

# Prado v3.0.1 Quick Start Tutorial

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# Preface

Prado quick start doc



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# Chapter 1

## Getting Started

### 1.1 Welcome to the PRADO QuickStart Tutorial

This QuickStart tutorial is provided to help you quickly start building your own Web applications based on PRADO version 3.0.

You may refer to the following resources if you find this tutorial does not fulfill all your needs.

- [PRADO API Documentation](#)
- [PRADO Forum](#)
- [PRADO Wiki](#)
- [PRADO Trac](#)

### 1.2 What is PRADO?

PRADO is a component-based and event-driven programming framework for developing Web applications in PHP 5. PRADO stands for **P**HP **R**apid **A**pplication **D**evelopment **O**bject-oriented.

A primary goal of PRADO is to enable maximum reusability in Web programming. By reusability, we mean not only reusing one's own code, but also reusing other people's code in an easy way. The

latter is more important as it saves the effort of reinventing the wheels and may cut off development time dramatically. The introduction of the concept of component is for this purpose.

To achieve the above goal, PRADO stipulates a protocol of writing and using components to construct Web applications. A component is a software unit that is self-contained and can be reused with trivial customization. New components can be created by simple composition of existing components.

To facilitate interacting with components, PRADO implements an event-driven programming paradigm that allows delegation of extensible behavior to components. End-user activities, such as clicking on a submit button, are captured as server events. Methods or functions may be attached to these events so that when the events happen, they are invoked automatically to respond to the events. Compared with the traditional Web programming in which developers have to deal with the raw POST or GET variables, event-driven programming helps developers better focus on the necessary logic and reduces significantly the low-level repetitive coding.

In summary, developing a PRADO Web application mainly involves instantiating prebuilt component types, configuring them by setting their properties, responding to their events by writing handler functions, and composing them into pages for the application. It is very similar to RAD toolkits, such as Borland Delphi and Microsoft Visual Basic, that are used to develop desktop GUI applications.

### 1.2.1 Why PRADO?

PRADO is mostly quoted as a unique framework. In fact, it is so unique that it may turn your boring PHP programming into a fun task. The following list is a short summary of the main features of PRADO,

- Reusability - Code following the PRADO component protocol are highly reusable. Everything in PRADO is a reusable component.
- Event-driven programming - End-user activities, such as clicking on a submit button, are captured as server events so that developers have better focus on dealing with user interactions.
- Team integration - Presentation and logic are separately stored. PRADO applications are themable.



## 1.2. WHAT IS PRADO?

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- Powerful Web controls - PRADO comes with a set of powerful components dealing with Web user interfaces. Highly interactive Web pages can be created with a few lines of code. For example, using the datagrid component, one can quickly create a page presenting a data table which allows paging, sorting, editing, and deleting rows of the data.
- I18N and L10N support - PRADO includes complete support for building applications with multiple languages and locales.
- Seamless Ajax support - PRADO provides a set of Ajax-enabled components that can be easily used (to be available in v3.1).
- XHTML compliance - Web pages generated by PRADO are XHTML-compliant.
- Accommodation of existing work - PRADO is a generic framework with focus on the presentational layer. It does not exclude developers from using most existing class libraries or toolkits. For example, one can AdoDB or Creole to deal with DB in his PRADO application.
- Other features - Powerful error/exception handling and message logging; generic caching and selective output caching; customizable and localizable error handling; extensible authentication and authorization; security measures such as cross-site script (CSS) prevention, cookie protection, etc.

### 1.2.2 What Is PRADO Best For?

PRADO is best suitable for creating Web front-ends that are highly user-interactive and require small to medium traffic. It can be used to develop systems as simple as a blog system to systems as complex as a content management system (CMS) or a complete e-commerce solution. PRADO can help you cut your development time significantly.

PRADO does not exclude other back-end solutions such as most DB abstraction layers. In fact, they can be used like what you usually do with traditional PHP programming.

Without caching techniques, PRADO may not be suitable for developing extremely high-traffic Web applications, such as popular portals, forums, etc. In these applications, every niche of potential performance gain must be exploited and server caching (e.g. Zend optimizer) is almost a must. PRADO implements a generic cache technique and enables selective caching of part of Web contents.

### 1.2.3 How Is PRADO Compared with Other Frameworks?

PRADO is described as a unique framework. Its uniqueness mainly lies in the component-based and event-driven programming paradigm that it tries to promote. Although this programming paradigm is not new in desktop application programming and not new in a few Web programming languages, PRADO is perhaps the first PHP framework enabling it.

Most PHP frameworks are trying to establish a loose standard of organizing PHP programming, most preferably the MVC (model-view-controller) model. It is difficult to compare PRADO with these frameworks because they have different focuses. What we can say is, PRADO is more like a high-level language built upon PHP, while the MVC frameworks stand for the best programming practices. Both aim to help developers to rapidly complete Web application development. The advantage of PRADO is its rich set of prebuilt powerful components and extreme reusability of the PRADO code, while the advantage of the MVC frameworks is the complete separation of model, view and controller, which greatly facilitates team integration.

### 1.2.4 History of PRADO

The very original inspiration of PRADO came from Apache Tapestry. During the design and implementation, I borrowed many ideas from Borland Delphi and Microsoft ASP.NET. The first version of PRADO came out in June 2004 and was written in PHP 4. Driven by the Zend PHP 5 coding contest, I rewrote PRADO in PHP 5, which proved to be a wise move, thanks to the new object model provided by PHP 5. PRADO won the grand prize in the Zend contest, earning the highest votes from both the public and the judges' panel.

In August 2004, PRADO started to be hosted on SourceForge as an open source project. Soon after, the project site [xisc.com](http://xisc.com) was announced to public. With the fantastic support of PRADO developer team and PRADO users, PRADO evolved to version 2.0 in mid 2005. In this version, Wei Zhuo contributed to PRADO with the excellent I18N and L10N support.

In May 2005, we decided to completely rewrite the PRADO framework to resolve a few fundamental issues found in version 2.0 and to catch up with some cool features available in Microsoft ASP.NET 2.0. After nearly a year's hard work with over 50,000 lines of new code, version 3.0 was finally made available in April 2006.

Starting from version 3.0, significant efforts are allocated to ensure the quality and stability of PRADO. If we say PRADO v2.x and v1.x are proof-of-concept work, we can say PRADO 3.x has

grown up to a project that is suitable for serious business application development.

## 1.3 Installing PRADO

If you are viewing this page from your own Web server, you are already done with the installation.

The minimum requirement by PRADO is that the Web server support PHP 5. PRADO has been tested with Apache Web server on Windows and Linux. Highly possibly it may also run on other platforms with other Web servers, as long as PHP 5 is supported.

Installation of PRADO mainly involves downloading and unpacking.

1. Go to [pradosoft.com](http://pradosoft.com) to grab the latest version of PRADO.
2. Unpack the PRADO release file to a Web-accessible directory.

Your installation of PRADO is done and you can start to play with the demo applications included in the PRADO release via URL `http://web-server-address/prado/demos/`. Here we assume PRADO is unpacked to the `prado` subdirectory under the `DocumentRoot` of the Web server.

If you encounter any problems with the demo applications, please use the PRADO requirement checker script, accessible via `http://web-server-address/prado/requirements/index.php`, to check first if your server configuration fulfills the conditions required by PRADO.

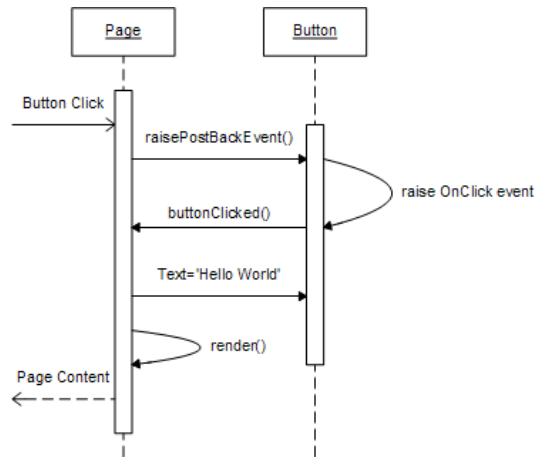
## 1.4 My First PRADO Application

In this section, we guide you through creating your first PRADO application, the famous "Hello World" application.

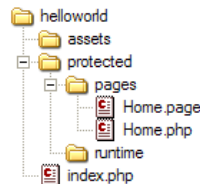
"Hello World" perhaps is the simplest *interactive* PRADO application that you can create. It displays to end-users a page with a submit button whose caption is `Click Me`. After the user clicks on the button, its caption is changed to `Hello World`.

There are many approaches that can achieve the above goal. One can submit the page to the server, examine the POST variable, and generate a new page with the button caption updated. Or one can simply use JavaScript to update the button caption upon its `onclick` client event.

PRADO promotes component-based and event-driven Web programming. The button is represented by a `TButton` object. It encapsulates the button caption as the `Text` property and associates the user button click action with a server-side `OnClick` event. To respond to the user clicking on the button, one simply needs to attach a function to the button's `OnClick` event. Within the function, the button's `Text` property is modified as "Hello World". The following diagram shows the above sequence,



Our PRADO application consists of three files, `index.php`, `Home.page` and `Home.php`, which are organized as follows,



where each directory is explained as follows. Note, the above directory structure can be customized. For example, one can move the `protected` directory out of Web directories. You will know how to do this after you go through this tutorial.

- **assets** - directory storing published private files. See [assets](#) section for more details. This directory must be writable by the Web server process.
- **protected** - application base path storing application data and private script files. This directory should be configured as inaccessible to end-users.

- **runtime** - application runtime storage path storing application runtime information, such as application state, cached data, etc. This directory must be writable by the Web server process.
- **pages** - base path storing all PRADO pages.

The three files that we need are explained as follows.

- **index.php** - entry script of the PRADO application. This file is required by all PRADO applications and is the only script file that is directly accessible by end-users. Content in **index.php** mainly consists of the following three lines,

```
require_once('path/to/prado.php'); // include the prado script
$application=new TApplication;      // create a PRADO application instance
$application->run();                 // run the application
```

- **Home.page** - template for the default page returned when users do not explicitly specify the page requested. A template specifies the presentational layout of components. In this example, we use two components, **TForm** and **TButton**, which correspond to the `<form>` and `<input>` HTML tags, respectively. The template contains the following content,

```
<html>
  <body>
    <com:TForm>
      <com:TButton Text="Click me" OnClick="buttonClicked" />
    </com:TForm>
  </body>
</html>
```

- **Home.php** - page class for the **Home** page. It mainly contains the method responding to the **OnClick** event of the button.

```
class Home extends TPage
{
    public function buttonClicked($sender,$param)
    {
        // $sender refers to the button component
        $sender->Text="Hello World!";
    }
}
```

```
    }  
}
```

The application is now ready and can be accessed via: `http://Web-server-address/helloworld/index.php`, assuming `helloworld` is directly under the `Web DocumentRoot`. Try to change `TButton` in `Home.page` to `TLinkButton` and see what happens.

Complete source code of this demo can be found in the PRADO release. You can also try the [online demo](#).

## 1.5 Upgrading from v2.x and v1.x

PRADO v3.0 is NOT backward compatible with earlier versions of PRADO.

A good news is, properties and events of most controls remain intact, and the syntax of control templates remains largely unchanged. Therefore, developers' knowledge of earlier versions of PRADO are still applicable in v3.0.

We summarize in the following the most significant changes in v3.0 to help developers upgrade their v2.x and v1.x PRADO applications more easily, if needed.

### 1.5.1 Component Definition

Version 3.0 has completely discarded the need of component specification files. It relies more on conventions for defining component properties and events. In particular, a property is defined by the existence of a getter method and/or a setter method, while an event is defined by the existence of an `on-`method. Property and event names in v3.0 are both case-insensitive. As a consequence, developers are now required to take care of type conversions when a component property is being set. For example, the following code is used to define the setter method for the `Enabled` property of `TControl`, which is of `boolean` type,

```
public function setEnabled($value)  
{  
    $value=TPropertyValue::ensureBoolean($value);  
    $this->setViewState('Enabled',$value,true);  
}
```

where `TPropertyValue::ensureBoolean()` is used to ensure that the input value be a boolean. This is because when the property is configured in template, a string value is passed to the setter. In previous versions, PRADO knows the property type based on the component specification files and does the type conversion for you.

### 1.5.2 Application Controller

Application controller now implements a modular architecture. Modules can be plugged in and configured in application specifications. Each module assumes a particular functionality, and they are coordinated together by the [application lifecycle](#). The concept of v2.x modules is replaced in v3.0 by [page directories](#). As a result, the format of v3.0 [application specification](#) is also different from earlier versions.

### 1.5.3 Pages

Pages in v3.0 are organized in directories which may be compared to the module concept in v2.x. Pages are requested using the path to them. For example, a URL `index.php?page=Controls.Samples.Sample1` would be used to request for a page named `Sample1` stored under the `[BasePath]/Controls/Samples` directory, where `[BasePath]` refers to the root page path. The file name of a page template must be ended with `.page`, mainly to differentiate page templates from non-page control templates whose file names must be ended with `.tpl`.

### 1.5.4 Control Relationship

Version 3.0 redefines the relationships between controls. In particular, the parent-child relationship now refers to the enclosure relationship between controls' presentation. And a new naming-container relationship is introduced to help better manage control IDs. For more details, see the [controls](#) section.

### 1.5.5 Template Syntax

The syntax of control templates in v3.0 remains similar to those in earlier versions, with many enhancements. A major change is about the databinding expression. In v3.0, this is done by the following,

```
<com:MyComponent PropertyName=<%# PHP expression %> .../>
```

Expression and statement tags are also changed similarly. For more details, see the [template definition](#) section.

### 1.5.6 Theme Syntax

Themes in v3.0 are defined like control templates with a few restrictions.



## Chapter 2

# Fundamentals

### 2.1 Architecture

PRADO is primarily a presentational framework, although it is not limited to be so. The framework focuses on making Web programming, which deals most of the time with user interactions, to be component-based and event-driven so that developers can be more productive. The following class tree depicts some of the major classes provided by PRADO,

When a PRADO application is processing a page request, its static object diagram can be shown as follows,

### 2.2 Components

A component is an instance of `TComponent` or its child class. The base class `TComponent` implements the mechanism of component properties and events.

#### 2.2.1 Component Properties

A component property can be viewed as a public variable describing a specific aspect of the component, such as the background color, the font size, etc. A property is defined by the existence



## 2.2. COMPONENTS

---

To get or set the ID property, do as follows, just like working with a variable,

```
$id = $component->ID;  
$component->ID = $id;
```

This is equivalent to the following,

```
$id = $component->getID();  
$component->setID( $id );
```

A property is read-only if it has a getter method but no setter method. Since PHP method names are case-insensitive, property names are also case-insensitive. A component class inherits all its ancestor classes' properties.

### Subproperties

A subproperty is a property of some object-typed property. For example, **TWebControl** has a **Font** property which is of **TFont** type. Then the **Name** property of **Font** is referred to as a subproperty (with respect to **TWebControl**).

To get or set the **Name** subproperty, use the following method,

```
$name = $component->getSubProperty('Font.Name');  
$component->setSubProperty('Font.Name', $name);
```

This is equivalent to the following,

```
$name = $component->getFont()->getName();  
$component->getFont()->setName( $name );
```

### 2.2.2 Component Events

Component events are special properties that take method names as their values. Attaching (setting) a method to an event will hook up the method to the places at which the event is raised. Therefore, the behavior of a component can be modified in a way that may not be foreseen during the development of the component.

A component event is defined by the existence of a method whose name starts with the word **on**. The event name is the method name and is thus case-insensitive. For example, in **TButton**, we have

```
class TButton extends TWebControl {  
    public function onClick( $param ) {  
        ...  
    }  
}
```

This defines an event named **OnClick**, and a handler can be attached to the event using one of the following ways,

```
$button->OnClick = $callback;  
$button->OnClick->add( $callback );  
$button->OnClick[] = $callback;  
$button->attachEventHandler( 'OnClick' , $callback );
```

where **\$callback** refers to a valid PHP callback (e.g. a function name, a class method `array($object, 'method')`, etc.)

### 2.2.3 Namespaces

A namespace refers to a logical grouping of some class names so that they can be differentiated from other class names even if their names are the same. Since PHP does not support namespace intrinsically, you cannot create instances of two classes who have the same name but with different definitions. To differentiate from user defined classes, all PRADO classes are prefixed with a letter 'T' (meaning 'Type'). Users are advised not to name their classes like this. Instead, they may prefix their class names with any other letter(s).

A namespace in PRADO is considered as a directory containing one or several class files. A class may be specified without ambiguity using such a namespace followed by the class name. Each namespace in PRADO is specified in the following format,

```
PathAlias.Dir1.Dir2
```

where **PathAlias** is an alias of some directory, while **Dir1** and **Dir2** are subdirectories under that directory. A class named **MyClass** defined under **Dir2** may now be fully qualified as **PathAlias.Dir1.Dir2.MyClass**.

## 2.2. COMPONENTS

---

To use a namespace in code, do as follows,

```
Prado::using('PathAlias.Dir1.Dir2.*');
```

which appends the directory referred to by `PathAlias.Dir1.Dir2` into PHP include path so that classes defined under that directory may be instantiated without the namespace prefix. You may also include an individual class definition by

```
Prado::using('PathAlias.Dir1.Dir2.MyClass');
```

which will include the class file if `MyClass` is not defined.

For more details about defining path aliases, see [application configuration](#) section.

### 2.2.4 Component Instantiation

Component instantiation means creating instances of component classes. There are two types of component instantiation: static instantiation and dynamic instantiation. The created components are called static components and dynamic components, respectively.

#### Dynamic Component Instantiation

Dynamic component instantiation means creating component instances in PHP code. It is the same as the commonly referred object creation in PHP. A component can be dynamically created using one of the following two methods in PHP,

```
$component = new ComponentClassName;  
$component = Prado::createComponent('ComponentType');
```

where `ComponentType` refers to a class name or a type name in namespace format (e.g. `System.Web.UI.TControl`). The second approach is introduced to compensate for the lack of namespace support in PHP.

#### Static Component Instantiation

Static component instantiation is about creating components via [configurations](#). The actual creation work is done by the PRADO framework. For example, in an [application configuration](#), one

can configure a module to be loaded when the application runs. The module is thus a static component created by the framework. Static component instantiation is more commonly used in [templates](#). Every component tag in a template specifies a component that will be automatically created by the framework when the template is loaded. For example, in a page template, the following tag will lead to the creation of a `TButton` component on the page,

```
<com:TButton Text="Register" />
```

## 2.3 Controls

A control is an instance of class `TControl` or its subclass. A control is a component defined in addition with user interface. The base class `TControl` defines the parent-child relationship among controls which reflects the containment relationship among user interface elements.

### 2.3.1 Control Tree

Controls are related to each other via parent-child relationship. Each parent control can have one or several child controls. A parent control is in charge of the state transition of its child controls. The rendering result of the child controls are usually used to compose the parent control's presentation. The parent-child relationship brings together controls into a control tree. A page is at the root of the tree, whose presentation is returned to the end-users.

The parent-child relationship is usually established by the framework via [templates](#). In code, you may explicitly specify a control as a child of another using one of the following methods,

```
$parent->Controls->add($child);  
$parent->Controls[]=$child;
```

where the property `Controls` refers to the child control collection of the parent.

### 2.3.2 Control Identification

Each control has an `ID` property that can be uniquely identify itself among its sibling controls. In addition, each control has a `UniqueID` and a `ClientID` which can be used to globally identify

the control in the tree that the control resides in. `UniqueID` and `ClientID` are very similar. The former is used by the framework to determine the location of the corresponding control in the tree, while the latter is mainly used on the client side as HTML tag IDs. In general, you should not rely on the explicit format of `UniqueID` or `ClientID`.

### 2.3.3 Naming Containers

Each control has a naming container which is a control creating a unique namespace for differentiating between controls with the same ID. For example, a `TRepeater` control creates multiple items each having child controls with the same IDs. To differentiate these child controls, each item serves as a naming container. Therefore, a child control may be uniquely identified using its naming container's ID together with its own ID. As you may already have understood, `UniqueID` and `ClientID` rely on the naming containers.

A control can serve as a naming container if it implements the `INamingContainer` interface.

### 2.3.4 ViewState and ControlState

HTTP is a stateless protocol, meaning it does not provide functionality to support continuing interaction between a user and a server. Each request is considered as discrete and independent of each other. A Web application, however, often needs to know what a user has done in previous requests. People thus introduce sessions to help remember such state information.

PRADO borrows the viewstate and controlstate concept from Microsoft ASP.NET to provides additional stateful programming mechanism. A value storing in viewstate or controlstate may be available to the next requests if the new requests are form submissions (called postback) to the same page by the same user. The difference between viewstate and controlstate is that the former can be disabled while the latter cannot.

Viewstate and controlstate are implemented in `TControl`. They are commonly used to define various properties of controls. To save and retrieve values from viewstate or controlstate, use following methods,

```
$this->getViewState('Name',$defaultValue);  
$this->setViewState('Name',$value,$defaultValue);  
$this->getControlState('Name',$defaultValue);
```

```
$this->setControlState('Name',$value,$defaultValue);
```

where `$this` refers to the control instance, `Name` refers to a key identifying the persistent value, `$defaultValue` is optional. When retrieving values from viewstate or controlstate, if the corresponding key does not exist, the default value will be returned.

## 2.4 Pages

Pages are top-most controls that have no parent. The presentation of pages are directly displayed to end-users. Users access pages by sending page service requests.

Each page must have a [template](#) file. The file name suffix must be `.page`. The file name (without suffix) is the page name. PRADO will try to locate a page class file under the directory containing the page template file. Such a page class file must have the same file name (suffixed with `.php`) as the template file. If the class file is not found, the page will take class `TPage`.

### 2.4.1 PostBack

A form submission is called *postback* if the submission is made to the page containing the form. Postback can be considered an event happened on the client side, raised by the user. PRADO will try to identify which control on the server side is responsible for a postback event. If one is determined, for example, a `TButton`, we call it the postback event sender which will translate the postback event into some specific server-side event (e.g. `Click` and `Command` events for `TButton`).

### 2.4.2 Page Lifecycles

Understanding the page lifecycles is crucial to grasp PRADO programming. Page lifecycles refer to the state transitions of a page when serving this page to end-users. They can be depicted in the following statechart,



## 2.5 Modules

A module is an instance of a class implementing the `IModule` interface. A module is commonly designed to provide specific functionality that may be plugged into a PRADO application and shared by all components in the application.

PRADO uses configurations to specify whether to load a module, load what kind of modules, and how to initialize the loaded modules. Developers may replace the core modules with their own implementations via application configuration, or they may write new modules to provide additional functionalities. For example, a module may be developed to provide common database logic for one or several pages. For more details, please see the [configurations](#).

There are three core modules that are loaded by default whenever an application runs. They are [request module](#), [response module](#), and [error handler module](#). In addition, [session module](#) is loaded when it is used in the application. PRADO provides default implementation for all these modules. [Custom modules](#) may be configured or developed to override or supplement these core modules.

### 2.5.1 Request Module

Request module represents provides storage and access scheme for user request sent via HTTP. User request data comes from several sources, including URL, post data, session data, cookie data, etc. These data can all be accessed via the request module. By default, PRADO uses `THttpRequest` as request module. The request module can be accessed via the `Request` property of application and controls.

### 2.5.2 Response Module

Response module implements the mechanism for sending output to client users. Response module may be configured to control how output are cached on the client side. It may also be used to send cookies back to the client side. By default, PRADO uses `THttpResponse` as response module. The response module can be accessed via the `Response` property of application and controls.

### 2.5.3 Session Module

Session module encapsulates the functionalities related with user session handling. Session module is automatically loaded when an application uses session. By default, PRADO uses `THttpSession` as session module, which is a simple wrapper of the session functions provided by PHP. The session module can be accessed via the `Session` property of application and controls.

### 2.5.4 Error Handler Module

Error handler module is used to capture and process all error conditions in an application. PRADO uses `TErrorHandler` as error handler module. It captures all PHP warnings, notices and exceptions, and displays in an appropriate form to end-users. The error handler module can be accessed via the `ErrorHandler` property of the application instance.

### 2.5.5 Custom Modules

PRADO is released with a few more modules besides the core ones. They include caching modules (`TSqliteCache` and `TMemCache`), user management module (`TUserManager`), authentication and authorization module (`TAuthManager`), etc.

When `TPageService` is requested, it also loads modules specific for page service, including asset manager (`TAssetManager`), template manager (`TTemplateManager`), theme/skin manager (`TThemeManager`).

Custom modules and core modules are all configurable via [configurations](#).

## 2.6 Services

A service is an instance of a class implementing the `IService` interface. Each kind of service processes a specific type of user requests. For example, the page service responds to users' requests for PRADO pages.

A service is uniquely identified by its `ID` property. By default when `THttpRequest` is used as the [request module](#), GET variable names are used to identify which service a user is requesting. If a GET variable name is equal to some service ID, the request is considered for that service, and the value of the GET variable is passed as the service parameter. For page service, the name of the GET

variable must be **page**. For example, the following URL requests for the **Fundamentals.Services** page,

```
http://hostname/index.php?page=Fundamentals.Services
```

Developers may implement additional services for their applications. To make a service available, configure it in [application configurations](#).

### 2.6.1 Page Service

PRADO implements **TPageService** to process users' page requests. Pages are stored under a directory specified by the **BasePath** property of the page service. The property defaults to **pages** directory under the application base path. You may change this default by configuring the service in the application configuration.

Pages may be organized into subdirectories under the **BasePath**. In each directory, there may be a page configuration file named **config.xml**, which contains configurations effective only when a page under that directory or a sub-directory is requested. For more details, see the [page configuration](#) section.

Service parameter for the page service refers to the page being requested. A parameter like **Fundamentals.Services** refers to the **Services** page under the **<BasePath>/Fundamentals** directory. If such a parameter is absent in a request, a default page named **Home** is assumed. Using **THttpRequest** as the request module (default), the following URLs will request for **Home**, **About** and **Register** pages, respectively,

```
http://hostname/index.php
http://hostname/index.php?page=About
http://hostname/index.php?page=Users.Register
```

where the first example takes advantage of the fact that the page service is the default service and **Home** is the default page.

## 2.7 Applications

An application is an instance of `TApplication` or its derived class. It manages modules that provide different functionalities and are loaded when needed. It provides services to end-users. It is the central place to store various parameters used in an application. In a PRADO application, the application instance is the only object that is globally accessible via `Prado::getApplication()` function call.

Applications are configured via [application configurations](#). They are usually created in entry scripts like the following,

```
require_once('/path/to/prado.php');
$application = new TApplication;
$application->run();
```

where the method `run()` starts the application to handle user requests.

### 2.7.1 Directory Organization

A minimal PRADO application contains two files: an entry file and a page template file. They must be organized as follows,

- `wwwroot` - Web document root or sub-directory.
- `index.php` - entry script of the PRADO application.
- `assets` - directory storing published private files. See [assets](#) section.
- `protected` - application base path storing application data and private script files. This directory should be configured inaccessible to Web-inaccessible, or it may be located outside of Web directories.
- `runtime` - application runtime storage path. This directory is used by PRADO to store application runtime information, such as application state, cached data, etc.
- `pages` - base path storing all PRADO pages. See [services](#) section.
- `Home.page` - default page returned when users do not explicitly specify the page requested. This is a page template file. The file name without suffix is the page name. The page class is `TPage`. If there is also a class file `Home.php`, the page class becomes `Home`.

A product PRADO application usually needs more files. It may include an application configuration file named `application.xml` under the application base path `protected`. The pages may be organized in directories, some of which may contain page configuration files named `config.xml`. For more details, please see [configurations](#) section.

### 2.7.2 Application Deployment

Deploying a PRADO application mainly involves copying directories. For example, to deploy the above minimal application to another server, follow the following steps,

1. Copy the content under `wwwroot` to a Web-accessible directory on the new server.
2. Modify the entry script file `index.php` so that it includes correctly the `prado.php` file.
3. Remove all content under `assets` and `runtime` directories and make sure both directories are writable by the Web server process.

### 2.7.3 Application Lifecycles

Like page lifecycles, an application also has lifecycles. Application modules can register for the lifecycle events. When the application reaches a particular lifecycle and raises the corresponding event, the registered module methods are invoked automatically. Modules included in the PRADO release, such as `TAuthManager`, are using this way to accomplish their goals.

The application lifecycles can be depicted as follows,

## 2.8 Sample: Hangman Game

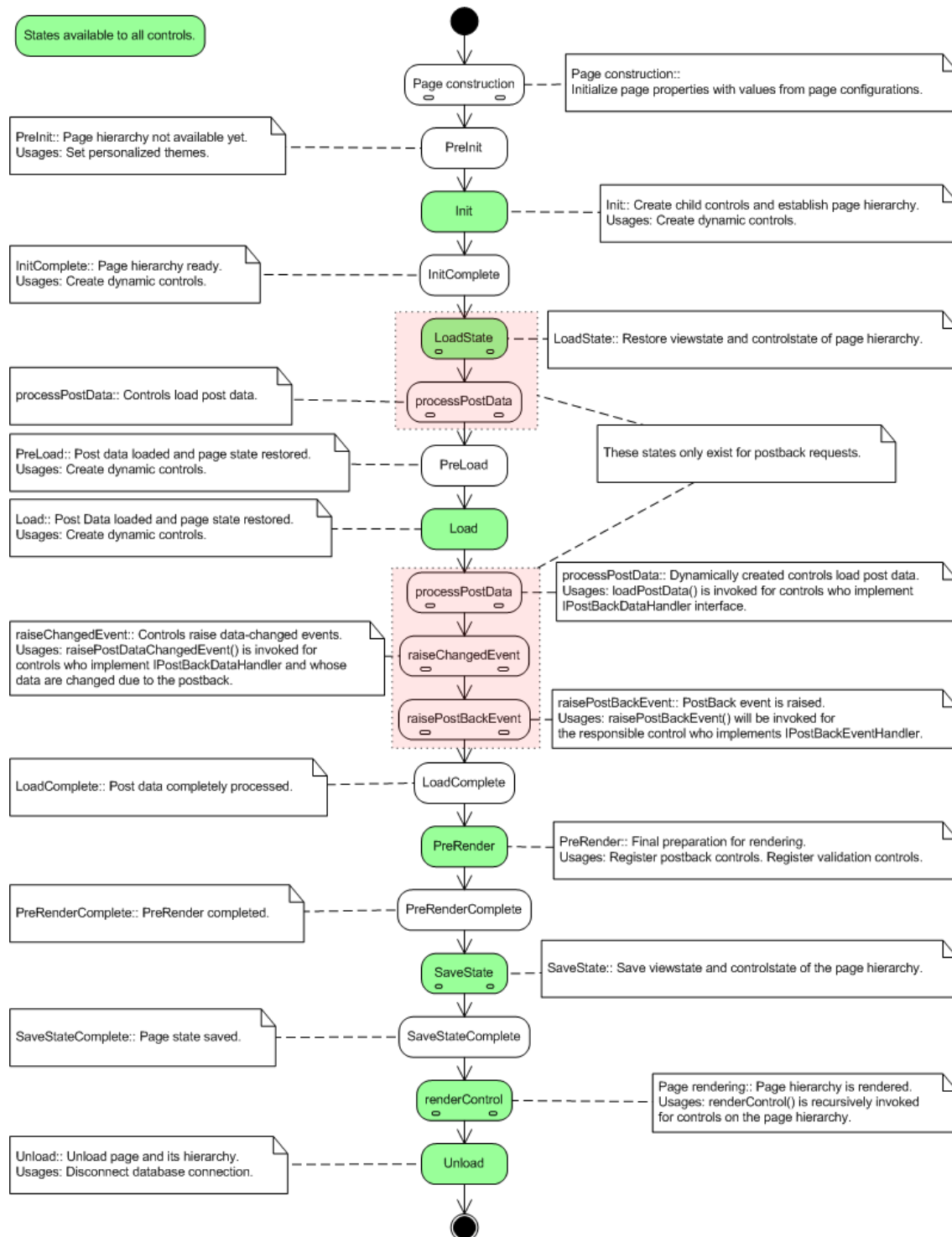
Having seen the simple "Hello World" application, we now build a more complex application called "Hangman Game". In this game, the player is asked to guess a word, a letter at a time. If he guesses a letter right, the letter will be shown in the word. The player can continue to guess as long as the number of his misses is within a prespecified bound. The player wins the game if he finds out the word within the miss bound, or he loses.

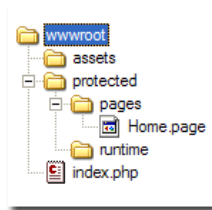
To facilitate the building of this game, we show the state transition diagram of the gaming process in the following,

To be continued...

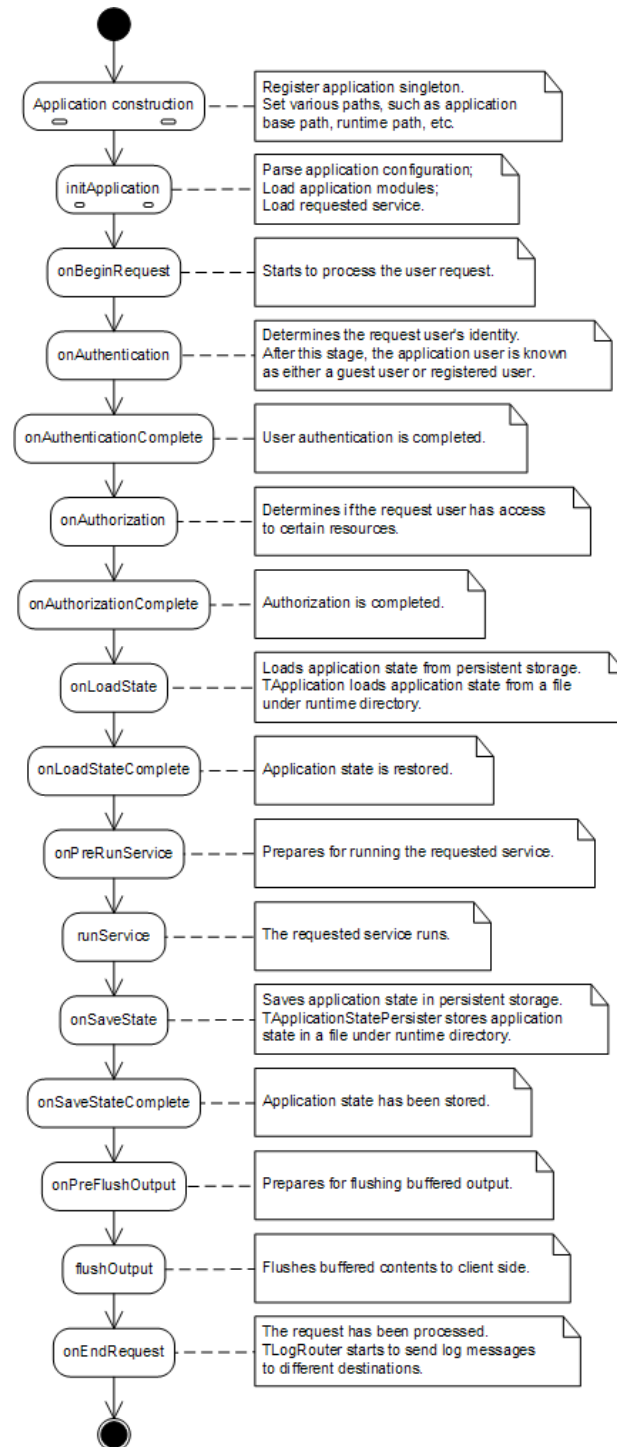
[Fundamentals.Samples.Hangman.Home Demo](#)

## 2.8. SAMPLE: HANGMAN GAME











## Chapter 3

# Configurations

### 3.1 Configuration Overview

PRADO uses configurations to glue together components into pages and applications. There are [application configurations](#), [page configurations](#), and [templates](#).

Application and page configurations are optional if default values are used. Templates are mainly used by pages and template controls. They are optional, too.

### 3.2 Templates: Part I

Templates are used to specify the presentational layout of controls. A template can contain static text, components, or controls that contribute to the ultimate presentation of the associated control. By default, an instance of `TTemplateControl` or its subclass may automatically load and instantiate a template from a file whose name is the same as the control class name. For page templates, the file name suffix must be `.page`; for other regular template controls, the suffix is `.tpl`.

The template format is like HTML, with a few PRADO-specific tags, including [component tags](#), [template control tags](#), [comment tags](#), [dynamic content tags](#), and [dynamic property tags](#). .

### 3.2.1 Component Tags

A component tag specifies a component as part of the body content of the template control. If the component is a control, it usually will become a child or grand child of the template control, and its rendering result will be inserted at the place where it is appearing in the template.

The format of a component tag is as follows,

```
<com:ComponentType PropertyName="PropertyValue" ... EventName="EventHandler" ...>
body content
</com:ComponentType>
```

**ComponentType** can be either the class name or the dotted type name (e.g. `System.Web.UI.TControl`) of the component. **PropertyName** and **EventName** are both case-insensitive. **PropertyName** can be a property or subproperty name (e.g. `Font.Name`). Note, **PropertyValue** will be HTML-decoded when assigned to the corresponding property. Content enclosed between the opening and closing component tag are normally treated the body of the component.

It is required that component tags nest properly with each other and an opening component tag be paired with a closing tag, similar to that in XML.

The following template shows a component tag specifying the **Text** property and **OnClick** event of a button control,

```
<com:TButton Text="Register" OnClick="registerUser" />
```

Note, property names and event names are all case-insensitive, while component type names are case-sensitive. Event names always begin with **On**.

Also note, initial values for properties whose name ends with **Template** are specially processed. In particular, the initial values are parsed as **TTemplate** objects. The **ItemTemplate** property of the **TRepeater** control is such an example.

To deal conveniently with properties taking big trunk of initial data, the following property initialization tag is introduced,

```
<prop:PropertyName>
PropertyValue
</prop:PropertyName>
```

It is equivalent to `...PropertyName="PropertyValue"...` in every aspect. Property initialization tags must be directly enclosed between the corresponding opening and closing component tag.

#### Component IDs

When specified in templates, component ID property has special meaning in addition to its normal property definition. A component tag specified with an ID value in template will register the corresponding component to the template owner control. The component can thus be directly accessed from the template control with its ID value. For example, in `Home` page's template, the following component tag

```
<com:TTextBox ID="TextBox" Text="First Name" />
```

makes it possible to get the textbox object in code using `$page->TextBox`.

#### 3.2.2 Template Control Tags

A template control tag is used to configure the initial property values of the control owning the template. Its format is as follows,

```
<%@ PropertyName="PropertyValue" ... %>
```

Like in component tags, `PropertyName` is case-insensitive and can be a property or subproperty name.

Initial values specified via the template control tag are assigned to the corresponding properties when the template control is being constructed. Therefore, you may override these property values in a later stage, such as the `Init` stage of the control.

Template control tag is optional in a template. Each template can contain at most one template control tag. You can place the template control tag anywhere in the template. It is recommended that you place it at the beginning of the template for better visibility.

### 3.2.3 Comment Tags

Comment tags are used to put comments in the template or the ultimate rendering result. There are two types of comment tags. One is like that in HTML and will be displayed to the end-users. The other only appear in a template and will be stripped out when the template is instantiated and displayed to the end-users. The format of these two comment tags is as follows,

```
<!--  
Comments VISIBLE to end-users  
-->
```

```
<!--  
Comments INVISIBLE to end-users  
--!>
```

Note, template comments (by `!- ... -!;`) cannot appear in a property value.

## 3.3 Templates: Part II

### 3.3.1 Dynamic Content Tags

Dynamic content tags are introduced as shortcuts to some commonly used [component tags](#). These tags are mainly used to render contents resulted from evaluating some PHP expressions or statements. They include [expression tags](#), [statement tags](#), [databind tags](#), [parameter tags](#), [asset tags](#) and [localization tags](#).

#### Expression Tags

An expression tag represents a PHP expression that is evaluated when the template control is in `PreRender` stage. The expression evaluation result is inserted at the place where the tag resides in the template. The context (namely `$this`) of the expression is the control owning the template.

The format of an expression tag is as follows,

```
<%= PhpExpression %>
```

For example, the following expression tag will display the current page title at the place,

```
<%= $this->Title %>
```

#### Statement Tags

Statement tags are similar to expression tags, except that statement tags contain PHP statements rather than expressions. The output of the PHP statements (using for example `echo` or `print` in PHP) are displayed at the place where the statement tag resides in the template. The context (namely `$this`) of the statements is the control owning the template. The format of statement tags is as follows,

```
<%%  
PHP Statements  
%>
```

The following example displays the current time in Dutch at the place,

```
<%%  
setlocale(LC_ALL, 'nl_NL');  
echo strftime("%A %e %B %Y",time());  
%>
```

#### Databind Tags

Databind tags are similar to expression tags, except that the expressions are evaluated only when a `dataBind()` call is invoked on the controls representing the databind tags. The context (namely `$this`) of a databind expression is the control owning the template. The format of databind tags is as follows,

```
<## PhpExpression %>
```

### Parameter Tags

Parameter tags are used to insert application parameters at the place where they appear in the template. The format of parameter tags is as follows,

```
<{$ ParameterName %>
```

Note, application parameters are usually defined in application configurations or page directory configurations. The parameters are evaluated when the template is instantiated.

### Asset Tags

Asset tags are used to publish private files and display the corresponding the URLs. For example, if you have an image file that is not Web-accessible and you want to make it visible to end-users, you can use asset tags to publish this file and show the URL to end-users so that they can fetch the published image.

The format of asset tags is as follows,

```
<%~ LocalFileName %>
```

where `LocalFileName` refers to a file path that is relative to the directory containing the current template file. The file path can be a single file or a directory. If the latter, the content in the whole directory will be made accessible by end-users.

BE VERY CAUTIOUS when you are using asset tags as it may expose to end-users files that you probably do not want them to see.

### Localization Tags

Localization tags represent localized texts. They are in the following format,

```
<%[string]%>
```

where `string` will be translated to different languages according to the end-user's language preference. Localization tags are in fact shortcuts to the function call `Prado::localize(string)`.



## 3.4 Templates: Part III

### 3.4.1 Dynamic Property Tags

Dynamic property tags are very similar to dynamic content tags, except that they are applied to component properties. The purpose of dynamic property tags is to allow more versatile component property configuration. Note, you are not required to use dynamic property tags because what can be done using dynamic property tags can also be done in PHP code. However, using dynamic property tags bring you much more convenience at accomplishing the same tasks. The basic usage of dynamic property tags is as follows,

```
<com:ComponentType PropertyName=DynamicPropertyTag ...>
body content
</com:ComponentType>
```

where you may enclose `DynamicPropertyTag` within single or double quotes for better readability.

Like dynamic content tags, we have [expression tags](#), [databind tags](#), [parameter tags](#), [asset tags](#) and [localization tags](#). (Note, there is no statement tag here.)

#### Expression Tags

An expression tag represents a PHP expression that is evaluated when the control is in `PreRender` stage. The expression evaluation result is assigned to the corresponding component property. The format of expression tags is as follows,

```
<%= PhpExpression %>
```

In the expression, `$this` refers to the control owning the template. The following example specifies a `TLabel` control whose `Text` property is initialized as the current page title when the `TLabel` control is being constructed,

```
<com:TLabel Text=<%= $this->Page->Title %> />
```

### Databind Tags

Databind tags are similar to expression tags, except that they can only be used with control properties and the expressions are evaluated only when a `dataBind()` call is invoked on the controls represented by the component tags. In the expression, `$this` refers to the control owning the template. Databind tags do not apply to all components. They can only be used for controls.

The format of databind tags is as follows,

```
<%# PhpExpression %>
```

### Parameter Tags

Parameter tags are used to assign application parameter values to the corresponding component properties. The format of parameter tags is as follows,

```
<%$ ParameterName %>
```

Note, application parameters are usually defined in application configurations or page directory configurations. The parameters are evaluated when the template is instantiated.

### Asset Tags

Asset tags are used to publish private files and assign the corresponding the URLs to the component properties. For example, if you have an image file that is not Web-accessible and you want to make it visible to end-users, you can use asset tags to publish this file and show the URL to end-users so that they can fetch the published image. The asset tags are evaluated when the template is instantiated.

The format of asset tags is as follows,

```
<%~ LocalFileName %>
```

where `LocalFileName` refers to a file path that is relative to the directory containing the current template file. The file path can be a single file or a directory. If the latter, the content in the whole directory will be made accessible by end-users.

BE VERY CAUTIOUS when you are using asset tags as it may expose to end-users files that you probably do not want them to see.

#### Localization Tags

Localization tags represent localized texts. They are in the following format,

```
<%[string]%>
```

where `string` will be translated to different languages according to the end-user's language preference. The localization tags are evaluated when the template is instantiated. Localization tags are in fact shortcuts to the function call `Prado::localize(string)`.

## 3.5 Application Configurations

Application configurations are used to specify the global behavior of an application. They include specification of path aliases, namespace usages, module and service configurations, and parameters.

Configuration for an application is stored in an XML file named `application.xml`, which should be located under the application base path. Its format is shown in the following,

```
<application PropertyName="PropertyValue" ...>
  <paths>
    <alias id="AliasID" path="AliasPath" />
    <using namespace="Namespace" />
  </paths>
  <modules>
    <module id="ModuleID" class="ModuleClass" PropertyName="PropertyValue" ... />
  </modules>
  <services>
    <service id="ServiceID" class="ServiceClass" PropertyName="PropertyValue" ... />
  </services>
  <parameters>
    <parameter id="ParameterID" class="ParameterClass" PropertyName="PropertyValue" ... />
  </parameters>
</application>
```

`</application>`

- The outermost element `<application>` corresponds to the `TApplication` instance. The `PropertyName="PropertyValue"` pairs specify the initial values for the properties of `TApplication`.
- The `<paths>` element contains the definition of path aliases and the PHP inclusion paths for the application. Each path alias is specified via an `<alias>` whose `path` attribute takes an absolute path or a path relative to the directory containing the application configuration file. The `<using>` element specifies a particular path (in terms of namespace) to be appended to the PHP include paths when the application runs. PRADO defines two default aliases: `System` and `Application`. The former refers to the PRADO framework root directory, and the latter refers to the directory containing the application configuration file.
- The `<modules>` element contains the configurations for a list of modules. Each module is specified by a `<module>` element. Each module is uniquely identified by the `id` attribute and is of type `class`. The `PropertyName="PropertyValue"` pairs specify the initial values for the properties of the module.
- The `<services>` element is similar to the `<modules>` element. It mainly specifies the services provided by the application.
- The `<parameters>` element contains a list of application-level parameters that are accessible from anywhere in the application. You may specify component-typed parameters like specifying modules, or you may specify string-typed parameters which take a simpler format as follows,

```
<parameter id="ParameterID" value="ParameterValue" />
```

Note, if the `value` attribute is not specified, the whole parameter XML node (of type `TXmlElement`) will be returned as the parameter value. In addition, the `System.Util.TParameterModule` module provides a way to load parameters from an external XML file. See more details in its API documentation.

Complete specification of application configurations can be found in the [DTD](#) and [XSD](#) files.

By default without explicit configuration, a PRADO application when running will load a few core modules, such as `THttpRequest`, `THttpResponse`, etc. It will also provide the `TPageService` as a default service. Configuration and usage of these modules and services are covered in individual sections of this tutorial. Note, if your application takes default settings for these modules and

service, you do not need to provide an application configuration. However, if these modules or services are not sufficient, or you want to change their behavior by configuring their property values, you will need an application configuration.

## 3.6 Page Configurations

Page configurations are mainly used by `TPageService` to modify or append the application configuration. As the name indicates, a page configuration is associated with a directory storing some page files. It is stored as an XML file named `config.xml`.

When a user requests a page stored under `<BasePath>/dir1/dir2`, the `TPageService` will try to parse and load `config.xml` files under `<BasePath>`, `<BasePath>/dir1` and `<BasePath>/dir1/dir2`. Paths, modules, and parameters specified in these configuration files will be appended or merged into the existing application configuration. Here `<BasePath>` is as defined in [page service](#).

The format of a page configuration file is as follows,

```
<configuration>
  <paths>
    <alias id="AliasID" path="AliasPath" />
    <using namespace="Namespace" />
  </paths>
  <modules>
    <module id="ModuleID" class="ModuleClass" PropertyName="PropertyValue" ... />
  </modules>
  <authorization>
    <allow pages="PageID1,PageID2" users="User1,User2" roles="Role1,Role2" verb="get" />
    <deny pages="PageID1,PageID2" users="User1,User2" roles="Role1,Role2" verb="post" />
  </authorization>
  <pages PropertyName="PropertyValue" ...>
    <page id="PageID" PropertyName="PropertyValue" ... />
  </pages>
  <parameters>
    <parameter id="ParameterID" class="ParameterClass" PropertyName="PropertyValue" ... />
  </parameters>
</configuration>
```

The `<paths>`, `<modules>` and `<parameters>` are similar to those in an application configuration. The `<authorization>` specifies the authorization rules that apply to the current page directory and all its subdirectories. It will be explained in more detail in future sections. The `<pages>` element specifies the initial values for the properties of pages. Each `<page>` element specifies the initial property values for a particular page identified by the `id` attribute. Initial property values given in the `<pages>` element apply to all pages in the current directory and all its subdirectories.

Complete specification of page configurations can be found in the [DTD](#) and [XSD](#) files.

## Chapter 4

# Control Reference : Standard Controls

### 4.1 TButton

#### [System.Web.UI.WebControls.TButton API Reference](#)

**TButton** creates a click button on a Web page. The button's caption is specified by **Text** property. A button is used to submit data to a page. **TButton** raises two server-side events, **Click** and **Command**, when it is clicked on the client-side. The difference between **Click** and **Command** events is that the latter event is bubbled up to the button's ancestor controls. A **Command** event handler can use **CommandName** and **CommandParameter** associated with the event to perform specific actions.

Clicking on button can trigger form validation, if **CausesValidation** is true. And the validation may be restricted within a certain group of validator controls according to **ValidationGroup**.

#### [Controls.Samples.TButton.Home Demo](#)

TODO: custom attributes

## 4.2 TCheckBox

### [System.Web.UI.WebControls.TCheckBox API Reference](#)

**TCheckBox** displays a check box on a Web page. A caption can be specified via **Text** and displayed beside the check box. It can appear either on the right or left of the check box, which is determined by **TextAlign**. You may further specify attributes applied to the text by using **LabelAttributes**.

To determine whether the check box is checked, test the **Checked** property. A **CheckedChanged** event is raised if the state of **Checked** is changed between posts to the server. If **AutoPostBack** is true, changing the check box state will cause postback action. And if **CausesValidation** is also true, upon postback validation will be performed for validators within the specified **ValidationGroup**.

### [Controls.Samples.TCheckBox.Home Demo](#)

## 4.3 TColorPicker

### [System.Web.UI.WebControls.TColorPicker API Reference](#)

TBD

## 4.4 TDatePicker

### [System.Web.UI.WebControls.TDatePicker API Reference](#)

**TDatePicker** displays a text box for date input purpose. When the text box receives focus, a calendar will pop up and users can pick up from it a date that will be automatically entered into the text box. The format of the date string displayed in the text box is determined by the **DateFormat** property. Valid formats are the combination of the following tokens:

Character	Format Pattern (en-US)
d	day digit
dd	padded day digit e.g. 01, 02
M	month digit
MM	padded month digit



#### 4.4. TDATEPICKER

---

MMM	localized abbreviated month names, e.g. Mar, Apr
MMMM	localized month name, e.g. March, April
yy	2 digit year
yyyy	4 digit year

-----

The date of the date picker can be set using the **Date** or **Timestamp** properties. The **Date** property value must be in the same format as the pattern specified in the **DateFormat** property. The **Timestamp** property only accepts integers such as the Unix timestamp.

TDatePicker has three **Mode** to show the date picker popup.

- **Basic** - Only shows a text input, focusing on the input shows the date picker.
- **Button** - Shows a button next to the text input, clicking on the button shows the date, button text can be by the **ButtonText** property.
- **ImageButton** - Shows an image next to the text input, clicking on the image shows the date picker, image source can be change through the **ImageUrl** property.

The **CssClass** property can be used to override the css class name for the date picker panel. The **CalendarStyle** property changes the overall calendar style. The following **CalendarStyle** values are available:

- **default** - The default calendar style.

The **InputMode** property can be set to "TextBox" or "DropDownList" with default as "TextBox". In **DropDownList** mode, in addition to the popup date picker, three drop down list (day, month and year) are presented to select the date . When **InputMode** equals "DropDownList", the order and appearance of the date, month, and year will depend on the pattern specified in **DateFormat** property.

The popup date picker can be hidden by specifying **ShowCalendar** as false. Much of the text of the popup date picker can be changed to a different language using the **Culture** property.

The calendar picker year limit can be set using the **FromYear** and **UpToYear** properties where **FromYear** is the starting year and **UpToYear** is the last year selectable. The starting day of the week can be changed by the **FirstDayOfWeek** property, with 0 as Sunday, 1 as Monday, etc.

**Note 1:** If the `InputMode` is "TextBox", the `DateFormat` should only **NOT** contain MMM or MMMM patterns. The server side date parser will not be able to determine the correct date if MMM or MMMM are used. When `InputMode` equals "DropDownList", all patterns can be used.

**Note 2:** When the `TDatePicker` is used together with a validator, the `DateFormat` property of the validator must be equal to the `DateFormat` of the `TDatePicker` **AND** must set `DataType="Date"` on the validator to ensure correct validation. See [TCompareValidator](#), [TDataTypeValidator](#) and [TRangeValidator](#) for details.

[Controls.Samples.TDatePicker.Home Demo](#)

## 4.5 TExpression

[System.Web.UI.WebControls.TExpression API Reference](#)

`TExpression` evaluates a PHP expression and displays the evaluation result. To specify the expression to be evaluated, set the `Expression` property. Note, `TExpression` evaluates the expression during the rendering control lifecycle.

The context of the expression in a `TExpression` control is the control itself. That is, `$this` represents the control object if it is present in the expression. For example, the following template tag will display the title of the page containing the `TExpression` control.

```
<com:TExpression Expression="$this->Page->Title" />
```

Be aware, since `TExpression` allows execution of arbitrary PHP code, in general you should not use it to evaluate expressions submitted by your application users.

[Controls.Samples.TExpression.Home Demo](#)

## 4.6 TFileUpload

[System.Web.UI.WebControls.TFileUpload API Reference](#)

`TFileUpload` displays a file upload field on a Web page. Upon postback, the text entered into the field will be treated as the (local) name of the file that is uploaded to the server.

## 4.7. THead

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**TFileUpload** raises an **OnFileUpload** event when it is post back. The property **HasFile** indicates whether the file upload is successful or not. If successful, the uploaded file may be saved on the server by calling **saveAs()** method.

The following properties give the information about the uploaded file:

- **FileName** - the original client-side file name without directory information.
- **FileType** - the MIME type of the uploaded file.
- **FileSize** - the file size in bytes.
- **LocalName** - the absolute file path of the uploaded file on the server. Note, this file will be deleted after the current page request is completed. Call **saveAs()** to save the uploaded file.

If the file upload is unsuccessful, the property **ErrorCode** gives the error code describing the cause of failure. See [PHP documentation](#) for a complete explanation of the possible error codes.

[Controls.Samples.TFileUpload.Home Demo](#)

## 4.7 THead

[System.Web.UI.WebControls.THead API Reference](#)

TBD

## 4.8 THiddenField

[System.Web.UI.WebControls.THiddenField API Reference](#)

**THiddenField** represents a hidden field on a Web page. The value of the hidden field can be accessed via its **Value** property.

**THiddenField** raises an **OnValueChanged** event if its value is changed during postback.

## 4.9 THtmlArea

### System.Web.UI.WebControls.THtmlArea API Reference

**THtmlArea** displays a WYSIWYG text input field on a Web page to collect input in HTML format. The text displayed in the **THtmlArea** control is specified or determined by using the **Text** property. To adjust the size of the input region, set **Width** and **Height** properties instead of **Columns** and **Rows** because the latter has no meaning under this situation. To disable the WYSIWYG feature, set **EnableVisualEdit** to false.

**THtmlArea** provides the WYSIWYG feature by wrapping the functionalities provided by the [TinyMCE project](#).

The default editor gives only the basic tool bar. To change or add additional tool bars, use the **Options** property to add additional editor options with each options on a new line. See [TinyMCE website](#) for a complete list of options. The following example displays a toolbar specific for HTML table manipulation,

```
<com:THtmlArea>
  <prop:Options>
plugins : "table"
theme_advanced_buttons3 : "tablecontrols"
  </prop:Options>
</com:THtmlArea>
```

The client-side visual editing capability is supported by Internet Explorer 5.0+ for Windows and Gecko-based browser. If the browser does not support the visual editing, a traditional textarea will be displayed.

	Windows XP	MacOS X 10.4
-----		
MSIE 6	OK	
MSIE 5.5 SP2	OK	
MSIE 5.0	OK	
Mozilla 1.7.x	OK	OK
Firefox 1.0.x	OK	OK
Firefox 1.5b2	OK	OK

Safari 2.0 (412)		OK(1)
Opera 9 Preview 1	OK(1)	OK(1)

-----

(1) - Partially working

-----

[Controls.Samples.THtmlArea.Home Demo](#)

## 4.10 THyperLink

[System.Web.UI.WebControls.THyperLink API Reference](#)

**THyperLink** displays a hyperlink on a page. The hyperlink URL is specified via the **NavigateUrl** property, and link text is via the **Text** property. The link target is specified via the **Target** property. It is also possible to display an image by setting the **ImageUrl** property. In this case, **Text** is displayed as the alternate text of the image. If both **ImageUrl** and **Text** are empty, the content enclosed within the control tag will be rendered.

[Controls.Samples.THyperLink.Home Demo](#)

## 4.11 TImageButton

[System.Web.UI.WebControls.TImageButton API Reference](#)

**TImageButton** is also similar to **TButton**, except that **TImageButton** displays the button as an image. The image is specified via **ImageUrl**, and the alternate text is specified by **Text**. In addition, it is possible to obtain the coordinate of the point where the image is clicked. The coordinate information is contained in the event parameter of the **Click** event (not **Command**).

[Controls.Samples.TImageButton.Home Demo](#)

## 4.12 TImageMap

[System.Web.UI.WebControls.TImageMap API Reference](#)

**TImageMap** represents an image on a Web page with predefined hotspot regions that can respond differently to users' clicks on them. Depending on the **HotSpotMode** of the hotspot region, clicking on the hotspot may trigger a postback or navigate to a specified URL.

Each hotspot is described using a **THotSpot** object and is maintained in the **HotSpots** collection in **TImageMap**. A hotspot can be a circle, rectangle, polygon, etc.

Hotspots can be added to **TImageMap** via its **HotSpots** property or in a template like the following,

```
<com:TImageMap ... >
  <com:TCircleHotSpot ... />
  <com:TRectangleHotSpot ... />
  <com:TPolygonHotSpot ... />
</com:TImageMap>
```

[Controls.Samples.TImageMap.Home Demo](#)

## 4.13 TImage

[System.Web.UI.WebControls.TImage API Reference](#)

**TImage** displays an image on a page. The image is specified via the **ImageUrl** property which takes a relative or absolute URL to the image file. The alignment of the image displayed is set by the **ImageAlign** property. To set alternate text or long description of the image, use **AlternateText** or **DescriptionUrl**, respectively.

[Controls.Samples.TImage.Home Demo](#)

## 4.14 TInlineFrame

[System.Web.UI.WebControls.TInlineFrame API Reference](#)

**TInlineFrame** displays an inline frame (`iframe`) on a Web page. The location of the frame content is specified by the **FrameUrl** property.

The appearance of a **TInlineFrame** may be customized with the following properties, in addition

to those inherited from `TWebControl`.

- **Align** - the alignment of the frame.
- **DescriptionUrl** - the URI of a long description of the frame's contents.
- **MarginWidth** and **MarginHeight** - the number of pixels to use as the left/right margins and top/bottom margins, respectively.
- **ScrollBars** - whether scrollbars are provided for the inline frame. By default, it is **Auto**, meaning the scroll bars appear as needed. Setting it as **None** or **Both** to explicitly hide or show the scroll bars.

The following samples show `TInlineFrame` with different property settings. The Google homepage is used as the frame content.

[Controls.Samples.TInlineFrame.Home Demo](#)

## 4.15 TJavascriptLogger

[System.Web.UI.WebControls.TJavascriptLogger API Reference](#)

`TJavascriptLogger` provides logging for client-side javascript. It is mainly a wrapper of the javascript developed at <http://gleepglop.com/javascripts/logger/>.

To use `TJavascriptLogger`, simply place the following component tag in a page template.

```
<com:TJavascriptLogger />
```

Then, the client-side javascript may contain the following statements. When they are executed, they will appear in the logger window.

```
Logger.info('something happend');  
Logger.warn('A warning');  
Logger.error('This is an error');  
Logger.debug('debug information');
```

To toggle the visibility of the logger and console on the browser window, press ALT-D (or CTRL-D on OS X).

## 4.16 TLabel

[System.Web.UI.WebControls.TLabel API Reference](#)

**TLabel** displays a piece of text on a Web page. The text to be displayed is set via its **Text** property. If **Text** is empty, content enclosed within the **TLabel** component tag will be displayed. **TLabel** may also be used as a form label associated with some control on the form. Since **Text** is not HTML-encoded when being rendered, make sure it does not contain dangerous characters that you want to avoid.

[Controls.Samples.TLabel.Home Demo](#)

## 4.17 TLinkButton

[System.Web.UI.WebControls.TLinkButton API Reference](#)

**TLinkButton** is similar to **TButton** in every aspect except that **TLinkButton** is displayed as a hyperlink. The link text is determined by its **Text** property. If the **Text** property is empty, then the body content of the button is displayed (therefore, you can enclose a `<img>` tag within the button body and get an image button).

[Controls.Samples.TLinkButton.Home Demo](#)

## 4.18 TLiteral

[System.Web.UI.WebControls.TLiteral API Reference](#)

**TLiteral** displays a static text on a Web page. **TLiteral** is similar to the **TLabel** control, except that the **TLiteral** \* control has no style properties, such as **BackColor**, **Font**, etc.

The text displayed by **TLiteral** can be programmatically controlled by setting the **Text** property. The text displayed may be HTML-encoded if the **Encode** is true (the default value is false).

**TLiteral** will render the contents enclosed within its component tag if **Text** is empty.

Be aware, if **Encode** is false, make sure **Text** does not contain unwanted characters that may bring security vulnerabilities.



[Controls.Samples.TLiteral.Home Demo](#)

## 4.19 TMultiView

[System.Web.UI.WebControls.TMultiView API Reference](#)

**TMultiView** serves as a container for a group of **TView** controls, which can be retrieved by the **Views** property. Each view contains child controls. **TMultiView** determines which view and its child controls are visible. At any time, at most one view is visible (called *active*). To make a view active, set **ActiveView** or **ActiveViewIndex**. Note, by default there is no active view.

To add a view to **TMultiView**, manipulate the **Views** collection or add it in template as follows,

```
<com:TMultiView>
  <com:TView>
    view 1 content
  </com:TView>
  <com:TView>
    view 2 content
  </com:TView>
</com:TMultiView>
```

**TMultiView** responds to the following command events to manage the visibility of its views.

- **NextView** : switch to the next view (with respect to the currently active view).
- **PreviousView** : switch to the previous view (with respect to the currently active view).
- **SwitchViewID** : switch to a view by its ID path. The ID path is fetched from the command parameter.
- **SwitchViewIndex** : switch to a view by its zero-based index in the **Views** collection. The index is fetched from the command parameter.

Upon postback, if the active view index is changed, **TMultiView** will raise an **OnActiveViewChanged** event.

The [Hangman game](#) is a typical use of `TMultiView`. The following example demonstrates another usage of `TMultiView`.

[Controls.Samples.TMultiView.Home Demo](#)

## 4.20 TPanel

[System.Web.UI.WebControls.TPanel API Reference](#)

`TPanel` acts as a presentational container for other control. It displays a `div` element on a page. The property `Wrap` specifies whether the panel's body content should wrap or not, while `HorizontalAlign` governs how the content is aligned horizontally and `Direction` indicates the content direction (left to right or right to left). You can set `BackImageUrl` to give a background image to the panel, and you can set `GroupingText` so that the panel is displayed as a field set with a legend text. Finally, you can specify a default button to be fired when users press 'return' key within the panel by setting the `DefaultButton` property.

[Controls.Samples.TPanel.Home Demo](#)

## 4.21 TPlaceholder

[System.Web.UI.WebControls.TPlaceholder API Reference](#)

`TPlaceholder` reserves a place on a template, where static texts or controls may be dynamically inserted.

[Controls.Samples.TPlaceholder.Home Demo](#)

## 4.22 TRadioButton

[System.Web.UI.WebControls.TRadioButton API Reference](#)

`TRadioButton` is similar to `TCheckBox` in every aspect, except that `TRadioButton` displays a radio button on a Web page. The radio button can belong to a specific group specified by `GroupName` such that only one radio button within that group can be selected at most.

[Controls.Samples.TRadioButton.Home Demo](#)

## 4.23 TSafeHtml

[System.Web.UI.WebControls.TSafeHtml API Reference](#)

**TSafeHtml** is a control that strips down all potentially dangerous HTML content. It is mainly a wrapper of the [SafeHTML](#) project. According to the SafeHTML project, it tries to safeguard the following situations when the string is to be displayed to end-users:

- Opening tag without its closing tag
- closing tag without its opening tag
- any of these tags: base, basefont, head, html, body, applet, object, iframe, frame, frameset, script, layer, ilayer, embed, bgsound, link, meta, style, title, blink, xml, etc.
- any of these attributes: on\*, data\*, dynsrc
- javascript:/vbscript:/about: etc. protocols
- expression/behavior etc. in styles
- any other active content.

To use **TSafeHtml**, simply enclose the content to be secured within the **TSafeHtml** component tag in a template. The content may consist of both static text and PRADO controls. If the latter, the rendering result of the controls will be secured.

[Controls.Samples.TSafeHtml.Home Demo](#)

## 4.24 TStatements

[System.Web.UI.WebControls.TStatements API Reference](#)

**TStatements** evaluates a sequence of PHP statements and displays the content rendered by the statements. To specify the PHP statements to be evaluated, set the **Statements** property. For example, the following component tag displays the current time on the Web page,

```
<com:TStatements>
  <prop:Statements>
    setlocale(LC_ALL, 'nl_NL');
    echo strftime("%A %e %B %Y",time());
  </prop:Statements>
</com:TStatements>
```

Note, **TStatements** evaluates the PHP statements during the rendering control lifecycle. Unlike **TExpression**, **TStatements** only displays the content 'echoed' within the statements.

The context of the statements in a **TStatements** control is the control itself. That is, **\$this** represents the control object if it is present in the statements. For example, the following statement tag will display the title of the page containing the **TStatements** control.

```
<com:TStatements>
  <prop:Statements>
    $page=$this->Page;
    echo $page->Title;
  </prop:Statements>
</com:TStatements>
```

Be aware, since **TStatements** allows execution of arbitrary PHP code, in general you should not use it to evaluate PHP code submitted by your application users.

[Controls.Samples.TStatements.Home Demo](#)

## 4.25 TTable

[System.Web.UI.WebControls.TTable API Reference](#)

**TTable** displays an HTML table on a page. It is used together with **TTableRow** and **TTableCell** to allow programmatically manipulating HTML tables. The rows of the table is stored in **Rows** property. You may set the table cellspacing and cellpadding via the **CellSpacing** and **CellPadding** properties, respectively. The table caption can be specified via **Caption** whose alignment is specified by **CaptionAlign**. The **GridLines** property indicates how the table should display its borders, and the **BackImageUrl** allows the table to have a background image.

[Controls.Samples.TTable.Home Demo](#)

## 4.26 TTextBox

[System.Web.UI.WebControls.TTextBox API Reference](#)

TTextBox displays a text box on a Web page. The content in the text box is determined by the **Text** property. You can create a **SingleLine**, a **MultiLine**, or a **Password** text box by setting the **TextMode** property. The **Rows** and **Columns** properties specify their dimensions. If **AutoPostBack** is true, changing the content in the text box and then moving the focus out of it will cause postback action.

[Controls.Samples.TTextBox.Home Demo](#)

## 4.27 TTextHighlighter

[System.Web.UI.WebControls.TTextHighlighter API Reference](#)

TTextHighlighter does syntax highlighting for its body content, including both static text and the rendering results of its child controls. The text being highlighted follows the syntax of the specified **Language**, which can be 'php' (default), 'prado', 'css', 'html', etc. Here, 'prado' stands for the syntax of PRADO control templates.

If line numbers are desired in front of each line, set **ShowLineNumbers** to true.

To use TTextHighlighter, simply enclose the contents to be syntax highlighted within the body of a TTextHighlighter control. The following example highlights a piece of PHP code,

```
<com:TTextHighlighter ShowLineNumbers="true">
<?php
$str = 'one|two|three|four';
print_r(explode('|', $str, 2)); // will output an array
?>
</com:TTextHighlighter>
```

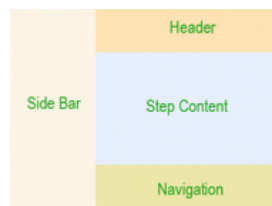
[Controls.Samples.TTextHighlighter.Home Demo](#)

## 4.28 TWizard

[System.Web.UI.WebControls.TWizard API Reference](#)

### 4.28.1 Overview

**TWizard** is analogous to the installation wizard commonly used to install software on Windows. It splits a large form and presents the user with a series of smaller forms, called wizard steps, to complete. The following figure shows how a wizard is composed of when presented to users, where **step content** is the main content of a wizard step for users to complete, **header** refers to header content common to all steps, **navigation** contains buttons that allow users to navigate step by step, and **side bar** contains a list of hyperlinks by which users can reach to any step with one click. The visibility of the side bar can be toggled by setting **ShowSideBar**.



By default, **TWizard** embeds the above components in an HTML table so that the side bar is displayed on the left while the rest on the right. If **UseDefaultLayout** is set to false, no HTML table will be used, and developers should use pure CSS techniques to position the wizard components. Note, each component is displayed as a `<div>` and the wizard itself is also a `<div>` that encloses its components' `<div>`.

Wizard steps are represented by **TWizardStep** and are maintained in **TWizard** through its **WizardSteps** property. At any time, only one step is visible, which is determined by the **ActiveStep** property. The **ActiveStepIndex** property gives the index of the active step in the step collection. Clicking on navigation buttons can activate different wizard steps.

Wizard steps are typically added to a wizard through template as follows,

```
<com:TWizard>
<com:TWizardStep Title="step 1" StepType="Start">
content in step 1, may contain other controls
</com:TWizardStep>
```

```
<com:TWizardStep Title="step 2" StepType="Step">
content in step 2, may contain other controls
</com:TWizardStep>

<com:TWizardStep Title="finish step" StepType="Finish">
content in finish step, may contain other controls
</com:TWizardStep>
</com:TWizard>
```

In the above, **StepType** refers to the type of a wizard step, which can affect how the navigation appearance and behavior of the step. A wizard step can be of one of the following types:

- **Start** - the first step in the wizard.
- **Step** - the internal steps in the wizard.
- **Finish** - the last step that allows user interaction.
- **Complete** - the step that shows a summary to user. In this step, both side bar and navigation panel are invisible. Thus, this step usually does not allow user interaction.
- **Auto** - the step type is determined by wizard automatically.

### 4.28.2 Using TWizard

#### A Single-Step Wizard Sample

In this sample, we use wizard to collect user's preference of color. In the first step, the user is presented with a dropdown list from which he can choose his favorite color. In the second step, the complete step, his choice in the previous step is displayed. In real application, at this step the choice may be stored in database in the backend.

[Controls.Samples.TWizard.Sample1 Demo](#)

### Customizing Wizard Styles

**Twizard** defines a whole set of properties for customization of appearance of its various components as shown in the above figure. In particular, the following properties are provided for style customization:

- Header - `HeaderStyle`.
- Step - `StepStyle`.
- Navigation - `NavigationStyle`, `StartNextButtonStyle`, `StepNextButtonStyle`, `StepPreviousButtonStyle`, `FinishPreviousButtonStyle`, `FinishCompleteButtonStyle`, `CancelButtonStyle`.
- Side bar - `SideBarStyle`, `SideBarButtonStyle`.

[Controls.Samples.TWizard.Sample2 Demo](#)

### Customizing Wizard Navigation

Given a set of wizard steps, **Twizard** supports three different ways of navigation among them:

- Bidirectional - Users can navigate forward and backward along a sequence of wizard steps. User input data is usually collected at the last step. This is also known as commit-at-the-end model. It is the default navigation way that **Twizard** supports.
- Unidirectional - Users can navigate forward along a sequence of wizard steps. Backward move is not allowed. User input data is usually collected step by step. This is also known as command-as-you-go model. To disallow backward move to a specific step, set its `AllowReturn` property to false.
- Nonlinear - User input in a step determines which step to go next. To do so, set `ActiveStepIndex` to the step that you want the user to go to. In this case, when a user clicks on the previous button in the navigation panel, the previous step that they visited (not the previous step in the sequential order) will become visible.

[Controls.Samples.TWizard.Sample3 Demo](#)



### Using Templates in Wizard

**Twizard** supports more concrete control of its outlook through templating. In particular, it provides the following template properties that allow complete customization of the wizard's header, navigation and side bar.

- Header - `HeaderTemplate`.
- Navigation - `StartNavigationTemplate`, `StepNavigationTemplate`, `FinishNavigationTemplate`.
- Side bar - `SideBarTemplate`.

[Controls.Samples.TWizard.Sample4 Demo](#)

### Using Templated Wizard Steps

Wizard steps can also be templated. By using `TTemplatedWizardStep`, one can customize step content and navigation through its `ContentTemplate` and `NavigationTemplate` properties, respectively. This is useful for control developers to build specialized wizards, such as user registration, shopping carts, etc.

[Controls.Samples.TWizard.Sample5 Demo](#)



## Chapter 5

# Control Reference : List Controls

### 5.1 List Controls

List controls covered in this section all inherit directly or indirectly from `TListControl`. Therefore, they share the same set of commonly used properties, including,

- **Items** - list of items in the control. The items are of type `TListItem`. The item list can be populated via databinding or specified in templates like the following:

```
<com:TListBox>
  <com:TListItem Text="text 1" Value="value 1" />
  <com:TListItem Text="text 2" Value="value 2" Selected="true" />
  <com:TListItem Text="text 3" Value="value 3" />
</com:TListBox>
```

- **SelectedIndex** - the zero-based index of the first selected item in the item list.
- **SelectedIndices** - the indices of all selected items.
- **SelectedItem** - the first selected item in the item list.
- **SelectedValue** - the value of the first selected item in the item list.
- **AutoPostBack** - whether changing the selection of the control should trigger postback.

- **CausesValidation** - whether validation should be performed when postback is triggered by the list control.

Since **TListControl** inherits from **TDataBoundControl**, these list controls also share a common operation known as **databinding**. The **Items** can be populated from preexisting data specified by **DataSource** or **DataSourceID**. A function call to **dataBind()** will cause the data population. For list controls, data can be specified in the following two kinds of format:

- one-dimensional array or objects implementing **ITraversable** : array keys will be used as list item values, and array values will be used as list item texts. For example

```
$listbox->DataSource=array(
    'key 1'=>'item 1',
    'key 2'=>'item 2',
    'key 3'=>'item 3');
$listbox->dataBind();
```

- tabular (two-dimensional) data : each row of data populates a single list item. The list item value is specified by the data member indexed with **DataValueField**, and the list item text by **DataTextField**. For example,

```
$listbox->DataTextField='name';
$listbox->DataValueField='id';
$listbox->DataSource=array(
    array('id'=>'001', 'name'=>'John', 'age'=>31),
    array('id'=>'002', 'name'=>'Mary', 'age'=>30),
    array('id'=>'003', 'name'=>'Cary', 'age'=>20));
$listbox->dataBind();
```

### 5.1.1 TListBox

**TListBox** displays a list box that allows single or multiple selection. Set the property **SelectionMode** as **Single** to make a single selection list box, and **Multiple** a multiple selection list box. The number of rows displayed in the box is specified via the **Rows** property value.

[Controls.Samples.TListBox.Home Demo](#)

### 5.1.2 TDropDownList

`TDropDownList` displays a dropdown list box that allows users to select a single option from a few prespecified ones.

[Controls.Samples.TDropDownList.Home Demo](#)

### 5.1.3 TCheckBoxList

`TCheckBoxList` displays a list of checkboxes on a Web page. The alignment of the text besides each checkbox can be specified `TextAlign`. The layout of the checkboxes can be controlled by the following properties:

- `RepeatLayout` - can be either `Table` or `Flow`. A `Table` uses HTML table cells to organize the checkboxes, while a `Flow` uses HTML span tags and breaks for the organization. With `Table` layout, you can set `CellPadding` and `CellSpacing`.
- `RepeatColumns` - how many columns the checkboxes should be displayed in.
- `RepeatDirection` - how to traverse the checkboxes, in a horizontal way or a vertical way (because the checkboxes are displayed in a matrix-like layout).

[Controls.Samples.TCheckBoxList.Home Demo](#)

### 5.1.4 TRadioButtonList

`TRadioButtonList` is similar to `TCheckBoxList` in every aspect except that each `TRadioButtonList` displays a group of radiobuttons. Only one of the radiobuttons can be selected (`TCheckBoxList` allows multiple selections.)

[Controls.Samples.TRadioButtonList.Home Demo](#)

### 5.1.5 TBulletedList

`TBulletedList` displays items in a bullet format on a Web page. The style of the bullets can be specified by `BulletStyle`. When the style is `CustomImage`, the bullets are displayed as images, which is specified by `BulletImageUrl`.

`TBulletedList` displays the item texts in three different modes,

- **Text** - the item texts are displayed as static texts;
- **HyperLink** - each item is displayed as a hyperlink whose URL is given by the item value, and **Target** property can be used to specify the target browser window;
- **LinkButton** - each item is displayed as a link button which posts back to the page if a user clicks on that, and the event **OnClick** will be raised under such a circumstance.

[Controls.Samples.TBulletedList.Home Demo](#)

## Chapter 6

# Control Reference : Validation Controls

### 6.1 Validation Controls

Validation controls, called validators, perform validation on user-entered data values when they are post back to the server. The validation is triggered by a postback control, such as a **TButton**, a **TLinkButton** or a **TTextBox** (under **AutoPostBack** mode) whose **CausesValidation** property is true.

Validation is always performed on server side. If **EnableClientScript** is true and the client browser supports JavaScript, validators may also perform client-side validation. Client-side validation will validate user input before it is sent to the server. The form data will not be submitted if any error is detected. This avoids the round-trip of information necessary for server-side validation.

Validators share a common set of properties, which are defined in the base class **TBaseValidator** class and listed as follows,

- **ControlToValidate** specifies the input control to be validated. This property must be set to the ID path of an input control. An ID path is the dot-connected IDs of the controls reaching from the validator's naming container to the target control.
- **ErrorMessage** specifies the error message to be displayed in case the corresponding validator

fails.

- **Text** is similar to **ErrorMessage**. If they are both present, **Text** takes precedence. This property is useful when used together with **TValidationSummary**.
- **ValidationGroup** specifies which group the validator is in. The validator will perform validation only if the current postback is triggered by a control which is in the same group.
- **EnableClientScript** specifies whether client-side validation should be performed. By default, it is enabled.
- **Display** specifies how error messages are displayed. It takes one of the following three values:
  - **None** - the error message will not be displayed even if the validator fails.
  - **Static** - the space for displaying the error message is reserved. Therefore, showing up the error message will not change your existing page layout.
  - **Dynamic** - the space for displaying the error message is NOT reserved. Therefore, showing up the error message will shift the layout of your page around (usually down).
- **ControlCssClass** - the Css class that is applied to the control being validated in case the validation fails.
- **FocusOnError** - set focus at the validating place if the validation fails. Defaults to false.
- **FocusElementID** - the ID of the HTML element that will receive focus if validation fails and **FocusOnError** is true.

### 6.1.1 TRequiredFieldValidator

TRequiredFieldValidator ensures that the user enters some data in the specified input field. By default, TRequiredFieldValidator will check if the user input is empty or not. The validation fails if the input is empty. By setting **InitialValue**, the validator can check if the user input is different from **InitialValue**. If not, the validation fails.

[Controls.Samples.TRequiredFieldValidator.Home Demo](#)

### 6.1.2 TRegularExpressionValidator

TRegularExpressionValidator verifies the user input against a regular pattern. The validation fails if the input does not match the pattern. The regular expression can be specified by the



**RegularExpression** property. Some commonly used regular expressions include:

- At least 6 characters: `[\w]{6,}`
- Japanese Phone Number: `(0\d{1,4}-|\(0\d{1,4}\) )?\d{1,4}-\d{4}`
- Japanese Postal Code: `\d{3}(-(\d{4}|\d{2}))?`
- P.R.C. Phone Number: `(\(\d{3}\)|\d{3}-)?\d{8}`
- P.R.C. Postal Code: `\d{6}`
- P.R.C. Social Security Number: `\d{18}|\d{15}`
- U.S. Phone Number: `((\(\d{3}\) )|(\d{3}-))?\d{3}-\d{4}`
- U.S. ZIP Code: `\d{5}(-\d{4})?`
- U.S. Social Security Number: `\d{3}-\d{2}-\d{4}`

More regular expression patterns can be found on the Internet, e.g. <http://regexlib.com/>.

Note, **TRegularExpressionValidator** only checks for nonempty user input. Use a **TRequiredFieldValidator** to ensure the user input is not empty.

[Controls.Samples.TRegularExpressionValidator.Home Demo](#)

### 6.1.3 TEmailAddressValidator

**TEmailAddressValidator** verifies that the user input is a valid email address. The validator uses a regular expression to check if the input is in a valid email address format. If **CheckMXRecord** is true, the validator will also check whether the MX record indicated by the email address is valid, provided **checkdnsrr()** is available in the installed PHP.

Note, if the input being validated is empty, **TEmailAddressValidator** will not do validation. Use a **TRequiredFieldValidator** to ensure the value is not empty.

[Controls.Samples.TEmailAddressValidator.Home Demo](#)

### 6.1.4 TCompareValidator

TCompareValidator compares the user input with a constant value specified by **ValueToCompare**, or another user input specified by **ControlToCompare**. The **Operator** property specifies how to compare the values, which includes **Equal**, **NotEqual**, **GreaterThan**, **GreaterThanEqual**, **LessThan** and **LessThanEqual**. Before comparison, the values being compared will be converted to the type specified by **DataType** listed as follows,

- **String** - A string data type.
- **Integer** - A 32-bit signed integer data type.
- **Float** - A double-precision floating point number data type.
- **Date** - A date data type. The date format can be specified by setting **DateFormat** property, which must be recognizable by **TSimpleDateFormatter**. If the property is not set, the GNU date syntax is assumed.

Note, if the input being validated is empty, **TEmailAddressValidator** will not do validation. Use a **TRequiredFieldValidator** to ensure the value is not empty.

**N.B.** If validating against a [TDatePicker](#) the **DataType** must be equal to "Date" and the **DateFormat** property of the validator must be equal to the **DateFormat** of the [TDatePicker](#).

[Controls.Samples.TCompareValidator.Home Demo](#)

### 6.1.5 TDataTypeValidator

TDataTypeValidator verifies if the input data is of specific type indicated by **DataType**. The data types that can be checked against are the same as those in TCompareValidator.

**N.B.** If validating against a [TDatePicker](#) the **DataType** must be equal to "Date" and the **DateFormat** property of the validator must be equal to the **DateFormat** of the [TDatePicker](#).

[Controls.Samples.TDataTypeValidator.Home Demo](#)

### 6.1.6 TRangeValidator

TRangeValidator verifies whether an input value is within a specified range. TRangeValidator uses three key properties to perform its validation. The **MinValue** and **MaxValue** properties specify the minimum and maximum values of the valid range. The **DataType** property specifies the data type of the value being validated. The value will be first converted into the specified type and then compare with the valid range. The data types that can be checked against are the same as those in TCompareValidator.

**N.B.** If validating against a [TDatePicker](#) the **DataType** must be equal to "Date" and the **DateFormat** property of the validator must be equal to the **DateFormat** of the [TDatePicker](#).

[Controls.Samples.TRangeValidator.Home Demo](#)

### 6.1.7 TCustomValidator

TCustomValidator performs user-defined validation (either server-side or client-side or both) on an input control.

To create a server-side validation function, provide a handler for the **OnServerValidate** event that performs the validation. The data string of the input control to validate can be accessed by the event parameter's **Value** property. The result of the validation should be stored in the **IsValid** property of the parameter.

To create a client-side validation function, add the client-side validation javascript function to the page template and assign its name to the **ClientValidationFunction** property. The function should have the following signature:

```
<script type="text/javascript">
function ValidationFunctionName(sender, parameter)
{
    // if(parameter == ...)
    //     return true;
    // else
    //     return false;
}
</script>
```

[Controls.Samples.TCustomValidator.Home Demo](#)

### 6.1.8 TValidationSummary

TValidationSummary displays a summary of validation errors inline on a Web page, in a message box, or both.

By default, a validation summary will collect **ErrorMessage** of all failed validators on the page. If **ValidationGroup** is not empty, only those validators who belong to the group will show their error messages in the summary.

The summary can be displayed as a list, a bulleted list, or a single paragraph based on the **DisplayMode** property. The messages shown can be prefixed with **HeaderText**. The summary can be displayed on the Web page or in a JavaScript message box, by setting the **ShowSummary** and **ShowMessageBox** properties, respectively. Note, the latter is only effective when **EnableClientScript** is true.

[Controls.Samples.TValidationSummary.Home Demo](#)

## Chapter 7

# Control Reference : Data Controls

### 7.1 Data Controls

- [TDataList](#) is used to display or modify a list of data items.
- [TDataGrid](#) displays data in a tabular format with rows and columns.
- [TRepeater](#) displays its content defined in templates repeatedly based on the given data.

### 7.2 TDataList

TDataList is used to display or modify a list of data items specified by its **DataSource** or **DataSourceID** property. Each data item is displayed by a data list item which is a child control of the data list. The **Items** property contains the list of all data list items.

TDataList displays its items in either a **Table** or **Flow** layout, which is specified by the **RepeatLayout** property. A table layout uses HTML table cells to organize the items while a flow layout uses line breaks to organize the items. When the layout is **Table**, the table's cellpadding and cellspacing can be adjusted by **CellPadding** and **CellSpacing** properties, respectively. And **Caption** and **CaptionAlign** can be used to add a table caption with the specified alignment. The number of columns used to display the data list items is specified via **RepeatColumns** property, while the **RepeatDirection** governs the order of the items being rendered.

Each data list item is created according to one of the seven kinds of templates that developers may specified for a `TDataList`,

- **HeaderTemplate** - the template used for displaying content at the beginning of a data list;
- **FooterTemplate** - the template used for displaying content at the end of a data list;
- **ItemTemplate** - the template used for displaying every data list item. If **AlternatingItemTemplate** is also defined, **ItemTemplate** will be used for displaying item 1, 3, 5, etc.
- **AlternatingItemTemplate** - the template used for displaying every alternating data list item (i.e., item 2, 4, 6, etc.)
- **SeparatorTemplate** - the template used for displaying content between items.
- **EditItemTemplate** - the template used for displaying items in edit mode.
- **SelectedItemTemplate** - the template used for displaying items in selected mode.

Each of the above templates is associated with a style property that is applied to the items using the template. For example, **ItemTemplate** is associated with a property named **AlternatingItemStyle**. Through this property, one can set CSS style fields or CSS classes for the data list items.

Item styles are applied in a hierarchical way. Style in higher hierarchy will inherit from styles in lower hierarchy. Starting from the lowest hierarchy, the item styles include item's own style, **ItemStyle**, **AlternatingItemStyle**, **SelectedItemStyle**, and **EditItemStyle**. Therefore, if background color is set as red in **ItemStyle**, **EditItemStyle** will also have red background color, unless it is explicitly set to a different value.

A data list item can be in normal mode, edit mode or selected mode. Different templates will apply to items of different modes. To change an item's mode, modify **EditItemIndex** or **SelectedItemIndex**. Note, if an item is in edit mode, then selecting this item will have no effect.

`TDataList` provides several events to facilitate manipulation of its items,

- **OnItemCreated** - raised each time an item is newly created. When the event is raised, data and child controls are both available for the new item.
- **OnItemDataBound** - raised each time an item just completes databinding. When the event is raised, data and child controls are both available for the item, and the item has finished databindings of itself and all its child controls.

- **OnItemCommand** - raised when a child control of some item (such as a **TButton**) raises an **OnCommand** event.
- command events - raised when a child control's **OnCommand** event has a specific command name,
  - **OnSelectedIndexChanged** - if the command name is **select**.
  - **OnEditCommand** - if the command name is **edit**.
  - **OnDeleteCommand** - if the command name is **delete**.
  - **OnUpdateCommand** - if the command name is **update**.
  - **OnCancelCommand** - if the command name is **cancel**.

The following example shows how to use **TDataList** to display tabular data, with different layout and styles.

#### [Controls.Samples.TDataList.Sample1 Demo](#)

A common use of **TDataList** is for maintaining tabular data, including browsing, editing, deleting data items. This is enabled by the command events and various item templates of **TDataList**.

The following example displays a computer product information. Users can add new products, modify or delete existing ones. In order to locate the data item for updating or deleting, **DataKeys** property is used.

Be aware, for simplicity, this application does not do any input validation. In real applications, make sure user inputs are valid before saving them into databases.

#### [Controls.Samples.TDataList.Sample2 Demo](#)

## 7.3 TDataGrid

**TDataGrid** is an important control in building complex Web applications. It displays data in a tabular format with rows (also called items) and columns. A row is composed by cells, while columns govern how cells should be displayed according to their association with the columns. Data specified via **DataSource** or **DataSourceID** are bound to the rows and feed contents to cells.

**TDataGrid** is highly interactive. Users can sort the data along specified columns, navigate through different pages of the data, and perform actions, such as editing and deleting, on rows of the data.

Rows of `TDataGrid` can be accessed via its `Items` property. A row (item) can be in one of several modes: browsing, editing and selecting, which affects how cells in the row are displayed. To change an item's mode, modify `EditItemIndex` or `SelectedItemIndex`. Note, if an item is in edit mode, then selecting this item will have no effect.

### 7.3.1 Columns

Columns of a data grid determine how the associated cells are displayed. For example, cells associated with a `TBoundColumn` are displayed differently according to their modes. A cell is displayed as a static text if the cell is in browsing mode, a text box if it is in editing mode, and so on.

PRADO provides five types of columns:

- `TBoundColumn` associates cells with a specific field of data and displays the cells according to their modes.
- `TCheckBoxColumn` associates cells with a specific field of data and displays in each cell a checkbox whose check state is determined by the data field value.
- `THyperLinkColumn` displays in the cells a hyperlink whose caption and URL can be either statically specified or bound to some fields of data.
- `TEditCommandColumn` displays in the cells edit/update/cancel command buttons according to the state of the item that a cell resides in.
- `TButtonColumn` displays in the cells a command button.
- `TTemplateColumn` displays the cells according to different templates defined for it.

### 7.3.2 Item Styles

`TDataGrid` defines different styles applied to its items. For example, `AlternatingItemStyle` is applied to alternating items (item 2, 4, 6, etc.) Through these properties, one can set CSS style fields or CSS classes for the items.

Item styles are applied in a hierarchical way. Styles in higher hierarchy will inherit from styles in lower hierarchy. Starting from the lowest hierarchy, the item styles include item's own style,



`ItemStyle`, `AlternatingItemStyle`, `SelectedItemStyle`, and `EditItemStyle`. Therefore, if background color is set as red in `ItemStyle`, `EditItemStyle` will also have red background color, unless it is explicitly set to a different value.

#### 7.3.3 Events

`TDataGrid` provides several events to facilitate manipulation of its items,

- `OnItemCreated` - raised each time an item is newly created. When the event is raised, data and child controls are both available for the new item.
- `OnItemDataBound` - raised each time an item just completes databinding. When the event is raised, data and child controls are both available for the item, and the item has finished databindings of itself and all its child controls.
- `OnItemCommand` - raised when a child control of some item (such as a `TButton`) raises an `OnCommand` event.
- command events - raised when a child control's `OnCommand` event has a specific command name,
  - `OnSelectedIndexChanged` - if the command name is `select`.
  - `OnEditCommand` - if the command name is `edit`.
  - `OnDeleteCommand` - if the command name is `delete`.
  - `OnUpdateCommand` - if the command name is `update`.
  - `OnCancelCommand` - if the command name is `cancel`.
  - `OnSortCommand` - if the command name is `sort`.
  - `OnPageIndexChanged` - if the command name is `page`.

#### 7.3.4 Using TDataGrid

##### Automatically Generated Columns

`TDataGrid` by default will create a list of columns based on the structure of the bound data. `TDataGrid` will read the first row of the data, extract the field names of the row, and construct a column for each field. Each column is of type `TBoundColumn`.

The following example displays a list of computer product information using a TDataGrid. Columns are automatically generated. Pay attention to how item styles are specified and inherited. The data are populated into the datagrid using the follow code, which is common among most datagrid applications,

```
public function onLoad($param) {  
    parent::onLoad($param);  
    if(!$this->IsPostBack) {  
        $this->DataGrid->DataSource=$this->Data;  
        $this->DataGrid->dataBind();  
    }  
}
```

### Controls.Samples.TDataGrid.Sample1 Demo

#### Manually Specified Columns

Using automatically generated columns gives a quick way of browsing tabular data. In real applications, however, automatically generated columns are often not sufficient because developers have no way customizing their appearance. Manually specified columns are thus more desirable.

To manually specify columns, set `AutoGenerateColumns` to false, and specify the columns in a template like the following,

```
<com:TDataGrid ...>  
    <com:TBoundColumn DataField="name" .../>  
    <com:TBoundColumn DataField="price" .../>  
    <com:TEditCommandColumn ...>  
        ...  
</com:TDataGrid>
```

Note, if `AutoGenerateColumns` is true and there are manually specified columns, the automatically generated columns will be appended to the manually specified columns. Also note, the datagrid's `Columns` property contains only manually specified columns and no automatically generated ones.

The following example uses manually specified columns to show a list of book information,

- Book title - displayed as a hyperlink pointing to the corresponding amazon.com book page. `THyperLinkColumn` is used.
- Publisher - displayed as a piece of text using `TBoundColumn`.
- Price - displayed as a piece of text using `TBoundColumn` with output formatting string and customized styles.
- In-stock or not - displayed as a checkbox using `TCheckBoxColumn`.
- Rating - displayed as an image using `TTemplateColumn` which allows maximum freedom in specifying cell contents.

Pay attention to how item (row) styles and column styles cooperate together to affect the appearance of the cells in the datagrid. [Controls.Samples.TDataGrid.Sample2 Demo](#)

#### 7.3.5 Interacting with TDataGrid

Besides the rich data presentation functionalities as demonstrated in previous section, `TDataGrid` is also highly user interactive. An import usage of `TDataGrid` is editing or deleting rows of data. The `TBoundColumn` can adjust the associated cell presentation according to the mode of datagrid items. When an item is in browsing mode, the cell is displayed with a static text; when the item is in editing mode, a textbox is displayed to collect user inputs. `TDataGrid` provides `TEditCommandColumn` for switching item modes. In addition, `TButtonColumn` offers developers the flexibility of creating arbitrary buttons for various user interactions.

The following example shows how to make the previous book information table an interactive one. It allows users to edit and delete book items from the table. Two additional columns are used in the example to allow users interact with the datagrid: `TEditCommandColumn` and `TButtonColumn`.

[Controls.Samples.TDataGrid.Sample3 Demo](#)

#### 7.3.6 Sorting

`TDataGrid` supports sorting its items according to specific columns. To enable sorting, set `AllowSorting` to true. This will turn column headers into clickable buttons if their `SortExpression` property is not empty. When users click on the header buttons, an `OnSortCommand` event will be raised.

Developers can write handlers to respond to the sort command and sort the data according to **SortExpression** which is specified in the corresponding column.

The following example turns the datagrid in [Example 2](#) into a sortable one. Users can click on the link button displayed in the header of any column, and the data will be sorted in ascending order along that column.

[Controls.Samples.TDataGrid.Sample4 Demo](#)

### 7.3.7 Paging

When dealing with large datasets, paging is helpful in reducing the page size and complexity. **TDataGrid** has an embedded pager that allows users to specify which page of data they want to see. The pager can be customized via **PagerStyle**. For example, **PagerStyle.Visible** determines whether the pager is visible or not; **PagerStyle.Position** indicates where the pager is displayed; and **PagerStyle.Mode** specifies what type of pager is displayed, a numeric one or a next-prev one.

To enable paging, set **AllowPaging** to true. The number of rows of data displayed in a page is specified by **PageSize**, while the index (zero-based) of the page currently showing to users is by **CurrentPageIndex**. When users click on a pager button, **TDataGrid** raises **OnPageIndexChanged** event. Typically, the event handler is written as follows,

```
public function pageIndexChanged($sender,$param) {  
    $this->DataGrid->CurrentPageIndex=$param->NewPageIndex;  
    $this->DataGrid->DataSource=$this->Data;  
    $this->DataGrid->dataBind();  
}
```

The following example enables the paging functionality of the datagrid shown in [Example 1](#). In this example, you can set various pager styles interactively to see how they affect the pager display.

[Controls.Samples.TDataGrid.Sample5 Demo](#)

#### Custom Paging

The paging functionality shown above requires loading all data into memory, even though only a portion of them is displayed in a page. For large datasets, this is inefficient and may not always be

feasible. TDataGrid provides custom paging to solve this problem. Custom paging only requires the portion of the data to be displayed to end users.

To enable custom paging, set both `AllowPaging` and `AllowCustomPaging` to true. Notify TDataGrid the total number of data items (rows) available by setting `VirtualItemCount`. And respond to the `OnPageIndexChanged` event. In the event handler, use the `NewPageIndex` property of the event parameter to fetch the new page of data from data source. For MySQL database, this can be done by using `LIMIT` clause in an SQL select statement.

[Controls.Samples.TDataGrid.Sample6 Demo](#)

#### 7.3.8 Extending TDataGrid

Besides traditional class inheritance, extensibility of TDataGrid is mainly through developing new datagrid column components. For example, one may want to display an image column. He may use `TTemplateColumn` to accomplish this task. A better solution is to develop an image column component so that the work can be reused easily in other projects.

All datagrid column components must inherit from `TDataGridColumn`. The main method that needs to be overridden is `initializeCell()` which creates content for cells in the corresponding column. Since each cell is also in an item (row) and the item can have different types (such as `Header`, `AlternatingItem`, etc.), different content may be created according to the item type. For the image column example, one may want to create a `TImage` control within cells residing in items of `Item` and `AlternatingItem` types.

```
class ImageColumn extends TDataGridColumn {
    ...
    public function initializeCell($cell,$columnIndex,$itemType) {
        parent::initializeCell($cell,$columnIndex,$itemType);
        if($itemType==='Item' || $itemType==='AlternatingItem') {
            $image=new TImage;
            // ... customization of the image
            $cell->Controls[]=$image;
        }
    }
}
```

In `initializeCell()`, remember to call the parent implementation, as it initializes cells in items of `Header` and `Footer` types.

## 7.4 TRepeater

TRepeater displays its content defined in templates repeatedly based on the given data specified by the `DataSource` or `DataSourceID` property. The repeated contents can be retrieved from the `Items` property. Each item is created by instantiating a template and each is a child control of the repeater.

Like normal control templates, the repeater templates can contain static text, controls and special tags, which after instantiation, become child contents of the corresponding item. TRepeater defines five templates for different purposes,

- **HeaderTemplate** - the template used for displaying content at the beginning of a repeater;
- **FooterTemplate** - the template used for displaying content at the end of a repeater;
- **ItemTemplate** - the template used for displaying every repeater item. If **AlternatingItemTemplate** is also defined, **ItemTemplate** will be used for displaying item 1, 3, 5, etc.
- **AlternatingItemTemplate** - the template used for displaying every alternating repeater item (i.e., item 2, 4, 6, etc.)
- **SeparatorTemplate** - the template used for displaying content between items.

To populate data into the repeater items, set `DataSource` to a valid data object, such as array, `TList`, `TMap`, or a database table, and then call `dataBind()` for the repeater. That is,

```
class MyPage extends TPage {
    protected function onLoad($param) {
        parent::onLoad($param);
        if(!$this->IsPostBack) {
            $this->Repeater->DataSource=$data;
            $this->Repeater->dataBind();
        }
    }
}
```

Normally, you only need to do this when the page containing the repeater is initially requested. In postbacks, TRepeater is smart enough to remember the previous state, i.e., contents populated with datasource information. The following sample displays tabular data using TRepeater.

TRepeater provides several events to facilitate manipulation of its items,

- **OnItemCreated** - raised each time an item is newly created. When the event is raised, data and child controls are both available for the new item.
- **OnItemDataBound** - raised each time an item just completes databinding. When the event is raised, data and child controls are both available for the item, and the item has finished databindings of itself and all its child controls.
- **OnItemCommand** - raised when a child control of some item (such as a TButton) raises an OnCommand event.

The following example shows how to use TRepeater to display tabular data.

### Controls.Samples.TRepeater.Sample1 Demo

TRepeater can be used in more complex situations. As an example, we show in the following how to use nested repeaters, i.e., repeater in repeater. This is commonly seen in presenting master-detail data. To use a repeater within another repeater, for an item for the outer repeater is created, we need to set the detail data source for the inner repeater. This can be achieved by responding to the **OnItemDataBound** event of the outer repeater. An **OnItemDataBound** event is raised each time an outer repeater item completes databinding. In the following example, we exploit another event of repeater called **OnItemCreated**, which is raised each time a repeater item (and its content) is newly created. We respond to this event by setting different background colors for repeater items to achieve alternating item background display. This saves us from writing an **AlternatingItemTemplate** for the repeaters.

### Controls.Samples.TRepeater.Sample2 Demo

Besides displaying data, TRepeater can also be used to collect data from users. Validation controls can be placed in TRepeater templates to verify that user inputs are valid.

The **PRADO component composer** demo is a good example of such usage. It uses a repeater to collect the component property and event definitions. Users can also delete or adjust the order of the properties and events, which is implemented by responding to the **OnItemCommand** event of repeater.

See in the following yet another example showing how to use repeater to collect user inputs.

[Controls.Samples.TRepeater.Sample3 Demo](#)



## Chapter 8

# Write New Controls

### 8.1 Writing New Controls

Writing new controls is often desired by advanced programmers, because they want to reuse the code that they write for dealing with complex presentation and user interactions.

In general, there are two ways of writing new controls: composition of existing controls and extending existing controls. They all require that the new control inherit from `TControl` or its child classes.

#### 8.1.1 Composition of Existing Controls

Composition is the easiest way of creating new controls. It mainly involves instantiating existing controls, configuring them and making them the constituent components. The properties of the constituent components are exposed through [subproperties](#).

One can compose a new control in two ways. One is to extend `TCompositeControl` and override the `TControl::createChildControls()` method. The other is to extend `TTemplateControl` (or its child classes) and write a control template. The latter is easier to use and can organize the layout constituent components more intuitively, while the former is more efficient because it does not require parsing of the template.

As an example, we show how to create a labeled textbox called `LabeledTextBox` using the above

two approaches. A labeled textbox displays a label besides a textbox. We want reuse the PRADO provided `TLabel` and `TTextBox` to accomplish this task.

### Composition by Writing Templates

We need two files: a control class file named `LabeledTextBox.php` and a control template file named `LabeledTextBox.tpl`. Both must reside under the same directory.

Like creating a PRADO page, we can easily write down the content in the control template file.

```
<com:TLabel ID="Label" ForControl="TextBox" />
<com:TTextBox ID="TextBox" />
```

The above template specifies a `TLabel` control named `Label` and a `TTextBox` control named `TextBox`. We would to expose these two controls. This can be done by defining a property for each control in the `LabeledTextBox` class file. For example, we can define a `Label` property as follows,

```
class LabeledTextBox extends TTemplateControl {
    public function getLabel() {
        $this->ensureChildControls();
        return $this->getRegisteredObject('Label');
    }
}
```

In the above, the method call to `ensureChildControls()` ensures that both the label and the textbox controls are created (from template) when the `Label` property is accessed. The `TextBox` property can be implemented similarly.

[Controls.Samples.LabeledTextBox1.Home Demo](#)

### Composition by Overriding `createChildControls()`

For a composite control as simple as `LabeledTextBox`, it is better to create it by extending `TCompositeControl` and overriding the `createChildControls()` method, because it does not use templates and thus saves template parsing time.

Complete code for `LabeledTextBox` is shown as follows,

```
class LabeledTextBox extends TCompositeControl {
    private $_label;
    private $_textbox;
    protected function createChildControls() {
        $this->_label=new TLabel;
        $this->_label->setID('Label');
        // add the label as a child of LabeledTextBox
        $this->getControls()->add($this->_label);
        $this->_textbox=new TTextBox;
        $this->_textbox->setID('TextBox');
        $this->_label->setForControl('TextBox');
        // add the textbox as a child of LabeledTextBox
        $this->getControls()->add($this->_textbox);
    }
    public function getLabel() {
        $this->ensureChildControls();
        return $this->_label;
    }
    public function getTextBox() {
        $this->ensureChildControls();
        return $this->_textbox;
    }
}
```

[Controls.Samples.LabeledTextBox2.Home Demo](#)

### Using LabeledTextBox

To use `LabeledTextBox` control, first we need to include the corresponding class file. Then in a page template, we can write lines like the following,

```
<com:LabeledTextBox ID="Input" Label.Text="Username" />
```

In the above, `Label.Text` is a subproperty of `LabeledTextBox`, which refers to the `Text` property of the `Label` property. For other details of using `LabeledTextBox`, see the above online examples.

### 8.1.2 Extending Existing Controls

Extending existing controls is the same as conventional class inheritance. It allows developers to customize existing control classes by overriding their properties, methods, events, or creating new ones.

The difficulty of the task depends on how much an existing class needs to be customized. For example, a simple task could be to customize `TLabel` control, so that it displays a red label by default. This would merely involve setting the `ForeColor` property to `"red"` in the constructor. A difficult task would be to create controls that provide completely innovative functionalities. Usually, this requires the new controls extend from "low level" control classes, such as `TControl` or `TWebControl`.

In this section, we mainly introduce the base control classes `TControl` and `TWebControl`, showing how they can be customized. We also introduce how to write controls with specific functionalities, such as loading post data, raising post data and databinding with data source.

#### Extending TControl

`TControl` is the base class of all control classes. Two methods are of the most importance for derived control classes:

- `addParsedObject()` - this method is invoked for each component or text string enclosed within the component tag specifying the control in a template. By default, the enclosed components and text strings are added into the `Controls` collection of the control. Derived controls may override this method to do special processing about the enclosed content. For example, `TListControl` only accepts `TListItem` components to be enclosed within its component tag, and these components are added into the `Items` collection of `TListControl`.
- `render()` - this method renders the control. By default, it renders items in the `Controls` collection. Derived controls may override this method to give customized presentation.

Other important properties and methods include:

- **ID** - a string uniquely identifying the control among all controls of the same naming container. An automatic ID will be generated if the ID property is not set explicitly.
- **UniqueID** - a fully qualified ID uniquely identifying the control among all controls on the current page hierarchy. It can be used to locate a control in the page hierarchy by calling `TControl::findControl()` method. User input controls often use it as the value of the name attribute of the HTML input element.
- **ClientID** - similar to **UniqueID**, except that it is mainly used for presentation and is commonly used as HTML element id attribute value. Do not rely on the explicit format of **ClientID**.
- **Enabled** - whether this control is enabled. Note, in some cases, if one of the control's ancestor controls is disabled, the control should also be treated as disabled, even if its **Enabled** property is true.
- **Parent** - parent control of this control. The parent control is in charge of whether to render this control and where to place the rendered result.
- **Page** - the page containing this control.
- **Controls** - collection of all child controls, including static texts between them. It can be used like an array, as it implements **Traversable** interface. To add a child to the control, simply insert it into the **Controls** collection at appropriate position.
- **Attributes** - collection of custom attributes. This is useful for allowing users to specify attributes of the output HTML elements that are not covered by control properties.
- **getViewState()** and **setViewState()** - these methods are commonly used for defining properties that are stored in viewstate.
- **saveState()** and **loadState()** - these two methods can be overridden to provide last step state saving and loading.
- **Control lifecycles** - Life page lifecycles, controls also have lifecycles. Each control undergoes the following lifecycles in order: constructor, **onInit()**, **onLoad()**, **onPreRender()**, **render()**, and **onUnload**. More details can be found in the [page](#) section.

### Extending TWebControl

**TWebControl** is mainly used as a base class for controls representing HTML elements. It provides a set of properties that are common among HTML elements. It breaks the **TControl::render()**

into the following methods that are more suitable for rendering an HTML element:

- **addAttributesToRender()** - adds attributes for the HTML element to be rendered. This method is often overridden by derived classes as they usually have different attributes to be rendered.
- **renderBeginTag()** - renders the opening HTML tag.
- **renderContents()** - renders the content enclosed within the HTML element. By default, it displays the items in the **Controls** collection of the control. Derived classes may override this method to render customized contents.
- **renderEndTag()** - renders the closing HTML tag.

When rendering the opening HTML tag, **TWebControl** calls **getTagName()** to obtain the tag name. Derived classes may override this method to render different tag names.

### Creating Controls with Special Functionalities

If a control wants to respond to client-side events and translate them into server side events (called postback events), such as **TButton**, it has to implement the **IPostBackEventHandler** interface.

If a control wants to be able to load post data, such as **TTextBox**, it has to implement the **IPostBackDataHandler** interface.

If a control wants to get data from some external data source, it can extend **TDataBoundControl**. **TDataBoundControl** implements the basic properties and methods that are needed for populating data via databinding. In fact, controls like **TListControl**, **TRepeater** and **TDataGrid** are all derived from it.

## Chapter 9

# Advanced Topics

### 9.1 Collections

Collection is a basic data structure in programming. In traditional PHP programming, array is used widely to represent collection data structure. A PHP array is a mix of cardinal-indexed array and hash table.

To enable object-oriented manipulation of collections, PRADO provides a set of powerful collection classes. Among them, the `TList` and `TMap` are the most fundamental and usually serve as the base classes for other collection classes. Since many PRADO components have properties that are of collection type, it is very important for developers to master the usage of PRADO collection classes.

#### 9.1.1 Using TList

A `TList` object represents a cardinal-indexed array, i.e., an array (object) with the index 0, 1, 2, ...

`TList` may be used like a PHP array. For example,

```
$list=new TList; // create a list object
...
$item=$list[$index]; // read the item at the specified index
```

```
$list[]=$item; // append the item at the end
$list[$index]=$item; // replace the item at the specified index
unset($list[$index]); // remove the item at $index
if(isset($list[$index])) // test if the list has an item at $index
foreach($list as $index=>$item) // traverse each item in the list
```

To obtain the number of items in the list, use the `Count` property. Note, do not use `count($list)`, as it always returns 1.

In addition, `TList` implements a few commonly used convenient methods for manipulating the data in a list. These include

- `clear()`: removes all items in the list.
- `contains()`: tests if the list contains the specified item.
- `indexOf()`: obtains the zero-based index of the specified item in the list.
- `toArray()`: returns an array representation of the items in the list.
- `copyFrom()`: populates the list with data from an array or traversable object (including `TList`). Existing items will be removed first.
- `mergeWith()`: appends the list with data from an array or traversable object (including `TList`).

### Using `TList`-based component properties

As aforementioned, many PRADO component properties are based on `TList` or `TList`-derived collection classes. These properties all share the above usages.

For example, `TControl` (the base class for all PRADO controls) has a property called `Controls` which represents the collection of child controls. The type of `Controls` is `TControlCollection` which extends `TList`. Therefore, to append a new child control, we can use the following,

```
$control->Controls[]=$newControl;
```

To traverse through the child controls, we can use,



```
foreach($control->Controls as $childControl) ...
```

Another example is the `Items` property, available in list controls, `TRepeater`, `TDataList` and `TDataGrid`. In these controls, the ancestor class of `Items` is `TList`.

### Extending TList

Often, we want to extend `TList` to perform additional operations for each addition or removal of an item. The only methods that the child class needs to override are `insertAt()` and `removeAt()`. For example, to ensure the list only contains items that are of `TControl` type, we can override `insertAt()` as follows,

```
public function insertAt($index,$item)
{
    if($item instanceof TControl)
        parent::insertAt($index,$item)
    else
        throw new Exception('TControl required.');
```

### 9.1.2 Using TMap

A `TMap` object represents a hash table (or we say string-indexed array).

Similar to `TList`, `TMap` may be used like an array,

```
$map=new TMap; // create a map object
...
$map[$key]=$value; // add a key-value pair
unset($map[$key]); // remove the value with the specified key
if(isset($map[$key])) // if the map contains the key
foreach($map as $key=>$value) // traverse the items in the map
```

The `Count` property gives the number of items in the map while the `Keys` property returns a list of keys used in the map.

The following methods are provided by `TMap` for convenience,

- `clear()`: removes all items in the map.
- `contains()`: tests if the map contains the specified key.
- `toArray()`: returns an array representation of the items in the map.
- `copyFrom()`: populates the map with data from an array or traversable object (including `TMap`). Existing items will be removed first.
- `mergeWith()`: appends the map with data from an array or traversable object (including `TMap`).

### Using of `TAttributeCollection`

`TAttributeCollection` is a special class extending from `TMap`. It is mainly used by the `Attributes` property of `TControl`.

Besides the normal functionalities provided by `TMap`, `TAttributeCollection` allows you to get and set collection items like getting and setting properties. For example,

```
$collection->Label='value'; // equivalent to: $collection['Label']='value';  
echo $collection->Label; // equivalent to: echo $collection['Label'];
```

Note, in the above `$collection` does NOT have a `Label` property.

Unlike `TMap`, keys in `TAttributeCollection` are case-insensitive. Therefore, `$collection->Label` is equivalent to `$collection->LABEL`.

Because of the above new features, when dealing with the `Attributes` property of controls, we may take advantage of the subproperty concept and configure control attribute values in a template as follows,

```
<com:TButton Attributes.onclick="if(!confirm('Are you sure?')) return false;" .../>
```

which adds an attribute named `onclick` to the `TButton` control.

## 9.2 Authentication and Authorization

Authentication is a process of verifying whether someone is who he claims he is. It usually involves a username and a password, but may include any other methods of demonstrating identity, such as a smart card, fingerprints, etc.

Authorization is finding out if the person, once identified, is permitted to manipulate specific resources. This is usually determined by finding out if that person is of a particular role that has access to the resources.

### 9.2.1 How PRADO Auth Framework Works

PRADO provides an extensible authentication/authorization framework. As described in [application lifecycles](#), **TApplication** reserves several lifecycles for modules responsible for authentication and authorization. PRADO provides the **TAuthManager** module for such purposes. Developers can plug in their own auth modules easily. **TAuthManager** is designed to be used together with **TUserManager** module, which implements a read-only user database.

When a page request occurs, **TAuthManager** will try to restore user information from session. If no user information is found, the user is considered as an anonymous or guest user. To facilitate user identity verification, **TAuthManager** provides two commonly used methods: `login()` and `logout()`. A user is logged in (verified) if his username and password entries match a record in the user database managed by **TUserManager**. A user is logged out if his user information is cleared from session and he needs to re-login if he makes new page requests.

During **Authorization** application lifecycle, which occurs after **Authentication** lifecycle, **TAuthManager** will verify if the current user has access to the requested page according to a set of authorization rules. The authorization is role-based, i.e., a user has access to a page if 1) the page explicitly states that the user has access; 2) or the user is of a particular role that has access to the page. If the user does not have access to the page, **TAuthManager** will redirect user browser to the login page which is specified by **LoginPage** property.

### 9.2.2 Using PRADO Auth Framework

To enable PRADO auth framework, add the **TAuthManager** module and **TUserManager** module to [application configuration](#),

```
<service id="page" class="TPageService">
  <modules>
    <module id="auth" class="System.Security.TAuthManager"
      UserManager="users" LoginPage="UserLogin" />
    <module id="users" class="System.Security.TUserManager"
      PasswordMode="Clear">
      <user name="demo" password="demo" />
      <user name="admin" password="admin" />
    </module>
  </modules>
</service>
```

In the above, the `UserManager` property of `TAuthManager` is set to the `users` module which is `TUserManager`. Developers may replace it with a different user management module that is derived from `TUserManager`.

Authorization rules for pages are specified in [page configurations](#) as follows,

```
<authorization>
  <allow pages="PageID1,PageID2"
    users="User1,User2"
    roles="Role1" />
  <deny pages="PageID1,PageID2"
    users="?"
    verb="post" />
</authorization>
```

An authorization rule can be either an `allow` rule or a `deny` rule. Each rule consists of four optional properties:

- **pages** - list of comma-separated page names that this rule applies to. If empty or not set, this rule will apply to all pages under the current directory and all its subdirectories recursively.
- **users** - list of comma-separated user names that this rule applies to. A character `*` refers to all users including anonymous/guest user. And a character `?` refers to anonymous/guest user.
- **roles** - list of comma-separated user roles that this rule applies to.

- **verb** - page access method that this rule applies to. It can be either **get** or **post**. If empty or not set, the rule applies to both methods.

When a page request is being processed, a list of authorization rules may be available. However, only the *first effective rule matching* the current user will render the authorization result.

- Rules are ordered bottom-up, i.e., the rules contained in the configuration of current page folder go first. Rules in configurations of parent page folders go after.
- A rule is effective if the current page is in the listed pages of the rule AND the current user action (**get** or **post**) is in the listed actions.
- A rule matching occurs if the current user name is in the listed user names of an *effective* rule OR if the user's role is in the listed roles of that rule.
- If no rule matches, the user is authorized.

In the above example, anonymous users will be denied from posting to **PageID1** and **PageID2**, while **User1** and **User2** and all users of role **Role1** can access the two pages (in both **get** and **post** methods).

### 9.2.3 Using TUserManager

As aforementioned, **TUserManager** implements a read-only user database. The user information are specified in either application configuration or an external XML file.

We have seen in the above example that two users are specified in the application configuration. Complete syntax of specifying the user and role information is as follows,

```
<user name="demo" password="demo" roles="demo,admin" />
<role name="admin" users="demo,demo2" />
```

where the **roles** attribute in **user** element is optional. User roles can be specified in either the **user** element or in a separate **role** element.

## 9.3 Security

### 9.3.1 Viewstate Protection

Viewstate lies at the heart of PRADO. Viewstate represents data that can be used to restore pages to the state that is last seen by end users before making the current request. By default, PRADO uses hidden fields to store viewstate information.

It is extremely important to ensure that viewstate is not tampered by end users. Without protection, malicious users may inject harmful code into viewstate and unwanted instructions may be performed when page state is being restored on server side.

To prevent viewstate from being tampered, PRADO enforces viewstate HMAC (Keyed-Hashing for Message Authentication) check before restoring viewstate. Such a check can detect if the viewstate has been tampered or not by end users. Should the viewstate is modified, PRADO will stop restoring the viewstate and return an error message.

HMAC check requires a private key that should be secret to end users. Developers can either manually specify a key or let PRADO automatically generate a key. Manually specified key is useful when the application runs on a server farm. To do so, configure `TSecurityManager` in application configuration,

```
<modules>
  <module id="security"
    class="TSecurityManager"
    ValidationKey="my private key" />
</modules>
```

HMAC check does not prevent end users from reading the viewstate content. An added security measure is to encrypt the viewstate information so that end users cannot decipher it. To enable viewstate encryption, set the `EnableStateEncryption` of pages to true. This can be done in [page configurations](#) or in page code. Note, encrypting viewstate may degrade the application performance. A better strategy is to store viewstate on the server side, rather than the default hidden field.

### 9.3.2 Cross Site Scripting Prevention

Cross site scripting (also known as XSS) occurs when a web application gathers malicious data from a user. Often attackers will inject JavaScript, VBScript, ActiveX, HTML, or Flash into a vulnerable application to fool other application users and gather data from them. For example, a poorly design forum system may display user input in forum posts without any checking. An attacker can then inject a piece of malicious JavaScript code into a post so that when other users read this post, the JavaScript runs unexpectedly on their computers.

One of the most important measures to prevent XSS attacks is to check user input before displaying them. One can do HTML-encoding with the user input to achieve this goal. However, in some situations, HTML-encoding may not be preferable because it disables all HTML tags.

PRADO incorporates the work of [SafeHTML](#) and provides developers with a useful component called `TSafeHtml`. By enclosing content within a `TSafeHtml` component tag, the enclosed content are ensured to be safe to end users. In addition, the commonly used `TTextBox` has a `SafeText` property which contains user input that are ensured to be safe if displayed directly to end users.

### 9.3.3 Cookie Attack Prevention

Protecting cookies from being attacked is of extreme important, as session IDs are commonly stored in cookies. If one gets hold of a session ID, he essentially owns all relevant session information.

There are several countermeasures to prevent cookies from being attacked.

- An application can use SSL to create a secure communication channel and only pass the authentication cookie over an HTTPS connection. Attackers are thus unable to decipher the contents in the transferred cookies.
- Expire sessions appropriately, including all cookies and session tokens, to reduce the likelihood of being attacked.
- Prevent [cross-site scripting \(XSS\)](#) which causes arbitrary code to run in a user's browser and expose his cookies.
- Validate cookie data and detect if they are altered.

Prado implements a cookie validation scheme that prevents cookies from being modified. In particular, it does HMAC check for the cookie values if cookie validation is enable.

Cookie validation is disabled by default. To enable it, configure the `THttpRequest` module as follows,

```
<modules>
  <module id="request" class="THttpRequest" EnableCookieValidation="true" />
</modules>
```

To make use of cookie validation scheme provided by Prado, you also need to retrieve cookies through the `Cookies` collection of `THttpRequest` by using the following PHP statements,

```
foreach($this->Request->Cookies as $cookie)
    // $cookie is of type THttpCookie
```

To send cookie data encoded with validation information, create new `THttpCookie` objects and add them to the `Cookies` collection of `THttpResponse`,

```
$cookie=new THttpCookie($name,$value);
$this->Response->Cookies[]=$cookie;
```

## 9.4 Assets

Assets are resource files (such as images, sounds, videos, CSS stylesheets, javascripts, etc.) that belong to specific component classes. Assets are meant to be provided to Web users. For better reusability and easier deployment of the corresponding component classes, assets should reside together with the component class files. For example, a toggle button may use two images, stored in file `down.gif` and `up.gif`, to show different toggle states. If we require the image files be stored under `images` directory under the Web server document root, it would be inconvenient for the users of the toggle button component, because each time they develop or deploy a new application, they would have to manually copy the image files to that specific directory. To eliminate this requirement, a directory relative to the component class file should be used for storing the image files. A common strategy is to use the directory containing the component class file to store the asset files.

Because directories containing component class files are normally inaccessible by Web users, PRADO implements an asset publishing scheme to make available the assets to Web users. An asset, after being published, will have a URL by which Web users can retrieve the asset file.



### 9.4.1 Asset Publishing

PRADO provides several methods for publishing assets or directories containing assets:

- In a template file, you can use [asset tags](#) to publish assets and obtain their URLs. Note, the assets must be relative to the directory containing the template file.
- In PHP code, you can call `$object->publishAsset($assetPath)` to publish an asset and obtain its URL. Here, `$object` refers to an instance of `TApplicationComponent` or derived class, and `$assetPath` is a file or directory relative to the directory containing the class file.
- If you want to publish an arbitrary asset, you need to call `TAssetManager::publishFilePath($path)`.

BE AWARE: Be very careful with assets publishing, because it gives Web users access to files that were previously inaccessible to them. Make sure that you do not publish files that do not want Web users to see.

### 9.4.2 Customization

Asset publishing is managed by the `System.Web.TAssetManager` module. By default, all published asset files are stored under the `[AppEntryPath]/assets` directory, where `AppEntryPath` refers to the directory containing the application entry script. Make sure the `assets` directory is writable by the Web server process. You may change this directory to another by configuring the `BasePath` and `BaseUrl` properties of the `TAssetManager` module in application configuration,

```
<modules>
  <module id="asset"
    class="System.Web.TAssetManager"
    BasePath="Web.images"
    BaseUrl="images" />
</modules>
```

### 9.4.3 Performance

PRADO uses caching techniques to ensure the efficiency of asset publishing. Publishing an asset essentially requires file copy operation, which is expensive. To save unnecessary file copy operations,

`System.Web.TAssetManager` only publishes an asset when it has a newer file modification time than the published file. When an application runs under the **Performance** mode, such timestamp checkings are also omitted.

ADVISORY: Do not overuse asset publishing. The asset concept is mainly used to help better reuse and redistribute component classes. Normally, you should not use asset publishing for resources that are not bound to any component in an application. For example, you should not use asset publishing for images that are mainly used as design elements (e.g. logos, background images, etc.) Let Web server to directly serve these images will help improve the performance of your application.

#### 9.4.4 A Toggle Button Example

We now use the toggle button example to explain the usage of assets. The control uses two image files `up.gif` and `down.gif`, which are stored under the directory containing the control class file. When the button is in Up state, we would like to show the `up.gif` image. This can be done as follows,

```
class ToggleButton extends TWebControl {
    ...
    protected function addAttributesToRender($writer) {
        ...
        if($this->getState()=='Up') {
            $url=$this->getAsset('up.gif');
            $writer->addAttribute('src',$url);
        }
        ...
    }
    ...
}
```

In the above, the call `$this->getAsset('up.gif')` will publish the `up.gif` image file and return a URL for the published image file. The URL is then rendered as the `src` attribute of the HTML image tag.

To redistribute `ToggleButton`, simply pack together the class file and the image files. Users of `ToggleButton` merely need to unpack the file, and they can use it right away, without worrying

about where to copy the image files to.

## 9.5 Master and Content

Pages in a Web application often share common portions. For example, all pages of this tutorial application share the same header and footer portions. If we repeatedly put header and footer in every page source file, it will be a maintenance headache if in future we want to something in the header or footer. To solve this problem, PRADO introduces the concept of master and content. It is essentially a decorator pattern, with content being decorated by master.

Master and content only apply to template controls (controls extending `TTemplateControl` or its child classes). A template control can have at most one master control and one or several contents (each represented by a `TContent` control). Contents will be inserted into the master control at places reserved by `TContentPlaceholder` controls. And the presentation of the template control is that of the master control with `TContentPlaceholder` replaced by `TContent`.

For example, assume a template control has the following template:

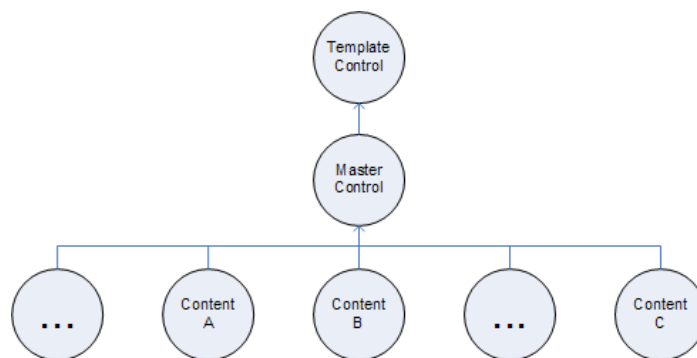
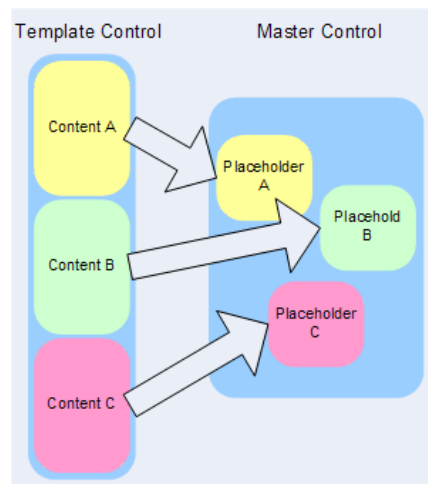
```
<%@ MasterClass="MasterControl" %>
<com:TContent ID="A" >
content A
</com:TContent >
<com:TContent ID="B" >
content B
</com:TContent >
<com:TContent ID="B" >
content B
</com:TContent >
```

which uses `MasterControl` as its master control. The master control has the following template,

```
other stuff
<com:TContentPlaceholder ID="A" />
other stuff
<com:TContentPlaceholder ID="B" />
other stuff
```

```
<com:TContentPlaceholder ID="C" />  
other stuff
```

Then, the contents are inserted into the master control according to the following diagram, while the resulting parent-child relationship can be shown in the next diagram. Note, the template control discards everything in the template other than the contents, while the master control keeps everything and replaces the content placeholders with the contents according to ID matching.



## 9.6 Themes and Skins

### 9.6.1 Introduction

Themes in Prado provide a way for developers to provide a consistent look-and-feel across an entire web application. A theme contains a list of initial values for properties of various control types. When applying a theme to a page, all controls on that page will receive the corresponding initial property values from the theme. This allows themes to interact with the rich property sets of the various PRADO controls, meaning that themes can be used to specify a large range of presentational properties that other theming methods (e.g. CSS) cannot. For example, themes could be used to specify the default page size of all data grids across an application by specifying a default value for the `PageSize` property of the `TDataGrid` control.

### 9.6.2 Understanding Themes

A theme is a directory consists of skin files, javascript files and CSS files. Any javascript or CSS files contained in a theme will be registered with the page that the theme is applied to. A skin is a set of initial property values for a particular control type. A control type may have one or several skins, each identified by a unique `SkinID`. When applying a theme to a page, a skin is applied to a control if the control type and the `SkinID` value both match to those of the skin. Note, if a skin has an empty `SkinID` value, it will apply to all controls of the particular type whose `SkinID` is not set or empty. A skin file consists of one or several skins, for one or several control types. A theme is the union of skins defined in all skin files.

### 9.6.3 Using Themes

To use a theme, you need to set the `Theme` property of the page with the theme name, which is the theme directory name. You may set it in either [page configurations](#) or in the constructor or `onPreInit()` method of the page. You cannot set the property after `onPreInit()` because by that time, child controls of the page are already created (skins must be applied to controls right after they are created.)

To use a particular skin in the theme for a control, set `SkinID` property of the control in template like following,

```
<com:TButton SkinID="Blue" ... />
```

This will apply the 'Blue' skin to the button. Note, the initial property values specified by the 'Blue' skin will overwrite any existing property values of the button. Use stylesheet theme if you do not want them to be overwritten. To use stylesheet theme, set the `StyleSheetTheme` property of the page instead of `Theme` (you can have both `StyleSheetTheme` and `Theme`).

To use the javascript files and CSS files contained in a theme, a `ThHead` control must be placed on the page template. This is because the theme will register those files with the page and `ThHead` is the right place to load those files.

#### 9.6.4 Theme Storage

All themes by default must be placed under the `[AppEntryPath]/themes` directory, where `AppEntryPath` refers to the directory containing the application entry script. If you want to use a different directory, configure the `BasePath` and `BaseUrl` properties of the `System.Web.UI.ThemeManager` module in application configuration,

```
<service id="page" class="TPageService">
  <modules>
    <module id="theme"
      class="System.Web.UI.ThemeManager"
      BasePath="mythemes"
      BaseUrl="mythemes" />
  </modules>
</service>
```

#### 9.6.5 Creating Themes

Creating a theme involves creating the theme directory and writing skin files (and possibly javascript and CSS files). The name of skin files must be terminated with `.skin`. The format of skin files are the same as that of control template files. Since skin files do not define parent-child presentational relationship among controls, you cannot place a component tag within another. And any static texts between component tags are discarded. To define the aforementioned 'Blue' skin for `TButton`, write the following in a skin file,

```
<com:TButton SkinID="Blue" BackColor="blue" />
```

As aforementioned, you can put several skins within a single skin file, or split them into several files. A commonly used strategy is that each skin file only contains skins for one type of controls. For example, `Button.skin` would contain skins only for the `TButton` control type.

## 9.7 Persistent State

Web applications often need to remember what an end user has done in previous page requests so that the new page request can be served accordingly. State persistence is to address this problem. Traditionally, if a page needs to keep track of user interactions, it will resort to session, cookie, or hidden fields. PRADO provides a new line of state persistence schemes, including view state, control state, and application state.

### 9.7.1 View State

View state lies at the heart of PRADO. With view state, Web pages become stateful and are capable of restoring pages to the state that end users interacted with before the current page request. Web programming thus resembles to Windows GUI programming, and developers can think continuously without worrying about the roundtrips between end users and the Web server. For example, with view state, a textbox control is able to detect if the user input changes the content in the textbox.

View state is only available to controls. View state of a control can be disabled by setting its `EnableViewState` property to false. To store a variable in view state, call the following,

```
$this->setViewState('Caption',$caption);
```

where `$this` refers to the control object, `Caption` is a unique key identifying the `$caption` variable stored in viewstate. To retrieve the variable back from view state, call the following,

```
$caption = $this->getViewState('Caption');
```

### 9.7.2 Control State

Control state is like view state in every aspect except that control state cannot be disabled. Control state is intended to be used for storing crucial state information without which a page or control may not work properly.

To store and retrieve a variable in control state, use the following commands,

```
$this->setControlState('Caption',$caption);  
$caption = $this->getControlState('Caption');
```

### 9.7.3 Application State

Application state refers to data that is persistent across user sessions and page requests. A typical example of application state is the user visit counter. The counter value is persistent even if the current user session terminates. Note, view state and control state are lost if the user requests for a different page, while session state is lost if the user session terminates.

To store and retrieve a variable in application state, use the following commands,

```
$application->setGlobalState('Caption',$caption);  
$caption = $application->getGlobalState('Caption');
```

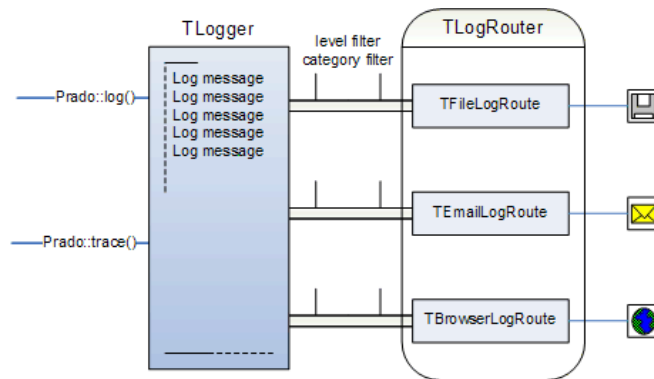
### 9.7.4 Session State

PRADO encapsulates the traditional session management in `THttpSession` module. The module can be accessed from within any component by using `$this->Session`, where `$this` refers to the component object.

## 9.8 Logging

PRADO provides a highly flexible and extensible logging functionality. Messages logged can be classified according to log levels and message categories. Using level and category filters, the messages can be further routed to different destinations, such as files, emails, browser windows, etc. The following diagram shows the basic architecture of PRADO logging mechanism,





### 9.8.1 Using Logging Functions

The following two methods are provided for logging messages in PRADO,

```
Prado::log($message, $logLevel, $category);
Prado::trace($message, $category);
```

The difference between `Prado::log()` and `Prado::trace()` is that the latter automatically selects the log level according to the application mode. If the application is in **Debug** mode, stack trace information is appended to the messages. `Prado::trace()` is widely used in the core code of the PRADO framework.

### 9.8.2 Message Routing

Messages logged using the above two functions are kept in memory. To make use of the messages, developers need to route them to specific destinations, such as files, emails, or browser windows. The message routing is managed by `System.Util.TLogRouter` module. When plugged into an application, it can route the messages to different destination in parallel. Currently, PRADO provides three types of routes:

- **TFileLogRoute** - filtered messages are stored in a specified log file. By default, this file is named `prado.log` under the runtime directory of the application. File rotation is provided.
- **TEmailLogRoute** - filtered messages are sent to pre-specified email addresses.
- **TBrowserLogRoute** - filtered messages are appended to the end of the current page output.

To enable message routing, plug in and configure the `TLogRouter` module in application configuration,

```
<module id="log" class="System.Util.TLogRouter">
  <route class="TBrowserLogRoute"
    Levels="Info"
    Categories="System.Web.UI.TPage, System.Web.UI.WebControls" />
  <route class="TFileLogRoute"
    Levels="Warning, Error"
    Categories="System.Web" />
</module>
```

In the above, the `Levels` and `Categories` specify the log and category filters to selectively retrieve the messages to the corresponding destinations.

### 9.8.3 Message Filtering

Messages can be filtered according to their log levels and categories. Each log message is associated with a log level and a category. With levels and categories, developers can selectively retrieve messages that they are interested on.

Log levels defined in `System.Util.TLogger` include: `DEBUG`, `INFO`, `NOTICE`, `WARNING`, `ERROR`, `ALERT`, `FATAL`. Messages can be filtered according log level criteria. For example, if a filter specifies `WARNING` and `ERROR` levels, then only those messages that are of `WARNING` and `ERROR` will be returned.

Message categories are hierarchical. A category whose name is the prefix of another is said to be the ancestor category of the other category. For example, `System.Web` category is the ancestor of `System.Web.UI` and `System.Web.UI.WebControls` categories. Messages can be selectively retrieved using such hierarchical category filters. For example, if the category filter is `System.Web`, then all messages in the `System.Web` are returned. In addition, messages in the child categories, such as `System.Web.UI.WebControls`, are also returned.

By convention, the messages logged in the core code of PRADO are categorized according to the namespace of the corresponding classes. For example, messages logged in `TPage` will be of category `System.Web.UI.TPage`.

## 9.9 Internationalization (I18N) and Localization (L10N)

Many web application built with PHP will not have internationalization in mind when it was first written. It may be that it was not intended for use in languages and cultures. Internationalization is an important aspect due to the increase adoption of the Internet in many non-English speaking countries. The process of internationalization and localization will contain difficulties. Below are some general guidelines to internationalize an existing application.

### 9.9.1 Separate culture/locale sensitive data

Identify and separate data that varies with culture. The most obvious are text/string/message. Other type of data should also be considered. The following list categorize some examples of culture sensitive data

- Strings, Messages, Text, in relatively small units (e.g. phrases, sentences, paragraphs, but not the full text of a book).
- Labels on buttons.
- Help files, large units of text, static text.
- Sounds.
- Colors.
- Graphics,Icons.
- Dates, Times.
- Numbers, Currency, Measurements.
- Phone numbers.
- Honorifics and personal titles.
- Postal address.
- Page layout.

If possible all manner of text should be isolated and store in a persistence format. These text include, application error messages, hard coded strings in PHP files, emails, static HTML text, and text on form elements (e.g. buttons).

### 9.9.2 Configuration

To enable the localization features in Prado, you need to add a few configuration options in your [application configuration](#). First you need to include the `System.I18N.*` namespace to your paths.

```
<paths>
    <using namespace="System.I18N.*" />
</paths>
```

Then, if you wish to translate some text in your application, you need to add one translation message data source.

```
<module id="globalization" class="TGlobalization">
    <translation type="XLIFF"
        source="MyApp.messages"
        autosave="true" cache="true" />
</module>
```

Where `source` in `translation` is the dot path to a directory where you are going to store your translate message catalogue. The `autosave` attribute if enabled, saves untranslated messages back into the message catalogue. With `cache` enabled, translated messages are saved in the application `runtime/i18n` directory.

With the configuration complete, we can now start to localize your application. If you have `autosave` enabled, after running your application with some localization activity (i.e. translating some text), you will see a directory and a `messages.xml` created within your `source` directory.

### 9.9.3 What to do with messages.xml?

The translation message catalogue file, if using `type="XLIFF"`, is a standardized translation message interchange XML format. You can edit the XML file using any UTF-8 aware editor. The format of the XML is something like the following.

```
<?xml version="1.0"?>
<xliff version="1.0">
    <file original="I18N Example IndexPage"
```

```
        source-language="EN"
        datatype="plaintext"
        date="2005-01-24T11:07:53Z">
    <body>

    <trans-unit id="1">
    <source>Hello world.</source>
    <target>Hi World!!!</target>
    </trans-unit>

    </body>
    </file>
</xliff>
```

Each translation message is wrapped within a **trans-unit** tag, where **source** is the original message, and **target** is the translated message. Editors such as [Heartsome XLIFF Translation Editor](#) can help in editing these XML files.

#### 9.9.4 Setting and Changing Culture

Once globalization is enabled, you can access the globalization settings, such as **Culture**, **Charset**, etc, using

```
$globalization = $this->getApplication()->getGlobalization();
echo $globalization->Culture;
$globalization->Charset= "GB-2312"; //change the charset
```

You also change the way the culture is determined by changing the **class** attribute in the module configuration. For example, to set the culture that depends on the browser settings, you can use the **TGlobalizationAutoDetect** class.

```
<module id="globalization" class="TGlobalizationAutoDetect">
    ...
</module>
```

You may also provide your own globalization class to change how the application culture is set. Lastly, you can change the globalization settings on page by page basis using [template control tags](#). For example, changing the `Culture` to "zh".

```
<%@ Application.Globalization.Culture="zh" %>
```

### 9.9.5 Localizing your Prado application

There are two areas in your application that may need message or string localization, in PHP code and in the templates. To localize strings within PHP, use the `localize` function detailed below. To localize text in the template, use the [TTranslate](#) component.

### 9.9.6 Using localize function to translate text within PHP

The `localize` function searches for a translated string that matches original from your translation source. First, you need to locate all the hard coded text in PHP that are displayed or sent to the end user. The following example localizes the text of the `$sender` (assuming, say, the sender is a button). The original code before localization is as follows.

```
function clickMe($sender,$param)
{
    $sender->Text="Hello, world!";
}
```

The hard coded message "Hello, world!" is to be localized using the `localize` function.

```
function clickMe($sender,$param)
{
    $sender->Text=Prado::localize("Hello, world!");
}
```

### 9.9.7 Compound Messages

Compound messages can contain variable data. For example, in the message "There are 12 users online.", the integer 12 may change depending on some data in your application. This is difficult

to translate because the position of the variable data may be difference for different languages. In addition, different languages have their own rules for plurals (if any) and/or quantifiers. The following example can not be easily translated, because the sentence structure is fixed by hard coding the variable data within message.

```
$num_users = 12;  
$message = "There are " . $num_users . " users online.";
```

This problem can be solved using the `localize` function with string substitution. For example, the `$message` string above can be constructed as follows.

```
$num_users = 12;  
$message = Prado::localize("There are {num_users} users online.", array('num_users'=>$num_users));
```

Where the second parameter in `localize` takes an associative array with the key as the substitution to find in the text and replaced it with the associated value. The `localize` function does not solve the problem of localizing languages that have plural forms, the solution is to use [TChoiceFormat](#).

The following sample demonstrates the basics of localization in Prado. [Advanced.Samples.I18N.Home Demo](#)

## 9.10 I18N Components

### 9.10.1 TTranslate

Messages and strings can be localized in PHP or in templates. To translate a message or string in the template, use `TTranslate`.

```
<com:TTranslate>Hello World</com:TTranslate>  
<com:TTranslate Text="Goodbye" />
```

`TTranslate` can also perform string substitution. The `Parameters` property can be use to add name values pairs for substitution. Substrings in the translation enclosed with "{" and "}" are consider as the parameter names during substitution lookup. The following example will substitute the substring "{time}" with the value of the parameter attribute "





## Chapter 10

# Client-side Scripting

### 10.1 Introduction to Javascript

This guide is based on the [Quick guide to somewhat advanced JavaScript tour of some OO features](#) by Sergio Pereira.

#### 10.1.1 Hey, I didn't know you could do that

If you are a web developer and come from the same place I do, you have probably used quite a bit of Javascript in your web pages, mostly as UI glue.

Until recently, I knew that Javascript had more OO capabilities than I was employing, but I did not feel like I needed to use it. As the browsers started to support a more standardized featureset of Javascript and the DOM, it became viable to write more complex and functional code to run on the client. That helped giving birth to the AJAX phenomena.

As we all start to learn what it takes to write our cool, AJAXy applications, we begin to notice that the Javascript we used to know was really just the tip of the iceberg. We now see Javascript being used beyond simple UI chores like input validation and frivolous tasks. The client code now is far more advanced and layered, much like a real desktop application or a client-server thick client. We see class libraries, object models, hierarchies, patterns, and many other things we got used to seeing only in our server side code.

In many ways we can say that suddenly the bar was put much higher than before. It takes a heck lot more proficiency to write applications for the new Web and we need to improve our Javascript skills to get there. If you try to use many of the existing javascript libraries out there, like [Prototype.js](#), [Scriptaculous](#), [moo.fx](#), [Behaviour](#), [YUI](#), etc you'll eventually find yourself reading the JS code. Maybe because you want to learn how they do it, or because you're curious, or more often because that's the only way to figure out how to use it, since documentation does not seem to be highly regarded with most of these libraries. Whatever the case may be, you'll face some kung-fu techniques that will be foreign and scary if you haven't seen anything like that before.

The purpose of this article is precisely explaining the types of constructs that many of us are not familiar with yet.

### 10.1.2 JSON (JavaScript Object Notation)

JavaScript Object Notation ([JSON](#)), is one of the new buzzwords popping up around the AJAX theme. JSON, simply put, is a way of declaring an object in javascript. Let's see an example right away and note how simple it is.

```
var myPet = { color: 'black', leg_count: 4, communicate: function(repeatCount){
for(i=0;i<repeatCount;i++) alert('Woof!');} };
```

Let's just add little bit of formatting so it looks more like how we usually find out there:

```
var myPet =
{
    color: 'black',
    legCount: 4,
    communicate: function(repeatCount)
    {
        for(i=0;i<repeatCount;i++)
            alert('Woof!');
    }
};
```

Here we created a reference to an object with two properties (`color` and `legCount`) and a method (`communicate`.) It's not hard to figure out that the object's properties and methods are defined

as a comma delimited list. Each of the members is introduced by name, followed by a colon and then the definition. In the case of the properties it is easy, just the value of the property. The methods are created by assigning an anonymous function, which we will explain better down the line. After the object is created and assigned to the variable `myPet`, we can use it like this:

```
alert('my pet is ' + myPet.color);
alert('my pet has ' + myPet.legCount + ' legs');
//if you are a dog, bark three times:
myPet.communicate(3);
```

You'll see JSON used pretty much everywhere in JS these days, as arguments to functions, as return values, as server responses (in strings,) etc.

### 10.1.3 What do you mean? A function is an object too?

This might be unusual to developers that never thought about that, but in JS a function is also an object. You can pass a function around as an argument to another function just like you can pass a string, for example. This is extensively used and very handy.

Take a look at this example. We will pass functions to another function that will use them.

```
var myDog =
{
    bark: function()
    {
        alert('Woof!');
    }
};

var myCat =
{
    meow: function()
    {
        alert('I am a lazy cat. I will not meow for you.');
```

```
function annoyThePet(petFunction)
{
    //let's see what the pet can do
    petFunction();
}

//annoy the dog:
annoyThePet(myDog.bark);
//annoy the cat:
annoyThePet(myCat.meow);
```

Note that we pass `myDog.bark` and `myCat.meow` without appending parenthesis `()` to them. If we did that we would not be passing the function, rather we would be calling the method and passing the return value, `undefined` in both cases here.

If you want to make my lazy cat start barking, you can easily do this:

```
myCat.meow = myDog.bark;
myCat.meow(); //alerts 'Woof!'
```

#### 10.1.4 Arrays, items, and object members

The following two lines in JS do the same thing.

```
var a = new Array();
var b = [];
```

As I'm sure you already know, you can access individual items in an array by using the square brackets:

```
var a = ['first', 'second', 'third'];
var v1 = a[0];
var v2 = a[1];
var v3 = a[2];
```

But you are not limited to numeric indices. You can access any member of a JS object by using its name, in a string. The following example creates an empty object, and adds some members by name.

```
var obj = {}; //new, empty object
obj['member_1'] = 'this is the member value';
obj['flag_2'] = false;
obj['some_function'] = function()\{ /* do something */\};
```

The above code has identical effect as the following:

```
var obj =
{
    member_1:'this is the member value',
    flag_2: false,
    some_function: function(){ /* do something */}
};
```

In many ways, the idea of objects and associative arrays (hashes) in JS are not distinguishable. The following two lines do the same thing too.

```
obj.some_function();
obj['some_function']();
```

### 10.1.5 Enough about objects, may I have a class now?

The great power of object oriented programming languages derive from the use of classes. I don't think I would have guessed how classes are defined in JS using only my previous experience with other languages. Judge for yourself.

```
//defining a new class called Pet
var Pet = function(petName, age)
{
    this.name = petName;
    this.age = age;
```

```
};

//let's create an object of the Pet class
var famousDog = new Pet('Santa\'s Little Helper', 15);
alert('This pet is called ' + famousDog.name);
```

Let's see how we add a method to our `Pet` class. We will be using the `prototype` property that all classes have. The `prototype` property is an object that contains all the members that any object of the class will have. Even the default JS classes, like `String`, `Number`, and `Date` have a `prototype` object that we can add methods and properties to and make any object of that class automatically gain this new member.

```
Pet.prototype.communicate = function()
{
    alert('I do not know what I should say, but my name is ' + this.name);
};
```

That's when a library like [prototype.js](#) comes in handy. If we are using `prototype.js`, we can make our code look cleaner (at least in my opinion.)

```
var Pet = Class.create();
Pet.prototype =
{
    //our 'constructor'
    initialize: function(petName, age)
    {
        this.name = petName;
        this.age = age;
    },

    communicate: function()
    {
        alert('I do not know what I should say, but my name is ' + this.name);
    }
};
```

### 10.1.6 Functions as arguments, an interesting pattern

If you have never worked with languages that support closures you may find the following idiom too funky.

```
var myArray = ['first', 'second', 'third'];
myArray.each( function(item, index)
{
    alert('The item in the position #' + index + ' is:' + item);
});
```

Whoa! Let's explain what is going on here before you decide I've gone too far and navigate to a better article than this one.

First of all, in the above example we are using the prototype.js library, which adds the each function to the Array class. The each function accepts one argument that is a function object. This function, in turn, will be called once for each item in the array, passing two arguments when called, the item and the index for the current item. Let's call this function our iterator function. We could have also written the code like this.

```
function myIterator(item, index)
{
    alert('The item in the position #' + index + ' is:' + item);
}

var myArray = ['first', 'second', 'third'];
myArray.each( myIterator );
```

But then we would not be doing like all the cool kids in school, right? More seriously, though, this last format is simpler to understand but causes us to jump around in the code looking for the myIterator function. It's nice to have the logic of the iterator function right there in the same place it's called. Also, in this case, we will not need the iterator function anywhere else in our code, so we can transform it into an anonymous function without penalty.

### 10.1.7 This is this but sometimes this is also that

One of the most common troubles we have with JS when we start writing our code is the use of the `this` keyword. It could be a real tripwire.

As we mentioned before, a function is also an object in JS, and sometimes we do not notice that we are passing a function around.

Take this code snippet as an example.

```
function buttonClicked()
{
    alert('button ' + this.id + ' was clicked');
}

var myButton = document.getElementById('someButtonID');
var myButton2 = document.getElementById('someOtherButtonID');
myButton.onclick = buttonClicked;
myButton2.onclick = buttonClicked;
```

Because the `buttonClicked` function is defined outside any object we may tend to think the `this` keyword will contain a reference to the `window` or `document` object (assuming this code is in the middle of an HTML page viewed in a browser.)

But when we run this code we see that it works as intended and displays the `id` of the clicked button. What happened here is that we made the `onclick` method of each button contain the `buttonClicked` object reference, replacing whatever was there before. Now whenever the button is clicked, the browser will execute something similar to the following line.

```
myButton.onclick();
```

That isn't so confusing afterall, is it? But see what happens you start having other objects to deal with and you want to act on these object upon events like the button's click.

```
var myHelper =
{
    formFields: [ ],
```



```
emptyAllFields: function()
{
    for(i=0; i < this.formFields.length; i++)
    {
        var elementID = this.formFields[i];
        var field = document.getElementById(elementID);
        field.value = '';
    }
}

};

//tell which form fields we want to work with
myHelper.formFields.push('txtName');
myHelper.formFields.push('txtEmail');
myHelper.formFields.push('txtAddress');

//clearing the text boxes:
myHelper.emptyAllFields();

var clearButton = document.getElementById('btnClear');
clearButton.onclick = myHelper.emptyAllFields;
```

So you think, nice, now I can click the Clear button on my page and those three text boxes will be emptied. Then you try clicking the button only to get a runtime error. The error will be related to (guess what?) the `this` keyword. The problem is that `this.formFields` is not defined if `this` contains a reference to the button, which is precisely what's happening. One quick solution would be to rewrite our last line of code.

```
clearButton.onclick = function()
{
    myHelper.emptyAllFields();
};
```

That way we create a brand new function that calls our helper method within the helper object's context.

## 10.2 Developer Notes for prototype.js

This guide is based on the [Developer Notes for prototype.js](#) by Sergio Pereira.

### 10.2.1 What is that?

In case you haven't already used it, [prototype.js](#) is a JavaScript library written by [Sam Stephenson](#). This amazingly well thought and well written piece of **standards-compliant** code takes a lot of the burden associated with creating rich, highly interactive web pages that characterize the Web 2.0 off your back.

If you tried to use this library recently, you probably noticed that documentation is not one of its strongest points. As many other developers before me, I got my head around prototype.js by reading the source code and experimenting with it. I thought it would be nice to take notes while I learned and share with everybody else.

As you read the examples and the reference, developers familiar with the Ruby programming language will notice an intentional similarity between Ruby's built-in classes and many of the extensions implemented by this library.

### 10.2.2 Using the `$()` function

The `$()` function is a handy shortcut to the all-too-frequent `document.getElementById()` function of the DOM. Like the DOM function, this one returns the element that has the id passed as an argument.

Unlike the DOM function, though, this one goes further. You can pass more than one id and `$()` will return an `Array` object with all the requested elements. The example below should illustrate this.

```
<com:TClientScript UsingClientScripts="prado" />
<div id="myDiv">
    This is a paragraph
</div>

<div id="myOtherDiv">
```

```
    This is another paragraph
</div>

<input type="button" value=Test1 onclick="test1();" />
<input type="button" value=Test2 onclick="test2();" />

<script type="text/javascript">
/**/
function test1()
{
    var d = $('myDiv');
    alert(d.innerHTML);
}

function test2()
{
    var divs = $('myDiv','myOtherDiv');
    for(i=0; i&lt;divs.length; i++)
    {
        alert(divs[i].innerHTML);
    }
}
/*]]&gt;*/
&lt;/script&gt;</pre></div><div data-bbox="157 604 862 659" data-label="Text"><p>Another nice thing about this function is that you can pass either the <code>id</code> string or the element object itself, which makes this function very useful when creating other functions that can also take either form of argument.</p></div><div data-bbox="157 691 469 709" data-label="Section-Header"><h3>10.2.3 Using the <code>$F()</code> function</h3></div><div data-bbox="157 731 862 785" data-label="Text"><p>The <code>$F()</code> function is a another welcome shortcut. It returns the value of any field input control, like text boxes or drop-down lists. The function can take as argument either the element <code>id</code> or the element object itself.</p></div><div data-bbox="157 810 599 825" data-label="Text"><pre>&lt;input type="text" id="userName" value="Joe Doe" /&gt;</pre></div><div data-bbox="490 881 523 896" data-label="Page-Footer">125</div>
```

```
<input type="button" value=Test3 onclick="test3();" />

<script type="text/javascript">
/**/
function test3()
{
    alert($F('userName'));
}
/*]]&gt;*/
&lt;/script&gt;</pre></div><div data-bbox="157 353 468 372" data-label="Section-Header"><h3>10.2.4 Using the <code>$A()</code> function</h3></div><div data-bbox="157 394 737 411" data-label="Text"><p>The <code>$A()</code> function converts the single argument it receives into an <code>Array</code> object.</p></div><div data-bbox="157 424 862 479" data-label="Text"><p>This function, combined with the extensions for the <code>Array</code> class, makes it easier to convert or copy any enumerable list into an <code>Array</code> object. One suggested use is to convert DOM <code>NodeLists</code> into regular arrays, which can be traversed more efficiently. See example below.</p></div><div data-bbox="157 509 787 823" data-label="Text"><pre>&lt;select id="lstEmployees" size="10" &gt;
    &lt;option value="5"&gt;Buchanan, Steven&lt;/option&gt;
    &lt;option value="8"&gt;Callahan, Laura&lt;/option&gt;
    &lt;option value="1"&gt;Davolio, Nancy&lt;/option&gt;
&lt;/select&gt;

&lt;input type="button" value="Show the options" onclick="showOptions();" /&gt;

&lt;script type="text/javascript"&gt;
/*<![CDATA[*/
function showOptions()
{
    var someNodeList = $('lstEmployees').options;
    var nodes = $A(someNodeList);

    nodes.each(function(node)
    {</pre></div><div data-bbox="490 881 523 896" data-label="Page-Footer">126</div>
```

```
        alert(node.nodeName + ': ' + node.innerHTML);
    });
}
/*]]>*/
</script>
```

### 10.2.5 Using the \$H() function

The \$H() function converts objects into enumerable Hash objects that resemble associative arrays.

```
function testHash()
{
    //let's create the object
    var a =
    {
        first: 10,
        second: 20,
        third: 30
    };

    //now transform it into a hash
    var h = $H(a);
    alert(h.toString());

    //displays: first=10&second=20&third=30
}
```

### 10.2.6 Enumerating... Wow! Damn! Wahoo!

We are all familiar with for loops. You know, create yourself an array, populate it with elements of the same kind, create a loop control structure (for, foreach, while, repeat, etc.) access each element sequentially, by its numeric index, and do something with the element.

When you come to think about it, almost every time you have an array in your code it means that you'll be using that array in a loop sooner or later. Wouldn't it be nice if the array objects had

more functionality to deal with these iterations? Yes, it would, and many programming languages provide such functionality in their arrays or equivalent structures (like collections and lists.)

Well, it turns out that `prototype.js` gives us the `Enumerable` object, which implements a plethora of tricks for us to use when dealing with iterable data. The `prototype.js` library goes one step further and extends the `Array` class with all the methods of `Enumerable`.

### Loops and iterator

In standard javascript, if you wanted to sequentially display the elements of an array, you could very well write something like this.

```
<script type="text/javascript">
/**/
function showList()
{
    var simpsons = ['Homer', 'Marge', 'Lisa', 'Bart', 'Meg'];
    for(i=0; i &lt; simpsons.length; i++)
    {
        alert(simpsons[i]);
    }
}
/*]]&gt;*/
&lt;/script&gt;

&lt;input type="button" value="Show List" onclick="showList();" /&gt;</pre></div><div data-bbox="157 654 686 670" data-label="Text"><p>With our new best friend, <code>prototype.js</code>, we can rewrite this loop like this.</p></div><div data-bbox="157 697 683 825" data-label="Text"><pre>function showList()
{
    var simpsons = ['Homer', 'Marge', 'Lisa', 'Bart', 'Meg'];
    simpsons.each( function(familyMember)
    {
        alert(familyMember);
    });
}</pre></div><div data-bbox="490 881 523 896" data-label="Page-Footer">128</div>
```

```
}
```

You are probably thinking "big freaking deal...just a weird syntax for the same old thing." Well, in the above example, yes, there's nothing too earth shattering going on. Afterall, there's not much to be changed in such a drop-dead-simple example. But keep reading, nonetheless.

Before we move on. Do you see this function that is being passed as an argument to the **each** method? Let's start referring to it as an **iterator** function.

### Your arrays on steroids

Like we mentioned above, it's very common for all the elements in your array to be of the same kind, with the same properties and methods. Let's see how we can take advantage of iterator functions with our new souped-up arrays.

Finding an element according to a criteria.

```
<script type="text/javascript">
/**/
function findEmployeeById(emp_id)
{
    var listBox = $('lstEmployees')
    var options = $(listBox.options);
    var opt = options.find( function(employee)
    {
        return (employee.value == emp_id);
    });

    alert(opt.innerHTML); //displays the employee name
}
/*]]&gt;*/
&lt;/script&gt;

&lt;select id="lstEmployees" size="10" &gt;
    &lt;option value="5"&gt;Buchanan, Steven&lt;/option&gt;
    &lt;option value="8"&gt;Callahan, Laura&lt;/option&gt;
    &lt;option value="1"&gt;Davolio, Nancy&lt;/option&gt;</pre></div><div data-bbox="490 881 523 896" data-label="Page-Footer">129</div>
```

```
</select>
```

```
<input type="button" value="Find Laura" onclick="findEmployeeById(8);" />
```

Now let's kick it up another notch. See how we can filter out items in arrays, then retrieve just a desired member from each element.

```
<script type="text/javascript">
/**/
function showLocalLinks(paragraph)
{
    paragraph = $(paragraph);
    var links = $A(paragraph.getElementsByTagName('a'));

    //find links that do not start with 'http'
    var localLinks = links.findAll( function(link)
    {
        var start = link.href.substring(0,4);
        return start != 'http';
    });

    //now the link texts
    var texts = localLinks.pluck('innerHTML');

    //get them in a single string
    var result = texts.inspect();
    alert(result);
}
/*]]&gt;*/
&lt;/script&gt;

&lt;p id="someText"&gt;
    This &lt;a href="http://othersite.com/page.html"&gt;text&lt;/a&gt; has
    a &lt;a href="#localAnchor"&gt;lot&lt;/a&gt; of
    &lt;a href="#otherAnchor"&gt;links&lt;/a&gt;. Some are
    &lt;a href="http://wherever.com/page.html"&gt;external&lt;/a&gt;
    and some are &lt;a href="#someAnchor"&gt;local&lt;/a&gt;</pre></div><div data-bbox="490 881 523 896" data-label="Page-Footer">130</div>
```



```
<input type=button value="Find Local Links"
      onclick="showLocalLinks('someText')" />
```

It takes just a little bit of practice to get completely addicted to this syntax. Next we will go through the available functions with the following example.

## 10.3 Enumerable Functions

The sample data for the following examples.

```
var Fixtures =
{
  Products:
  [
    {name: 'Basecamp', company: '37signals', type: 'Project Management'},
    {name: 'Shopify', company: 'JadedPixel', type: 'E-Commerce'},
    {name: 'Mint', company: 'Shaun Inman', type: 'Statistics'}
  ],

  Artist:
  [
    'As I Lay Dying',
    '36 Crazyfist',
    'Shadows Fall',
    'Trivium',
    'In Flames'
  ],

  Numbers: [0, 1, 4, 5, 98, 32, 12, 9]
};

var F = Fixtures;
```

### 10.3.1 Enumerable.each function

I used to find myself writing a lot of for loops. Although, Prototype doesn't by any means eliminate the need to do for loops, it does give you access to what I consider to be a cleaner, easier to read method in each.

```
for(var i = 0; i < F.Numbers.length; i++)
{
    Logger.info(F.Numbers[i]);
}
```

The `each` function allows us to iterate over these objects Ruby style.

```
F.Numbers.each(function(num)
{
    Logger.info(num);
});
```

```
//Output
0
1
4
5
98
32
12
9
```

The `each` function takes one argument, an **iterator** function. This iterator is invoked once for every item in the array, and that item along with the optional index is passed to the iterator. So if we also needed the index we could do something like the code below.

```
F.Numbers.each(function(num, index)
{
    Logger.info(index + ": " + num);
});
```

```
//Output
0: 0
1: 1
2: 4
3: 5
4: 98
5: 32
6: 12
7: 9
```

#### 10.3.2 Hash key/value pairs

Hashes can be created by wrapping an Object (associative array) in `$H()` and can have their key/value pairs exposed.

```
$H(F.Products[0]).each(function(product)
{
  Logger.info(product.key + ": " + product.value);
});
```

```
//Outputs
name: Basecamp
company: 37signals
type: Project Management
```

We can also directly access the keys and values of a Hash without iterating over it.

```
$H(F.Products[1]).keys();
//Outputs name,company,type

$H(F.Products[1]).values();
//Outputs Shopify,JadedPixel,E-Commerce
```

### 10.3.3 Enumerable.collect function

The `collect` function allows you to iterate over an `Array` and return the results as a new array. Each item returned as a result of the iteration will be pushed onto the end of the new array.

```
var companies = F.Products.collect(function(product)
{
    return product.company;
});
```

```
Logger.info(companies.join(', '));
```

```
// Outputs
// 37signals, JadedPixel, Shaun Inman
```

You can even join on the end of the block.

```
return F.Products.collect(function(product)
{
    return product.company;
}).join(', ');
```

### 10.3.4 Enumerable.include function

The `include` function allows you to check if a value is included in an array and returns true or false depending on if a match was made. Assuming I put up a form asking the user to name some artist in my iTunes playlist, we could do something like the code below. Prime candidate for some conditional madness.

```
return F.Artists.include('Britney Spears'); // returns false
```

### 10.3.5 Enumerable.inject function

The `inject` function is good for getting a collective sum from an array of values. For instance, to add up all the numbers.

```
var score = F.Numbers.inject(0, function(sum, value)
{
    return sum + value;
});

Logger.info(score);
//Output 161
```

The first argument to `inject` is just an initial value that would be added to the sum, so if we added 1 instead of 0, the output would be 162.

#### 10.3.6 `Enumerable.findAll` function

When given an Array, the `findAll` function will return an array of items for which the iterator evaluated to true. Basically, it allows you to build a new array of values based on some search criteria. If we wanted to find all products whose type was E-Commerce we could do something like the code below.

```
var ecom = F.Products.findAll(function(product)
{
    return product.type == 'E-Commerce';
});

Logger.info(ecom[0].company + " produces " + ecom[0].name);

//Outputs
JadedPixel produces Shopify
```

Note that even if only one match is made, just as in this case, the result is still returned as an array. In that case, `ecom.company` would return `undefined`.

#### 10.3.7 `Enumerable.detect` function

Unlike the `findAll` function, the `detect` function will only return the first item for which the expression inside the iterator is true. So, if we wanted to find the first number that was greater

than 5 we'd do something like the code below.

```
var low = F.Numbers.detect(function(num)
{
    return num > 5
});
```

```
Logger.info(low);
//Outputs 98
```

Even though, there are other numbers above 5 in our array, `detect` only gives us the first match back.

### 10.3.8 `Enumerable.invoke` function

The `invoke` function allows us to pass a method as a string and have that method invoked. For instance, if we wanted to sort our array of artists we'd do something like this:

```
[F.Artists].invoke('sort')
//Outputs 36 Crazyfist,As I Lay Dying,In Flames,Shadows Fall,Trivium
```

Why not just use `F.Artists.sort`? Well, for the example above we could do just that, but here is where `invoke` shines.

```
[F.Artists, F.Letters].invoke('sort');
//Outputs 36 Crazyfist,As I Lay Dying,In Flames,...
```

So we invoked `sort` for each sub-array. Note that the code below will not work.

```
F.Artists.invoke('sort');
```

The reason this will not work is because it is taking each item in that array and trying to apply `sort` to it, thus if we wrote it outright, it would look something like this:

```
"36 Crazy Fists".sort();
```

We could however do something like this:

```
F.Artists.invoke('toLowerCase');  
//Outputs 36 crazyfist,as i lay dying,in flames,shadows ...
```

Now, what about passing arguments to the `invoke` function? The first argument passed to `invoke` is the method to be invoked, and any other arguments beyond that will be passed as arguments to the invoked method.

```
F.Artists.invoke('concat', " is awesome ")  
//Outputs  
36 Crazyfist is awesome ,As I Lay Dying is awesome ,...
```

## 10.4 DOM Events and Javascript

### 10.4.1 Basic event handling

The syntax for working with events looks like the code below.

```
Event.observe(element, name, observer, [useCapture]);
```

Assuming for a moment that we want to observe when a link was clicked, we could do the following:

```
// <a id="clicker" href="http://foo.com">Click me</a>  
Event.observe('clicker', 'click', function(event)  
{  
    alert('clicked!');  
});
```

If we wanted to get the element that fired the event, we'd do this:

```
Event.observe('clicker', 'click', function(event)  
{  
    alert(Event.element(event));  
});
```

### 10.4.2 Observing keystrokes

If we wanted to observe keystrokes for the entire document, we could do the following:

```
Event.observe(document, 'keypress', function(event)
{
    if(Event.keyCode(event) == Event.KEY_TAB)
        alert('Tab Pressed');
});
```

And lets say we wanted to keep track of what has been typed :

```
Event.observe('search', 'keypress', function(event)
{
    Element.update('search-results', $F(Event.element(event)));
});
```

Prototype defines properties inside the event object for some of the more common keys, so feel free to dig around in Prototype to see which ones those are.

A final note on keypress events; If you'd like to detect a left click you can use `Event.isLeftClick(event)`.

### 10.4.3 Getting the coordinates of the mouse pointer

Drag and drop, dynamic element resizing, games, and much more all require the ability to track the X and Y location of the mouse. Prototype makes this fairly simple. The code below tracks the X and Y position of the mouse and spits out those values into an input box named mouse.

```
Event.observe(document, 'mousemove', function(event)
{
    $('mouse').value = "X: " + Event.pointerX(event) +
        "px Y: " + Event.pointerY(event) + "px";
});
```

If we wanted to observe the mouse location when it was hovering over a certain element, we'd just change the document argument to the id or element that was relevant.



### 10.4.4 Stopping Propagation

`Event.stop(event)` will stop the propagation of an event .

### 10.4.5 Events, Binding, and Objects

Everything has been fairly straight forward so far, but things start getting a little trickier when you need to work with events in an object-oriented environment. You have to deal with binding and funky looking syntax that might take a moment to get your head around.

Lets look at some code so you can get a better understanding of what I'm talking about.

```
EventDispenser = Class.create();
EventDispenser.prototype =
{
  initialize: function(list)
  {
    this.list = list;

    // Observe clicks on our list items
    $$ (this.list + " li").each(function(item)
    {
      Event.observe(item, 'click', this.showTagName.bindEvent(this));
    }.bind(this));

    // Observe when a key on the keyboard is pressed.
    // In the observer, we check for
    // the tab key and alert a message if it is pressed.
    Event.observe(document, 'keypress', this.onKeyPress.bindEvent(this));

    // Observe our fake live search box. When a user types
    // something into the box, the observer will take that
    // value(-1) and update our search-results div with it.
    Event.observe('search', 'keypress', this.onSearch.bindEvent(this));

    Event.observe(document, 'mousemove', this.onMouseMove.bindEvent(this));
```

```
    },

    // Arbitrary functions to respond to events
    showTagName: function(event)
    {
        alert(Event.element(event).tagName);
    },

    onKeyPress: function(event)
    {
        var code = event.keyCode;
        if(code == Event.KEY_TAB)
            alert('Tab key was pressed');
    },

    onSearch: function(event)
    {
        Element.update('search-results', $F(Event.element(event)));
    },

    onMouseMove: function(event)
    {
        $('mouse').value = "X: " + Event.pointerX(event) +
            "px Y: " + Event.pointerY(event) + "px";
    }
}
```

Whoa! What's going on here? Well, we've defined our a custom class `EventDispenser`. We're going to be using this class to setup events for our document. Most of this code is a rewrite of the code we looked at earlier except this time, we are working from inside an object.

Looking at the `initialize` method, we can really see how things are different now. Take a look at the code below:

```
// Observe clicks on our list items
$$('this.list + " li").each(function(item)
{
```

```
    Event.observe(item, 'click', this.showTagName.bindEvent(this));  
  }.bind(this));
```

We've got iterators, binding and all sorts of stuff going on. Lets break down what this chunk of code is doing.

First we are hunting for a collection of elements based on it's Css selector. This uses the Prototype selector function `$$()`. After we've found the list items we are dealing with we send those into an each iteration where we will add our observers.

```
Event.observe(item, 'click', this.showTagName.bindEvent(this));
```

Now looking at the code above, you'll notice the `bindEvent` function. This takes the method before it `showTagName` and treats it as the method that will be triggered when, in this case, someone clicks one of our list items.

You'll also notice we pass `this` as an argument to the `bindEvent` function. This simply allows us to reference the object in context `EventDispenser` inside our function `showTagName(event)`. If the `showTagName` function requires additional parameters, you can attach them to the later parameters of `bindEvent`. For example

```
this.showTagName.bindEvent(this, param1, param2);  
  
//where the showTagName function is defined as  
showTime : function (event, param1, param2) { ... }
```

Moving on, you'll see `bind(this)` attached to our iterator function. This really has nothing to do with events, it is only here to allow me to use `this` inside the iterator. If we didn't use `bind(this)`, I couldn't reference the method `showTagName` inside the iterator.

Ok, so we'll move on to looking at our methods that actually get called when an event occurs. Since we've been dealing with `showTagName`, lets look at it.

```
showTagName: function(event)  
{  
    alert(Event.element(event).tagName);  
}
```

As you can see, this function accepts one argument—the event. In order for us to get the element which fired the event we need to pass that argument to `Event.element`. Now we can manipulate it at will.

This covers the most confusing parts of our code. The text above is also relevant to the remaining parts of our code. If there is anything about this you don't understand, feel free to ask questions in the forum.

### 10.4.6 Removing Event Listeners

This one threw me for a loop the first time I tried to use it. I tried something similar to what I did in the `Event.observe` call with the exception of using `stopObserving`, but nothing seemed to change. In other words, the code below does **NOT** work.

```
$(this.list + " li").each(function(item)
{
    Event.stopObserving(item, 'click', this.showTagName);
}).bind(this));
```

What's the deal here? The reason this doesn't work is because there is no pointer to the observer. This means that when we passed `this.showTagName` in the `Event.observe` method before hand, we passed it as an anonymous function. We can't reference an anonymous function because it simply doesn't have a pointer.

So how do we get the job done? All we need to do is give the observing function a pointer, or the jargon free version: Set a variable that points to `this.showTagName`. Ok, lets change our code a bit.

```
this.showTagObserver = this.showTagName.bindEvent(this);

// Observe clicks on our list items
$(this.list + " li").each(function(item)
{
    Event.observe(item, 'click', this.showTagObserver);
}).bind(this));
```

Now we can remove the event listeners from our list like this:

```
$(this.list + " li").each(function(item)
{
    Event.stopObserving(item, 'click', this.showTagObserver);
}).bind(this));
```

## 10.5 Javascript in Prado, Questions and Answers

### 10.5.1 How do I include the predefined javascript libraries?

- Adding libraries in the template

```
<com:TClientScript UsingPradoScripts="effects" />
```

- Adding libraries in PHP code

```
$this->getPage()->getClientScript()->registerPradoScript("effects");
```

The available packaged libraries included in Prado are

- **prado** : basic prado javascript framework based on Prototype
- **effects** : visual effects from script.aculo.us
- **ajax** : ajax and callback related based on Prototype
- **validator** : validation
- **logger** : javascript logger and object browser
- **datepicker** : datepicker
- **rico** : Rico library
- **colorpicker** : colorpicker

The dependencies for each library are automatically resolved. Components that require a particular library will also automatically load the necessary libraries. For example, if you add a `TDatePicker` component on the page, the **datepicker** and its dependencies will be automatically included on the page.