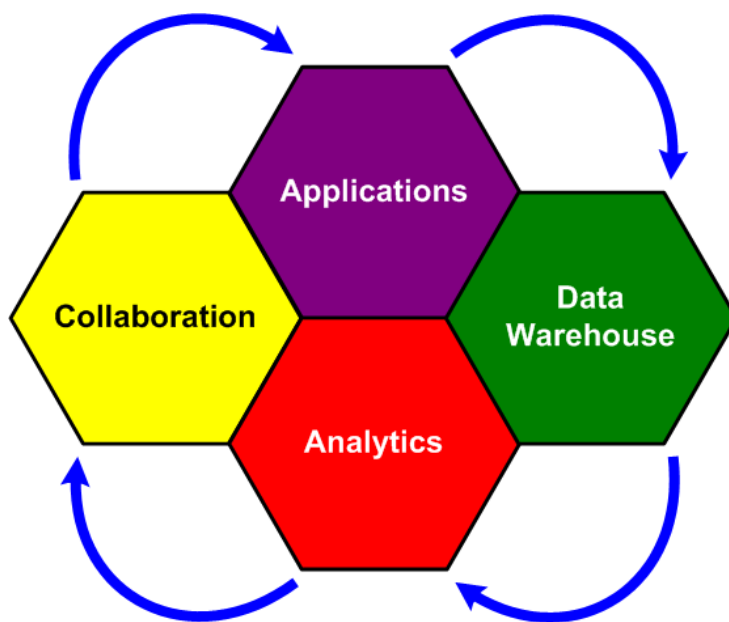


The New Era of Collaborative Business Intelligence



March 2010

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The New Era of Collaborative Business Intelligence

It is no longer acceptable to create Business Intelligence output such as reports, charts, graphs and dashboards with the intention to passively share this information with others. The era of collaborating by attaching files to emails is giving way to real-time embedded collaborative services which reflect the dynamics of business operations today. This new era of collaboration and information sharing provides the means to set oneself apart from the competition in today's very competitive business environments.

IBM Lotus continues to be the leader in the collaboration space with innovative new offerings and creative new interfaces which integrate with IBM's Business Intelligence portfolio including Cognos 8. This paper provides a historical perspective as well as a new, fresh outlook on why this technology is so critical to your success.

Evolving Architectures

Over the years, business computing has evolved from a model where hardware and software were concentrated on a single mainframe or mini computer, to the present where computing services are distributed over a range of platforms from mainframes to desktop computers and to web based cloud services. The mainframe continues to play an important role in the enterprise, hosting many mission critical enterprise applications.

Customers are demanding full integration across their hardware and software platforms. Information infrastructures have become too complex for users to be

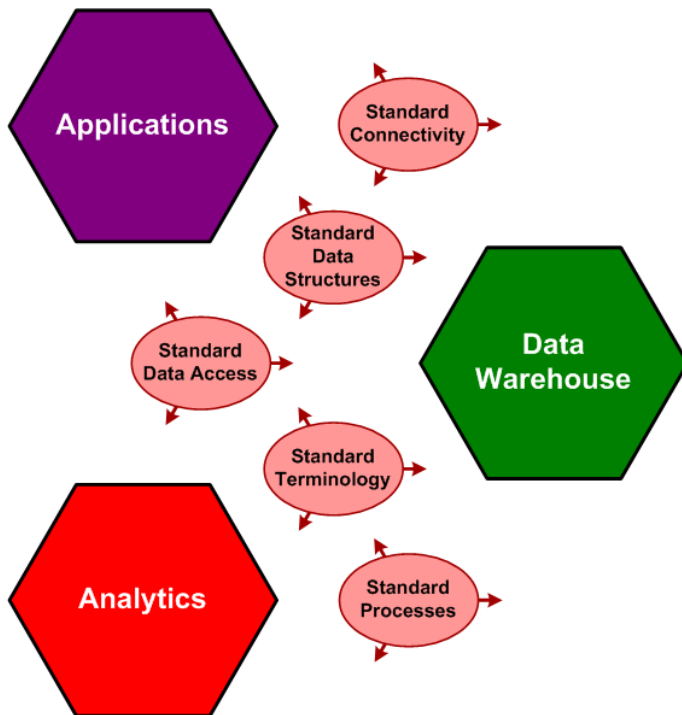
able to continue to juggle multiple applications, running on multiple systems, just to accomplish straightforward business tasks. To address this demand, IBM and other industry players have developed enterprise information architectures, service oriented architectures (SOA), aggregating interfaces such as portals and cloud based computing services.

Enterprise information architectures provide standardization across various platforms, applications and data stores throughout the organization. At the data layer this is accomplished through the use of metadata services, ETL (Extract-Transform-Load) services and other data management tools. These allow structured data from all sources to be integrated into common data stores, typically referred to as data warehouses or data marts, for easier reporting and analysis.

Service Oriented Architectures solve the problem of linking disparate applications and data sources to provide interoperation and data sharing. Modern computer infrastructures are often widely geographically distributed and consist of dissimilar hardware and software systems. Integration is

accomplished through the use of common standards for web based services which are accessed through standard web protocols. Web services and SOA are becoming the backbone for enterprise information architectures and can leverage enterprise integration tools.

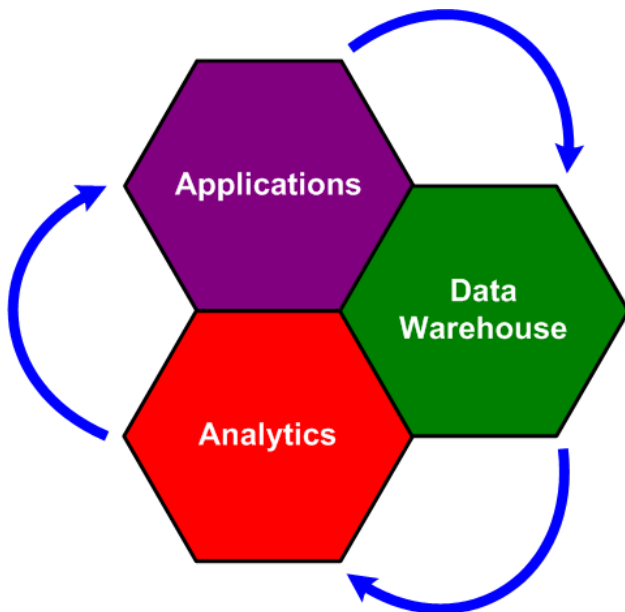
Portals provide an architecture for delivering integrated user interfaces which bring together information from any number of different back-end systems as well as a common delivery mechanism for applications. Portal components,



called portlets, can access applications, data sources and services across the enterprise and interoperate in a seamless and productive interface. Portals hide the details of the underlying applications and data structures in order to provide a unified and transparent user experience.

Cloud solutions and services hide the workings of the server infrastructure for web and portal solutions by moving them out of the enterprise and into a completely managed and self contained service. Cloud services are also referred to as Software as a Service, which targets consumer applications. In the business context, Cloud services are highly secure and can consist of off-premise, on premise or hybrid solutions, which integrate with other existing software systems. Cloud takes advantage of the same enterprise information architecture, SOA and aggregation services, but in a delivery mode which is massively scalable.

All of these information integration standards and services, with the exception of cloud, are mature and widely implemented. Cloud is a rapidly emerging technology and is being broadly adopted. The mainframe is playing a greater role in the enterprise as a result of these trends. Enterprise information architectures require the massive centralized processing and storage capabilities that the mainframe is best known for. Portals are highly processor intensive (server-based) and are best served and managed through virtualized portal services on the mainframe.



The one critical piece missing from this discussion of seamless information integration in the enterprise is collaboration. Collaboration is a critically important component of any information architecture, as it deals with the processes where human interaction is essential to getting work done. As powerful and sophisticated as computer systems might be, if they only deliver information to the desktop, they are only delivering partial value. Once information is delivered to the desktop, the real human work begins (of thinking, comparing, consulting, creating, etc.) This is the work of collaborative software. If collaboration is not integrated with the rest of the enterprise information architecture, the architecture will be incomplete and will only deliver a fraction of its

potential value. This paper describes the important steps being taken to bring this critically important collaboration service into line with an established enterprise information architecture.

Collaboration in the Enterprise

Collaboration software is a critical component of any organization's enterprise software infrastructure. For many organizations, collaboration services consist simply of email, for others they include additional services such as instant messaging, online meetings, collaborative applications, shared workspaces and more. For all organizations, collaboration software is the critical component that allows workers and colleagues to communicate, to share information, to make decisions and to implement these decisions. The trend today is to provide real-time collaboration and immediate feedback for better decision making at levels within the enterprise.

The IBM Lotus software brand literally defines the 'Collaboration Agenda' for the enterprise. Lotus offers the most complete and mature portfolio of collaborative products in the industry and continues to lead in this space.

Lotus Notes, the Lotus flagship product, provides enterprise scale email, calendar and directory services, an integrated collaboration desktop, and a platform for building and accessing collaborative applications. The Notes architecture consists of two products, Lotus Notes, the collaboration desktop, and Lotus Domino, the collaboration server. We refer to the combined product architecture as either Notes or Domino interchangeably. Notes client services can be accessed through the Notes desktop application, through a web browser and through smart phone interfaces.

The integrated Domino Developer environment brings together a rich document based content store, security, workflow and routing capabilities. The Notes platform enables the rapid development of routing, tracking, account management and other similar collaborative applications. Although other vendors provide email services, no competitors can match the completeness of the package of integrated messaging, desktop and application services that Notes provides.

The Lotus Sametime family of products provide instant messaging, online meetings and unified communications (integration with telephony vendor products). These products incorporate real time communications with the robustness and security that corporate users demand. Sametime services integrate seamlessly into the Notes desktop with presence awareness and contextual click to action.

The Lotus Quickr family of products provide shared workspaces for team collaboration. These team spaces include template based page creation, document and file sharing, shared calendars and meeting and project management. Quickr is designed to support project teams, communities of interest and ad hoc work groups. Through Lotus Quickr Connections, Quickr document management links to enterprise content management systems such as FileNet and DB2 Content Manager for seamless enterprise document management. Quickr seamlessly integrates with the Notes desktop and Sametime services to provide an integrated and comprehensive team collaboration experience.

Lotus Connections provides social networking capabilities in a business context. Connections features include shared user profiles, shared bookmarks, activity management, blogs, wikis and file sharing. Connections services integrate with Lotus Notes, Sametime and Quickr. Together they provide a comprehensive platform for business collaboration.

Lotus' new LotusLive cloud based offerings promise to make the full suite of Lotus collaboration services available through the cloud model. Lotus continues to lead the market for business collaboration through innovation, market leading products, a complete and fully integrated portfolio and its support for innovative and paradigm breaking new delivery methods such as cloud computing. Lotus truly defines the 'Collaboration Agenda' for the enterprise.

An Architecture Apart

Although Lotus leads in the business collaboration market, its products have not integrated in a meaningful way with enterprise information architectures and SOA models. Technically, this has primarily been due to limited connectivity and limited accessibility to Lotus products, which we will describe in more detail. More importantly though, this has been the result of compartmental thinking within both IBM and the broader industry.

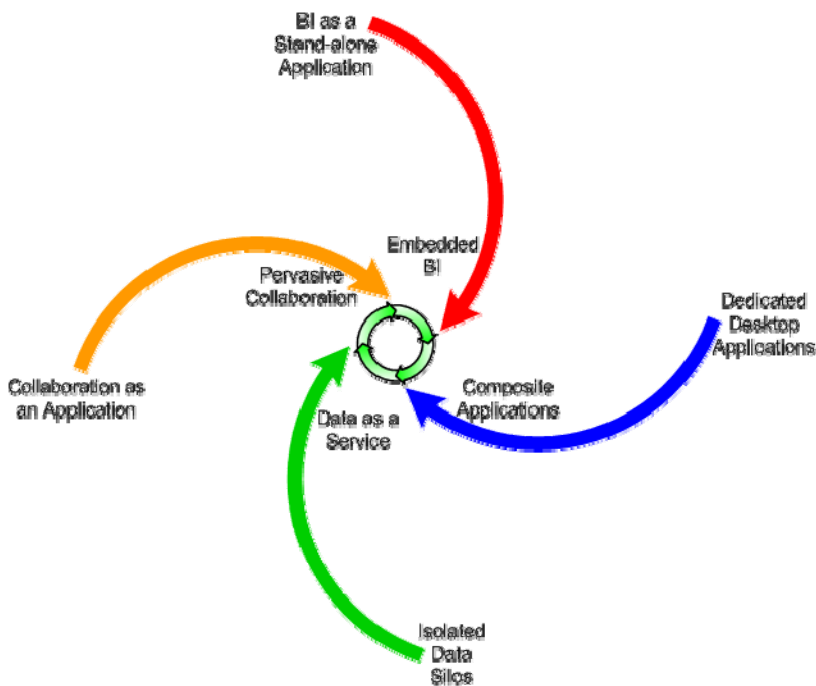
Data architects have long worked with those technologies with which they have been familiar and comfortable: relational databases, SQL query language, data warehouses and standard interfaces for reporting and analysis. All of these are mature technologies that benefit from established standards. Data architects tend to see collaboration products and services, on the other hand, as wild and

unmanageable. These products exhibit minimally structured data, loosely defined processes, lack of standardization, and, worst of all, the insertion of the unpredictable human element into an otherwise orderly world of data.

At the same time, Lotus has also seen itself as different and somewhat detached from the world of data management. Collaboration, after all, is a completely different type of software that meets different requirements, has different structures and follows different rules. Lotus' priorities have centered around building a highly competitive world class suite of collaboration products. Data integration has not been a priority and has not received significant budget or resources.

It is no mystery that this gap exists between the worlds of data management and collaboration. Whatever obstacles to better integration that have existed are no longer acceptable, as they are not conducive to an integrated business computing model. Customers are demanding solutions that integrate completely at the hardware level, at the software level, at the data level and at the user interface. Collaboration can no longer stand apart.

We have written previously about multiple levels of transformation that are converging to create a new paradigm in business computing. These include the transformation from isolated data stores to data as a service, the transformation



of stand alone business intelligence (BI) applications to embedded BI, the transformation of stand alone desktop applications to composite applications, and the transformation of stand alone collaboration software to embedded collaboration services. These forces of convergence are bringing previously isolated products together as integrated components of the new computing models that the market is demanding. Standards based integration is a critical requirement of this new convergent model. New standards and services such as SOA, portals, and composite applications require that all pieces of the business solution (hardware, software, information and human) be made able to work together as a seamless whole. Barriers to integration must be identified and removed.

We will take a look at some of the barriers that limit the integration of collaboration with data management and enterprise information architectures. We are going to focus on Lotus Notes in our discussion about collaboration

software. Although it is true that all Lotus collaboration products are not built using the Notes / Domino technology platform, it is useful to focus on Notes for several important reasons. 1. Notes is the Lotus flagship collaboration product, has been around the longest, and is most widely deployed. 2. Notes provides the collaboration desktop which serves as the primary point of integration for all the of Lotus collaboration products. 3. By addressing architectural issues of the Notes platform, all collaboration products will benefit, due to the high level of integration between the Lotus products.

Nonstandard Data Structures The Notes data store, or object store, is not relational. Notes data is document based, not record based, and consists of a compound document structure which includes field based data, rich formatted text, embedded graphics and file attachments. Notes data is stored as a self contained NSF file which contains application design, document data, view

indexes and security data. For Notes mail, each user has a dedicated NSF file; Notes applications can consist of one or multiple NSF files. There are well defined APIs for accessing and manipulating Notes data for the C, Java and LotusScript programming languages.

Notes data is not structured relational data consisting of tables, rows and columns. It is also not unstructured data like desktop files and web pages. Notes defines a different class of data which we refer to as semi structured data. Semi structured data includes both field based data elements of the standard text, numeric and date types, as well as rich, unstructured data, all within the same document container. Analysts estimate that semi structured data comprises 16% of the total information within an organization. For comparison, structured data makes up 4% and unstructured data 80%. Common examples of semi structured data include email, tracking and routing applications and collaborative account management applications (customer management, call tracking, etc.).

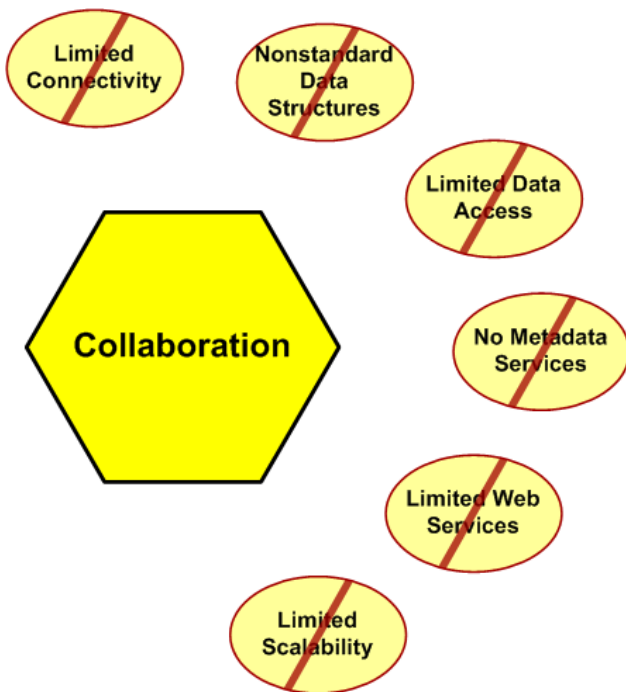
Semi structured data is important. It makes up a significant portion of the data in the enterprise - even more than structured data. But it does not conform to established data structures, neither for structured relational data nor for unstructured file based data. Existing tools for data integration do not work with Notes. Common Notes data elements like multivalue fields make it difficult to integrate Notes data with data warehouses or business intelligence tools. It is therefore difficult to integrate the semi structured data of Notes collaborative applications with other data in broader hybrid or composite applications.

Limited Data Access and Connectivity Other applications and systems are able to access Notes data via the NotesSQL ODBC driver which is provided by Lotus. NotesSQL poses a number of issues around both data access and connectivity. The ODBC architecture represents data as tabular structures and supports queries as SQL statements. Since Notes is not a structured data store, the Notes data must be transformed from the actual data structure in the NSF file to a tabular representation. There is no standard approach to doing this. The same data can be accessed through different query structures; some queries may offer reasonable performance, while for others performance will be unacceptable.

NotesSQL is implemented as an ODBC driver, and this introduces serious platform limitations. ODBC is not a true standard. It was developed by Microsoft and is available only on the Windows platform. Although there are some Linux variants of ODBC, these are not supported by the NotesSQL driver. The result is that Notes data can only be accessed by applications running on the Windows platform. This effectively rules out integration with IBM System z, System i and any Linux or AIX platforms.

Many users resort to extracting the data from the Notes NSF file and dumping it into a relational database. While this may be a reasonable approach for historical reporting, it is not a realistic solution for real time queries to collaborative applications. Data transfer tools are available from Lotus and from third part vendors. Lotus provides Lotus Enterprise Integrator (LEI) which allows for scheduled transfers to and from relational databases. However, extracting Notes data is not a complete solution. Users of the data must still contend with nonstandard Notes data structures like multivalue fields which do not conform to relational data structures or standard SQL query syntax.

No Metadata Services Metadata services are an important component of any information management architecture. Metadata definitions allow the structure



of any data source to be abstracted into easily understood and utilized data definitions. Metadata definitions allow business users to work with complex data structures, relieving them of the need to understand the technical details of lower level structures. Metadata services enable data migration to enterprise data warehouses and enable sophisticated business intelligence solutions. Metadata services also enable enterprise SOA by providing the high level views of data resources and data flows required by SOA.

There is no provision for metadata definitions in the NSF, so anyone working to access Notes data must have a developer's understanding of the underlying design of the Notes application. This prevents most business users from building reports from Notes applications using standard BI tools and makes any data integration time consuming and expensive. The lack of metadata services seriously impedes the integration of Notes data with other systems.

Limited Scalability As we have described, Notes applications (databases) are stored as separate NSF files. Due to the internal structure of the NSF, performance begins to degrade rapidly when the size of the file reaches 100-200,000 documents. This is not a problem for email systems, since each user has his own NSF file and rarely stores hundreds of thousands of messages. For collaboration applications, however, this is a critical barrier.

Notes excels as a rapid application development platform. It is relatively quick and inexpensive to build Notes applications. The result is that Notes applications tend proliferate rapidly at the workgroup or departmental level. However, very few enterprise applications are built using Notes because of these scalability barriers. Frequently a Notes application will be rolled out very successfully at a limited scale, but will run into critical performance barriers as it is scaled up to the larger organization. At this point the customer is faced with the prospect of having to completely rewrite the application on another platform, at much higher cost.

For collaboration to integrate effectively with enterprise information management architectures, collaborative Notes applications must be able to scale to the enterprise. Limiting integration to email and small scale applications is not a credible solution to the problem.

Limited Web Services In order for collaboration to integrate with other systems and hybrid applications, Notes and other Lotus collaboration products must fully support web services and SOA. To date, support for web services in Notes has been minimal; other Lotus collaboration products provide even less support. The Domino Designer development environment allows developers to build agents which can be published as web services. This must be done by Notes developers and, given the lack of Notes metadata services, is technical and difficult. It is significant that the IBM SOA Reference Architecture does not include Lotus Notes or other Lotus collaboration products.

All of these factors have continued to serve as barriers to the integration of Notes data with enterprise information architectures. However, it is not a completely gloomy story. There are exciting developments in process which promise to completely change this picture.

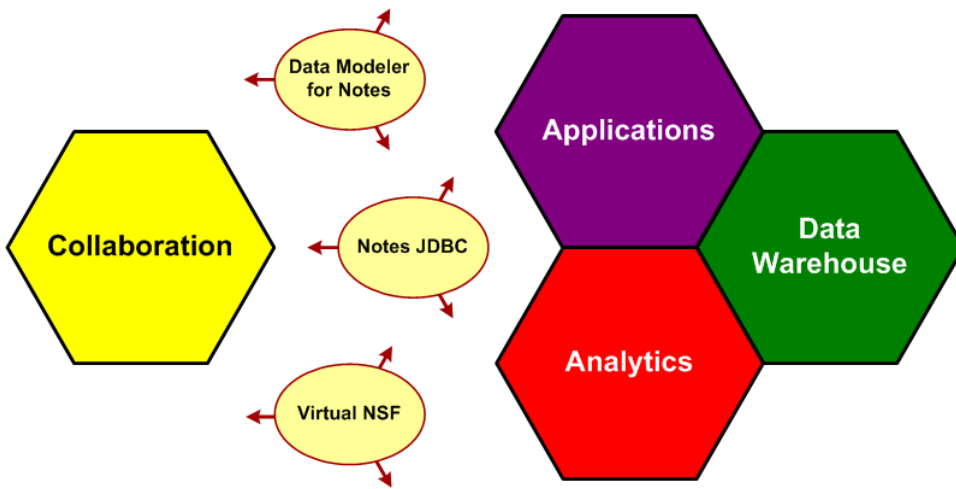
New Developments bring Lotus into the Enterprise

Sun & Son's Data Modeler for Notes is available now and enables enterprise Notes connectivity. Sun & Son in partnership with IBM is working on additional technologies which move the Lotus Collaboration Agenda more fully into the enterprise.

Data Modeler for Notes The Data Modeler for Notes removes many of the barriers to integrating Notes with the enterprise information architecture. The Data Modeler provides metadata services for Notes application databases. Data

Modeler interface takes the modeler (technical user creating the model) through the design of the application and produces complete metadata structures. The resulting metadata definitions can be published in any of several formats: vendor specific formats for Cognos or Information Builders, or the open OMG XMI metadata standard format. Cognos metadata definitions can be imported into the IBM InfoSphere Information Server, which provides complete end to end metadata management services. Additionally, Notes metadata definitions can be incorporated into SOA, helping to integrate Notes data services into enterprise architectures.

By creating metadata models for Notes application data, the Data Modeler supports a separation of roles between the modeler, who has a technical understanding of the structure of the database, and the business user, who simply uses these models to build reports. Previously, any user seeking to



access Notes data had to have a technical developer's understanding of the underlying application structure. While the modeler still has to have this technical knowledge, nontechnical business users do not need to understand the underlying data structures. Thus, once a model has been built it can be published and used by any number of nontechnical users.

The Data Modeler also improves the accessibility of Notes data. The Data Modeler supports two data access modes: direct access and external staging. With direct access, data models access the Notes NSF directly via ODBC. The Data Modeler takes care of optimizing query performance so that the modeler does not have to worry about this. With external staging, the Data Modeler automatically stages the data referenced in the model to a relational database, e.g. DB2, Oracle or SQL Server. Additional data migration tools are not required; this is handled transparently by the Data Modeler DataBridge component.

When using external staging data access mode, the modeler has the option of mapping Notes multivalued fields to true relational table structures. The Data Modeler DataBridge creates and populates all of the required tables. This removes a significant barrier to integration posed by the nonstandard Notes multivalued field data structure. With external staging, the Data Modeler also supports Notes document level security in Cognos reports. It does this by mirroring the Notes document security parameters to the relational database and building document access logic into the metadata model itself.

The Data Modeler removes many of the barriers to Notes integration and allows data architects and report designers to start integrating Notes data today. The Data Modeler by itself does not address all of the barriers we have identified, but there are additional projects now underway which fill out the Notes data integration picture.

Notes JDBC Driver The Notes JDBC driver is a proposed joint development project between Sun & Son, Lotus and the IBM Server & Technology Group. When complete, it would be available from and supported by IBM. The JDBC driver addresses limited data access and limited connectivity obstacles to Notes integration through improved real time access. The JDBC driver is designed for high performance access to Notes / Domino data sources from any platform,

including System z, System i, AIX and Linux. The JDBC driver will plug into an upcoming release of the Cognos BI Server to provide seamless Cognos connectivity.

The Notes JDBC architecture incorporates the Derby open source database as an intermediate data store to provide fast sort and aggregate operations on query results. By including the Derby database, the driver is able to virtualize relational data tables for Notes multivalued fields in much the same way that the Data Modeler does now for staged data.

The combination of the Data Modeler and the Notes JDBC driver creates a full featured tool set for integrating Notes application data with enterprise business intelligence, data warehouse or SOA architectures on any platform. Notes data can be accessed directly in place or staged with full feature parity and fidelity.

Virtual NSF Virtual NSF is a proposed extension architecture for the Notes / Domino NSF data structure that eliminates the scalability limitations of the current NSF structure. With Virtual NSF, a Domino application can grow as large as it needs to serve enterprise requirements. Virtual NSF is ideal for cloud based Notes applications since cloud systems could theoretically grow to any size. With Virtual NSF, Notes ISVs can sell their solutions to much larger opportunities than can now, and move their Notes applications to IBM cloud services.

Virtual NSF exploits the inherent strengths of IBM System z to make it the ideal platform for enterprise scale Notes / Domino applications. IBM is in the process of consolidating its own information services into a z based data cloud architecture. IBM's Domino email also runs on System z. The Virtual NSF capitalizes on the massive scalability of this platform to deliver enterprise scale collaborative applications.

The Virtual NSF manager is a services layer that sits on top of the Domino server on System z. The current NSF architecture combines documents, design, view indexes and security information in a self contained NSF file. Virtual NSF distributes this NSF content across multiple content stores to eliminate performance limitations. The NSF structure is optimized for managing semi structured data. Virtual NSF continues to store documents and design in NSF files, but distributes them over multiple containers. As a Notes application grows, the Virtual NSF manager can spawn additional NSF containers or additional Domino servers as required.

The view indexes in the NSF are tabular data and are not particularly well suited to the NSF structure. In fact, view index performance is a significant limitation to Notes scalability. Virtual NSF moves view indexes out of the NSF and into DB2, where they are not limited to size or performance. The Virtual NSF manager automatically maintains links from the view indexes to Notes documents, wherever they are stored. By storing the view indexes in DB2, enterprise connectivity is also enhanced. The bulk of queries against Notes from external applications are executed against the view indexes, not against the documents themselves. Since Virtual NSF stores the view indexes in a native relational structure in DB2, these queries can be executed through standard high speed DB2 drivers using native SQL query syntax.

To a user with a Notes client or a browser, the Virtual NSF application looks the same as a native Domino application. Virtual NSF services are completely transparent. Users can make local replicas of subsets of data for disconnected use and replicate their changes back to the server, just as they do now with standard NSF structures.

For application developers, Virtual NSF presents new opportunities and a slightly different development environment. Certain Domino application features that are not relevant to very large databases are not supported. For example, unread marks become meaningless in a virtual database which could contain millions of

documents. Similarly, it becomes pointless for the user to press the F9 key to refresh the display of a very large view.

For very large databases, views will take a much less important role than they do now in Notes application design. With the current NSF architecture, the view is the only interface available for visualizing a collection of documents. For this reason, many applications end up containing hundreds of views, each supporting different required presentation formats or reports. Since a view is essentially a list of documents, the utility of views decreases as databases grow larger. With the availability of seamless enterprise integration, application designers can now use sophisticated BI reporting and analysis tools to generate the reports, charts, scorecards and dashboards they need to present Notes data. We believe the role and usage of Notes views will decline significantly as developers start building hybrid solutions which include Notes, BI and relational data.

Virtual NSF brings together the power of Domino, DB2 and System z to provide a continuously scalable platform for collaborative Notes / Domino applications. Virtual NSF includes all of the technology packaged separately as Data Modeler for Notes and Notes JDBC, providing a full featured and complete enterprise ready collaboration platform.

XPages

XPages is a new development environment in Lotus Domino Designer 8.5, which allows developers to build modern Web 2.0 interfaces for Domino applications. XPages is based on Java Server Faces and is fully integrated into the Domino environment with full support for the Domino object model and JavaScript support for Notes formula language. We expect that Lotus will extend XPages as a common development environment for all of its collaboration products.

XPages supports the Notes NSF structure, in fact XPages applications are included as design elements within the NSF. The XPages architecture makes Notes applications more manageable, supporting a complete MVC (Model View Controller) architecture by moving presentation and business logic out of Notes forms and into a new set of design elements. Data structures continue to be defined in Notes Forms and content stored in Notes documents. XPages components can access data from both NSF and non-NSF data sources, can combine multiple data sources onto the same page and provide more flexible view rendering that promises to reduce or eliminate the proliferation of views in Notes applications.

XPages offers a number of important benefits to Notes customers and developers. First and foremost, it provides a powerful development environment, based on open standards, for building modern web interfaces for Notes applications. Existing Domino Designer tools are dated and web development for Domino has been a fussy and convoluted process. XPages can be used to build new Notes applications or to retrofit existing applications with new, more modern interfaces. XPages promises to make Notes applications more maintainable through its use of shared components. XPages also promises an incremental improvement in application scalability through reduced server processing and by eliminating the need for scores of views in each Notes application.

The enterprise integration technologies we have discussed, Data Modeler for Notes, Notes JDBC and Virtual NSF, all work well with XPages and complement the XPages capabilities. These technologies remain essential for enterprise integration. XPages does not provide standard metadata definitions or services. XPages is an application development tool, not a reporting or analysis tool, so it does not reduce the requirements for metadata modeling and enterprise access. XPages offers the possibility for incremental scalability improvements; it does not offer the order of magnitude greater scalability that Virtual NSF will provide.

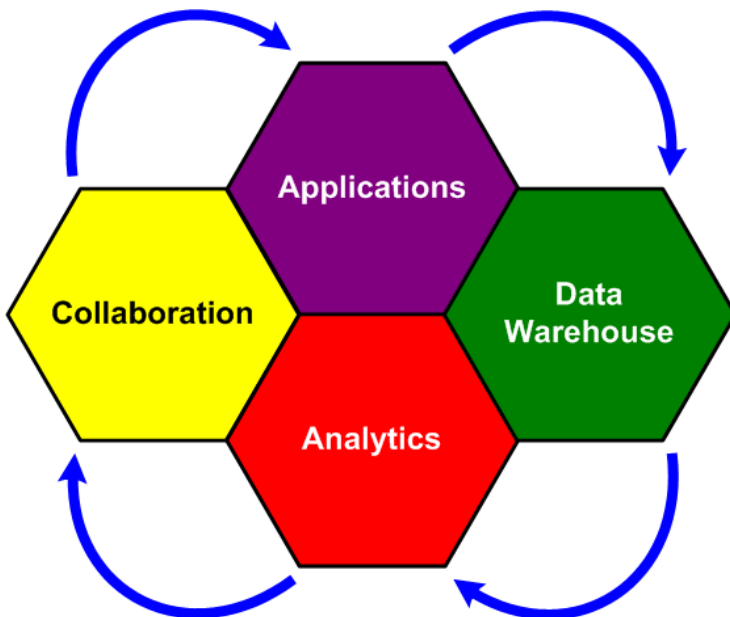
Scalability is improved only if the application is written to only use XPages design elements. It offers no benefit to existing applications without modification. If Lotus customers had budgets available to rewrite their existing applications, many would have already moved away from the Notes platform. Although Lotus is working to support its customer base migrating to Notes/Domino 8.5, most customers are still running prior versions.

XPages is an exciting new technology and an important enhancement to the Domino development environment. It does not address the critical shortcomings to enterprise integration that we have pointed out. The Data Modeler for Notes, Notes JDBC and Virtual NSF all work together with and complement XPages to provide an enterprise ready development and information management platform for Notes.

New Opportunities for Integrated Collaboration

The developments we have described create a world of new opportunities for integrating Lotus collaboration with enterprise applications and data services.

With enterprise integration, Lotus Notes becomes a first class player in the enterprise information architecture, tightly integrated with the data warehouse



and business intelligence. Notes applications become readily accessible data sources for data warehouse and business intelligence services. Notes data sources become manageable at the metadata level with tools like the InfoSphere Information Server for enterprise scale metadata management. Lotus collaboration can be directly embedded in BI reports, scorecards and dashboards, enhancing the utility of BI components. Live links to rich Notes documents from BI reports enhance the power of BI with the rich content and powerful collaboration capabilities of the Notes platform. Through the Data Modeler for Notes, Notes JDBC and Virtual NSF, obstacles to seamless integration of Notes with information management and business intelligence are eliminated. Cognos BI becomes the preferred tool for visualizing and analyzing Notes data. Notes users are no longer limited to seeing Notes data as Notes views. They can now view their Notes applications through BI reports, charts dashboards and scorecards. At the same time, BI objects can

be securely imbedded in Notes applications and messaging for distribution, routing and workflow processing.

The enhanced scalability of Notes applications extends Lotus collaborative applications to the enterprise. Existing Notes applications can be scaled up from the departmental level to the enterprise. This eliminates the expense of replacing otherwise successful Notes applications with completely rewritten applications on other platforms. Existing Notes applications that have been segmented to get around limitations of scale can now be consolidated for easier administration, application maintenance and reporting. Enterprises can build completely new collaborative applications with the assurance that their investments in new development will be secure and return value over a reasonable life cycle.

The combination of greater scalability and better integration at the services level creates major new opportunities for hybrid applications. Hybrid applications combine traditional relational data structures with the semi structured data of Notes. Existing structured applications can be enhanced to add collaborative

capabilities through collaboration services exposed as web services or through new features that integrate collaboration and semi structured data. Notes applications can be joined to structured applications, either at the application level or through aggregating interfaces such as portals and composite applications. New enterprise applications can be designed from the ground up as completely collaboration enabled. By eliminating the barriers of accessibility and scalability, all enterprise applications can become fully collaborative.

The cloud model presents more opportunities for fully scalable Notes collaborative applications. Since the infrastructure behind cloud services is completely transparent, cloud solutions must be able to scale to any size. Now cloud based applications will be able to be fully or partially built using the Domino platform to provide cloud based collaboration solutions. Enhanced Notes connectivity allows hybrid cloud solutions that access existing applications and data systems. Independent software vendors (ISVs) with Notes applications can confidently sell these as fully scalable cloud solutions and are no longer limited to selling their solutions at the departmental level.

Enhanced scalability and connectivity create new opportunities for enterprise customers, for ISVs and for cloud services. They also create new integration services opportunities for IBM and partners. Enterprise integration services are the mainstay of the IBM Global Technology Services group. New integration opportunities around enterprise applications, application consolidation, hybrid applications and integration of collaboration with business intelligence and information management will drive new demand for high value technical services. To integrating collaboration with other enterprise information management services requires technical skills in all of the component platforms. As an example, Cognos BI skills are very different from Lotus Domino application skills, but both are required together to successfully integrate these products. Many IBM customers will not have these diverse skills in house and will look to IBM and IBM partners to provide these critical integration services.

Enterprise collaboration will deliver new opportunities across the board. It will create new opportunities for customers to realize higher value from their existing assets and through better integration. It will create new opportunities for IBM through new product, services and cloud opportunities.

Leveraging the Power of IBM Hardware and Software

These developments leverage the power of IBM hardware and software products and offer higher value to IBM customers through tighter integration and seamless interoperation.

IBM System z is a primary beneficiary of enterprise scale collaboration. IBM's mainframe systems play an important and growing role in enterprise computing. System z performance and economics are unmatched for enterprise solutions. IBM is aggressively moving its Cognos BI product to the mainframe as part of a completely integrated enterprise data management and BI suite. In the past, collaboration rarely touched the mainframe. Now, with enterprise level accessibility and scalability, Lotus collaboration is finding a natural new home on the mainframe. System z will grow in prominence as a preferred platform for messaging, collaborative applications, hybrid applications and cloud based collaborative solutions of all kinds. New developments in mainframe based management of distributed systems will put System z squarely in the middle of the entire enterprise computing model.

IBM System i benefits from enhanced Notes accessibility. Domino is dominant on System i as a messaging platform, but the opportunities around collaborative applications have been largely untapped. Now, tight integration between Domino, native DB2 and i based business intelligence products create major new opportunities for Lotus ISVs, corporate developers and information managers.

For Cognos, tight integration with Lotus collaboration will differentiate it from competing products and make it a compelling first choice for corporate BI standardization efforts. None of the major competitors in the BI market has a credible collaboration message. CEOs are seeing improved collaboration as an important route to realizing higher value from human and software investments. Business intelligence and collaboration are a natural combination.

For IBM's DB2 software, particularly DB2 on System z, integration with Lotus collaboration delivers multiple benefits. Since DB2 on z is a core component of the Virtual NSF architecture, Virtual NSF deployments will create new business opportunities for DB2. The integration of collaborative data with DB2 will be an important competitive feature differentiator for DB2. The enterprise database market is very competitive and it is dominated by DB2 and Oracle. Both products are mature, powerful and roughly equivalent in functionality. By adding integrated collaboration, DB2 differentiates itself in ways that can lead to significant new competitive wins in the marketplace.

The IBM WebSphere and InfoSphere product groups focus on enterprise application development and metadata management respectively. Both are enhanced through seamless enterprise collaboration and connectivity to collaboration data.

The benefits and opportunities created through enterprise collaboration integration go far beyond the IBM Lotus brand. Positive benefits flow through to most of the software group brands and well as to important Server & Technology Group brands.

Summary

Recent developments enhance the accessibility and scalability for Domino collaborative applications and the entire Lotus collaboration portfolio. The enhancements make Lotus collaboration enterprise scalable and enterprise ready. These developments bring Lotus Software to the enterprise data management table as an important player. This in turn will create significant new opportunities for IBM, IBM customers and IBM business partners.

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