MODULE 7: TECHNOLOGY OVERVIEW

Module Overview

The Microsoft Dynamics® NAV 2013 architecture is made up of three core components – also known as a three-tier architecture - and offers many programming features for effective customization of code and execution of functions.

In this module, selected features and characteristics are introduced through conceptual descriptions and reinforced with a test your knowledge section. Accordingly, the lessons include no demonstrations or labs on the subject.

For detailed information on architecture and development features, refer to the courses *C/SIDE Introduction in Microsoft Dynamics NAV 2013* and *Installation and Configuration in Microsoft Dynamics NAV 2013.*

📝   **Note:** *For an overview of the different types of communication that are offered in Microsoft Dynamics NAV 2013, refer to the "Microsoft Dynamics NAV 2013 as an ERP System" module in this course.*

The architectural basics of Microsoft Dynamics NAV 2013 and the structure of the programming code are important concepts for all IT professionals involved in the configuration and maintenance of Microsoft Dynamics NAV 2013.

Objectives

The objectives are:

- Explain the web services support in Microsoft Dynamics NAV 2013.
- Describe the different client types.
- Provide an overview of the Microsoft Dynamics NAV 2013 Development Environment.
- Describe the multilanguage functionality.

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Web Services Support

Web services are a lightweight, standardized way to make application data and functionality available to many external systems and users. Web services architecture enables applications to communicate with one another, in a language- and platform-independent manner. Applications access web services through standardized web protocols and data formats such as HTTP, XML, SOAP, and OData, without having to adjust for how each web service is implemented.

Microsoft Dynamics NAV 2013 supports the creation and publishing of Microsoft Dynamics NAV 2013 data and functionality as web services.

Web services make easier the highly dynamic data interchange that is required in business transactions. Standardized integration technologies, such as web services, bring value to businesses by breaking down data silos that are created by proprietary systems.

To provide a robust development and operational environment, web services are described by using machine-readable metadata. Web service metadata serves several purposes. The metadata is used to describe the message interchange formats that a web service can support, in addition to the valid message exchange patterns of a service. Metadata is also used to describe the capabilities and requirements of a service. Web Services Description Language (WSDL), which is an XML-based language for defining web services, is used to express the interchange formats and message exchange patterns for Simple Object Access Protocol (SOAP) web services.

Microsoft Dynamics NAV web services can be used by customers and partners who want to use business logic or a standard interface to access data from outside Microsoft Dynamics NAV. You can use most major software Microsoft Dynamics NAV Development Environments, such as Microsoft® Visual Studio® 2012, to build applications that use web services. Also, because web services are XML based, you can build web services across platforms and programming languages.

Multiple Client Support

You have several options for interacting with the business logic and business data in the Microsoft Dynamics NAV Server. The most obvious options are the following RoleTailored clients:

- The Microsoft Dynamics NAV Windows client.
- The Microsoft Dynamics NAV Web client.

For more specialized tasks, you can use the Microsoft Dynamics NAV SharePoint client through the Microsoft Dynamics NAV Portal Framework.

Other systems, applications, and specialized clients can integrate to Dynamics NAV by using the following services:

- SOAP web services.
- OData web services.

You can obtain task scheduling, client offloading, and specialized integration scenarios by using NAS services.

Windows Client

The Windows client, which is a Windows Forms-based client, is the front end for the three-tiered architecture. It is an intuitive and versatile Windows-based application that partners, administrators, and users can configure and personalize to support the job functions of a full range of work roles in an organization.

Microsoft provides 21 role centers out of the box. Examples of role centers are Sales Order Processor and Accounting Manager. Each role center displays key information that is required for relevant employees and makes day-to-day tasks easier to finish. Users run the Windows client to find the information and data entry points their jobs require in the most efficient way.

The Windows client is installed when you select either the **Client** option or the **Developer** option in Microsoft Dynamics NAV Setup.

Web Client

With the Microsoft Dynamics NAV Web client, you can access Microsoft Dynamics NAV data from a web browser, even over the Internet. You can view and edit data by using an interface that resembles the Windows client. Microsoft Dynamics NAV Web client does not replace the Windows client but complements it by enabling scenarios that are not possible or prove difficult with the Windows client.

You develop solutions for Microsoft Dynamics NAV Web client by using the Microsoft Dynamics NAV Development Environment - implementing the same objects and business logic as you would with the Windows client.

SharePoint Client

Microsoft Dynamics NAV Portal Framework for Microsoft SharePoint 2010 is a set of components that can be used to build Microsoft SharePoint web applications that display Microsoft Dynamics NAV pages and reports.

Using the Microsoft Dynamics NAV Portal Framework for Microsoft SharePoint, a Microsoft Dynamics NAV administrator can create a browser application that provides access to specific Microsoft Dynamics NAV features, applications, and pages.

SOAP Web Services

In Microsoft Dynamics NAV 2013, SOAP web services enable external applications to create, read, update, and delete data through page objects and to call functions and run business logic in Microsoft Dynamics NAV through codeunits. OData web services enable external applications to read and query data through page and query objects in an a flexible and structured way. SOAP web services are useful when external applications need to interact with Microsoft Dynamics NAV.

OData Web Services

We recommend Open Data Protocol (OData) web services for client applications that require a uniform, flexible, general purpose. They are less suited for applications that are primarily method oriented or in which data operations are constrained to certain prescribed patterns. OData supports Representational State Transfer (REST)-based data services, which enable resources, identified by using Uniform Resource Identifiers (URIs), and defined in an abstract data model (EDM), to be published and edited by web clients within corporate networks and across the Internet by using simple HTTP messages. OData services are lightweight, with functionality frequently referenced directly in the URI. You define and publish Microsoft Dynamics NAV 2013 OData web services in the Windows client, and manage them from the Microsoft Dynamics NAV Server Administration Tool.

OData web services are useful for data analyses, such as through the PowerPivot add-in for Microsoft Excel.

NAS Services

NAV Application Server (NAS) is a middle-tier server component that executes business logic without a user interface or user interaction. NAS is re-engineered in Microsoft Dynamics NAV 2013 to be one of the client services in Microsoft Dynamics NAV Server.

The Microsoft Dynamics NAV Application Server can run both as a Windows service and from a command prompt. It provides access from external clients to the Microsoft Dynamics NAV database. NAV Application Server runs key components of the business logic. Therefore, it can start processes to produce refined results exactly as if one were requesting information from the Windows client.

You manage NAS services from the Microsoft Dynamics NAV Server Administration Tool.

✸Microsoft Dynamics NAV 2013 Development Environment

You use the Microsoft Dynamics NAV 2013 Development Environment to develop Microsoft Dynamics NAV applications. This component, which in earlier versions of Microsoft Dynamics NAV was also an end-user client, was formerly known as the Classic client.

You use the Microsoft Dynamics NAV Development Environment to create and manage Microsoft Dynamics NAV 2013 databases, to create and manage Microsoft Dynamics NAV companies, and to upload or change Microsoft Dynamics NAV licenses.

When you open the Microsoft Dynamics NAV Development Environment, you see Object Designer. This gives you access to Microsoft Dynamics NAV objects. You use the Microsoft Dynamics NAV Development Environment to modify the application or to create new application areas.

To access the Microsoft Dynamics NAV Development Environment, follow these steps:

1. Click Start.
2. Click All Programs.
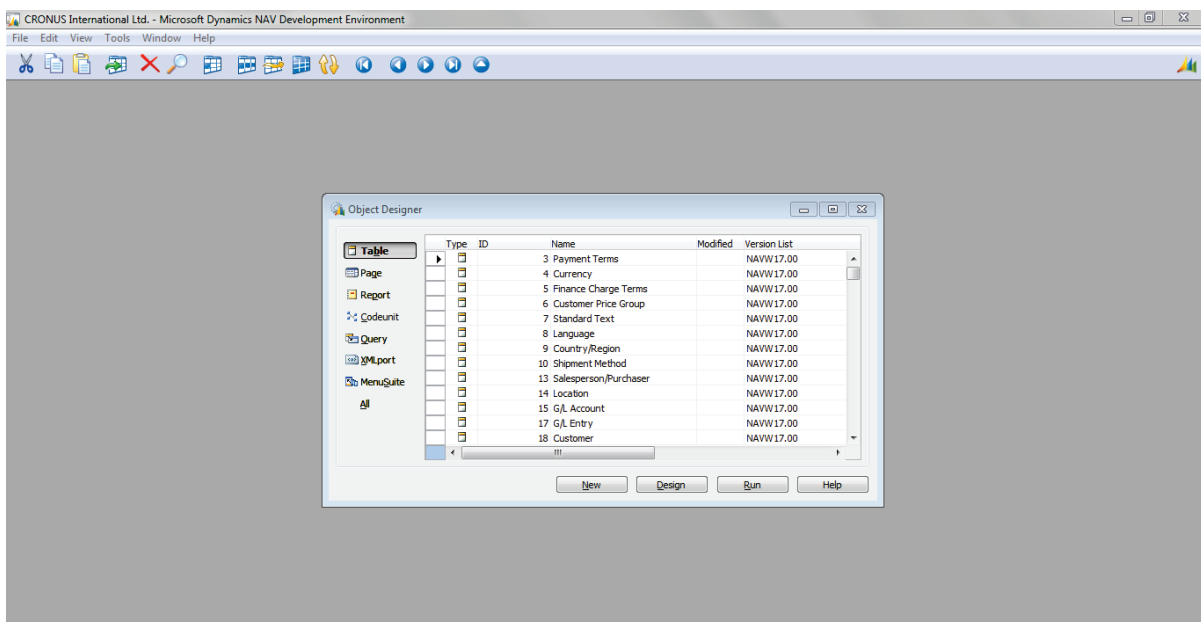3. Select Microsoft Dynamics NAV 2013 Development Environment.

FIGURE 7.1: MICROSOFT DYNAMICS NAV 2013 DEVELOPMENT ENVIRONMENT

Object Designer

The Object Designer enables developers to design applications. From Object Designer, they can run an application object or start an application Object Designer (for example, the Page Designer).

In Object Designer, there are seven types of application objects:

- Tables
- Pages
- Reports
- Codeunits
- Queries
- XMLports
- MenuSuites

Application Objects

You design Microsoft Dynamics NAV 2013 application objects from Object Designer. The following objects make up the Microsoft Dynamics NAV Development Environment.

Object	Description
Table	Tables are the fundamental objects in any database. They are the objects in which you store and manipulate data. This is true regardless of what kind of data you have to manage. When you create a new database, you begin by building the tables. Later, you create pages and reports in order to access and view the data in the tables.
Pages	Pages provide the main way to interact with the client user interface. Pages are XML based and can be displayed on multiple display targets. They are also role based, targeting the needs of individual users.

Object	Description
Reports	You can use reports to structure and summarize information from a database. You can use them to display or print documents, such as invoices. For example, you can create a report that lists all customers or all orders that are placed by each customer. You can also create a report that is automatically completed with the relevant information for an invoice.
	Finally, you can use reports to process data without printing or displaying content. For example, you can use a report to automate the update of all prices in an item list.
Codeunits	A codeunit is a container for C/AL code that you can use in many application objects.
	For example, codeunit 80 (Sales-Post) contains the C/AL code to post sales transactions. This codeunit is used in different application objects such as the sales invoice page or the sales order page.
Queries	A query is a new object in Microsoft Dynamics NAV 2013 that you use to specify a set of data from the Microsoft Dynamics NAV database. You can query the database for the following:
	• Retrieve fields from a single table or multiple tables.
	• Specify how to join tables in the query.
	• Filter the resulting data.
	• Specify totaling methods on fields, such as sums and averages.
XMLports	XMLports are used to export or import data between an external source and a Microsoft Dynamics NAV database.
	Various data file formats are supported, including fixed text, variable text, and (of course) XML.
	Sharing data between different computer systems is seamless when it is shared in XML format. The details of how the XML file is handled are encapsulated in XMLports.
	To use an XMLport to import or export data, you first design the XMLport in the **XMLport Designer** window. You can run the XMLport directly from Object Designer or from a Page action, or you can control the XMLport by using C/AL code.

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Object	Description
MenuSuites	With MenuSuites objects, you can create menus for applications that let the user send, receive, and exchange information with other systems. These systems could be software, hardware, or data sources that may be inside or outside Microsoft Dynamics NAV. MenuSuite objects contain menus that provide a user interface users can use to explore and perform actions in the Windows client. MenuSuite objects display menus on the **Departments** page in the Windows client. The menus are displayed as hyperlinks that enable users to browse application objects, and make the applications easier to access in the Windows client. Microsoft Dynamics NAV provides a basic MenuSuite object that can be modified. You can also create your own MenuSuite object. You create MenuSuite objects in Object Designer and modify them in Navigation Pane Designer.

The Graphical User Interface (GUI)

The user interface (UI) is easy to use if you are already familiar with Microsoft Dynamics or Microsoft Office products. The user interface has many benefits, such as the fact that many windows can be open at the same time and that the GUI follows the same design principles throughout Microsoft Dynamics NAV.

The Windows experience is based on the Microsoft Office fluent user interface to help give you a familiar and easy environment for your work.

📃 *Note: The "User Interface" module of this course provides an overview and description of the different components of the Windows client user interface.*

Special Features

Microsoft Dynamics NAV fulfills the requirements of a business management solution by supplying tools for entering and managing information and always satisfying the current accounting laws. Microsoft Dynamics NAV also contains some special facilities that help you develop business applications.

Microsoft Dynamics NAV provides many useful features. These include the following:

- Direct access from one table to another.
- Easy data entry.
- Information in multiple dimensions.

- Automatic calculation of amounts and quantities.

- Information on what is included in a calculated amount.

- Filtering of information.

- Intuitive search.

- Sorting with one or more keys.

- Pictures of items or a company logo on the screen, together with the associated information.

- Connections to mail merge, spreadsheet applications, and presentation graphics programs.

- Windows 7 features:

  o Jump List Tasks and Places

  o Error and Warning Icon Overlay

  o Progress Information Icon Overlay

  o Thumbnail Window Preview Overlay

Other Uses

In addition to Object Designer, you can use the Microsoft Dynamics Development Environment for following functions:

- **Databases**: Create and manage Microsoft Dynamics NAV 2013 databases.

- **Companies**: Create and manage Microsoft Dynamics NAV 2013 companies.

- **Debugger**: Verify correctness or find issues as you use the debugger to accompany program flow.

- **Backup/Restore**: Make a backup of your database, and restore it afterward.

- **NAV Licenses**: Upload or change Microsoft Dynamics NAV licenses.

Multilanguage Functionality

Microsoft Dynamics NAV is multilanguage enabled. This means that a localized version of Microsoft Dynamics NAV can present itself in different languages. The user can change the language that is used to display texts, and the change is immediate. Users do not have to stop and restart Microsoft Dynamics NAV.

You should be aware of the difference between changing the language of Microsoft Dynamics NAV and changing the language of the data that is stored in Microsoft Dynamics NAV. You can address the first issue by enabling the multilanguage features. These features let the user change the language of all the texts displayed by the application in captions for text boxes, on command buttons, in menus, and so on.

Changing the texts that are stored as application data is not part of the multilanguage capability. This is an application design issue. Examples of such texts are the names of items in the inventory or the comments for a customer. In other words, these types of text are not translated.

Eliminate Employee Language Barriers

Microsoft Dynamics NAV helps employees become more efficient by eliminating language barriers among your multilingual workforce.

Microsoft Dynamics NAV users can work in the language of their choice. For example, a Swiss user can run his or her version of Microsoft Dynamics NAV in German, French, or Italian. However, the local functionality is still Swiss. If a user prefers French, but wants to send a report to an Italian colleague, he or she can do so in Italian. This means that, for example, French and Italian colleagues can work side by side on the same database or even share a workstation.

With Microsoft Dynamics NAV, your customer service improves because you can do business in your customer's preferred language. For example, if a Polish customer wants invoices in his or her native language, you can print the invoices in Polish from the Microsoft Dynamics NAV application. Therefore, communication becomes more efficient with both existing and potential customers and partners around the globe.

Language Layers

A language must be present as a granule in the license file for a user to select it from the Microsoft Dynamics **Application** menu. The application must also be translated to that language so that you can import it into the database as a text file or a language module in either of the following ways:

- Export all text strings and translate them in a translation tool, such as the Microsoft Localization Studio.
- Enter the translation of the text strings directly in the multilanguage editor.

Demonstration: Use the Multilanguage Editor

Although UI translation is usually a batch translation process performed when a local version of the program is created, you can manually translate additional field or window captions in individual objects by using the **Multilanguage Editor** window.

To translate the (customer) **Name** field into Danish, follow these steps:

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Demonstration Steps

1. Translate the **Name** field in the customer table to Danish.

   a. Open the Microsoft Dynamics NAV Development Environment.

   b. In Object Designer, select the **Customer** table (table 18).

   c. Click **Design** to open the Page Designer.

   d. Select **Name**, and then click **View > Properties** (or press SHIFT+F4) to open the **Properties** window.

   e. Locate the **CaptionML** property, and then click the **AssistEdit (...)** button in the **Value** field.

   f. In the **Multilanguage Editor** window, move to an empty line and, look up from the **Language** field to select Danish from the list (or type "DAN").
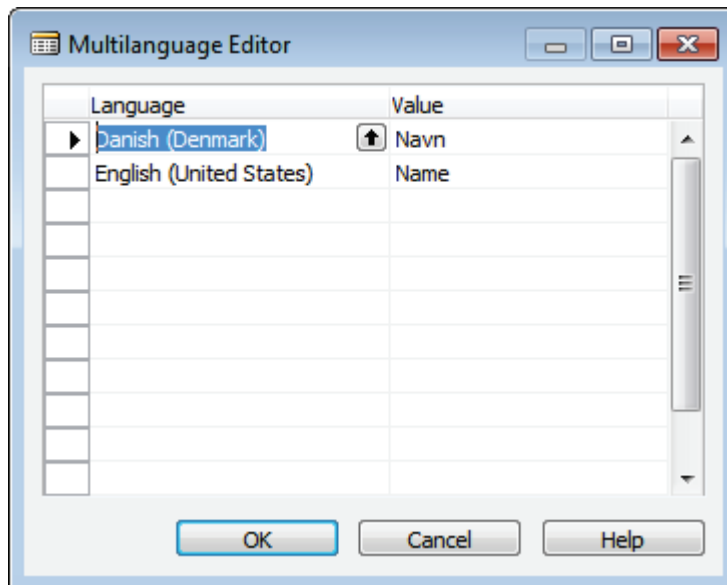
   g. In the **Value** field, type "Navn".

FIGURE 7.2: MULTILANGUAGE EDITOR WINDOW

   h. Click **OK** to save the translation.

   i. Close the dialog boxes.

   j. Click **Yes** to compile the **Customer** table when closing the Form Designer.

In an installation that has the Danish language layer imported, this particular **Name** field now includes the new translation.

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Developing Multilanguage-Enabled Applications

When you develop in a multilanguage-enabled environment, remember the following general rules:

- Set the application language to English (United States).
- Specify the Name property in English (United States).
- Use text constants in your code instead of using hardcoded text strings.
- Verify that everything that is displayed to the user has a Caption property.
- Use the DateFormula data type instead of Text or Code for date formulas.

Before you start to work in a multilanguage-enabled database, set the application language to (United States) English. Do this by clicking **Tools > Language** and then selecting English (United States).
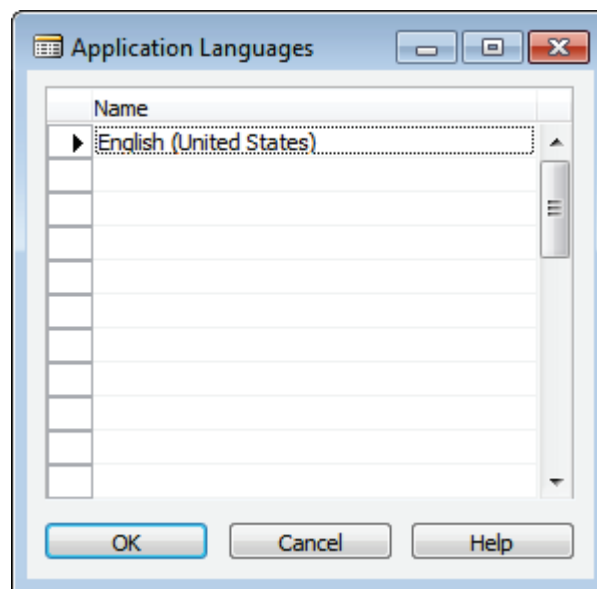

FIGURE 7.3: APPLICATION LANGUAGES WINDOW

In Microsoft Dynamics NAV, the code base is English (United States). This means that the **Name** property of, for example, an object must always be English (United States).

The code base in English (United States) includes the following:

- Object names
- Field names
- Function and variable names
- Comments
- Option strings
- Control names

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Module Review

Module Review and Takeaways

The most important technology updates to Microsoft Dynamics NAV 2013 were introduced to provide new partner roles or users with basic knowledge of what is behind the UI and architecture.

This fundamental knowledge is a prerequisite for anyone training to become a skilled partner role - even if his or her focus is on application features.

Test Your Knowledge

Test your knowledge with the following questions.

1. Which function can you only use in the Development Environment?

    ( ) Select Language

    ( ) Upload License

    ( ) Set Work Date

    ( ) Select Company

2. Name at least six types of objects in C/SIDE.

    _____

    _____

    _____

    _____

3. What is a codeunit?

    _____

    _____

    _____

    _____

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4. Which language should you use when you develop in a multilanguage-enabled environment, such as Microsoft Dynamics NAV 2013?

    (   ) English (United States)

    (   ) English (United Kingdom)

    (   ) Danish

    (   ) You can use any application language that is included in the license.

5. Which are the two RoleTailored clients in Microsoft Dynamics NAV 2013.

    _____

    _____

    _____

    _____

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Test Your Knowledge Solutions

Module Review and Takeaways

1. Which function can you only use in the Development Environment?

    (   ) Select Language

    (√) Upload License

    (   ) Set Work Date

    (   ) Select Company

2. Name at least six types of objects in C/SIDE.

    MODEL ANSWER:

    Tables, Reports, Queries, XMLports, Codeunits, MenuSuite, Pages

3. What is a codeunit?

    MODEL ANSWER:

    A codeunit is an object type that contains functions that are written in C/AL code.

4. Which language should you use when you develop in a multilanguage-enabled environment, such as Microsoft Dynamics NAV 2013?

    (√) English (United States)

    (   ) English (United Kingdom)

    (   ) Danish

    (   ) You can use any application language that is included in the license.

5. Which are the two RoleTailored clients in Microsoft Dynamics NAV 2013.

    MODEL ANSWER:

    Windows client, Web client