Ambientes de Desenvolvimento Avançados

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Aula 9

Engenharia Informática

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Microsoft®

Designing Data Tier Components and Passing Data Through Tiers

PARTE 3

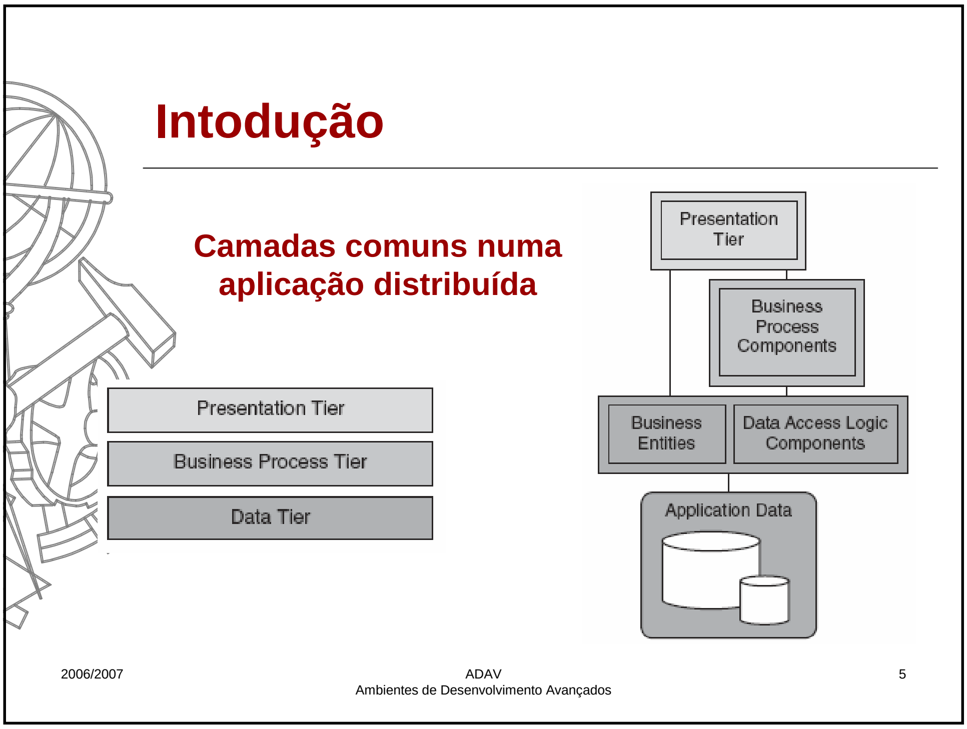
Projecto de Componentes da Camada de Acesso a Dados e Passagem de Dados entre Camadas

patterns & practices
proven practices for predictable results

Conteúdo

- Introdução
- Componentes Lógicos de Acesso a Dados
- Representação de Entidades de Negócio
- Mapeamento de Dados Relacionais a Entidades de Negócio
- Implementação de Componentes Lógicos de Acesso a Dados
- *Implementação de Entidades de Negócio*
- Transacções
- Validações
- Gestão de Excepções
- Autorização e Segurança
- Distribuição e Instalação (Deployment)

Enquadramento:
Resumo aulas 7 e 8



Intodução

Camadas comuns numa aplicação distribuída

Presentation Tier

Business Process Tier

Data Tier

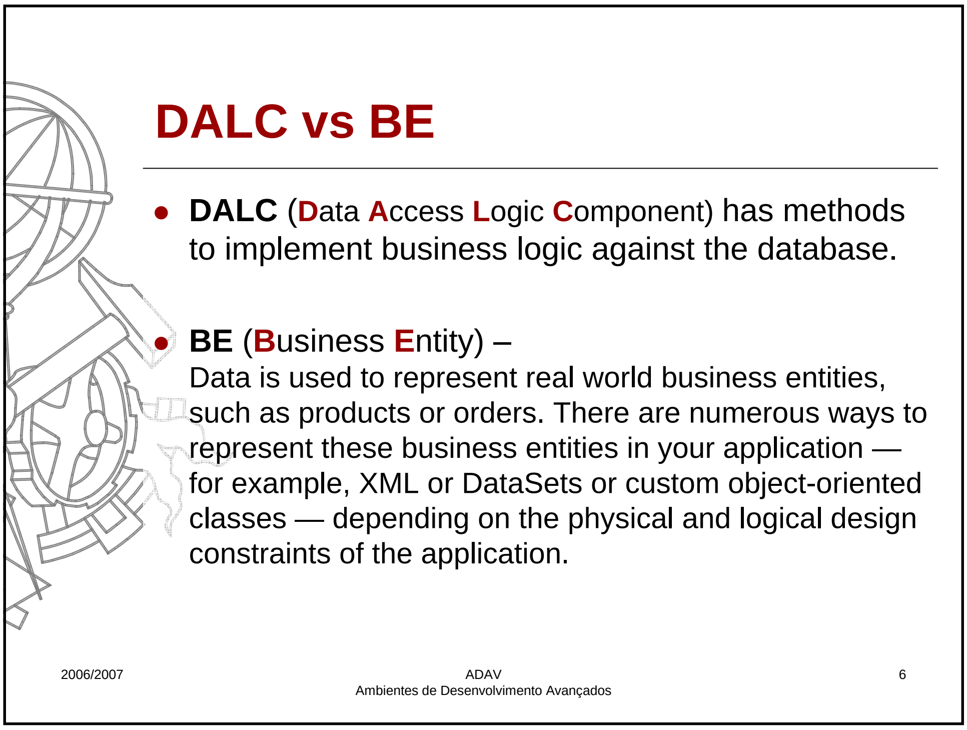
Presentation Tier

Business Process Components

Business Entities

Data Access Logic Components

Application Data

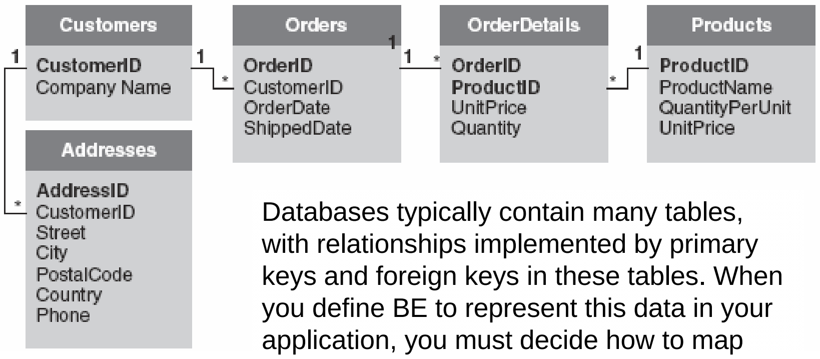


DALC vs BE

- **DALC** (**D**ata **A**ccess **L**ogic **C**omponent) has methods to implement business logic against the database.
- **BE** (**B**usiness **E**ntity) –
  Data is used to represent real world business entities, such as products or orders. There are numerous ways to represent these business entities in your application — for example, XML or DataSets or custom object-oriented classes — depending on the physical and logical design constraints of the application.

Mapeamento de Dados Relacionais a Entidades de Negócio

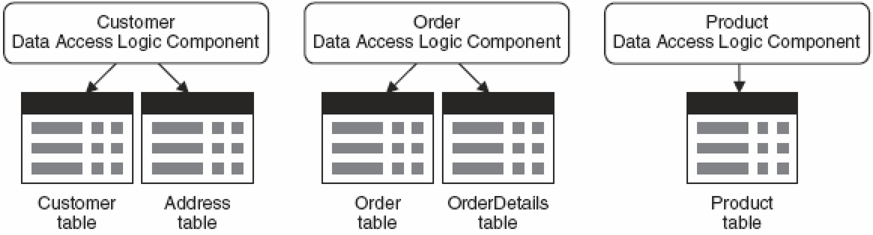
An hypothetical retailer’s database



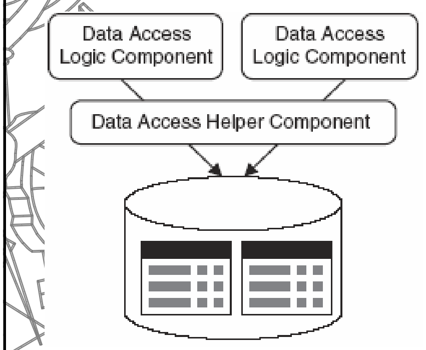
Databases typically contain many tables, with relationships implemented by primary keys and foreign keys in these tables. When you define BE to represent this data in your application, you must decide how to map these tables to BE.

Mapeamento de Dados Relacionais a Entidades de Negócio

The relationships between the data access logic components and the tables that they represent in the database.


Customer Data Access Logic Component
Order Data Access Logic Component
Product Data Access Logic Component
Customer table
Address table
Order table
OrderDetails table
Product table

Implementação das classes de um DALC



Data Access Logic Component

Data Access Logic Component

Data Access Helper Component

- DALC use ADO.NET to execute SQL statements or call stored procedures.
- If your application contains multiple DALC, you can simplify the implementation of DALC classes by using a **data access helper component**.
- Design your DALC classes to provide a consistent interface for different types of clients.

How to Define a DALC Class

Sample

- The code is a sample definition of a class named `CustomerDALC`, which is the DALC class for Customer BE. The `CustomerDALC` class implements the CRUD operations for the Customer BE and provides additional methods to encapsulate business logic for this object.

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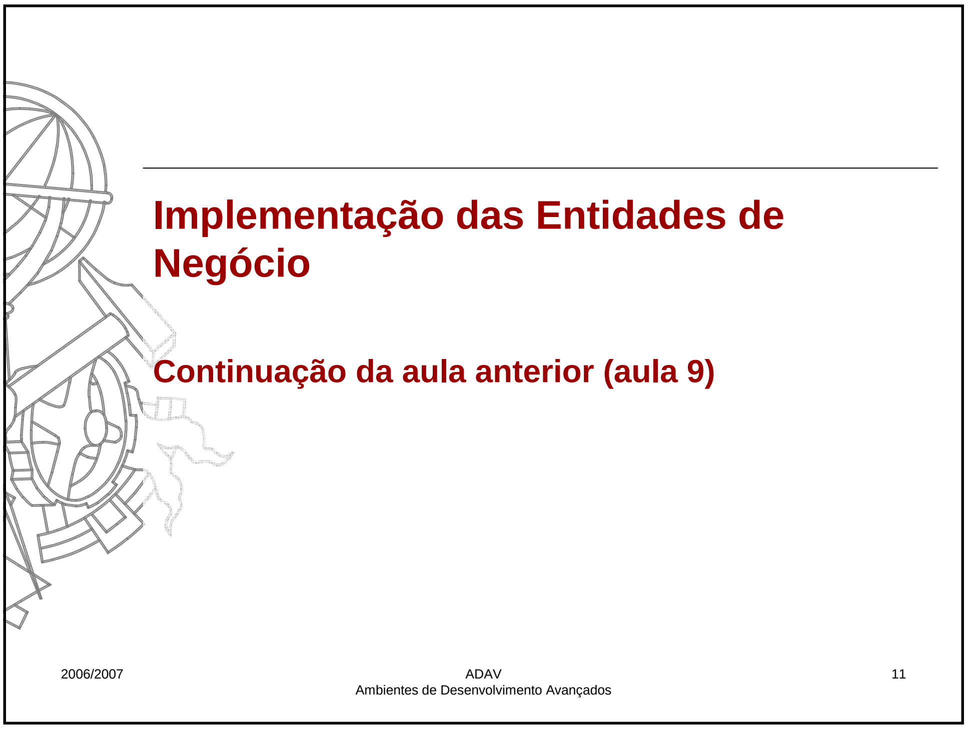
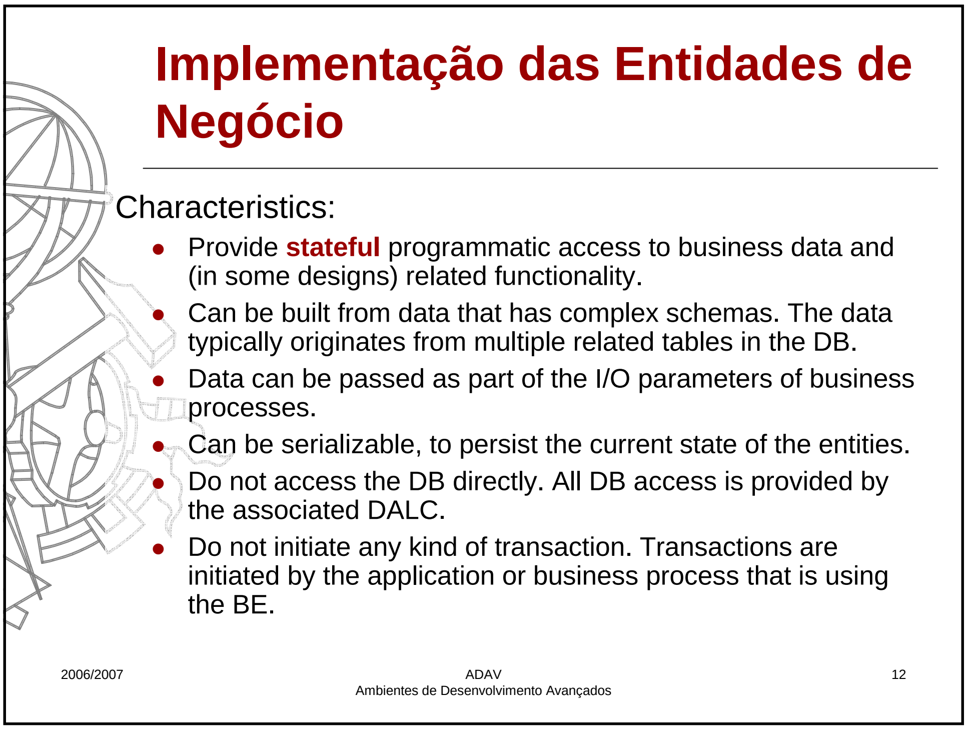


Implementação das Entidades de Negócio

Continuação da aula anterior (aula 9)



Implementação das Entidades de Negócio

Characteristics:

- Provide **stateful** programmatic access to business data and (in some designs) related functionality.
- Can be built from data that has complex schemas. The data typically originates from multiple related tables in the DB.
- Data can be passed as part of the I/O parameters of business processes.
- Can be serializable, to persist the current state of the entities.
- Do not access the DB directly. All DB access is provided by the associated DALC.
- Do not initiate any kind of transaction. Transactions are initiated by the application or business process that is using the BE.

Implementação das Entidades de Negócio

- There are various ways to represent business entities in your application, ranging from a data-centric model to a more object oriented representation:
  - XML
  - Generic DataSet (.NET Framework)
  - Typed DataSet (.NET Framework)
  - Custom BE components
  - Custom BE components with CRUD behaviors

Representing BE as XML

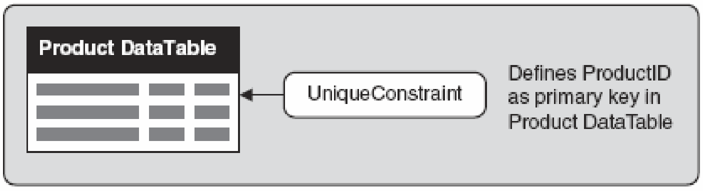
Example: The BE consists of a single product

```
<?xml version="1.0"?>
<Product xmlns="urn:aUniqueNamespace">
  <ProductID> 1 </ProductID>
  <ProductName>Chai</ProductName>
  <QuantityPerUnit>10 boxes x 20 bags</QuantityPerUnit>
  <UnitPrice> 18.00 </UnitPrice>
  <UnitsInStock> 39 </UnitsInStock>
  <UnitsOnOrder> 0 </UnitsOnOrder>
  <ReorderLevel> 10 </ReorderLevel>
</Product>
```

Representing BE As a Generic DataSet

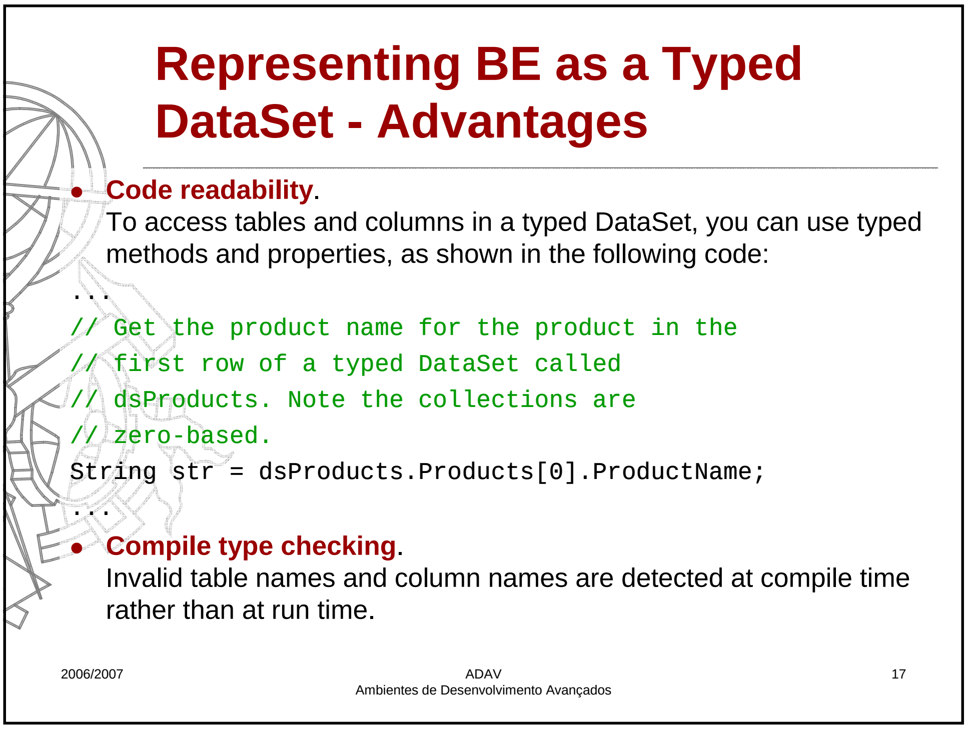
- A generic DataSet is an instance of the DataSet class, which is defined in the System.Data namespace in ADO.NET.
- A DataSet object contains one or more DataTable objects to represent information that the DALC retrieves from the DB.

A generic DataSet object for the Product BE.



Representing BE as a Typed DataSet

- A typed DataSet is a class that contains strongly typed methods, properties, and type definitions to expose the data and metadata in a DataSet.

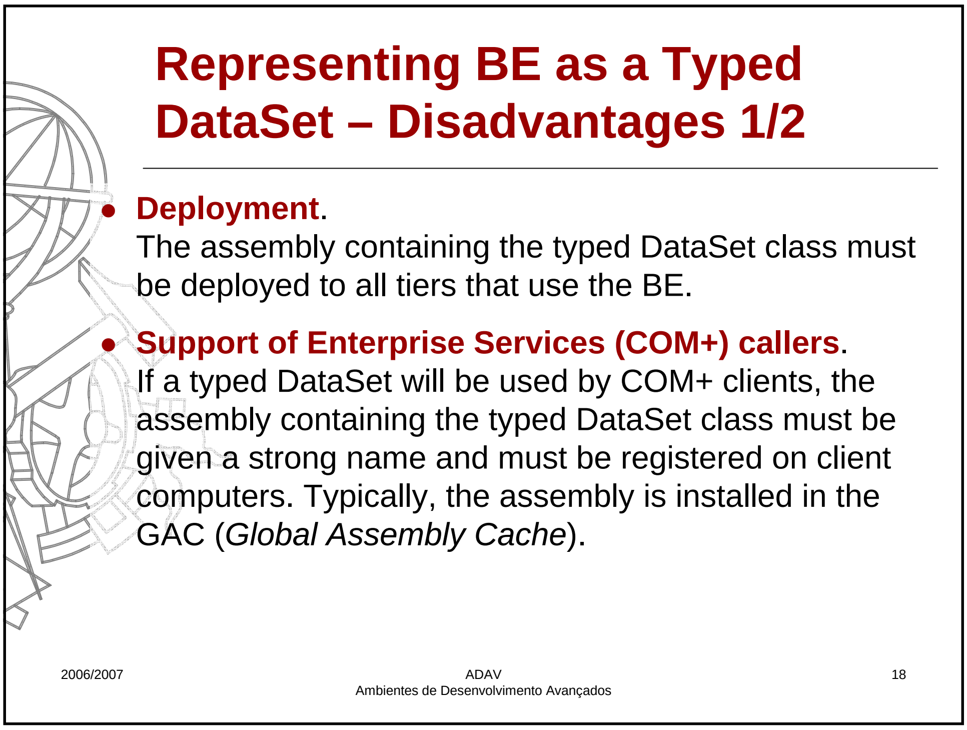


Representing BE as a Typed DataSet - Advantages

- **Code readability**.
  To access tables and columns in a typed DataSet, you can use typed methods and properties, as shown in the following code:

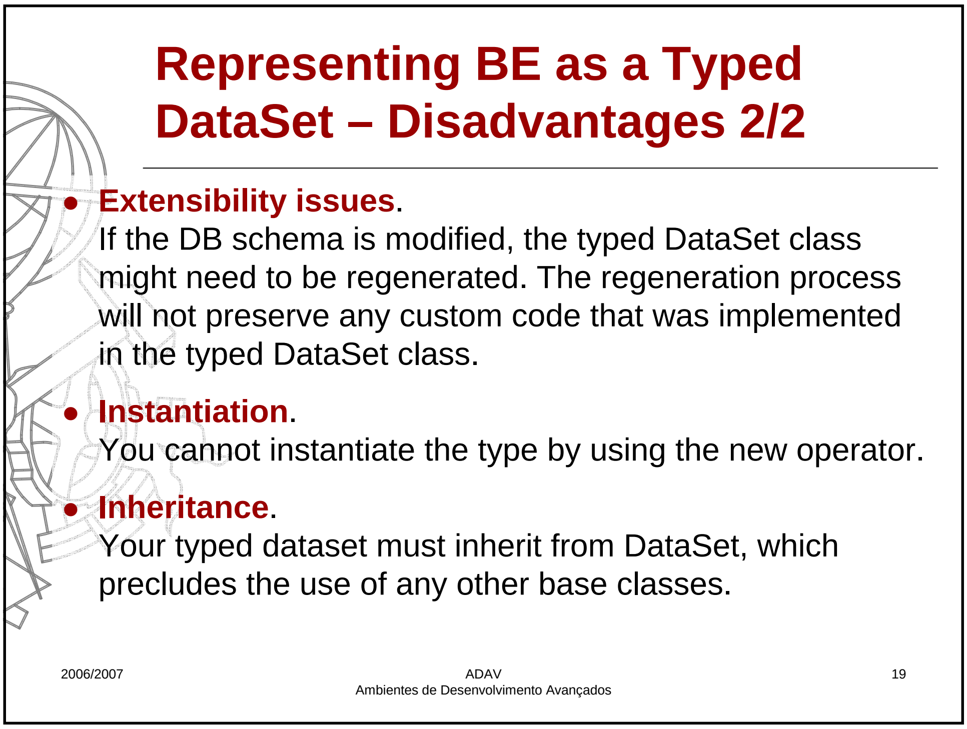
```
...
// Get the product name for the product in the
// first row of a typed DataSet called
// dsProducts. Note the collections are
// zero-based.
String str = dsProducts.Products[0].ProductName;
...
```

- **Compile type checking**.
  Invalid table names and column names are detected at compile time rather than at run time.



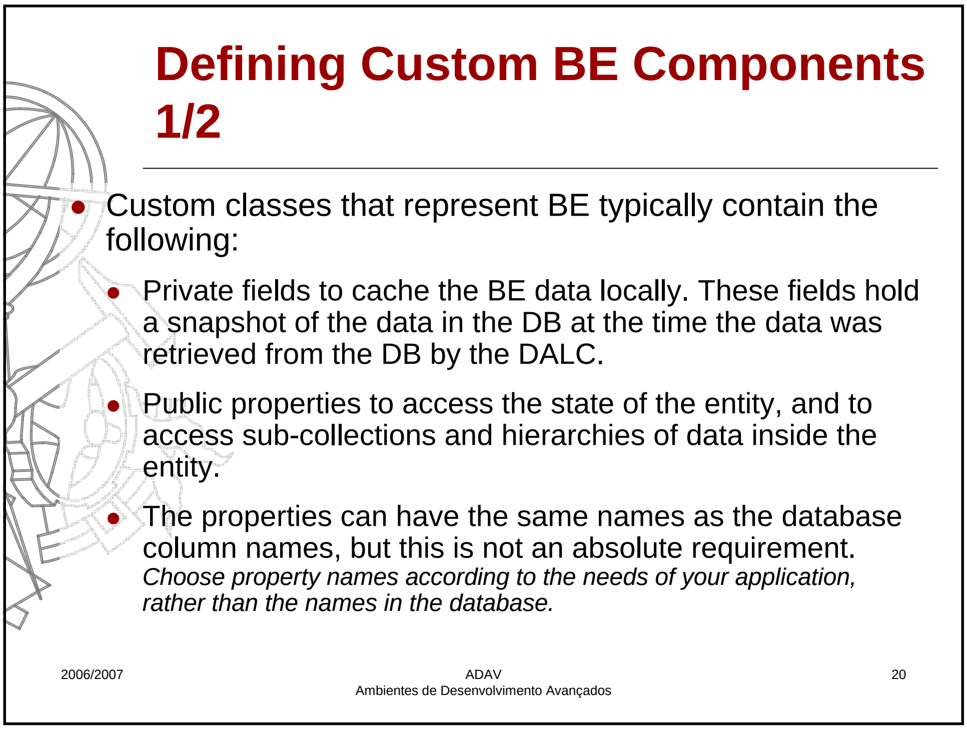
Representing BE as a Typed DataSet – Disadvantages 1/2

- **Deployment**.
  The assembly containing the typed DataSet class must be deployed to all tiers that use the BE.
- **Support of Enterprise Services (COM+) callers**.
  If a typed DataSet will be used by COM+ clients, the assembly containing the typed DataSet class must be given a strong name and must be registered on client computers. Typically, the assembly is installed in the GAC (*Global Assembly Cache*).



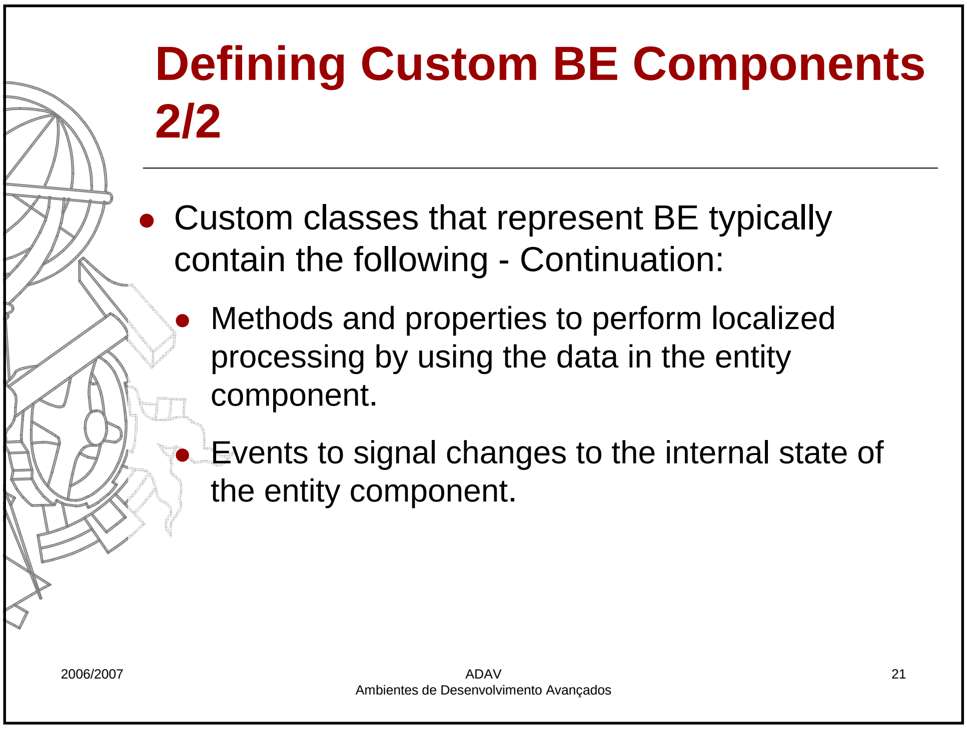
Representing BE as a Typed DataSet – Disadvantages 2/2

- **Extensibility issues**.
  If the DB schema is modified, the typed DataSet class might need to be regenerated. The regeneration process will not preserve any custom code that was implemented in the typed DataSet class.
- **Instantiation**.
  You cannot instantiate the type by using the new operator.
- **Inheritance**.
  Your typed dataset must inherit from DataSet, which precludes the use of any other base classes.



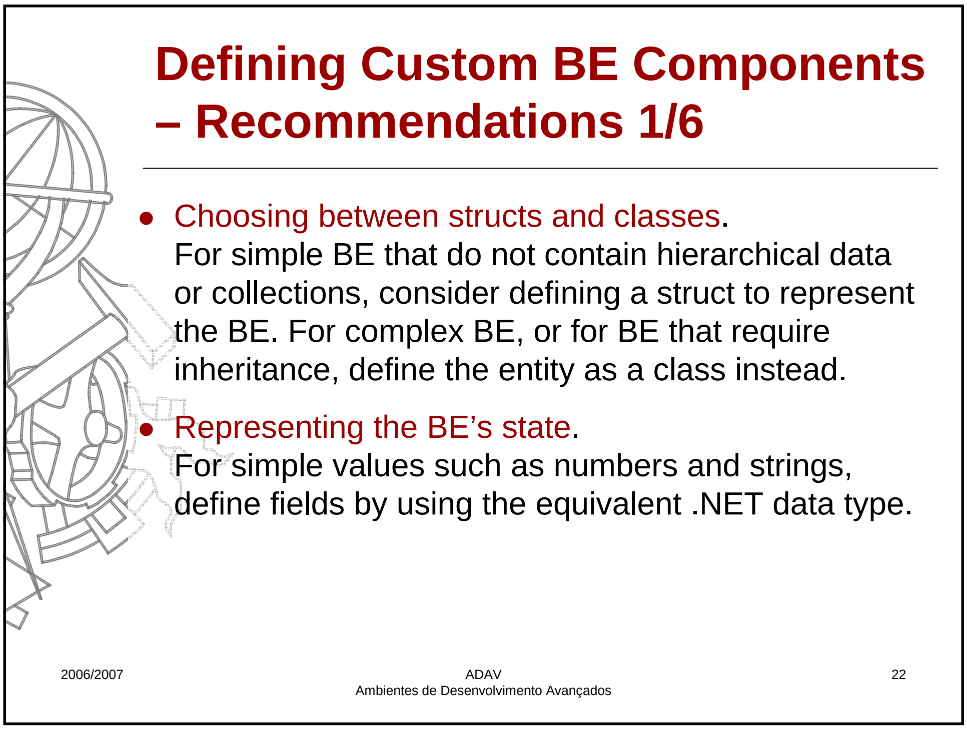
Defining Custom BE Components 1/2

- Custom classes that represent BE typically contain the following:
  - Private fields to cache the BE data locally. These fields hold a snapshot of the data in the DB at the time the data was retrieved from the DB by the DALC.
  - Public properties to access the state of the entity, and to access sub-collections and hierarchies of data inside the entity.
  - The properties can have the same names as the database column names, but this is not an absolute requirement.
    Choose property names according to the needs of your application, rather than the names in the database.



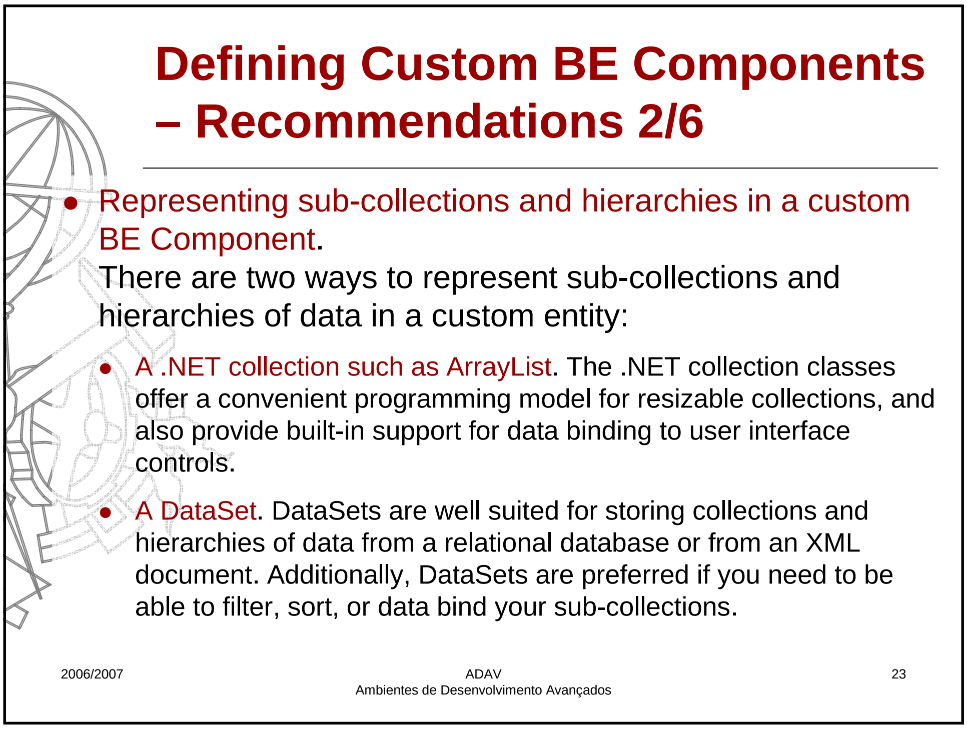
Defining Custom BE Components 2/2

- Custom classes that represent BE typically contain the following - Continuation:
  - Methods and properties to perform localized processing by using the data in the entity component.
  - Events to signal changes to the internal state of the entity component.



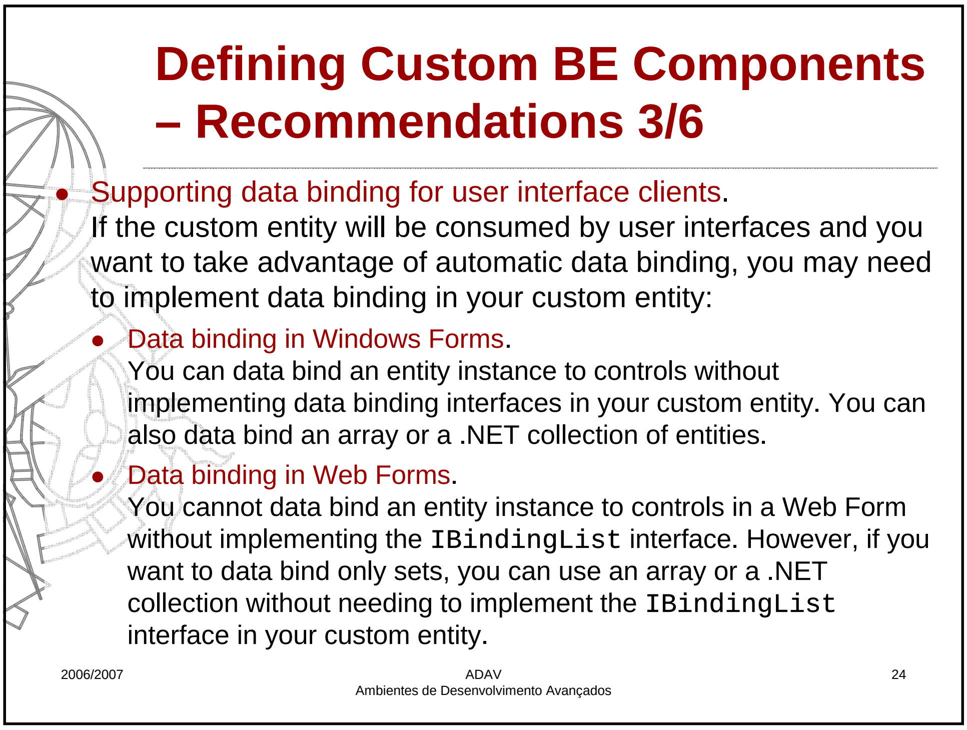
Defining Custom BE Components – Recommendations 1/6

- Choosing between structs and classes.
  For simple BE that do not contain hierarchical data or collections, consider defining a struct to represent the BE. For complex BE, or for BE that require inheritance, define the entity as a class instead.
- Representing the BE's state.
  For simple values such as numbers and strings, define fields by using the equivalent .NET data type.



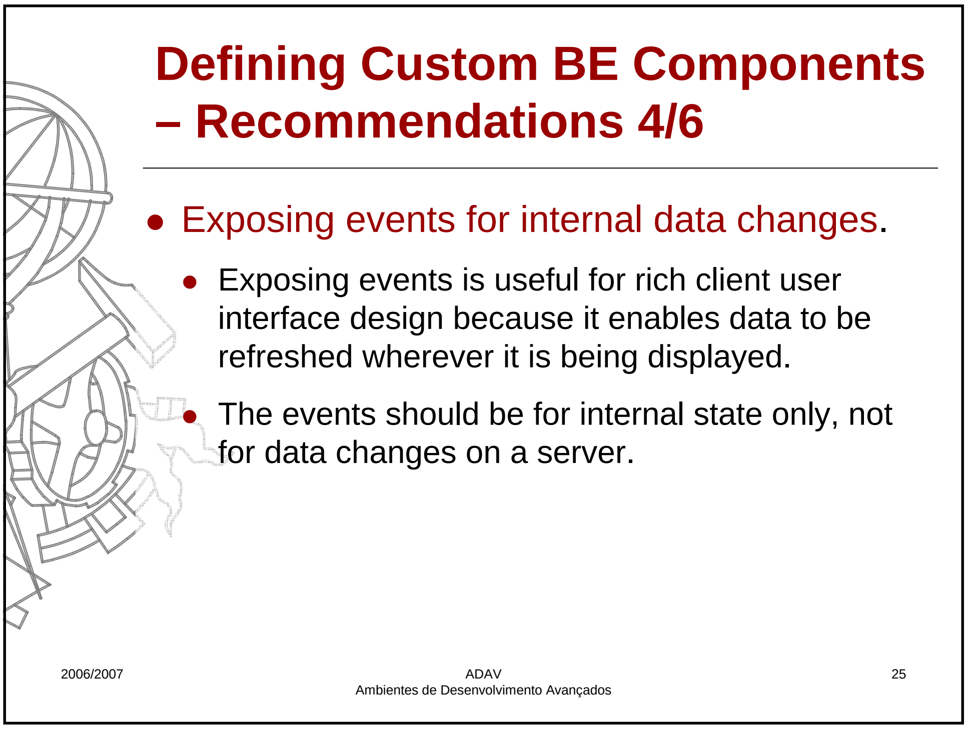
Defining Custom BE Components – Recommendations 2/6

- Representing sub-collections and hierarchies in a custom BE Component.
  There are two ways to represent sub-collections and hierarchies of data in a custom entity:
  - A .NET collection such as ArrayList. The .NET collection classes offer a convenient programming model for resizable collections, and also provide built-in support for data binding to user interface controls.
  - A DataSet. DataSets are well suited for storing collections and hierarchies of data from a relational database or from an XML document. Additionally, DataSets are preferred if you need to be able to filter, sort, or data bind your sub-collections.



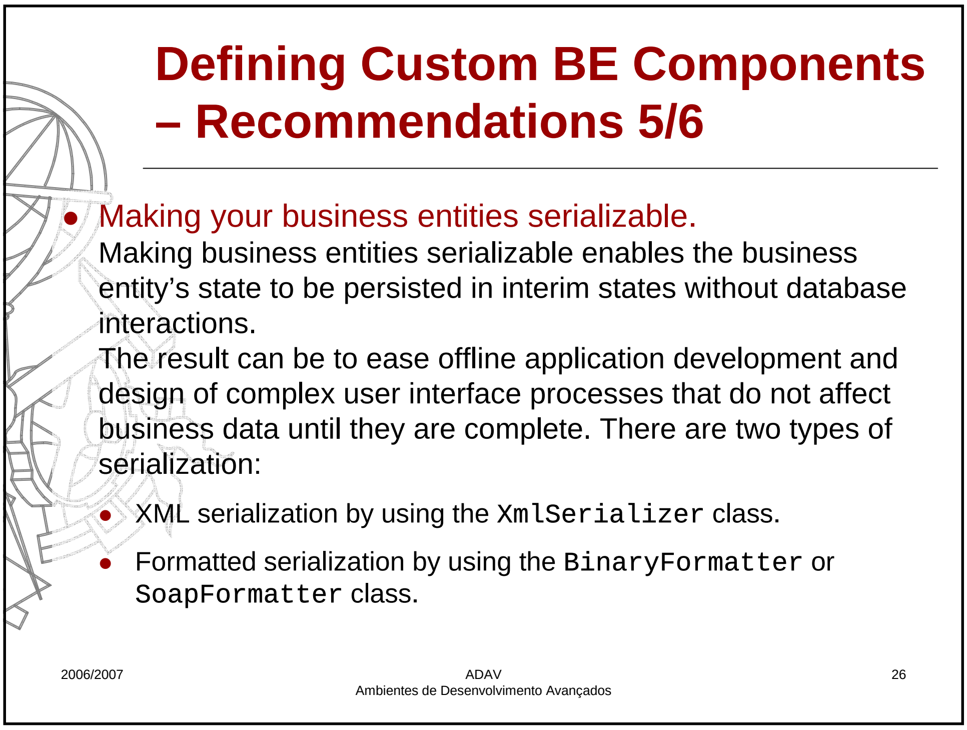
Defining Custom BE Components – Recommendations 3/6

- Supporting data binding for user interface clients.
  If the custom entity will be consumed by user interfaces and you want to take advantage of automatic data binding, you may need to implement data binding in your custom entity:
  - Data binding in Windows Forms.
    You can data bind an entity instance to controls without implementing data binding interfaces in your custom entity. You can also data bind an array or a .NET collection of entities.
  - Data binding in Web Forms.
    You cannot data bind an entity instance to controls in a Web Form without implementing the `IBindingList` interface. However, if you want to data bind only sets, you can use an array or a .NET collection without needing to implement the `IBindingList` interface in your custom entity.



Defining Custom BE Components – Recommendations 4/6

- Exposing events for internal data changes.
  - Exposing events is useful for rich client user interface design because it enables data to be refreshed wherever it is being displayed.
  - The events should be for internal state only, not for data changes on a server.



Defining Custom BE Components – Recommendations 5/6

- Making your business entities serializable.
  Making business entities serializable enables the business entity's state to be persisted in interim states without database interactions.
  The result can be to ease offline application development and design of complex user interface processes that do not affect business data until they are complete. There are two types of serialization:
  - XML serialization by using the `XmlSerializer` class.
  - Formatted serialization by using the `BinaryFormatter` or `SoapFormatter` class.

Defining Custom BE Components – Recommendations 6/6

- XML serialization by using the `XmlSerializer` class.
  - Use XML serialization when you need to serialize only public fields and public read/write properties to XML.
    Note that if you return BE data from a Web service, the object is automatically serialized to XML through XML serialization.
- Formatted serialization by using the `BinaryFormatter` or `SoapFormatter` class.
  - Use formatted serialization when you need to serialize all the public and private fields and object graphs of an object, or if you will pass an entity component to or from a remoting server.

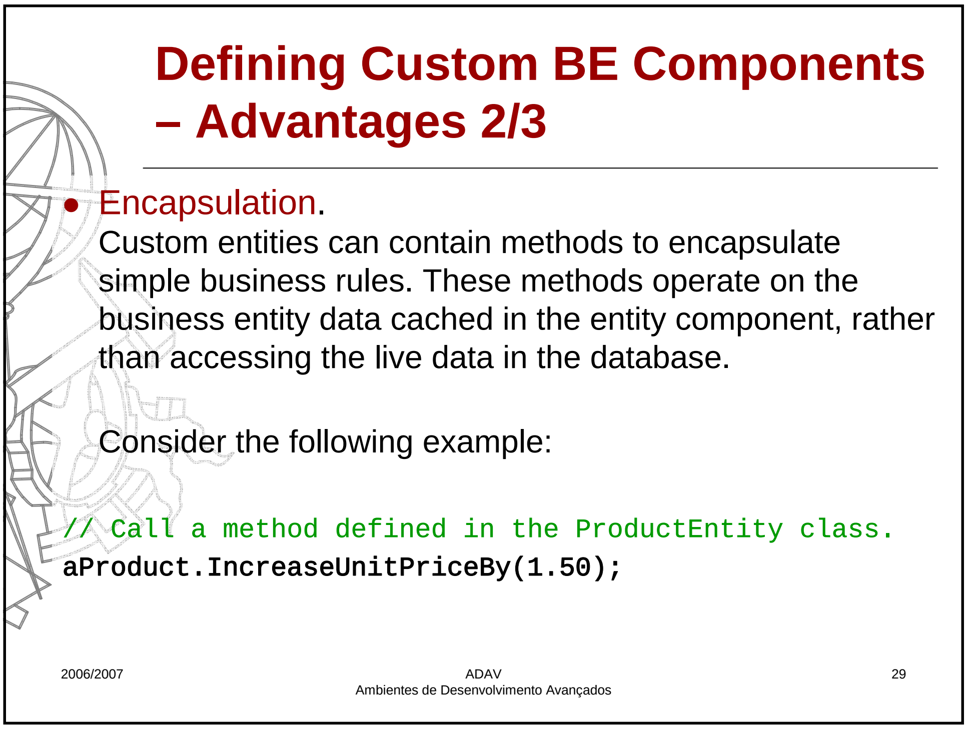
Defining Custom BE Components – Advantages 1/3

- **Code readability.**
  To access data in a custom entity class, you can use typed methods and properties;

```
// Create a ProductDALC object
ProductDALC dalcProduct = new ProductDALC();

// Use the ProductDALC object to create and populate a
// ProductEntity object. This code assumes the ProductDALC class
// has a method named GetProduct, which takes a Product ID as a
// parameter (21 in this example) and returns a ProductEntity
// object containing all the data for this product.
ProductEntity aProduct = dalcProduct.GetProduct(21);

// Change the product name for this product
aProduct.ProductName = "Roasted Coffee Beans";
```

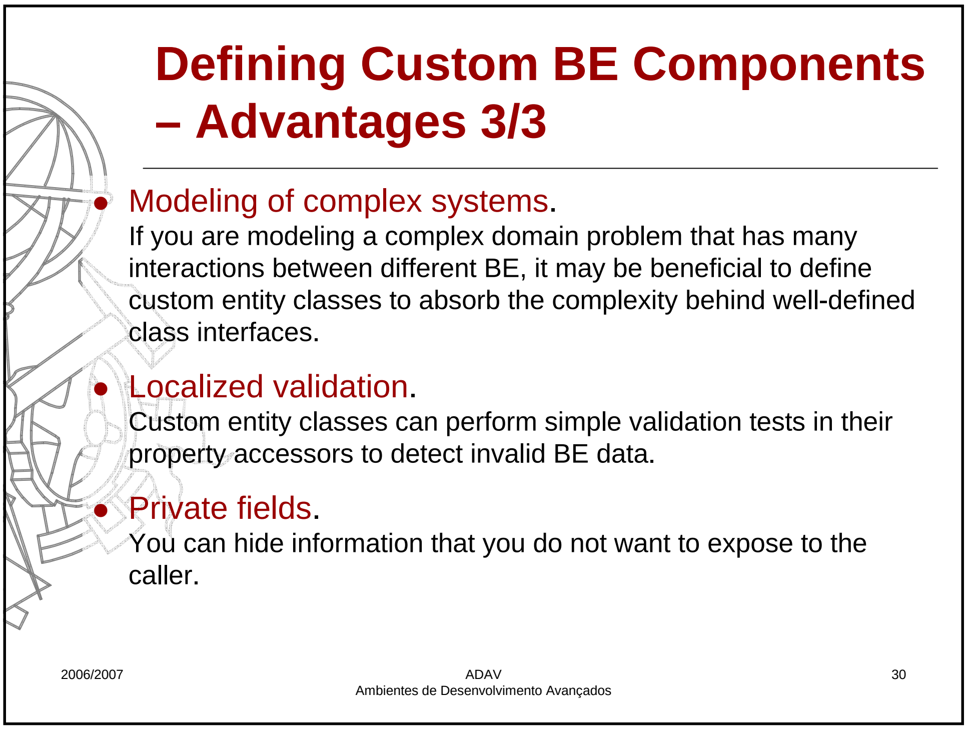


Defining Custom BE Components – Advantages 2/3

- Encapsulation.
  Custom entities can contain methods to encapsulate simple business rules. These methods operate on the business entity data cached in the entity component, rather than accessing the live data in the database.

  Consider the following example:

```
// Call a method defined in the ProductEntity class.
aProduct.IncreaseUnitPriceBy(1.50);
```



Defining Custom BE Components – Advantages 3/3

- Modeling of complex systems.
  If you are modeling a complex domain problem that has many interactions between different BE, it may be beneficial to define custom entity classes to absorb the complexity behind well-defined class interfaces.
- Localized validation.
  Custom entity classes can perform simple validation tests in their property accessors to detect invalid BE data.
- Private fields.
  You can hide information that you do not want to expose to the caller.

Defining Custom BE Components – Disadvantages 1/3

- Collections of business entities.
  A custom entity represents a single BE, not a collection of BE. The calling application must create an array or a collection to hold multiple BE.

- Serialization.
  You must implement your own serialization mechanism in a custom entity. You can use attributes to control how entity components are serialized, or you can implement the `ISerializable` interface to control your own serialization.

Defining Custom BE Components – Disadvantages 2/3

- Representation of complex relationships and hierarchies.
  You must implement your own mechanism for representing relationships and hierarchies of data in a BE Component. As described previously, DataSets are often the easiest way to achieve this effect.
- Searching and sorting of data.
  You must define your own mechanism to support searching and sorting of entities.
- Deployment.
  You must deploy, on all physical tiers, the assembly containing the custom entity.

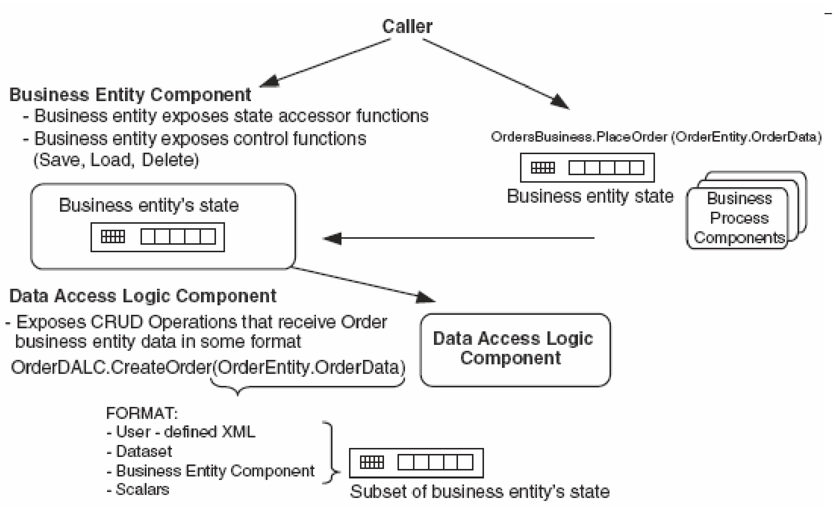
Defining Custom BE Components – Disadvantages 3/3

- Support for Enterprise Services (COM+) clients.
  If a custom entity will be used by COM+ clients, the assembly containing the entity must be given a strong name and must be registered on client computers. Typically, the assembly is installed in the GAC.
- Extensibility issues.
  If the database schema is modified, you might need to modify the custom entity class and redeploy the assembly.

Defining Custom BE Components with CRUD Behaviors

- When you define a custom entity, you can provide methods to completely encapsulate the CRUD operations on the underlying DALC.
- This is the more traditional object-oriented approach, and may be appropriate for complex object domains. The client application no longer accesses the DALC class directly.
- Instead, the client application creates an entity component and calls CRUD methods on the entity component. These methods forward to the underlying DALC.

Defining Custom BE Components with CRUD Behaviors



Caller

Business Entity Component
- Business entity exposes state accessor functions
- Business entity exposes control functions (Save, Load, Delete)

Business entity's state

OrdersBusiness.PlaceOrder (OrderEntity.OrderData)

Business entity state

Business Process Components

Data Access Logic Component
- Exposes CRUD Operations that receive Order business entity data in some format

OrderDALC.CreateOrder(OrderEntity.OrderData)

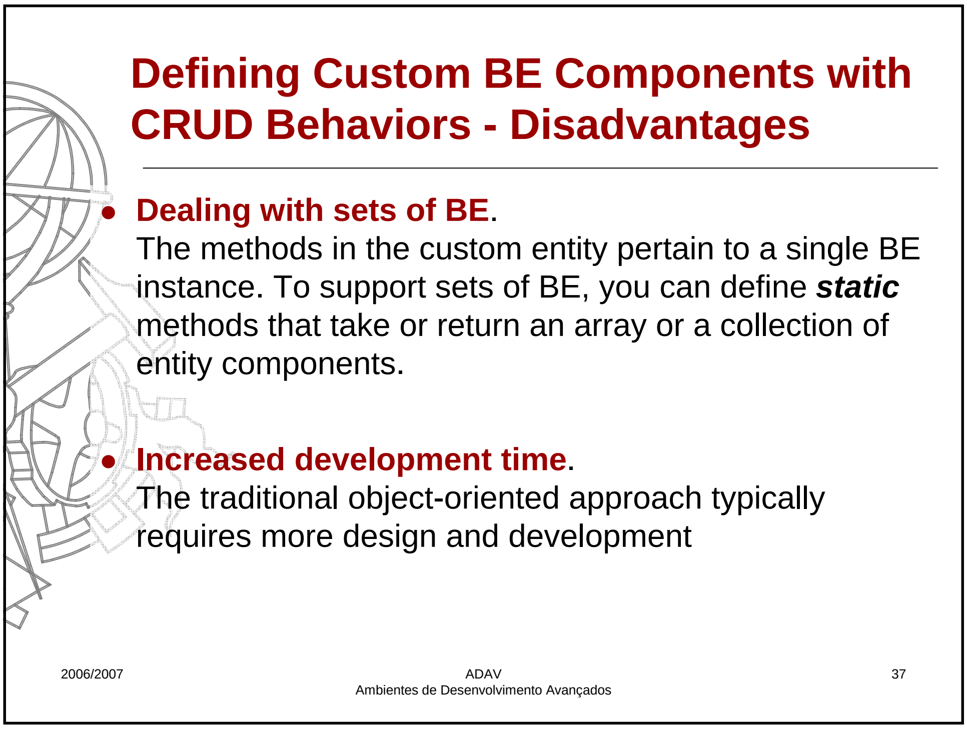
Data Access Logic Component

FORMAT:
- User - defined XML
- Dataset
- Business Entity Component
- Scalars

Subset of business entity's state

Defining Custom BE Components with CRUD Behaviors - Advantages

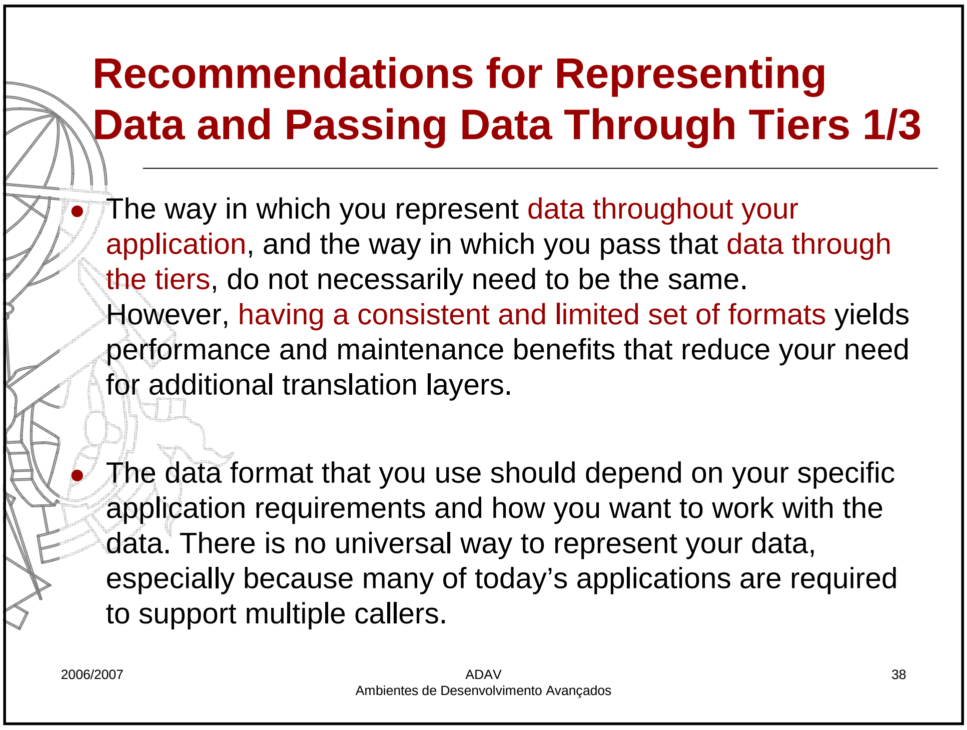
- **Encapsulation**.
  The custom entity encapsulates the operations defined by the underlying DALC.
- **Interface to caller**.
  The caller must deal with only one interface to persist BE data. There is no need to access the DALC directly.
- **Private fields**.
  You can hide information that you do not want to expose to the caller.



Defining Custom BE Components with CRUD Behaviors - Disadvantages

- **Dealing with sets of BE**.
  The methods in the custom entity pertain to a single BE instance. To support sets of BE, you can define ***static*** methods that take or return an array or a collection of entity components.

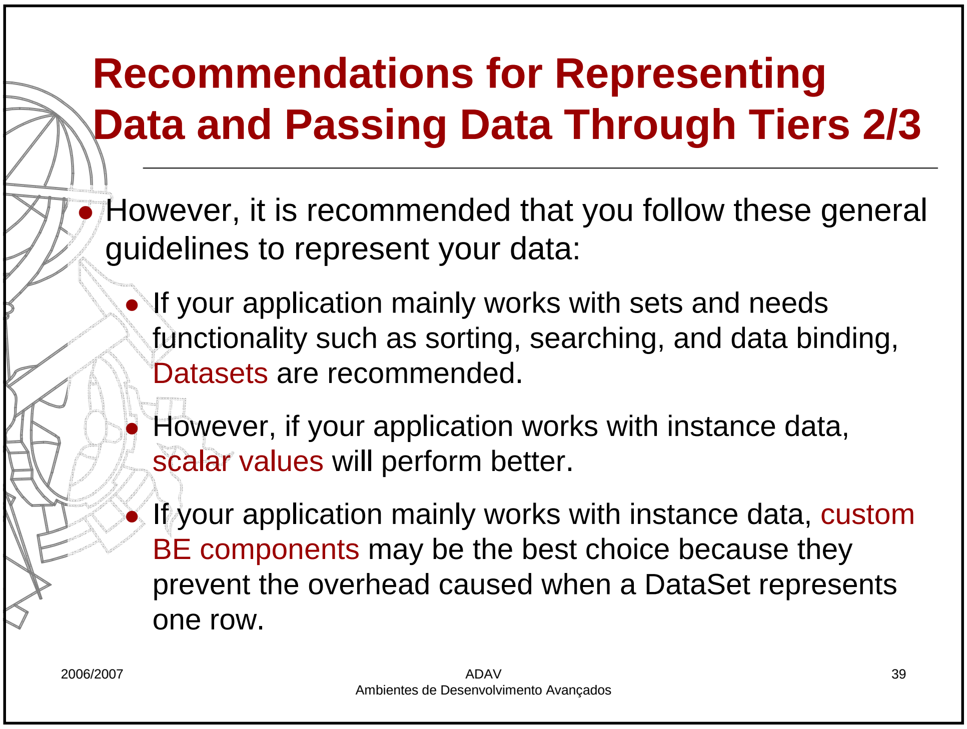
- **Increased development time**.
  The traditional object-oriented approach typically requires more design and development



Recommendations for Representing Data and Passing Data Through Tiers 1/3

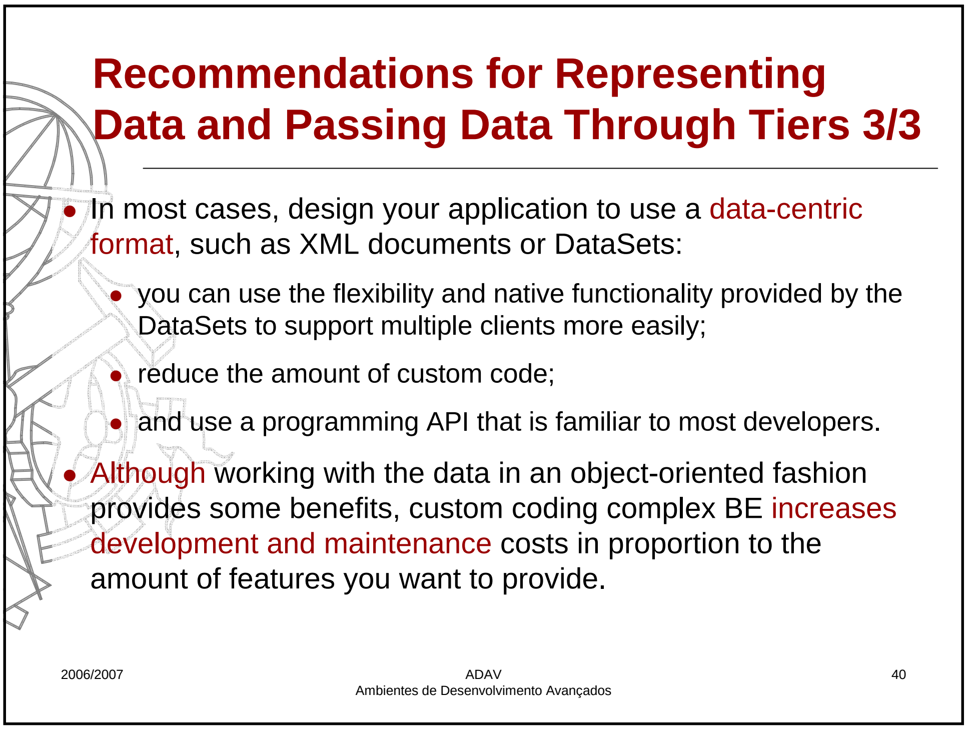
- The way in which you represent data throughout your application, and the way in which you pass that data through the tiers, do not necessarily need to be the same.
  However, having a consistent and limited set of formats yields performance and maintenance benefits that reduce your need for additional translation layers.

- The data format that you use should depend on your specific application requirements and how you want to work with the data. There is no universal way to represent your data, especially because many of today's applications are required to support multiple callers.



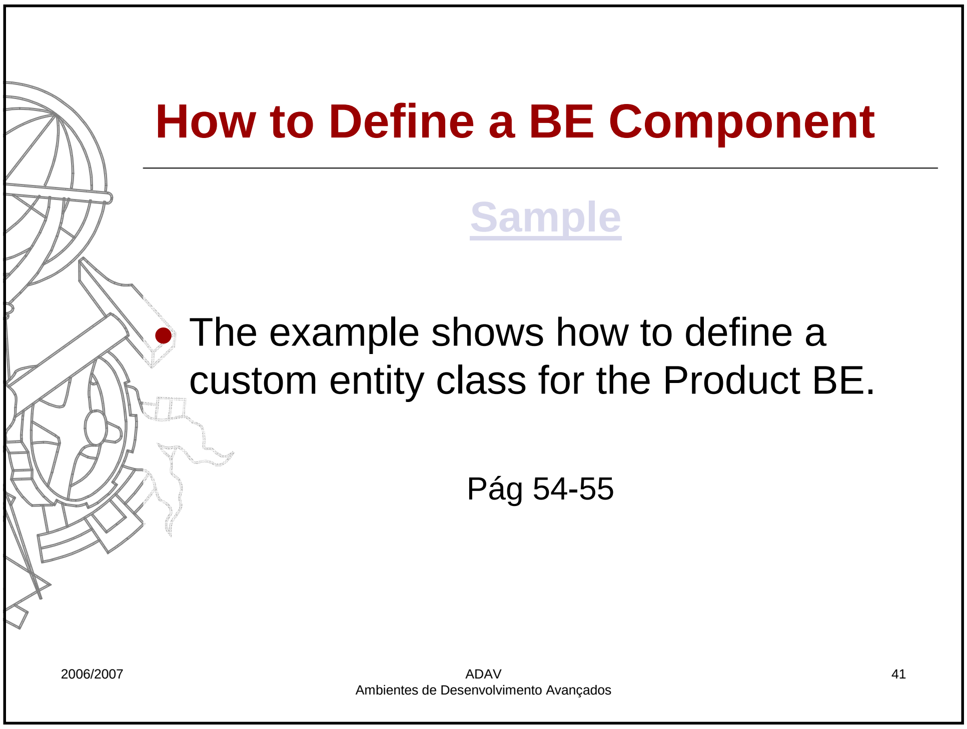
Recommendations for Representing Data and Passing Data Through Tiers 2/3

- However, it is recommended that you follow these general guidelines to represent your data:
  - If your application mainly works with sets and needs functionality such as sorting, searching, and data binding, Datasets are recommended.
  - However, if your application works with instance data, scalar values will perform better.
  - If your application mainly works with instance data, custom BE components may be the best choice because they prevent the overhead caused when a DataSet represents one row.



Recommendations for Representing Data and Passing Data Through Tiers 3/3

- In most cases, design your application to use a data-centric format, such as XML documents or DataSets:
  - you can use the flexibility and native functionality provided by the DataSets to support multiple clients more easily;
  - reduce the amount of custom code;
  - and use a programming API that is familiar to most developers.
- Although working with the data in an object-oriented fashion provides some benefits, custom coding complex BE increases development and maintenance costs in proportion to the amount of features you want to provide.



How to Define a BE Component

Sample

- The example shows how to define a custom entity class for the Product BE.

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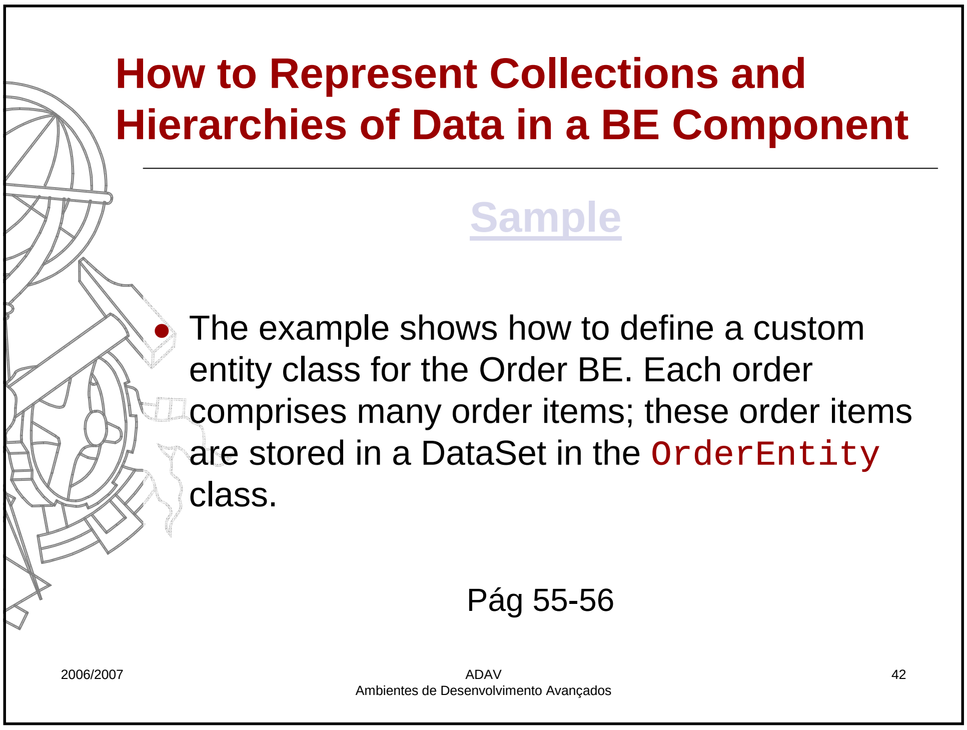
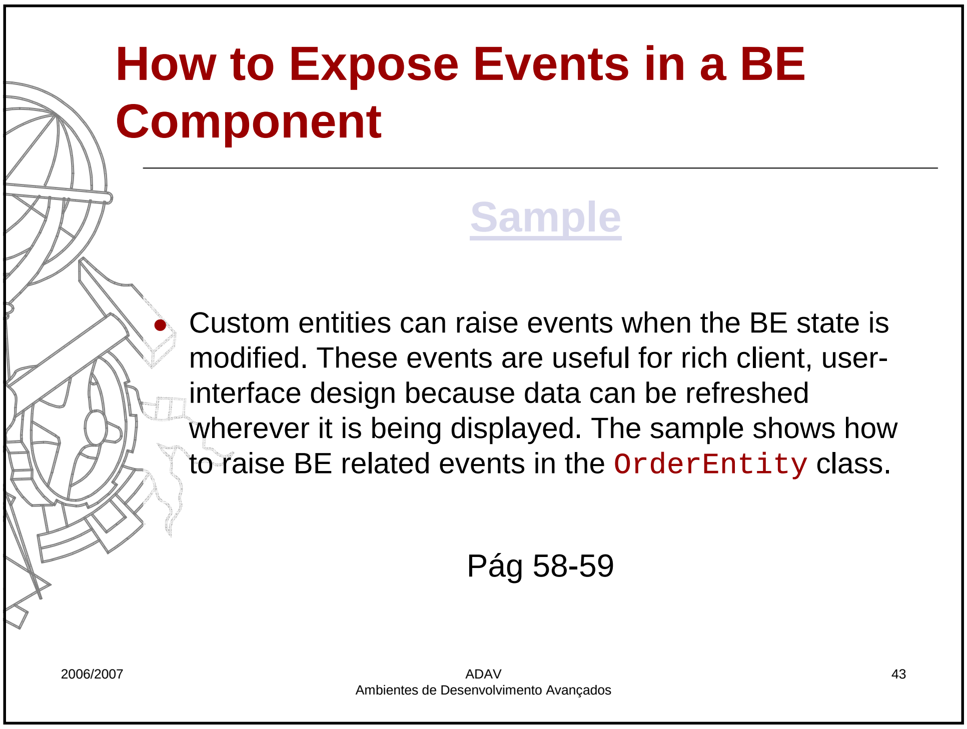


How to Represent Collections and Hierarchies of Data in a BE Component

Sample

- The example shows how to define a custom entity class for the Order BE. Each order comprises many order items; these order items are stored in a DataSet in the `OrderEntity` class.

Pág 55-56

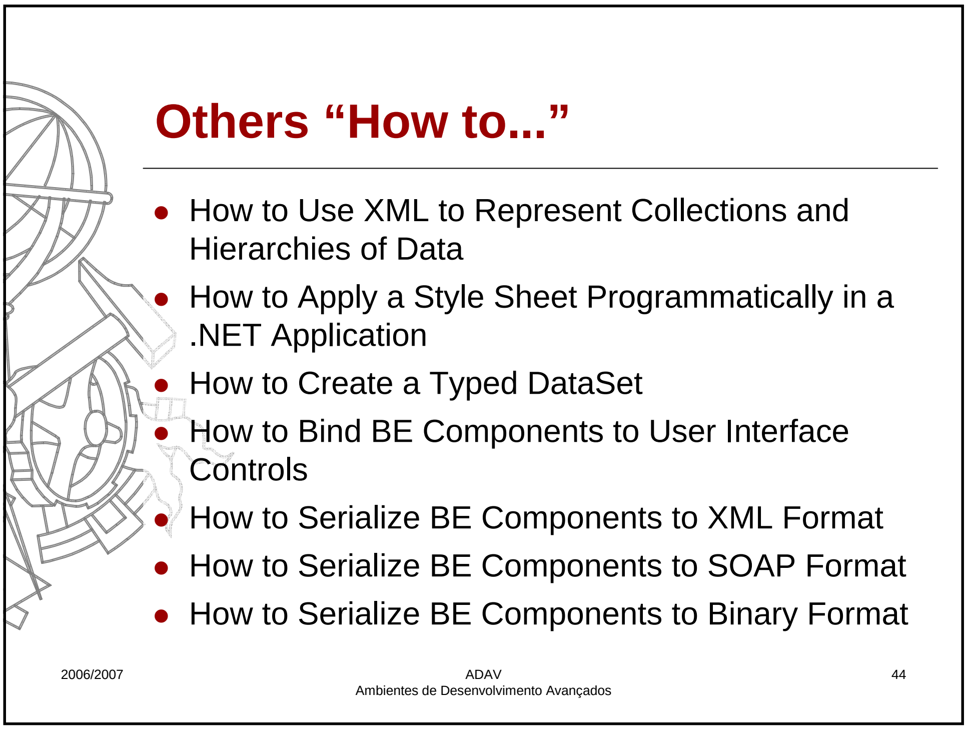


How to Expose Events in a BE Component

Sample

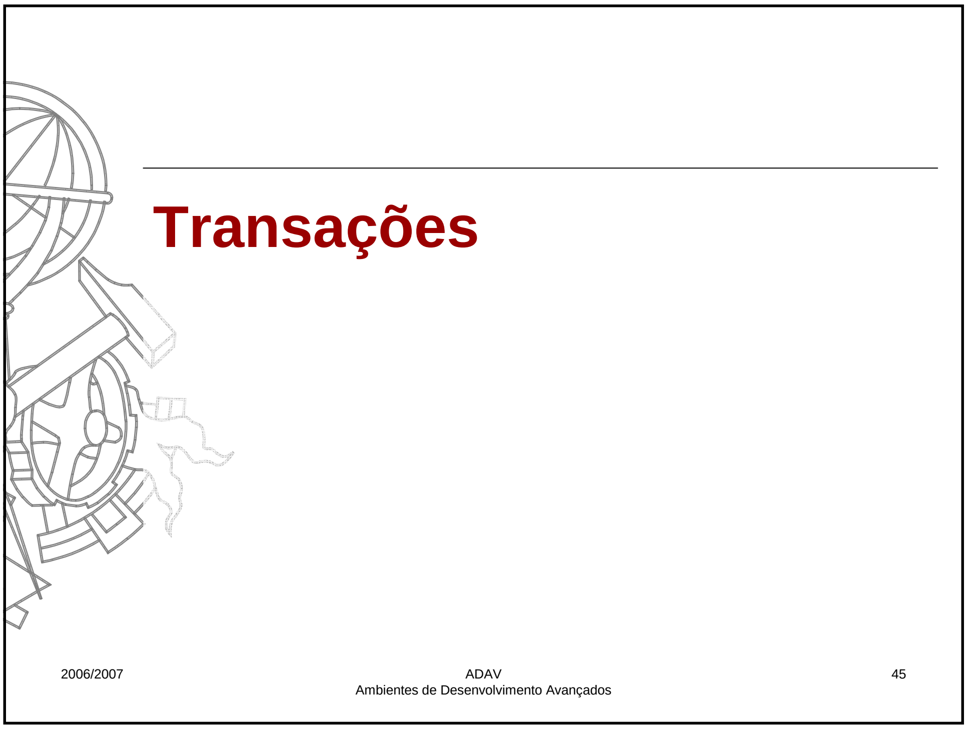
- Custom entities can raise events when the BE state is modified. These events are useful for rich client, user-interface design because data can be refreshed wherever it is being displayed. The sample shows how to raise BE related events in the `OrderEntity` class.

Pág 58-59

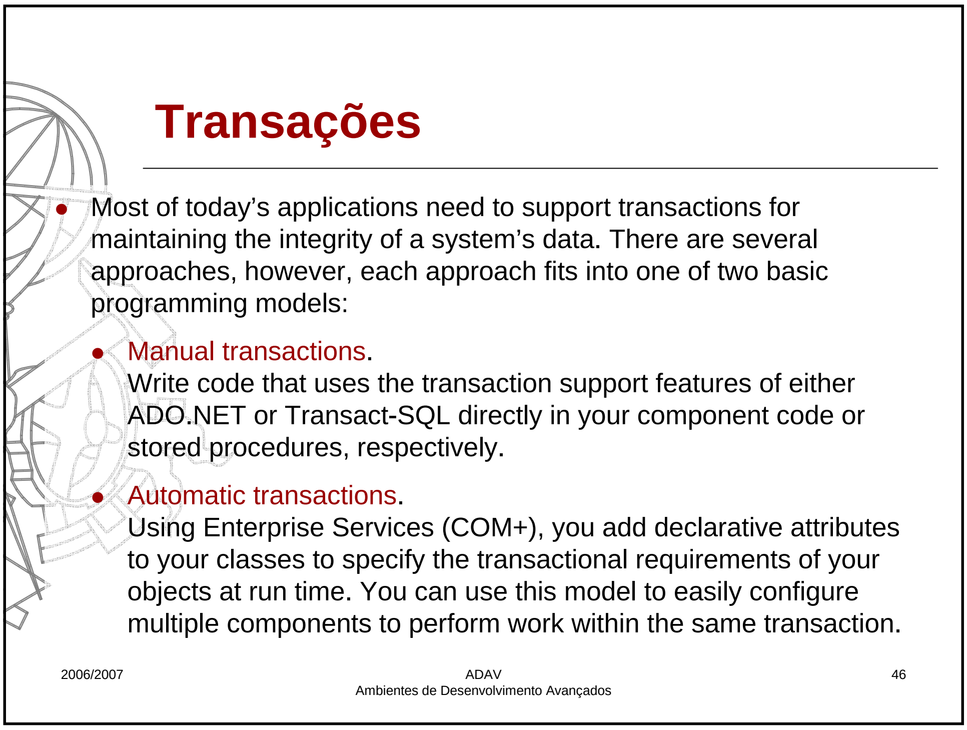


Others “How to...”

- How to Use XML to Represent Collections and Hierarchies of Data
- How to Apply a Style Sheet Programmatically in a .NET Application
- How to Create a Typed DataSet
- How to Bind BE Components to User Interface Controls
- How to Serialize BE Components to XML Format
- How to Serialize BE Components to SOAP Format
- How to Serialize BE Components to Binary Format

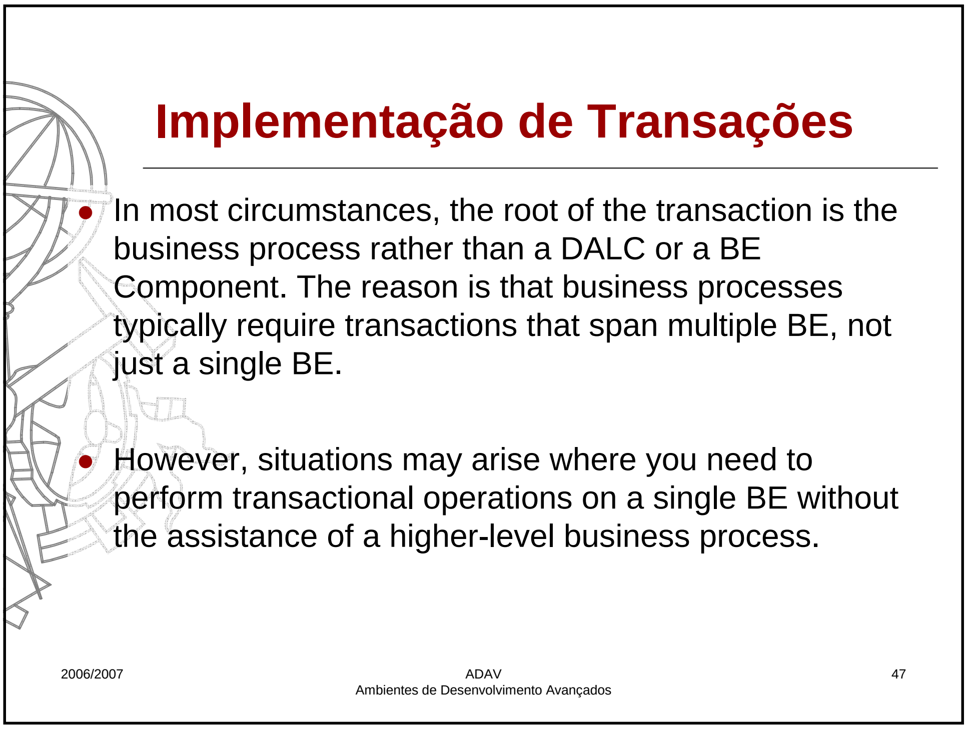


Transações



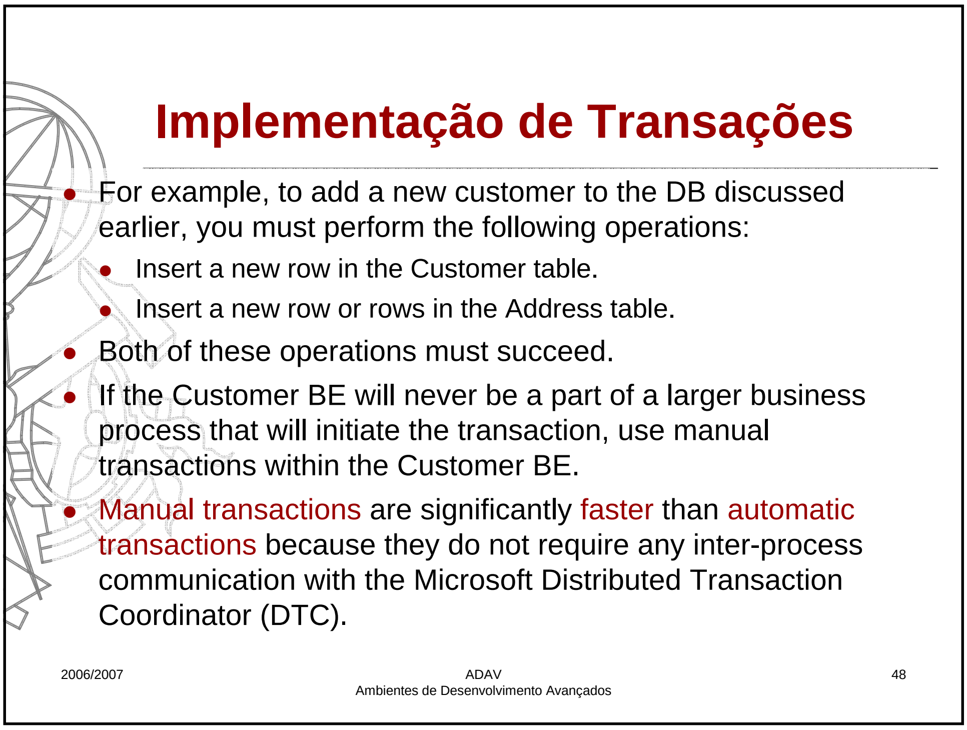
Transações

- Most of today’s applications need to support transactions for maintaining the integrity of a system’s data. There are several approaches, however, each approach fits into one of two basic programming models:
  - Manual transactions.
    Write code that uses the transaction support features of either ADO.NET or Transact-SQL directly in your component code or stored procedures, respectively.
  - Automatic transactions.
    Using Enterprise Services (COM+), you add declarative attributes to your classes to specify the transactional requirements of your objects at run time. You can use this model to easily configure multiple components to perform work within the same transaction.



Implementação de Transações

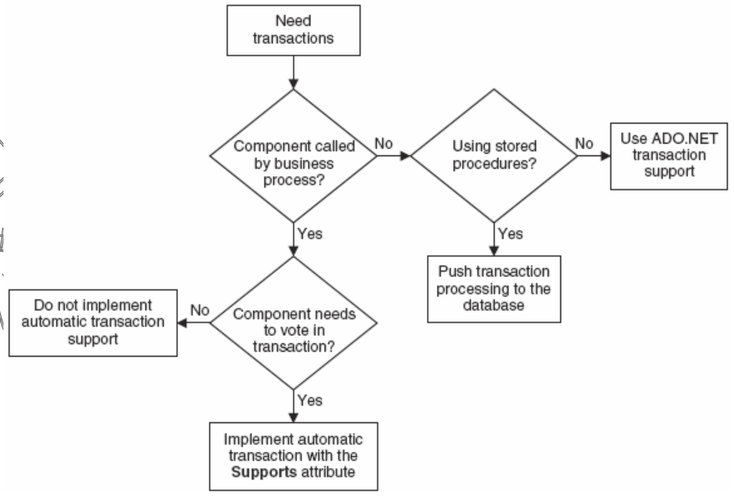
- In most circumstances, the root of the transaction is the business process rather than a DALC or a BE Component. The reason is that business processes typically require transactions that span multiple BE, not just a single BE.
- However, situations may arise where you need to perform transactional operations on a single BE without the assistance of a higher-level business process.



Implementação de Transações

- For example, to add a new customer to the DB discussed earlier, you must perform the following operations:
  - Insert a new row in the Customer table.
  - Insert a new row or rows in the Address table.
- Both of these operations must succeed.
- If the Customer BE will never be a part of a larger business process that will initiate the transaction, use manual transactions within the Customer BE.
- Manual transactions are significantly faster than automatic transactions because they do not require any inter-process communication with the Microsoft Distributed Transaction Coordinator (DTC).

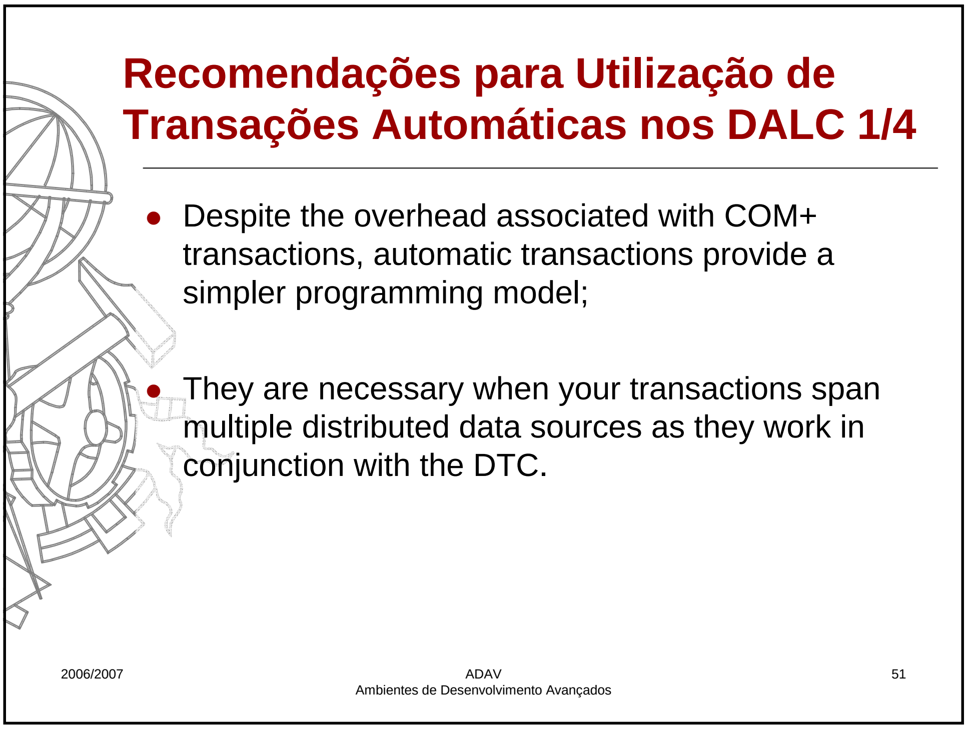
Implementação de Transações



Need transactions
Component called by business process?
No
Using stored procedures?
No
Use ADO.NET transaction support
Yes
Push transaction processing to the database
Yes
Component needs to vote in transaction?
No
Do not implement automatic transaction support
Yes
Implement automatic transaction with the **Supports** attribute

Recomendações para Utilização de Transações Manuais nos DALC

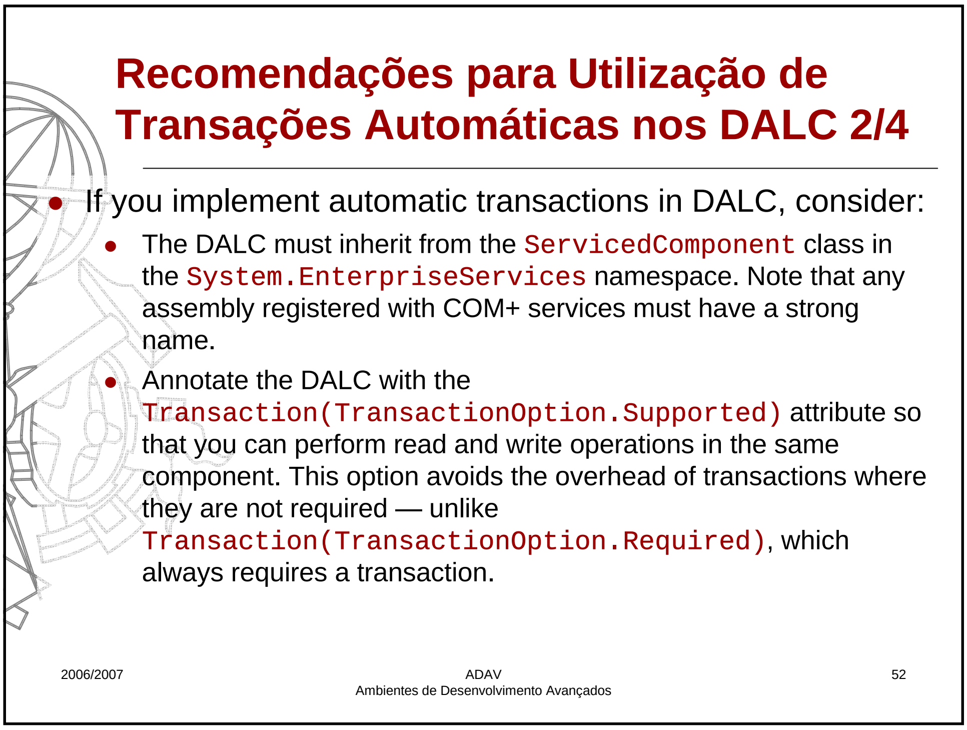
- Where possible, perform your processing in stored procedures. Use the Transact-SQL statements BEGIN TRANSACTION, END TRANSACTION, and ROLLBACK TRANSACTION to control transactions.
- If you are not using stored procedures, and the DALC will not be called from a business process, you can control transactions programmatically by using ADO.NET.



Recomendações para Utilização de Transações Automáticas nos DALC 1/4

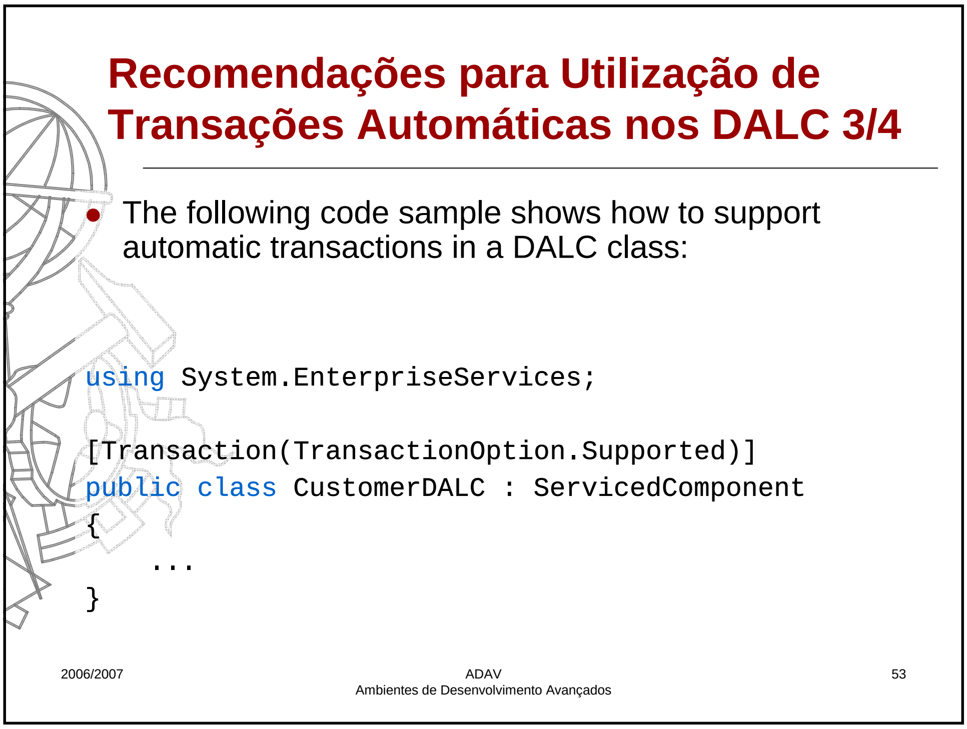
- Despite the overhead associated with COM+ transactions, automatic transactions provide a simpler programming model;

- They are necessary when your transactions span multiple distributed data sources as they work in conjunction with the DTC.



Recomendações para Utilização de Transações Automáticas nos DALC 2/4

- If you implement automatic transactions in DALC, consider:
  - The DALC must inherit from the `ServicedComponent` class in the `System.EnterpriseServices` namespace. Note that any assembly registered with COM+ services must have a strong name.
  - Annotate the DALC with the `Transaction(TransactionOption.Supported)` attribute so that you can perform read and write operations in the same component. This option avoids the overhead of transactions where they are not required — unlike `Transaction(TransactionOption.Required)`, which always requires a transaction.

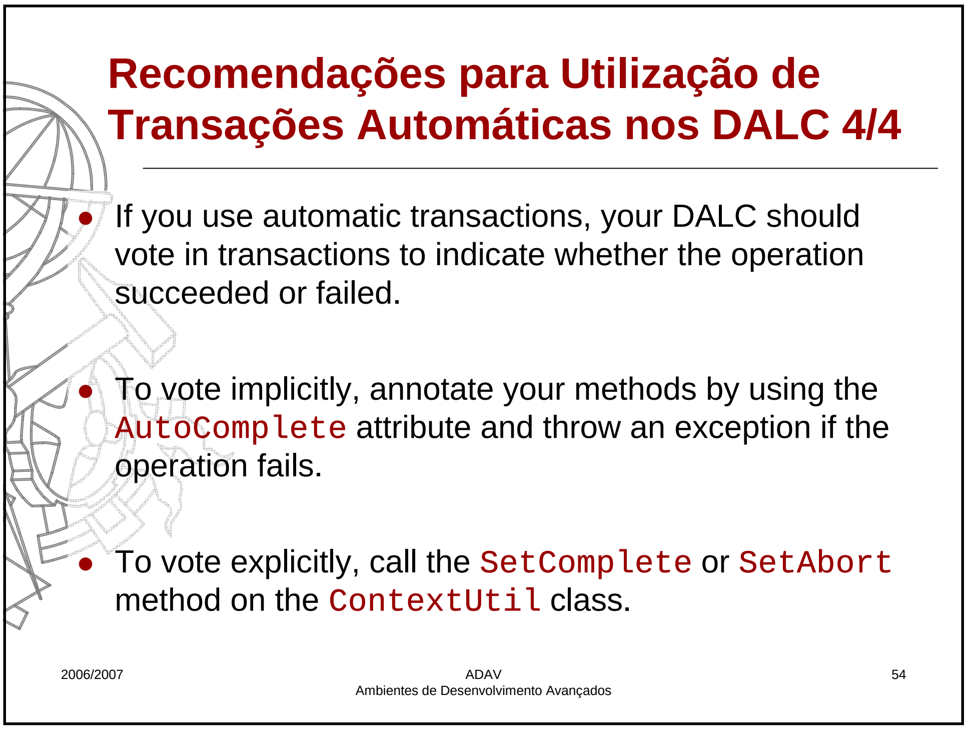


Recomendações para Utilização de Transações Automáticas nos DALC 3/4

- The following code sample shows how to support automatic transactions in a DALC class:

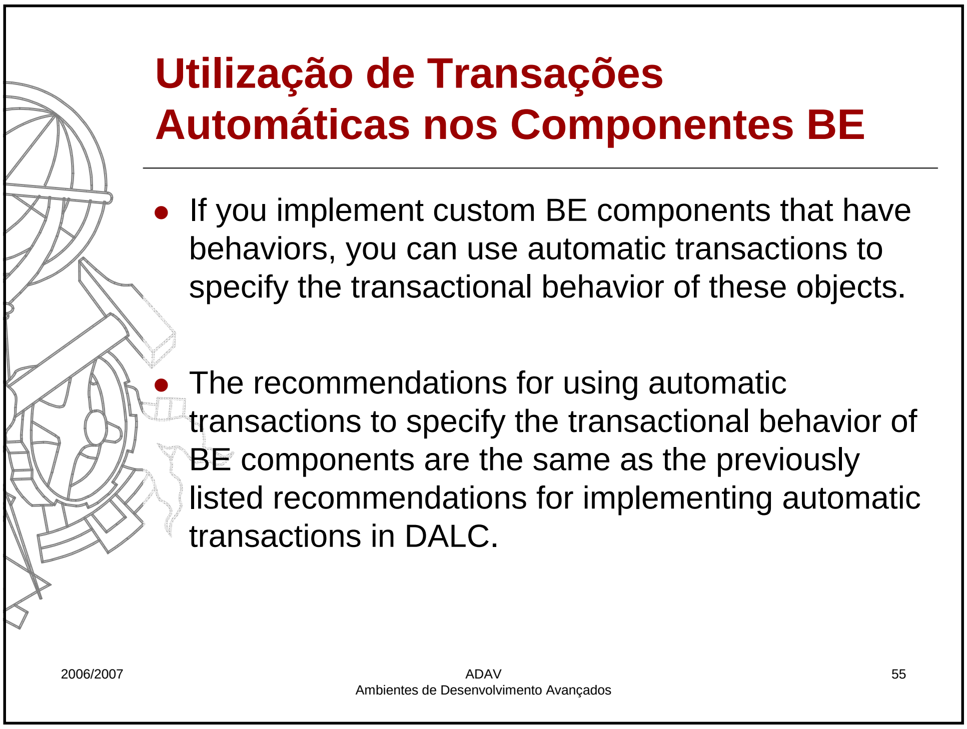
```
using System.EnterpriseServices;

[Transaction(TransactionOption.Supported)]
public class CustomerDALC : ServicedComponent
{
    ...
}
```



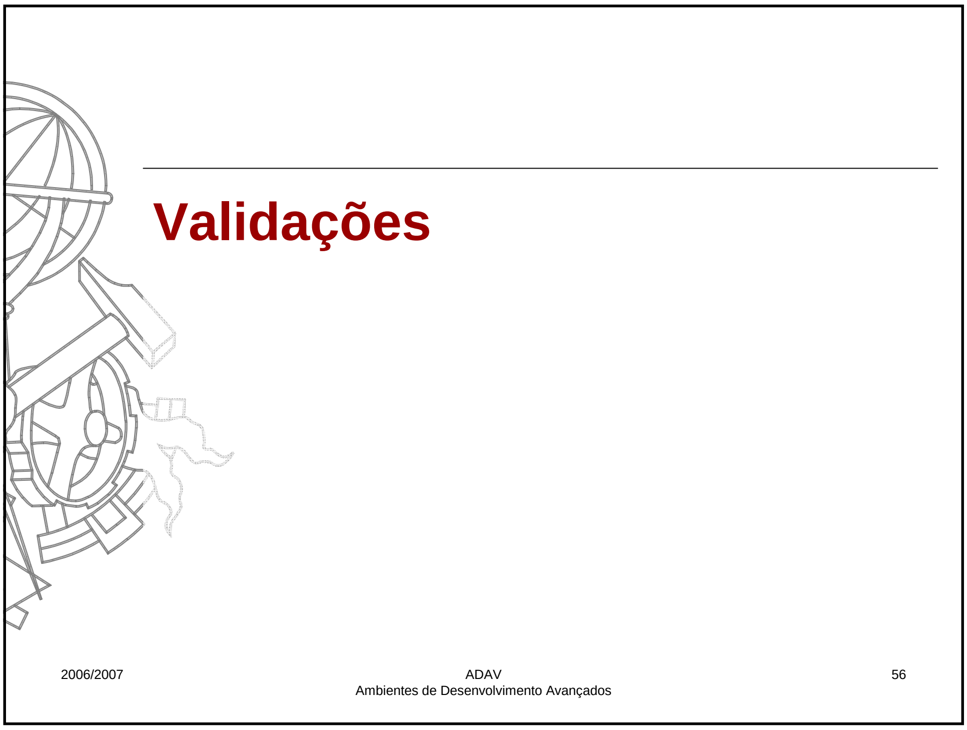
Recomendações para Utilização de Transações Automáticas nos DALC 4/4

- If you use automatic transactions, your DALC should vote in transactions to indicate whether the operation succeeded or failed.
- To vote implicitly, annotate your methods by using the `AutoComplete` attribute and throw an exception if the operation fails.
- To vote explicitly, call the `SetComplete` or `SetAbort` method on the `ContextUtil` class.

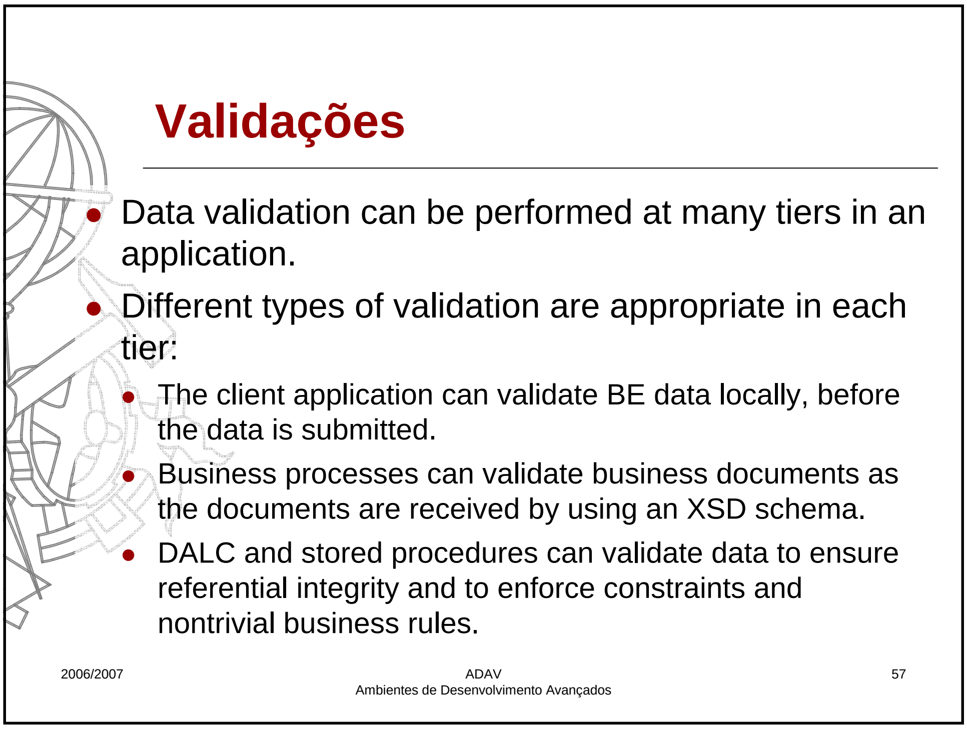


Utilização de Transações Automáticas nos Componentes BE

- If you implement custom BE components that have behaviors, you can use automatic transactions to specify the transactional behavior of these objects.
- The recommendations for using automatic transactions to specify the transactional behavior of BE components are the same as the previously listed recommendations for implementing automatic transactions in DALC.

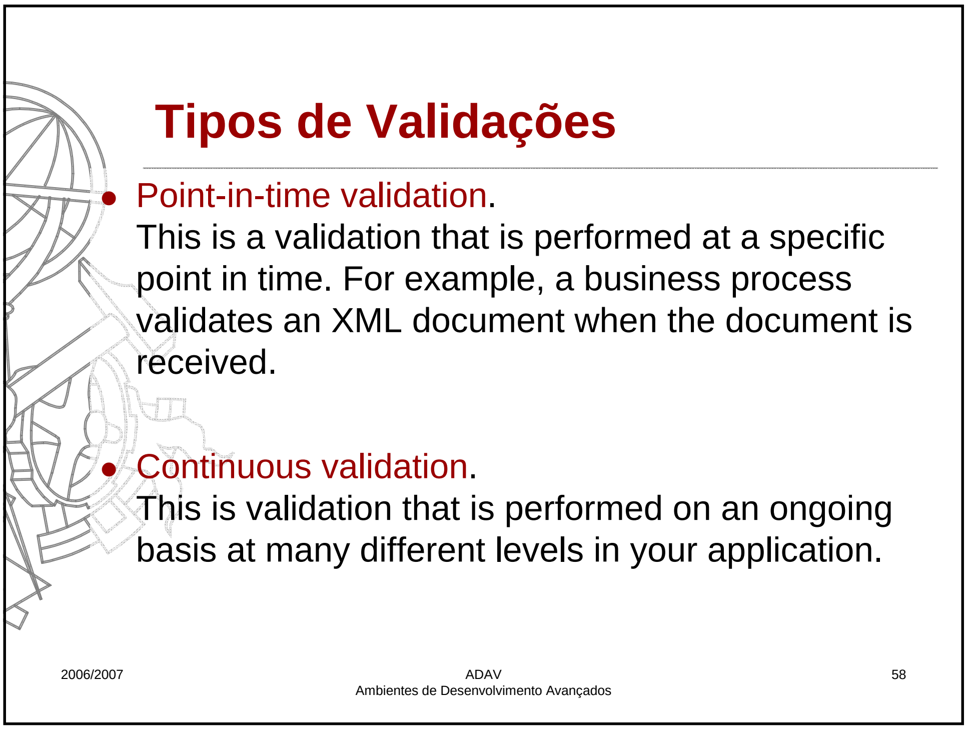


Validações



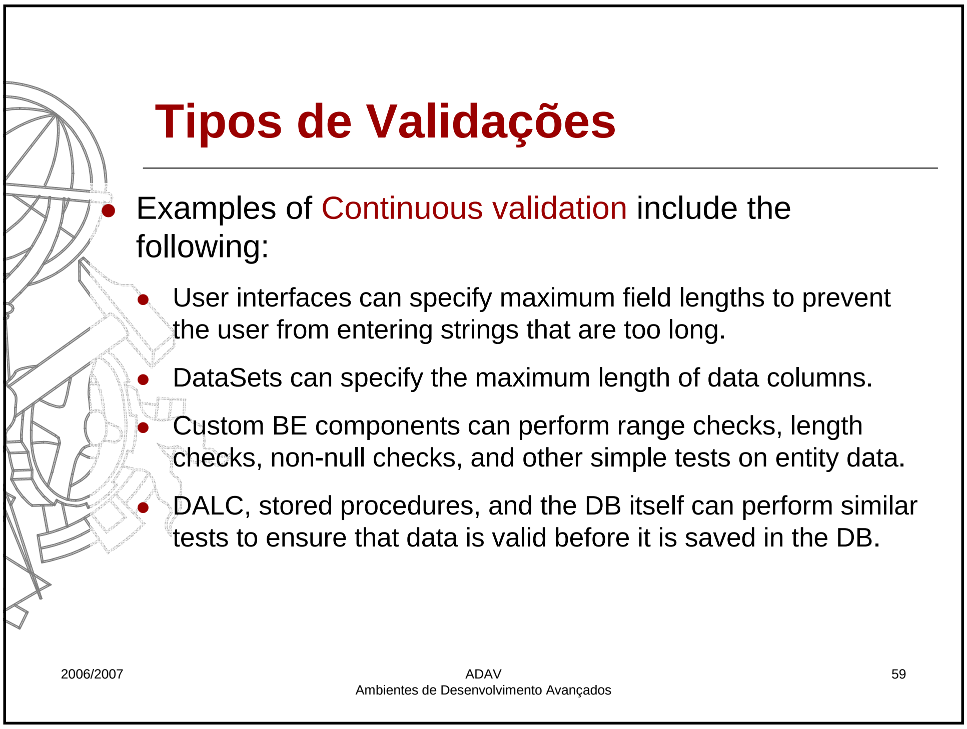
Validações

- Data validation can be performed at many tiers in an application.
- Different types of validation are appropriate in each tier:
  - The client application can validate BE data locally, before the data is submitted.
  - Business processes can validate business documents as the documents are received by using an XSD schema.
  - DALC and stored procedures can validate data to ensure referential integrity and to enforce constraints and nontrivial business rules.



Tipos de Validações

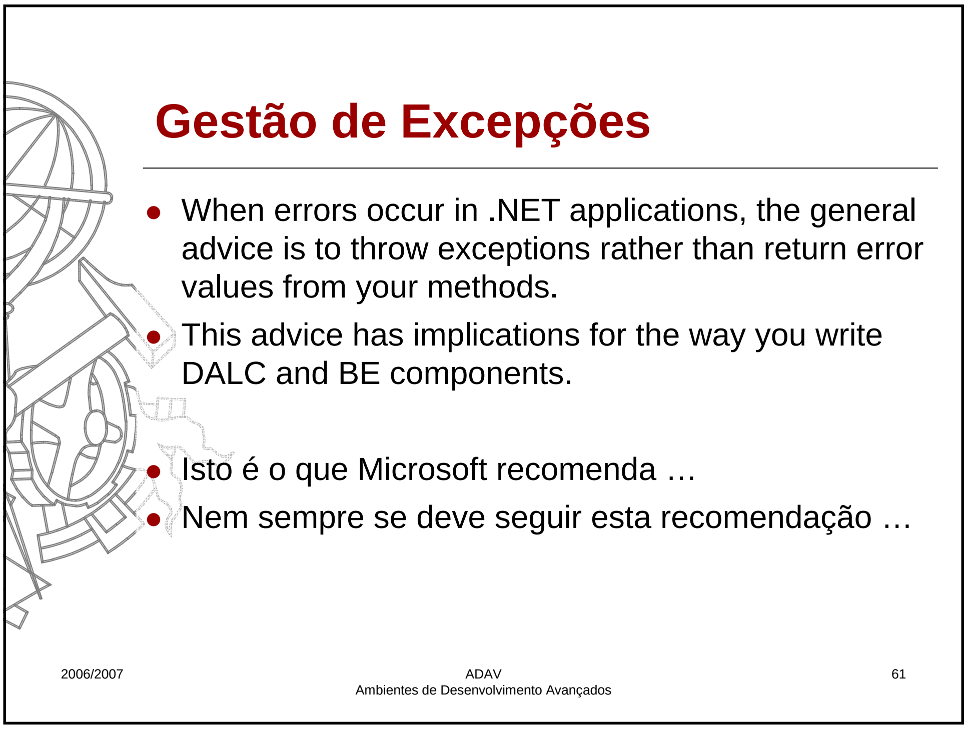
- Point-in-time validation.
  This is a validation that is performed at a specific point in time. For example, a business process validates an XML document when the document is received.
- Continuous validation.
  This is validation that is performed on an ongoing basis at many different levels in your application.



Tipos de Validações

- Examples of Continuous validation include the following:
  - User interfaces can specify maximum field lengths to prevent the user from entering strings that are too long.
  - DataSets can specify the maximum length of data columns.
  - Custom BE components can perform range checks, length checks, non-null checks, and other simple tests on entity data.
  - DALC, stored procedures, and the DB itself can perform similar tests to ensure that data is valid before it is saved in the DB.

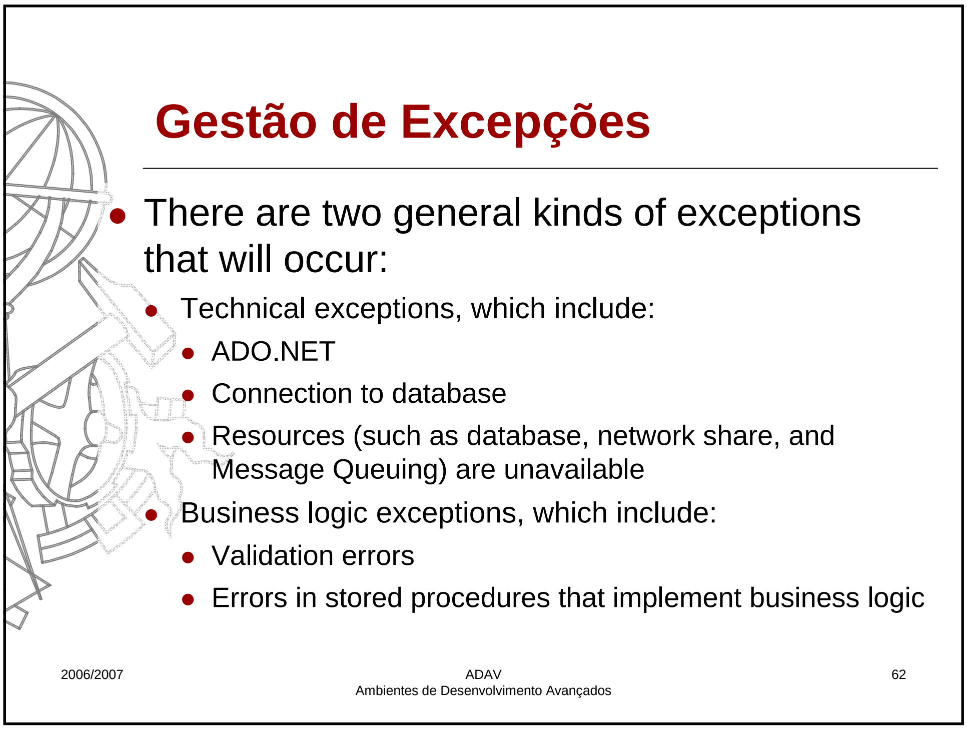
Gestão de Excepções



Gestão de Excepções

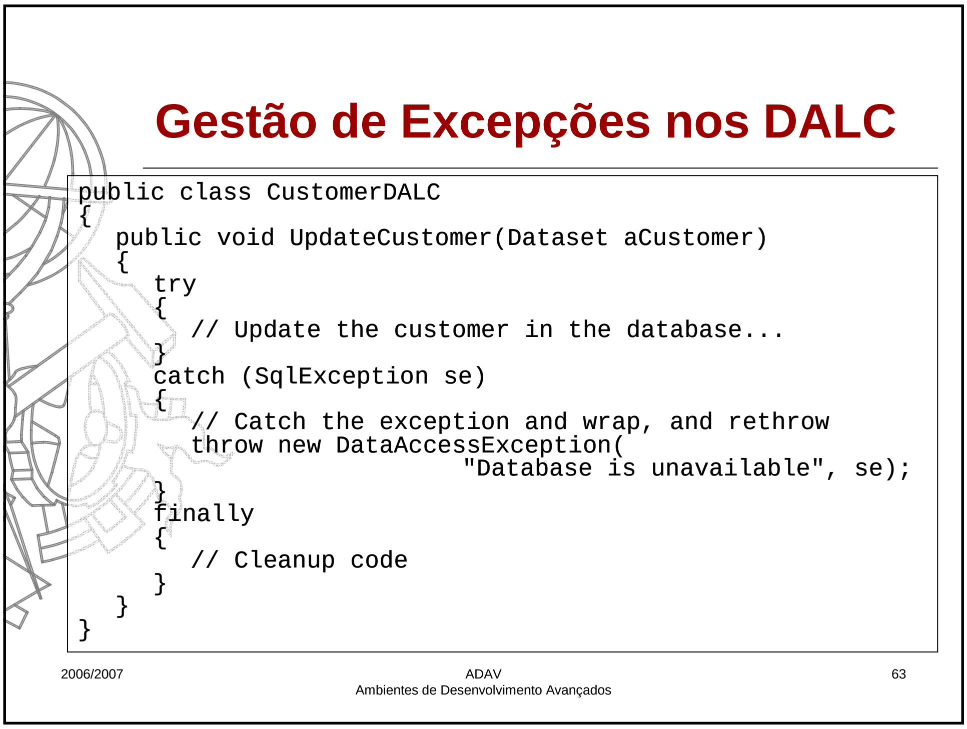
- When errors occur in .NET applications, the general advice is to throw exceptions rather than return error values from your methods.
- This advice has implications for the way you write DALC and BE components.

- Isto é o que Microsoft recomenda …
- Nem sempre se deve seguir esta recomendação …



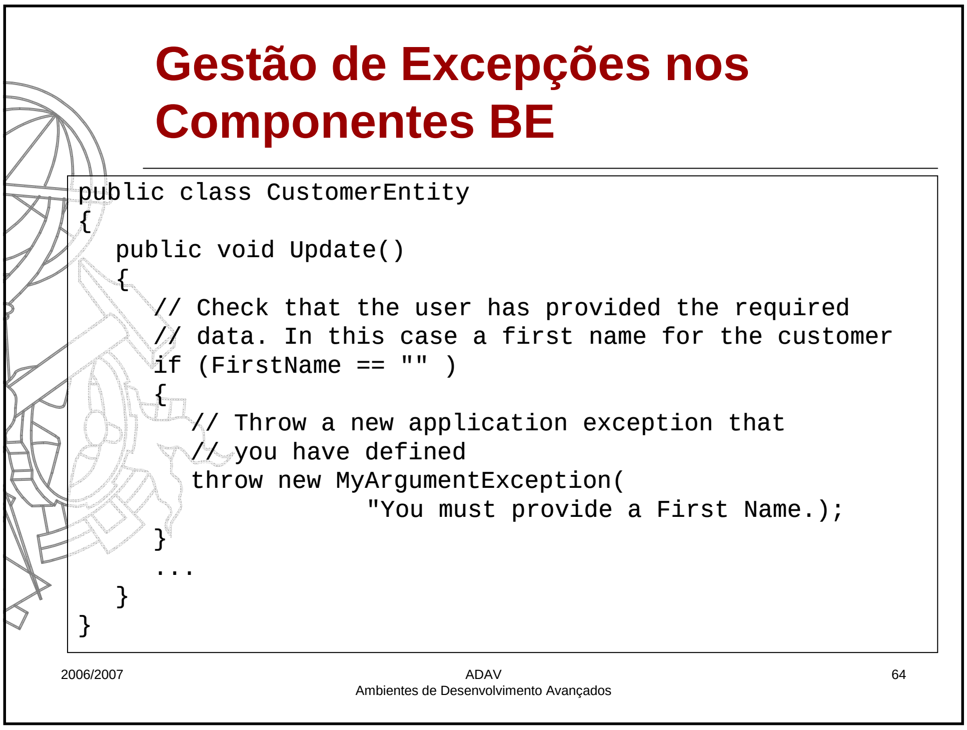
Gestão de Excepções

- There are two general kinds of exceptions that will occur:
  - Technical exceptions, which include:
    - ADO.NET
    - Connection to database
    - Resources (such as database, network share, and Message Queuing) are unavailable
  - Business logic exceptions, which include:
    - Validation errors
    - Errors in stored procedures that implement business logic



Gestão de Excepções nos DALC

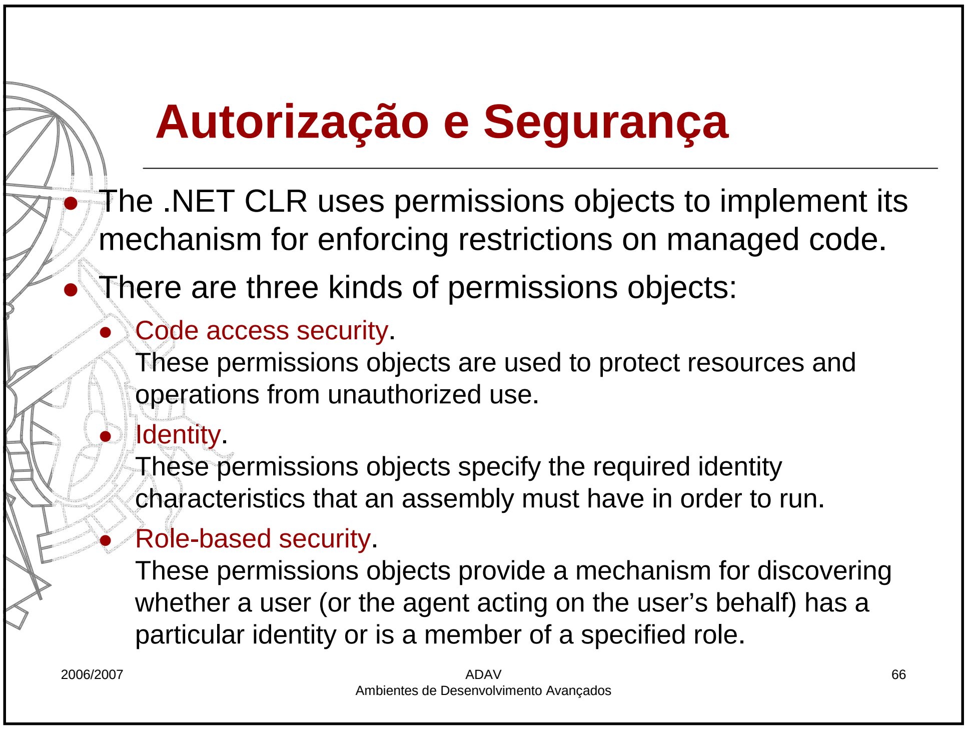
```
public class CustomerDALC
{
   public void UpdateCustomer(Dataset aCustomer)
   {
      try
      {
         // Update the customer in the database...
      }
      catch (SqlException se)
      {
         // Catch the exception and wrap, and rethrow
         throw new DataAccessException(
                           "Database is unavailable", se);
      }
      finally
      {
         // Cleanup code
      }
   }
}
```



Gestão de Excepções nos Componentes BE

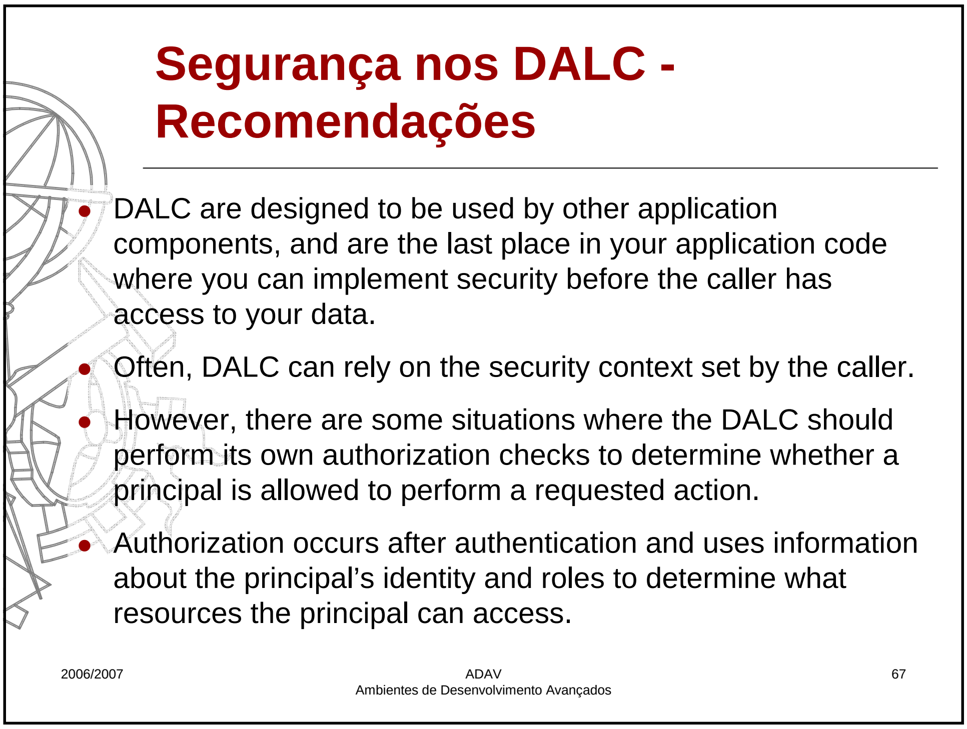
```
public class CustomerEntity
{
   public void Update()
   {
      // Check that the user has provided the required
      // data. In this case a first name for the customer
      if (FirstName == "" )
      {
         // Throw a new application exception that
         // you have defined
         throw new MyArgumentException(
                    "You must provide a First Name.);
      }
      ...
   }
}
```

Autorização e Segurança



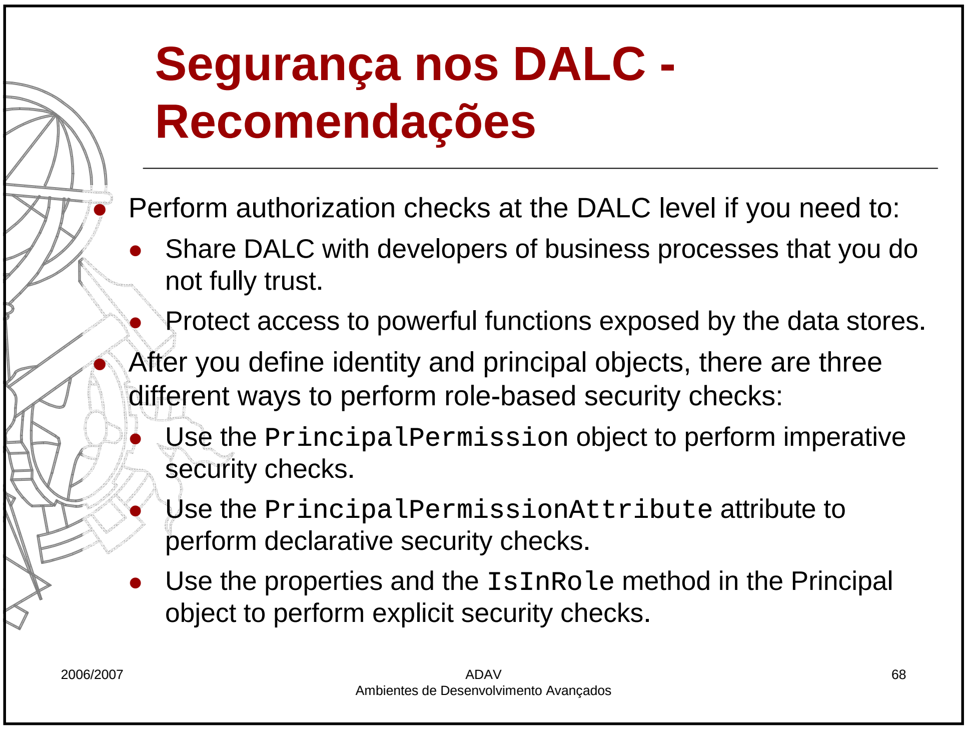
Autorização e Segurança

- The .NET CLR uses permissions objects to implement its mechanism for enforcing restrictions on managed code.
- There are three kinds of permissions objects:
  - Code access security.
    These permissions objects are used to protect resources and operations from unauthorized use.
  - Identity.
    These permissions objects specify the required identity characteristics that an assembly must have in order to run.
  - Role-based security.
    These permissions objects provide a mechanism for discovering whether a user (or the agent acting on the user's behalf) has a particular identity or is a member of a specified role.



Segurança nos DALC - Recomendações

- DALC are designed to be used by other application components, and are the last place in your application code where you can implement security before the caller has access to your data.
- Often, DALC can rely on the security context set by the caller.
- However, there are some situations where the DALC should perform its own authorization checks to determine whether a principal is allowed to perform a requested action.
- Authorization occurs after authentication and uses information about the principal’s identity and roles to determine what resources the principal can access.



Segurança nos DALC - Recomendações

- Perform authorization checks at the DALC level if you need to:
  - Share DALC with developers of business processes that you do not fully trust.
  - Protect access to powerful functions exposed by the data stores.
- After you define identity and principal objects, there are three different ways to perform role-based security checks:
  - Use the `PrincipalPermission` object to perform imperative security checks.
  - Use the `PrincipalPermissionAttribute` attribute to perform declarative security checks.
  - Use the properties and the `IsInRole` method in the Principal object to perform explicit security checks.

Windows Authentication

- Ideally, you should use Windows Authentication, rather than using SQL Server Authentication, when you connect to the database.
- However, you should use service accounts and avoid impersonating through to the database, because this will impede connection pooling.
- Connection pooling requires identical connection strings; if you try to open the database by using different connection strings, you will create separate connection pools, which will limit scalability.

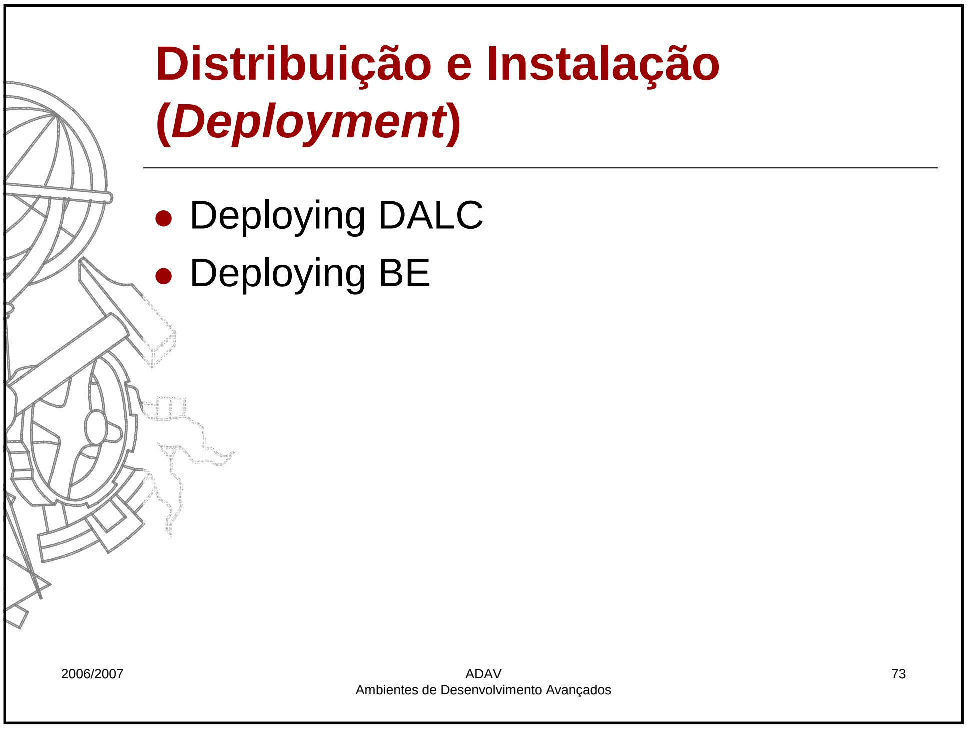
Secure Communication Recommendations

- To achieve secure communication between calling applications and DALC, consider the following recommendations:
  - If your DALC are called over the wire from diverse tiers, and the exchange involves sensitive information that needs to be protected, use Distributed Component Object Model (DCOM), Secure Sockets Layer (SSL), or Secure Internet Protocol (IPSec) secure communication technologies.
  - If data is stored encrypted in a DB, DALC are usually responsible for encrypting and decrypting the data. If the risk of exposing the information is high, strongly consider securing the communication channel to and from the DALC.

Recommendations for Security in BE Components

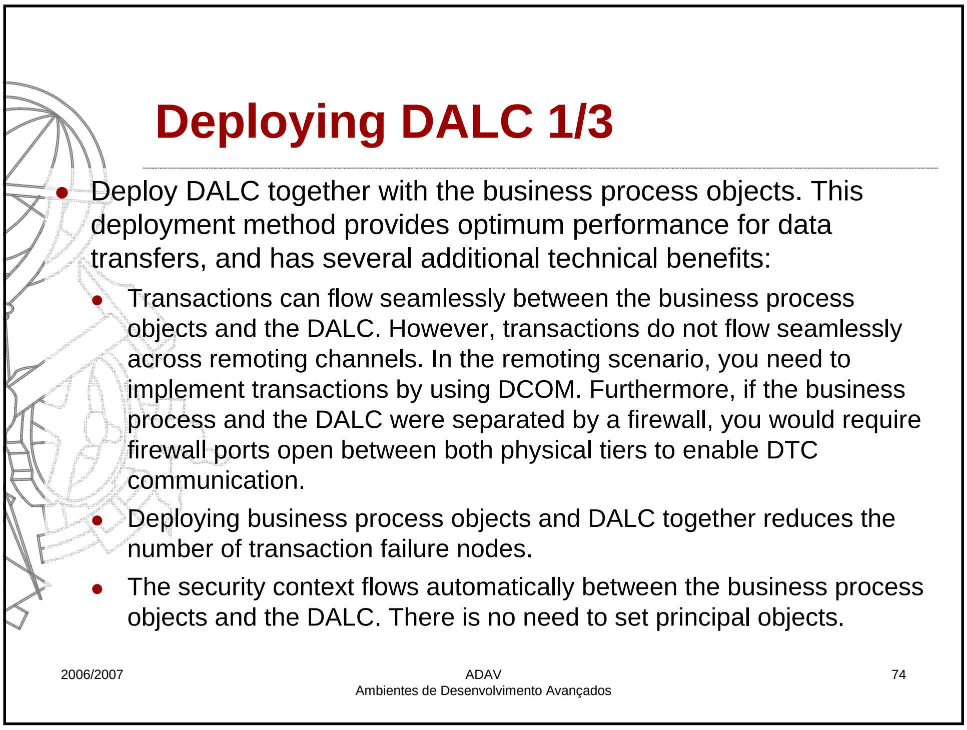
- If you implement your BE as data structures (such as XML or DataSets), you do not need to implement security checks.
- However, if you implement your BE as custom BE components with CRUD operations, consider the following recommendations:
  - If the entities are exposed to business processes that you do not fully trust, implement authorization checks in the BE components and in the DALC. If you do implement checks at both levels, however, you may encounter the maintenance issue of keeping the security policies synchronized.
  - BE components should not deal with communication security or data encryption. Leave these tasks to the corresponding DALC.

Distribuição e Instalação (*Deployment*)



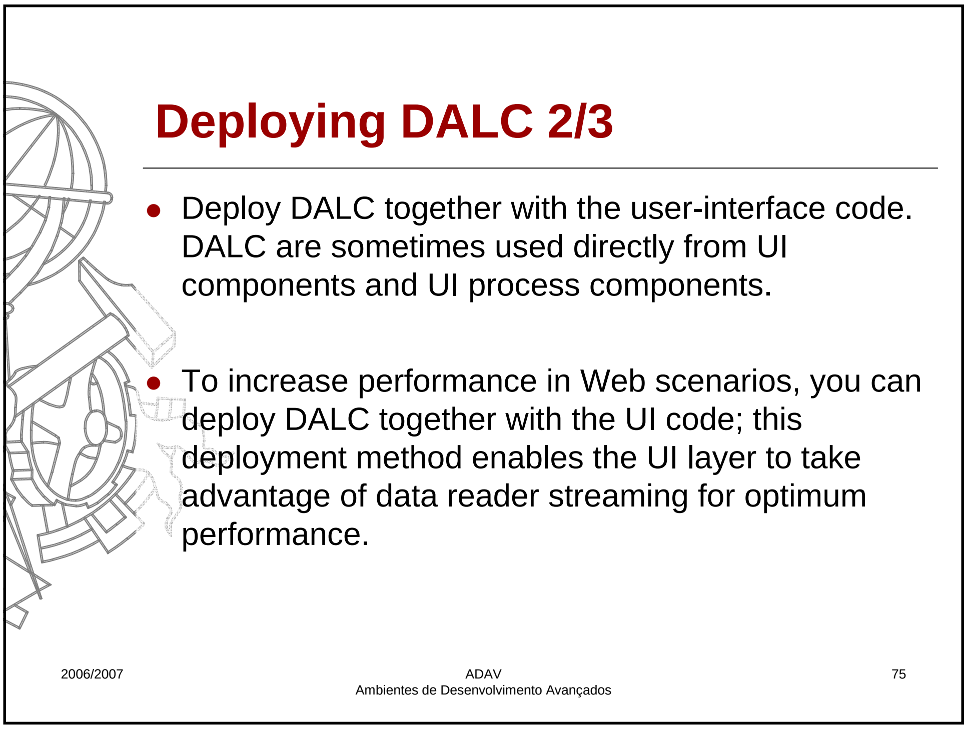
Distribuição e Instalação (*Deployment*)

- Deploying DALC
- Deploying BE



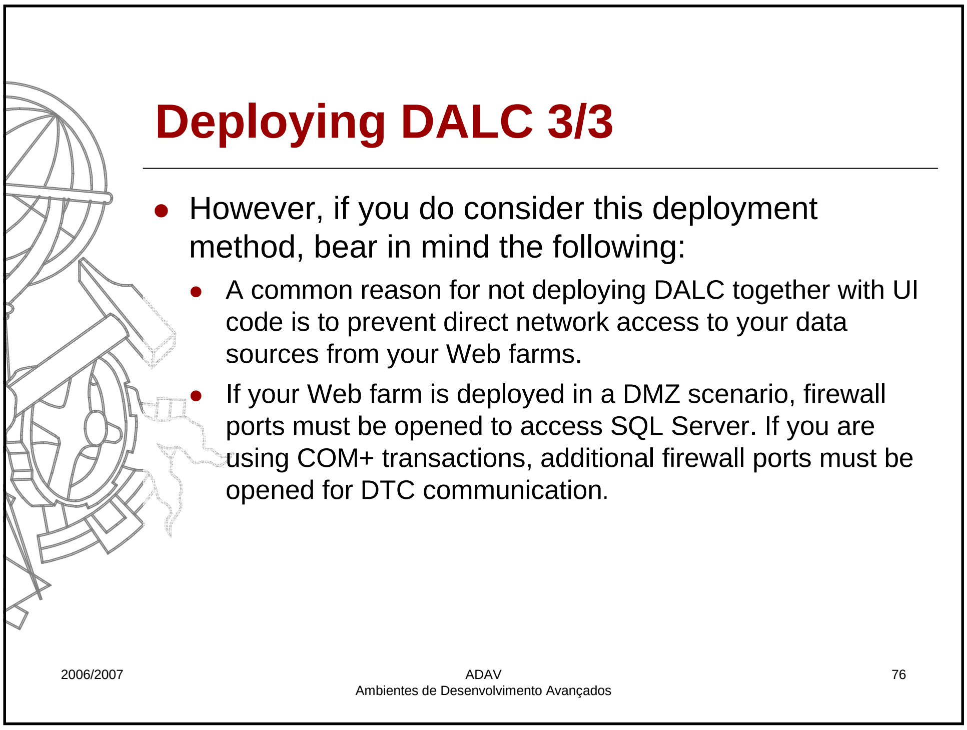
Deploying DALC 1/3

- Deploy DALC together with the business process objects. This deployment method provides optimum performance for data transfers, and has several additional technical benefits:
  - Transactions can flow seamlessly between the business process objects and the DALC. However, transactions do not flow seamlessly across remoting channels. In the remoting scenario, you need to implement transactions by using DCOM. Furthermore, if the business process and the DALC were separated by a firewall, you would require firewall ports open between both physical tiers to enable DTC communication.
  - Deploying business process objects and DALC together reduces the number of transaction failure nodes.
  - The security context flows automatically between the business process objects and the DALC. There is no need to set principal objects.



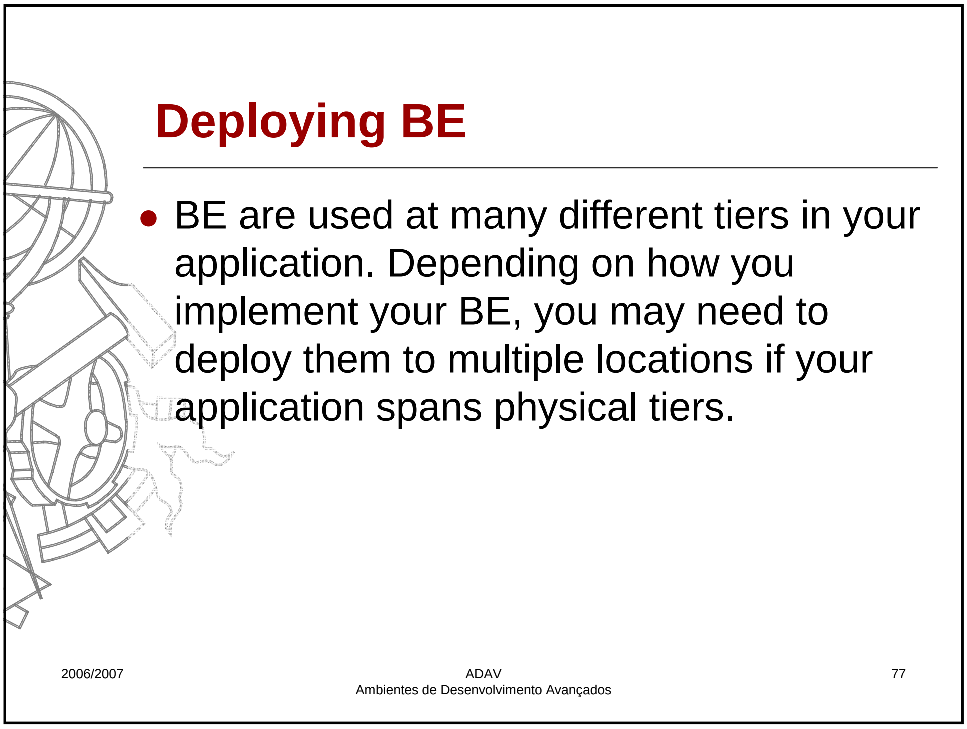
Deploying DALC 2/3

- Deploy DALC together with the user-interface code. DALC are sometimes used directly from UI components and UI process components.
- To increase performance in Web scenarios, you can deploy DALC together with the UI code; this deployment method enables the UI layer to take advantage of data reader streaming for optimum performance.



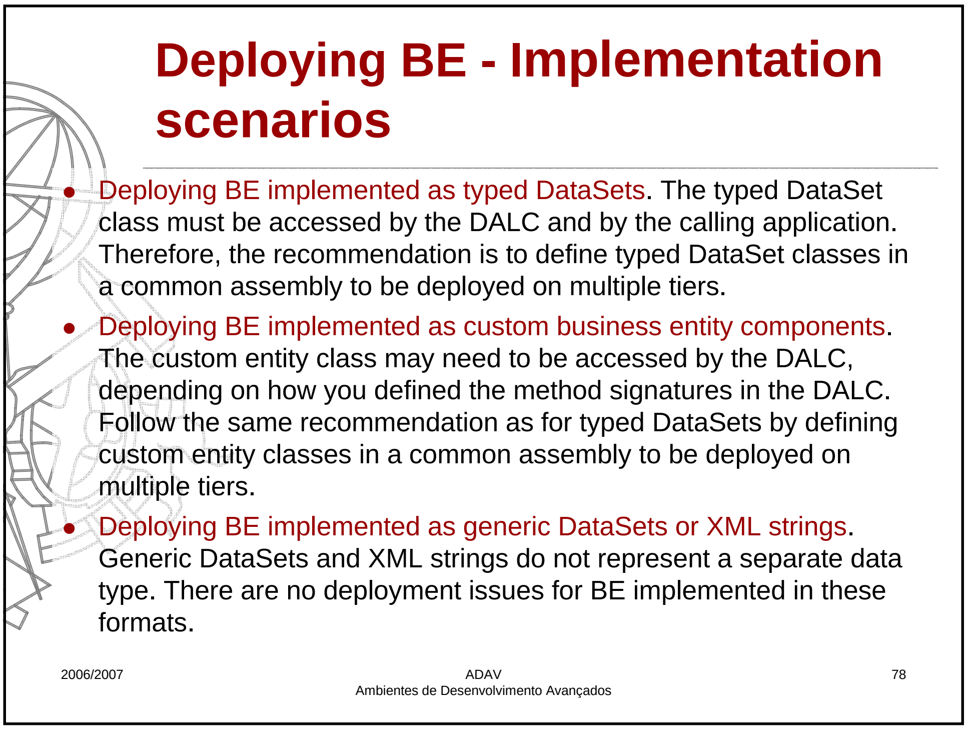
Deploying DALC 3/3

- However, if you do consider this deployment method, bear in mind the following:
  - A common reason for not deploying DALC together with UI code is to prevent direct network access to your data sources from your Web farms.
  - If your Web farm is deployed in a DMZ scenario, firewall ports must be opened to access SQL Server. If you are using COM+ transactions, additional firewall ports must be opened for DTC communication.



Deploying BE

- BE are used at many different tiers in your application. Depending on how you implement your BE, you may need to deploy them to multiple locations if your application spans physical tiers.



Deploying BE - Implementation scenarios

- Deploying BE implemented as typed DataSets. The typed DataSet class must be accessed by the DALC and by the calling application. Therefore, the recommendation is to define typed DataSet classes in a common assembly to be deployed on multiple tiers.
- Deploying BE implemented as custom business entity components. The custom entity class may need to be accessed by the DALC, depending on how you defined the method signatures in the DALC. Follow the same recommendation as for typed DataSets by defining custom entity classes in a common assembly to be deployed on multiple tiers.
- Deploying BE implemented as generic DataSets or XML strings. Generic DataSets and XML strings do not represent a separate data type. There are no deployment issues for BE implemented in these formats.

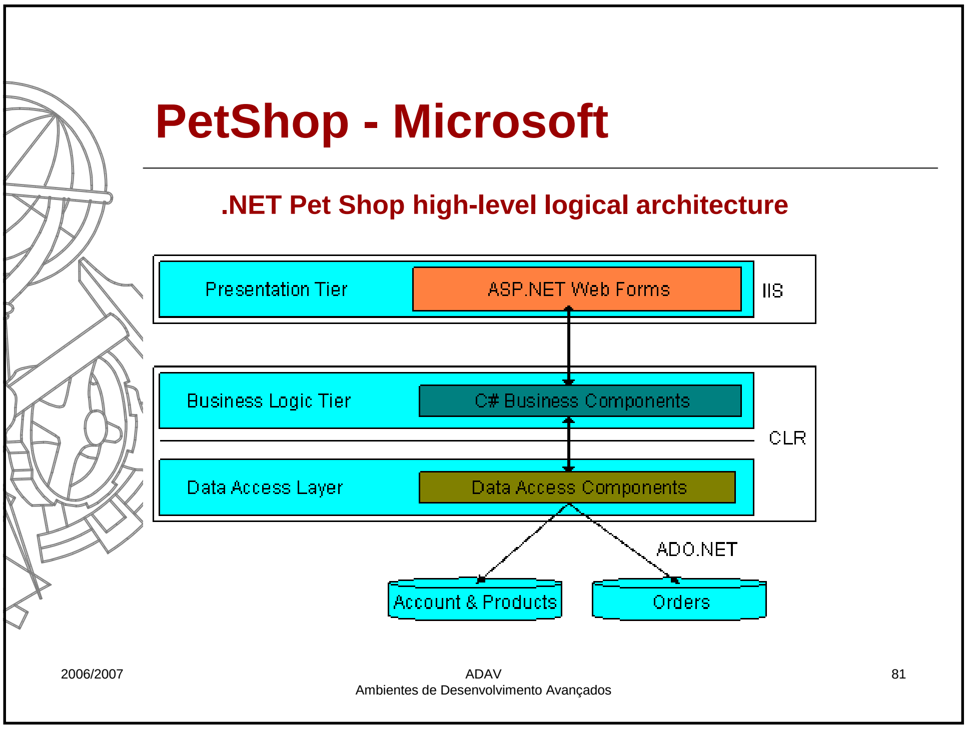
Pet Shop Application

PetShop - Microsoft

Microsoft .NET Pet Shop

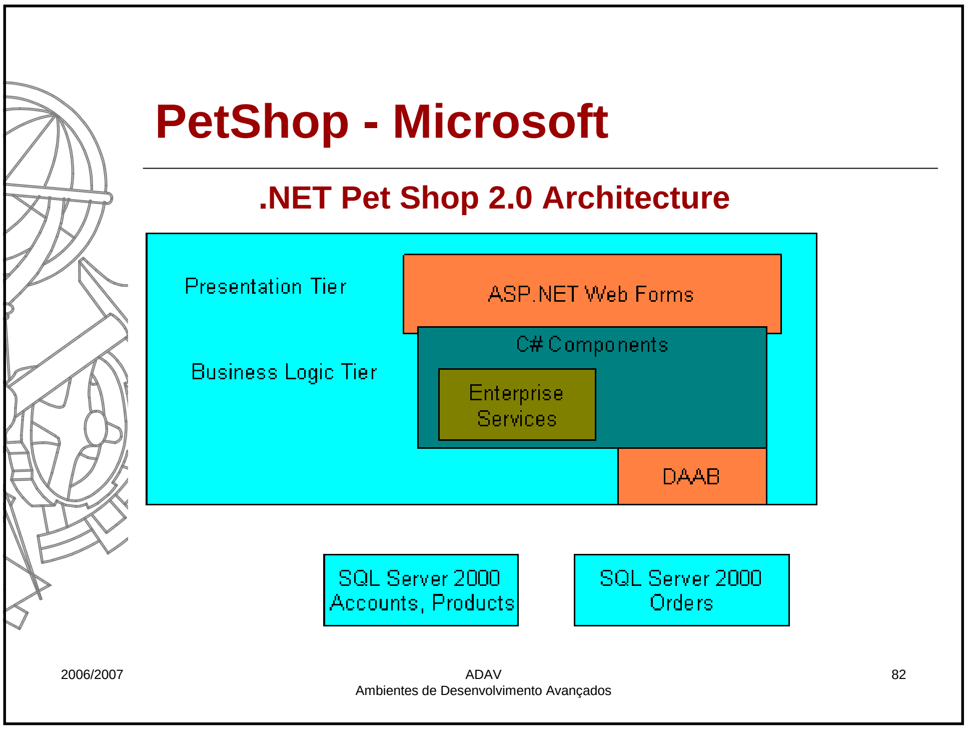
http://msdn.microsoft.com/library/en-us/dnbda/html/bdasamppet.asp

http://java.sun.com/developer/releases/petstore/



PetShop - Microsoft

.NET Pet Shop high-level logical architecture

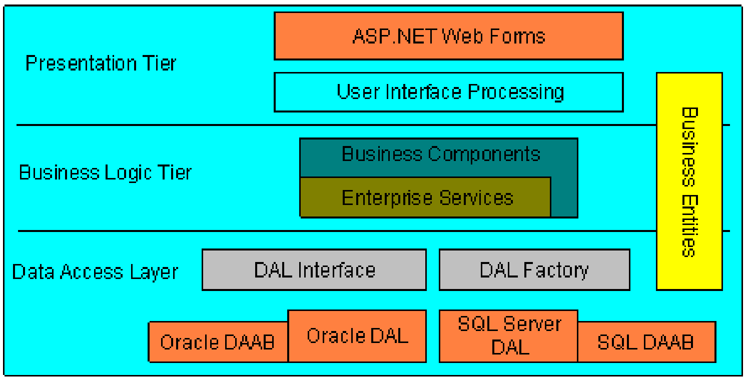


PetShop - Microsoft

.NET Pet Shop 2.0 Architecture

PetShop - Microsoft

.NET Pet Shop 3.0 Architecture



Presentation Tier

ASP.NET Web Forms

User Interface Processing

Business Logic Tier

Business Components

Enterprise Services

Business Entities

Data Access Layer

DAL Interface

DAL Factory

Oracle DAAB

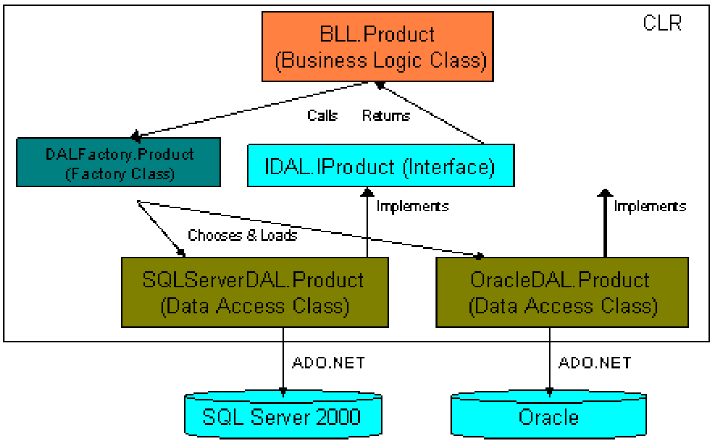
Oracle DAL

SQL Server DAL

SQL DAAB

PetShop - Microsoft

DAL factory implementation in .NET Pet Shop



CLR

BLL.Product
(Business Logic Class)

Calls

Returns

DALFactory.Product
(Factory Class)

IDAL.IProduct (Interface)

Implements

Implements

Chooses & Loads

SQLServerDAL.Product
(Data Access Class)

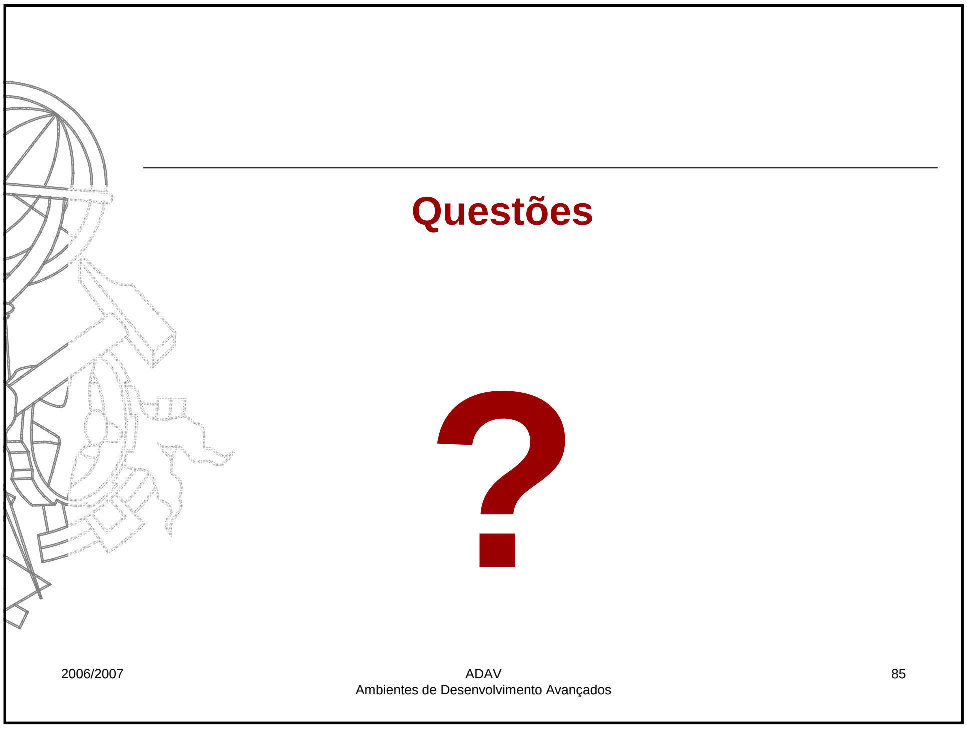
OracleDAL.Product
(Data Access Class)

ADO.NET

ADO.NET

SQL Server 2000

Oracle



Questões

?