

IM500038

Fusion 360 Multi-User Assembly Design Collaboration

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Learning Objectives

- Become proficient at distributed assembly design in Fusion 360
- Learn how to use new features that enable collaborative workflows while avoiding design conflicts
- Learn how to work efficiently with multiple team members on complex assemblies
- Learn how to avoid design conflicts while working collaboratively

Description

As workforces become more remote in a post pandemic world, working together and designing products as a team becomes much more challenging. Cloud-based products are removing many of the barriers to connecting and collaborating with remote team members. Fusion 360 software's cloud-connected capabilities enable users to step away from the office but maintain excellent connectivity with their teams with limited interruption in productivity. This demonstration will show how multiple team members can work simultaneously and remotely on a distributed assembly while avoiding common design conflicts. We will show new collaboration capabilities as well as advanced assembly design techniques that will help your company push ahead of competition as businesses adapt to new ways of working.

Speaker(s)

Tyler Henderson

Principal User Experience Designer (Fusion 360)

- Based in Portland, OR
- Mechanical Engineering background
- 16th year at Autodesk
- Experienced in Inventor Assemblies and Sketching | Fusion 360 Simulation, Generative Design, and Assemblies

John Helfen

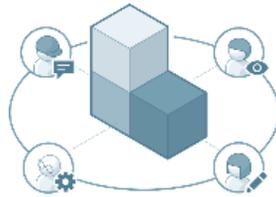
Product Manager (Fusion 360)

- Based in Troy, MI
- 25 years at Autodesk
- Mechanical background, Education, Maker (3DP/CNC), Inventor, Buzzsaw, Tinkercad, Fusion 360

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Team Member Avatars and Design Reservation

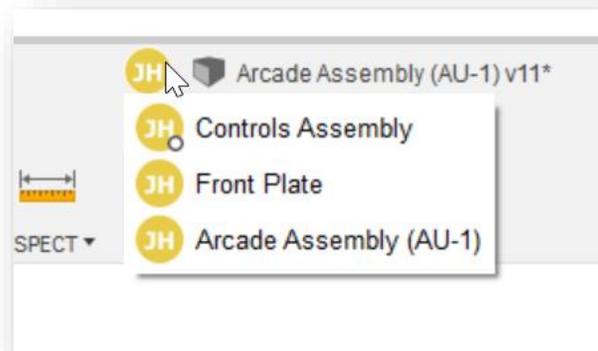
When multiple team members collaborate on an assembly in Fusion 360, it's important to know who's working on which components. It's also important to know that no one else is going to save a version of a design that conflicts with your changes or doesn't even include your changes. This is where team member avatars and implicit design reservation come in.



Team Member Avatars

Avatars are unique colored discs with your initials. Each member of your team who uses Fusion 360 has an avatar.

If you open a design someone else has open, or if someone else opens the same design you have open, you'll notice the other person's avatar appear in the document tab.

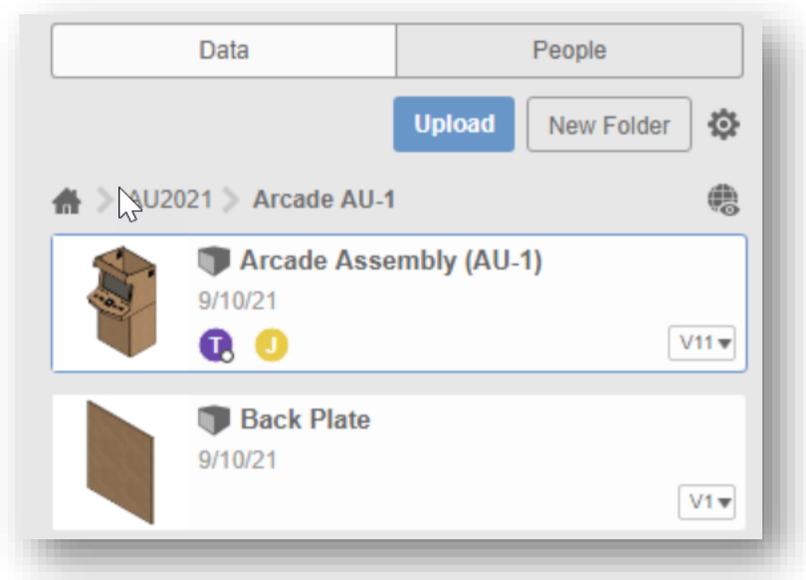


Document Tab Avatar

You can hover the pointer over the avatar to show a menu with more information, such as the team member's full name and the name of each component they have open. Click on an item in the menu to highlight the corresponding component in the canvas.

You'll also see other team members' avatars in the **Data Panel** on any design they have open.

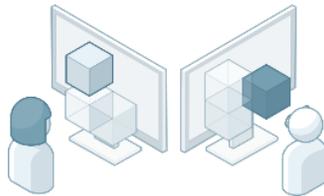
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Data Panel Avatars

Hover over avatars in the **Data Panel** to see more information.

Design Reservation



Design Reservation is a collaboration feature in Fusion 360 that implicitly reserves designs while you and your project members edit them in order to prevent design conflicts in your projects.

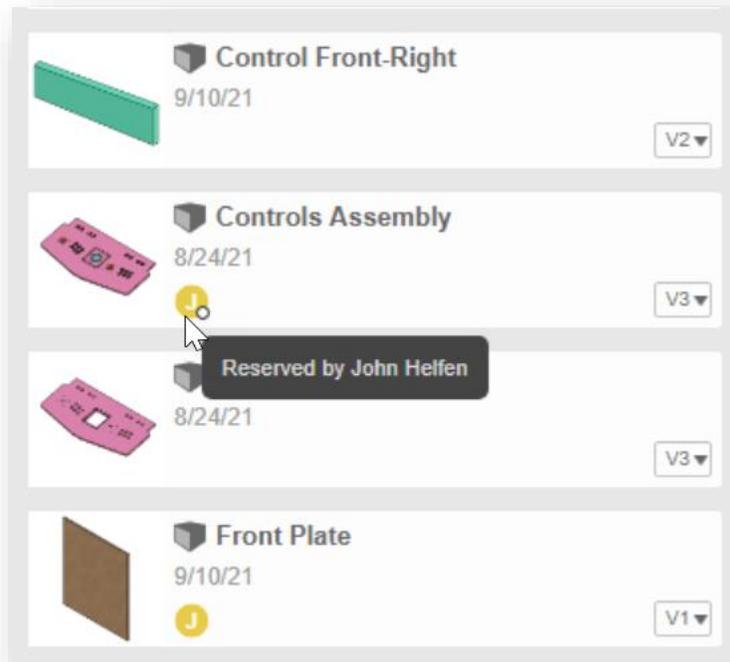
Design Reservation is on by default for teams with two or more team members.

A team administrator can toggle **Design Reservation** on or off in Fusion Team, in the **Admin > Team Settings** section, under **Collaboration**.

When you or one of your team members start editing a design and make a savable change, the design is automatically reserved for you. This means only you can save a new version of that design while it is reserved for you.

A **Reservation Badge** is a white dot applied to the lower-right corner of your **Avatar** while you are editing a design and it is reserved by you. Here is an example showing a design in the **Data Panel** that is reserved by John Helfen:

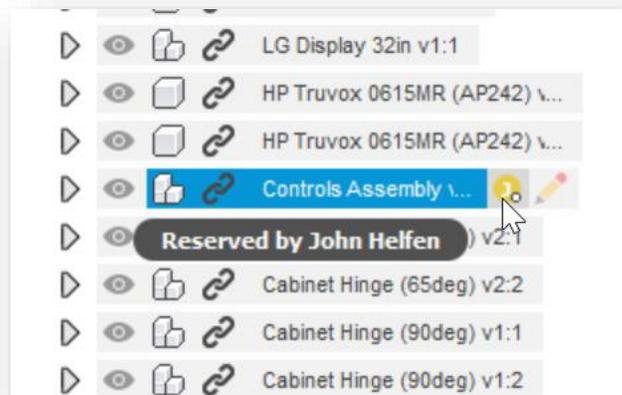
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Data Panel Reservation

While you have a design reserved, other team members can open the same design, and they can do anything they want to the design, except save a new version. This prevents other team members from saving versions of a design while you're making changes to it.

In an assembly, a team member's avatar and reservation badge appear in the **Browser** next to any external component that they are editing and have reserved.



Browser Reservation

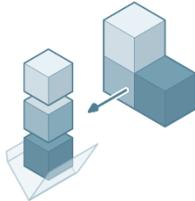
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When you save your changes or close the design without saving, the reservation is removed automatically. The reservation badge is removed from your avatar a few seconds after you save, or if you close without saving, your avatar will disappear immediately from that design in the **Data Panel** and the **Browser**.

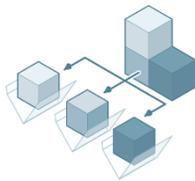
This signals to other team members that you've finished editing and they can open the latest version of that design and start editing if they want.

Internal Components and External Components

Before we talk about **Edit In Place** in the next section, it's important to understand the difference between **Internal Components** and **External Components** in Fusion 360.



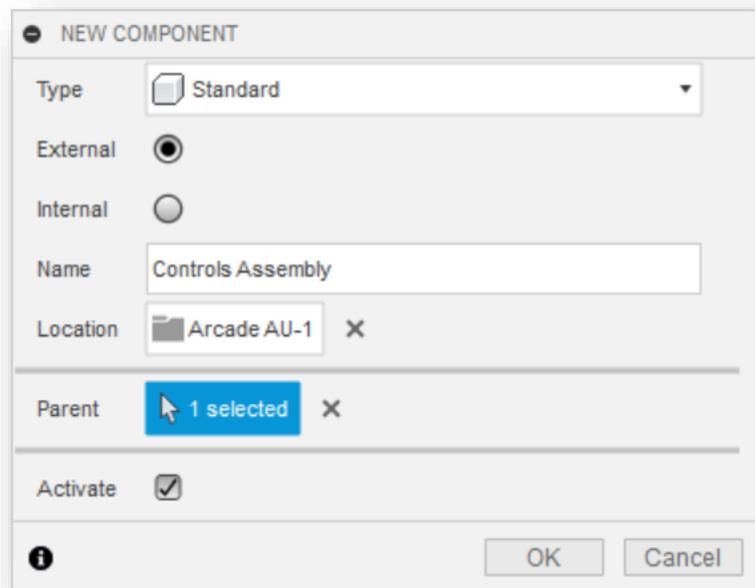
Internal Components are components that are contained entirely within the same design document as the assembly. You typically use them when designing top-down, and when you don't need to use the component in other assemblies. Since **Internal Components** are in the same design as the assembly, you can't collaborate on the design document that contains the assembly by having different people design and edit different components simultaneously. Only one person can edit and reserve a design at any time.



External Components are separate Fusion 360 design documents that are inserted into the assembly or created in place in the current design document. They can be distinguished from internal components in the **Browser** by the link  icon. This creates a distributed design where multiple team members can work on different components in the same assembly simultaneously.

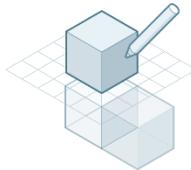
Tip #1: When you use the **New Component** command in an assembly, you now have the option of **Internal** or **External**. So, you can create **External Components** on the fly in a top-down method.

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New Component command

We recommend you use **External Components** when you think they will need to be used in other assemblies or you want to collaborate on the assembly design with other team members.



Edit In Place

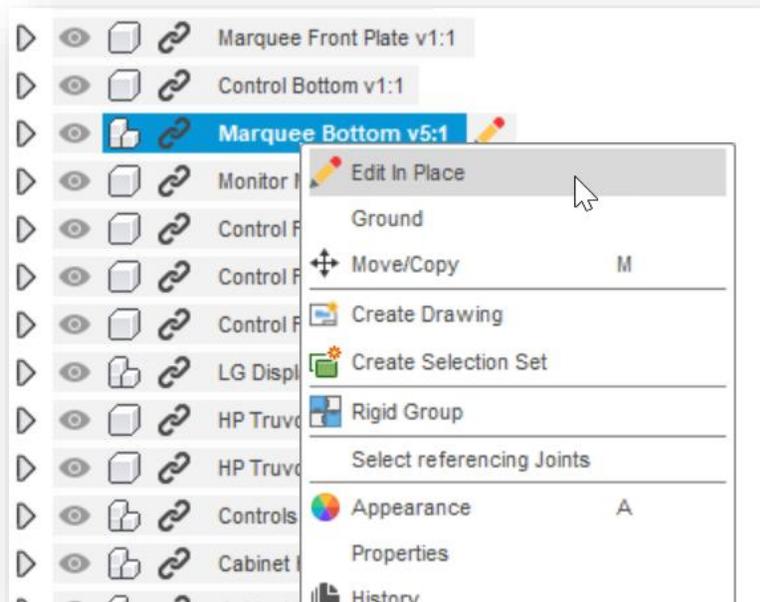
Edit In Place lets you edit an external component in the context of an assembly without leaving the parent design where the component is used. Rather than having to open the external component in its own tab, you simply start **Edit In Place** on that component while you have the assembly open.

You can right-click the component in the **Browser** to enter **Edit In Place**, or click the pencil  button that flies out when you hover over the component in the **Browser**.

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Pointer hovered on external component



Right-Click menu on external component

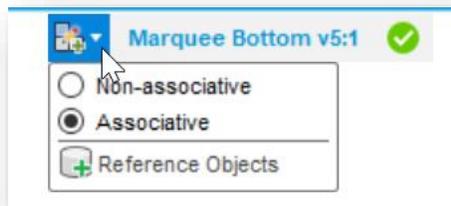
When you enter **Edit In Place**, you'll see a menu appear at the top of the canvas and a blue border surrounds the canvas. The menu tells you if you are in **Non-Associative** or **Associative** mode, and the name of the component you're editing.

Non-Associative Edit In Place is much like opening the component in its own tab, but you can still see all the surrounding components in the assembly. You just can't create associative relationships with other components as you create sketches or features.

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Associative Edit In Place lets you select objects and geometry from other components in the assembly to create associative references. This also creates an **Assembly Context** to capture the geometry and positions at that specific time in the assembly, so you can use them later if you open the external component in its own tab. We'll talk more about **Assembly Contexts** in the next section.

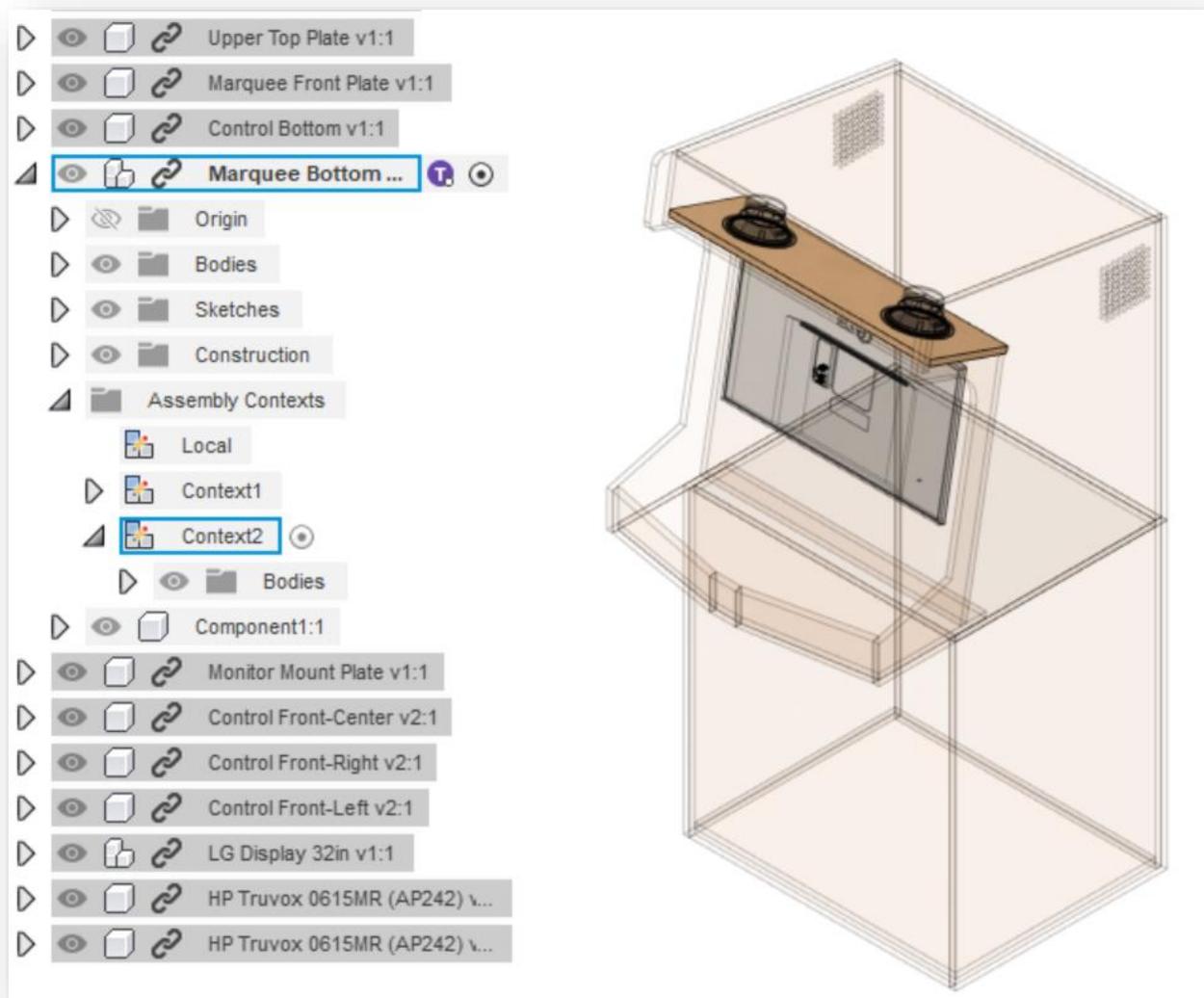
You can switch from **Non-Associative** to **Associative** mode in the dropdown menu, but once you create an associative relationship to another component in the assembly an **Assembly Context** is created, and you can't switch to **Non-Associative** in that **Edit In Place** session.



Edit In Place menu (no Context yet)



Edit In Place menu (Context2 created and active)



Edit In Place on “Marquee Bottom” component

Tip #2: If you prefer to always use Non-associative Edit In Place, you can toggle off this setting in Preferences>Design:

Allow creation of Assembly Context during an Edit in Place session

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When you want to stop **Edit In Place**, simply click the green disc with the checkmark  in the **Edit In Place** menu.

You must **Save** the assembly to save the changes you made during **Edit In Place**, otherwise you won't see those changes in the component when you open it in its own tab.

Tip #2: When you open a component in its own tab, the **Local Context** is active by default. This is simply the normal state of the component outside of the assembly.

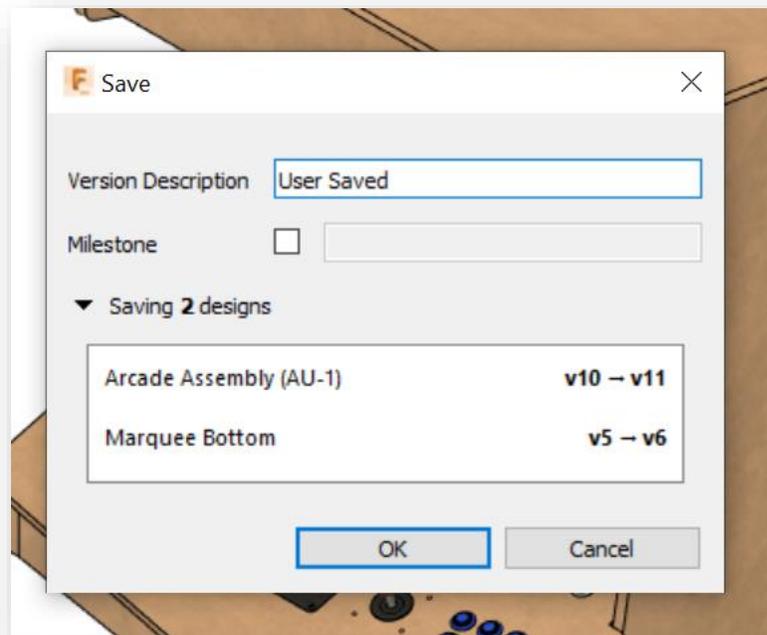
Tip #3: If you create a joint while in **Edit In Place**, the **Local Context** will be activated automatically. This is because the joint is created in the component, not the assembly.

Edit In Place and Design Reservation

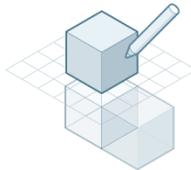
When you and your team members use **Edit In Place** to edit external components in context, it unlocks simultaneous collaboration in the your assembly. Since external components are separate design documents, multiple team members can use **Edit In Place** to edit different components in the same assembly at the same time.

However, it's important to understand that when you use **Edit In Place** on a component in an assembly, you implicitly reserve that component and all parents of that component, including the design that contains the full assembly. Other team members can use **Edit In Place** to edit different components that are siblings of your component or are in a different part of the **Browser** structure.

As each team member saves their changes, other team members can use the **Update**  button to consume those changes. This loads the latest versions of external components that other team members have saved, while preserving the changes you haven't saved yet. The **Save** dialog tells you which components you can save, and which components are reserved by others and can't be saved by you.



Save dialog



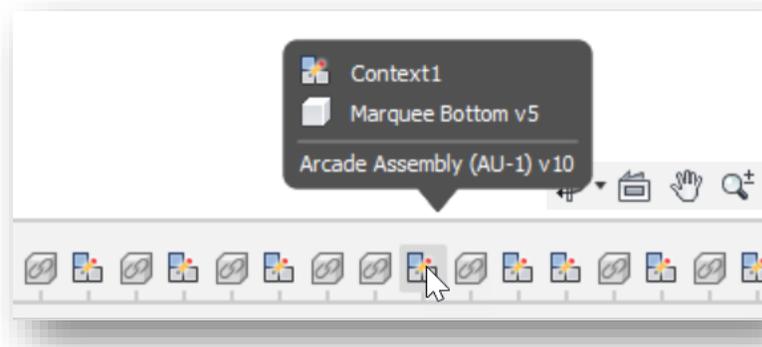
Assembly Contexts

An **Assembly Context** is the connection between a parent design and an external component at a specific point in time. It holds positional information related to the assembly, and it is where geometry is derived to maintain the association to the parent design.

As mentioned in the previous section, **Assembly Contexts** are created during **Associative Edit In Place**. While in **Edit In Place** mode, the menu displays the name of the **Assembly Context** that you're working in.

When you reference anything outside of the component you're editing, the referenced object is captured in an **Assembly Context**. For example, if you're sketching in the component during **Edit In Place**, and you project a face from another component, the **Body** of that face is captured as a reference **Body** in the active **Assembly Context**.

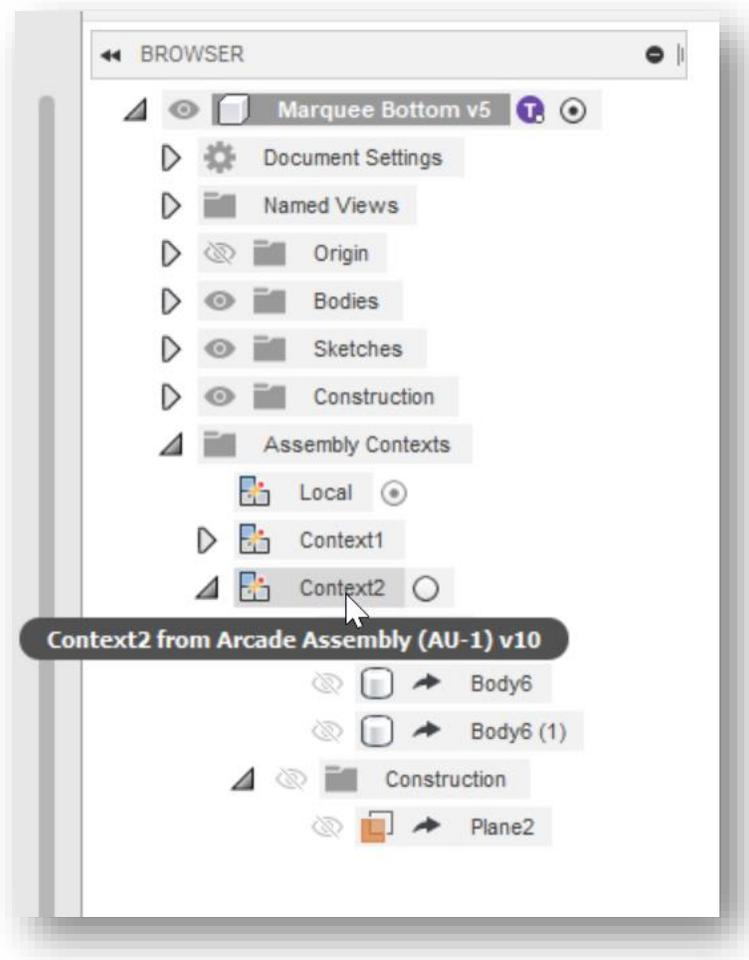
Assembly Contexts appear in the **Timeline** of the assembly at the time they're created. This means you can reference any feature or component in the **Assembly Context**, as long as it appears in the assembly's **Timeline** prior to the **Assembly Context**.



Assembly Context in assembly timeline

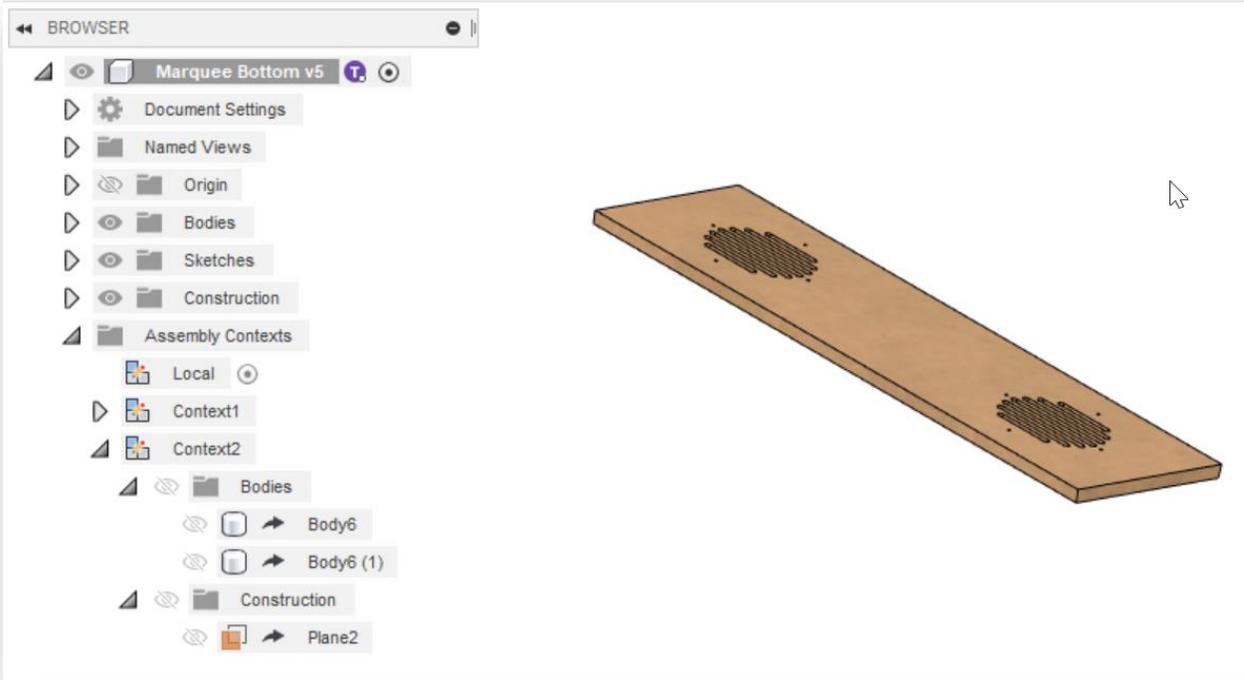
After you exit **Edit In Place** and save your changes, you can open the component in its own tab and see the **Assembly Context** in the **Browser**.

Expand the **Assembly Context** in the **Browser** to see a list of all the reference objects that were captured.

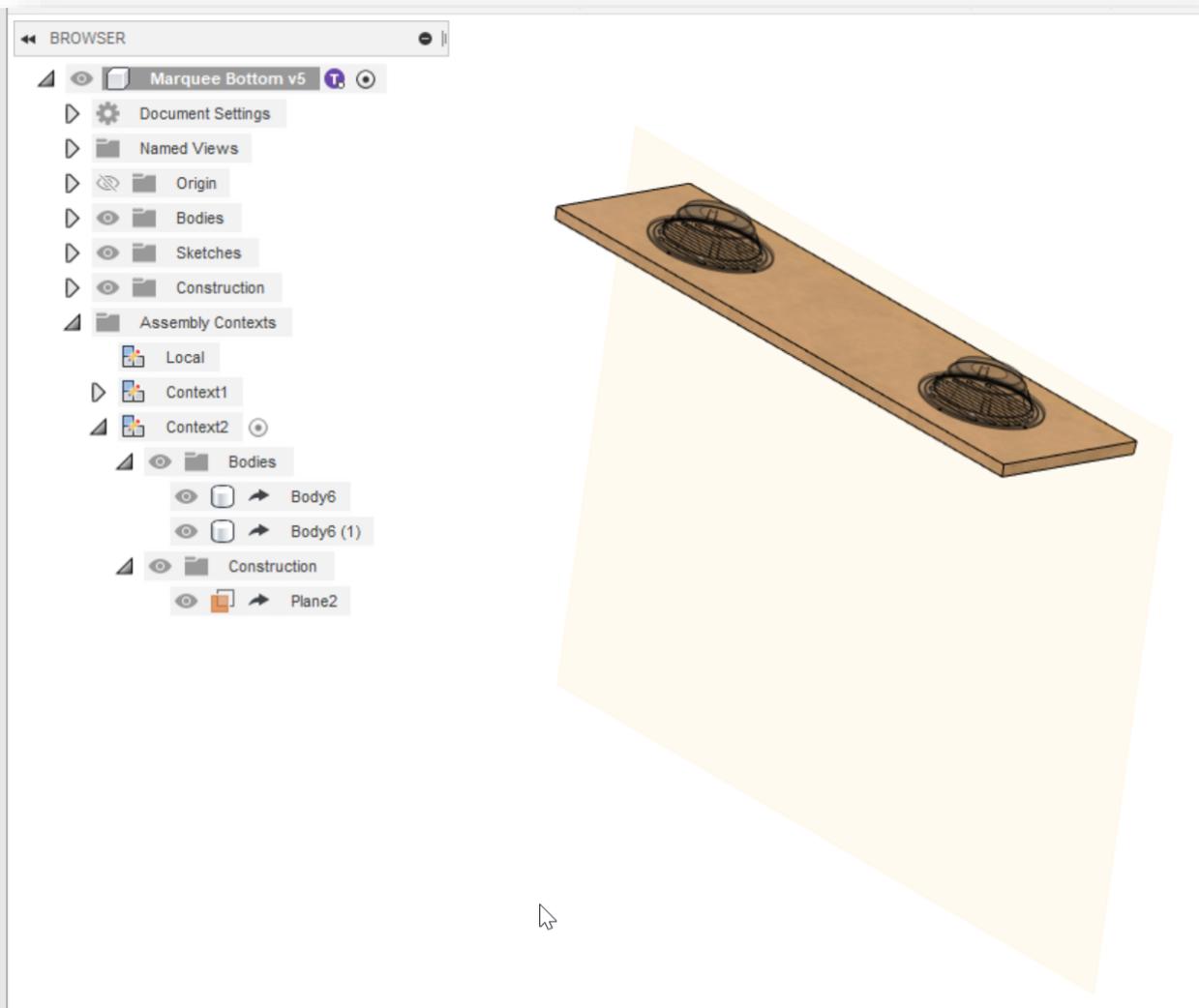


Assembly Context Browser node

You can activate an **Assembly Context** to show all the reference objects in the canvas and continue using them as you create more features.



Local Context active in component tab

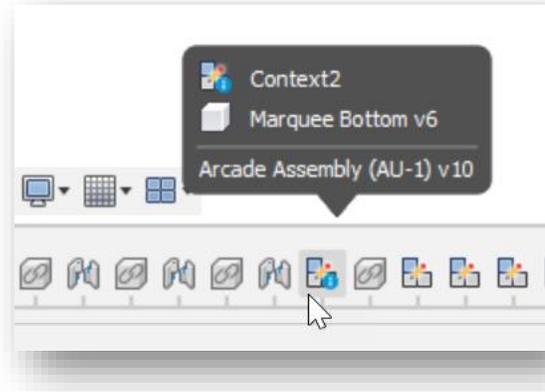


“Context2” active in component tab

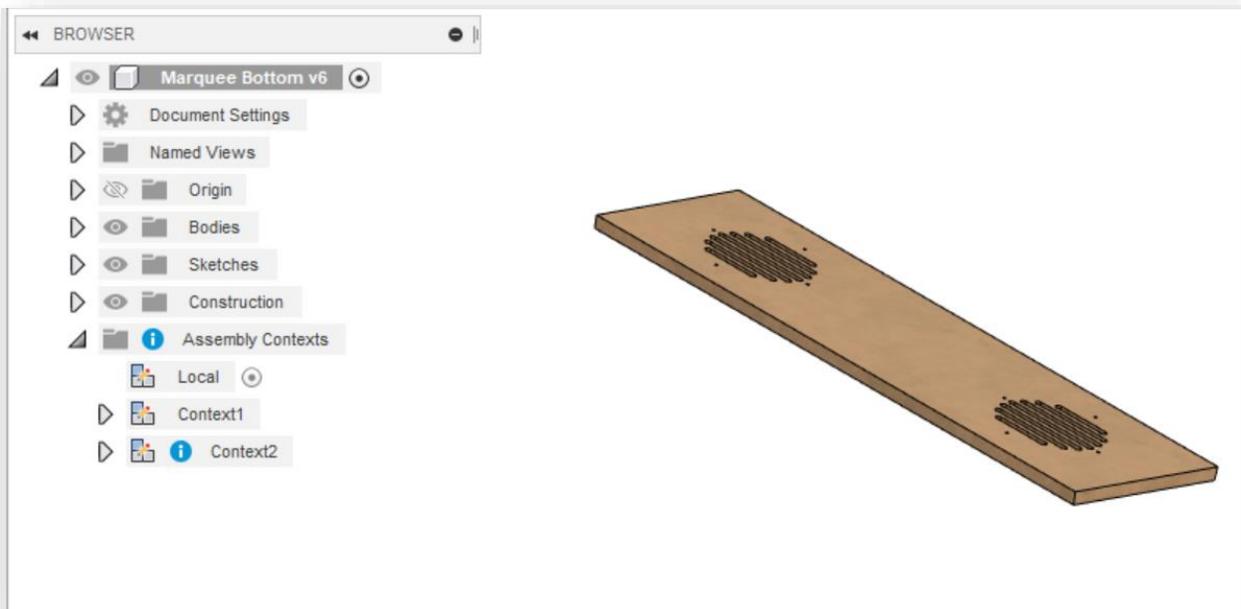
You can also active **Assembly Contexts** in the parent assembly. You automatically enter **Edit In Place** mode and work directly in that **Assembly Context**.

Out-of-sync Assembly Context

Remember how **Assembly Contexts** are created implicitly when you use **Associative Edit In Place**? Well, when you or a team member change a reference object in the assembly, then save the change, any **Assembly Contexts** that reference that object become out-of-sync with the assembly. When an **Assembly Context** is out-of-sync, a blue dot appears on its feature  in the assembly **Timeline** and in the component **Browser**.



Out-of-sync Assembly Context in parent assembly timeline



Out-of-sync Assembly Context in component tab

To synchronize an **Assembly Context** that is out-of-sync, you can right-click the **Assembly Context** feature in the assembly **Timeline** or in the **Browser** and choose **Sync Assembly Context**. The sync process updates the reference objects and features in the component that use those references. Syncing is also an edit operation, so the component is reserved for you until you save the changes or close without saving.

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Tip #4: If you move a component in the assembly by dragging it in the canvas or positioning it with a joint, that position change can be captured by an **Assembly Context**. When you activate that **Assembly Context** in the external component's tab, you will see the component's position relative to the assembly. This position can differ from the component's position in the **Local Context**, so don't be alarmed by this.

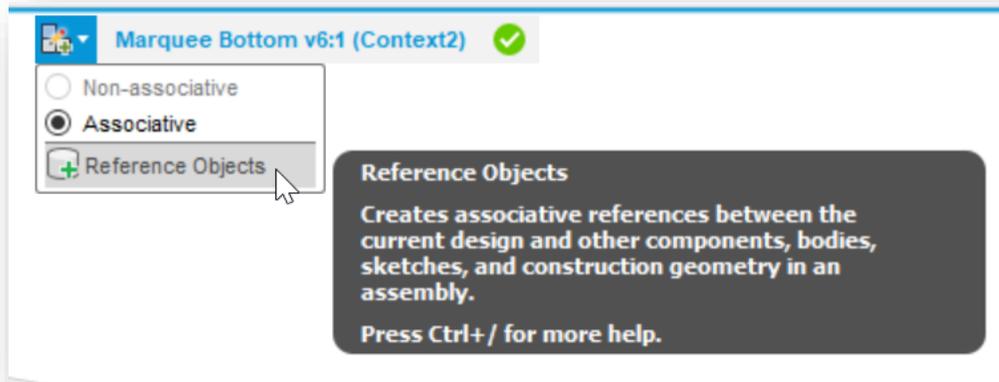
Tip #5: If a component already has an **Assembly Context** for a particular assembly, it's a good idea to activate the existing **Assembly Context** rather than use **Edit In Place** again. This will prevent you from creating additional **Assembly Contexts** that you don't need. As you and your team members create new components and features in the assembly, you may want to reference them in an **Assembly Context** that appears earlier in the **Timeline**. You can simply drag the **Assembly Context** forward in the assembly **Timeline**, and then you can reference any feature that appears before the **Assembly Context**.



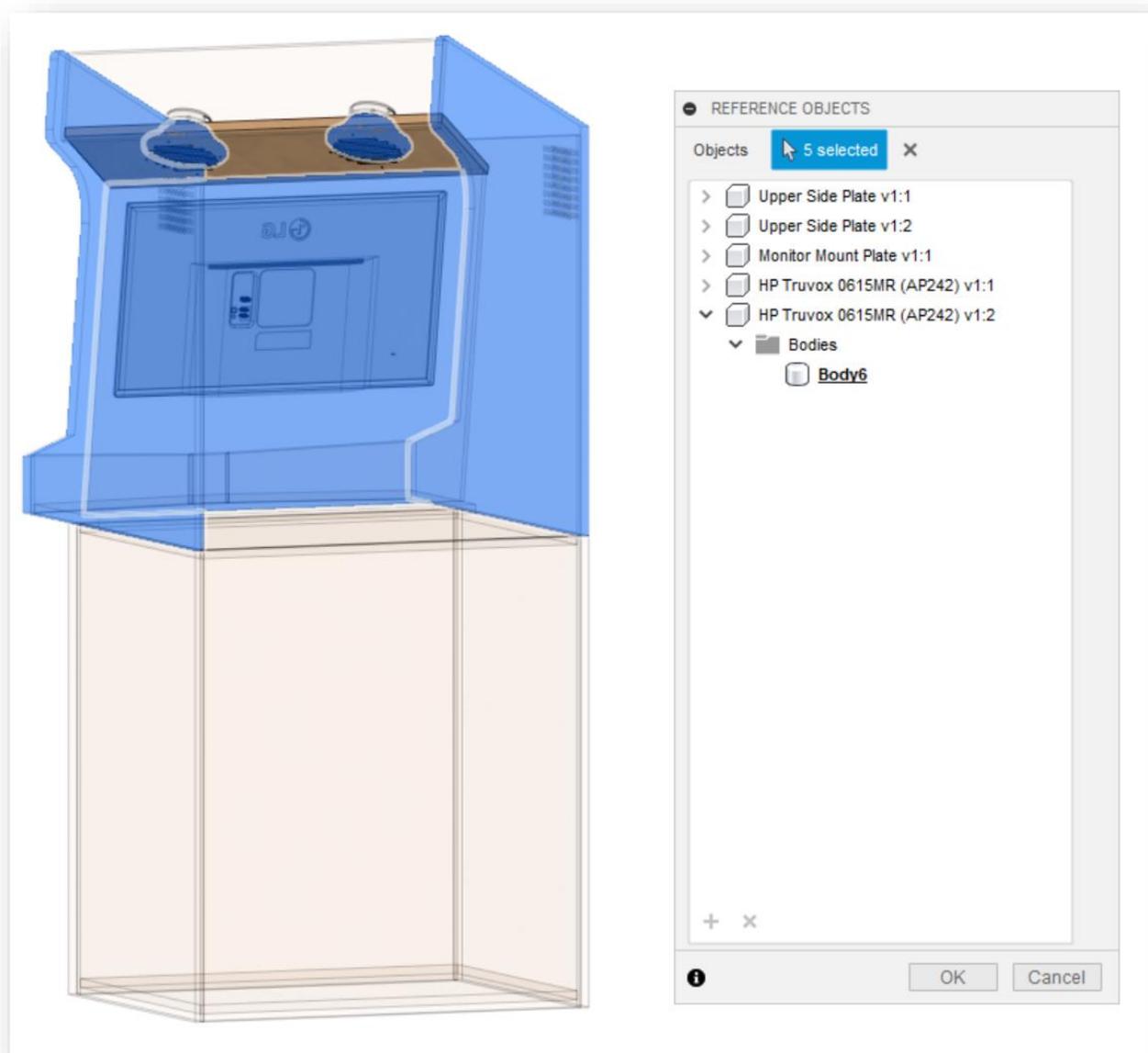
Reference Objects

So far, you've learned about **Avatars**, **Design Reservation**, **Edit In Place**, and **Assembly Contexts**. You learned that you can collaborate with team members in the same assembly at the same time using **Edit In Place** on external components. We also know not everyone wants to be working in the assembly. Sometimes the complexity of the assembly makes it difficult to focus on the area you're working on, or you simply have too many cooks in the kitchen. But even if you prefer to detail components outside the assembly, many times you still need to be able to reference the interfacing components that are inside the assembly.

This is where **Reference Objects** come in. **Reference Objects** is a command available in the **Edit In Place** menu and you can use it any time you're in **Edit In Place** mode.



Reference Objects command in Edit In Place mode



Reference Objects command dialog

The **Reference Objects** command lets you explicitly select the things you want to reference without having to create any features that reference them. While the command is active, just click on objects in the canvas or the **Browser** to add them to the dialog. Then when you finish **Edit In Place** and save, the reference objects are saved in the **Assembly Context** that was active. Open the external component in its own tab, activate that **Assembly Context**, and you'll see all the objects appear in the canvas. You can start referencing the objects associatively as you create features in the external component without losing the context of the assembly.

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A great way to use **Reference Objects** is if you are a project lead, and you want to create components in an assembly but someone else will do the detailing. You can create the external component in the assembly using the **New Component** command (check the **Activate** box to go into **Edit In Place** mode automatically), then use the **Reference Objects** command to select the surrounding objects that the designer will need to define and detail the new component. **Finish Edit In Place**, save the assembly and the new component, and your team member will be all set to detail that component outside the assembly.

Tip #6: Later in the assembly, you can activate an **Assembly Context**, then show the **Reference Objects** dialog again. Any object in the dialog that has been used for a feature in the component will have **bold** text. You can remove references from the list, but any object that is reference by a feature can't be removed. So, to clean up the list, just **Shift+select** everything in the list, then click the **X** in the bottom of the list to remove everything that isn't referenced by a feature.

Summary

We know that the world we work in has rapidly changed over the last few years. There are more challenges that affect where we work, who we work with, and how we work together. We hope that the things you learned in this class will help you overcome some of those challenges, and become more effective at designing assemblies while collaborating with your teammates in Fusion 360.

- You should be able to utilize **Avatars** to see who you're working with and what others are working on.
- **Design Reservation** should help give you peace of mind that your work won't be overwritten by someone else while collaborating.
- **Edit In Place** will let you and your teammates work in the same assembly on different components simultaneously.
- **Assembly Contexts** will provide associative references from the assembly to external components so you can drive the design in a top-down fashion.
- **Reference Objects** will let you explicitly select those references from the assembly so others can use them for detailing components outside of the assembly.

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Here are some helpful links if you want to continue learning about assemblies and collaboration in Fusion 360

[Collaborating in distributed designs \(video series\)](#)

[Exploring Avatars and Design Reservation \(blog post\)](#)

[Working with Joints and Edit In Place \(blog post\)](#)

[Assembly Contexts and Reference Objects \(blog post\)](#)