



**ONware™**

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**The Most Direct Path to Relational Database Technology for  
MultiValue Database Users**

# A White Paper

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# Table of Contents

<i>ONware</i>	<i>1</i>
<i>How ONware Works</i>	<i>2</i>
<b>The ONware Servers</b>	<b>2</b>
The Login Server	2
The Application Server	3
The Virtual Run-machine	4
The Data Servers	4
Presentation Servers	4
<i>Save Years &amp; Millions of Dollars</i>	<i>5</i>
<b>Migration Scenario</b>	<b>5</b>
Approach and Database Options	6
Object Format	7
Object-Relational Format	7
Relational Format	8
Least Painful & Lowest Risk Migration	9

## ONware

*ONware ends real or perceived isolation of MultiValue data, dictionaries and programs by enabling them to live and breathe in a standard relational environment such as Oracle, SQL Server, and DB2.*

**O**Nware is uniquely designed for organizations with significant investments in mature and stable business applications developed on one of the common MultiValue platforms, to communicate with, migrate to, and develop for Oracle, MS SQL Server and other relational and object-relational databases.

ONware allows the users of UniVerse, UniData, PI/Open, Power95, and D3 database management systems to run their programs, dictionaries, PROCs, paragraphs and sentences directly on the operating system, without re-engineering the code, and without the need for the Database Management System in which they were originally developed. ONgroup clients worldwide are using ONware to solve business problems such as:

- ❑ Migration of valuable and irreplaceable business systems,
- ❑ Integration of legacy systems and data with relational applications, such as Oracle Financials, Great Plains, SAP, and more,
- ❑ Data sharing between Relational and MultiValue type databases
- ❑ Normalization of multivalued data to the relational, SQL compliant form,
- ❑ Re-use of mature and stable business logic on Oracle, SQL Server and other relational platforms
- ❑ Maintain a single set of source code while deploying applications on multiple O/S and Database Management System platforms.

ONware provides a run-time and development environment with the editor, BASIC language compiler, Query language, Command language and GCI's familiar to the MultiValue professional. The existing IT staff can continue to maintain and develop applications on SQL Server and Oracle just as they do now, and at the same time learn the new technology available in the world of relational tools and products.

## How ONware Works

*ONware operates on a network of underlying technologies, insulating the application layer from the limitations of any single platform.*

**O**Nware is a collection of servers that service application objects and insulates the objects from the specific differences in underlying technologies such as the type and location of operating system, database management system, network architecture and user interfaces.

The benefit is that an application can, for example, be developed on a PC with Windows and a MultiValue Database Management System such as UniVerse and then deployed on a totally different platform such as LINUX or UNIX, running an Oracle or SQL Server Database Management System and using Macintosh as the user interface.

### The ONware Servers

- ❑ Login Server
- ❑ Application Server
- ❑ Virtual Run-machine
- ❑ Data Servers
- ❑ Presentation Servers

### The Login Server

The Login Server is the component that starts up other servers and establishes modes of communication and operation. The role of the Login Server is to log into a server and verify the user ID and password. It provides a map to where other servers are running in the network and performs security services. A Login Server is required to be installed and started somewhere on the network. Regardless of where other components are located, only one Login Server is required.

## The Application Server

The Application Server contains the system and user catalogs for the Run-Machines running somewhere on the network. It performs application logic that emulates UniVerse, UniData, PI/Open and D3. The Application Server provides some important capabilities beyond these other MultiValue environments as ONware's development and operation environment is performed on a foundation that insulates it from the underlying hardware and software on which it is deployed.

### A Familiar Development Environment

This feature means that an organization can operate and continue to develop MultiValue applications using a wide choice of information technology, such as relational and object oriented databases, the Internet, and graphical user interface software.

This also means that legacy MultiValue applications deploy without re-engineering on complex network topologies: multiple node types, multiple database types, multiple workstation types, and multiple communication protocols.. Multiple users can concurrently operate in different modes such as standalone or multitier client/server.

The Application Server provides the tools familiar to the seasoned MultiValue developer including:

BASIC Language Compiler	The BASIC compiler compiles legacy and newly developed BASIC programs into pseudo-code, which can then be executed directly on the operating system of choice. The BASIC compiler incorporates "flavor" switches to process the variations in syntax for the common MultiValue Database Management System environments.
COMMAND Line Processor	ONware's COMMAND line processor offers commands familiar to the MultiValue developer, such as CREATE.FILE, DELETE, LOGTO, COPY and more.
QUERY Processor	The QUERY processor executes familiar retrievals such as PROCs, Paragraphs and Sentences as well as commands such as LIST.DICT, SELECT, SORT, SAVE.LIST, GET.LIST and more.
Line EDITOR	The ONware Line EDITOR provides the same editor features of the common MultiValue platforms. The source code and data may live in an Oracle table, and still use the trusty MultiValue editor to write BASIC CODE, perform maintenance, and troubleshoot data.

## The Virtual Run-machine

The compilation of a BASIC program produces pseudo-code, which is executed by the run machine. ONware's Virtual Run Machine executes programs in the catalog on a foundation that insulates it from the underlying hardware and software on which it is deployed.

## The Data Servers

No DATA Servers are required for access to relational and object relational databases such as Oracle and SQL Server. Vendor standard interface protocols, such as Oracle's OCI (Oracle Call Interface), provide the method of communication with Relational databases. However, for the PICK style databases, ONware provides DATA Servers to allow concurrent and native database access to MultiValue databases such as UniVerse, UniData, PI/open, D3, and other PICK variations.

The use of ONware's Data Servers allow for a free flow of data between disparate databases located anywhere on the network. You can, for example use simple COPY, OPEN, READ, and WRITE statements to pass data back and forth between UniVerse, SQL Server, and Oracle. It is as simple as creating file pointers to files and tables on the network and executing the familiar COPY command.

## Presentation Servers

A presentation server is a type of user interface. ONware supports a choice of presentation options. Current examples of presentation methods used are Windows, Macintosh, and various types of character terminals (e.g. VT100s, Wyse 50s, and TV155s). The workstation software can be terminal emulators or products with graphical orientation such as FUSION, TERM, STERM, wIntegrate, WINNIX, Termite, Visual Basic, and Java. Each user can choose the presentation technology for their session when they begin an ONware session regardless of the choice of the person sitting next to them.



## Save Years & Millions of Dollars

*ONgroup's team of experts and proven methodologies move organizations to relational technology in months vs. years, saving millions of dollars and with greatly reduced risk of organizational disruption.*

**C**ore business applications are difficult to replace. They are mature, stable, and generally serve the needs of the organization. Flipping the switch overnight, to a package replacement, generally results in a loss of features and functionality and often causes significant operational disruption. Organizations should consider introducing new technology with a sane, systematic and controlled approach—reducing the risk of operational disruption, saving years of effort and millions of dollars in reaching significant IT goals.

Organizations, both end users and VARs, who have investigated redeveloping their business applications, have generally concluded that the redevelopment effort in a new development environment would take many man-years. Often figures of 50 to 100s of man-years have been estimated. Such redevelopment projects, apart from requiring 10s of millions of dollars, pose a large risk to the business. Some organizations have made this investment and found that the resulting application could not be deployed and have since embarked on a migration strategy using ONware.

ON believes that organizations should be able to develop and maintain applications with a single source code version and deploy on various types of databases (concurrently) without having to re-engineer the source. It is common to hear of MultiValue VARs (value added resellers) losing opportunities solely because they do not provide their solution on the de facto industry standard databases, Oracle for UNIX and SQL Server for Windows. ONware provides businesses a safe path avoiding the risk of the loss of orders when a trusted system is replaced by a packaged solution overnight..

### Migration Scenario

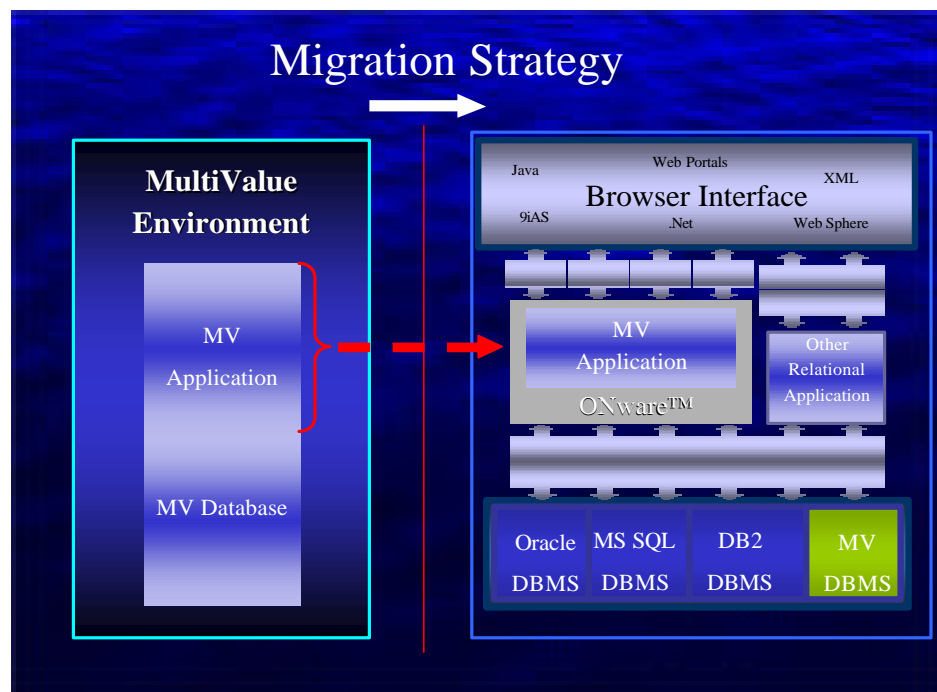
Large-scale clients such as CitiGroup, New York's Suffolk County, and California's Orange County Transportation Authority have used ON's proven tools and methodologies to move

their business systems from MultiValue to Relational in as little as six months. As an example, an organization can go from UniVerse to Oracle very quickly using the following scenario:

1. Install and configure Oracle Server and Oracle Client
2. Install and configure ONware
3. Export UniVerse account (similar to account save)
4. Import to Oracle tables (similar to account restore)
5. Use ONware compiler to compile BASIC and dictionary objects
6. Begin Quality Assurance testing

## Approach and Database Options

The MultiValue System depends on a MultiValue database. As illustrated on the left side of the diagram, the application is isolated from current and future systems.



ONgroup recommends using ONware to eliminate dependence on any technology component and open the door to mainstream technologies. When a MultiValue application is migrated to ONware, as is illustrated on the right side of the diagram, dependency on the MultiValue database is removed and access to other relational tools enabled.

ONware runs the MultiValue System's applications without the need for the MultiValue database and without re-engineering the application. The data may be stored in the database of choice and on the hardware, O/S, and network topology chosen on the basis of the best available for the organization.

Open the door to the vast options available in the mainstream technology marketplace with your data stored in standard relational technology. The ONware solution supports data stored in the following three database formats:

## Object Format

Object format means that the data is stored in an un-structured table with the contents of a record unknown to the relational database manager.

ONware allows data to be stored in a relational database in Object Format. The advantage of storing data in a relational database, in this format, is 100% compatibility between the MultiValue and Relational database.

Object Format is the standard method of storing data in a MultiValue Database Management System and the MultiValue application depends on this structure.

Object Format stores the data in one big column, as a large block of text, with delimiters. The primary key is held in an indexed primary key column. The common delimiters used in a MultiValue style database include:

Item marks, Char (225)

Field marks, Char (254)

Value marks, Char (253)

Sub-value marks, Char (252)

Text marks, Char (251)

Object Format provides an effective way to migrate an application to a relational database. With object format there is no concern about data typing or schema design, allowing efforts to be concentrated on the functionality of the application.

Object Format tables are useful for storing data when access is solely by an immutable primary key, or when the data is not homogeneous.

## Object-Relational Format

In Object-Relational Format, a table in the relational database schema represents each file in the MultiValue application. Each field in the MultiValue file becomes a column in the relational database table.

Where a field is single valued, it may be assigned the appropriate data type for its usage. For example where the field is a date field, a DATE data type would represent it. Good data typing helps to optimize database performance.

With Object-Relational Format, the contents of the record are known to the Database Management System. There are, however, structures in the records, especially Non-First Normal Form (NF2), that require manipulation of the data outside of the capabilities of the ANSI definition of a compliant Relational database system.

The Object extensions of the database manager can manipulate the data, as can application development tools. By using the database manager, some aspects of the application become specific to the database manager. Both Oracle and SQL Server have similar capabilities, though are syntactically different. A benefit of ONware is that it provides this capability without the dependence on the syntax of a specific database manager. With ONware, the application remains database independent, allowing the application to function regardless of future database requirements.

ORF provides the same MultiValue view of the data, with the added performance and data integrity features of the database manager. ONware is aware of the type of table structure it is dealing with and where possible, seeks to use the capabilities of the underlying database manager rather than process the data itself. For example, with Object-Relational Format, ONware optimizes the use of column indexes rather than relying on the MultiValue environment to process all the data.

Object Relational Format tables facilitate the performance both of the database and the application. ONware generates native database objects such as VIEWS which allow the MultiValue application to see a set of Relational tables as single MultiValue file. The benefit is more efficient data manipulation and the ability to use embedded SQL statements where appropriate. With larger data structures the option to create sub-data set VIEWS offer additional benefits.

## Relational Format

Relational Format is the standard SQL compliant data structure. There are no MultiValues in Relational Format, the contents of the record are explicitly known to the database manager.

With Relational Format, the data is in First Normal Form (FNF). First Normal Form means that every item of data is accessible by the file name, the record ID, and the column name. As MultiValue data structures store more than one item of data at each location, MultiValue applications have been, historically, unable to perform with data stored in Relational Format in relational databases.

ONware supports Relational Format. ONware presents the MultiValue application with the data, as it would have been in the original MultiValue deployment environment. By accessing the updateable VIEW on the table, ONware reads the data in the standard relational format and presents it to the MultiValue application with the MultiValue delimiters. ONware, therefore, allows the MultiValue application to perform I/O with data stored in SQL compliant format in a relational database.

The advantage of Relational Format over Object Format and Object-Relational Format is that in Relational Format, tools that support structures defined in the ANSI standards for a Relational database manager now have direct access to the data. This includes Crystal, Cognos, Oracle Financials, Great Plains, ONware Query, and others.

In summary, there are advantages to all three of these data formats. ONware not only supports all of these data format options, but also supports a mixture of all three. For example, there are advantages to normalizing only that part of the System that requires integration with non-MultiValue tools. Most organizations find it useful to use a combination of all three formats.

## Least Painful & Lowest Risk Migration

ONware provides some powerful features for organizations planning a migration to Relational technology or integration of their legacy MultiValue applications with Relational. With ONware, an organization can continue to run mature and stable business applications while moving one or all of the data files to Oracle, SQL Server, and DB2. ONware provides an application the ability to perform I/O with multiple Database Management Systems concurrently from a single application and without re-engineering.

Whether the goal is to move a few files to SQL Server, integrate with an Oracle application, or plan a complete migration to DB2, ONware will ease the process, speed up the timeline, reduce the risk, and minimize the financial expense, and maximize the use of technical resources.