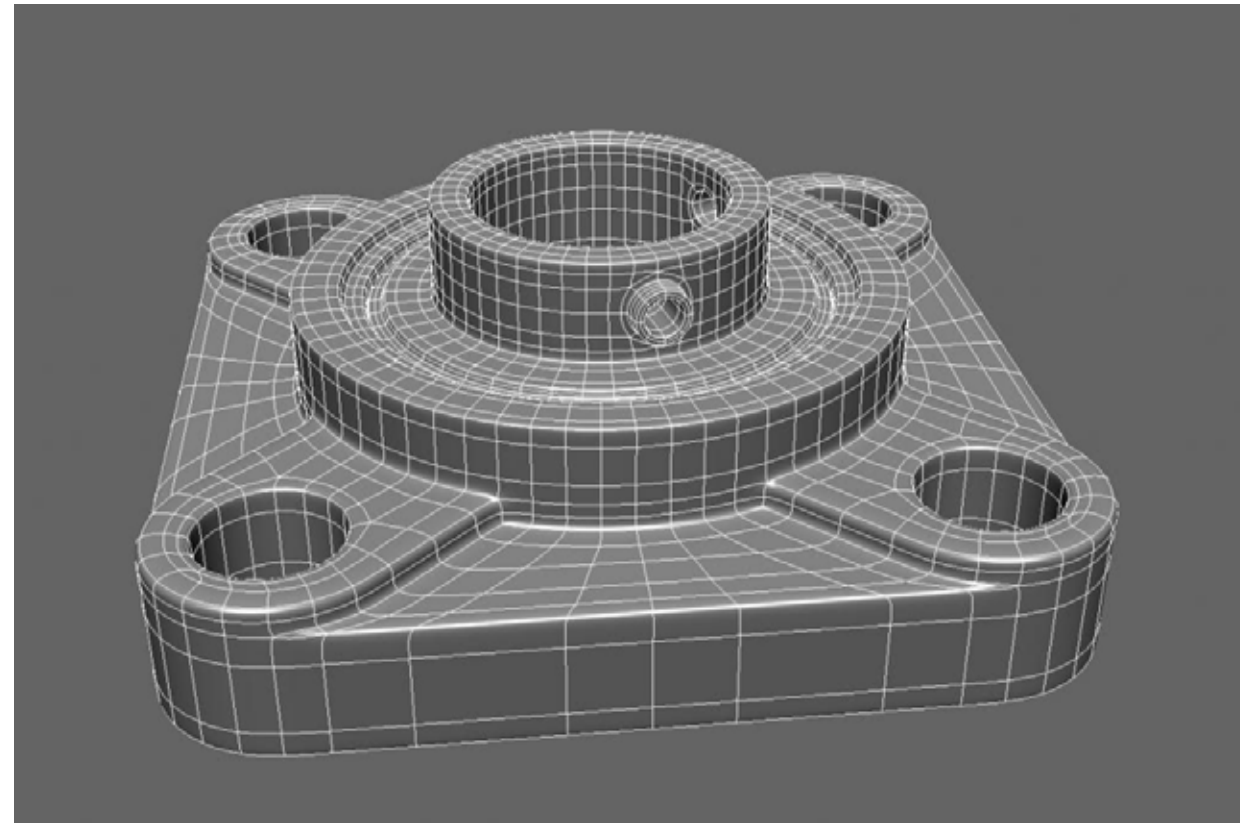
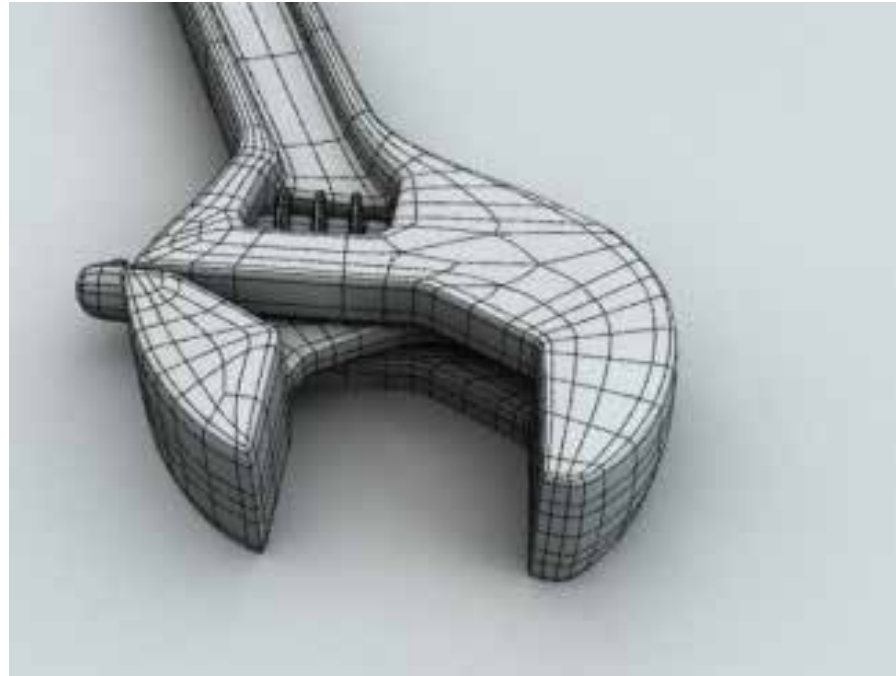


3D POLYGON MODELING

TOPOLOGY

What is Topology?



Topology is the wireframe or mesh of a 3D object.

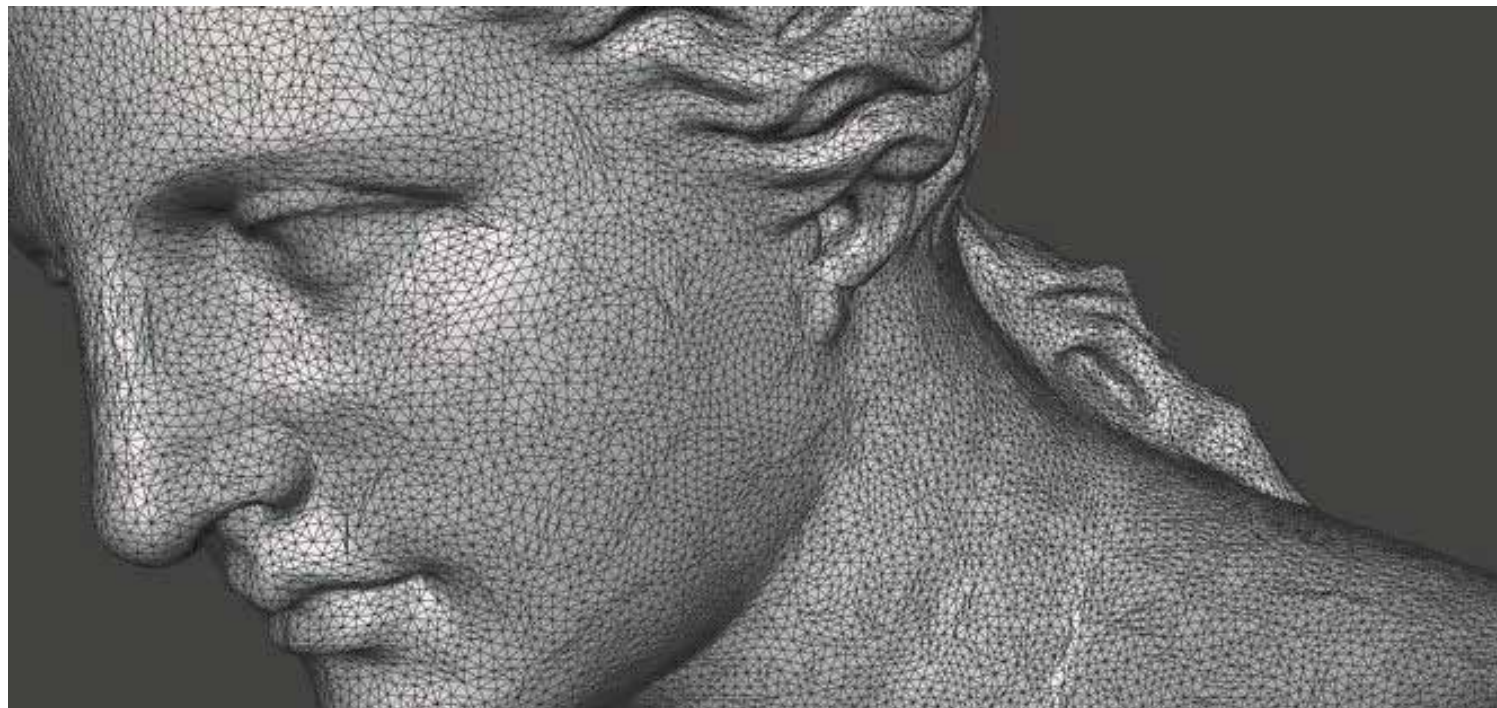
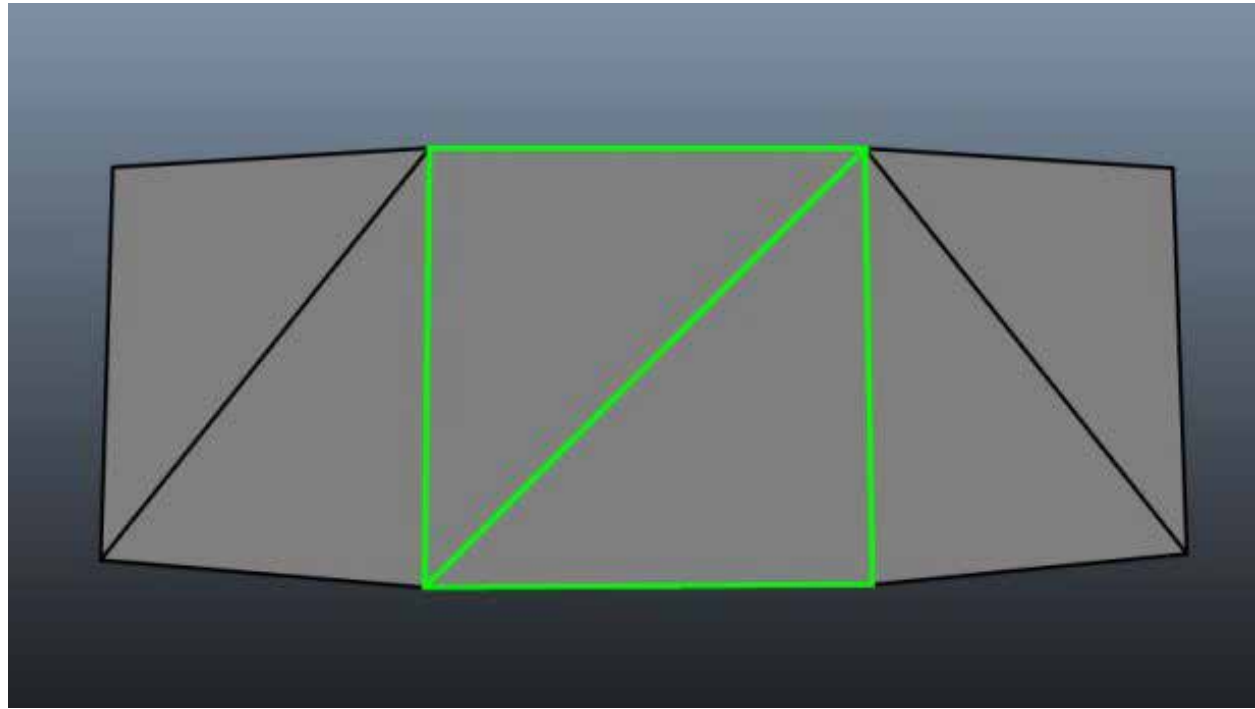
Topology refers to the geometric surface characteristics and the organization of faces, edges, and vertices.

The goal with topology is to have the fewest number of faces to describe the 3D form.

More faces can be added when need for detail, deforming, or animation.

3D modelers strive for clean topology with proper edges that loop all the way around the model.

3 TYPES OF TOPOLOGY: TRIANGLES, QUADS, NGONS



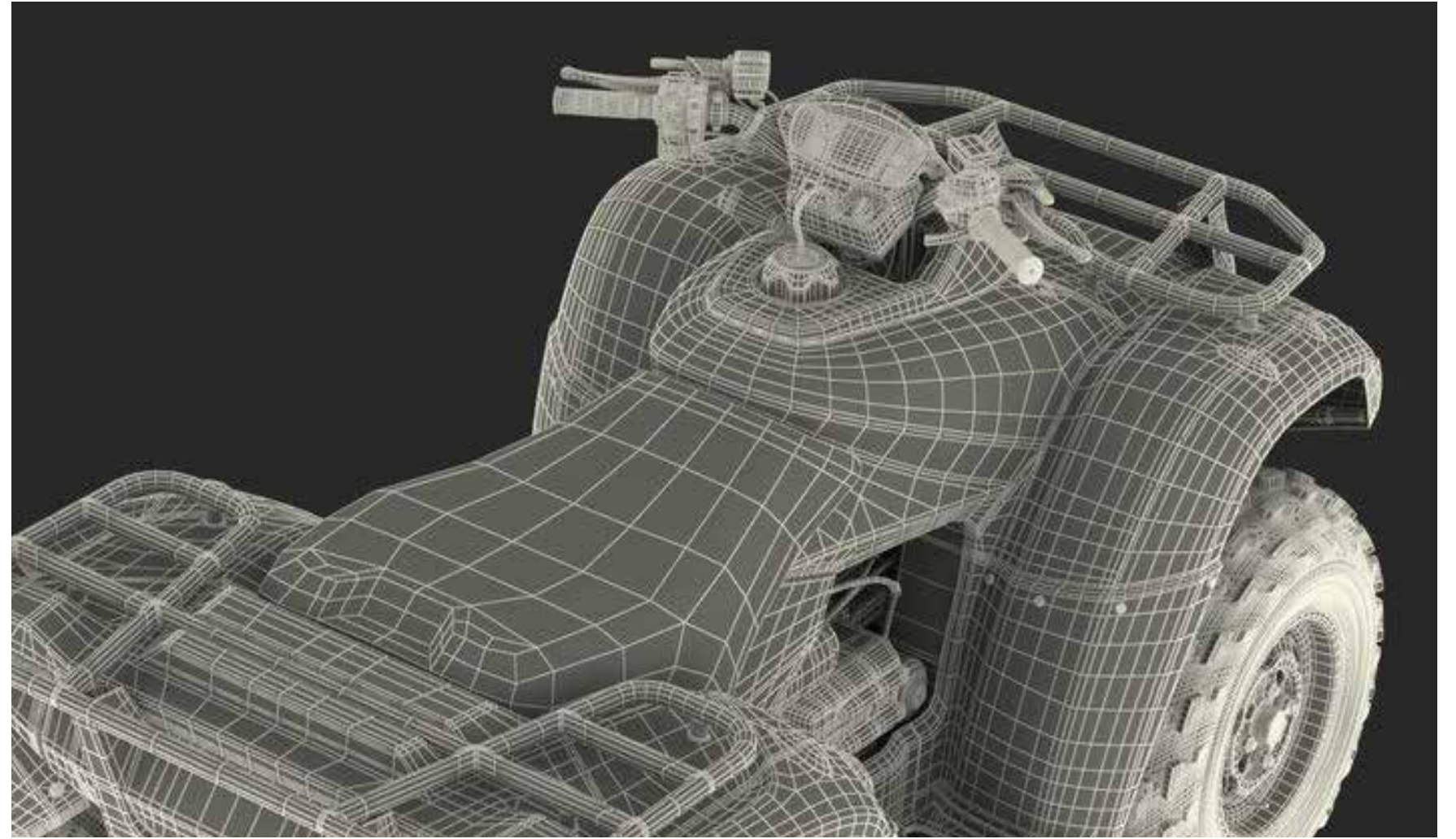
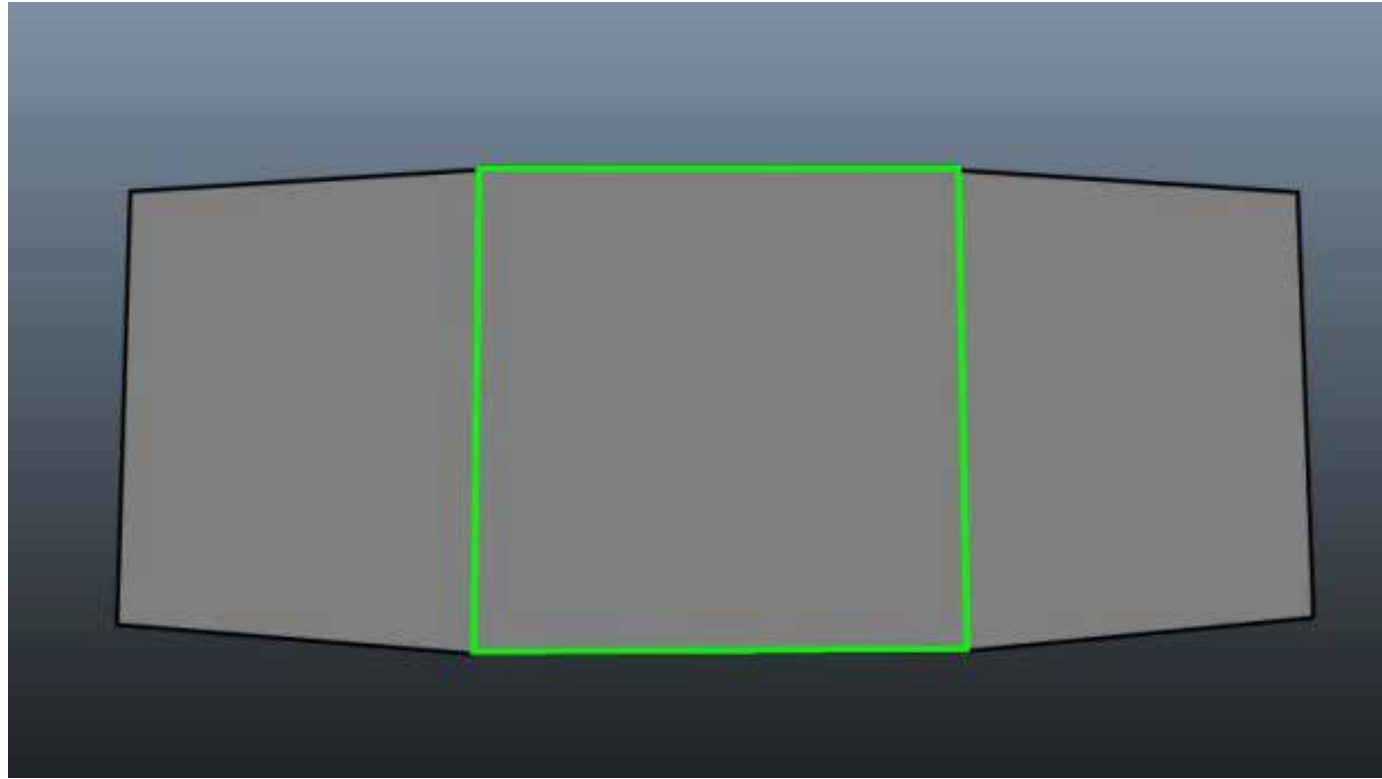
Tris is a topology that uses triangles. This type of topology is **often avoided** as when attempting to produce complex meshes.

Triangles cause problems when subdividing and deforming

Other software packages will sometimes not accept tris such as game engines and VR pipelines.

Tris can be produced from 3D scans and exports from different 3D file formats.

QUADS

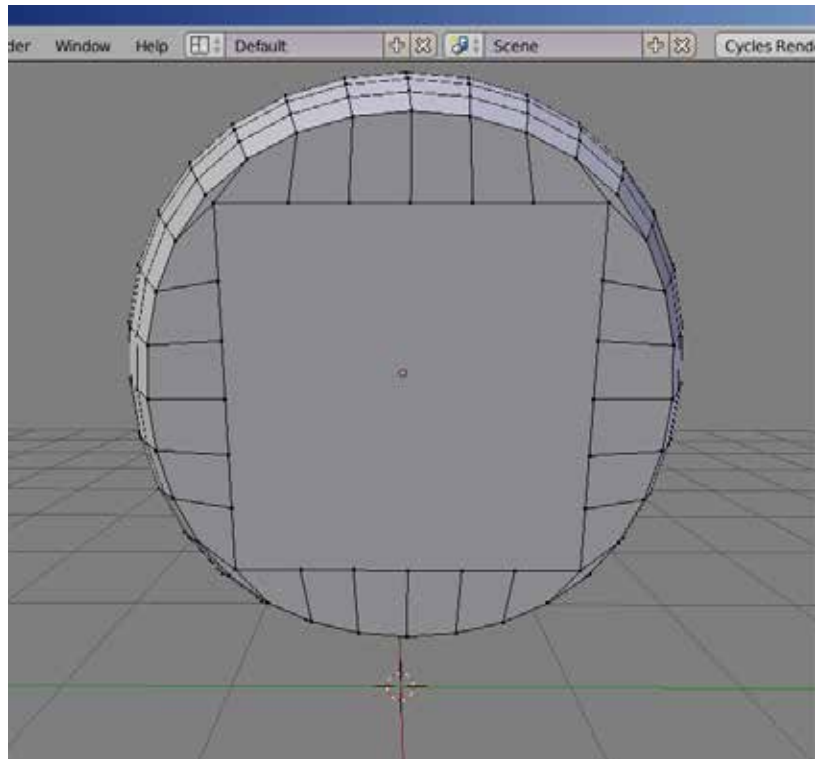
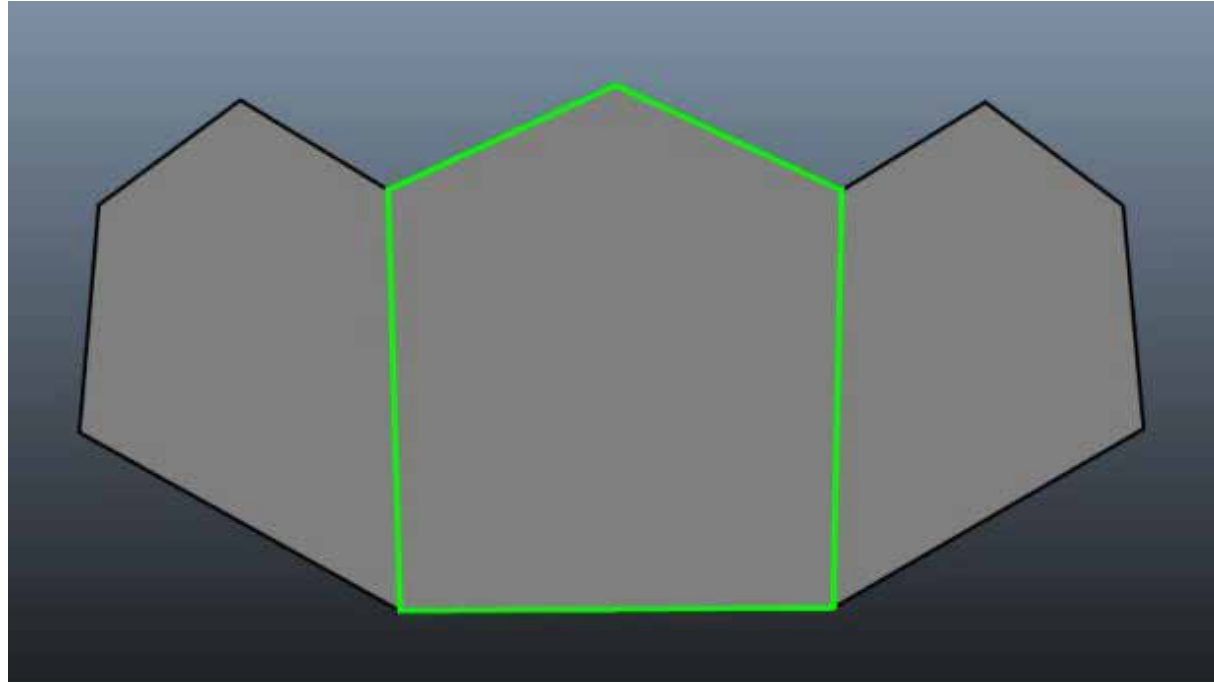


Quads are a topology that uses 4-sided shapes.

This form of topology is best for creating 3D models

Quad meshes have clean topology that can deform well.

NGONS

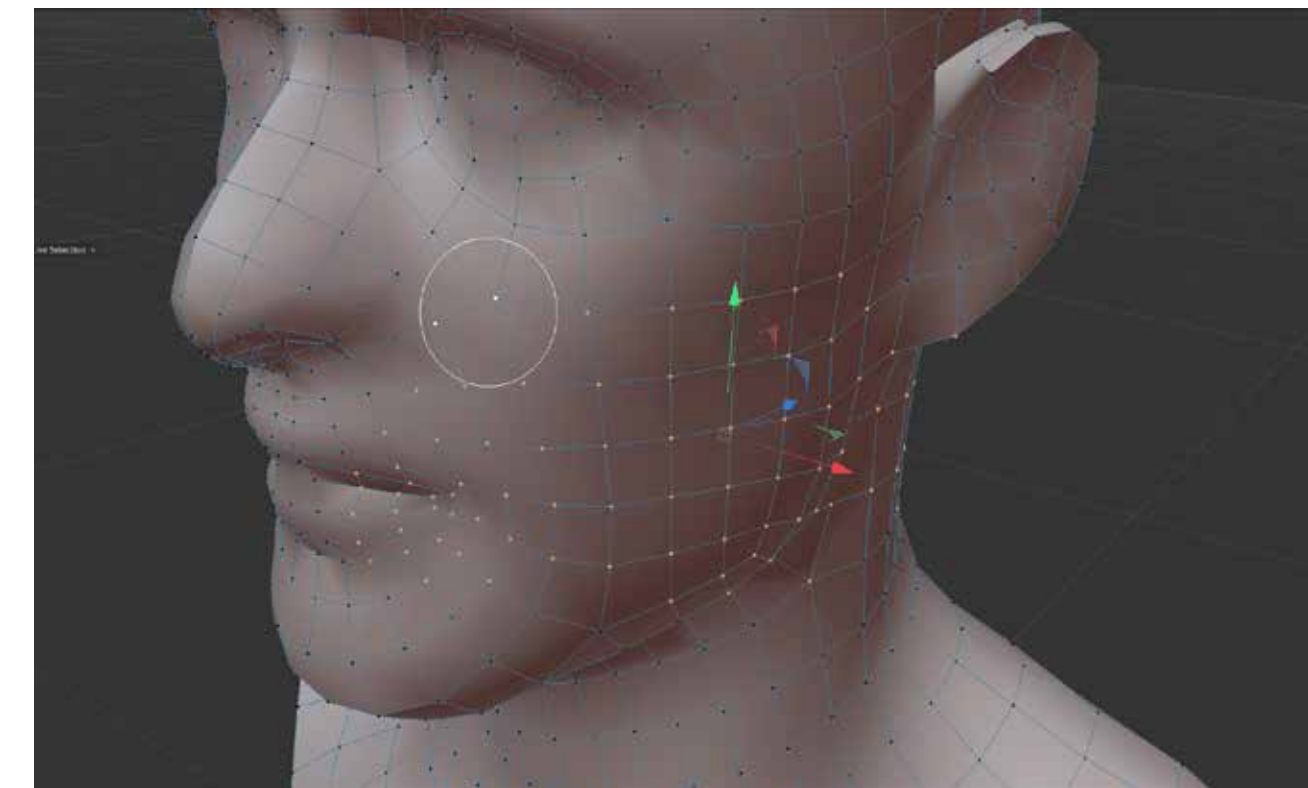
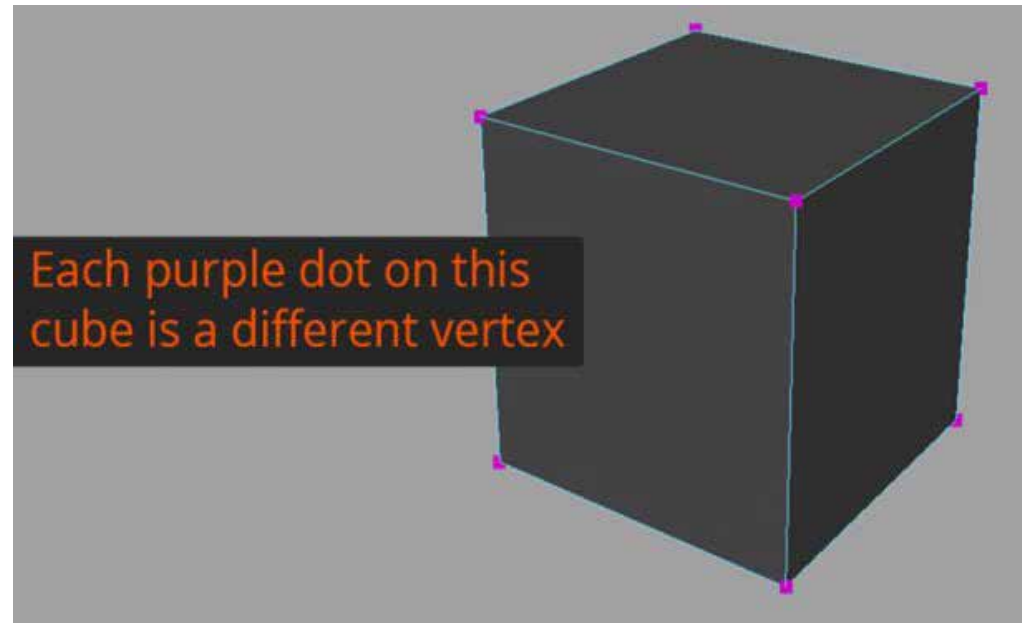


N-Gons are a topology that uses shapes with 5 or more sides. N-Gons should be avoided whenever possible within 3D modelling

Some file formats will not support N-Gons.

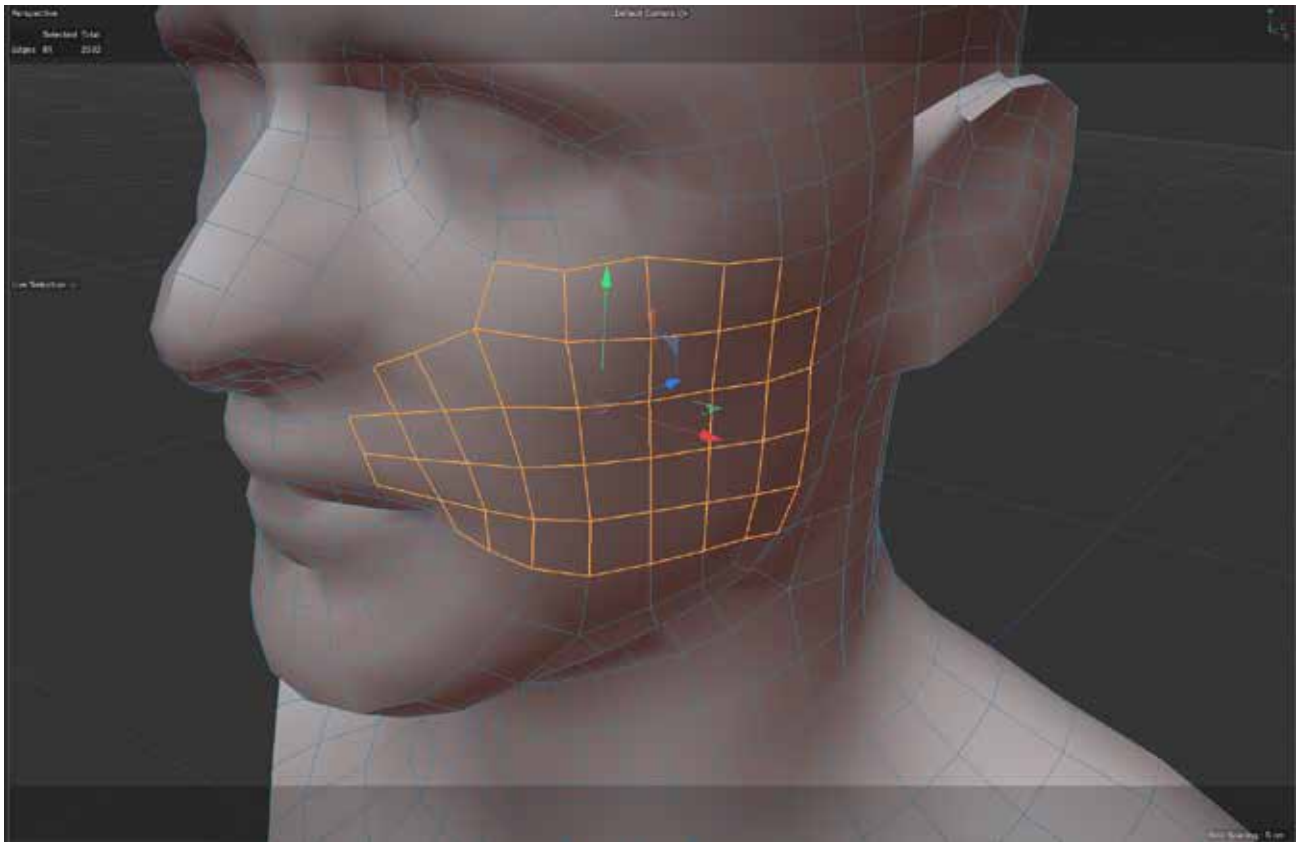
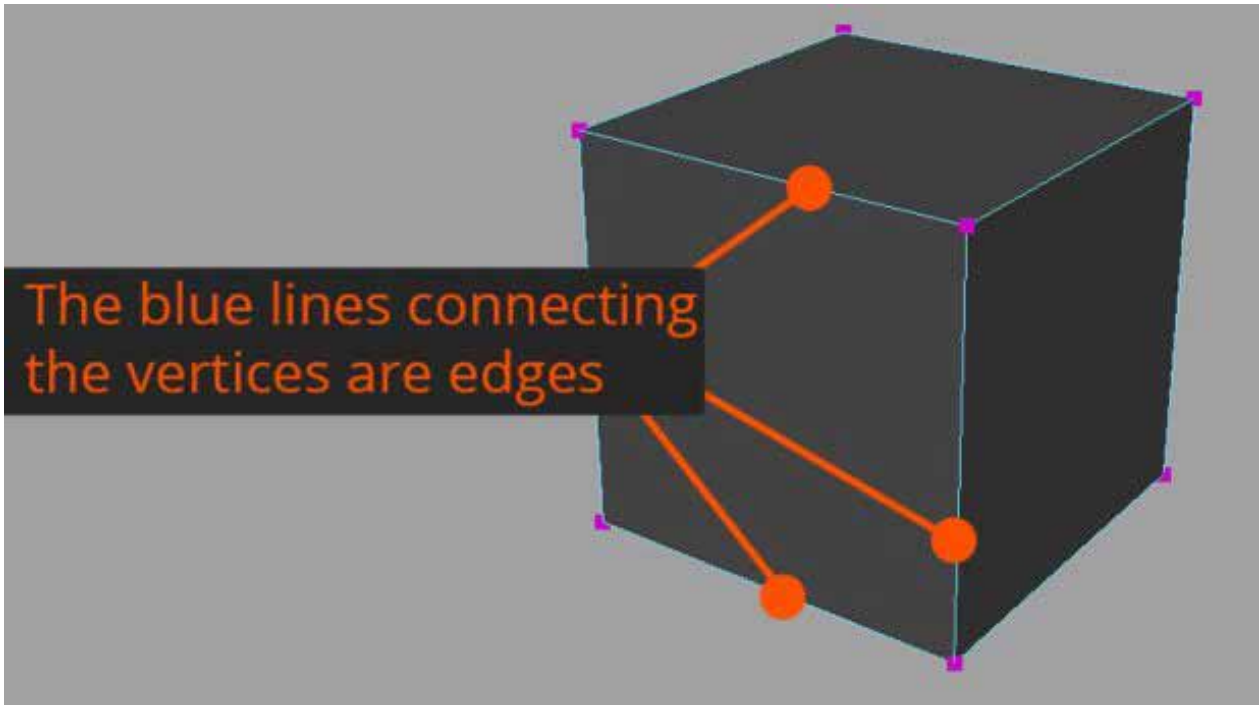
COMPONENTS - POINTS, EDGES, POLYGONS, OBJECTS

There are 3 points that are used together to make a 3D polygonal wireframe.



Vertices are the point at which 3 or more edges meet. In C4D, you can edit vertices in **Point Mode**.

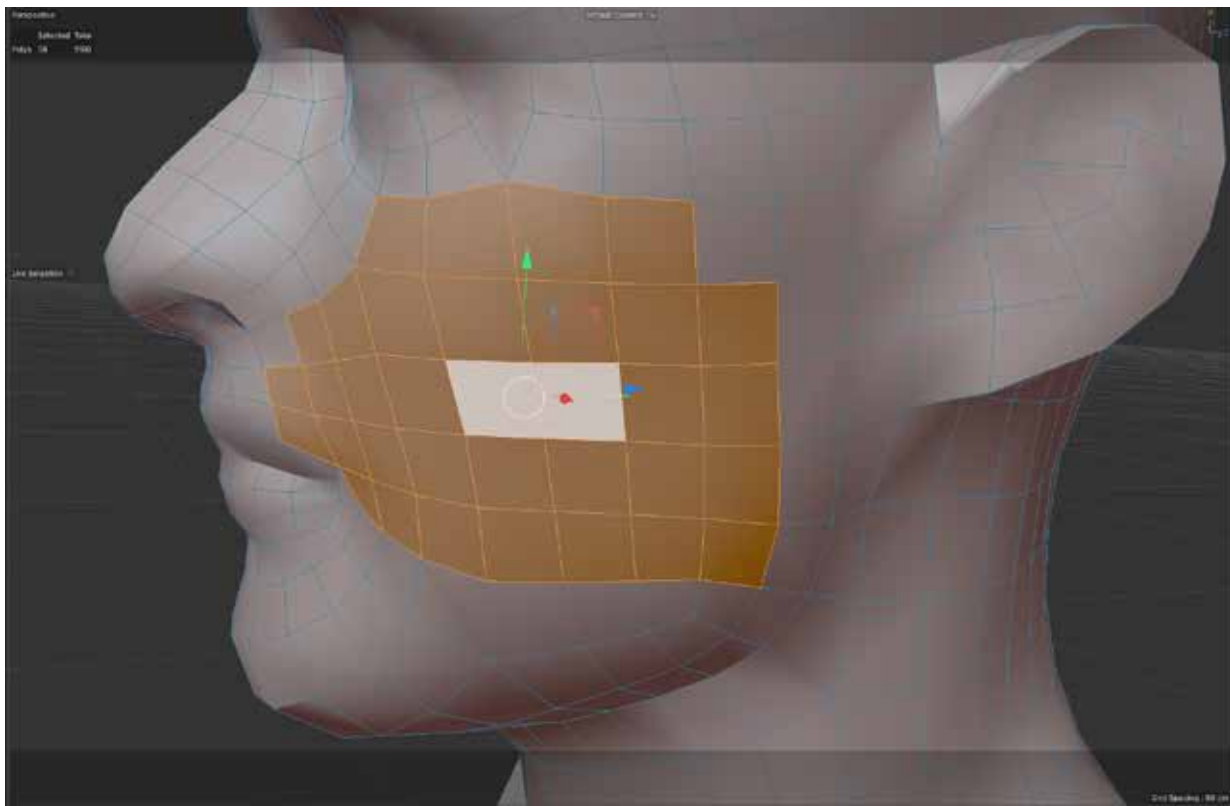
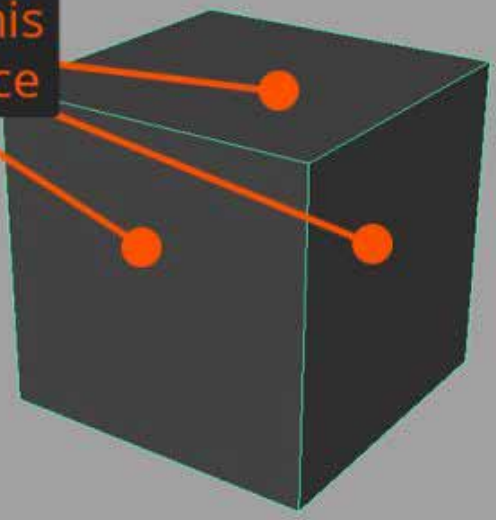
EDGES



Edges are lines that can be made up of two vertices, arcs or curves. C4D can edit them in **Edge Mode**.

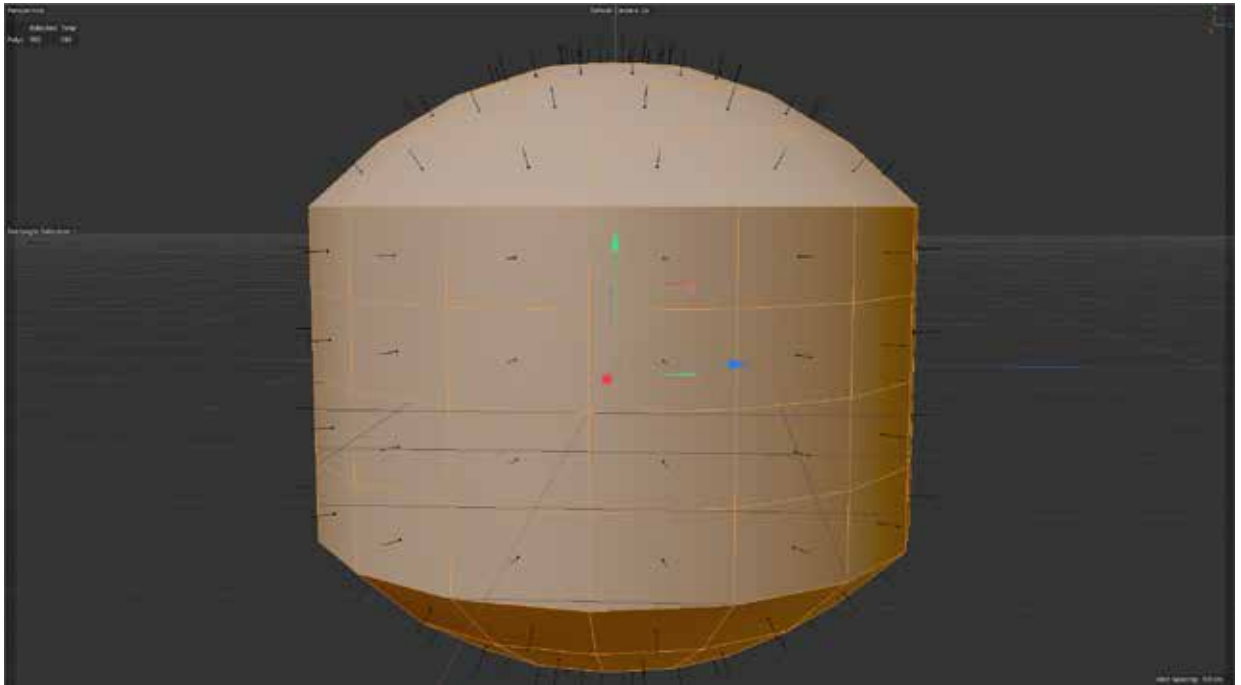
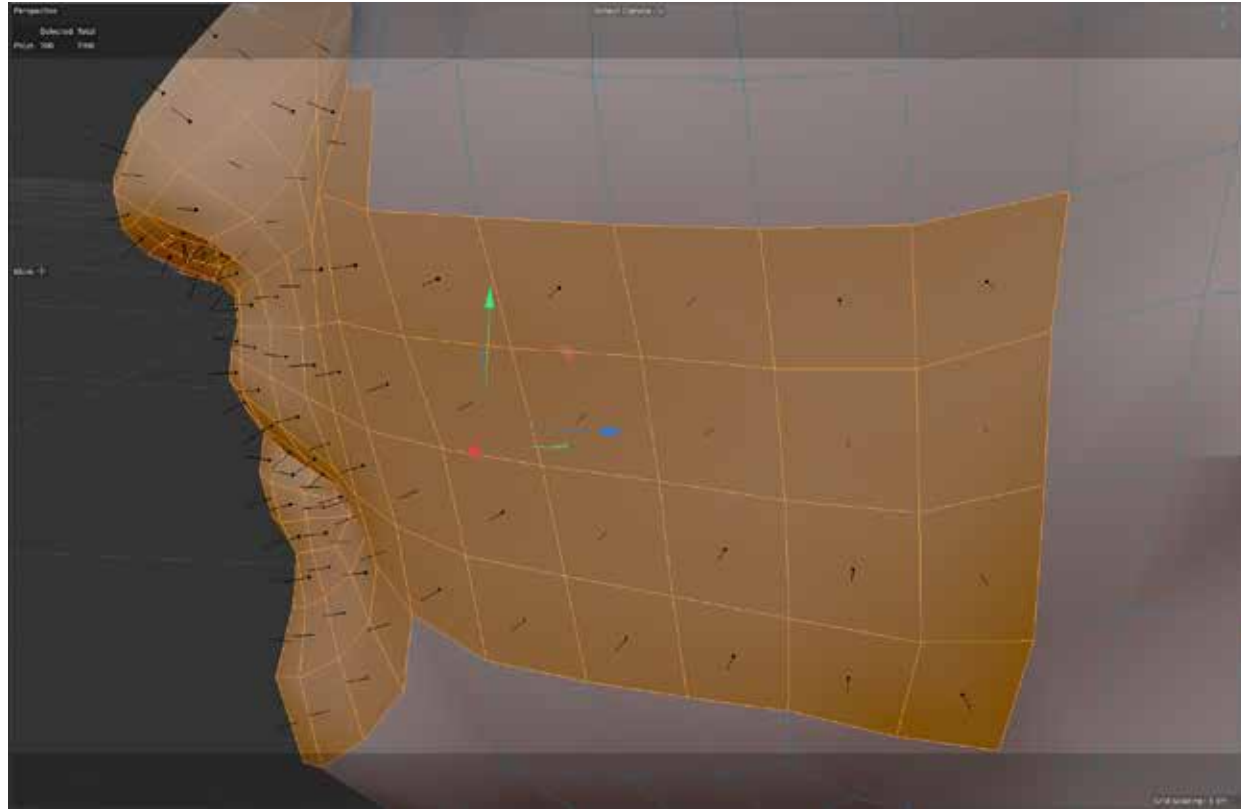
FACES

Each gray piece on this cube is a different face



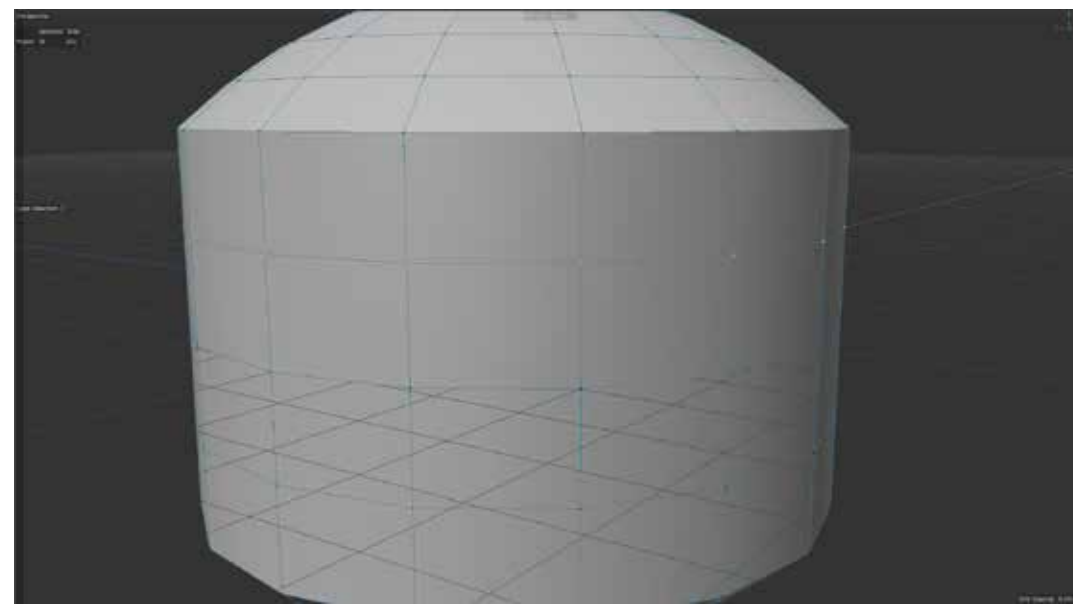
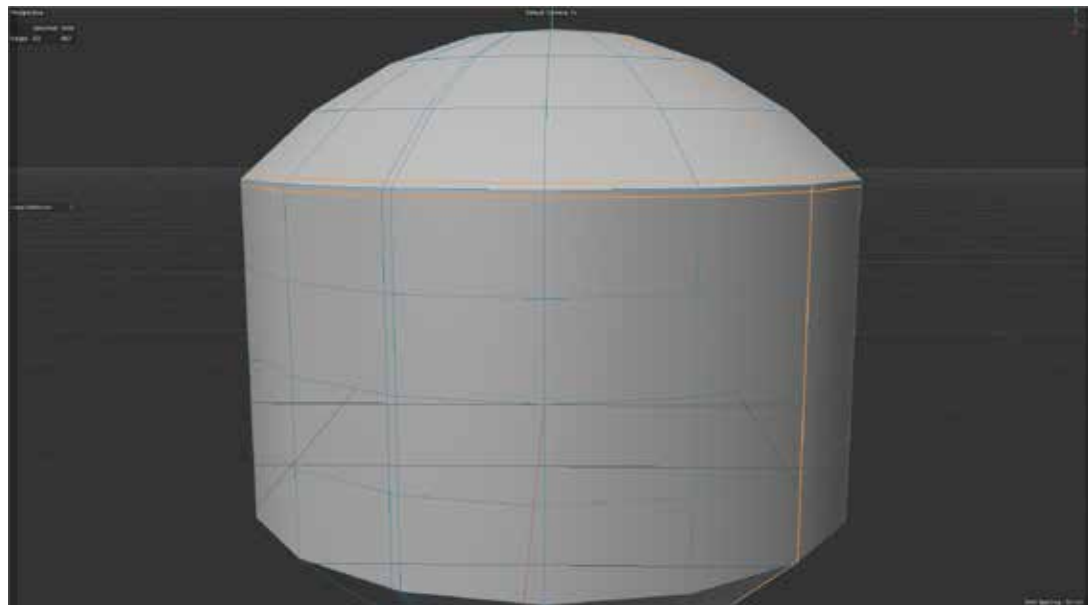
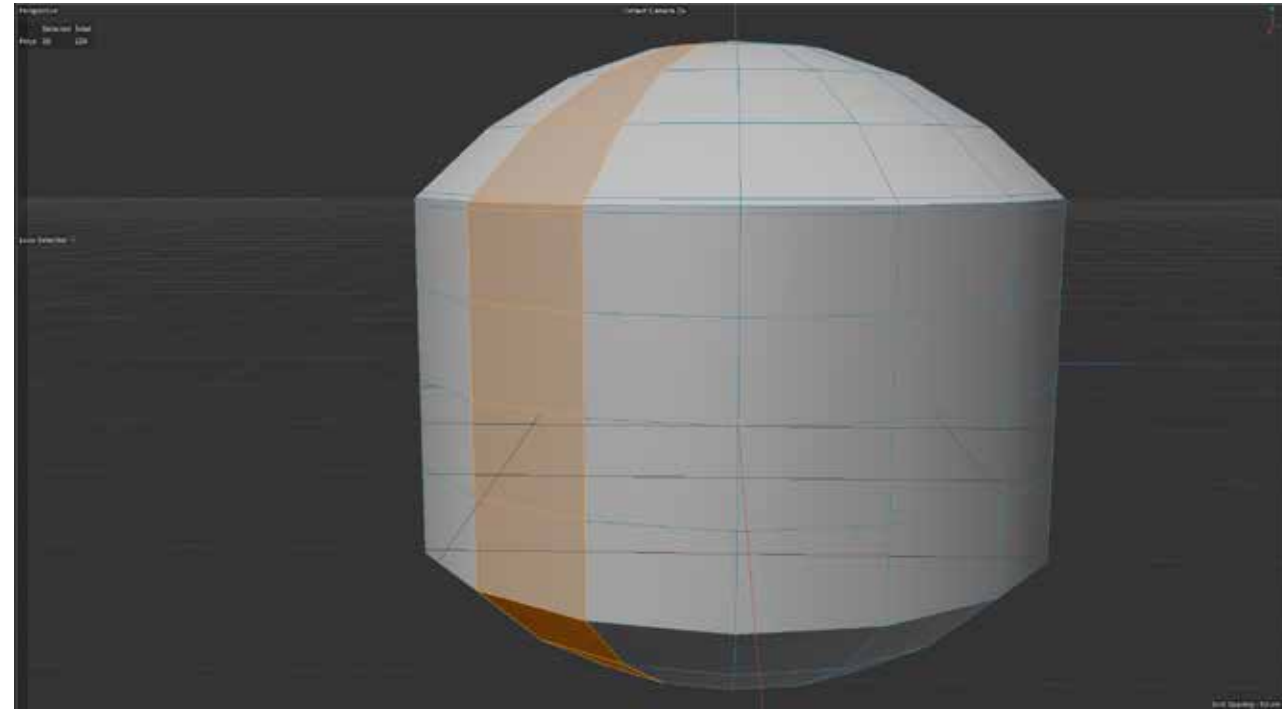
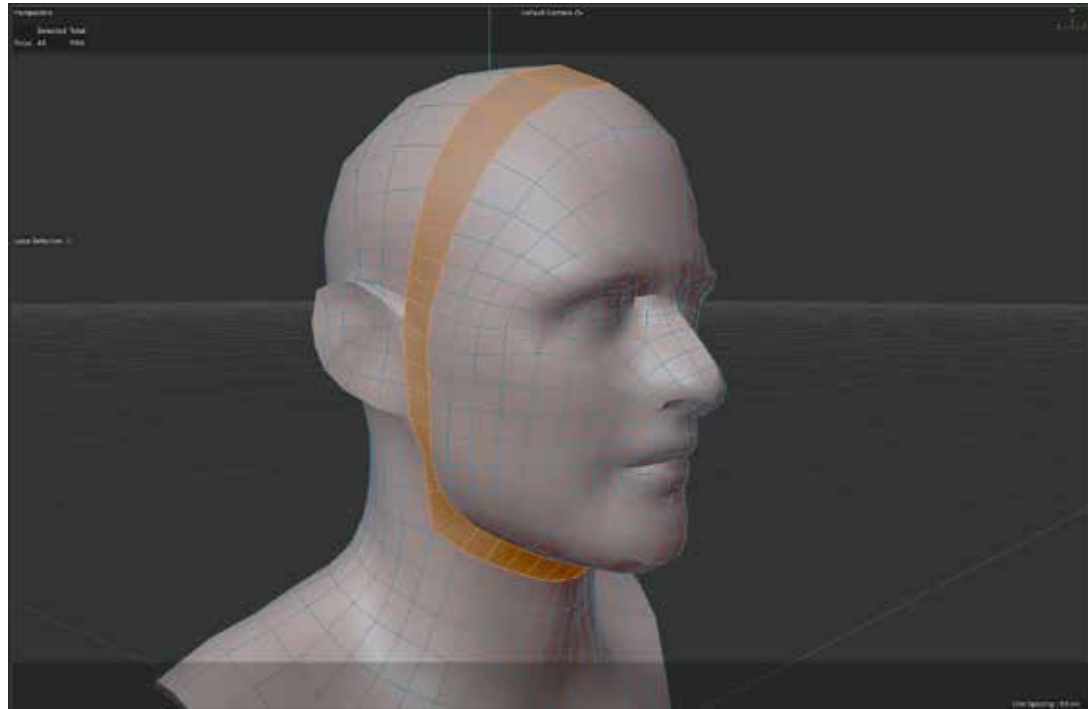
Faces are formed when vertices and edges connect. C4D can edit faces in **Polygon Mode**.

NORMALS



Normals represent lines that are created perpendicular to the geometry. The direction of the geometry determines the direction of the normal. Normals are used to determine the inward and outward sides of a face, edge, or vertex and can influence how geometry is rendered.

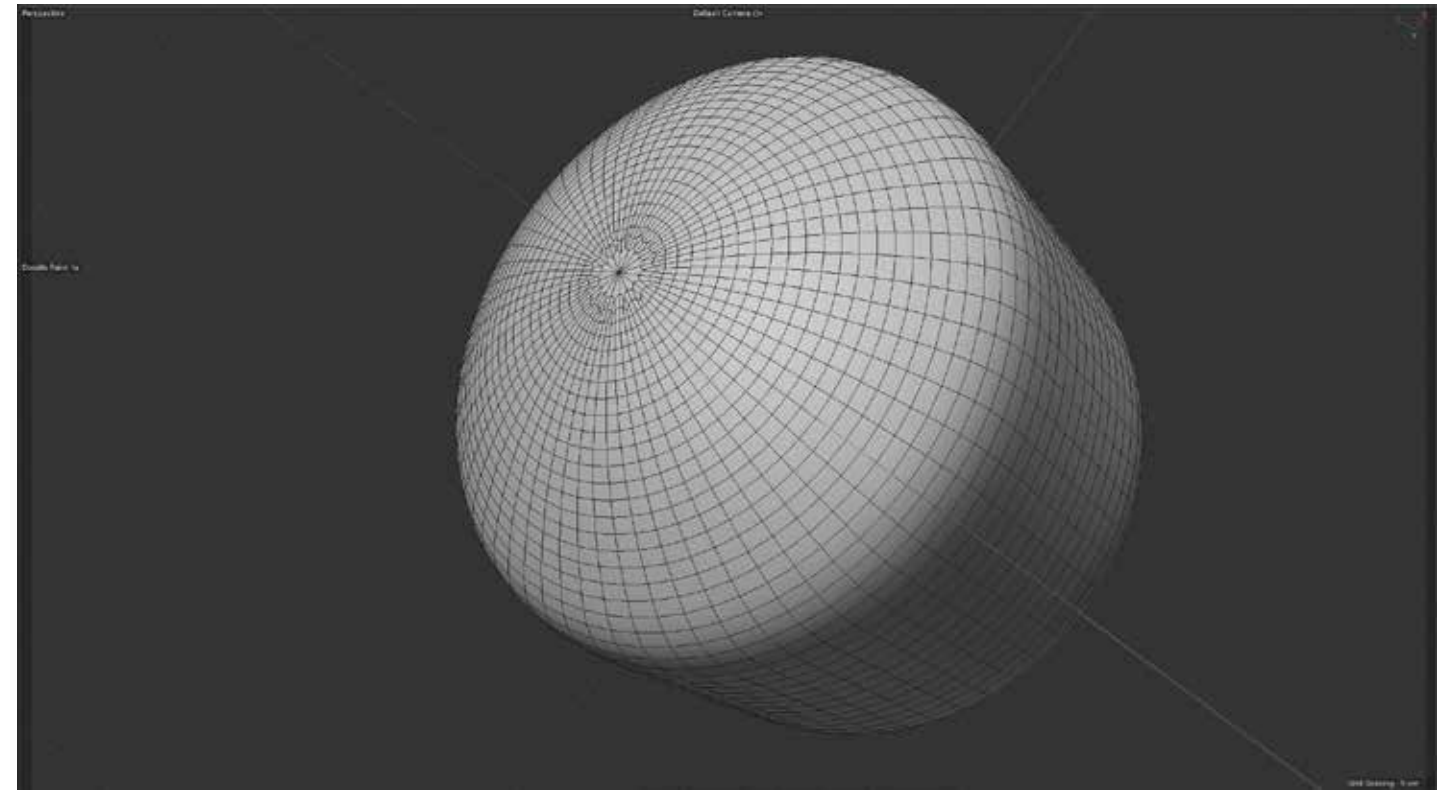
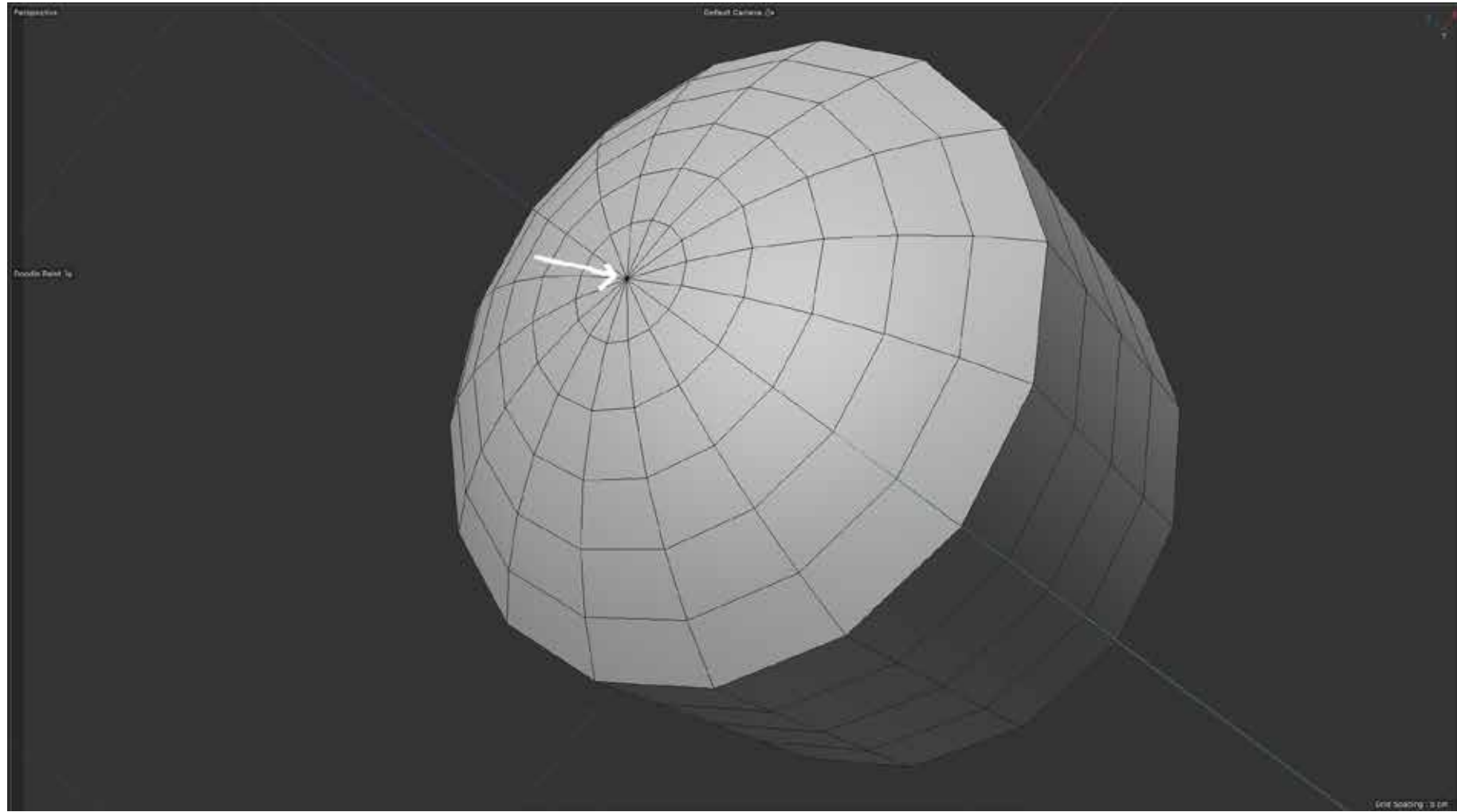
LOOPS



An **Loop** is a series of connected edges OR faces on the surface of an object that runs completely around an object and ends up at the starting point. The connected edges that encircle a model are **edge loops**. The connected faces are called **face loops**.

Edge Loops are often used to support the edges of a mesh to create a crisp-looking edge, or just to provide additional geometry very quickly.

POLES

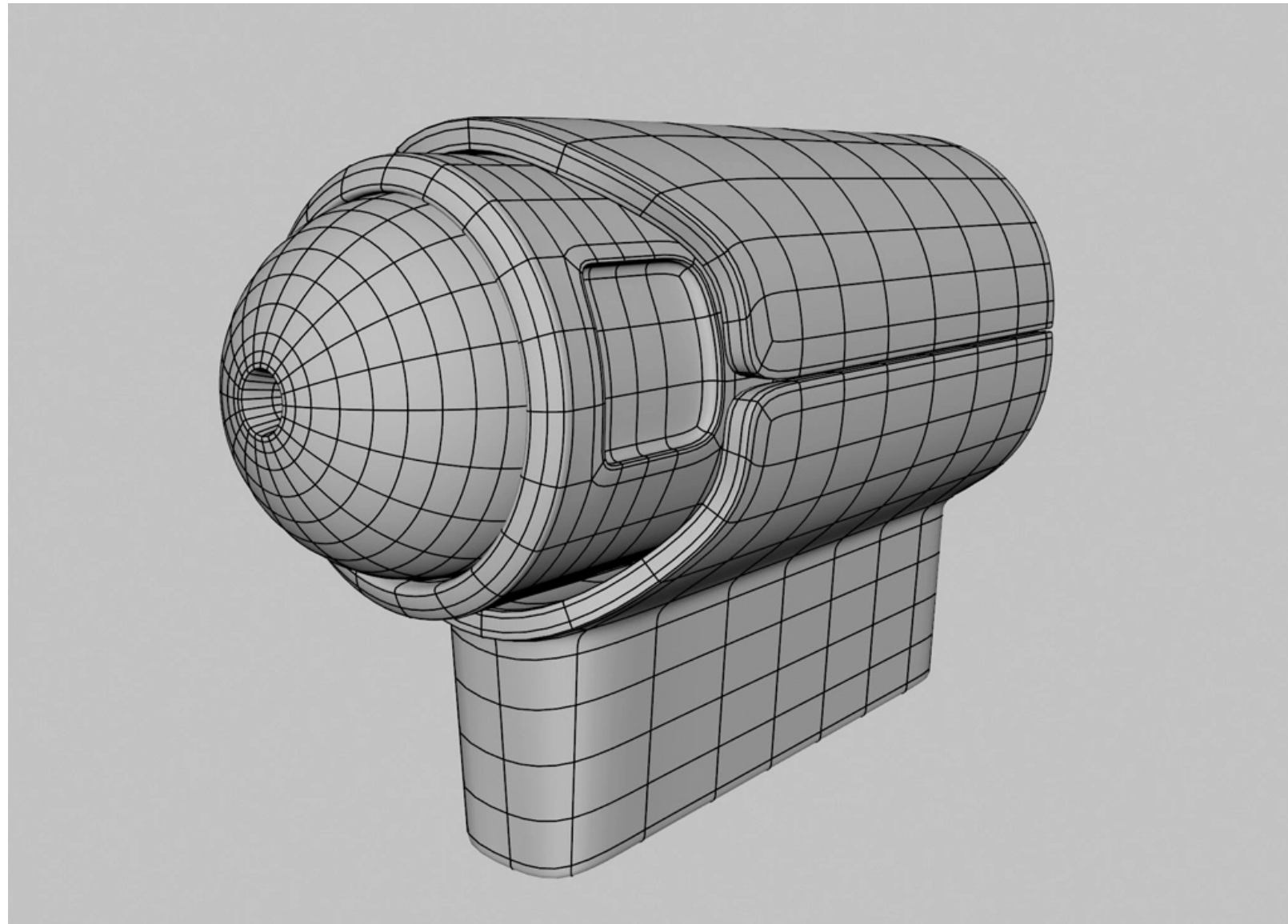


A **pole** is a set of edges that merge into a single vertex.

Avoiding poles with six or more edges on a curved surfaces is considered best practice.

Using poles can interrupt a the way a model is smoothed through Subdivision. Modifying and editing a model with complex poles can be difficult.

GOOD TOPOLOGY



Working with good topology is not just for looks. Good topology will allow for successful smoothing, using deformers, editing, and animating.

Good topology consists of good:

Edge flow - how the edges of a model follow the curvature and features of the model. Edge flow is very important when modeling organic objects that will be animated or deformed.

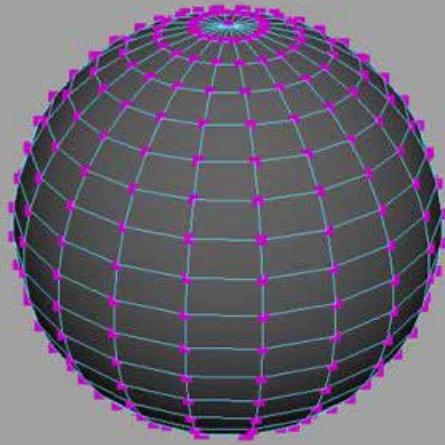
Spaces (**Contour Proximity**) between vertices increase and decrease appropriately to the model's movement.

Variable Density - the density of topology in areas should depend on the curvature and motion of a model. Where there will be a lot of movement or any curvature, the topology should be denser.

Use of Quads with Manifold Geometry - there aren't polygons inside of a cavity, or hidden directly below another polygon

MODELING METHODS

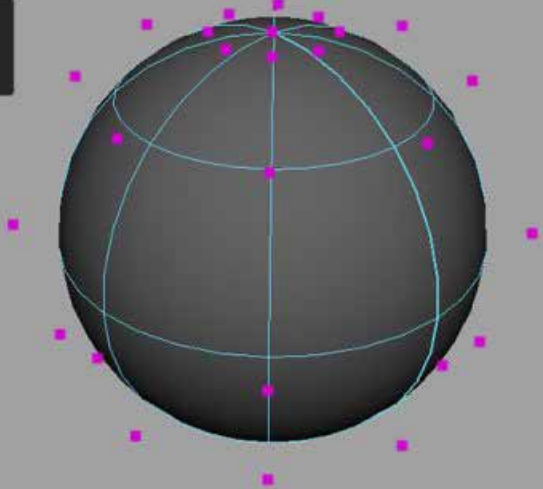
Polygon



Polygons are often used the most when modelling in 3D. They can be used for all types of objects and so are very versatile.

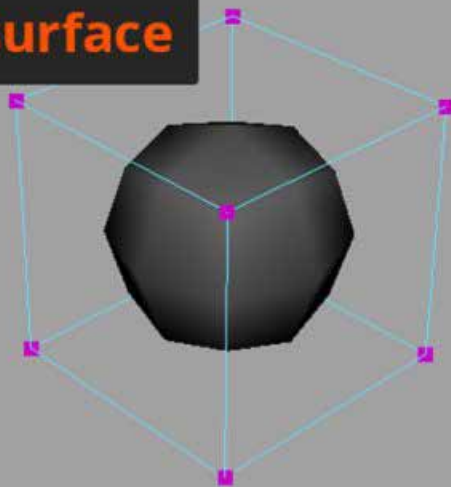
sometimes called “box modeling”, “polygon modeling”, “mesh modeling”

NURBS



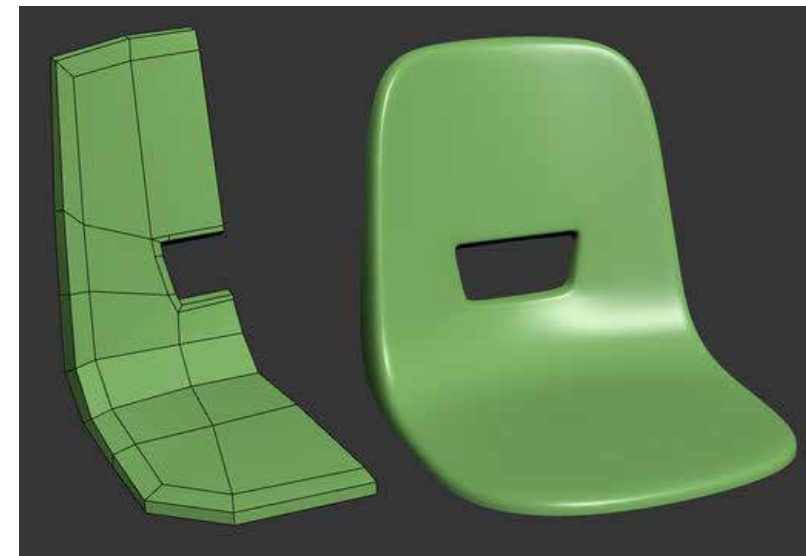
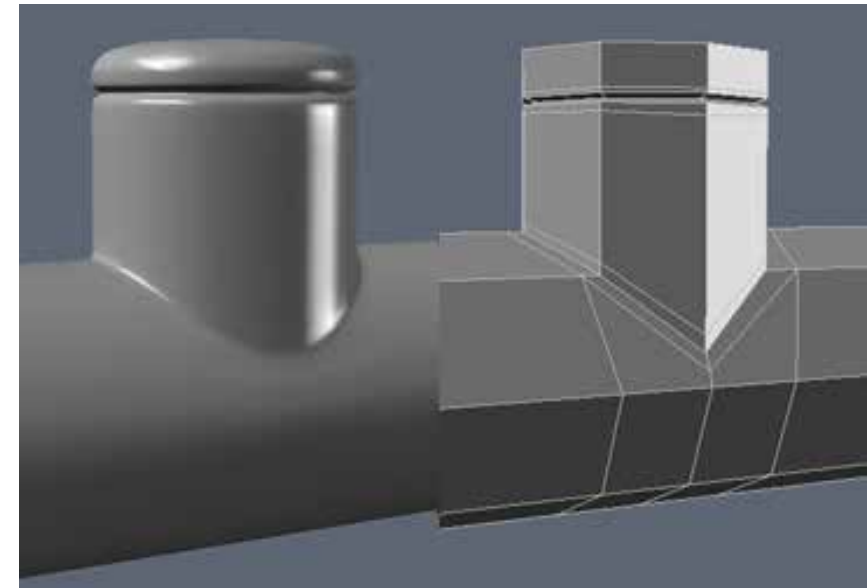
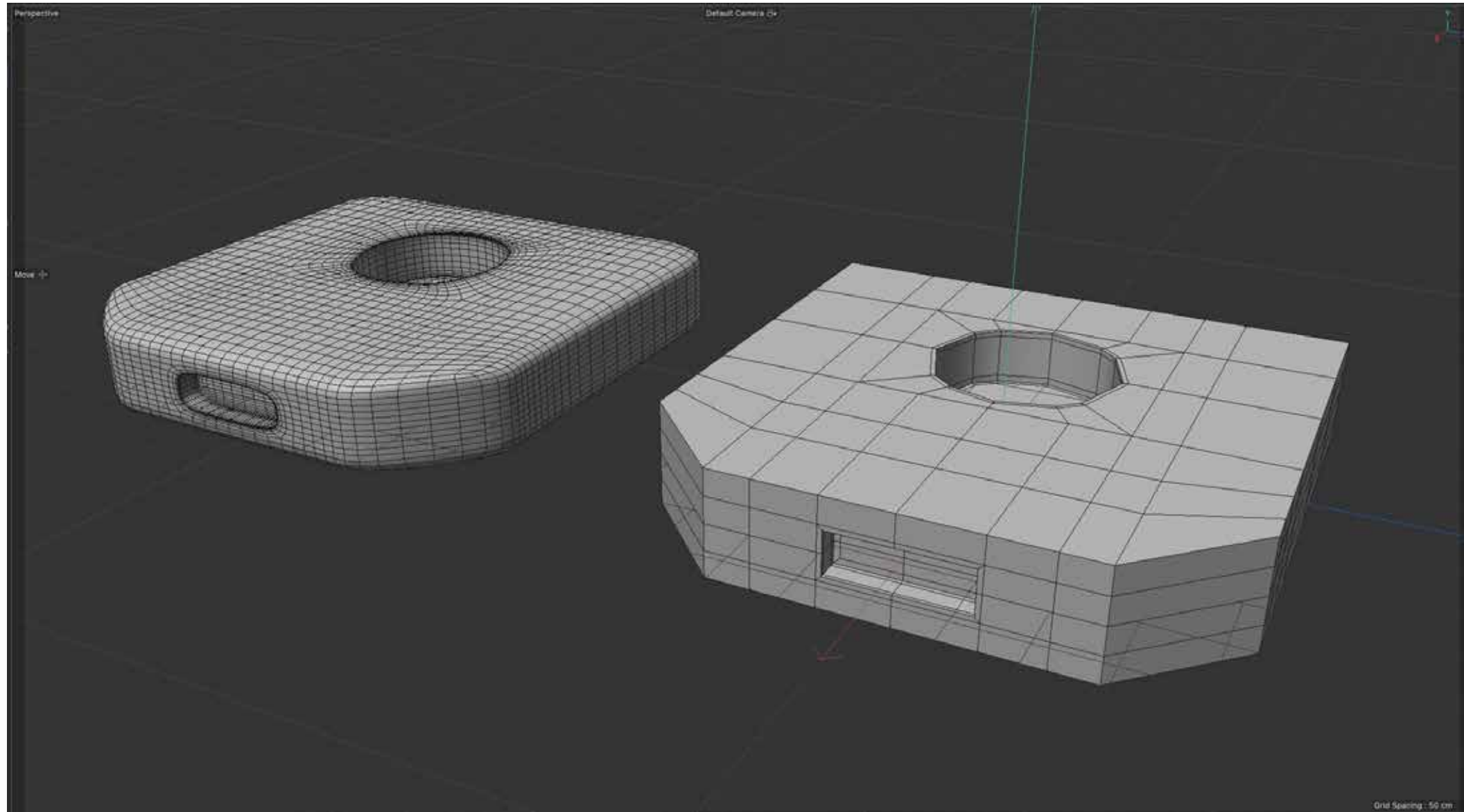
NURBS stands for non-uniform rational b-spline. They are most often used when modelling very smooth objects as they don't need to use as many points as polygonal geometry would to look smooth. NURBS geometry has four sides that are defined by control points

Subdivision surface



Subdivision modelling, also known as NURMS (non-uniform rational mesh smooth), is similar to polygonal geometry. It takes the polygonal geometry and uses an algorithm to smooth it automatically. This type of modelling is something like a mixture of polygonal and NURB based modelling.

SUBDIVISION SURFACES



Modeling technique for making high-resolution models, by manipulating a lower-resolution "cage" model and using software to subdivide for a smoother surface.

Subdividing increases the number of vertices on the model, making curves more rounded.

Usually each subdivision level increases the vertex count 4x the original count.

POLYGON COMPONENTS - SELECT AND TRANSFORM:

PROMITIVE OBJECTS IN C4D CAN BE CONVERTED TO POLYGONS BY PRESSING C

LIVE SELECTION

RECTANGLE SELECTION

CONTROL + SWITCH COMPONENT

MOVE

ROTATE

SCALE

COMPONENT COORDINATES

ENABLE AXIS MODIFICATION

SNAPPING

GUIDES

POLYGON COMMANDS AND TOOLS:

PROMITIVE OBJECTS IN C4D CAN BE CONVERTED TO POLYGONS BY PRESSING C

EXTRUDE

BEVEL

INSET

LINE CUT

LOOP CUT

DISSOLVE

MELT

WELD

COLLAPSE

CUT

BRIDGE

EDGES

DEFORMERS

SCAFFOLDING