring increased flexibility and responsiveness, better control of the supply chain and improved ability to adopt new processes.

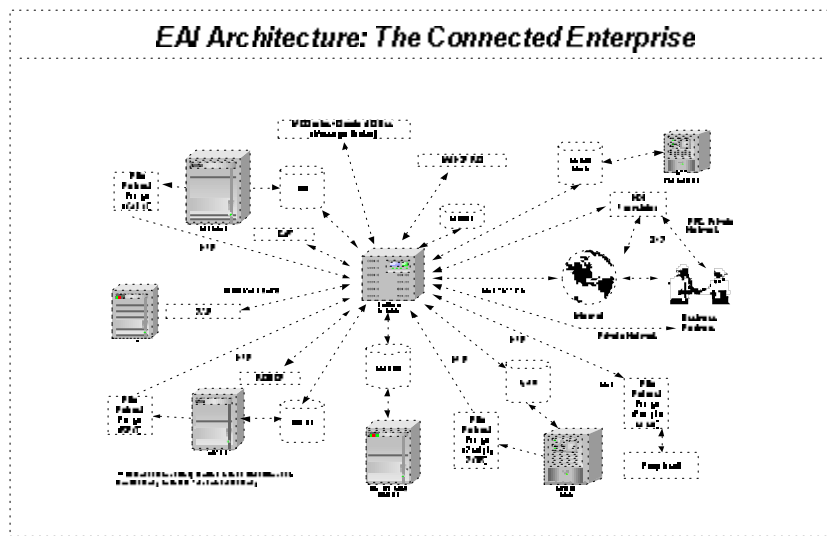
One scenario for an integrated Enterprise is illustrated in Figure 5 below. Its puts the Hub at the heart of the Enterprise, with its central data repository describing

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critical corporate data that must be used across systems, the key to maintaining useable data flows between different applications across the Enterprise, effectively transforming all participating applications into a cooperative business processing platform.

But the architecture illustrated below still provides essentially a batch processing regime. All data movements, all export or import jobs into and out of each system need to be scheduled using an enterprise scheduling tool, in this case Maestro.

Figure 5: A unified platform for Enterprise data



It's a huge step, but still not the final goal. Success of the SAP implementation and the new EAI architecture is a major milestone along a long winding road. Near real-time information flow and greatly reduced supply chain cycles, even same day shipment of product, are ultimate goals.

XML messaging wrapped up in SOAP envelopes requesting and providing data via HTTP from Web Services discovered in UDDI directories offers great promise for the future, assuming emerging standards are codified and widely adopted, knowledge spreads and resources are put into hard (equipment) and soft infrastructure (people and skills).

The Studio is actively studying the potential of this exciting technology with the hope that the new architecture being defined (Constellar Hub supports XML mapping) will be the foundation for the evolution of the intelligent interfaces of the future, both within the Enterprise and in its relationships with its partners.

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3. Project Approach: Integrating People for Success

3.1. Project Timelines and Deliverables

The Business Blueprint Project ran for three months. Its prime purpose was to define the Studio's business practices and parameters, to understand business goals and structures, and to determine how SAP can be configured and customized to accommodate these.

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The goal was to provide a system design, a Blueprint, to support the future state of the Studio's business as defined by the mapping of SAP processes envisioned by the project team.

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This included identifying the gaps between standard SAP and the Studio's to-be processes, identifying and quantifying the development effort required to customize the new environment (whether in SAP or external systems).

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In addition, the underlying technical requirements to support the business design needed to be worked out.

The major deliverables of the Blueprint Phase were:

- Definition of a Project Charter detailing project objectives, scope, planning, methodology, issue management, monitoring and standards and procedures.
- Technical Design, encompassing physical infrastructure requirements, including sizing of servers, and definition of Basis requirements and installation of a preliminary sandbox for development work.
- Blueprint Documents detailing the design for every [technical and business](#) process identified as in scope (see Project Scope above).
- A RICE List identifying all Reports, Interfaces, Conversions, Enhancements and SAPScript forms that needed to be built to support the business.
- Blueprint Document outlining conversion and interface strategy, including design of an EAI architecture to tie together EDI, SAP and all interfaces identified as required for SAP.
- Project Plans detailing tasks required to complete the Blueprinted system.
- Training Plans.
- Project Organizational Structure.
- Change Management Assessment.

3.2. Organizing and integrating the effort

IDS Scheer provided the SAP consultants, both functional and technical, and the methodology, [based on the ARIS](#) framework, to the project team. From the Studio came business process owners, legacy analysts and programmers, integration spe-

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cialists, EDI developers and assorted consultants with specialized technical knowledge of existing processes and systems.

Day to day leadership of the team was in the hands of a joint project management team, composed of an IDS Scheer and two Studio project managers: one from MIS and the other from the Business. The project management team reported to a Steering Committee composed of mid-management decision makers, which in turn was responsible to an Executive Steering Committee that included the CEO, CIO and other high-ranking management from the Business. The Executive Steering Committee had ultimate responsibility for project direction and sign-offs.

The project team was divided into 6 core sub teams focused on business processes, including:

- Finance and Controlling
- Sales and Distribution
- Purchasing and Inventory Management
- Business Warehouse
- Organizational Change Management
- Technical Infrastructure

Each team had a core membership composed of a process leader from the Studio, supported by a Studio MIS team member and an IDS Scheer consultant and an extended team of additional resources that included international employees.

The bulk of the work of identifying and mapping in scope business processes to SAP was done in intensive 5-hour workshops that ran on a two-week rolling basis over most of the life of the project. Workshop topics were changed only when the previous topic had been exhausted.

There were also workshops that examined points of integration between processes bringing together a number of teams at the same time.

The Technical Infrastructure team coordinated the efforts of 5 sub teams that worked on key technical issues including:

- Basis Infrastructure
- Authorizations
- ABAP Development
- Application Integration (EDI, EAI and Data Conversion)
- Software Change Management

3.3. The Process of Discovery

We're most concerned here with the work of the Technical Infrastructure team, particularly the ABAP and Application Integration sub teams. These two teams, led by an IDS Scheer ABAP consultant with extensive experience in data conversion and integration of SAP with external systems, were directly responsible for the design of the EAI architecture, including the EDI interfaces that emerged from the Blueprint Phase.

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The work of these teams was largely dependent on the progress made by the functional teams in a number of areas, including:

- Design of business processing cycles dependent on EDI, for example, the entire Sales Orders processing cycle including the initial order, returns processing, shipping and delivery, invoicing and payment.
- Design of business processing cycles dependent on the flow of data between SAP and external Home Video systems, such as journal entries in SAP from the Corporate Financial System.
- Identification of gaps between standard SAP business transactions and the processing steps required to complete Home Video's business processes.
- Identification of new requirements to handle business processes not available in standard SAP, whether through a custom written program or by tweaking the code behind an IDOC in a customer exit.

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These variables determined the pace and direction for the work of identifying programming requirements for SAP (and sometimes external systems) and of designing an integrated architectural approach to EDI and EAI.

Requirements needed to be collected and this was largely accomplished by reading through the documentation produced by the functional business process teams and extensive interviews with the relevant functional consultants, business process owners, legacy analysts and programmers, EDI developers, Home Video consultants and outside experts including Vendors responsible for the various systems that needed to be integrated.

As the business requirements firmed up and the identification of development objects proceeded, the existing EDI architecture was examined in detail with the help of the EDI and in-house integration teams. Every transmission was plotted and analyzed and mapped against corresponding data containers (IDOC's, BAPI's) in SAP. Gaps were identified and solutions researched in SAP, usually involving extension of IDOC's and custom code in user exits.

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The process was the same for the interfaces between SAP and legacy systems. They had to be identified and plotted and technical gaps defined. From this began to grow a list of programming requirements.

At the same time, architecture was being examined. The Studio already owned Constellar Hub, but was also considering Mercator for both EAI and EDI. Research was done on EDI subsystems, since this was the critical piece. Vendors

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were consulted. A decision was made to keep TrustedLink on the AS400 to leverage existing skills within the organization. But it would need to be upgraded and an SAP bolt-on installed to read in the structure of SAP IDOC's for mapping to X12 messages.

The issue became how to best integrate the existing EDI subsystem, all of the other interfaces and SAP into a coherent data processing model, without breaking the bank or taking unnecessary risks with exotic and untried technology. The Constellar Hub had been used by the Studio in a pilot project and its general operating principles were known. Its Oracle database and support for PL SQL was seen to be a big plus. The Hub was therefore the obvious starting point.

The EAI architecture emerged thereafter through the cooperative effort of a large group of people supported every step of the way by team leaders and project management. The initial architectural design was produced by IDS Scheer as the larger SAP design effort proceeded.

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These design was continuously updated with input from the various business process teams as they finalized their system designs, as well as from different groups within the Studio's IS Department and among business process owners. Through a continual cycle of meetings, brain-storming sessions, informal conversations with users, developers and vendors, research, writing and drawing, a final Blueprint document emerged describing a strategy and detailing an architecture for rationalizing and managing enterprise interfaces.

This Blueprint design document was signed off on and became the starting point for building the EAI architecture in the Realization phase.

4. Results

4.1. Achievements

The SAP system design that emerged from the workshops led by IDS Scheer was signed off on by the Executive Steering Committee. Through the hard work and cooperative efforts of everybody involved, the Blueprint successfully defined the best SAP system that could be built considering the business requirements, time constraints, future plans and available resources of the Studio. Every consulting firm that was invited to bid on the Final Realization Phase of the SAP implementation project, had to bid on the Blueprint that IDS Scheer developed in cooperation with the Studio's employees.

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The cooperative approach adopted by IDS Scheer and its client partners proved to be a winning combination. Despite fierce competition from larger consulting companies with more resources, IDS Scheer, with its impressive combination of talent, methodology, technical vision, deep SAP implementation experience and knowledge of the client's business, won the final contract

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4.1.1. Defining a vision for the future

Defining the EAI architecture was all about defining a vision of how disparate data sources and applications could be harnessed to better serve the future of the

enterprise. It pointed to the potential of a unified data model providing a platform for ongoing rationalization and automation of business process. An additional bonus: the cooperative effort involved in producing the work provided an effective model for future projects.

4.1.2. Bringing people together

Application integration is also about bringing people together into a cooperative enterprise aimed at improving everybody's working life. The EAI architectural design that came out of Blueprint was a joint effort between IDS Scheer and a number of different groups and organizations within the Home Video Division's IS Department, including Applications, EDI, EAI and Infrastructure, as well as a large number of business owners.

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Bringing all these people together in a common effort, in an environment as busy and dynamic as the Studio's, was an impressive and effective achievement.

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4.2. Consistency with defined goals

4.2.1. All major objectives being met

All major achievements outlined out in sections 1.5 and 1.6 were met. A design document was produced that became the basis for the subsequent Realization phase and that is still driving the basic design of the EAI architecture. This architecture is being built and tested and there is every expectation that it will be implemented successfully at the end of the Realization phase (scheduled for spring 2004).

In addition to the concrete achievement of designing a system that is being built, and simplifying and rationalizing enterprise data flows, the Studio is well on its way to having a unified data model.

5. Lessons Learned

5.1. Analyze until it Hurts

All systems need to be analyzed, including legacy systems that may have little or no documentation but be locked up in the heads of one or two consultants. It's worth the effort to dig out this information and document it.

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5.2. Need for Enterprise Scheduler Highlighted

The complexity of all the moving parts in the EAI architecture is daunting. The design effort underlined the need for a central management tool that would be used to schedule and monitor all these moving parts. In addition, error reporting, controls and balancing all need to be considered.

5.3. Communicate, Communicate

People and organizations need to work effectively together. In order for this to happen, communications are absolutely critical. Good communications are the glue for cooperation. Communications need to flow in all directions, not just from the top down or the bottom up. Everybody needs to be on the same page.