

ARCHITECTURE

Microsoft Dynamics™ GP Architecture

White Paper

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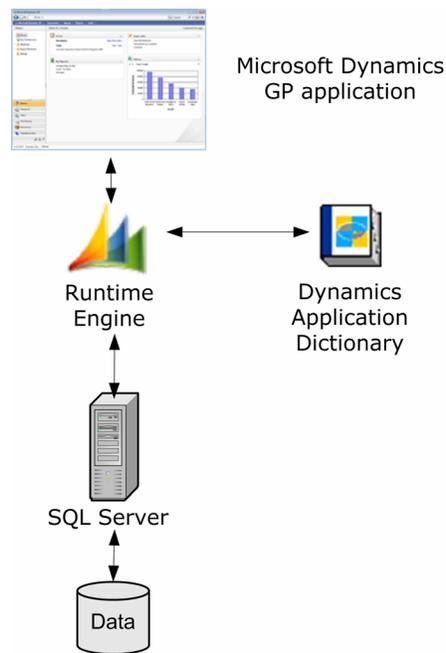
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Introduction

This document describes the architecture for Microsoft Dynamics™ GP. It explains how the architecture's features make Microsoft Dynamics GP an outstanding solution for organizations implementing a business management system today. The document also describes how the architecture allows Microsoft Dynamics GP to grow with these organizations in the future.

Application Structure

The structure of the core Microsoft Dynamics GP application is shown in the following illustration. For single-user installations, all components are installed on a single workstation. For multi-user installations, the Runtime engine and Microsoft Dynamics GP application dictionary are installed on individual workstations. Data for the system is managed by a separate server.



The application is composed of the following parts:

- Dexterity runtime engine
- Dynamics application dictionary
- Microsoft® SQL Server™ database

Dexterity® and the Dexterity Runtime Engine

Dexterity is the development tool used to create the Microsoft Dynamics GP application. The Dexterity runtime engine presents the Microsoft Dynamics GP application to the end-user. Both the development tool and runtime engine are developed using Microsoft Visual Studio®.

Dexterity and the Dexterity runtime engine are mixed-mode applications, containing both Win32® code traditionally used for Windows® applications, as well as managed code. The mixed-mode application allows Microsoft Dynamics GP to use the capabilities of the .NET Framework to provide features like an enhanced user interface and a .NET programming interface that is used by integrating applications.

Dexterity

Used by the Microsoft Dynamics GP development team, Dexterity is a complete integrated development environment. Its features include:

Feature	Description
Graphical forms designer	A WYSIWYG layout window used to design forms visually.
sanScript scripting language	An English-like scripting language used to add business logic to the application.
Extensive function library	Hundreds of special-purpose functions allow implementing key functionality in an application.
Integrated script debugger	Allows interactive debugging of an application.
Structured exception handling	A built-in mechanism for dealing with unexpected conditions in the application.
COM support	Excellent access to features made available by other applications through COM.
Integrated Source Code Control	Built-in support for managing application resources using Microsoft Visual SourceSafe®.
Built-in Report Writer	A WYSIWIG report layout tool used to design reports.

Dexterity is designed to remove complexity from the development process, allowing the developer to focus on the application being created. Any capable software developer will find Dexterity easy to learn.

Dexterity Runtime Engine

The Dexterity runtime engine displays the functioning application to the end-user. It provides the basic capabilities used by the Microsoft Dynamics GP application, such as:

- The main application shell
- The user interface subsystem
- The data subsystem used to access the SQL database.

The runtime also provides additional tools and technologies available for Microsoft Dynamics GP. For example, the Modifier, Report Writer, Visual Basic® for Applications (VBA) environment, .NET programming interface, and COM programming interface are just some of the tools and technologies provided by the runtime engine.

Dynamics Application Dictionary

The Dynamics application dictionary contains the resources and business logic for the core application. Separating the business logic from the application presentation helps insulate the application from technology changes. For example, integration technologies such as VBA and the .NET programming interface can be added to the Dexterity runtime engine without affecting business logic.

The internal structure of application dictionary has been carefully designed. It uniquely identifies and separates resources into the various types to allow the following:

- End-users can modify the appearance of forms and reports in the Microsoft Dynamics GP application without impacting the business logic.
- User-visible resources like strings and messages can be extracted from a dictionary, translated to another language, and replaced. The business logic in the dictionary is unaffected.
- Special files can be used to update resources in an application dictionary after it has been deployed.
- Third-party integrations can reuse resources from the main Dynamics application dictionary. This is especially helpful for developers who use Dexterity or Visual Studio Tools for Microsoft Dynamics GP to create their integrations.

The Multidictionary Architecture section later in this document describes how software developers can use this capability to produce add-on applications for Microsoft Dynamics GP.

Microsoft SQL Server

Microsoft Dynamics GP uses Microsoft SQL Server to store and manage data for the application. Microsoft Dynamics GP is designed and optimized for SQL Server, using key features to maximize performance, ensure data integrity, and improve security.

Stored Procedures

Stored procedures are a core feature of SQL Server used to improve application performance. Typically, stored procedures are hand-coded to perform specific tasks that can be run directly on the SQL server. Microsoft Dynamics GP uses several stored procedures to perform data-intensive tasks, such as posting.

Microsoft Dynamics GP also employs an innovative approach for SQL stored procedures to optimize performance for all database actions in the application. The Dexterity runtime engine examines the table structures defined in each application dictionary, and automatically generates stored procedures for each table. These "auto-generated" stored procedures are called automatically by the runtime engine to optimize the data operations performed on each table. The performance benefit of stored procedures is achieved without the tedious hand-coding.

SQL Transactions

SQL transactions help ensure data integrity as an application processes data. If an entire transaction cannot be completed, it is rolled back. This leaves the database in its previous state, as if the transaction had not been attempted. Any Dexterity-based application can use SQL transactions. They are used in key areas of Microsoft Dynamics GP, especially in critical areas such as posting.

SQL Login Security

Microsoft Dynamics GP utilizes the password security features available in SQL Server. Users can be required to change their password the first time they log into Microsoft Dynamics GP. The password policy set up for the Windows domain can also be enforced when the user chooses a new password.

SQL Server Scheduled Jobs

SQL Server Scheduled Jobs are another feature used by Microsoft Dynamics GP. From within Microsoft Dynamics GP, you can set up Business Alerts that notify you when specific conditions exist in your accounting data. Business Alerts are based on SQL Server Scheduled Jobs.

Performance and Scalability

Microsoft Dynamics GP is designed to support a large number of simultaneous workstations, while still providing a responsive application for the end-user. It is also designed to efficiently use system resources for both client workstations and servers.

Workstation Performance

Microsoft Dynamics GP uses several techniques to help ensure that workstations are responsive for users of the system. The following are some of the techniques applied.

Optimistic Concurrency

Microsoft Dynamics GP implements optimistic concurrency. This is a form of row locking that allows multiple users to work in the same tables and access the same rows with minimal restrictions, while helping ensure data integrity. Optimistic concurrency reduces the chance that a user will be prevented from accessing data in the system because that same data is being accessed by another user. Support for optimistic concurrency is built into the Dexterity runtime engine, making it easy to implement throughout the Microsoft Dynamics GP application.

Index Design

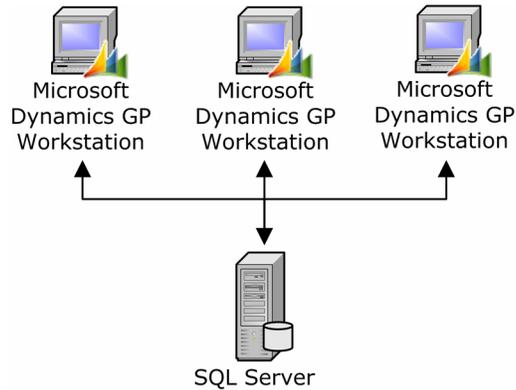
The indexes for tables in Microsoft Dynamics GP are carefully designed to optimize performance. For example, the Dexterity runtime engine supports clustered indexes for SQL Server. With a clustered index, data in a table is sorted and physically stored in a specific order as indicated by the index definition. Using clustered indexes can prevent "hot spots" in SQL tables, where multiple users are trying to access rows in the same location in a table. Hot spots negatively impact workstation performance.

Background Processing

Many processes in Microsoft Dynamics GP are data-intensive, and can take more time to process than a typical user is willing to wait. To avoid having these processes take over the workstation, Microsoft Dynamics GP uses the background processing capabilities of the Dexterity runtime engine. When data-intensive processes are sent to the background processing queue, the workstation is available for the user to perform other tasks. The tasks sent to the background are processed when time is available for the workstation.

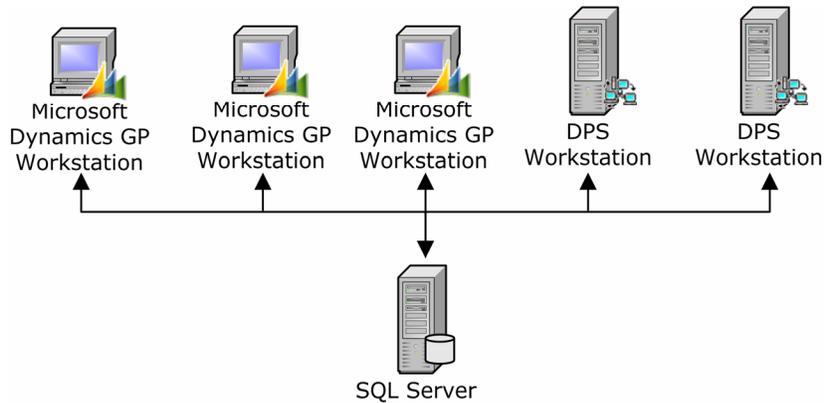
Server Performance

The Microsoft Dynamics GP architecture is designed to make optimal use of the SQL Server managing data for the accounting system. In many cases, the SQL Server will have better throughput when the overall workload is spread over several workstations, rather than concentrated on just a few.



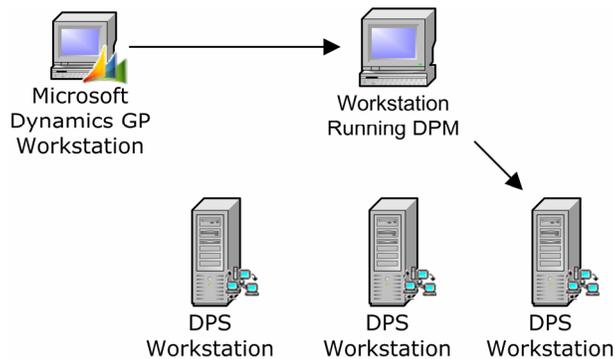
Distributed Process Server

The Distributed Process Server (DPS) is a special version of the Dexterity runtime engine that runs on a separate workstation. Other workstations can send process-intensive tasks to be run on the process server. This frees the workstation sending the task, and helps spread the overall processing load to more workstations. This also helps achieve optimal performance for the SQL Server.



Distributed Process Manager

If multiple Distributed Process Server systems are used, optimal processing performance is achieved when the processing load is evenly distributed across them. The Distributed Process Manager (DPM) is an application included with Microsoft Dynamics GP that implements load balancing across several workstations running the DPS. When a process is sent from a workstation, the DPM will direct the job to the process server with the lowest current processing load.



Customization

Organizations and individuals have unique needs, so Microsoft Dynamics GP is designed to be customized. Some customization features are built directly into the software, and are accessible to all users. Other customizations require additional tools and are typically implemented by the system administrator.

End-user Customizations

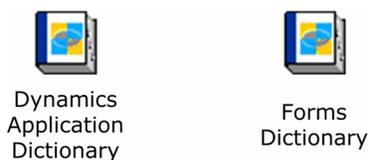
Several end-user customizations are available in Microsoft Dynamics GP, allowing users to adjust the application to their liking. The following table lists some of the customizations available:

Customization Feature	Description
Home page	Each user can specify the content of the Home page displayed in Microsoft Dynamics GP.
Toolbars	Users can specify which toolbars are displayed, what buttons they contain, and where they are positioned.
Navigation Pane	Users can select which groups they want to display in the Navigation Pane.
Shortcuts	Users can add items to the shortcut bar, giving them quick access to areas of the application important to them.
Lists	The lists displayed in the main window for Microsoft Dynamics GP are configurable, allowing users to specify which columns to display and the order they are presented. Filters can also be applied to list data.
Action Pane	The groups and actions shown in the Action Pane for each list are configurable. Actions and groups can be rearranged or removed. New groups can be created. Additional actions can be added that are appropriate for each specific list.

Modifier

The Modifier allows the appearance of windows in Microsoft Dynamics GP to be modified. For example, a field that isn't used can be hidden to simplify the window. Other cosmetic changes can be made with the Modifier, such as changing an image displayed in the system, or the text that appears in a message. The Modifier works with any Dexterity-based product that integrates with Microsoft Dynamics GP. Security settings in Microsoft Dynamics GP determine whether a specific user will see the modifications that were made.

Modifications made with the Modifier are stored in a separate dictionary, not the application dictionary. This ensures that business logic is not affected by the changes. For Microsoft Dynamics GP, the Forms.dic dictionary stores the modifications made using the Modifier.



Modifications made with the Modifier can be exported to special "package" files. These package files can be imported into other Microsoft Dynamics GP installations, making it easy to copy modifications from one workstation to another.

Report Writer

The Report Writer allows the layout and appearance of reports in Microsoft Dynamics GP to be modified. For example, a company logo could be added to a report. The way data is presented by the report can also be modified, such as by defining a different sorting order. The Report Writer works with any Dexterity-based product that integrates with Microsoft Dynamics GP. Security settings in Microsoft Dynamics GP determine whether a specific user will use the modified version of a report.

Changes made with the Report Writer are stored in a separate dictionary, not the application dictionary. This ensures that the original report is unaffected by the changes made with the Report Writer. For Microsoft Dynamics GP, modified reports are stored in the Reports.dic dictionary.

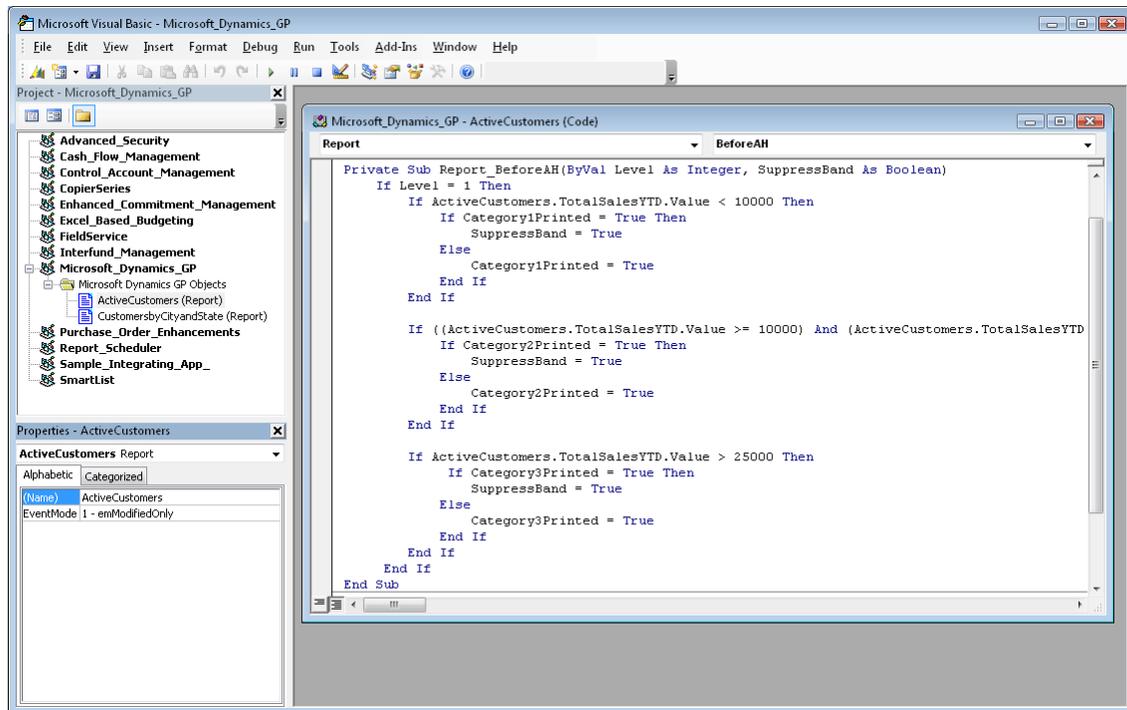


Modifications made with the Report Writer can be exported to special "package" files. These package files can be imported into other Microsoft Dynamics GP installations, making it easy to copy modifications from one workstation to another. Dozens of package files are available from Microsoft that contain common modifications made to Microsoft Dynamics GP reports.

The Report Writer can also be used to create new reports. While Microsoft Dynamics GP provides numerous detailed reports, the specific information an organization needs may not be presented in them. You can use the Report Writer to create a custom report that presents the data needed.

Visual Basic for Applications (VBA)

The Visual Basic for Applications environment is available in Microsoft Dynamics GP when the Modifier has been registered. This is the standard VBA environment that is found in other Microsoft products, such as Office. With VBA, you can use standard Visual Basic syntax to add additional business logic to Microsoft Dynamics GP windows and reports. New Visual Basic forms can be added, allowing additional capabilities to be added to the accounting system. The following illustration shows the VBA environment in Microsoft Dynamics GP:



Third-party integrating applications created with Dexterity can also be modified using VBA.

Update Support

With all of the customization options available to them, users can spend considerable time modifying Microsoft Dynamics GP. When updates for Microsoft Dynamics GP are released, it's important that these customizations are preserved. The Dexterity runtime engine contains special code that works to preserve changes that users have made with the Modifier, Report Writer, and VBA, protecting the time investment made.

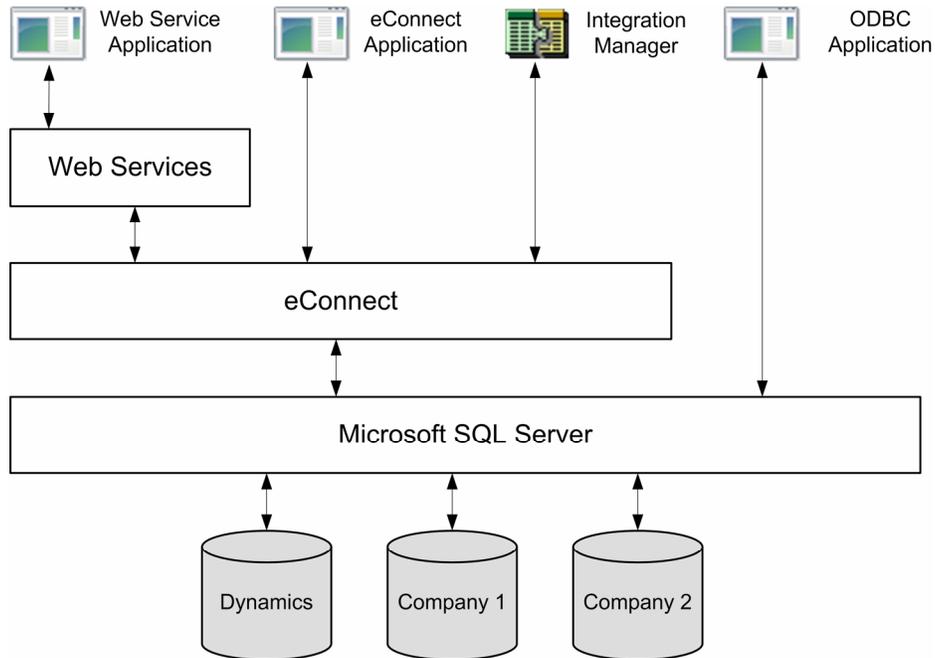
Third-party Integrations

The tools used to create third-party integrations to Microsoft Dynamics GP can also be used to make customizations. For instance, a Dexterity-based application can make extensive customizations to the Microsoft Dynamics GP application. These types of integrations can even replace entire forms and reports in the main application.

The .NET programming interface and the COM programming interface (called Continuum) available in Microsoft Dynamics GP allow external applications to customize Microsoft Dynamics GP. For example, an application written with Visual Basic .NET could use Visual Studio Tools for Microsoft Dynamics GP and the .NET programming interface in the runtime engine to modify the appearance of a form.

Data Integration

A vital issue with any accounting application is the ability to import data into and export data from the system. The Microsoft Dynamics GP architecture provides several ways to accomplish this task. The following illustration shows how the data integration tools available access Microsoft Dynamics GP data.



eConnect

The primary platform for importing and exporting data from Microsoft Dynamics GP is eConnect. eConnect is a special set of SQL stored procedures that are installed on the SQL Server managing Microsoft Dynamics GP data. These stored procedures allow data to be imported into or exported from tables in the accounting system. Logic in these stored procedures ensures that only valid data can be imported.

eConnect serves as a data access platform. Other data integration options, such as Web Services for Microsoft Dynamics GP and Integration Manager, use eConnect to provide their core capabilities.

eConnect uses XML documents to import or export data. These documents must conform to a special schema that defines the structure of each type of document that can be imported or exported.

Several standard programming interfaces are included with eConnect. The following table lists them:

Programming Interface	Description
eConnect .NET Assembly	The .NET interface used to interact with eConnect.
BizTalk® Adapter	The interface that allows eConnect to be accessed by BizTalk.
Microsoft Message Queue (MSMQ)	Provides a loosely-coupled, message-based interface for eConnect.
SQL Stored Procedures	The stored procedures defined by eConnect, which can be accessed directly.

The programming interface you choose will depend on the type of application you are integrating to Microsoft Dynamics GP, and the tools you are using to create the integration.

Web Services

Web Services for Microsoft Dynamics GP can be installed to provide a standard Web service interface to access data in the accounting system. Through the Web service, integrating applications can retrieve documents, create new documents, update existing documents, and delete or void documents. The primary documents in the system can be accessed. The following are some of the documents that are available:

- Customers
- Vendors
- Sales documents
- Purchase documents
- Receivables transactions
- Payables transactions
- General ledger transactions
- Accounts

Web services use standard Internet transport protocols such as Hypertext Transfer Protocol (HTTP) and standard XML-based document formats such as Simple Object Access Protocol (SOAP) to exchange information. ASP .NET is used as the foundation to implement the Web Services for Microsoft Dynamics GP. It provides the support for the standard protocols that make the Web service accessible. The Dynamics GP Web service uses eConnect to provide access to the data managed by the accounting system.

Web Services for Microsoft Dynamics GP is an essential tool that can help you integrate Microsoft Dynamics GP data into any Service Oriented Architecture (SOA) you are creating for your organization.

Integration Manager

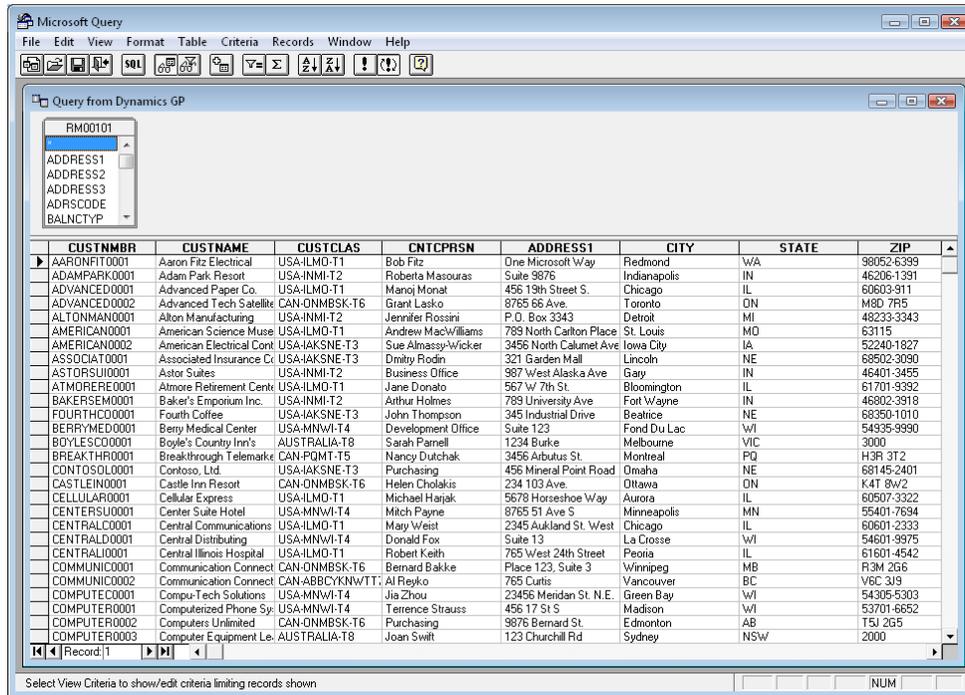
The Integration Manager is a separate application used to import data into Microsoft Dynamics GP. The data can come from various sources, such as text files or Excel[®] spreadsheets. A graphical interface in the Integration Manager makes it easy to map items in the source data to the destination object in Microsoft Dynamics GP, such as a Sales Order Processing document. All data imported by the Integration Manager is validated, helping to ensure the integrity of the accounting system.

The Integration Manager is very flexible while importing data. Only required fields must be supplied. Non-essential fields have default values that will be used if no value from the source is specified. This greatly simplifies mapping complex objects.

The scripting system built into the Integration Manager allows further customization. Scripts (written in VBScript) can be attached to various events in the integration process. For instance, as values are imported from the source documents, a script can set the value of a field in the destination object based on the value of another source field in the integration.

ODBC

Microsoft Dynamics GP uses a standard ODBC interface to access the data managed by SQL Server. This same ODBC interface can be used by other applications to securely access data in the accounting system. Applications such as Crystal Reports or Microsoft Query use the ODBC interface to access data. The following illustration shows Microsoft Query accessing data in Microsoft Dynamics GP through ODBC.



The screenshot shows the Microsoft Query application window titled "Microsoft Query". The main window displays a table of customer data. The table has the following columns: CUSTNMBR, CUSTNAME, CUSTCLAS, CNTCPRSN, ADDRESS1, CITY, STATE, and ZIP. The data is sorted by CUSTNMBR in ascending order. The first few rows are:

CUSTNMBR	CUSTNAME	CUSTCLAS	CNTCPRSN	ADDRESS1	CITY	STATE	ZIP
AARONFIT0001	Aaron Fitz Electrical	USA-ILMO-T1	Bob Fitz	One Microsoft Way	Redmond	WA	98052-6399
ADAMPARK0001	Adam Park Resort	USA-INMI-T2	Roberta Masouras	Suite 9876	Indianapolis	IN	46206-1391
ADVANCED0001	Advanced Paper Co	USA-ILMO-T1	Mano Monal	456 19th Street S.	Chicago	IL	60603-9111
ADVANCED0002	Advanced Tech Satellite	CAN-ONMBSK-T6	Grant Lasko	8765 66 Ave.	Toronto	ON	M6D 7R5
ALTONMAN0001	Alton Manufacturing	USA-INMI-T2	Jennifer Rossini	P.O. Box 3343	Detroit	MI	48233-3343
AMERICAN0001	American Science Muse	USA-ILMO-T1	Andrew MacWilliams	789 North Carlton Place	St. Louis	MO	63115
AMERICAN0002	American Electrical Cont	USA-IAKSNE-T3	Sue Almassy-Wicker	3456 North Calumet Ave	Iowa City	IA	52240-1827
ASSOCIAT0001	Associated Insurance Co	USA-IAKSNE-T3	Dmitry Rodin	321 Garden Mall	Lincoln	NE	68502-3090
ASTORSUJ0001	Astor Suites	USA-INMI-T2	Business Office	987 West Alaska Ave	Gary	IN	46401-3455
ATMORERE0001	Almore Retirement Cent	USA-ILMO-T1	Jane Donato	567 W 7th St.	Bloomington	IL	61701-3332
BAKERSEM0001	Baker's Emporium Inc.	USA-INMI-T2	Arthur Holmes	789 University Ave	Fort Wayne	IN	46802-3918
FOURTHCO0001	Fourth Coffee	USA-IAKSNE-T3	John Thompson	345 Industrial Drive	Beastice	NE	68360-1010
BERRYMED0001	Berry Medical Center	USA-MNWI-T4	Development Office	Suite 123	Fond Du Lac	WI	54935-9990
BOYLESCO0001	Boyle's Country Inn's	AUSTRALIA-T8	Sarah Parnell	1234 Burke	Melbourne	VIC	3000
BREAKTHR0001	Breakthrough Telemark	CAN-PQMT-T5	Nancy Dutchak	3456 Arbutus St.	Montreal	PQ	H3R 3T2
CONTOSOL0001	Contoso, Ltd	USA-IAKSNE-T3	Purchasing	456 Mineral Point Road	Omaha	NE	68145-2401
CASTLEIN0001	Castle Inn Resort	CAN-ONMBSK-T6	Helen Cholakis	234 103 Ave.	Ottawa	ON	K4T 8W2
CELLULAR0001	Cellular Express	USA-ILMO-T1	Michael Harjak	5678 Horseshoe Way	Aurora	IL	60507-3322
CENTERSU0001	Center Suite Hotel	USA-MNWI-T4	Match Payne	8765 51 Ave S	Minneapolis	MN	55401-7534
CENTRALC0001	Central Communications	USA-ILMO-T1	Mary West	2345 Aukland St. West	Chicago	IL	60601-2333
CENTRALD0001	Central Distributing	USA-MNWI-T4	Donald Fox	Suite 13	La Crosse	WI	54601-9975
CENTRALI0001	Central Illinois Hospital	USA-ILMO-T1	Robert Keith	765 West 24th Street	Peoria	IL	61601-4542
COMMUNIC0001	Communication Connect	CAN-ONMBSK-T6	Bernard Bakke	Place 123, Suite 3	Winnipeg	MB	R3M 2G6
COMMUNIC0002	Communication Connect	CAN-ABBCYKNWTT	Al Resko	765 Curtis	Vancouver	BC	V6C 3J9
COMPUTEC0001	Compu-Tech Solutions	USA-MNWI-T4	Jia Zhou	23456 Meridian St. N.E.	Green Bay	WI	54305-5303
COMPUTER0001	Computerized Phone Sys	USA-MNWI-T4	Terence Sitrauss	456 17 St S	Madison	WI	53701-6652
COMPUTER0002	Computers Unlimited	CAN-ONMBSK-T6	Purchasing	9876 Bernard St.	Edmonton	AB	T5J 2G5
COMPUTER0003	Computer Equipment Le.	AUSTRALIA-T8	Joan Swift	123 Churchill Rd	Sydney	NSW	2000

The ODBC interface requires a more sophisticated developer to set up and use, especially when data is being written to the Microsoft Dynamics GP database. Knowledge of the Microsoft Dynamics GP database and table structures is essential. No data validation is performed when using ODBC, so the application writing data to Microsoft Dynamics GP tables must ensure that correct data is being saved. Information about tables and data flow is available in the Microsoft Dynamics GP SDK. Table structure information is available through the Resource Descriptions tool included with Microsoft Dynamics GP.

Platform Features

Several features have been added to the platform that enhance this category of business application. The following are some of the key features that provide unique functionality for Microsoft Dynamics GP.

Flexible Account Number

Most organizations that implement Microsoft Dynamics GP have unique requirements for account numbers. To provide flexibility in this key area, the Dexterity runtime engine supports a special data type called a composite. A composite is a grouping of several related fields that act together as a single field in the system. Using a composite for the account number allows it to appear as a single item throughout the application's windows and reports.

The following illustration shows the Account field in Microsoft Dynamics GP. This specific account number is nine characters long, with three segments.

Account	000-1100-00	<input type="checkbox"/> Inactive
Description	Cash - Operating Account	
Alias	\$0A	<input checked="" type="checkbox"/> Allow Account Entry

The structure of the account number is defined when Microsoft Dynamics GP is installed. The number of segments in the account number and their length can be specified. Composite fields can display scrolling arrows so that long account numbers can be accessed, but not use excessive space when displayed on a window.

Lists

The lists in the main window in Microsoft Dynamics GP provide a central location to access data and perform actions in the application. Each list displays a specific type of data, such as customer information or sales transactions. The data in each list can be sorted and filtered. A list containing customer information is shown in the following illustration. The data in this list is being filtered to show customers from Illinois.

The screenshot displays the Microsoft Dynamics GP interface. The main window title is "Microsoft Dynamics GP" and the breadcrumb path is "Home > Sales > Customers > Illinois Customers". The left-hand navigation pane shows a tree view with "Sales" expanded and "Customers" selected. The top ribbon contains various action buttons like "Apply Sales Document...", "Aging", "Print Statements", "Update Contact...", "Delete", "Apply Hold", "Remove Hold", "Customer", "Restrictions", "Reports", and "Go To".

The central area shows a list titled "Illinois Customers" with a search filter set to "State contains IL". The list has the following columns: Customer Name, Customer ID, State, Phone Number, and Contact. The first row is selected:

Customer Name	Customer ID	State	Phone Number	Contact
Advanced Paper Co.	ADVANCED0001	IL	(312) 555-0103 Ext. 0000	Manoj Monat
Atmore Retirement Center	ATMORE0001	IL	(309) 555-0110 Ext. 0000	Jane Donato
Cellular Express	CELLULAR0001	IL	(312) 555-0118 Ext. 0000	Michael Hajak
Central Communications LTD	CENTRALC0001	IL	(312) 555-0120 Ext. 0000	Mary West
Central Illinois Hospital	CENTRALI0001	IL	(309) 555-0122 Ext. 0000	Robert Keith
Coho Winery	COHOWINE0001	IL	(217) 555-0162 Ext. 0000	Brian Nypen
Downtown Hotel	DOWNTOWN0001	IL	(312) 555-0189 Ext. 0000	Yolanda Neilson
Franchise Office Machines	FRANCHIS0001	IL	(618) 555-0139 Ext. 0000	Customer Orders
Greenway Foods	GREENWAY0001	IL	(312) 555-0141 Ext. 0000	Purchasing & Sales
Hampton Village Eatery	HAMPTONV0001	IL	(217) 555-0142 Ext. 0000	Cheryl Miner

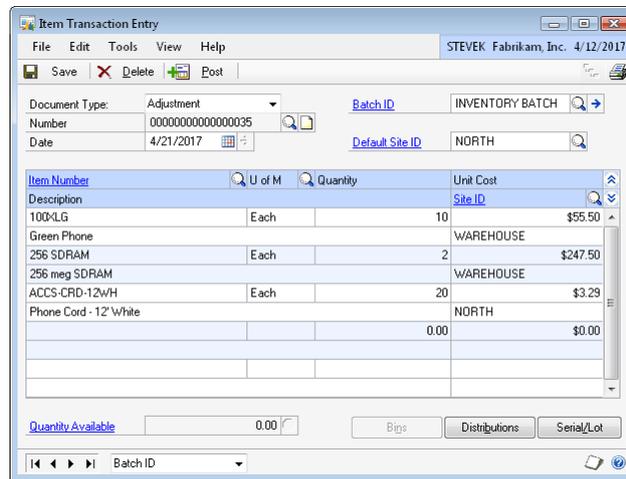
Below the list, the "Information Pane" for the selected customer "ADVANCED0001: Advanced Paper Co." is visible, showing details such as Bill To Address (456 19th Street S., Chicago, IL 60603-911, USA), Salesperson (Paul West), Customer Priority (None), Current Balance (\$327.08), Credit Limit (\$20,000.00), Payment Terms (Net 30), Average Days to Pay - YTD (346), Last Payment Date (2/2/2017), Last Payment Amount (\$256.59), Year to Date Sales (\$18,961.03), and Last Year Sales (\$0.00).

The Action Pane at the top of the list displays all of the actions that can be performed for the list. Users simply mark items in the list and choose the action they want to perform. Performing actions with the list reduces the need to open additional windows to complete tasks. The Action Pane is configurable, allowing the actions to be arranged based on the user's needs.

The Information Pane at the bottom of the list shows detailed information about the selected row. This allows the important information to be accessed without having to open a separate window.

Data-driven Scrolling Windows

An accounting system can have large quantity of data to present to the user, but a limited amount of screen area to display it. For example, a sales invoice can contain dozens of line items, each with additional item detail. Providing a way to enter, save, retrieve, and display this quantity of data is a complex task for the application. To simplify this, the Dexterity runtime engine supports a unique data-driven scrolling window control. Scrolling windows are used throughout Microsoft Dynamics GP in transaction entry windows, list windows, and lookups.



Scrolling windows have direct access to table data, and have been optimized to retrieve data efficiently from the database and display it quickly for the user. Data retrieval, record locking, and data concurrency issues are automatically handled by the scrolling window control. Special techniques ensure that the scrolling window paging and scroll bars work as users expect.

Security

Microsoft Dynamics GP has a flexible, role-based security system that allows the system administrator to control access to forms, reports, tables, and customization tools in Microsoft Dynamics GP. Users have access to only the resources needed to perform specific tasks. Microsoft Dynamics GP also provides activity tracking, which allows the actions performed by users of the accounting system to be tracked and analyzed. Comprehensive security reports help the system administrator manage compliance issues.

International Support

The Dexterity runtime engine provides features that allow Microsoft Dynamics GP to support transactions in multiple currencies. Microsoft Dynamics GP is also designed to be translated to support other languages.

Multicurrency

To support multicurrency transactions, Microsoft Dynamics GP must be able to display values in different currencies, and perform multicurrency calculations. The Dexterity runtime engine supplies formatting features that allow various currency formats to be displayed on windows and reports. Characteristics like the currency symbol, decimal separator, and thousands separator can be defined for a specific currency, and displayed whenever that currency type is used.

Microsoft Dynamics GP must perform multicurrency calculations when other currencies are used in the system. For example, if the functional currency being used by Microsoft Dynamics GP is US dollars and a transaction value is entered in euros, the value must be converted internally to the functional currency US dollars. The Dexterity runtime provides the variable currency data type to support multicurrency calculations. This special data type has the precision necessary for accurate currency calculations.

Translation

Microsoft Dynamics GP and the Dexterity runtime are designed to be translated to other languages and viewed in other locales. The application dictionary used for Microsoft Dynamics GP stores string and message resources separately. Tools available with Dexterity allow these resources to be extracted from the application dictionary, translated, and then re-added. The business logic is not affected. Special installation files allow merging the localized changes back into the dictionary when Microsoft Dynamics GP is installed for a specific locale.

Macro System

The Dexterity runtime engine provides a macro system that is designed to allow automated testing for applications like Microsoft Dynamics GP. The Microsoft Dynamics GP development team has created an extensive set of macros that test the functionality of the application. This macro set is run regularly during the development process to ensure that product quality is maintained.

Third-party software developers who create add-on products for Microsoft Dynamics GP use the macro capabilities in Microsoft Dynamics GP to create automated tests for their products. The macro system is also available to end-users in Microsoft Dynamics GP, where it can be used to automate processes in the application.

Named Printers

In certain cases, it is useful to have reports generated from Microsoft Dynamics GP always sent to a specific printer. For example, you may have a printer that contains check stock, and is used only to print checks. You would want checks printed from Microsoft Dynamics GP to be sent to this printer, but not other documents. To support this capability, Microsoft Dynamics GP can define specific printer instances, and always send specified reports to the named printer.

Mail API

Electronic mail is a critical business tool today. It is increasingly common to have accounting documents generated and sent to recipients through e-mail. The Dexterity runtime engine provides a mail API (Application Programming Interface) that allows applications like Microsoft Dynamics GP to generate and send accounting documents to recipients through e-mail.

Microsoft Application Error Reporting

Microsoft Application Error Reporting is the application feedback and diagnostic tool originally implemented in Microsoft Office applications. It allows the application to report serious issues (such as application crashes) to Microsoft, allowing problems to be diagnosed and addressed quickly. The Dexterity runtime engine has implemented Microsoft Application Error Reporting, allowing the Microsoft Dynamics GP development team to provide this diagnostic capability.

Reporting and Analytics

Extracting and presenting information in a meaningful way is vital for an application like Microsoft Dynamics GP. Several reporting and analytics solutions are available. Some are delivered as part of the core Microsoft Dynamics GP application, while others are additional products that extend the application.

Report Writer

The Report Writer is the reporting tool that is part of the Dexterity runtime engine. The core reporting capabilities of Microsoft Dynamics GP are provided by the Report Writer, which is available with every Microsoft Dynamics GP installation.

The Report Writer creates two types of reports. Graphics reports can use a variety of fonts, shapes, and pictures. They are used for reports that should be visually appealing, such as invoices. Text reports contain only text, and are designed to print quickly. They do this by using the built-in rendering capabilities of the current printer. Text reports are used for reports that can be lengthy, such as a trial balance.

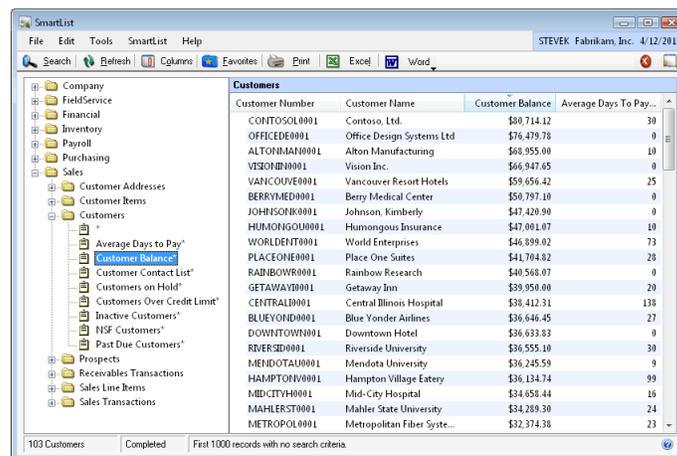
By being part of the runtime engine, the Report Writer has enhanced access to tables in the accounting system. The Report Writer automatically creates and executes special SQL queries that allow reports to be generated more quickly. Also, code in the Microsoft Dynamics GP application can pre-assemble data for optimal use on reports. Special features, such as formatting for currency values, are built in.

The Report Writer and reports created with it are integrated into the Microsoft Dynamics GP security model. The Microsoft Dynamics GP administrator can control which users can access to the Report Writer and the underlying data used for reports.

In addition to creating new reports, the Report Writer can be used by end-users to customize reports. The graphical layout window used to design reports is also used to customize their appearance.

SmartList

The SmartList feature in Microsoft Dynamics GP is another data access tool that can organize and present data from the accounting system. The SmartList displays lists of records from a specific category, such as Customers or Purchase Orders. Search criteria can be applied, limiting the results to only the records of interest. The columns displayed, as well as the column order can be specified.



The screenshot shows the SmartList application window for 'STEVEK Fabrikam, Inc.' dated 4/12/2017. The window displays a list of customers with the following columns: Customer Number, Customer Name, Customer Balance, and Average Days To Pay. The list includes 103 customers, and the first 1000 records are shown with no search criteria applied.

Customer Number	Customer Name	Customer Balance	Average Days To Pay...
CONTOSOL0001	Contoso, Ltd.	\$80,714.12	30
OFFCEDE0001	Office Design Systems Ltd	\$76,478.78	0
ALTONMAN0001	Alton Manufacturing	\$68,955.00	19
VISION0001	Vision Inc.	\$66,947.65	0
VANCOUVE0001	Vancouver Resort Hotels	\$59,656.42	25
BERRYMED0001	Berry Medical Center	\$50,797.10	0
JOHNISON0001	Johnson, Kimberly	\$47,420.90	0
HUMONGOU0001	Humongous Insurance	\$47,001.07	10
WORLDENT0001	World Enterprises	\$46,899.02	73
PLACEONE0001	Place One Suites	\$41,704.82	28
RAINBOWR0001	Rainbow Research	\$40,568.07	0
GETAWAY0001	Getaway Inn	\$39,950.00	20
CENTRALD0001	Central Illinois Hospital	\$38,412.31	138
BLUEYOND0001	Blue Yonder Airlines	\$36,646.45	27
DOWNTOWN0001	Downtown Hotel	\$36,633.83	0
RIVERSID0001	Riverside University	\$36,555.10	30
MENDOTAU0001	Mendota University	\$36,245.59	9
HAMPPTONV0001	Hampton Village Eatery	\$36,134.74	99
MIDCITYH0001	Mid-City Hospital	\$34,658.44	16
MAHLERST0001	Mahler State University	\$34,289.30	24
METROPOL0001	Metropolitan Fiber System...	\$32,374.38	23

Once set up, a SmartList search can be added as a favorite so it can easily be rerun. The search results can be exported to Excel or Word. These features make SmartList an excellent tool for creating ad-hoc reports.

Other Reporting Solutions

In some cases, the reporting solutions included with Microsoft Dynamics GP may not fill all of your reporting requirements. The Microsoft Dynamics GP architecture provides easy access to data to allow other reporting tools to be used.

FRx®

The FRx family of reporting and analysis tools is a standard in the industry. FRx makes it easy to manage and distribute critical financial reports your business depends on to run effectively. As a part of Microsoft, these tools fully integrate with Microsoft Dynamics GP.

SQL Reporting Services

Since all data for Microsoft Dynamics GP is stored and managed by SQL Server, another reporting option is to use SQL Server Reporting Services (SRS). Based on .NET and XML Web services, SQL Server Reporting Services is a robust environment for defining, managing, and distributing reports throughout an entire organization. Several predefined SRS reports are included with Microsoft Dynamics GP.

Excel Reports

From within Microsoft Dynamics GP, the system administrator can deploy Excel Reports that provide access to data from various areas of the accounting system. The Excel Reports use a data connection that allows them to be updated with real-time data from the back office application databases. When placed in a common network location or a Windows SharePoint® Library, people throughout the organization can access these Excel Reports without the need for a Microsoft Dynamics GP client.

Crystal Reports

Crystal Reports is a stand-alone report writer that is widely used to produce reports for applications like Microsoft Dynamics GP. When used with Microsoft Dynamics GP, Crystal Reports accesses data directly from the database through ODBC.

Workflow

Workflow, which controls the flow of documents through the accounting system, is a common business need. Microsoft Dynamics GP can use the workflow capabilities provided by Microsoft Office SharePoint Server to implement approval workflows for several common document types. For example, a purchase approval workflow can be set up to control who must approve purchase orders over a specified amount.

Workflow functionality can be accessed from within the Microsoft Dynamics GP application. The following illustration shows the workflow status for a sales quote document that has been submitted for approval.

The screenshot displays the 'Sales Transaction Entry' window in Microsoft Dynamics GP. The window title is 'Submitted for Approval'. The document is a 'Quote' (STQOTE) dated 4/12/2017, created by 'Steve K'. The customer is 'AARONFIT0001' (Aaron Fitz Electrical) at 'WAREHOUSE', 11403 45 St. South. The document number is 'ORDERS4/12' and the default site is 'WAREHOUSE'. The currency is 'ZUS\$'. The total amount is \$13,910.00.

Item Number	D	U	M	Quantity Quoted	Unit Price	Extended Price
1A2483A				1	\$13,000.00	\$13,000.00
				0.00	\$0.00	\$0.00

Summary:

Amount Received	\$0.00	Subtotal	\$13,000.00
Terms Discount Taken	\$0.00	Trade Discount	\$0.00
On Account	\$13,910.00	Freight	\$0.00
Comment ID		Miscellaneous	\$0.00
		Tax	\$910.00
		Total	\$13,910.00

There are several ways users can be notified of and perform workflow tasks.

- Users can receive workflow notifications directly in the Microsoft Dynamics GP. They can use the notification to view the document and perform actions such as approving or rejecting the request.
- Users can receive e-mail messages indicating that workflow tasks need to be performed. The tasks can be performed directly in Microsoft Outlook®.
- Users can access the SharePoint Web site through their Web browser to view workflow information and perform actions for the documents and batches assigned to them.

Business Portal

Microsoft Dynamics GP manages data that is valuable beyond the accounting department. Business Portal is a Web-based business application that you can use as your company intranet or as an extension to your company intranet. It provides secure access to this vital back office data to users throughout the organization.

The screenshot shows the 'Sales and Commissions' page for Fabrikam, Inc. The page is divided into two main sections: 'Customer Sales and Receivables Summary' and 'Commission Summary'. Both sections are filtered by Customer ID 'AARONFIT0001'.

Customer Sales and Receivables Summary

Customer ID	Year To Date	Last Year	Aging
AARONFIT0001	Total Sales: \$59,567.47	Total Sales: \$0.00	Balance Amount: \$24,272.06

Commission Summary

Customer ID	Document Number	Sales Amount	Commission Amount
AARONFIT0001	INVS3008	\$877.50	\$26.33
AARONFIT0001	SALES000000001000	\$0.00	\$0.00
AARONFIT0001	SALES000000001001	\$50.00	\$1.50
AARONFIT0001	SLS11012	\$45,488.23	\$4164.65
AARONFIT0001	SLS11012	\$45,488.23	(\$4164.65)
AARONFIT0001	SLS11012	(\$45,488.23)	(\$4164.65)
AARONFIT0001	SLS11012	\$45,488.23	\$4164.65
AARONFIT0001	SLS11012	(\$45,488.23)	(\$4164.65)
AARONFIT0001	SLS11015	\$4833.33	\$425.00
AARONFIT0001	SLS11015	\$4833.33	\$425.00

Architecture

Business Portal utilizes the latest Microsoft technology. It is hosted by Internet Information Services (IIS) running on Windows Server® 2003. It can be installed with Windows SharePoint Services (WSS) only, or with Office SharePoint Server, which is based on Windows SharePoint Services. Additional features, such as Search, are available when Business Portal is installed with Office SharePoint Server.

Capabilities

Business Portal uses a Web-based interface to provide access to back office data in Microsoft Dynamics GP. Several types of pages are used in Business Portal:

Page Type	Description
Center Site Home Pages	Provides a starting point to access a particular category of data, such as Financial, Sales, or Purchasing.
Information Pages	Presents data about particular items in the system, such as customers, accounts, or inventory items.
Query Pages	Allows users to create and run queries that retrieve data about specific items in the system. Several predefined queries are delivered with Business Portal. Users can modify these queries or create their own.
Reports Pages	Provides access to reports for a center within Business Portal. Reports pages are available only when using Business Portal with Windows SharePoint Services.
List Pages	Uses the Office SharePoint Server Business Data List Web part to present data from the back office. List pages are available only when using Business Portal with Office SharePoint Server, Enterprise Edition.
Dashboard Pages	Uses Business Data Web Parts to bring together related information to help people perform their jobs. For instance, the Sales Dashboard is designed for people working in sales. Dashboard pages are available only when using Business Portal with Office SharePoint Server, Enterprise Edition.

Additional applications available for the Business Portal extend its capabilities further. For example, employees can use the Human Resources application for Business Portal to perform tasks like updating personal contact information, submitting timecards, and viewing paychecks. Requisition Management, another application available for Business Portal, can manage purchase requests.

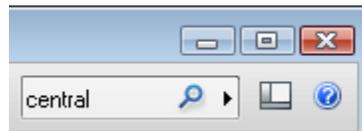
Support for Windows Terminal Services allows Microsoft Dynamics GP windows to be accessed directly through Business Portal. Users can access specific Microsoft Dynamics GP windows without needing a complete installation of the application.

Security is integrated throughout Business Portal. Once users have logged into a domain, their domain credentials are used to authenticate them for Business Portal. Access to resources in Business Portal is role-based. Several roles are defined in Business Portal, such as Accounting Specialist or Salesperson. Users can see only data relevant to the roles to which they have been assigned.

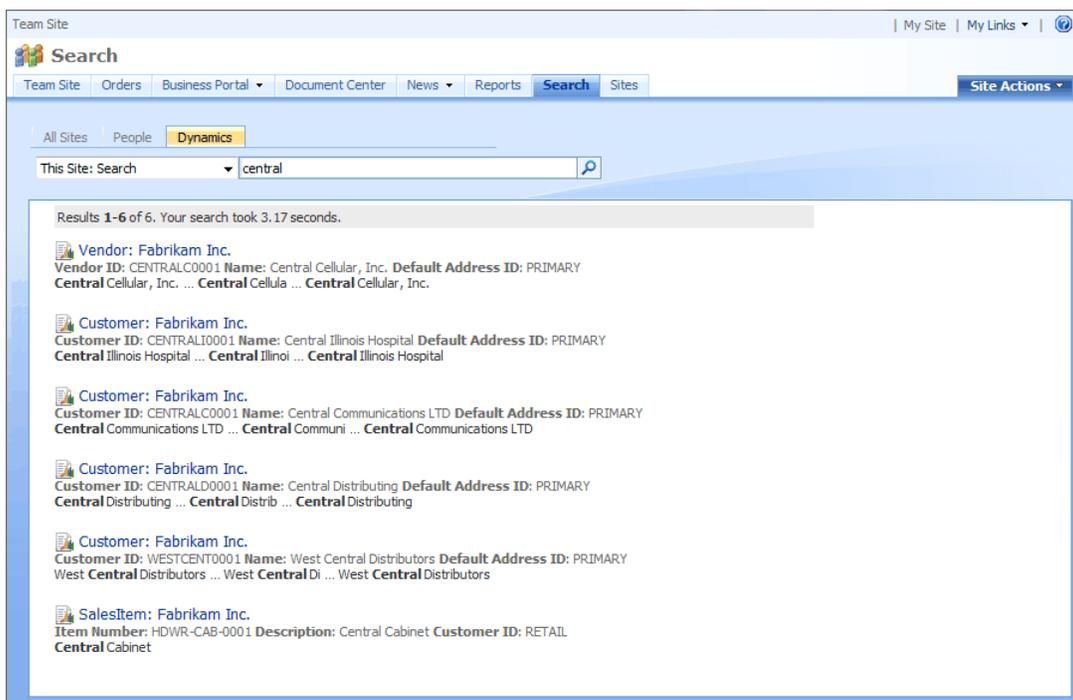
Search

When running Business Portal with Microsoft Office SharePoint Server, you can use the search functionality provided by the SharePoint Search Engine to search the structured data in Microsoft Dynamics GP. The search can be accessed from within Microsoft Dynamics GP, from within Business Portal, or from Windows Desktop Search.

When the search feature has been configured, a Search field automatically appears in the Microsoft Dynamics GP main window. The following illustration shows this field. The value "central" has been entered as a search term.



The search query is sent to the Office SharePoint Server that is running Business Portal. The search results are displayed in a SharePoint Web page. In this example, all business objects that match the term "central" are displayed.

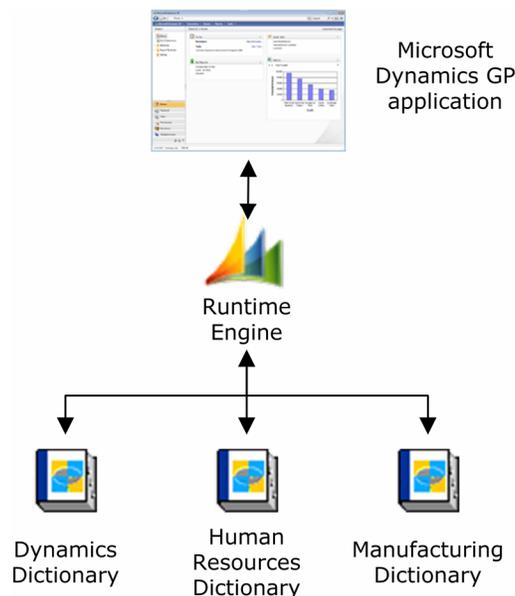


Application Extensibility

Microsoft Dynamics GP provides excellent core accounting features. However, many businesses require additional capabilities that are specific to their industry or market. Recognizing this important fact, Microsoft Dynamics GP has been designed from the beginning to be extensible. Hundreds of ISVs (Independent Software Vendors) have created add-ons and enhancements for Microsoft Dynamics GP to target specific industries, markets, and customer types.

Multidictionary Architecture

A primary feature of the Microsoft Dynamics GP platform that allows extensibility is the multidictionary architecture provided by the Dexterity runtime engine. The multidictionary architecture allows multiple applications created with Dexterity to be run at the same time. For example, the following illustration shows the core Dynamics dictionary, and two additional integrating application dictionaries that all function together in the multidictionary environment.



The following are the key benefits of the multidictionary architecture:

- Multiple applications can function together, appearing as a single application to the user.
- Integrating dictionaries can use resources from the Microsoft Dynamics GP core dictionary.
- Integrating dictionaries can provide alternate versions of forms and reports in Microsoft Dynamics GP.
- Like the main application dictionary, integrating dictionaries can be customized using tools like the Modifier, Report Writer, and VBA.

Trigger System

The Dexterity runtime engine provides an extensive trigger system that allows integrating application to be notified when events occur in another dictionary. An application registers the events for which it should be notified, such as a window being opened. When the event occurs, code in the application is run in response to the event. Integrating applications created with Dexterity, the Modifier with VBA, the .NET API (Visual Studio Tools), and the COM API (Continuum) all use this sophisticated trigger system.

Development Options

Add-on applications for Microsoft Dynamics GP can be created using several different tools. The following table lists the tools commonly used:

Tool	Description
Dexterity	The development environment used to create the Microsoft Dynamics GP application. The most tightly integrated add-ons are created with Dexterity.
Modifier with VBA	Customized forms are created with the Modifier, and additional forms and business logic are added with VBA.
Visual Studio Tools (.NET API)	An add-on for Microsoft Visual Studio that allows creating .NET-based integrations for Microsoft Dynamics GP. Integrations can be written in Visual Basic .NET or C#.
Continuum (COM API)	Any application development tool that can access a COM API, such as Visual Basic, can be used to create these types of integrations. Typically, these are smaller interface-level modifications or database integrations.
eConnect	Any development tool that can use one of the eConnect programming interfaces can be used. eConnect is the preferred method for database-level integrations.
Web Services	Most development tools that can access a standard Web interface can be used. Web Services provides an ideal way to access Microsoft Dynamics GP data over an intranet.

The tool chosen to create an integration depends on several factors. The primary factor is the type of integration being created. For add-ons that integrate tightly with the Microsoft Dynamics GP interface, Dexterity, Visual Studio Tools, and the Modifier with VBA are the preferred tools. Add-ons that integrate at the database level, and primarily import and export data would typically be created with eConnect or Web Services.

The developer's skill set is another factor. The various development tools that can be used to create integrations allow developers to leverage existing skills. For example, if a developer is already a capable Visual Basic programmer, the Modifier with VBA would be the preferred tool for developing an interface-level integration. Skilled .NET developers would likely choose Visual Studio Tools for Microsoft Dynamics GP.

Conclusion

With the foundation provided by the Dexterity runtime engine and Microsoft SQL Server, the Microsoft Dynamics GP architecture offers the following:

- Excellent performance on both the client and the server
- Great customization capabilities
- Flexible data integration to allow access to data
- Unique platform features ideal for business applications
- Ample reporting capabilities
- Workflow capabilities integrated with Office SharePoint Server
- Access to valuable data by the entire organization through Business Portal
- Integration with powerful Windows SharePoint features, such as search
- An extendable architecture allowing add-ons and vertical enhancements

The product architecture is a key element that makes Microsoft Dynamics GP an outstanding solution for an organization today and into the future.

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