

**Achieving Real-Time Multi-INT Data Fusion:
Using Objectivity/DB to Correlate Multiple Data Sources**

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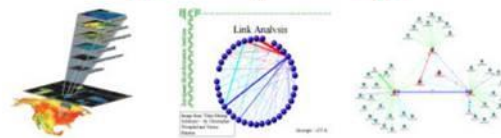
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Diverse
Inputs



Diverse
Usage



Introduction: This White Paper discusses practical ways of deploying Objectivity/DB as a hub for integrating data from multiple sources. There are many approaches to consolidating multisource data. Data warehouses are popular in traditional information technology departments. Data fusion is a difficult problem confronting users of geospatial and sensor data. Users of criminal investigation or intelligence data need to store and correlate vast amounts of disparate information, ranging from text, images, video and voice to various kinds of specialized intelligence data (such as SIGINT, ELINT, RADINT, TELINT and COMINT).

This White Paper examines the technical challenges faced by designers of advanced data integration systems. It contains technical case studies describing how to use Objectivity/DB to overcome these challenges. It then briefly outlines the pertinent features of Objectivity/DB and outlines material that you can use to evaluate the suitability of Objectivity/DB for your own project.

The Technical Challenges

Making Better Use of Complex Data: It is relatively easy to obtain data

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from multiple, similar sources. Some common mechanisms include:

- Using ODBC to access data in multiple relational databases
- Using messaging protocols such as CORBA or RMI to remotely invoke functions that can manipulate or transfer small amounts of data.
- Using XML to transfer object definitions and data between systems.
- Adopting a common structured file format, such as a JPEG or GIF bitmap.
- Using database triggers to snapshot data out to files or messages that are sent to other systems.

Complex data, such as data from a CAD system, a bioinformatics system or a remote sensor is much more difficult to store and manipulate. Conventional search languages do not include the ability to search voiceprints, images, fingerprints, solid [mechanical] models, SONAR, RADAR and many other kinds of complex data. Most of these data types can only be represented as opaque BLOBS in relational databases. They do not translate readily to generic data definition languages such as XML and the datasets can often be very large with a huge number of inter-relationships. They generally reside in structured files and can only be indexed with the help of humans or by encoding knowledge of some of the key data types within the file. Many repositories resort to brute force searches of these files in the hope of finding recognizable text strings.

The “Needle in a Haystack” Problem: There is a big difference between owning data and being able to find pertinent and timely information hidden within it. Many organizations routinely collect and file masses of information but lack the means to interpret its real meaning, or to extract all of the facts relating to a known item or event. Furthermore, the rate at which data is being collected or generated is rising exponentially. This issue is characterized as the “needle in a haystack” problem.

One part of the problem is that legacy databases can only store and query relatively simple information. They were not built to manipulate the many kinds of complex data that are being collected and processed in today’s

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systems. Increasing demands, particularly in the areas of Homeland Security and national defense, will place even greater strains on the legacy systems.

Another major issue is that most data mining tools were built to deal with relatively simple business data. They are not good at following and exploring relationships between data items, particularly where there are many types of relationship. In many cases the relationships between items only become clear as the users' explore existing data to solve a problem. Users must be able to define and record newly discovered types of relationship. Storing these relationships and building increasing numbers of indices over frequently used data puts an added burden on legacy systems.

Each new relationship may add a new JOIN table, adding to the complexity and overheads of queries that explore the relationships between data items. Each new index adds to the processing and I/Os that must be done to add new data. Once an index is added it must cover all instances of that type of data, which may be overkill.

Greater Volumes of Data: The increased power, capabilities and adoption rates of computers and communications systems are generating exponentially increasing amounts of data. Any attempt to centralize all of this data in a single database repository is doomed to failure. Published statistics on relational database usage show that the largest current databases based on that technology are around fifty to sixty Terabytes in size. Recent hardware storage architectures are designed to accommodate Petabytes and even Exabytes of data files, so the physical storage isn't a problem (other than its cost, perhaps).

The problem is that maintaining central server databases becomes very difficult as the number of data types and data instances grows. Discovering and defining new relationships between the data can significantly increase this complexity, to the point where relational indices and JOIN tables add to the problem rather than offering a simple solution¹.

¹ There is a good discussion of this problem in an article by Richard Winter in "Intelligent Enterprise" magazine.

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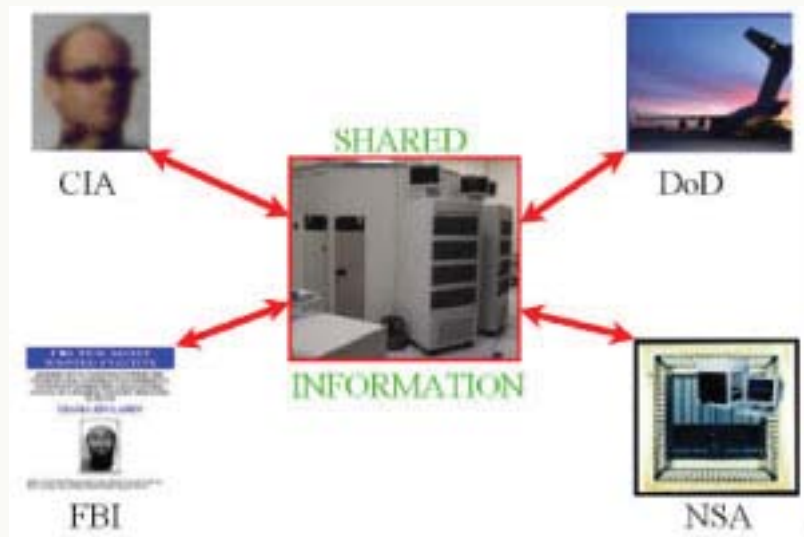
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Information Sharing: There is a growing need to share information across organizations. Users need a single logical view of the data relating to the situation that they are dealing with. This view needs to be governed by the security policies of the various organizations that are sharing the information. It must also be possible for organizations to add new types of data and relationships to existing databases, even when the ownership of that data may reside elsewhere.

Intranets and extranets are a partial solution to this problem, but they only apply to textual data. Sharing information across databases raises many other issues, such as:

- Data access protocols
- Data quality assurance
- Data security
- Application change control
- Potential impact on local system performance.



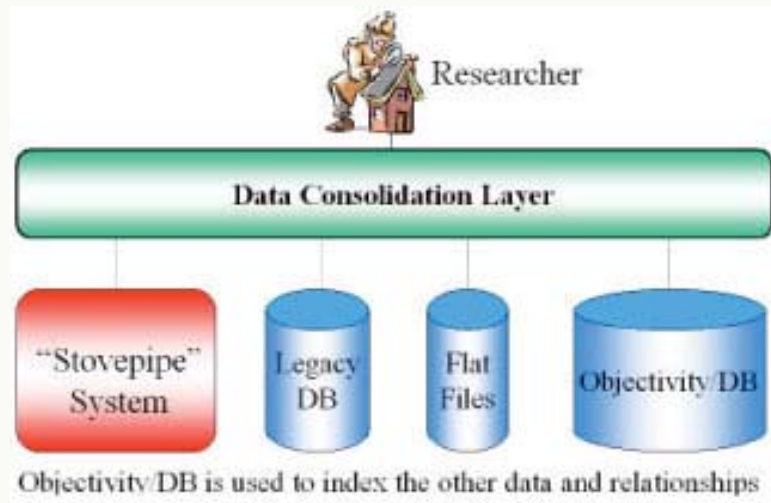
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CASE STUDIES

CASE STUDY 1 - Indexing Multiple Data Sources

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A Consolidated Credit Union Member Database: In January of 1998 Credit Union of North America [CUNA] set out to help its associated credit unions offer better services to their members by creating a consolidated member database. Previously data was spread out over disparate, policy number keyed databases rather than one with a member focus. CUNA had spent over \$1 Million on a previous attempt to use an RDBMS to solve the problem, but had experienced huge difficulties in mapping the required object model to the legacy technology.

Complexity - The data consisted of over 50 million records from over 5000 sources. There were over 4000 file formats representing over 30 million individuals. The database has since grown to over 100 million records and is over one terabyte in size. CUNA used parallel processing to load 18,000 objects and hash table entries per second into multiple Objectivity Databases in a single Federated Database

Performance - The initial task was to load the records and create sorted proxies that reference the original data source. A sophisticated rule-based match and selection process refined the proxies for business object creation,

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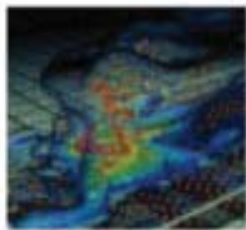
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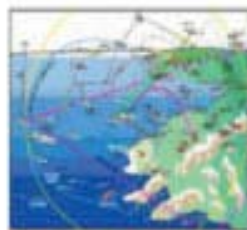
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determining, for example, which of John Doe’s addresses is the most recently verified. The final step was to create multi-level hierarchies that allow the user to view increasing levels of detail. Member lookup times average around one millisecond.

**CASE STUDY 2 – Data Integration
 A Distributed Crisis Management and Tracking System**



Weather



C4ISR



Geospatial



Intelligence



Documents



Logistics

This system integrates geospatial and weather information with crisis event tracking and logistical information in a distributed, online whiteboard environment. It checks planned or actual actions against an expert knowledge base to ensure compliance with mandatory rules and good practice. The users can:

- Display, browse & amplify data
- Generate briefing documents
- Review mission requirements
- Review, analyze and simulate a plan
- Teleconference with other planners

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Scalability - In a non-crisis mode the system typically has hundreds of users and during a crisis mode it may have thousands of users.

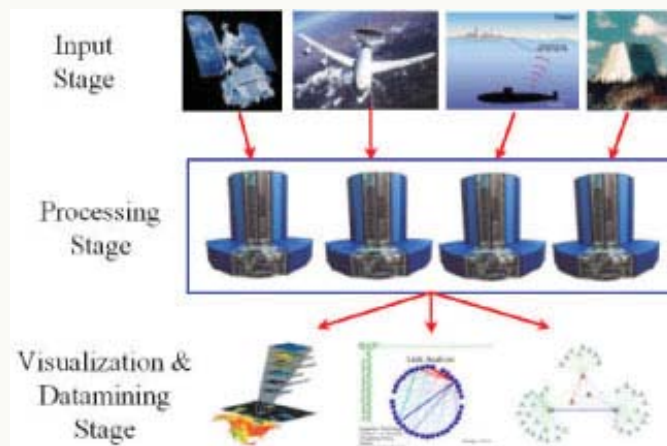
Flexibility - The system providers need to add new features, analysis functions and remote servers seamlessly into the deployed application.

Survivability – Failure of one location must not affect any of the other Defense organizations working on the crisis. Objectivity/DB is fully distributed with a Single Logical View, so it was easy to meet this user requirement.

Reliability - The system has to be up 24 hours a day, 7 days a week. Objectivity/Fault Tolerant Option and Data Replication Option were key discriminators.

CASE STUDY 3 – High Performance Computing

A Massive Data Acquisition, Number Crunching and Information Dissemination System



The Stanford Linear Accelerator Center [SLAC] BaBar Database System provides data persistency for the BaBar project. It is probably the largest unclassified database in the World. The vital statistics are impressive:

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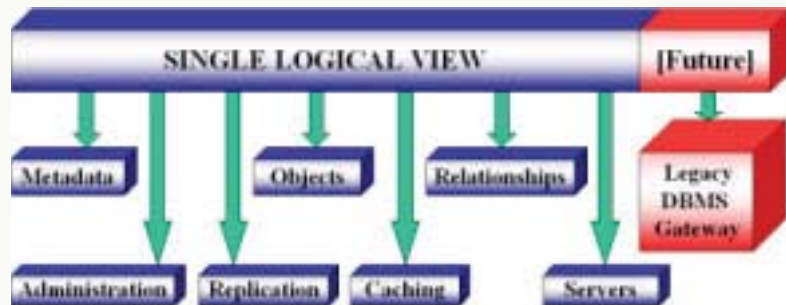
- There are over 5 million lines of custom written C++ code.
- There are over 2000 CPUs and 100 lock/data servers.
- There is over 750 Terabytes of data within the Objectivity/DB databases, stored in more than 45,000 database files.
- Data is shared by 76 organizations in North America and Europe.

The data is complex, with many variable length arrays and relationships. Each accelerator event requires many teraflops of compute power to render the raw data into information that is useful to the physicists.

This system is directly analogous to the pattern seen in many commercial and intelligence systems. There are three stages in the pipeline: a raw data input stage; a number crunching and data correlation stage; and a data interpretation and dissemination stage.

CASE STUDY 4 – A Heterogeneous Federation of Databases

Exploiting the Architecture of Objectivity/DB



Objectivity/DB provides a Single Logical View by storing objects within databases in a Federated Database. The Objectivity/DB Storage Manager currently manages and structures all of the databases. However, it would be feasible to add a Legacy DBMS Gateway to the architecture. This gateway could use ODBC, or possibly middleware such as Oracle’s Toplink, to service requests made by the Object Manager.

The advantages of this approach are:

- Data remains under the control of the existing systems.

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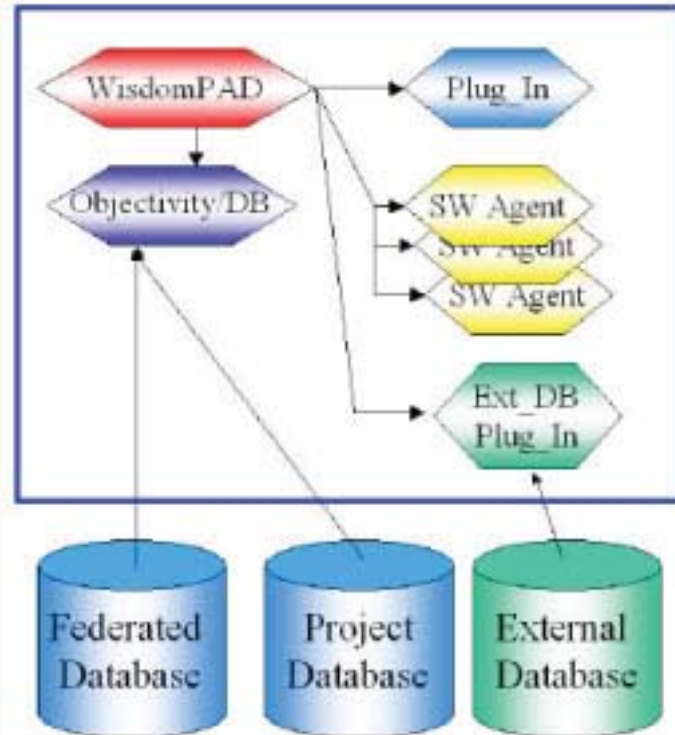
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- Object Oriented applications use a single API to access heterogeneous data sources.
- Frequently traversed objects and relationships can be represented by proxies within Objectivity/DB. This eliminates the cost of expensive join operations.

Coupling Objectivity/DB with a parallel, RAM-based data mining tool could significantly speed up complex searches across large datasets, effectively solving the “Needle in a haystack” problem.

CASE STUDY 5 – Intelligence Analysis System

Built using a collaborative work environment



WisdomPAD™ is a web-enabled collaborative work environment for supporting a variety of activities including modeling, planning, assessment and

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decision support. Its main features are:

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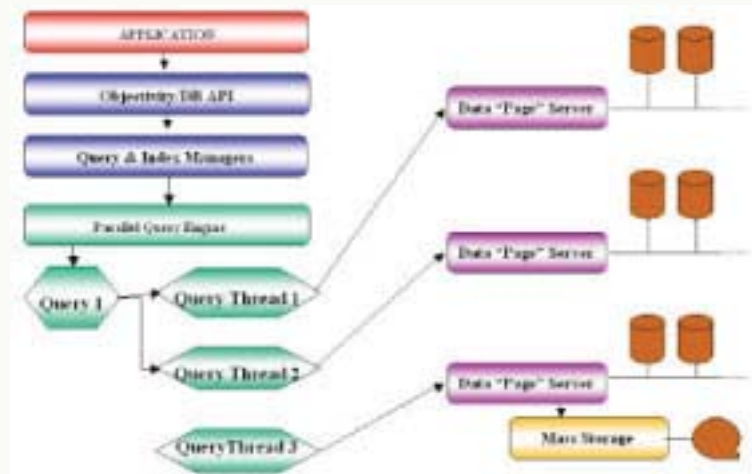
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- **Flexible Configuration for Turn-key Solutions.** Users select appropriate methods and can add new methods.
- **Software agents** classify open source information in line with hypotheses under consideration, a process termed hypothesis pull.
- **Decision framing** Encompasses all concerns and perspectives of the participants for collective consideration of all the issues based on the best data and information.
- **Access to Decision Data Anywhere** Uses software agents for data mining and organization of interesting evidence.
- **History and Archives**
- **Plug-In Architecture.** The system is open and adaptable.
- **Object-Level Access Control.**
- **Powerful Object Modeling and Scalability.** Provides the power and scalability of persistent object modeling, manipulation and storage afforded by Objectivity/DB™.

CASE STUDY 6 –A Parallel Search Engine

Exploiting the Objectivity/DB Storage Architecture



The time that it takes to search for an unindexed object in a very large

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database is governed by the speed of the I/O hardware. Sequentially scanning a 100 Terabyte federation for a single unindexed object could take FOUR YEARS! However, a fairly simple modification to Objectivity/DB opens up the possibility of parallel scans of only those containers known to hold objects of the required type.

A Parallel Query Engine would look at system information to rapidly determine the identities of containers that might contain instances of the required object. It would then use a user configurable number of threads, probably running close to the appropriate page servers, to iterate over the objects in each of the target containers. In an ideal case the number of threads would equal the number of containers. For simplicity, the diagram illustrates a case where there is only one target container “behind” each Page Server. In practice there would probably be many and there would be more query threads.

In the example cited above, the search time for the sole object of a given class, residing anywhere in the federation, would be reduced to around FOUR SECONDS [assuming 50,000,000 containers, database file sizes around 2 Gb and adequate hoarware].

Objectivity Advantages

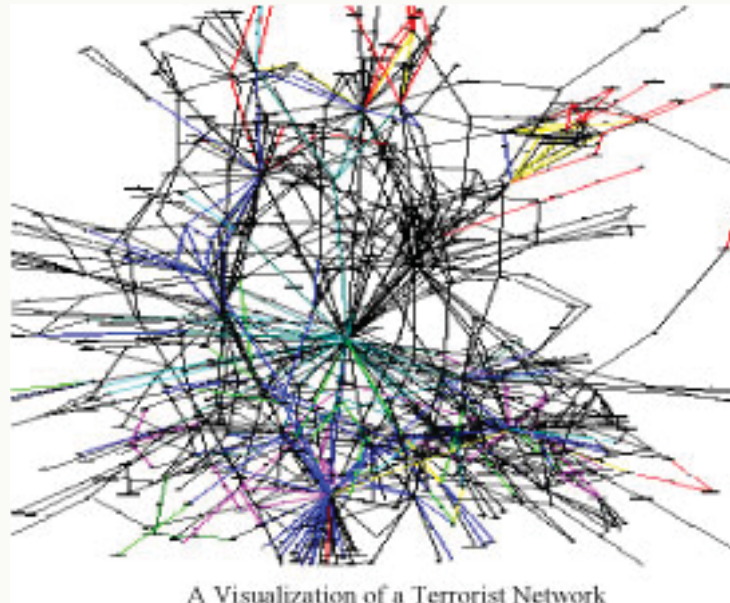
	Indexing Multiple Sources	Data Fusion	HPC	Federating Databases
Complex Object Model	Yes	Yes	Yes	Yes
Active Schema	Yes	Yes		Yes
Data Clustering	Yes	Yes	Yes	Yes
Data Replication	Yes	Yes	Yes	Yes
Distributed Architecture	Yes	Yes	Yes	-
High Availability	Yes	-	Yes	-
Lower administration	Yes	Yes	Yes	Yes
MROW	Yes	Yes	Yes	Yes
Performance	Yes	Yes	Yes	Yes
Scalability	Yes	Yes	Yes	Yes
Schema Migration	Yes	Yes	Yes	Yes

- Complex Object Model** – Complex object models are easier to map into Objectivity/DB and this allows very fast navigation to related data.
- Active Schema** – Object classes can be created, changed and populated dynamically.
- Data Clustering** – Objects are grouped in databases held close to the controlled NEs.
- Data Replication** – An element’s data may be replicated on another node, allowing the system to function in the case of an agent failure.
- Distributed Architecture** - Allows data to be located closer to the point of use, with a single logical view of the system for all system components.
- High Availability** - The system employs fault-tolerant hardware and Objectivity/DB to help ensure non-stop operation.
- Low administration** – “Close to Zero” administration is a main requirement.
- MROW** - Multiple Reader, One Writer mode provides the highest possible level of concurrency.
- Performance** - The performance of the EMS is essential to enabling it to manage an economical number of NEs. Using Objectivity/DB allows the system to accomplish this performance goal with very lightweight requirements, maximizing the usefulness of system resources.
- Scalability** - as the system grows the application will be able to handle the growth by adding systems and databases to the federation with no changes to the system configuration.

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OBJECTIVITY/DB MEETS THE TECHNICAL CHALLENGES

High Performance with Trees and Networks of Objects



High performance is critical in data correlation applications. The object models are often highly complex tree or network structures. Object models expressed in UML can be imported into Objectivity/DB via tools such as Rational ROSE and ROSElink for Objectivity. XML models (and data) can be imported and exported with Objectivity tools, making it easier to move metadata and data between disparate systems. Objectivity/DB can directly represent and manipulate standard C++ and Java collection classes, such as trees, sets and lists. The Scalable Collection Classes are a standard part of the C++ and Java APIs. Objectivity/DB also supports persistent versions of the C++ Standard Template Library collections.

Navigation & Inheritance Mechanisms

FASTER NAVIGATION - In this example, an RDBMS query that needs to find all of the Suspects associated with an Incident would perform $2 * N$ accesses to the B-Tree indices (where N is the number of Suspects) and $2 *$

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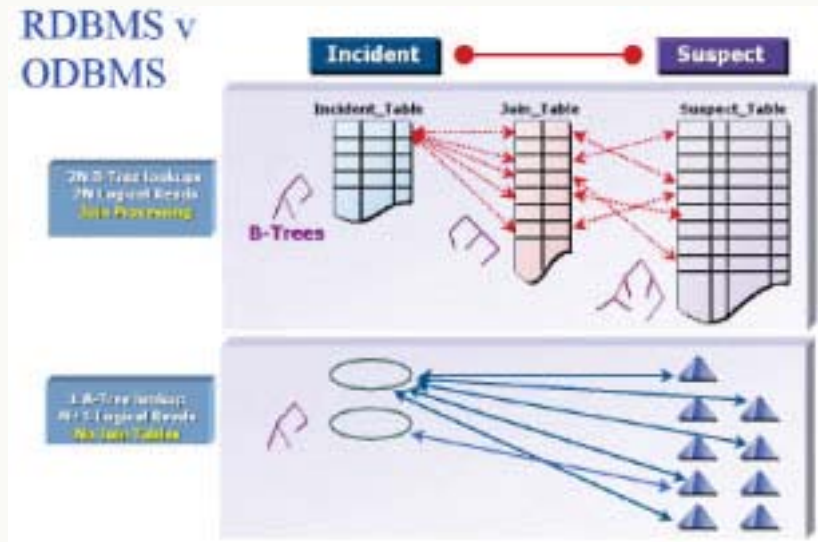
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N logical [row] reads into the Join table and the Suspect table. Objectivity/DB only needs 1 B-Tree access and (1 + N) logical reads.

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INHERITANCE - As the inheritance class hierarchy grows deeper the relational database has to create more tables and execute more JOINS, so performance degrades. Objectivity/DB handles inheritance deep within its kernel to ensure high and consistent performance.

High Performance Clustering and In-Memory Caching

Clustering reduces the number of physical I/Os needed to access a group of related objects. The application designer can cluster objects that are generally accessed together into a single logical “page”. Reducing the number of I/Os needed to service a transaction can dramatically shorten transaction times and increase overall system throughput.

Caching reduces I/Os by attempting to keep frequently used data in RAM; or by reusing RAM immediately if data is being streamed to or from disk. Frequently accessed data, such as dictionaries or glossaries, may be locked in memory. Incoming video (or other binary data) may be streamed to disk through a small RAM cache.

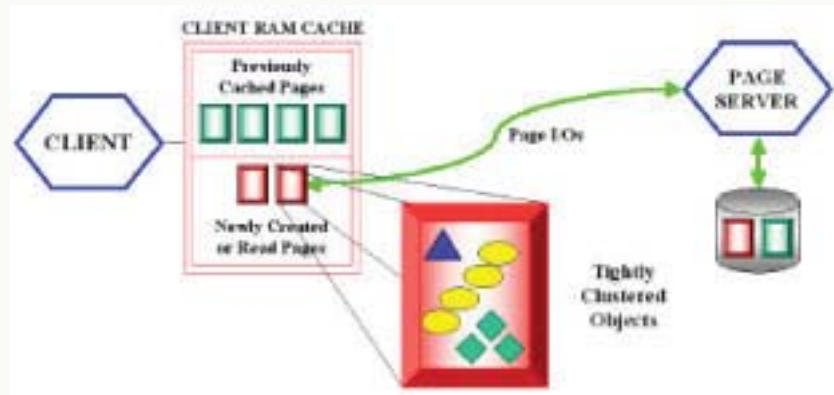
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In Objectivity/DB the clustering and caching strategies are defined at runtime on a per-thread basis, unlike RDBMSs that rely on a database administrator to control server behavior.

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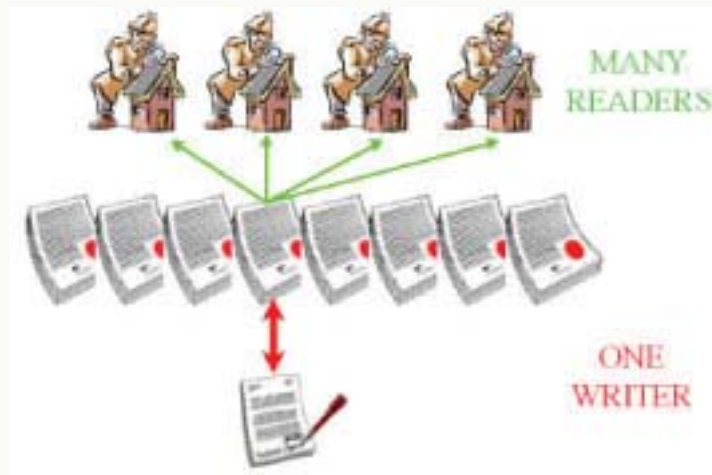
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High Performance with Concurrently Accessed Objects

MROW [Multi-Reader One Writer] - Many algorithms examine large amounts of reference data while processing new data. **MROW** provides readers with a consistent view of committed data while one writer is updating that set of data. **MROW** is more effective than fine-grained locking because it eliminates the need to repeatedly set and release read locks.



IPLS [In-Process Lock Server] – Most computationally intense applications

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deploy multithreaded servers in dedicated processors. The **IPLS** can be directly linked with the application “server” process to avoid TCP/IP and network overheads. Applications that are able to use the **IPLS** have shown throughput increases of 20 to 40 percent.

Distributed Architecture

A Federated Database presents a single logical view of all of the databases and the accompanying schemas [object definitions]. The distributed architecture is fundamental to Objectivity's fault tolerance and data replication capabilities. It offers new degrees of freedom in architecting systems to acquire, store, process or access information at any layer of the system. There is no longer a compelling need to push data back to a central server; or to build supplementary file caches close to or within any real-time equipment. Data can be stored and processed close to the point where it is most often used, but it (or a replica) can be made accessible to any authorized user or subsystem anywhere in the network.



Data Scalability

Single Logical View - Each object is uniquely represented by a 64-bit composite Object Identifier [OID]. Each component of the OID is a logical number, not a physical identifier, allowing Objectivity/DB to dynamically relocate objects to reclaim physical space quickly. **Single Federated**

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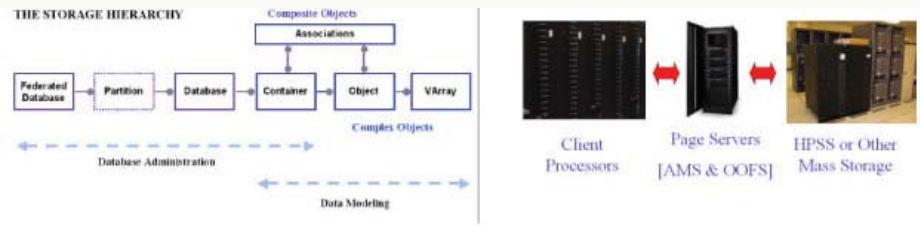
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Databases can scale into the Exabyte [1 million Terabytes] range.

Applications can also view multiple federations simultaneously. Groups of objects may be clustered within containers (loosely analogous to a file) that are clustered within databases. The databases are grouped within a federated database. Objects may be directly associated with other objects by using named 1:1, 1:many, many:1 or many:many links. The links may span containers and databases, allowing the creation of huge networks of objects spread across databases held on many machines. Navigation across databases is completely transparent to the application.

Mass Storage Integration - Many products have loose or single vendor integration with hierarchical mass storage devices. The Objectivity/DB remote data server automatically integrates with most standard file server products. In 1998 Objectivity pioneered the integration of a database with the High Performance Storage System (HPSS), a technology that resulted from a joint project between industry and the National Laboratories. The Objectivity Open File System (OOFS) layer integrates the Objectivity/DB remote data server with HPSS. The OOFS classes may be modified to interface with other non-standard storage devices. Customizable security (e.g. using Kerberos) can be invoked via a Generalized Security Architecture interface implemented behind the Page Server interface. The largest deployment of this technology currently holds over 750 Terabytes of objects, growing at over a Terabyte per day.



Continuous Availability

Objectivity provides continuous availability through a combination of features that work together to minimize downtime due to system maintenance, application upgrades or faults in hardware, network or system software. On-line administration - Objectivity/DB allows full and incremental backups to be performed without interrupting applications. Other tools permit movement of databases and on-line partitioning and repartitioning of federated

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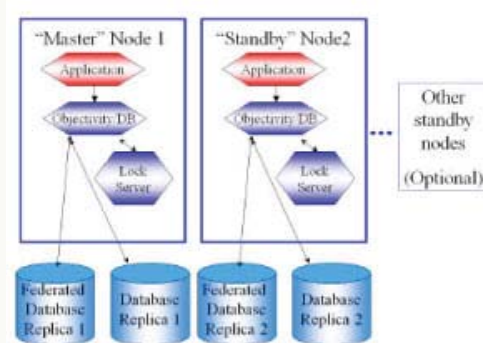
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databases across platforms.

Active Schema Option allows applications to access, change and add object class definitions. It even allows C++ applications to create new classes and start manipulating object instances without compiling code. This can add considerable flexibility to the configurability of systems to suit local conditions.

Fault Tolerant Option is designed to guarantee database availability in networked environments, where databases are distributed across computers. Faults at a database site are isolated and do not affect other databases. The Fault Tolerant Option is complementary to hardware solutions implemented with fault-tolerant processors and redundant disk (e.g. RAID).

Data Replication Option (DRO) permits on-line creation and deletion of database replicas. Made possible by Objectivity's underlying distributed architecture, DRO represents a dramatic advance in replication technology based on academic research performed in the early 1990's. Dynamic quorum (majority vote) calculations guarantee system integrity without constraining write access to one database master. To guarantee data integrity across replicas, the database manager performs a quorum calculation when it accesses a database. Portions of the federated database disconnected from the quorum are resynchronized with the quorum upon reconnection. As an example, data replication used inside a routing application can provide hot-failover in the case of platform failure and automatic resynchronization of data after the problem is corrected. Data replication across a WAN allows one time delivery of processed data to back-office applications or a carrier's partners.



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OBJECTIVITY/DB – KEY FEATURES

The architecture of Objectivity/DB was designed to provide the highest levels of reliability, performance, scalability (data volume and concurrency), distribution and interoperability. It provides the following major benefits to Federal systems designers and developers:

- An open but safe long-term repository for valuable data.
- Considerably simplifies the design, development, testing and deployment of complex network element management systems because:
 - It has the most powerful object modeling, storage and access capabilities of any Object Database Management System.
 - It provides a complete storage solution for metadata, raw data and generated data.
 - It can navigate trees and networks of objects much faster than relational or hybrid object-relational database management systems.
- Removes the bottlenecks inherent in object servers. It reduces network traffic and employs smart caching to avoid redundant disk I/O. It can be deployed anywhere in the organization, even down in real-time data collection elements.
- Outperforms persistent language, message based and home grown file-based systems as data volumes and concurrent usage increase.
- Objectivity/DB is better at making the location of data, metadata and DBMS processes transparent to client and administrative processes than any other DBMS.
- Distributed architecture for networked and multithreaded or multiprocessor environments.
- Objectivity/DB Open File System (OOFS) provides seamless integration to a wide range of industry standard hierarchical storage managers, Storage Area Networks, Network Accessed Storage and HPSS [High Performance Storage System] nodes. This opens up new product opportunities for archiving and data

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mining service information.

- Complete interoperability between all supported platforms [UNIX, Linux, Windows NT/2K and LynxOS] and languages [ODMG'93 C++, Smalltalk & Java and ANSI SQL & ODBC].
- Tools for importing and exporting XML class definitions and data. Objectivity Active Schema™ and Objectivity ROSElink™ can be used to build schema management tools or to migrate UML or GDMO definitions in and out of Objectivity/DB.
- The Fault Tolerant Option replicates system data and services. The Data Replication Option replicates user databases to multiple sites. Applications can survive both network and node failures in geographically or logically distributed systems.
- Objectivity/DB is built to cope with the realities of environments that include rapidly evolving applications and technologies. The Active Schema™ option supports the dynamic definition, creation and migration of persistent C++ or Java object instances.

OBJECTIVITY/DB MEETS THE PROGRAM CONTROL CHALLENGES

FASTER, SAFER DEPLOYMENT: The performance, reliability, flexibility, interoperability and scalability of Objectivity/DB undoubtedly make it the best database for complex data correlation systems. Its powerful object modeling and manipulation capabilities eliminate the need for the mapping layer needed by legacy DBMSs. This reduces software development and quality assurance effort and time to market.

Technical excellence is only a part of the solution in today's dynamic technical and business environments. Other factors to include in the choice of a database partner include:

Adherence to Standards - Objectivity/DB uses standard languages, compilers, operating systems and database APIs to reduce the learning curve for designers and programmers.

Domain expertise - Objectivity has a large user base of customers and integrators that have embedded Objectivity/DB within their data correlation systems.

www.objectivity.com

Corporate Headquarters:

640 West California Ave.
Suite 210 Sunnyvale,
CA 94086-2486 US
Tel: (408) 992-7100
Fax: (408) 992-7171

Using Objectivity/DB to Correlate Multiple Data Sources

Availability of Expert Help - Objectivity can provide expert consulting at the critical points in the design and deployment of a system. Objectivity's expertise has been gained by helping hundreds of customers, ranging from small, embedded systems to the deployment and maintenance of extremely large production databases. We can help reduce your project's risks and your product's "Time to Market".

LOWER COST OF OWNERSHIP:

Eliminating mapping reduces costs by as much as 30% - Objectivity/DB is not only faster at navigating trees and networks of objects than legacy technologies, it also reduces the amount of engineering effort needed to bring a software product to market. The cost savings that result from eliminating the mapping layer between the programming language and the DBMS can be as much as 30% in a typical database project.

Zero Administration Philosophy - Traditional DBMSs were designed to be managed by highly trained database administrators. Objectivity/DB was designed with a "Zero Administration" philosophy, making it much easier to embed it within a product. Its libraries, object definitions and pre-loaded databases can be shipped with your product and installed by field personnel with no DBMS expertise.

More Efficient Hardware Utilization - Objectivity/DB has a much lower memory and disk footprint than legacy DBMSs. Each client typically requires between 1.2 and 3 Mb of RAM for the shared library code, plus whatever cache the application needs for the objects it is working on. The lower footprint and the more efficient use of processor power translate into greater throughput on an existing hardware configuration; or less expensive hardware for new installations.

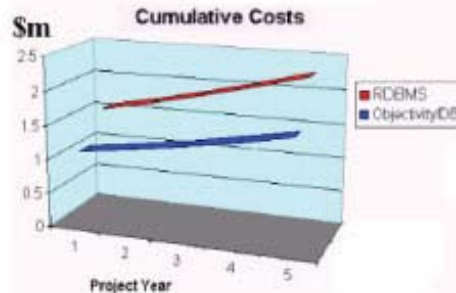
Increasing the Value of the Data Asset - Any revised or new application running on Objectivity/DB will automatically add powerful new features to your product with very little extra effort on the part of your existing engineers. It will also make it easier to handle system upgrades and language or platform changes in the future. Your user's data will be protected, be more accessible (with appropriate security) and be made more valuable as it accumulates over time.

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30% less = \$672,000 Over Five Years



- ❑ 112,000 v 160,000 lines of code (RDBMS has 30% mapping code)
- ❑ 16000 Lines of Code per Year
- ❑ 1 Year Development and 4 Years of Maintenance (10%)
- ❑ \$160k per Person Year

SUMMARY

We have seen that complex data correlation systems make high demands on the underlying DBMS. They need:

- High Performance with complex data – algorithms need the data at RAM speeds, not disk speeds. Data correlation systems may need to deal with batches of data or continuous streams from multiple sources.
- Scalability - in both data volume and the number of concurrent users (or threads).
- Reliability – many data correlation systems are deployed in 7 x 24 environments.
- Data Distribution – data may have to be globally available. It may be cached at one or more geographic sites to avoid depending on access to a central location.
- Interoperability – data may be captured and processed on different kinds of equipment. It may be processed in C++ and accessed via tools built with Java; or generated on an RTOS, processed on a UNIX/Linux box and viewed on a Windows PC.

Using Objectivity/DB to Correlate Multiple Data Sources

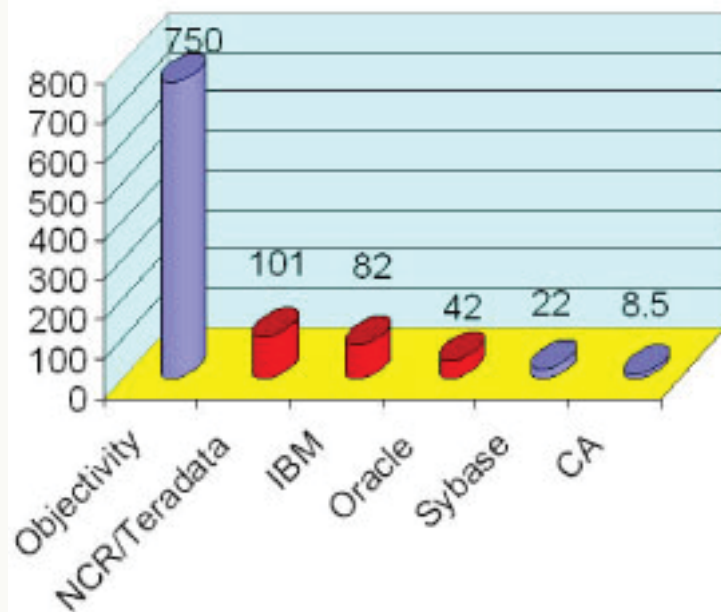
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- **Flexibility** – the types of data and the relationships between data instances may need to be dynamically configurable by domain experts or end users.
- **Additional functionality** at a very low cost.
- **Faster time to deployment** because of the elimination of mapping code and Objectivity/DB’s powerful object modeling and manipulation features.
- **Lower cost of ownership** because it is easier to maintain, upgrade and expand deployed applications and systems.
- **Dynamic adaption** to changing requirements.

World’s Largest Databases (Feb. 2003)



ADDITIONAL RESOURCES

Other White Papers

Choosing a Higher Performance Database

<http://www.objectivity.com/DevCentral/Products/TechDocs/pdfs/ChooseHighPerf.pdf>

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Accelerating Your Object Oriented Development

<http://www.objectivity.com/DevCentral/Products/TechDocs/Whitepapers/Accelerating/AcceleratingOODB.html>

Hitting the Relational Wall

<http://www.objectivity.com/DevCentral/Products/TechDocs/Whitepapers/WallFiles/WallPprIntro.html>

Technical Overview of Objectivity/DB

<http://www.objectivity.com/DevCentral/Products/TechDocs/TechOv.html>

Trial Product Download

<http://www.objectivity.com/DevCentral/Download>