

# Modifying 3D Mesh Objects

## Learning Objectives

After completing this chapter, you will be able to:

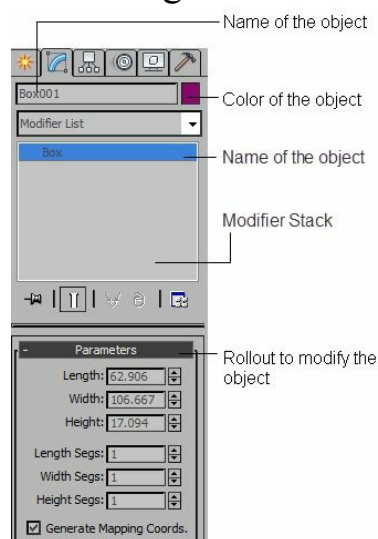
- **Convert objects into editable mesh**
- **Use sub-object levels**
- **Convert objects into editable poly**
- **Convert objects into editable patch**
- **Modify editable mesh, editable poly, and editable patch objects**

## INTRODUCTION

In the previous chapters, you have learned to create different 3D objects and shapes using the tools in the **Create** tab of the **Command Panel**. In this chapter, you will learn to modify the 3D mesh objects at an advanced level.

## MODIFYING THE 3D OBJECTS

To modify the 3D objects, select the object and choose the **Modify** tab in the **Command Panel**; the Modify panel will be displayed with various rollouts. In the Modify panel, the default name and color of the object will be displayed at the top. The modifier stack displays the name of the tools that you have used for creating the object, as shown in Figure 8-1.



**Figure 8-1** The Modify panel

## Note

The rollouts at the bottom of the Modify panel are displayed based on the type of the object selected.

You can modify the selected object using one of the following methods:

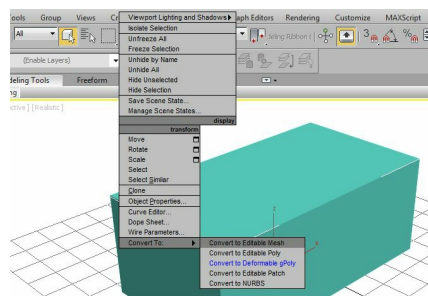
1. By entering new parameters in the rollouts displayed in the Modify panel. This has been discussed in the previous chapters.
2. By applying a modifier from the **Modifier List** drop-down list. You will learn about applying modifiers in the later chapters.
3. By converting the object into editable mesh, and editable poly, These methods are discussed next.

## Converting Objects into Editable Mesh

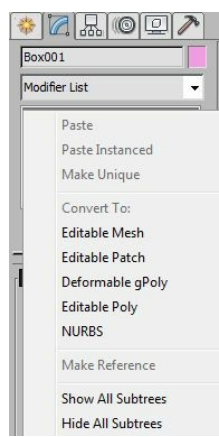
Most of the objects can be modified at advanced level by converting into editable mesh. When open splines such as line and arc are converted into the editable mesh, only vertices are available because open splines have no face or edge. When an object is converted into an editable mesh, you get access to its sub-object levels. These sub-object levels help you to select the sub-objects of an object in the viewport. You need to move, rotate, and scale these sub-objects to modify the shape of the object.

You can convert an object into editable mesh using one of the following methods:

1. Create an object and select it in the viewport. Next, right-click on the object; a quad menu will be displayed. Choose the **Convert To:** option; a cascading menu will be displayed, as shown in Figure 8-2. Choose **Convert to Editable Mesh** from the cascading menu; the object will be converted into an editable mesh.
2. Create an object and select it in the viewport. Choose the **Modify** tab in the **Command Panel**; the modifier stack will be displayed in the Modify panel. In the modifier stack, right-click on the name of the tool which has been used to create the object; a shortcut menu will be displayed, as shown in Figure 8-3. Choose the **Editable Mesh** option from the shortcut menu; the object will be converted into an editable mesh.



*Figure 8-2 The cascading menu displayed on choosing the **Convert To** option*



*Figure 8-3 The shortcut menu displayed*

3. Create an object and select it in the viewport. Choose the **Utilities** tab in the **Command Panel**; the **Utilities** rollout will be displayed, as shown in Figure 8-4. Choose the **Collapse** button in this rollout; the **Collapse** rollout will be displayed. Choose the **Collapse Selected** button in this rollout; the object will be converted into an editable mesh.



#### Note

*After an object is converted into editable mesh using any of the above method, it cannot be modified using the creation parameters rollouts such as **Parameters** rollout. So, it is recommended to set the parameters of an object before converting it into an editable mesh.*

You need to use the following method to set the parameters of an object even after converting it into an editable mesh.

4. Create an object and select it in the modifier stack. Next, click on the **Modifier List** drop-down list and select **Edit Mesh** from it; the **Edit Mesh** modifier is applied to the object.

## Sub-object Levels in Editable Mesh

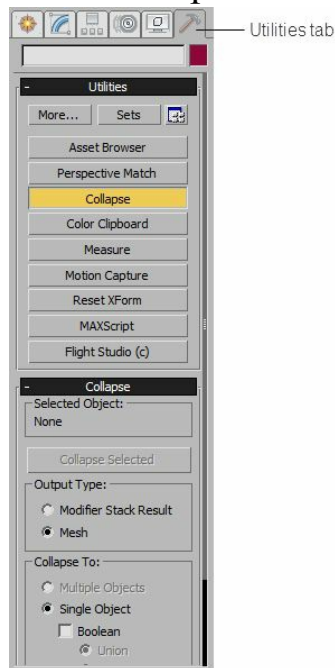
When you convert an object into an editable mesh using first three methods mentioned above, the label of the tool in the modifier stack will be replaced by **Editable Mesh**, which is known as object level. By clicking on the plus sign (+) on the left side of the **Editable Mesh**, you can view the sub-object levels such as **Vertex**, **Edge**, **Face**, **Polygon**, and **Element**, as shown in Figure 8-5. Various rollouts will also be displayed at the bottom of the modifier stack such as **Selection**, **Soft Selection**, **Edit Geometry**, and **Surface Properties**. These sub-object levels and rollouts are discussed next.

### Sub-object Levels

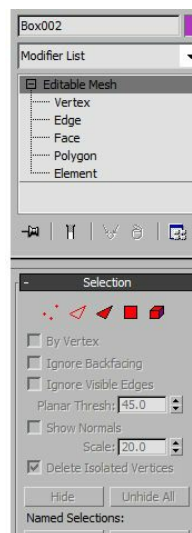
The sub-object levels are used to modify the object by moving, rotating, and scaling the sub-objects. To do so, select one of the sub-object levels from the modifier stack; the selected sub object will be activated and turn yellow in the **Selection** rollout. Alternatively, you can select the **Vertex**, **Edge**, **Face**, **Polygon**, or **Element** sub-object levels by pressing 1, 2, 3, 4, or 5 respectively from the main keyboard. These sub-objects level are discussed next.

## Vertex

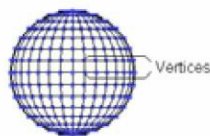
A vertex is a point on the object. To modify the vertex of the object, select the **Vertex** sub-object level from the modifier stack; the vertices of the object will be displayed in the viewport, as shown in Figures 8-6 and 8-7. The number of vertices depends on the number of segments in the object.



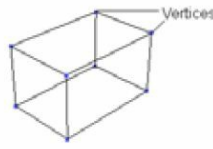
*Figure 8-4 The Utilities rollout displayed after choosing the Utilities tab*



*Figure 8-5 The sub-object levels of an object displayed*



*Figure 8-6 Displaying the vertices of the sphere*




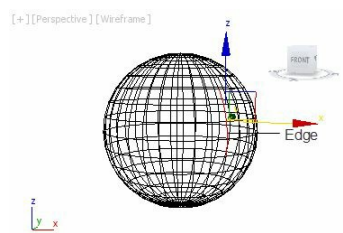
**Figure 8-7** *Displaying the vertices of the box*

 **Note**

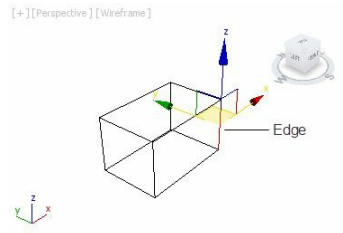
1. You need to set the number of segments in the object before converting it into editable mesh.
2. The sub-object components such as **Vertex**, **Edge**, **Face**, **Polygon**, and **Element** are not visible on rendering.

**Edge**

 An edge is a line joining two vertices. To modify an edge of the object, select the **Edge** sub-object level from the modifier stack and then select the edge(s) of the object, refer to Figures 8-8 and 8-9.




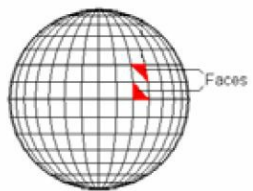
**Figure 8-8** *Selecting the edges of the sphere*



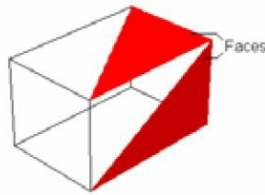
**Figure 8-9** *Selecting the edge of the box*

**Face**

 A face is a triangular shaped sub-object level formed by joining three vertices and three edges, as shown in Figure 8-10. To modify faces of the object, select the **Face** sub-object level from the modifier stack and then select the triangular faces of the object, as shown in Figure 8-11.




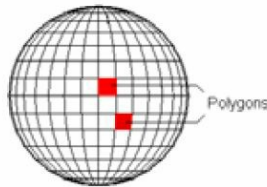
*Figure 8-10 The face sub-object level*



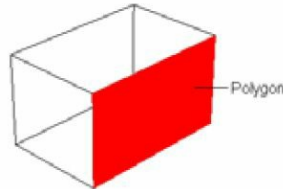
*Figure 8-11 A box with the faces selected*

## Polygon

 A polygon is a closed sequence of three or more edges connected by a surface, as shown in Figure 8-12. To modify polygons of the object, select the **Polygon** sub-object level from the modifier stack and then select the polygons of the object, as shown in Figure 8-13.




*Figure 8-12 The polygon sub-object level*



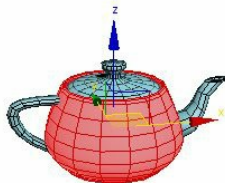
*Figure 8-13 A polygon of the box selected*

## Element

 An element is a group of two or more objects, as shown in Figure 8-14. To modify the elements of the object, select the **Element** sub-object level from the modifier stack and then select element of the object in the viewport, refer to Figures 8-14 and 8-15.



*Figure 8-14 The element sub-object level*



*Figure 8-15 The element of the box selected*

# Rollouts

When you convert an object into editable mesh, various rollouts will be displayed at the bottom of the modifier stack in the Modify panel. These rollouts are discussed next.

## Selection Rollout

The **Selection** rollout is used to toggle between various sub-object levels. In the **Selection** rollout, there are five buttons such as **Vertex**, **Edge**, **Face**, **Polygon**, and **Element**. These buttons are used to select the sub-objects levels of the object in the viewport and are discussed earlier in this chapter. Choose any of the buttons to activate the sub-object level of the object. The **By Vertex** check box will be activated on selecting **Edge**, **Face**, **Polygon**, or **Element** sub-object level from the **Selection** rollout. The **By Vertex** check box is used to select all the sub-objects that are connected to the selected vertex of the object. For example, if you select the **Polygon** sub-object level and then select the **By Vertex** check box. On clicking on a vertex of the object in the viewport, all the polygons that are connected to the selected vertex will be selected. Select the **Ignore Backfacing** check box to select the sub-objects that are facing toward you in the viewports. Note that you cannot select backfacing sub-objects on selecting this check box.

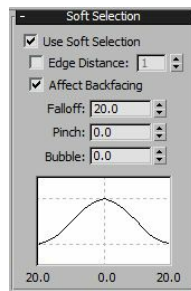


Note

*After selecting the **By Vertex** check box, you can select the sub-objects only by clicking a vertex or by selecting a portion of the object by dragging a selection box around it.*

## Soft Selection Rollout

This rollout enables you to display a soft selection on an object.



*Figure 8-16 The Soft Selection rollout*

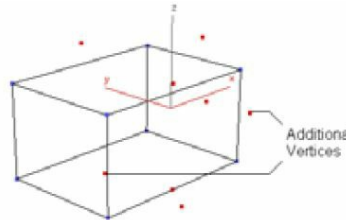
The options in this rollout are used to affect the action of movement, rotation, and scaling at sub-object level of the editable mesh object. To activate this rollout, you need to select a sub-object level. Next, to activate the other options of this rollout, select the **Use Soft Selection** check box, as shown in Figure 8-16. When you select the sub-objects of an object in the viewport, it shows the falloff in different color combinations. The influence of the colored zone is determined by the value set in the **Falloff** spinner. The shape of the falloff is controlled by the value in the **Pinch** and **Bubble** spinners, refer to Figure 8-16.

## Edit Geometry Rollout

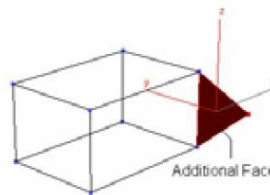
The options in this rollout are used to edit the geometry at the object as well as sub-object levels. These options are discussed next.



**Create:** The **Create** button is used to add the sub-objects to the selected object in the viewport. This button is available at the **Vertex**, **Face**, **Polygon**, and **Element** sub-object levels. To add the sub-objects, select the editable mesh object in the viewport and then choose the **Modify** tab. Next, select one of the sub-object levels in the modifier stack and then choose the **Create** button in the **Edit Geometry** rollout. Now, click anywhere in the viewport to add vertices in the selected object (if the **Vertex** sub-object level is selected), as shown in Figure 8-17. If you have selected the **Face** sub-object level, then click on the three vertices one by one to add a new face, as shown in Figure 8-18.



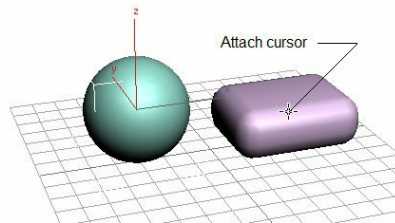
*Figure 8-17 Additional vertices created in a box using the **Create** button*



*Figure 8-18 A new face added in a box using the **Create** button*

**Delete:** The **Delete** button is used to delete the sub-objects in the selected object. To delete a sub-object, select the editable mesh object in the viewport and choose the **Modify** tab. Next, select one of the sub-objects levels in the modifier stack. Now, select the sub-object in the viewport that you want to delete and choose the **Delete** button; the selected sub-object will be deleted.

**Attach:** The **Attach** button is used to attach an object to the selected object in the viewport. To attach an object, select the editable mesh object in the viewport and choose the **Modify** tab. Next, choose the **Attach** button in the **Edit Geometry** rollout. Now, when you move the cursor over another object in the viewport, the attach cursor will be displayed, as shown in Figure 8-19. Click on the object; it will be attached to the selected object. Also, it will display the same color and properties as those of the selected object.



*Figure 8-19 The attach cursor after choosing the **Attach** button*

**Attach List:** The **Attach List** button is used to attach a number of objects simultaneously to selected object. To do so, select the editable mesh object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, choose the **Attach List** button from the **Edit Geometry** rollout;



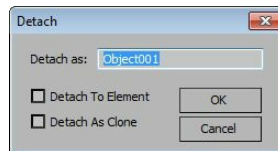
the **Attach List** dialog box will be displayed, as shown in Figure 8-20.



*Figure 8-20 The Attach List dialog box*

The **Attach List** dialog box displays a list of all the objects in the viewport. From this list, select the name of the objects that you want to attach by holding the CTRL or SHIFT key, and then choose the **Attach** button; the selected objects in the list will be attached to the object selected in the viewport. Note that these attached objects will display the same color and properties as that of the selected object.

**Detach:** The **Detach** button is used to detach the sub-objects from the selected object to make them individual objects. This button is available for the **Vertex**, **Face**, **Polygon**, and **Element** sub-object levels. To detach a sub-object,



*Figure 8-21 The Detach dialog box*

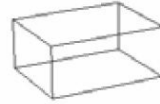
select the editable mesh object in the viewport, choose the **Modify** tab, and then select one of the sub-object levels in the modifier stack. Next, select the sub-object in the viewport that you want to detach as an individual object, and then choose the **Detach** button; the **Detach** dialog box will be displayed, as shown in Figure 8-21.

In this dialog box, enter the name of the new object in the **Detach as** text box and then choose the **OK** button; the selected sub-object will be detached and treated as an individual object. Now, when you move the individual object at the object level, it will leave a hole in the original object. In the **Detach** dialog box, select the **Detach As Clone** check box, the selected sub-object will be copied and treated as individual object. Also, the original object will not get modified.

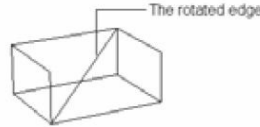
**Break:** The **Break** button is available only for the **Vertex** sub-object level. It creates a new vertex for each face attached to the selected vertices. If a vertex is used only by one face, then it will remain unaffected.

**Turn:** The **Turn** button is activated only for the **Edge** sub-object level. It is used to rotate the edges of an object. Select the editable mesh object in the viewport, choose the **Modify** tab, and then

select the **Edge** sub-object level in the modifier stack. Now, choose the **Turn** button in the **Edit Geometry** rollout and select the edges of the object in the viewport one by one; the edges will be rotated, refer to Figures 8-22 and 8-23.

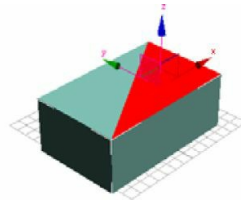


*Figure 8-22 The box before choosing the **Turn** button*

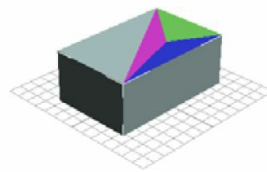


*Figure 8-23 The rotated edge of the box after choosing the **Turn** button*

**Divide:** The **Divide** button is available only for the **Edge**, **Face**, **Polygon**, and **Element** sub-object levels. It divides a single face into three smaller faces. If you divide the sub-object at the **Polygon** or **Element** sub-object level, then it will be divided into three faces. To do so, select the editable mesh object in the viewport, choose the **Modify** tab, and then select one of the sub-object levels in the modifier stack except **Vertex**. Next, choose the **Divide** button in the **Edit Geometry** rollout, and click on the sub-object in the viewport; the sub-object will be divided into three faces, refer to Figures 8-24 and 8-25.

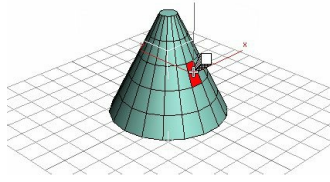


*Figure 8-24 The face before choosing the **Divide** button*

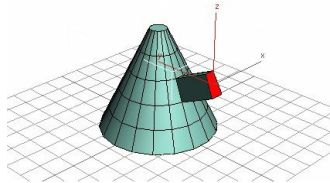


*Figure 8-25 The face divided after using the **Divide** button*

**Extrude:** The **Extrude** button is available for the **Edge**, **Face**, **Polygon**, and **Element** sub-object levels. It is used to extrude the sub-objects either by dragging the cursor or by entering the value in the spinner. To do so, select the editable mesh object in the viewport, choose the **Modify** tab, and then select one of the sub-object levels in the modifier stack, except **Vertex**. Next, select the sub-object in the viewport and choose the **Extrude** button to activate it. Now, move the cursor over the selected sub-object; the extrude cursor will be displayed, as shown in Figure 8-26. Next, press and hold the left mouse button and move the cursor up or down for the extrusion; the value for the extrusion will be displayed in the spinner on the right of the **Extrude** button. You can enter the value directly in this spinner to extrude the selected sub-object, refer to Figure 8-27.



**Figure 8-26** The extrude cursor displayed over the selected polygon

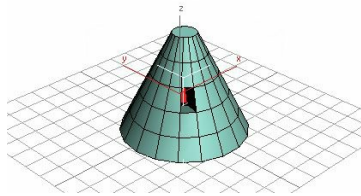


**Figure 8-27** The selected polygon sub-object after extrusion



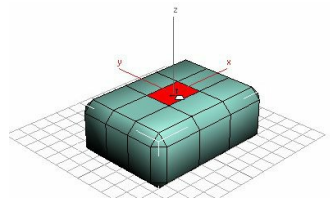
#### Note

To extrude multiple sub-objects simultaneously, select sub-objects by holding the CTRL key, and then execute the **Extrude** command. You can also enter a negative value in the **Extrude** spinner for negative extrusion, refer to Figure 8-28.

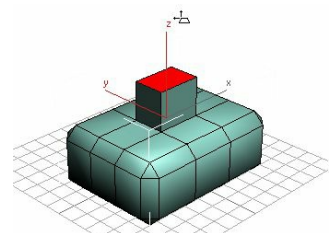


**Figure 8-28** The selected polygon after negative extrusion

**Bevel:** The **Bevel** button is available only for the **Face**, **Polygon**, and **Element** sub-object levels. It is used to extrude and bevel an object. This button can perform the extrude and bevel functions at the same time. You can bevel the sub-objects either by dragging the cursor or by entering the value in the spinner on the right side of the **Bevel** button. To do so, select the editable mesh object in the viewport. Choose the **Modify** tab, and then select one of the sub-object levels in the modifier stack, except **Vertex** and **Edge**. Next, select the sub-object in the viewport and then choose the **Bevel** button. Next, move the cursor over the selected sub-object; the bevel cursor will be displayed, as shown in Figure 8-29. Now, press and hold the left mouse button and move the cursor up or down to extrude the sub-object, as shown in Figure 8-30.



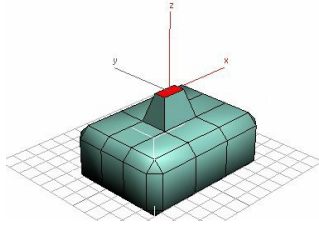
**Figure 8-29** The bevel cursor displayed over the selected polygon



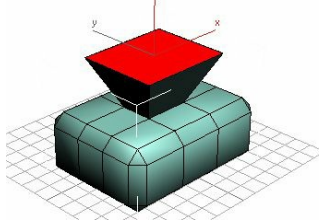
### *Figure 8-30 The polygon extruded*

To bevel the sub-object, release the left mouse button and then move the cursor up or down again to change the shape of the sub-object, as shown in Figures 8-31 and 8-32.

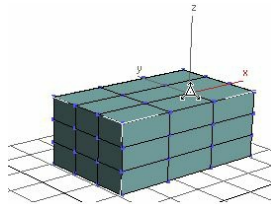
*Figure 8-31 The reduced size of the extruded polygon using the **Bevel** button*



*Figure 8-32 The increased size of the extruded polygon using the **Bevel** button*

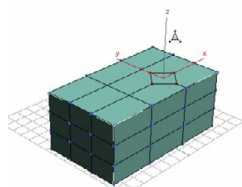


**Chamfer:** The **Chamfer** button is available only for the **Vertex** and **Edge** sub-object levels. It is used to cut the corners of the sub-object at an angle of 45-degree. You can chamfer the sub-objects either by dragging the cursor or by entering the value in the spinner on the right side of the **Chamfer** button. To do so, select the editable mesh object in the viewport, choose the **Modify** tab, and then select the sub-object level in the modifier stack. Next, select the sub-object in the viewport, choose the

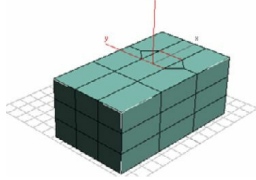


*Figure 8-33 The chamfer cursor displayed over the selected vertex*

**Chamfer** button, and move the cursor over the selected sub-object; the chamfer cursor will be displayed, as shown in Figure 8-33. Next, press and hold the left mouse button, move the cursor up to chamfer, and release the left mouse button; the sub-object will be chamfered at an angle of 45-degree, refer to Figures 8-34 and 8-35. As you move the cursor, the chamfer value will be displayed in the spinner on the right side of the **Chamfer** button. You can also enter the value directly in this spinner to chamfer the selected sub-object.

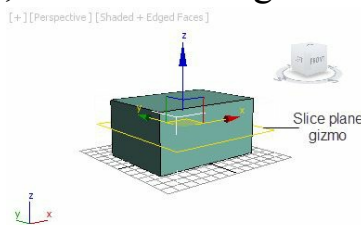


*Figure 8-34 The vertex sub-object chamfered using the **Chamfer** button*

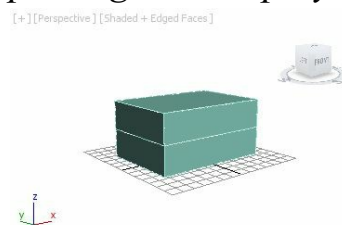


**Figure 8-35** The edge sub-object chamfered using the **Chamfer** button

**Slice Plane** and **Slice**: The **Slice Plane** and **Slice** buttons are used to slice the sub-objects to create new vertices, faces, edges, polygons, and elements. To do so, select the editable mesh object in the viewport, choose the **Modify** tab and then select the sub-object level in the modifier stack. Next, select one or more sub-objects in the viewport and then choose the **Slice Plane** button; a yellow colored slice plane gizmo will be displayed in the viewport, as shown in Figure 8-36. Set the position of the slice plane gizmo over the selected sub-objects by moving or rotating it at the position where you want to slice them. Then, choose the **Slice** button; the selected sub-objects will be divided to create new sub-objects, as shown in Figure 8-37.

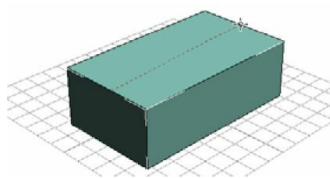


**Figure 8-36** The slice plane gizmo displayed in the selected object

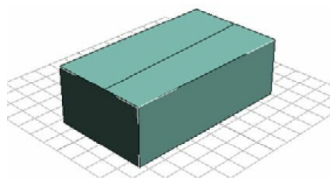


**Figure 8-37** The selected object sliced after choosing the **Slice** button

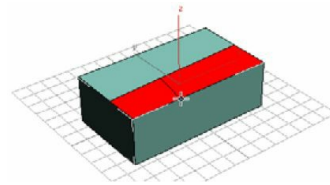
**Cut**: The **Cut** button is available only for the **Edge**, **Face**, **Polygon**, and **Element** sub-object levels. It is used to cut the edge, face, polygon, or element of an object to create new vertices, edges, and faces. To do so, select the editable mesh object in the viewport. Choose the **Modify** tab, and then select any sub-object level in the modifier stack, except **Vertex**. Next, choose the **Cut** button and move the cursor over the object; the cursor will change when it comes over any sub-object. Next, click on the sub-object to specify the first cut point and drag the mouse to specify the endpoint of the cut; a dotted line will be displayed, as shown in Figure 8-38. Now, click again to cut the sub-object and right-click to end the cut command; the object will be cut, refer to Figure 8-39. You can also select the sub-object to be cut at a particular area, as shown in Figure 8-40.



**Figure 8-38** The dotted lines



*Figure 8-39 The cut on the object after using the **Cut** button*



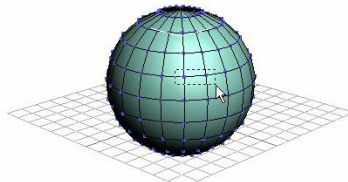
*Figure 8-40 The cut on the selected polygon*



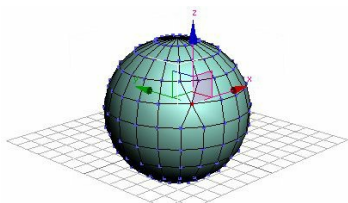
**Note**

While using the **Cut** button, select the **Ignore Backfacing** check box to avoid the cut on the back face of the sub-object.

**Weld Area:** The options in the **Weld** area are available only at the **Vertex** sub-object level. It is used to weld or join the vertices of the object. The **Selected** button in the **Weld** area is used to weld the selected vertices. To perform the weld operation, select the editable mesh object in the viewport. Choose the **Modify** tab, and then select the **Vertex** sub-object level in the modifier stack; all the vertices of the object will be displayed in the viewport. By using the rectangular marquee selection, select the vertices of the object which you need to weld together, refer to Figure 8-41. Now, set the value in the spinner located on the right side of the **Selected** button to define the weld threshold area. All the vertices that you want to weld together must be inside this area. Choose the **Selected** button; the vertices will be welded together, refer to Figure 8-42. If the vertices are not within the weld threshold area whose value you have defined in the spinner, the **Weld** message box will be displayed, as shown in Figure 8-43, warning you that there is no vertex in the weld threshold area. Therefore, you need to increase the threshold area by modifying the value in the spinner, and then choose the **Selected** button again to weld the vertices.



*Figure 8-41 The selection box around the vertices to be welded*

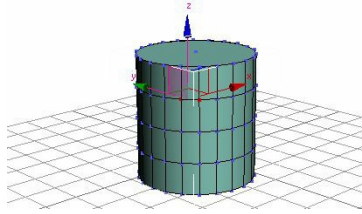


*Figure 8-42 The vertices welded together*

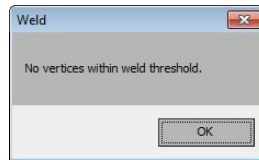
The **Target** button in the **Weld** area is used to weld the selected vertices to the unselected target vertex. To do so, select the editable mesh object in the viewport and choose the **Modify** tab. Now,



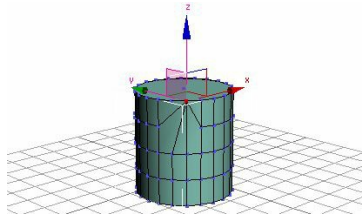
select the **Vertex** sub-object level in the modifier stack; all vertices of the object will be displayed in the viewport. Next, select the vertices of the object in the viewport by dragging a selection box around them, refer to Figure 8-44. Then, choose the **Target** button and move the vertices toward the unselected target vertex to which you want to weld the selected vertices. As you bring the selected vertices over the unselected target vertex, the cursor will convert into a plus sign. Release the mouse button; the vertices will be welded to the target vertex, as shown in Figure 8-45.



*Figure 8-44 The vertices selected for welding*



*Figure 8-43 The Weld message box*



*Figure 8-45 The selected vertices welded to the target vertex*

## Modifying Editable Mesh Objects Using Sub-object Levels

To get the advance level modeling of the objects, you need to convert the object into editable mesh object, which provides you the sub-object levels of an object as discussed earlier in this chapter. To view the sub-object levels, you need to click on the plus sign on the left side of the **Editable Mesh** in the modifier stack. By using these sub-object levels, you can select the sub-objects in the viewport and modify the object in different ways.

On selecting one of the sub-object levels in the modifier stack, it will be activated and turns yellow. You can select a sub-object by clicking on it in the viewport. To select more than one sub-object simultaneously, hold the CTRL key, and select them one by one. Alternatively, you can drag a selection box around the sub-objects to select them simultaneously; they will turn red. After selecting the sub-objects, you can modify them using the following options:

1. You can move, rotate, and scale the selected sub-objects using the **Select and Move**, **Select and Rotate**, and **Select and Uniform Scale** tools, respectively from the **Main Toolbar**.
2. You can use different options in the **Edit Geometry** rollout, as described earlier in this chapter.
3. You can use different modifiers from the **Modifier List** drop-down list.



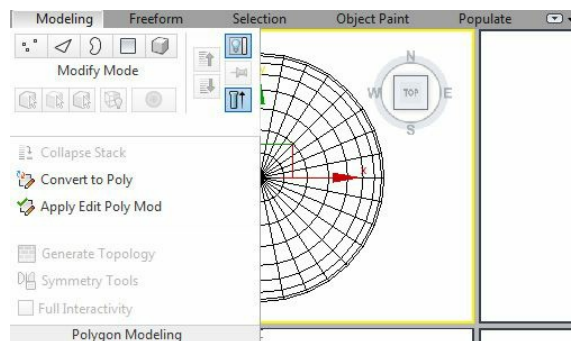
# Converting Objects into Editable Poly

To modify an object with editable poly is same as modifying an object with the editable mesh. The only difference is that the editable poly works with the advance tools meant for polygonal mesh editing. To work with editable poly, convert the object into editable poly. To do so, you need to use one of the following methods:

1. Create an object and select it in the viewport. Next, right-click on the object; a quad menu will be displayed. Choose the **Convert To:** option; a cascading menu will be displayed. Choose the **Convert to Editable Poly** option from the cascading menu; the object will be converted into editable poly.
2. Create an object and select it in the viewport. Choose the **Modify** tab in the **Command Panel**; the modifier stack will be displayed in the Modify panel. In the modifier stack, right-click on the name of the tool which you have used to create the object; a shortcut menu will be displayed. Choose the **Editable Poly** option; the object will be converted into editable poly.
3. Create an object and select it in the viewport. Next, move the cursor over the **Polygon Modeling** panel in the **Graphite Modeling Ribbon**; a flyout will be displayed, as shown in Figure 8-46. Choose the **Convert to Poly** option; the selected object will be converted into editable poly.

## Note

*When you convert an object into editable poly, various panels will be displayed in the **Graphite Modeling Tools** tab such as **Edit**, **Geometry (All)**, **Subdivision**, and so on. You will learn about these panels in the later chapters.*



**Figure 8-46** Flyout displayed after moving the cursor over the **Polygon Modeling** panel

## Note

*After an object is converted into an editable poly using any of the above method , it cannot be modified using the creation parameters rollouts such as the **Parameters** rollout. So, it is recommended to set the parameters of an object before converting it into an editable poly.*

You need to use the following method to set the parameters of an object even after converting it into an editable poly.

4. Create an object and select it in the modifier stack. Next, click on the **Modifier List** drop-down list and select **Edit Poly** from it; the **Edit Poly** modifier is applied to the object.

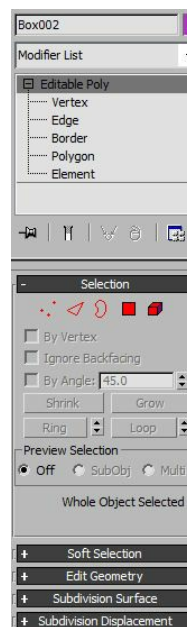


#### Note

*When you convert an object into an editable poly using the fourth method, some of the rollouts and/or options are not available.*

## Modifying Editable Poly Objects Using Sub-object Levels

On converting an object into an editable poly, the name of the tool in the modifier stack will be replaced by **Editable Poly**, which is known as the object level. Click on the plus sign on the left side of **Editable Poly** to view the sub-object levels such as **Vertex**, **Edge**, **Border**, **Polygon**, and **Element**, refer to Figure 8-47. Various rollouts will also be displayed below the modifier stack such as **Selection**, **Soft Selection**, **Edit Geometry**, **Subdivision Surface**, **Subdivision Displacement**, and **Paint Deformation**, as shown in Figure 8-47. Other rollouts such as **Edit Vertices**, **Vertex Properties**, **Edit Edges**, **Edit Borders**, **Edit Polygons**, **Polygon: Material IDs**, **Polygon: Smoothing groups**, **Polygon: Vertex Colors**, and **Edit Elements** will also be displayed, depending on the selection of the sub-object level.



*Figure 8-47 The sub-object levels displayed*

To modify the object using the sub-object levels, select one of the sub-object levels in the modifier stack; it is activated and turns yellow. Now, select the sub-object by clicking on it in the viewport. To select more than one sub-object at a time, hold the CTRL key and select them one by one. Alternatively, you can drag a selection box around the sub-objects to select them simultaneously; they will turn red. After selecting the sub-objects, you can modify them using the following methods:

1. You can move, rotate, and scale the selected sub-objects using the **Select and Move**, **Select and Rotate**, and **Select and Uniform Scale** tools, respectively in the **Main Toolbar**.


2. You can use different modifiers from the **Modifier List** drop-down list, about which you will learn in the later chapters.
3. You can use various options available in different rollouts of the Modify panel for a particular sub-object level.
4. You can use different tools available in the **Graphite Modeling Ribbon**, about which you will learn in later chapters.

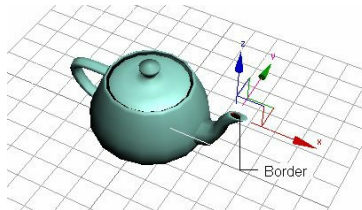
The sub-object levels and various rollouts in an editable poly object are discussed next.

## Sub-object Levels

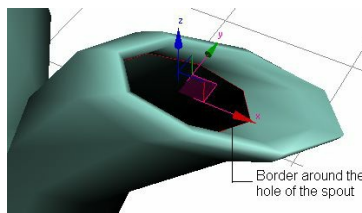
The editable poly objects consists of sub-objects levels. They are the **Vertex**, **Edge**, **Border**, **Polygon**, and **Element**. They do not have the **Face** sub-object level like the editable mesh. Therefore, you cannot select the triangular faces in the editable poly object. Additionally, the editable poly has the **Border** sub-object level. The **Vertex**, **Edge**, **Polygon**, and **Element** sub-objects are same as discussed in the editable mesh object. The **Border** sub-object is discussed next.

### Border

 The border is a series of edges that forms a ring around a hole in the object, as shown in Figures 8-48 and 8-49.



*Figure 8-48 The border selected around the hole of the spout of a teapot*



*Figure 8-49 The maximized view of the border selected around the hole of the spout of a teapot*

## Rollouts

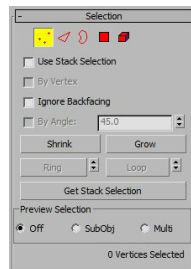
When you convert an object into editable poly, various rollouts will be displayed below the modifier stack. The number and name of the rollouts depends on the selection of the sub-object level. These rollouts are used to modify the objects at the sub-object levels and are discussed next.

### Selection Rollout

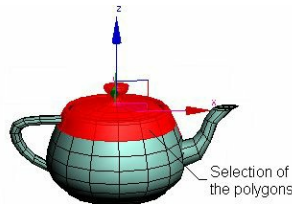
In the **Selection** rollout, there are five buttons, **Vertex**, **Edge**, **Border**, **Polygon**, and **Element**, as shown in Figure 8-50. These buttons are used to select the sub-objects of an object in the viewport

and are the same as described earlier. Choose any button to activate it. It is similar to selecting the sub-object level in the modifier stack. The other options in this rollout are discussed next.

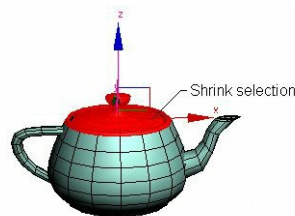
**Shrink/Grow:** The **Shrink** and **Grow** buttons are available for all the sub-object levels in this rollout. The **Shrink** button is used to reduce the selection area of the sub-objects in the viewport. The **Grow** button is used to increase the selection area of the sub-objects in the viewport. To use these buttons, select the editable poly object in the viewport, choose the **Modify** tab, and then select one of the sub-object levels in the modifier stack. Next, select the sub-objects in the viewport. Choose the **Shrink** or **Grow** button in the **Selection** rollout; the selection area will decrease or increase in the viewport, refer to Figures 8-51, 8-52, and 8-53.



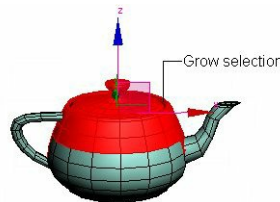
*Figure 8-50 The Selection rollout with the **Border** sub-object level selected*



*Figure 8-51 The selection area in the teapot*



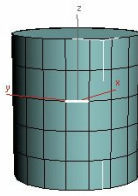
*Figure 8-52 The selection area in the teapot decreases after choosing the **Shrink** button*



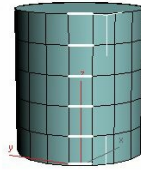
*Figure 8-53 The selection area in the teapot increases after choosing the **Grow** button*

**Ring:** The **Ring** button is available only for the **Edge** and **Border** sub-object levels. It is used to select all edges and borders of the object that are parallel to the selected edge. To do so, select an edge of the object in the viewport, as shown in Figure 8-54, and choose the **Ring** button; all the

edges parallel to the selected edge will be selected, as shown in Figure 8-55.

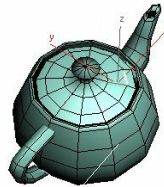


*Figure 8-54 An edge selected in a cylinder*

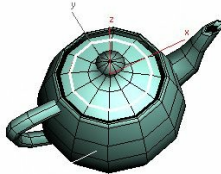


*Figure 8-55 The parallel edges selected after choosing the **Ring** button*

**Loop:** The **Loop** button is available only for the **Edge** and **Border** sub-object levels. It is used to select all the edges or borders of the object that are aligned with the selected edge or border. To use this button, select an edge or a border of the object in the viewport, as shown in Figure 8-56, and then choose the **Loop** button; all edges or borders that are aligned with the selected edge will be selected, as shown in Figure 8-57.



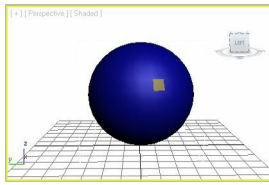
*Figure 8-56 The selected edge of the teapot*



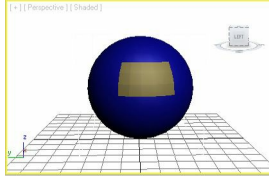
*Figure 8-57 The edges selected after choosing the **Loop** button*

**Preview Selection Area:** This area is used to preview the selection of sub-objects in the viewport before selecting them. To do so, you need to use the options in the **Preview Selection** area. By default, the **Off** radio button is selected in this area, therefore, the preview will not be visible in the viewport.

The **SubObj** radio button in this area enables you to preview the selection of the sub-objects at the current sub-object level only. To do so, select any sub-object level in the **Selection** rollout. Now, select the **SubObj** radio button in the **Preview Selection** area. Next, move the cursor over the object; the corresponding sub-object will be highlighted in yellow color in the viewport, as shown in Figure 8-58. Click on this sub-object; the sub-object will be selected. If you need to select multiple sub-objects at a time, move the cursor over the object and hold the CTRL key. Now, move the mouse over the sub-objects that you need to select; they will be highlighted, refer to Figure 8-59.



*Figure 8-58 The selected sub-object level highlighted*



*Figure 8-59 More than one polygon highlighted*

Click on them and release the CTRL key; the highlighted sub-objects will be selected. Similarly, to deselect a sub-object from the current selection, hold the ALT key, and move the cursor over the sub-object that you want to deselect; it will be highlighted. Now, click on it; the highlighted sub-object will be deselected. To deselect more than one sub-object, you need to hold the ALT+CTRL keys.

The **Multi** radio button in the **Preview Selection** area works similar to the **SubObj** radio button. Additionally, the **Multi** radio button enables you to switch among the sub-object levels in the Modify panel while selecting the sub-object in the viewport. For example, if you move the cursor over the **Polygon** sub-object in the viewport, then the polygon of the object will be highlighted. Click on it; the highlighted polygon will be selected. Also, the **Polygon** sub-object level will be activated in the Modify panel. Similarly, if you select an edge, vertex, or element in the viewport, then the corresponding sub-object level will be activated in the Modify panel. Therefore, you do not need to manually switch among the sub-object levels.

Just below the **Preview Selection** area, a text line is displayed which provides the information about the current selection. Also, when you move the cursor over the object to highlight the sub-objects in the viewport, another text line will be displayed that will provide the information about the number and name of the highlighted sub-objects.

### Soft Selection Rollout

The options in this rollout are the same as discussed in the editable mesh.

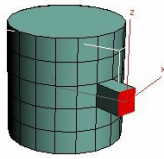
### Edit Geometry Rollout

The options in this rollout are used to edit the geometry of an object. Some of the options in this rollout are discussed next.

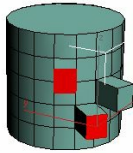
**Repeat Last:** The **Repeat Last** button is used to repeat the recently used command. For example, if you have applied a command to a polygon of an object, and need to apply the same command upto the same level to other polygons, then select the other polygons in the viewport and choose the



**Repeat Last** button; the same command will be applied to the selected polygons, refer to Figures 8-60 and 8-61.



*Figure 8-60 The extruded polygon in a cylinder*



*Figure 8-61 The same extrusion on other polygons after choosing the **Repeat Last** button*

**Constraints:** The options in the **Constraints** area are used to define the existing geometry to constrain sub-object transformation. There are four radio buttons in this area. They are: **None**, **Edge**, **Face**, and **Normal**. By default, the **None** radio button is selected. As a result, no constraints will be applied to the existing geometry. The **Edge** radio button is used to constrain the sub-object transformation to edge boundaries. The **Face** radio button is used to constrain the sub-object transformations to the individual face. The **Normal** radio button is used to constrain each sub-object transformations to its normal.

**Attach:** The **Attach** button is the same as discussed in the editable mesh object. Choose the **Attach List** button on the right side of the **Attach** button to display the **Attach List** dialog box. The options in this dialog box are the same as discussed in the editable mesh object.

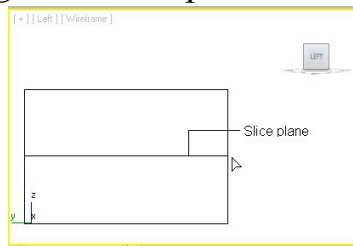
The **Create**, **Detach**, **Slice Plane**, **Slice**, and **Cut** buttons are the same as discussed in the editable mesh object.

**Reset Plane:** The **Reset Plane** button is used to reset the default position of the slice plane. When you choose the **Slice Plane** button, the **Reset Plane** and **Slice** buttons gets activated.

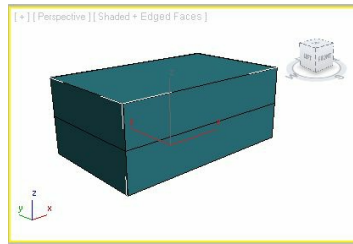
**QuickSlice:** The **QuickSlice** button is used to slice an object or sub-objects very quickly and easily. To slice an object quickly, choose the **QuickSlice** button; a quick slice cursor will be displayed, as shown in Figure 8-62. Click in the viewport to define the first point of the slice plane; a slice plane will be displayed, refer to Figure 8-62. Move the cursor to define an angle for the slice and click again to specify the endpoint of the slice; the object will be sliced according to the slice plane, as shown in Figure 8-63. It affects the slice operation on the entire object. If you need to slice particular sub-objects, then you need to select them. Next, right-click to end the **QuickSlice** command.



*It is recommended to avoid performing the slice operation in the Perspective viewport.*



**Figure 8-62** *The quick slice cursor and slice plane displayed*

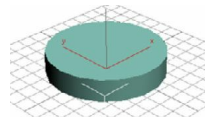


**Figure 8-63** *The box sliced in the Perspective viewport*

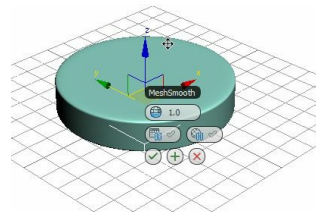
### **MSmooth**

The **MSmooth** button is used to smoothen the object or sub-objects. To smoothen the object, select it in the viewport, as shown in Figure 8-64, and then choose the **MSmooth** button in the **Edit Geometry** rollout; the object will be smoothened, as shown in Figure 8-65. Choose the **Settings** button on the right of the **MSmooth** button; the **MeshSmooth Selection** caddy control will be displayed in the viewport, as shown in Figure 8-66. Set the value in the **Smoothness** spinner to define the smoothness of the object. The value in this spinner varies from 0.0 to 1.0.

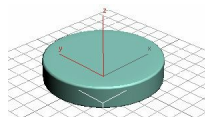
**Figure 8-64** *Selecting the cylinder in the viewport*



**Figure 8-66** *The MeshSmooth Selection caddy control*



**Figure 8-65** *The cylinder smoothened after choosing the MSmooth button*

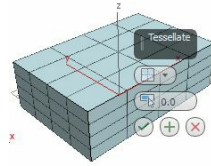


### **Note**

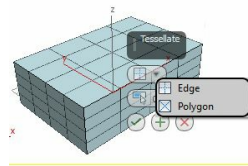
*To view the spinner names in the caddy control, you need to move the cursor over the buttons in it; the corresponding name will be displayed at the place of the name of the caddy control.*

**Tessellate:** The **Tessellate** button is used to increase the number of edges or faces in an object and smoothen the object. By default, when you choose the **Tessellate** button, the number of edges of

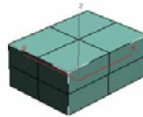
the object will increase. To change the settings, choose the **Settings** button on the right side of the **Tessellate** button; the **Tessellate Selection** caddy control will be displayed in the viewport, as shown in Figure 8-67. Next, click on the arrow placed on the **Edge** button; a drop-down list will be displayed to select the tessellation method, as shown in Figure 8-68. Select the **Edge** or the **Face** option and then choose the **Apply and Continue** button; the number of edges or faces will be increased in the object, refer to Figures 8-69, 8-70, and 8-71. If you need to apply the same settings again, then choose the **Apply and Continue** button again. To end the command and close the caddy control, choose the **OK** button. In case you need to close the caddy control without applying the settings to the selection, choose the **Cancel** button.



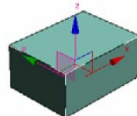
*Figure 8-67 The Tessellate Selection caddy control*



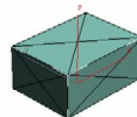
*Figure 8-68 The drop-down list displayed after clicking on the arrow*



*Figure 8-70 The box after selecting the Edge radio button*



*Figure 8-69 A box*



*Figure 8-71 The box after selecting the Face radio button*

**Make Planar:** The **Make Planar** button is used to bring all the vertices of an object in the same plane. However, if you select other sub-objects in the viewport, then it will enable you to bring all the selected sub-objects in the same plane. Choose the **X**, **Y**, and **Z** buttons to align the object according to the local coordinate system.

The **Hide Selected** button is activated for the **Vertex**, **Polygon**, or **Element** sub-object level. It is used to hide the selected sub-objects in the viewport.

The **Unhide All** button is activated for the **Vertex**, **Polygon**, or **Element** sub-object level. It is used to unhide all the hidden sub-objects in the viewport.

The **Hide Unselected** button is activated for the **Vertex**, **Polygon**, or **Element** sub-object level. It is used to hide the unselected sub-objects in the viewport.

### Subdivision Surface Rollout

The options in this rollout are used to apply the subdivision to the object to make it smooth. The different areas in this rollout are discussed next.

**Display and Render Areas:** The value in the **Iterations** spinner is used to specify the number of times the smooth algorithm will be applied to an object. If you select the **Iterations** check box in the **Render** area, then the value in the **Iterations** spinner of the **Display** area will show its effect only in the viewport. Note that when you increase the number of iterations in the spinner, the number of segments also increases and it takes longer time to display its effect in the viewport as well as on rendering. Therefore, increase the number of iterations as per your requirement. The **Smoothness** spinner is used to add new polygons to all vertices to smoothen object in the viewport as well as on rendering. The value in this spinner varies from 0.0 to 1.0. If you select the **Smoothness** check box in the **Render** area, then the value in the **Smoothness** spinner of the **Display** area will show the effect only in the viewport.

The **Iterations** and **Smoothness** spinners in the **Render** area are used to smoothen the polygon objects on rendering. To activate them, select the check boxes on the left side of the spinners.

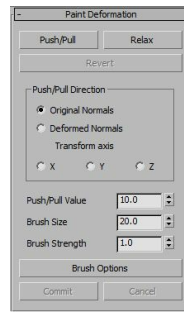
**Separate By Area:** Select the **Smoothing Groups** check box in this area to stop the creation of new polygons at edges between faces that are not under the smoothing group. Select the **Materials** check box to stop the creation of new polygons at edges between the faces that do not share the material IDs.

**Update Options Area:** Select the **Always** radio button in this area to automatically view the output of the smoothness settings in the viewport as well as on rendering. Select the **When Rendering** radio button to view the output of the smoothness settings only at the time of rendering. Select the **Manually** radio button to view the output of the smoothness settings only when you choose the **Update** button below the **Manually** radio button. In this case, if you change the settings as per your requirement, then to update the settings you need to choose the **Update** button.

### Paint Deformation Rollout

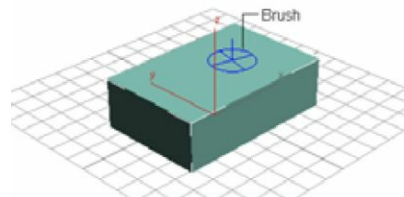
The options in this rollout are used to deform the surface of an object by pushing or pulling its vertices using the **Push/Pull** button, refer to Figure 8-72. At the object level, it affects the vertices of the entire object, while at the sub-object level, it affects only the selected vertices of the object. This rollout has three buttons. The **Push/Pull** button is used to push or pull the vertices of the object. Choose the **Push/Pull** button to activate it and move the cursor over the object in the viewport; a light blue colored brush along with the cursor will be displayed in the viewport, as shown in Figure 8-73. Press the left mouse button; the brush will turn red. Drag the cursor to

deform the surface of the object, as shown in Figure 8-74, and release the left mouse button; the

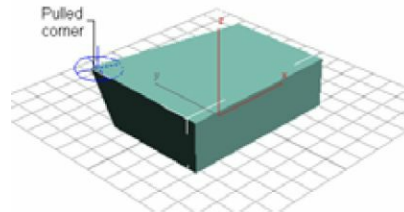


*Figure 8-72 The Paint Deformation rollout*

object will be deformed. At the sub-object level, choose the **Push/Pull** button to activate it and move the cursor over the selected sub-objects; a light blue colored brush will be displayed in the viewport. Now, click on it to deform the surface and right-click to exit the command. While performing the push/pull command, the object will be pushed or pulled, depending on the value that you have entered in the **Push/Pull Value** spinner



*Figure 8-73 The brush displayed on choosing the Push/Pull button*



*Figure 8-74 The object deformed at the corner vertex*

The **Relax** button is used to maintain the distance between the vertices of the object. The **Revert** button is used to erase the effect of the **Push/Pull** button by clicking on the same vertices or object. To reverse the effect of the **Push/Pull** button simultaneously while using it, you need to hold the CTRL key and click on the same vertex.

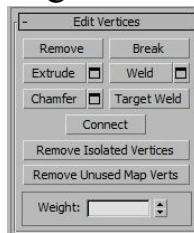
**Push/Pull Direction Area:** The radio buttons in this area are used to specify the direction of the push or pull over the object. If you select the **Original Normals** radio button, then after pushing or pulling, the vertices of the object will move in the direction of its normal before deformation. If you select the **Deformed Normals Transform axis** radio button, then after pushing or pulling, the vertices of the object will move in the direction of its normal after deformation. Select the **X**, **Y**, or **Z** radio button to move the vertices along the direction of the selected radio button.

As mentioned earlier, the value in the **Push/Pull Value** spinner is used to specify the extent of pushing or pulling the vertices of an object. The positive value enables you to pull the vertices, and

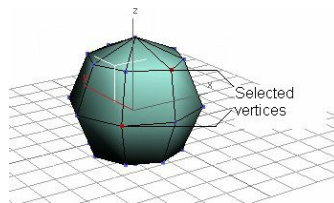
the negative value enables you to push the vertices. The **Brush Size** spinner is used to specify the size of the brush cursor in the viewport. The value in the **Brush Strength** spinner is used to specify the strength of the brush by which it applies the push or pull effect. It varies from 0.0 to 1.0. Choose the **Brush Options** button; the **Painter Options** dialog box will be displayed. You can set various parameters of the brush in this dialog box. Choose the **Commit** button to deform the object permanently. Note that you cannot use the **Revert** button after choosing the **Commit** button. Choose the **Cancel** button to erase all the changes that you made to deform the object. However, if you have already committed the effects, then you cannot use the **Cancel** button to erase the effects.

### Edit Vertices Rollout

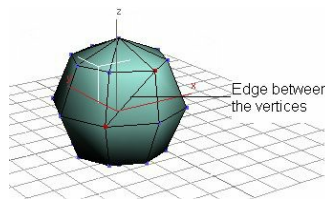
On selecting the **Vertex** sub-object level, the **Edit Vertices** rollout will be displayed in the Modify panel, as shown in Figure 8-75. The options in this rollout are used to edit the vertices of an object. To delete the vertices of an object, select them in the viewport and choose the **Remove** button; the vertices will be deleted. Alternatively, you can press the DELETE key, but it will create a hole in the object. The **Connect** button is used to connect the two selected vertices by creating an edge between them, refer to Figures 8-76 and 8-77.



*Figure 8-75 The Edit Vertices rollout*



*Figure 8-76 The vertices selected in the object*

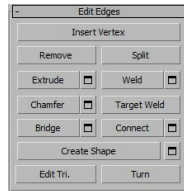


*Figure 8-77 The edge created between the vertices selected*

Choose the **Remove Isolated Vertices** button to remove the vertices that are not attached to any polygon in the object. Choose the **Remove Unused Map Verts** button to remove the vertices that cannot be used for mapping. The **Weight** spinner is used to set the weight of the vertex that specifies the smoothness towards the vertex in the output. The **Break**, **Extrude**, **Weld**, **Chamfer**, and **Target Weld** buttons are the same as discussed in the editable mesh. Also note that the **Extrude**, **Weld**, and **Chamfer** buttons have the **Settings** button on the right side to apply the selected command more accurately.

## Edit Edges Rollout

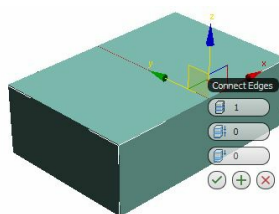
On selecting the **Edge** sub-object level, the **Edit Edges** rollout will be displayed, as shown in Figure 8-78. The options in this rollout are used to edit the edges of an object. The **Insert Vertex** button is used to add a vertex on the edge. To do so, choose the **Insert Vertex** button; the vertices of the object will be displayed in the viewport. Now, click on an edge of the object; a new vertex will be created. Right-click to exit the command. To delete an edge of the object, select the edge in the viewport, and choose the **Remove** button; the selected edge will be deleted. Alternatively, you can press the DELETE key, but it will create a hole in the object.



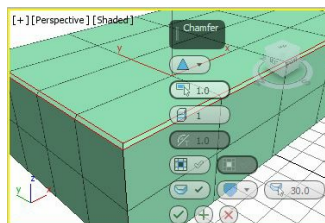
*Figure 8-78 The Edit Edges rollout*

The **Connect** button is used to connect the two selected edges by creating a new edge between them. Choose the **Settings** button on the right side of the **Connect** button; the **Connect Edges** caddy control will be displayed in the viewport, as shown in Figure 8-79. It is used to set the parameters of the additional edge created using the **Connect** button. The value in the **Segments** spinner in this caddy control is used to specify the number of new edges to be created in between the selected edges. The value in the **Pinch** spinner is used to set the distance between the new edges. The value in the **Slide** spinner specifies the position of the new edges. By default, the new edges are created at the center.

To set the number of segments per chamfer, select an edge of the object in the viewport. Now, choose the **Settings** button on the right of the **Chamfer** button; the **Chamfer** caddy control will be displayed in the viewport, as shown in Figure 8-80.



*Figure 8-79 The Connect Edges caddy control in the viewport*

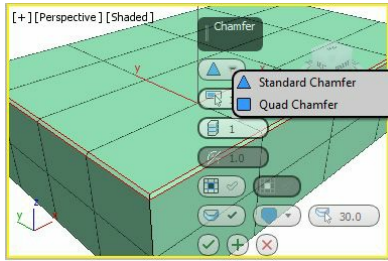


*Figure 8-80 The Chamfer caddy control in the viewport*

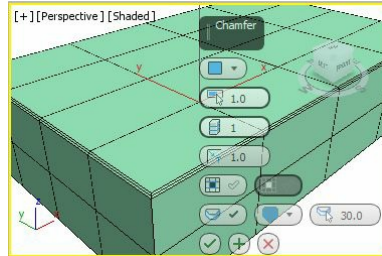
In this caddy control, click on the down arrow of the **Chamfer Type** button; a flyout will be displayed with two options, **Standard Chamfer** and **Quad Chamfer**, refer to Figure 8-81. The caddy control displayed on choosing **Standard Chamfer** from the **Chamfer Type** flyout is shown



in Figure 8-80. The caddy control displayed on choosing **Quad Chamfer** from the **Chamfer Type** flyout is shown in Figure 8-82.

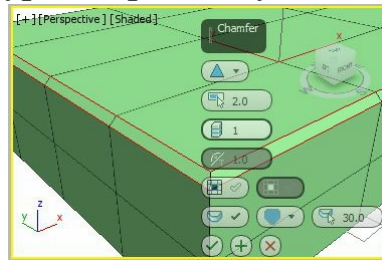


*Figure 8-81 The Chamfer Type flyout*

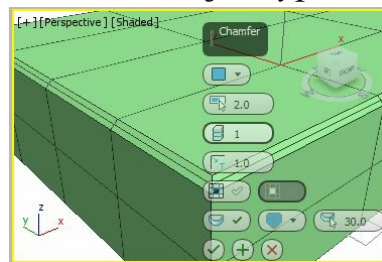


*Figure 8-82 The Chamfer caddy control on choosing Quad Chamfer from the flyout*

Set the value in the **Edge Chamfer Amount** spinner to specify the amount of chamfering for the selected edge. Figures 8-83 and 8-84 display the selected edges chamfered with the **Standard Chamfer** type and **Quad Chamfer** type, respectively.



*Figure 8-83 Chamfering with the Standard Chamfer type and Edge Chamfer Amount spinner = 2*

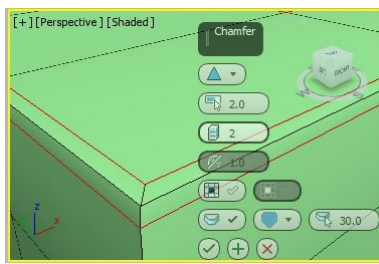


*Figure 8-84 Chamfering with the Quad Chamfer type and Edge Chamfer Amount spinner = 2*

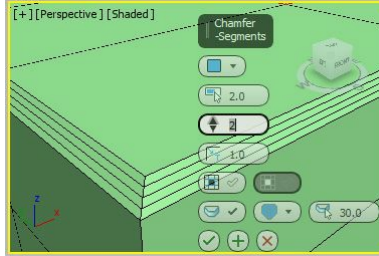
Note that you need to move the cursor over the buttons to know their respective names.

Set the value in the **Connect Edge Segments** spinner to define the number of segments in the chamfer. More the number of the segments, more will be the roundness of the chamfer. Figures 8-85 and 8-86 display the selected edges chamfered with the **Standard Chamfer** type and **Quad Chamfer** type, respectively. You will notice that in the **Standard Chamfer** type, the no of polygons created are equal to the value in the **Connect Edge Segments** spinner for each chamfered edge. However, in the **Quad Chamfer** type the no of polygons created are double the value in the **Connect Edge Segments** spinner for each chamfered edge.





**Figure 8-85** Chamfering with the **Standard Chamfer** type and the **Connect Edge Segments** spinner = 2

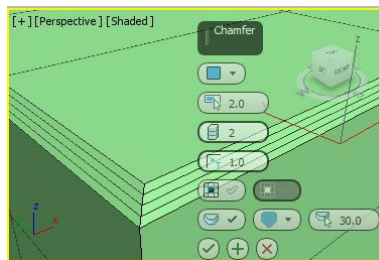


**Figure 8-86** Chamfering with the **Quad Chamfer** type and the **Connect Edge Segments** spinner = 2

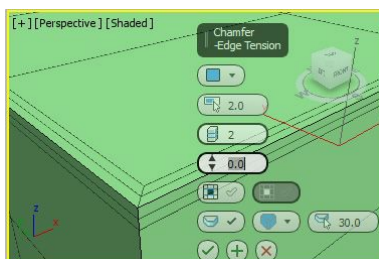
The **Edge Tension** spinner is activated only for the **Quad Chamfer** type. It determines the angle between the new polygons generated by chamfering edges between non-coplanar polygons. Figures 8-87, 8-88, and 8-89 display the chamfered edges with the value **1**, **0.5**, and **0** in the **Edge tension** spinner, respectively.

The lower the value of the **Edge Tension** spinner, higher will be the angle between the new polygons generated by chamfering edges between non-coplanar polygons.

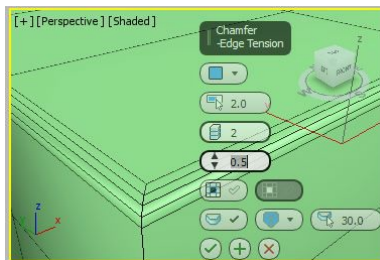
If you select the **Open** check box, the polygons which are created by chamfering process will be deleted, refer to Figure 8-90. The **Invert Open** spinner located at the right of the **Open** spinner is activated only when the **Open** check box is selected and the **Quad Chamfer** type is chosen. Select the **Invert Open** check box; all the polygons except those created while chamfering will be deleted, refer to Figure 8-91.



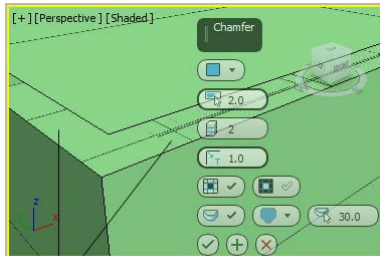
**Figure 8-87** Chamfering with the **Edge Tension** spinner = 1



**Figure 8-89** Chamfering with the **Edge Tension** spinner = 0

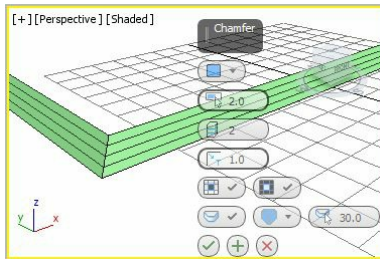


*Figure 8-88 Chamfering with the **Edge Tension** spinner = 0.5*



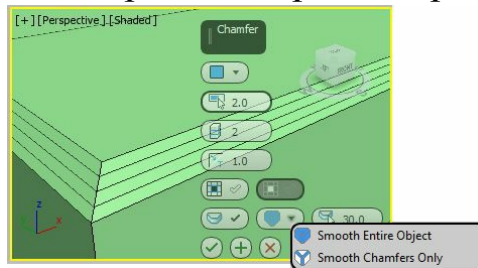
the faces deleted on selecting the **Open** check box

*Figure 8-90 The deleted faces on selecting the **Open** check box*



*Figure 8-91 The remaining polygons after selecting the **Invert Open** check box*

Click on the down arrow of the **Smooth Type** button; a flyout will be displayed, as shown in Figure 8-92. Choose the desired option from the flyout and then select the **Smooth** check box at the left of the **Smooth Type** button to smoothen the portion as per the option chosen from the flyout.

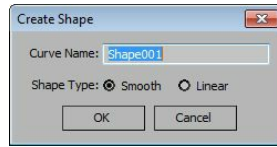


*Figure 8-92 The flyout displayed*

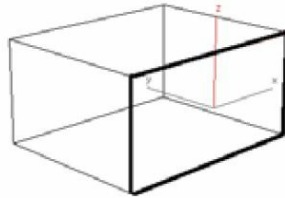
The value of the **Smooth Threshold** spinner ranges from 0 to 180. The more the value of the **Smooth Threshold** spinner, higher is the smoothness.

The **Create Shape From Selection** button in the **Edit Edges** rollout is used to create a spline shape from the selected edges. To do so, select the edges of an object in the viewport and then choose the **Create Shape From Selection** button; the **Create Shape** dialog box will be displayed,

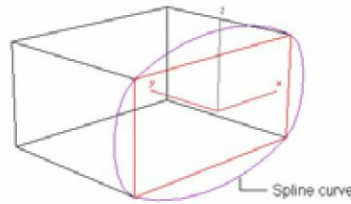
as shown in Figure 8-93. Enter a name in the **Curve Name** text box for the newly created shape. Select the **Smooth** or **Linear** radio button to create a smooth or a linear curve, respectively. Next, choose the **OK** button; a spline will be created along with the selected edges, as shown in Figures 8-94 and 8-95.



*Figure 8-93 The Create Shape dialog box*



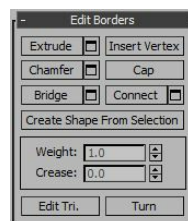
*Figure 8-94 The edges selected in the box*



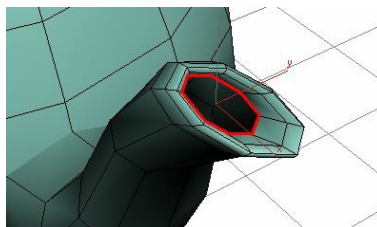
*Figure 8-95 The spline created after using the Create Shape From Selection button*

## Edit Borders Rollout

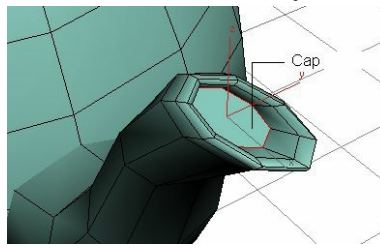
On selecting the **Border** sub-object level, the **Edit Borders** rollout will be displayed, as shown in Figure 8-96. The options in this rollout are used to edit the border of an object. The **Cap** button is used to create a polygon to cap the selected border of the object. To do so, select the border of the object in the viewport and then choose the **Cap** button; a polygon will be displayed to cap the border, as shown in Figures 8-97 and 8-98. The other options in this rollout are the same as described earlier in this chapter.



*Figure 8-96 The Edit Borders rollout*



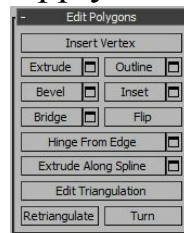
*Figure 8-97 The selected border of the spout of a teapot*



*Figure 8-98 The cap after choosing the Cap button*

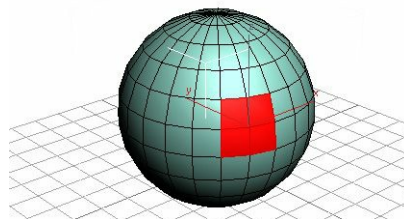
## Edit Polygons Rollout

When you select the **Polygon** sub-object level, the **Edit Polygons** rollout will be displayed, as shown in Figure 8-99. The options in this rollout are used to edit the polygons of the object. The **Outline** button is used to increase or decrease the outside edges of theselected polygons, refer to Figures 8-100 and 8-101. Choose the **Settings** button on the right of the **Outline** button; the **Outline** caddy control will be displayed in the viewport, refer to Figure 8-101. Set the value in the **Amount** spinner to specify the increment or decrement of the outside edge of the selected polygon. Choose the **OK** button to apply the function and exit the **Outline** dialog box.

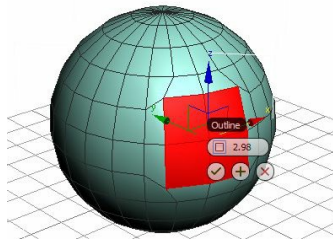


*Figure 8-99 The Edit Polygons rollout*

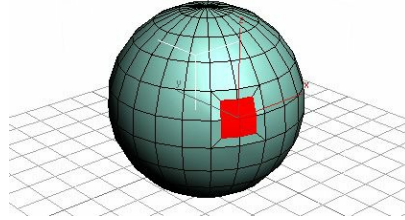
The **Inset** button in the **Edit Polygons** rollout is used to inset the outside edges of the selected polygons, refer to Figures 8-102 and 8-103. Choose the **Settings** button on the right of the **Inset** button; the **Inset** caddy control will be displayed in the viewport, as shown in Figure 8-103. Set the value in the **Amount** spinner to specify the amount of inset. Next, click on the arrow placed on the **Group** button; a drop-down list will be displayed, as shown in Figure 8-104. Select the **Group** option to inset the group of polygons. Select the **By Polygon** option to inset the polygons in the group individually. Choose the **OK** button to apply the function and exit the caddy control. The **Flip** button in the **Edit Polygons** rollout is used to flip the direction of the selected polygons.



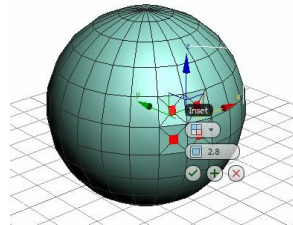
*Figure 8-100 The selected polygons in a sphere*



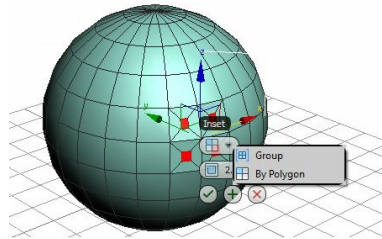
*Figure 8-101 The selected polygons after choosing the **Outline** button*



*Figure 8-102 The group of polygons inset on selecting the **Group** option*

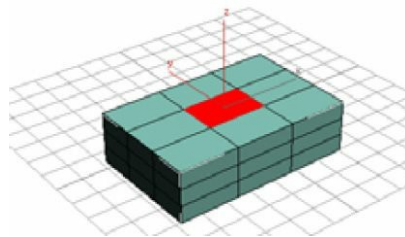


*Figure 8-103 The **Inset** caddy control displayed*



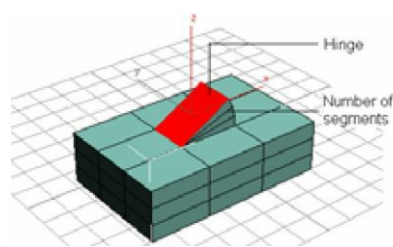
*Figure 8-104 The drop-down list displayed in the **Inset** caddy control*

The **Hinge From Edge** button is used to create a hinge on the selected polygon along the edge. To do so, select a polygon of the object in the viewport and choose the **Hinge From Edge** button. Now, move the cursor on an edge of the selected polygon, as shown in Figure 8-105, and drag the cursor in the vertical direction; the hinge will be created, as shown in Figure 8-106.



*Figure 8-105 The polygon selected in the box*

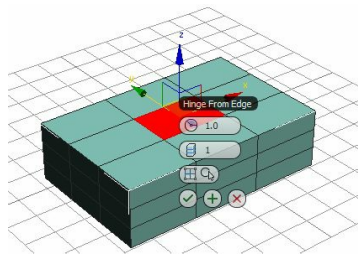




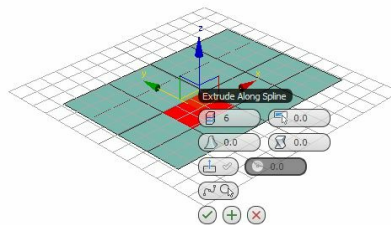
*Figure 8-106 The hinge created on choosing the **Hinge From Edge** button*

You can also create a hinge on the polygon using the **Settings** button on the right side of the **Hinge From Edge** button. To do so, select a polygon of the object in the viewport and choose the **Settings** button; the **Hinge From Edge** caddy control will be displayed in the viewport, as shown in Figure 8-107. The value in the **Angle** spinner is used to specify the angle of rotation. You can set a positive or a negative value in this spinner. The **Segments** spinner is used to specify the number of segments in the selected polygon. Choose the **Pick Hinge** button to activate it and click on an edge of the selected polygon in the viewport; the hinge will be created. Choose the **OK** button to close the caddy control.

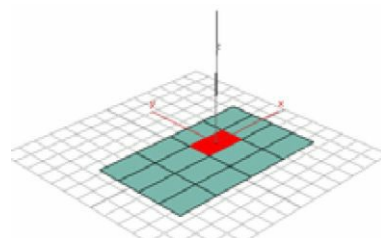
The **Extrude Along Spline** button in the **Edit Polygons** rollout is used to extrude the polygons of an object along the spline in the viewport. To do so, select a polygon of the editable poly object in the viewport. Now, choose the **Settings** button on the right side of the **Extrude Along Spline** button; the **Extrude Along Spline** caddy control will be displayed in the viewport, as shown in Figure 8-108. Choose the **Pick Spline** button in the caddy control to activate it and then select the spline in the viewport, as shown in Figure 8-109; the selected polygon will be extruded along the spline, as shown in Figure 8-110. Set the parameters of the extruded spline using the options in the **Extrude Polygons Along Spline** caddy control.



*Figure 8-107 The **Hinge From Edge** caddy control*

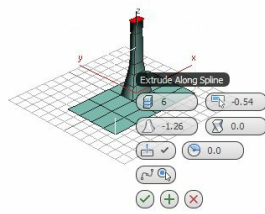


*Figure 8-108 The **Extrude Along Spline** caddy control*



*Figure 8-109 The polygon selected in the plane and the spline*





*Figure 8-110* The selected polygon extruded along the spline

## TUTORIALS

### Tutorial 1

In this tutorial, you will create a golf ball, as shown in Figure 8-111, by modifying the standard primitives at advanced level. **(Expected time: 20 min)**



*Figure 8-111* A golf ball model

The following steps are required to complete this tutorial:

- Create the project folder.
- Create a golf ball.
- Convert the golf ball.
- Modify the golf ball.
- Save and render the scene.

### Creating the Project Folder

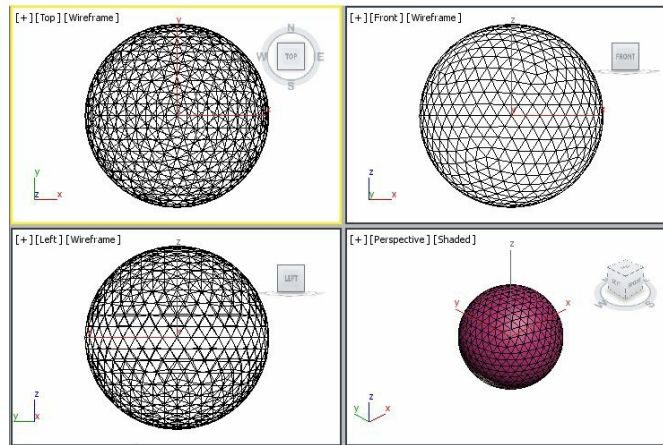
Create a new project folder with the name `c08_tut1` at `\Documents\3dsmax2015` and then save the file with the name `c08tut1`, as discussed in Tutorial 1 of Chapter 2.

### Creating a Golf Ball

In this section, you will create a golf ball by using the **Geosphere** tool.

- Activate the Top viewport and choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed by default in the drop-down list below the **Geometry** button. Now, choose the **GeoSphere** tool from the **Object Type** rollout.
- Expand the **Keyboard Entry** rollout and set the value **130.0** in the **Radius** spinner. Next, choose the **Create** button; a geosphere is created in viewports.
- In the **Parameters** rollout, set the value **8** in the **Segments** spinner.

4. Choose the **Zoom Extents All** tool to display the geosphere in viewports, as shown in Figure 8-112.



*Figure 8-112 The geosphere displayed in viewports*

5. In the **Name and Color** rollout, enter **golf ball**; the geosphere is named as *golf ball*.
6. Use the color swatch to change the color of *golf ball* to white.

Next, you need to convert *golf ball* into an editable mesh and modify it using the sub-object levels.

### Converting the Golf Ball into an Editable Mesh

In this section, you will convert *golf ball* into an editable mesh.

1. Select *golf ball* in any viewport and right-click on it; a quad menu is displayed. Choose the **Convert To** option; a cascading menu is displayed. Choose **Convert to Editable Mesh**; the *golf ball* is converted into editable mesh.

#### Note

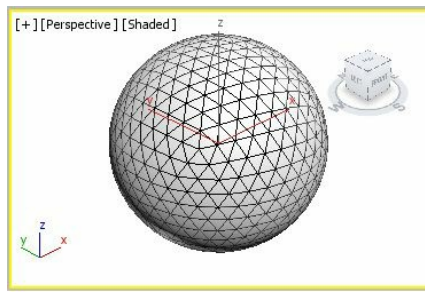
*When you convert the golf ball into editable mesh, the **GeoSphere** label in the modifier stack gets replaced by the **Editable Mesh**.*

Next, you need to modify *golf ball* using the sub-object levels in the modifier stack to give it a perfect shape.

### Modifying the Golf Ball Using the Sub-object Levels

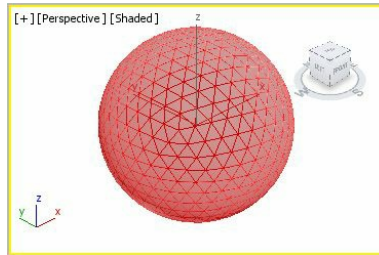
In this section, you will modify *golf ball* to give it a perfect shape.

1. Activate the Perspective viewport. Choose the **Zoom** tool and zoom in the Perspective viewport to view *golf ball*, as shown in Figure 8-113.



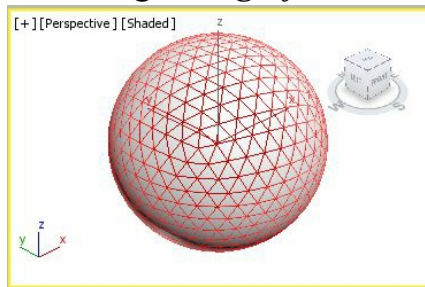
**Figure 8-113** The golf ball geometry zoomed in the Perspective viewport

2. Choose the **Maximize Viewport Toggle** tool to maximize the Perspective viewport.
3. Make sure that *golf ball* is selected in the Perspective viewport. In the modifier stack, click on the plus sign on the left of the **Editable Mesh** to view all the sub-object levels.
4. Select the **Polygon** sub-object level; it turns yellow and gets activated.
5. Press the CTRL+A keys to select all the polygons of *golf ball*, as shown in Figure 8-114.



**Figure 8-114** All polygons in the golf ball selected

6. Select the **Edge** sub-object level in the modifier stack.
7. Press the CTRL+A keys to select all the edges of *golf ball*, as shown in Figure 8-115.



**Figure 8-115** All edges of golf ball selected

Now, if you select the **Polygon** sub-object level in the modifier stack, all the polygons of golf ball will be selected in the viewport. And, if you select the **Edge** sub-object level, then all the edges of golf ball will be selected in the viewport.

8. In the **Edit Geometry** rollout, set the value of the **Chamfer** spinner to **5** and press ENTER; all the selected edges of *golf ball* are chamfered and hexagonal polygons are created, as shown in Figure 8-116.

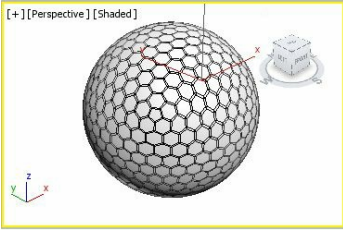


### Note

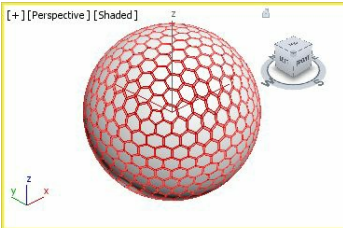
After entering a value in the **Chamfer** spinner and pressing the **ENTER** key, the value in the spinners changes to 0 automatically.

9. Now, in the modifier stack, select the **Polygon** sub-object level; all the polygons of *golf ball* get selected except the new hexagonal polygons, as shown in Figure 8-117.

Next, you need to select all new hexagonal polygons of *golf ball*.



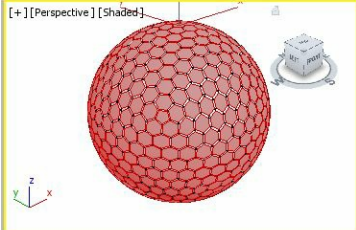
**Figure 8-116** All edges of *golf ball* chamfered



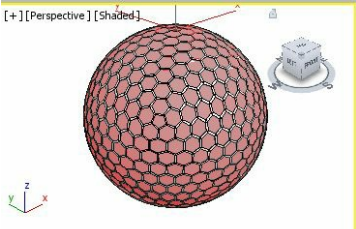
**Figure 8-117** All polygons in *golf ball*, except new hexagonal polygons selected

10. Choose the **Select Invert** option from the **Edit** menu; all the new hexagonal polygons of *golf ball* are selected in the viewport, as shown in Figure 8-118.

11. In the **Edit Geometry** rollout, set **-1** in the **Extrude** spinner for the negative extrusion of the selected hexagonal polygons and press **ENTER**, refer to Figure 8-119.



**Figure 8-118** All hexagonal polygons of *golf ball* selected in the viewport



**Figure 8-119** Hexagonal polygons displayed after negative extrusion

12. Enter **-4** in the **Bevel** spinner of the **Edit Geometry** rollout to bevel the selected hexagonal

polygons and then press ENTER.

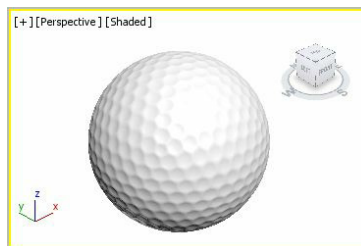
Now, you need to smoothen the selected polygons of *golf ball*.

13. Select the **MeshSmooth** modifier from the **Modifier List** drop-down list at the top of the modifier stack in the Modify panel. Use the default settings for the **MeshSmooth** modifier; the *golf ball* is smoothened, refer to Figure 8-120.
14. Click anywhere in the viewport to deselect the sub-objects. Press the F4 key; *golf ball* is displayed in the viewport.
15. Choose the **Maximize Viewport Toggle** tool to view *golf ball* in viewports.

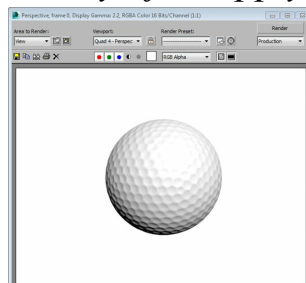
## Saving and Rendering the Scene

In this section, you will save the scene and then render it.

1. Change the background color of the scene to white, as discussed in Tutorial 1 of Chapter 2. Next, choose **Save** from the **Application** menu.
2. Activate the Perspective viewport. Next, choose **Save** from the **Application** menu.
3. Choose the **Render Production** tool from the **Main Toolbar**; the **Rendered Frame** window is displayed. This window shows the final output of *golf ball*, as shown in Figure 8-121.
4. Close this window.



**Figure 8-120** The *golf ball* geometry after applying the *Mesh Smooth* modifier



**Figure 8-121** The final output after rendering

## Tutorial 2

In this tutorial, you will create the model of an LCD monitor, as shown in Figures 8-122 and 8-123, by modifying 3D mesh objects at advanced level. **(Expected time: 30 min)**



*Figure 8-122 The model of an LCD monitor (view 1)*



*Figure 8-123 The model of an LCD monitor (view 2)*

The following steps are required to complete this tutorial:

- a. Create the project folder.
- b. Create the front portion of monitor.
- c. Create the back portion of monitor.
- d. Create speakers.
- e. Create buttons.
- f. Create the support of monitor.
- g. Save and render the scene.

### Creating the Project Folder

Create a new project folder with the name *c08\_tut2* at *\Documents\3dsmax2015* and then save the file with the name *c08tut2*, as discussed in Tutorial 1 of Chapter 2.

### Creating the Front Portion of Monitor

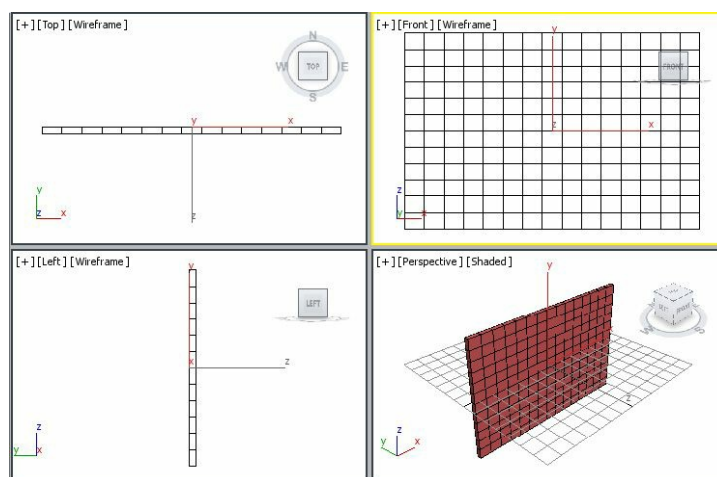
In this section, you will create the front portion of the LCD monitor.

1. Activate the Front viewport and choose **Create > Geometry** in the **Command Panel**. In this panel, by default the **Standard Primitives** option is displayed in the drop-down list below the **Geometry** button. Now, choose the **Box** tool from the **Object Type** rollout.
2. Expand the **Keyboard Entry** rollout and set the following values in their respective spinners:



Length: **86** Width: **128** Height: **3.0**

3. Choose the **Create** button; a box is displayed in the viewports.
4. In the **Parameters** rollout, set the values as follows:  
Length Segs: **12** Width Segs: **15** Height Segs: **1**
5. Choose the **Zoom Extents All** tool; a box is displayed in all the viewports, as shown in Figure 8-124.



**Figure 8-124** The box for the front portion of the monitor displayed in viewports

6. In the **Name and Color** rollout, enter **front portion**; the box is named as *front portion*. Also, change the color of *front portion* to white.

Next, you need to convert *front portion* into an editable poly to modify it using sub-object levels.

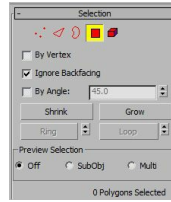
7. Select *front portion* in any viewport and right-click on it; a quad menu is displayed. Choose the **Convert To:** option; a cascading menu is displayed. Choose **Convert to Editable Poly**; *front portion* is converted into an editable poly.

When you convert *front portion* into an editable poly, the name of the **Box** tool in the modifier stack gets replaced with **Editable Poly**. Next, you need to modify *front portion* using sub-object levels in the modifier stack to give it a shape similar to the front portion of the monitor.

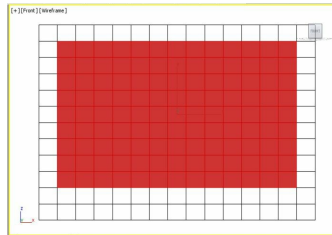
8. Activate the Front viewport and choose the **Maximize Viewport Toggle** tool to maximize it.
9. Make sure that *front portion* is selected in the viewport. In the modifier stack, click on the plus sign on the left of the **Editable Poly** to view all the sub-object levels.
10. Select the **Polygon** sub-object; it turns yellow and gets activated.
11. In the **Selection** rollout, select the **Ignore Backfacing** check box, refer to Figure 8-125.

12. In the Front viewport, hold the CTRL key and select all polygons of *front portion*, except the outer rows, refer to Figure 8-126.

**F**



**figure 8-125** The **Ignore Backfacing** check box selected



**Figure 8-126** All polygons selected in the Front viewport

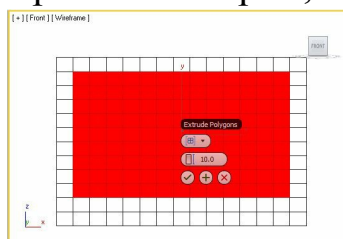
 **Note**

You can also use the **Grow** button in the **Selection** rollout to increase the selection area of polygons in the viewport.

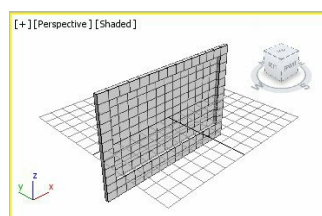
13. In the **Edit Polygons** rollout, choose the **Settings** button on the right side of the **Extrude** button to extrude the selected polygons; the **Extrude Polygons** caddy control is displayed in the viewport, as shown in Figure 8-127. In the **Height** spinner, set the value **-3** for negative extrusion and choose **OK** twice to close the caddy control.

14. Click on the **Polygon** sub-object level in the modifier stack to deactivate it. Next, click anywhere in the viewport to deselect *front portion*.

15. Choose the **Maximize Viewport Toggle** tool to view all the four viewports simultaneously. The extrusion effect is displayed in the Perspective viewport, as shown in Figure 8-128.



**Figure 8-127** The **Extrude Polygons** caddy control



**Figure 8-128** The extrusion effect displayed in the Perspective viewport

Now, you need to create a box for the screen of *front portion*.

16. Activate the Front viewport, choose **Create > Geometry** from the **Command Panel**. In this panel, the **Standard Primitives** option is displayed by default in the drop-down list below the **Geometry** button. Now, choose the **Box** tool from the **Object Type** rollout.

17. Expand the **Keyboard Entry** rollout and set the following values in their respective spinners:

Length: **72** Width: **110.5** Height: **0.5**

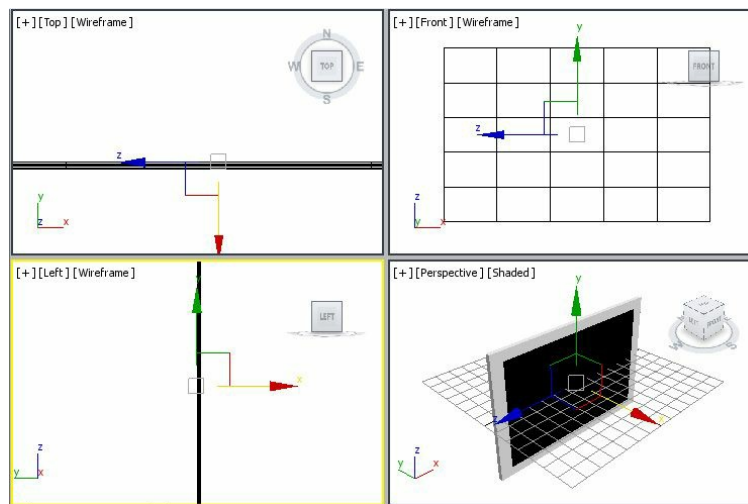
18. Choose the **Create** button; a box is displayed in viewports.

19. In the **Parameters** rollout, set the values as follows:

Length Segs: **5** Width Segs: **5** Height Segs: **5**

20. In the **Name and Color** rollout, enter **screen**; the box is named as *screen*. Change the color of *screen* to black. Figure 8-129 shows *screen* in the viewports.

21. Group *screen* and *front portion* as discussed earlier and name it as *front part*.



**Figure 8-129** The screen geometry in the viewports

## Creating the Back Portion of Monitor

In this section, you will create the back portion of the monitor.

1. Activate the Front viewport, choose **Create > Geometry** from the **Command Panel**. Now, choose the **Box** tool from the **Object Type** rollout.

2. Expand the **Keyboard Entry** rollout and set the following values in their respective spinners:

Length: **86** Width: **128** Height: **5.0**

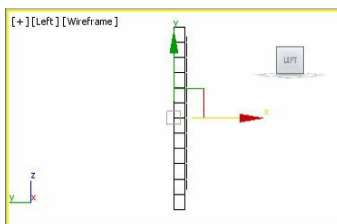
3. Choose the **Create** button; a box is displayed in viewports.

4. In the **Parameters** rollout, set the values as follows:

Length Segs: **12** Width Segs: **15** Height Segs: **1**

5. In the **Name and Color** rollout, enter **back portion** and press ENTER; the box is named as *back portion*. Now, change the color of *back portion* to black.

6. Activate the Left viewport and align *back portion* with the back of *front part*, as shown in Figure 8-130.



**Figure 8-130** Alignment of the back portion with the front part in the Left viewport

7. Convert *back portion* into editable poly to modify it at an advanced level as discussed earlier.

8. Activate the Front viewport and make sure *back portion* is selected. Now, right-click on *back portion*; a quad menu is displayed. Choose the **Hide Unselected** option from the quad menu; *front part* is hidden in the viewport and only *back portion* is displayed in all the viewports. This will help you to modify *back portion* easily.

Next, you need to modify the back side of *back portion*. To do so, you need to change the Front viewport to the Back viewport so that you can view the back side of the object.

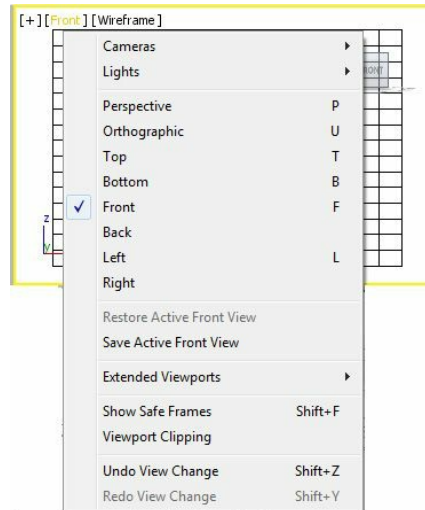
9. Click on the **Front** label in the Front viewport; a flyout is displayed showing various options to display different views of the viewport, as shown in Figure 8-131. Choose the **Back** option; the Back viewport is displayed.

10. In the modifier stack, click on the plus sign on the left of **Editable Poly** to view all the sub-object levels.

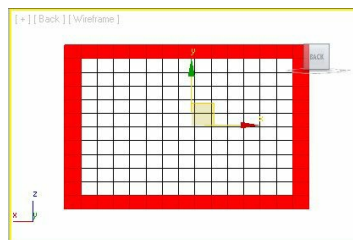
**Tip:** To perform precise modeling at an advanced level, you can invoke the **Maximize Viewport Toggle** tool.

11. Select the **Polygon** sub-object level; it turns yellow and gets activated.

12. In the Back viewport, hold the CTRL key and select the outer polygons of *back portion*, as shown in Figure 8-132.



*Figure 8-131 A flyout showing various options to display views*

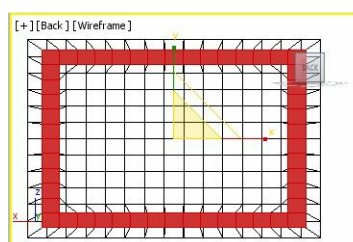


*Figure 8-132 The outer polygons selected in back portion*

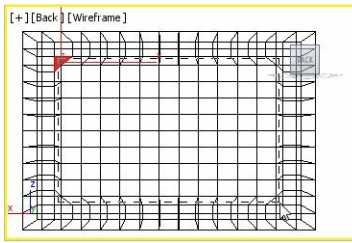
13. Right-click on the **Select and Uniform Scale** tool from the **Main Toolbar**; the **Scale Transform Type-In** dialog box is displayed. In the **Offset: Screen** area, set the value **90** in the **%** spinner and press ENTER; the selected polygons are uniformly scaled to 90 percent, as shown in Figure 8-133. Next, close this dialog box.

14. Click anywhere in the viewport to deselect polygons.

15. In the **Selection** rollout, select the **Ignore Backfacing** check box. Next, choose the **Select Object** tool and select the inner polygons by using the rectangular cross selection, as shown in Figure 8-134.

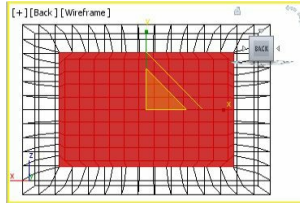


*Figure 8-133 The selected polygons uniformly scaled in back portion*

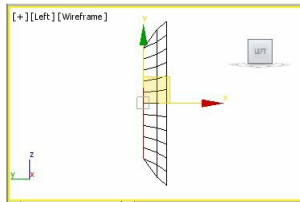


**Figure 8-134** *Selecting the inner polygons in back portion*

16. Right-click on the **Select and Uniform Scale** tool from the **Main Toolbar**; the **Scale Transform Type-In** dialog box is displayed. In the **Offset: Screen** area, set the value **90** in the **%** spinner and press ENTER; the selected polygons are uniformly scaled to 90 percent, as shown in Figure 8-135. Next, close this dialog box.
17. Activate the Left viewport and make sure that the polygons are still selected. Choose the **Select and Move** tool and right-click on it; the **Move Transform Type-In** dialog box is displayed. In the **Offset: Screen** area, enter **-7** in the **X** spinner and press ENTER; the selected polygons move in the horizontal direction, as shown in Figure 8-136. Next, close this dialog box.




**Figure 8-135** *The selected polygons uniformly scaled to 90 percent*



**Figure 8-136** *Selected polygons dragged horizontally*

18. Select the **Polygon** sub-object level in the modifier stack to deactivate it. Next, click anywhere in the viewport to deselect the object in the viewport.

 **Note**  
*While working in the Back or Left viewport, you can view the output of the modification in the Perspective viewport using the **Orbit** tool.*

19. Change the Back viewport to Front viewport as described earlier. Now, right-click in the viewport; a quad menu is displayed. Choose the **Unhide All** option; all objects are displayed in the viewports.
20. Select *back portion* and *front part* in any viewport simultaneously by dragging a selection box around them and group them as *monitor*.



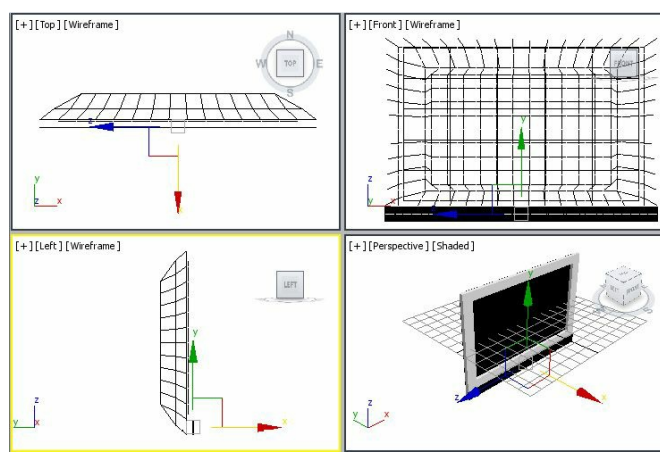
## Creating Speaker for the Monitor

In this section, you will create speaker for the monitor.

1. Activate the Front viewport and choose **Create > Geometry** from the **Command Panel**. By default, the **Standard Primitives** option is displayed in the drop-down list below the **Geometry** button. Now, choose the **Box** tool from the **Object Type** rollout.
2. Expand the **Keyboard Entry** rollout and set the following values in their respective spinners:  
Length: **7.0** Width: **128** Height: **0.2**
3. Choose the **Create** button; a box is displayed in the viewports.
4. In the **Parameters** rollout, make sure the value in the **Length Segs** and **Width Segs** spinner is **15** and in the **Height Segs** spinner is **1**.
5. In the **Name and Color** rollout, enter **speaker**; the box is named as *speaker*. Also, change the color of *speaker* to black.
6. Align *speaker* in viewports with *monitor*, as shown in Figure 8-137.

You need to apply the **Lattice** modifier to *speaker* from the **Modifier List** drop-down list located at the top of modifier stack.

7. Make sure that *speaker* is selected in the viewport. Next, choose the **Modify** tab in the **Command Panel** and then select the **Lattice** modifier from the **Modifier List** drop-down list; the **Lattice** modifier is displayed in the modifier stack.
8. In the **Parameters** rollout of the **Lattice** modifier, select the **Struts Only from Edges** radio button. In the **Struts** area, set the value **0.5** in the **Radius** spinner. Also, select the **Smooth** check box.
9. Click anywhere in the viewport to deselect *speaker* and choose the **Zoom Extents All** tool to view all objects in all the viewports.



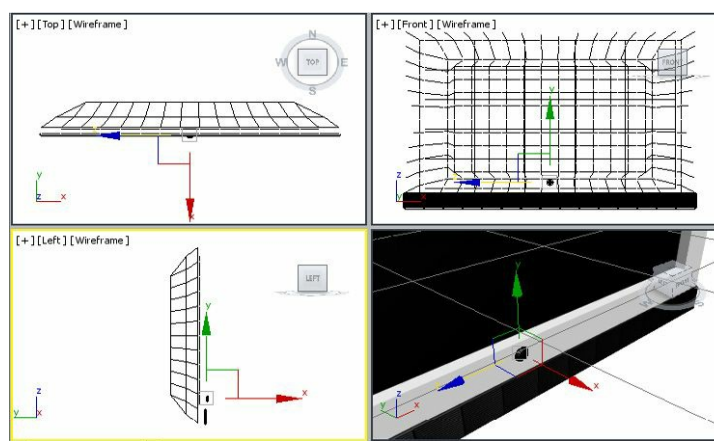
**Figure 8-137** Alignment of the speaker with the monitor in viewports

## Creating Buttons

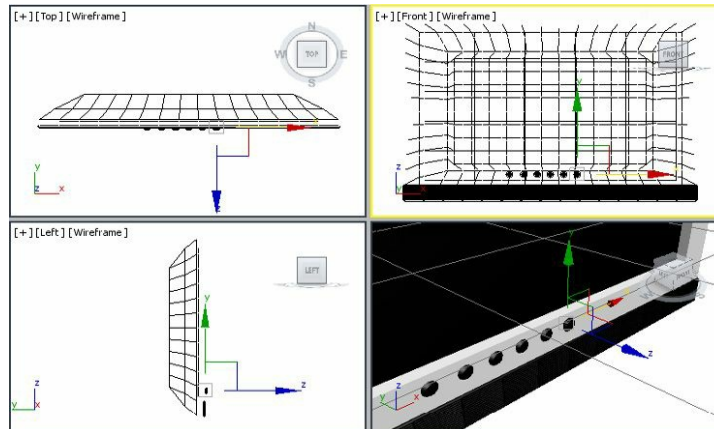
In this section, you will create buttons for the monitor by using the **ChamferCyl** tool.

1. Activate the Front viewport and choose **Create > Geometry** in the **Command Panel**. Now, select **Extended Primitives** from the drop-down list below the **Geometry** button and choose the **ChamferCyl** tool from the **Object Type** rollout.
2. Expand the **Keyboard Entry** rollout and set the values as follows:  
 Radius: **1.5** Height: **1.0** Fillet: **0.5**
3. Choose the **Create** button; a chamfer cylinder is displayed in the viewports.
4. In the **Name and Color** rollout, enter **b01**; the chamfer cylinder is named as *b01*. Also, change the color of the *b01* to black.
5. Align *b01* in viewports with *front portion*, as shown in Figure 8-138. You need to choose the **Zoom** or **Zoom Region** tool to align it properly.
6. In the Front viewport, create five copies of *b01*. They are automatically named as *b002*, *b003*, *b004*, *b005*, and *b006*. Next, align them in the viewports, as shown in Figure 8-139.
7. Select all the objects in the viewport and group them as *LCD Monitor*.
8. Activate the Left viewport and select *LCD Monitor*. Now, right-click on the **Select and Rotate** tool from the **Main Toolbar**; the **Rotate Transform Type-In** dialog box is displayed. In the **Offset: Screen** area, set the value **15** in the **Z** spinner and press the ENTER key.

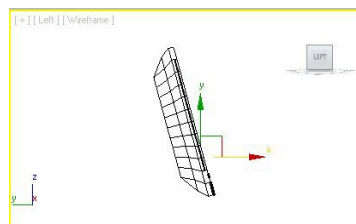
Next, close this dialog box; *LCD Monitor* is displayed in the viewports, as shown in Figures 8-140 and 8-141.



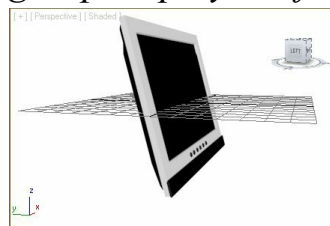
**Figure 8-138** Alignment of b01 with front portion in viewports



**Figure 8-139** Alignment of b002, b003, b004, b005, and b006 in viewports



**Figure 8-140** The LCD monitor group displayed after rotating it in the Left viewport



**Figure 8-141** The LCD monitor group displayed in the Perspective viewport

## Creating the Support of Monitor

In this section, you will create support of monitor by using the **ChamferCyl** tool

1. Activate the Top viewport and choose **Create > Geometry** in the **Command Panel**. Next, select **Extended Primitives** from the drop-down list below the **Geometry** button, and then choose the **ChamferCyl** tool from the **Object Type** rollout.
2. Expand the **Keyboard Entry** rollout and set the following values in their respective spinners:

Radius: **23.698** Height: **6.091** Fillet: **2.284**

3. Choose the **Create** button from the **Command Panel**; a chamfer cylinder is displayed in viewports.

4. In the **Parameters** rollout, set the values as follows:

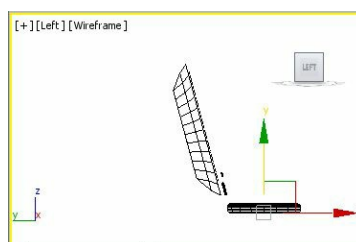
Fillet Segs: **5** Sides: **18** Cap Segs: **4**

5. In the **Name and Color** rollout, enter **support**; the chamfer cylinder is named as *support*. Also, use the color swatch to change the color of *support* using the following values:

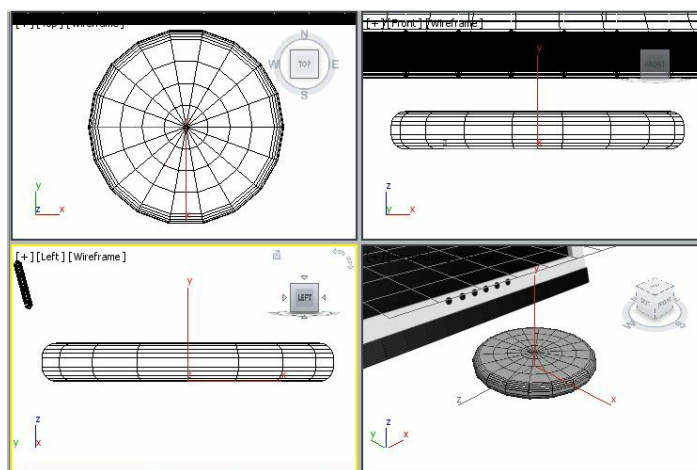
Red: **115** Green: **115** Blue: **115**

6. In the Left viewport, move the cursor over the Y axis and move *support* below *LCD monitor*. Also, move *support* in the horizontal direction, as shown in Figure 8-142.

7. Make sure that *support* is selected. Next, choose the **Zoom Extents All Selected** tool; *support* is zoomed in the viewports, as shown in Figure 8-143.



*Figure 8-142 The support geometry moved in the Left viewport*



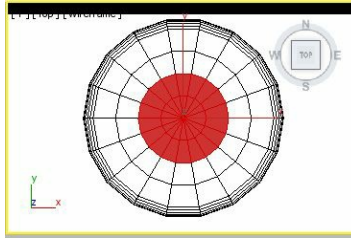
*Figure 8-143 The support geometry zoomed in viewports*

8. Convert *support* into editable poly to modify it to an advanced level.

9. In the modifier stack, click on the plus sign on the left of **Editable Poly** to view all the sub-object levels.

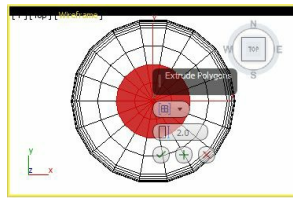
10. Select the **Polygon** sub-object level; it turns yellow and gets activated.

11. Press and hold the CTRL key and select the inner polygons of *support* in the Top viewport, as shown in Figure 8-144.

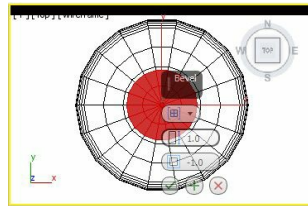


*Figure 8-144 The inner polygons of support selected*

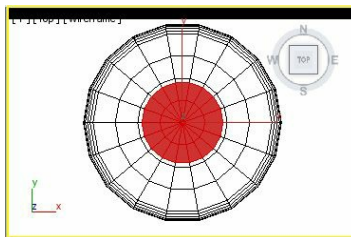
12. In the **Edit Polygons** rollout, choose the **Settings** button on the right of the **Extrude** button; the **Extrude Polygons** caddy control is displayed in the viewport. Set the value **2.0** in the **Height** spinner, refer to Figure 8-145, and choose the **OK** button twice to close this caddy control.
13. Choose the **Settings** button on the right of the **Bevel** button; the **Bevel** caddy control is displayed in the viewport. Set the value **1.0** in the **Height** spinner, refer to Figure 8-146, press ENTER, and choose **OK** twice to close the caddy control; the support is displayed in viewport. Figures 8-147 and 8-148 shows the support displayed in the Top and Perspective viewports, respectively.



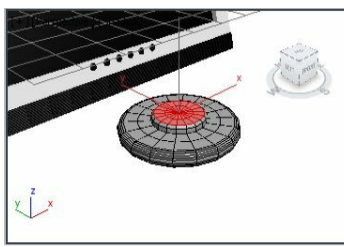
*Figure 8-145 The Extrude Polygons caddy control*



*Figure 8-146 The value set in the Height spinner of the Bevel caddy control*

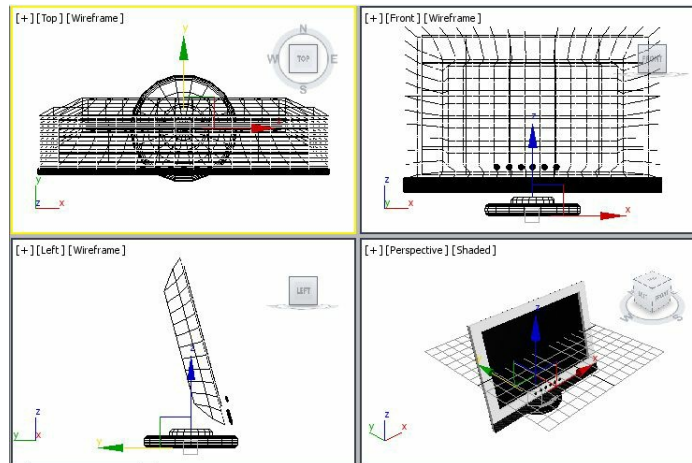


*Figure 8-147 The selected polygons in the Top viewport after extruding and beveling*



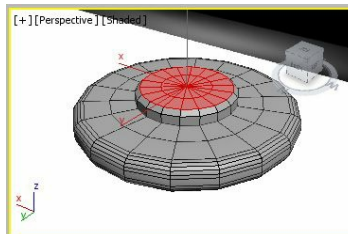
**Figure 8-148** The selected polygons in the Perspective viewport after extruding and beveling

14. Select the **Polygon** sub-object level in the modifier stack to deselect it and then click anywhere in the viewport to deselect the object.
15. Choose the **Zoom Extents All** tool and align *support* in viewports, as shown in Figure 8-149.

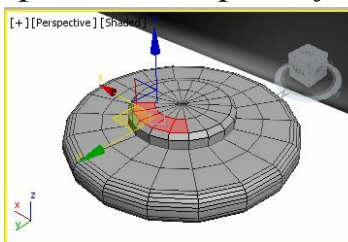


**Figure 8-149** Alignment of support in viewports

16. Select *support* and choose the **Zoom Extents All Selected** tool. Now, select the **Polygon** sub-object level in the modifier stack; all the selected polygons are displayed.
17. Activate the Perspective viewport and set the view using the **Zoom**, **Select and Move** and **Orbit** tools, as shown in Figure 8-150. Next by holding the ALT key, deselect the polygons except the five polygons on the back, refer to Figure 8-151.



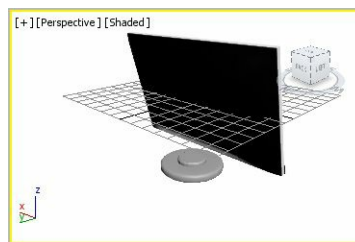
**Figure 8-150** The view of the Perspective viewport after using the **Zoom** and **Orbit** tools



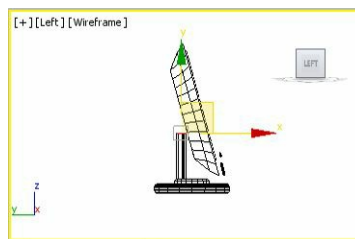


*Figure 8-151 The polygons selected in the Perspective viewport*

18. Select the **Polygon** sub-object level in the modifier stack to deactivate it and then click anywhere in the viewport to deselect the object.
19. Choose the **Zoom Extents All** tool and set the view of the Perspective viewport to view the back side of *LCD monitor*, as shown in Figure 8-152.
20. Activate the Left viewport and select *support* from it. Next, select the **Polygon** sub-object level; all the selected polygons are highlighted.
21. In the **Edit Polygons** rollout, choose the **Settings** button on the right of the **Extrude** button; the **Extrude Polygons** caddy control is displayed. Set the value **29** in the **Height** spinner, press ENTER and choose **OK** twice to close this caddy control; the selected polygons are extruded and displayed in the Left viewport, as shown in Figure 8-153.

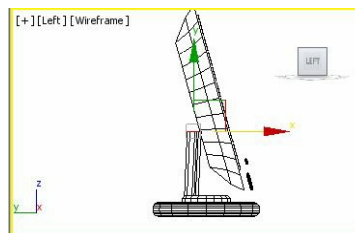


*Figure 8-152 The back side geometry of LCD monitor in the Perspective viewport*

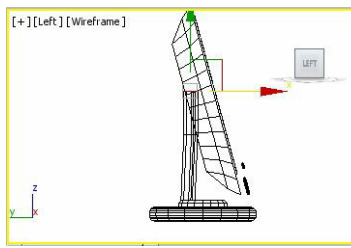


*Figure 8-153 The selected polygons extruded in the Left viewport*

22. In the Left viewport, move the cursor over the horizontal axis and drag the selected polygons horizontally toward the right side until they touch *LCD monitor*, as shown in Figure 8-154.
23. In the **Edit Polygons** rollout, again choose the **Settings** button on the right of the **Extrude** button; the **Extrude Polygons** caddy control is displayed. Set the value **19** in the **Height** spinner and press ENTER. Next, choose **OK** twice to close this caddy control. The *support* is extruded in the Left viewport, as shown in Figure 8-155.

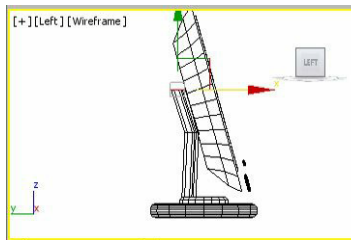


*Figure 8-154 The support geometry in the Left viewport after moving it horizontally*



*Figure 8-155 The support geometry in the Left viewport after extrusion*

24. In the Left viewport, move the cursor over the horizontal axis, and drag the selected polygons horizontally toward the left to align them with *LCD monitor*, as shown in Figure 8-156.



*Figure 8-156 The selected polygons of support in the Left viewport*

25. Select the **Polygon** sub-object level in the modifier stack to deselect it.

## Saving and Rendering the Scene

In this section, you will save the scene and then render it. \_\_\_\_\_

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1. Choose **Save** from the **Application** menu.

2. Activate the Perspective viewport. Next, choose the **Render Production** tool from the **Main Toolbar**; the **Rendered Frame** window is displayed. This window shows the final output of the scene, refer to Figures 8-122 and 8-123.