

Virtual Reality facilitator guide

Reviewed 2026

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Facilitator guide

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Virtual Reality facilitator guide – goal and objectives

Goal

- The goal of the DRAM Memory virtual reality module is to provide an engaging environment to learn about binary data and how that data gets stored in a DRAM memory array
- The goal of the Equipment Technician virtual reality module is to provide an engaging environment to learn about the cleanroom and specifically about the critical role of Equipment Technicians
- The goal of this guide is to provide educators/facilitators with the necessary tools to confidently facilitate these virtual reality experiences

Objectives

- Introduce how small the structures in a memory array are
- Present the different component of a memory array in a 3D environment to facilitate the appreciation of the scale and connections between structures
- Experience dressing up for the fab and understand why the order is key to minimize contamination
- Become an Equipment Technician for a day and observe some of the critical tasks this role performs

Target Audience for the virtual reality experiences

- Middle school, high school, community college, college, and adults.
- Elementary 3rd to 6th grade: recommend shrinking room, binary activity and smock room only
- Interns, NCGs (New College Grads), and new employees in many technical roles at Micron need to understand these concepts



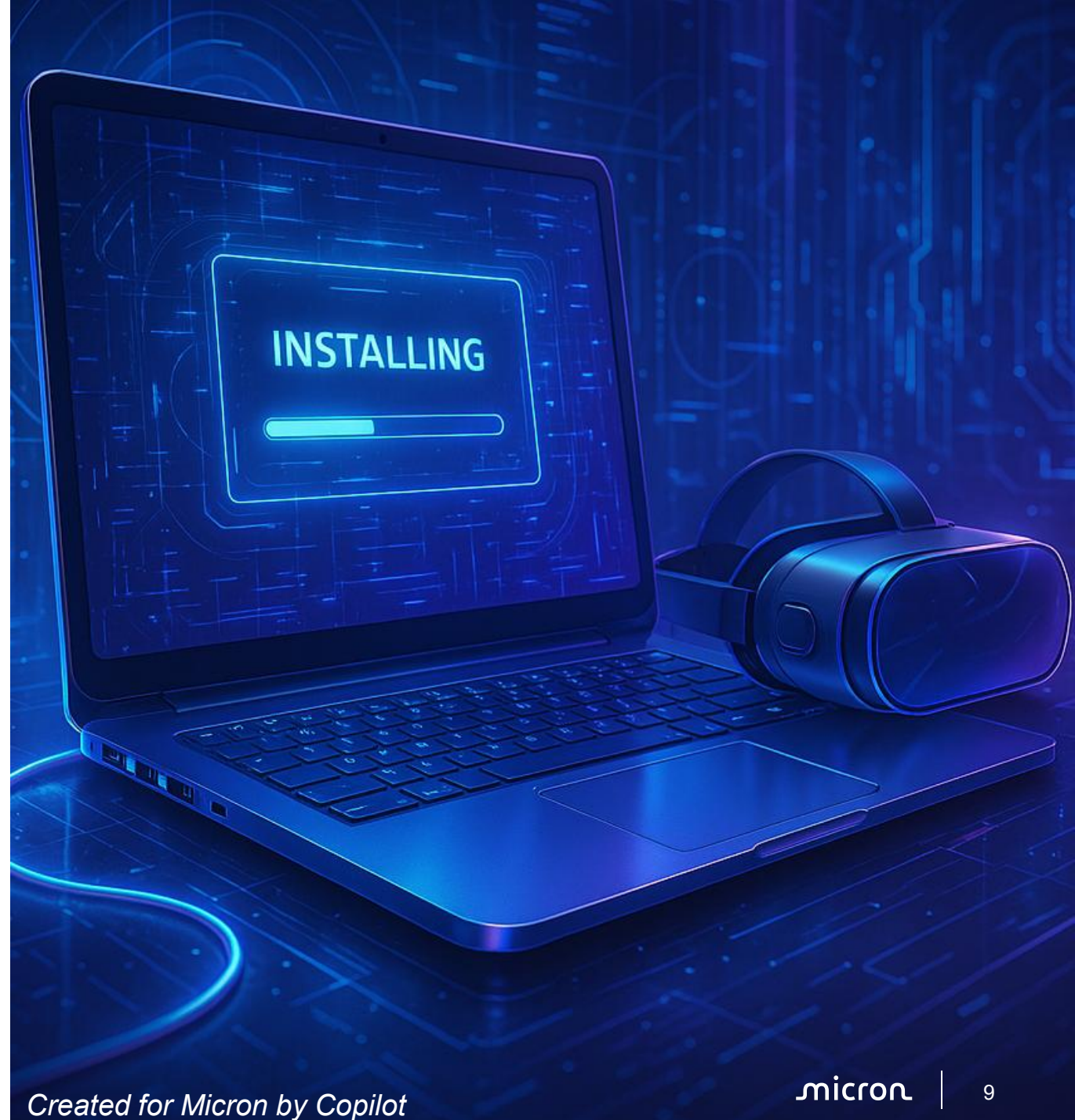
How to start the application in VR headset

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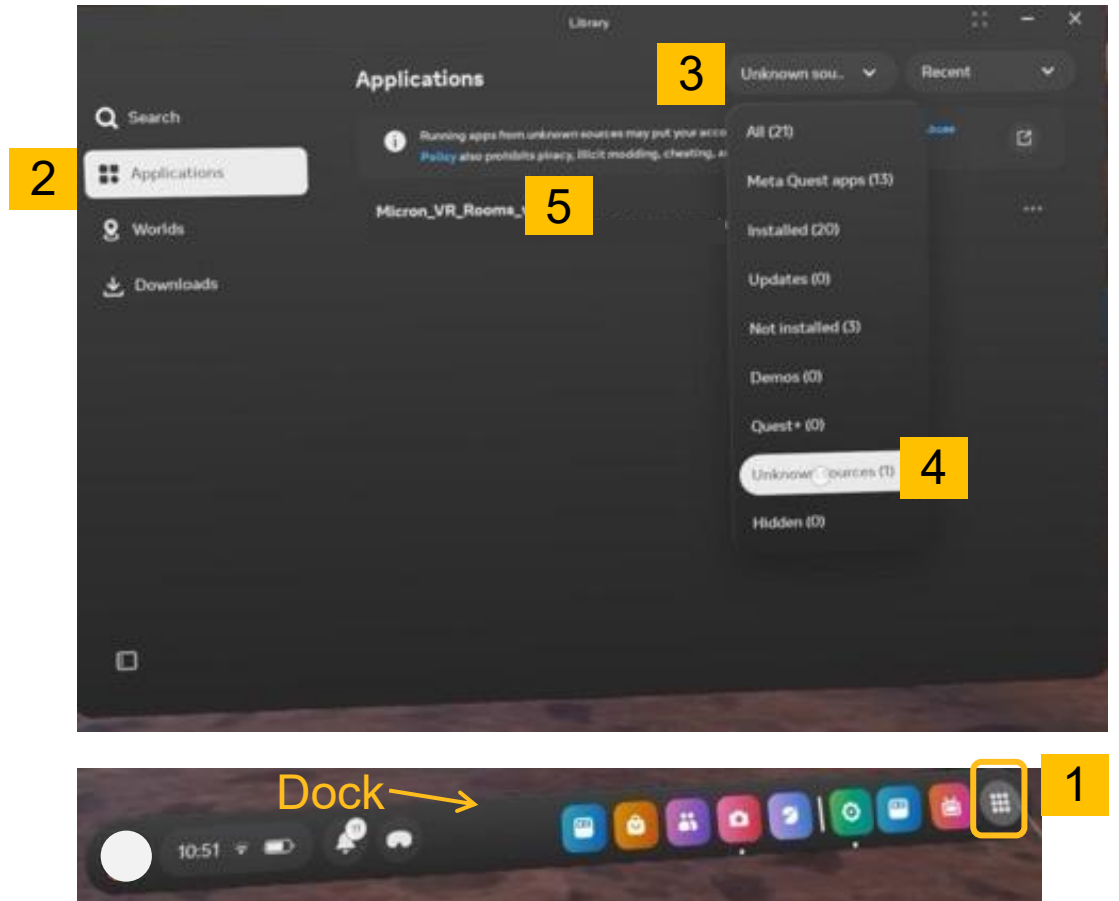
This document does not cover application installation

- This document assumes the application has already been installed in the VR headset
- The installation file can be found in the [Micron Educator Hub](#) under the [Micron Virtual Reality experiences module](#)
- If you need VR installation instructions, please submit an inquiry through the [Contact Us](#) form in the Micron Educator Hub and provide your official school or institution email address
- Contact Us form direct link:
<https://www.micron.com/educatorhub/#contact>



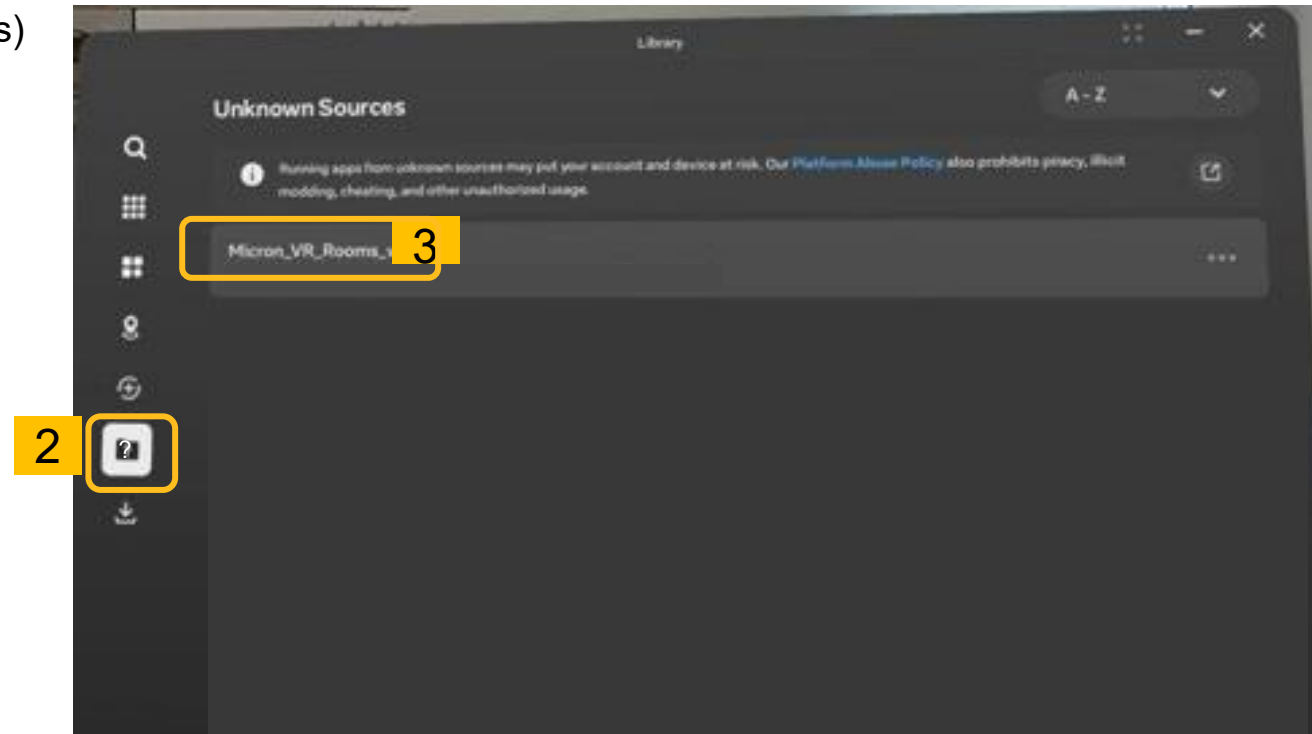
How to find the experience in Meta Quest™ 2 headsets

- 1 On the Dock, click on the “3x3 dots” symbol
- 2 A window will open. On the left side click on Applications
- 3 Click on the dropdown menu
- 4 Choose Unknown Sources
- 5 Click on application of interest, e.g., Micron_VR_Rooms_v2



How to find the experience in Meta Quest™ 3 headsets

- 1 On the Dock menu, click on the “3x3 dots” symbol (Applications)
- 2 A window will open. On the left side click on the “?” symbol
- 3 Click on application of interest, e.g., Micron_VR_Rooms_v2



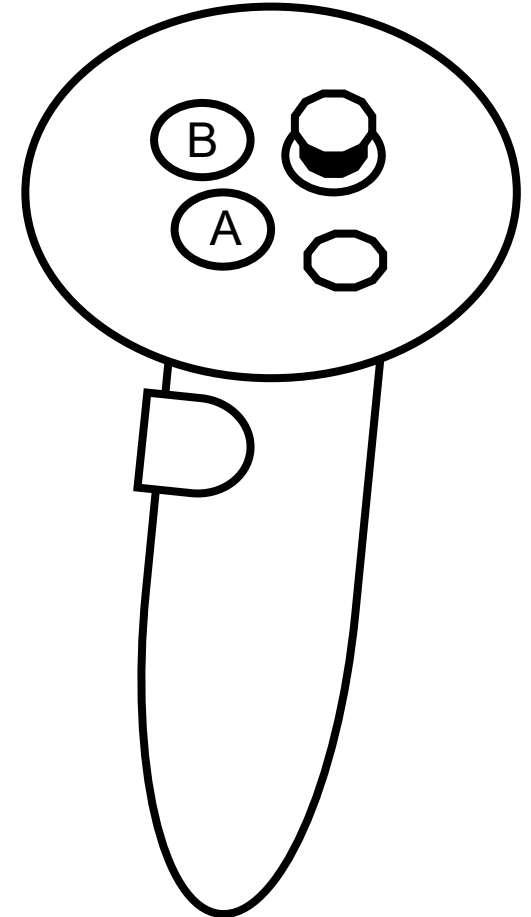
How to interact with the experience



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VR controllers

- The right-hand controller (the one with the A/B buttons) can be used for these tasks:
 - Interact with the experience (trigger) (shown in a later slide)
 - Turn on and turn off close captions (button A)
 - Exit the application
- The left-hand controller (X/Y buttons) can be used for these tasks:
 - Navigate to different rooms
 - Restart level
 - Reset orientation
 - Exit the application
- Recommendations:
 - Most facilitators prefer to only give participants the right-hand controller to avoid additional time to train participants on how to use left-hand controller.
 - Giving participants the left-hand controller is recommended when participants prefer more flexibility to explore the environment at their own pace.

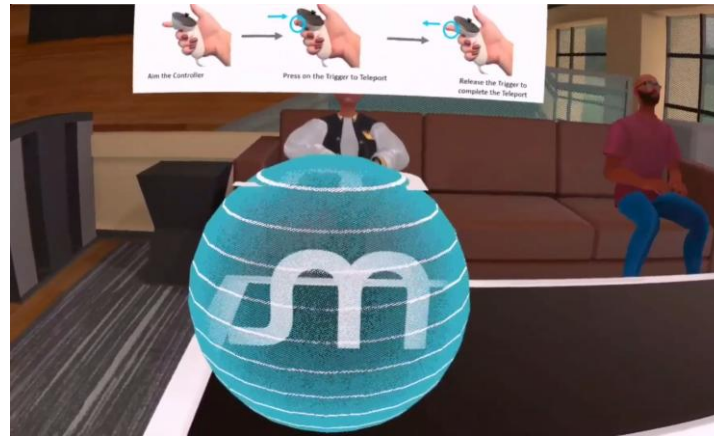


Right-hand controller

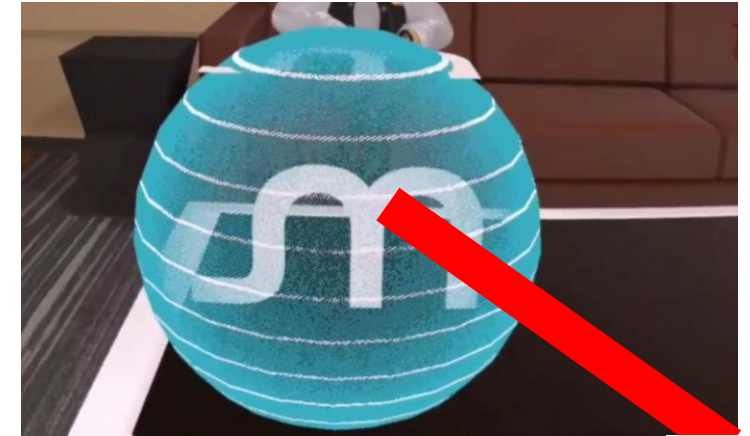
The Micron Lobby / The Micron Orb



- Once the experience starts there is a cinematic video of avatars entering into a Micron lobby



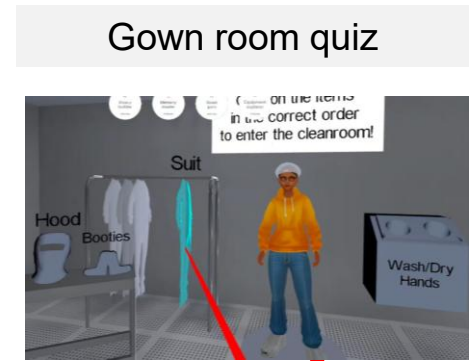
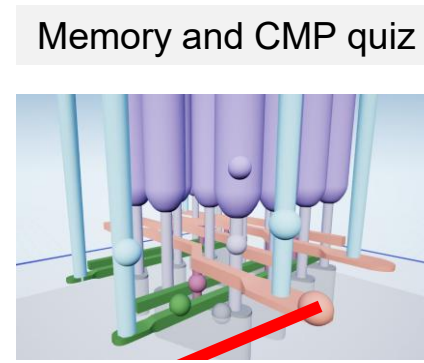
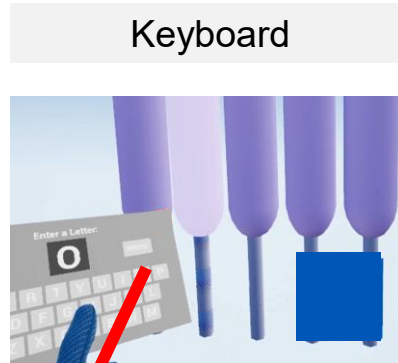
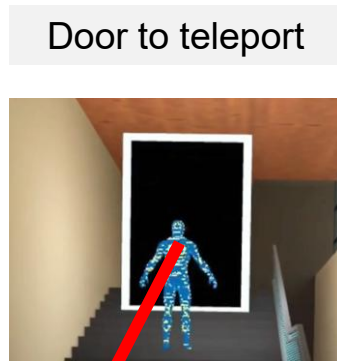
- Once the avatars are seated, the Micron blue orb shown above appears. This interactive symbol is used throughout the experience. Participants must engage with the orb to begin.



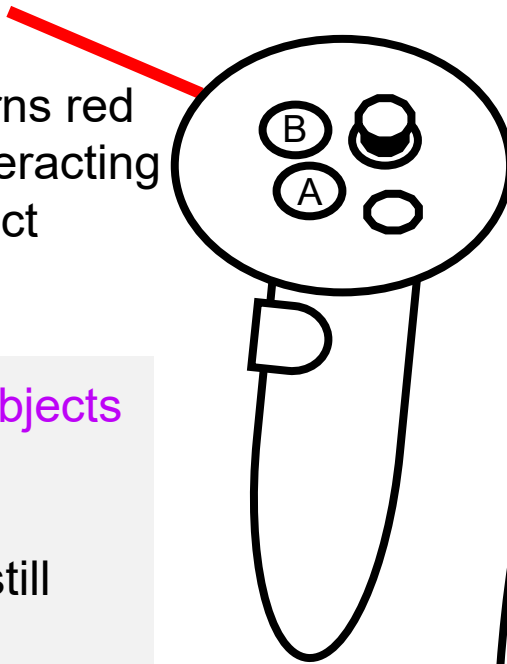
- Using the trigger on the right-hand controller (shown on the next slide), the participant activates the orb to move forward in the experience.

Right Hand Controls

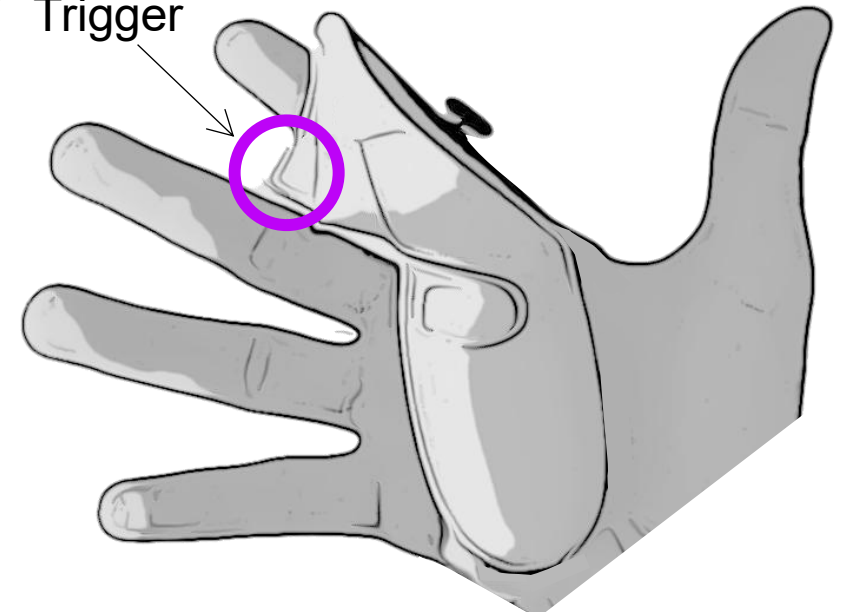
Meta Quest™



Laser turns red when interacting with object



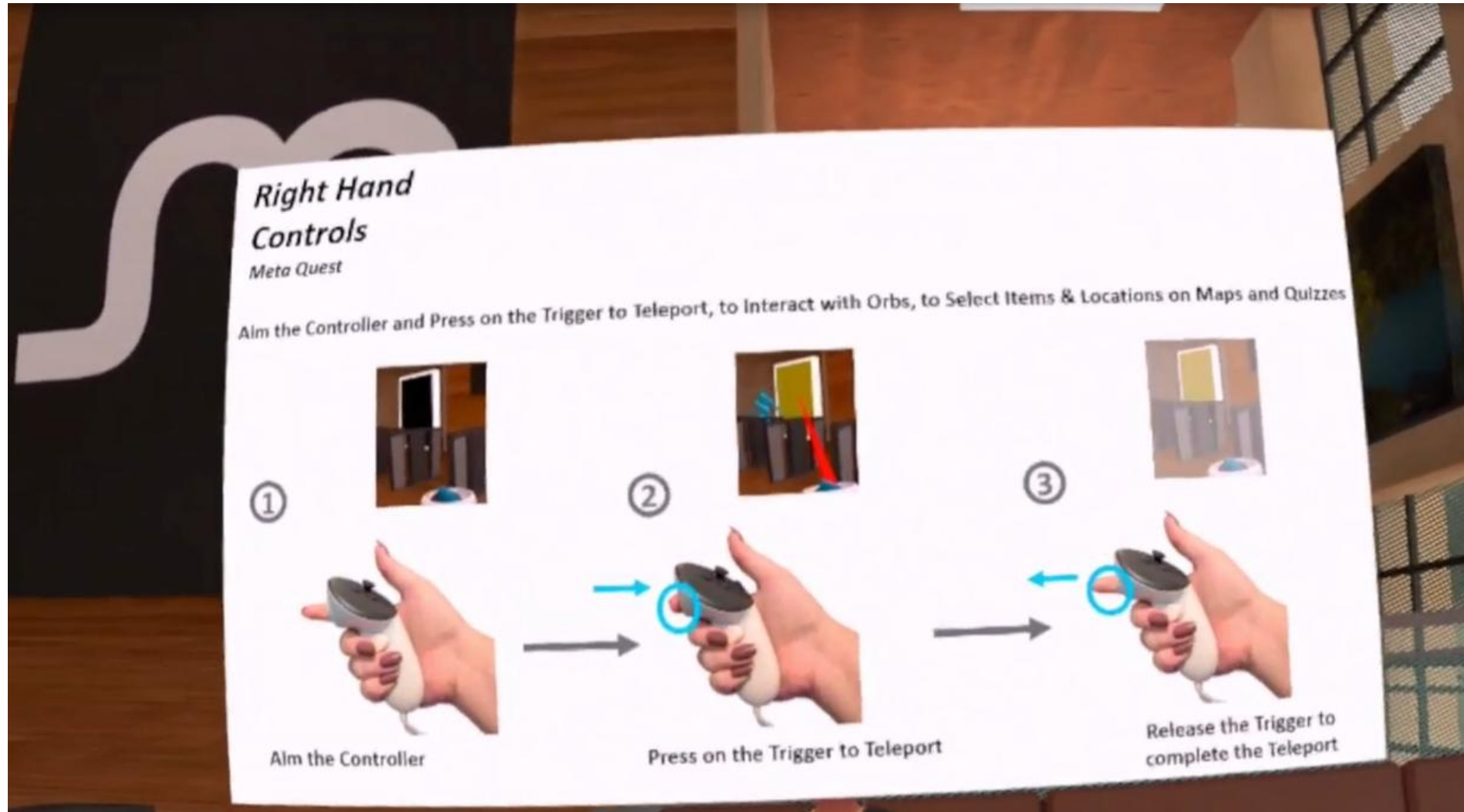
Trigger



Do these three steps to interact with objects

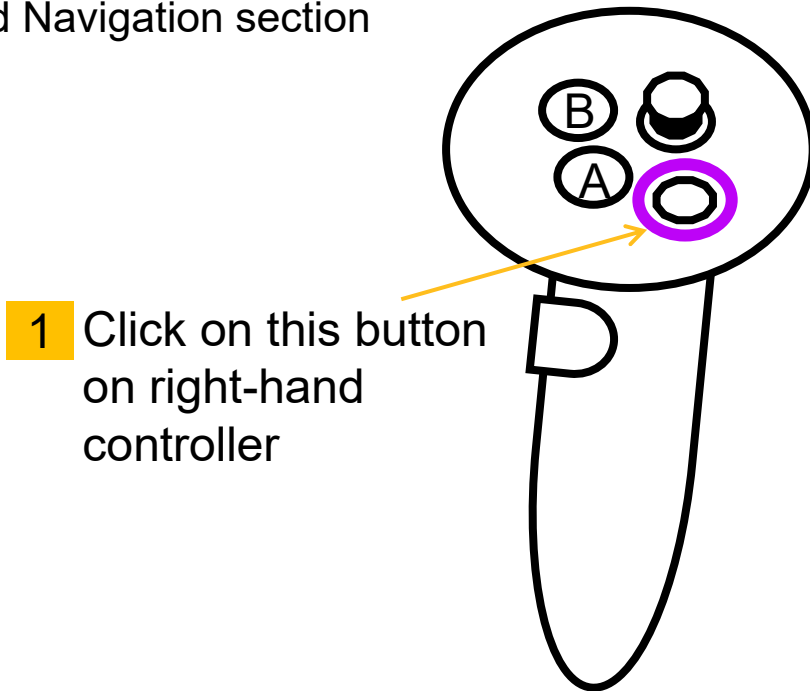
- 1) **Point** at object
- 2) **Press** the trigger button
- 3) **Release** the trigger button (while still pointing at object)

Control Instructions also embedded in the experience



Exit instructions

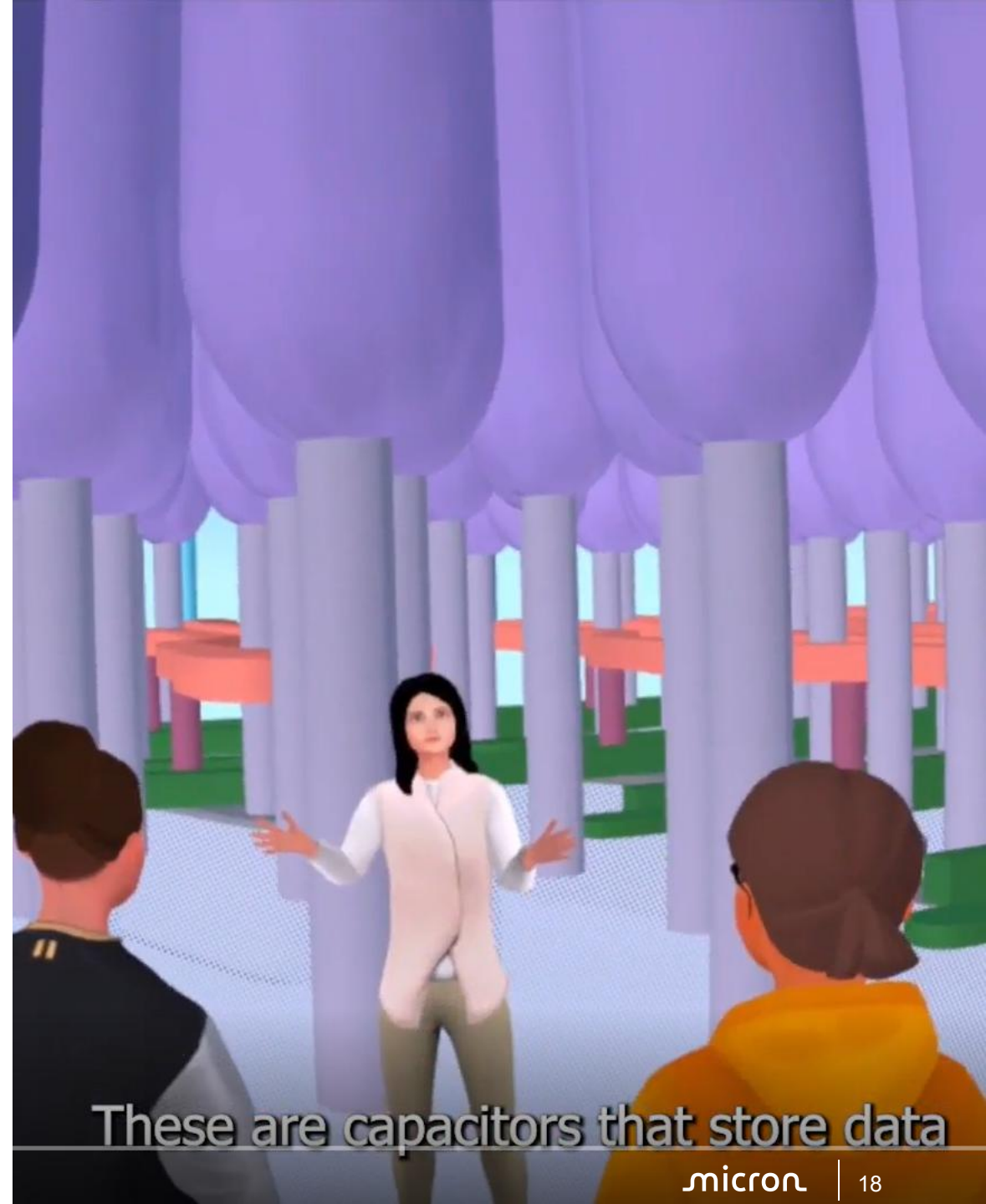
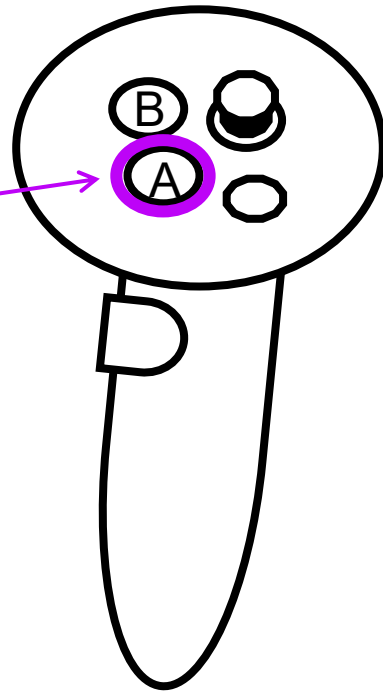
- The application can be exited at any time following these steps:
 1. Click on button shown in illustration
 2. A window will pop up
 3. Choose the Quit button to exit application
 4. Alternatively, choose the Resume button to continue the VR experience
- Another option to Exit the application is described in the Advanced Navigation section



Close Captions

- Participants can turn on close captions or turn them off at any point during the experience
- Use the **A button** on the right-hand controller. Press the A button once to turn on close captions, and press the A button again to turn them off.

Press A button on
right-hand controller



These are capacitors that store data

Description of experiences

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The Micron Lobby

- Once the Micron orb in the lobby is activated, two intro videos will play in sequence:
 1. Angie's intro video (~20 seconds)
 2. Alex's intro video (~20 seconds)
- After both videos conclude, the participant selects a Micron orb:
 - Either the orb of their choice, or
 - The orb indicated by the facilitator
- Experience Duration
 - Angie's experience: ~15 minutes
 - Alex's experience: ~15 minutes
- Important Note: if a participant selects a different experience than the one indicated by the facilitator, the facilitator may:
 - Allow the participant to continue with the selected experience, or
 - Ask the participant to exit and restart the experience (Refer to the *Exit Instructions* slide)



Description of experiences



DRAM Memory ~15 minutes

Angie guides us through a shrinking room experience that helps visualize the incredibly small scale of semiconductor memory circuits. As we shrink down to the **nanometer scale**, we enter a DRAM memory array, where we learn how **binary data** works and where that data is physically stored—inside very tall capacitors. This immersive experience introduces the **structure and operation** of DRAM in an engaging and intuitive way.



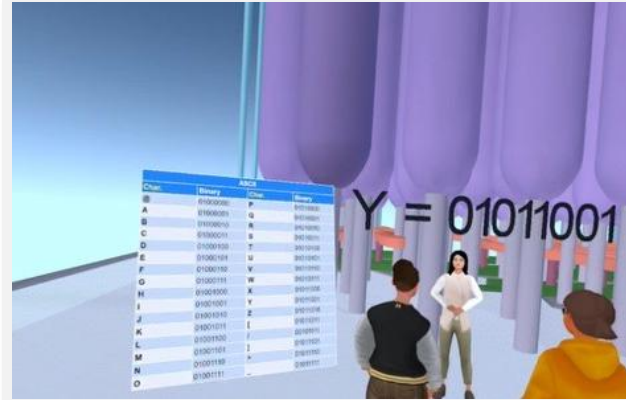
Equipment Technician Role ~15 minutes

Alex invites us to learn about the **Equipment Technician role**. First, he demonstrates the proper **gowning procedure** required before entering the fab. Participants then follow the correct gowning sequence themselves before entering the fab alongside Alex. Inside the fab, Alex explains key concepts related to the area where he works and its importance in the manufacturing process. To conclude, he walks us through a **preventive maintenance task**, showing how Equipment Technicians help keep operations running smoothly.

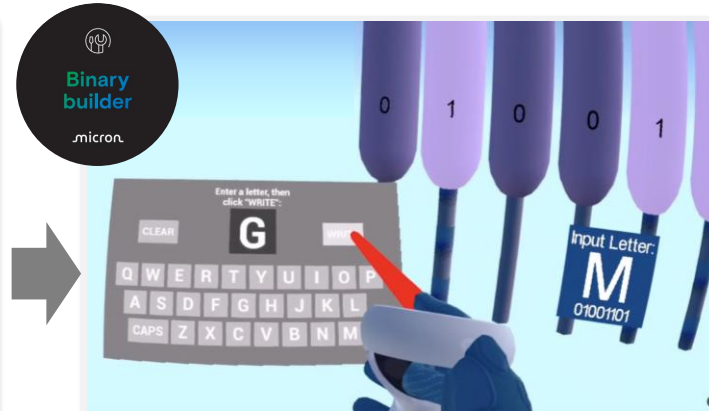
Angie: memory operation story board



Angie takes us into a “shrinking room” where different objects of known dimensions appear as we shrink to the nanometer scale.



Then we enter into a nanometer scale DRAM memory array where we first learn about binary data.



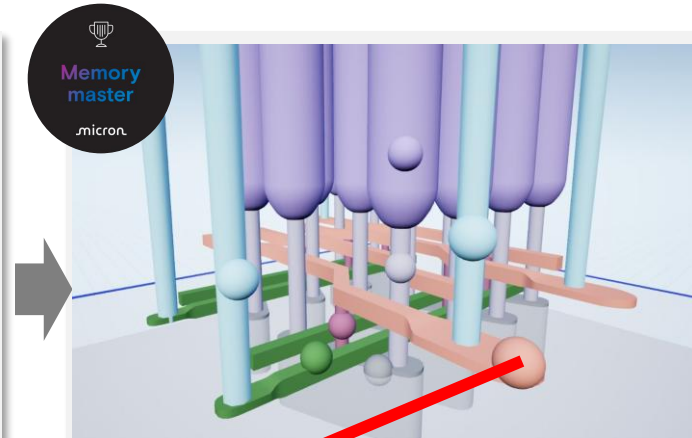
We get to practice how to store a single character (8 bits) into capacitors in a DRAM memory array. We earn the **Binary builder badge** along the way!



Next, we learn about the different components of a DRAM memory array, and we learn about the WRITE operation (how to write a 0 or a 1 in a capacitor).



Once Angie concludes the explanation we walk with her inside the memory array, and we get the chance spend a moment looking up, down, and around before the next step.



We next answer several quiz questions to check our understanding of DRAM memory and earn the **Memory master badge**!

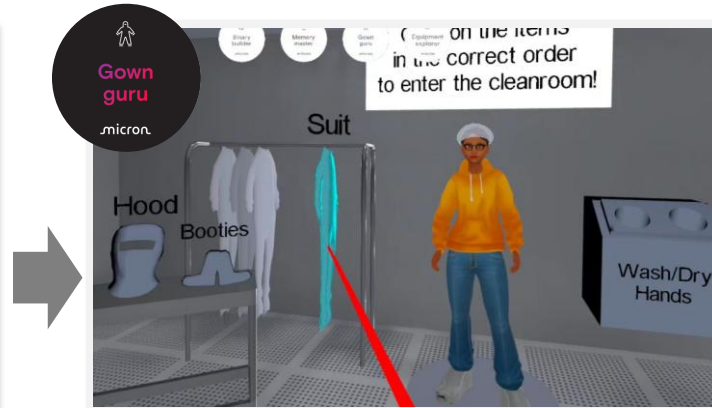


Back to the Lobby where we can repeat the adventure or choose a new adventure.

Alex: gown room and cleanroom story board



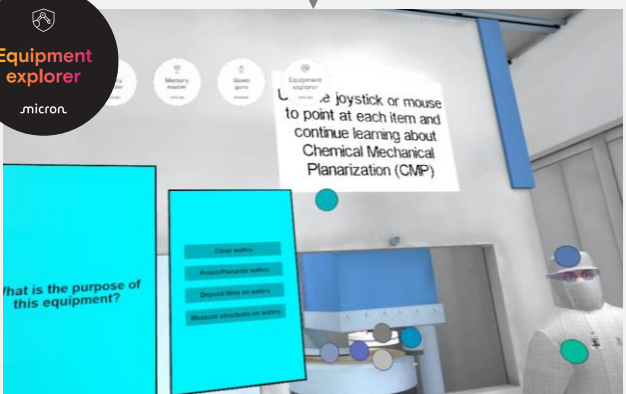
Alex takes us into the Gown Room where we learn the several steps to dress up correctly before entering the cleanroom to prevent introducing contamination.



Then we enter the Smock Quiz Room where we dress an avatar in the correct order to check understanding of the gowning process and earn the **Gown Guru badge!**



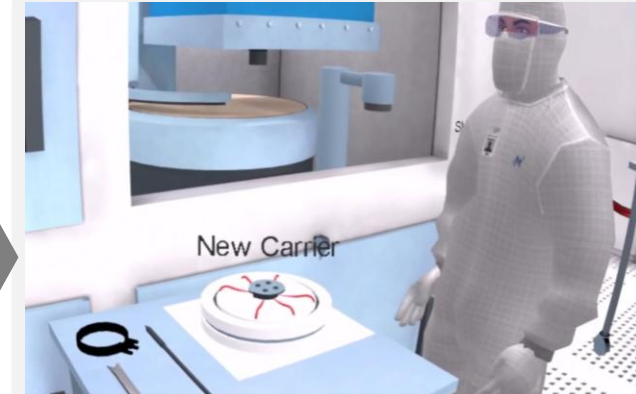
Then we enter the cleanroom where Alex explains the responsibilities of the Equipment Technician role and introduces us to the fab area where he works (the Chemical Mechanical Planarization Area).



Next, we answer several quiz questions to check our understanding and earn the **Equipment explorer badge!**



Next turn left where you will see two doors. You can go back to the Lobby, or you can continue learning about the Equipment Technician role.



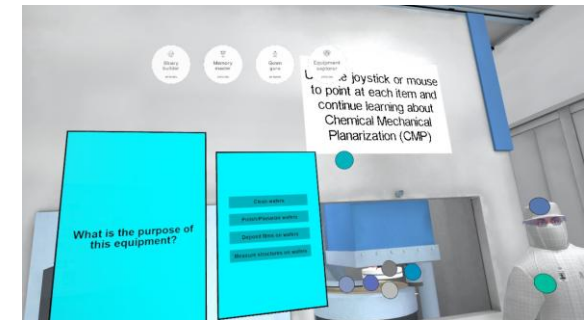
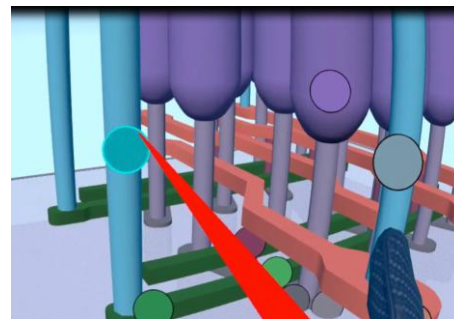
If we choose to continue, Alex shows step by step how he performs a preventive maintenance task. Today we learn how to change a "carrier" in a Chemical Mechanical Planarization tool he is responsible for.



Back to the Lobby where we can repeat the adventure or choose a new adventure.

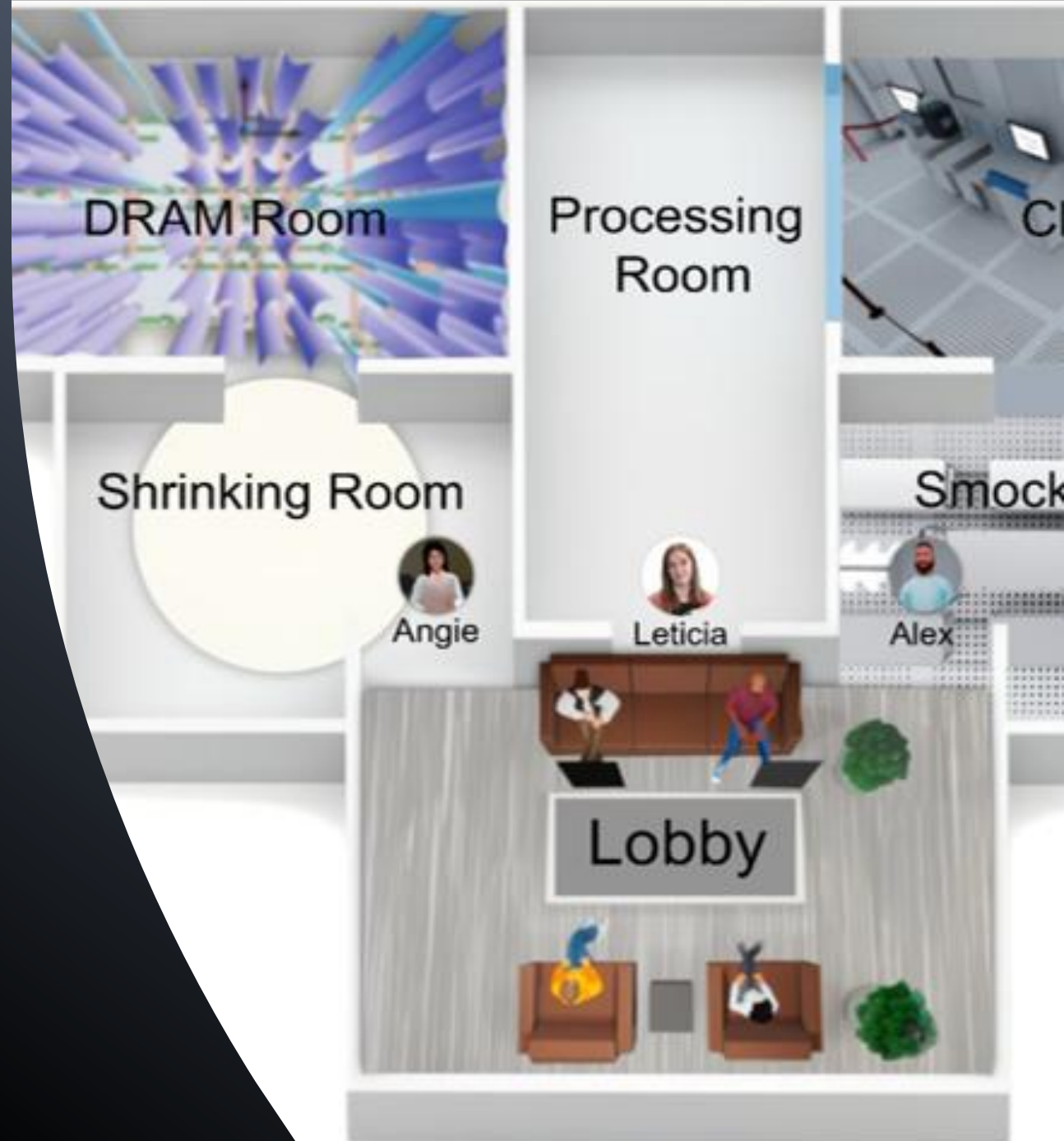
Stickers for each activity completed

Sticker design available for printing



Advanced navigation

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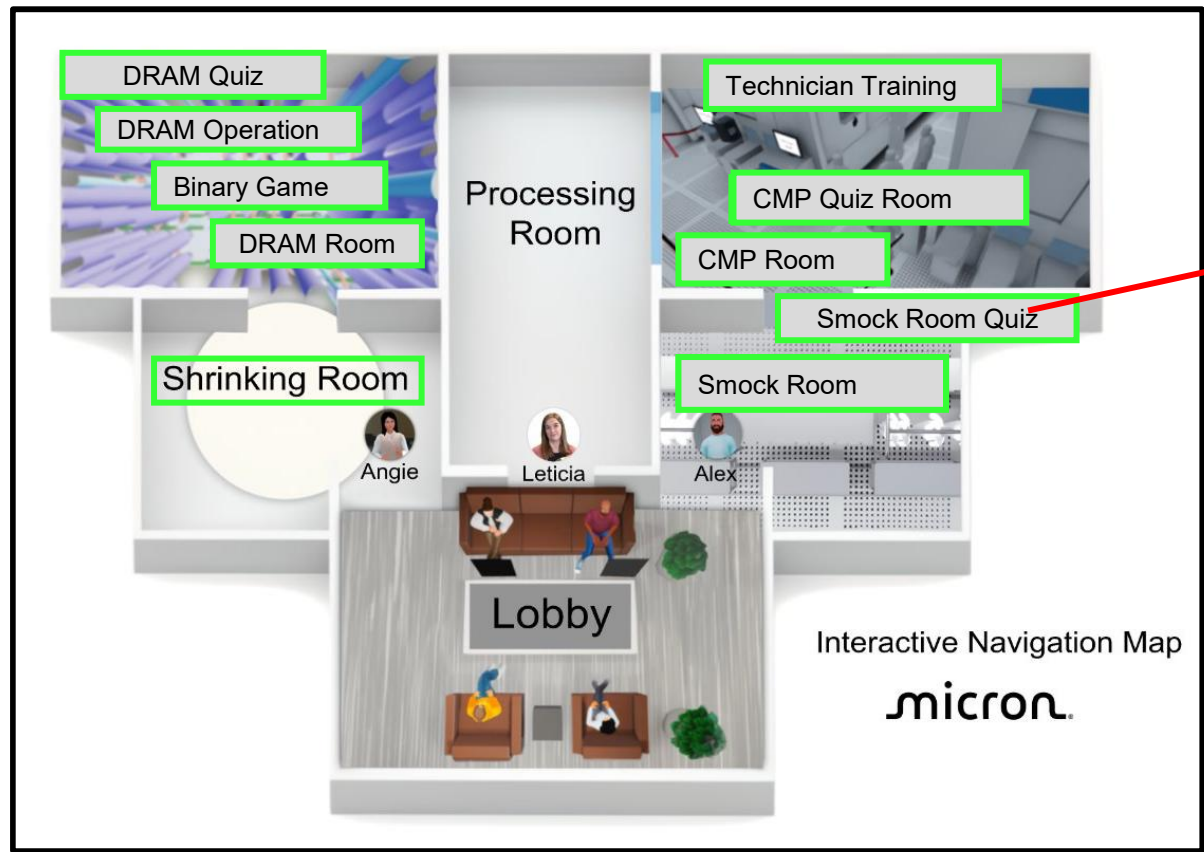
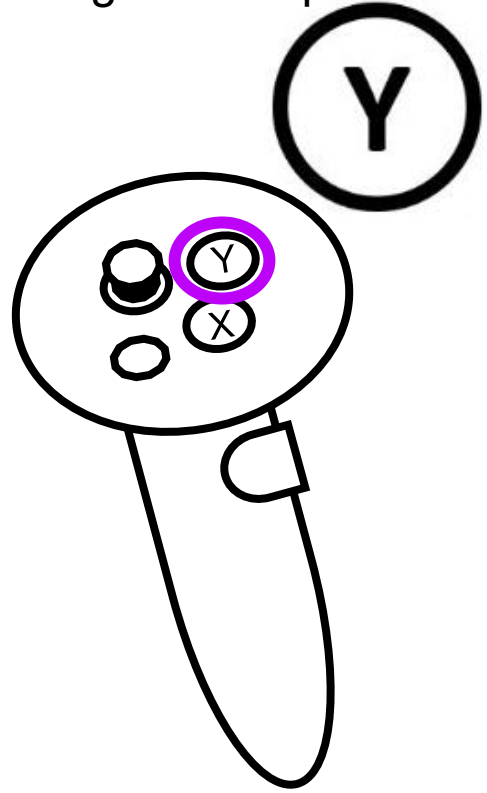


How to navigate to different rooms during interactive mode (recommended only for facilitators to use)

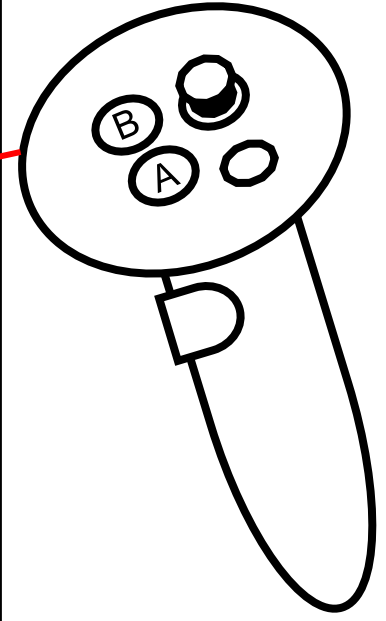
3) Use Right Hand Control to choose next adventure

2) Navigation Map opens on your left hand

1) On Left Hand Control click **Y button** to open Navigation Map



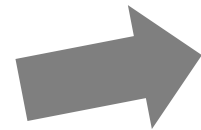
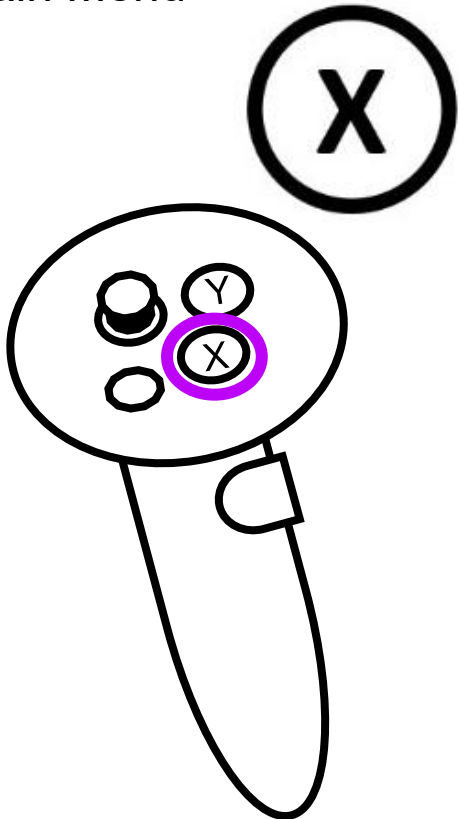
Trigger:
Point, Press and release



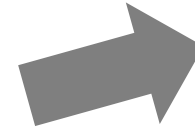
Note: to exit Navigation Map click on **Y button** again

How to use the Main Menu (recommended only for facilitators to use)

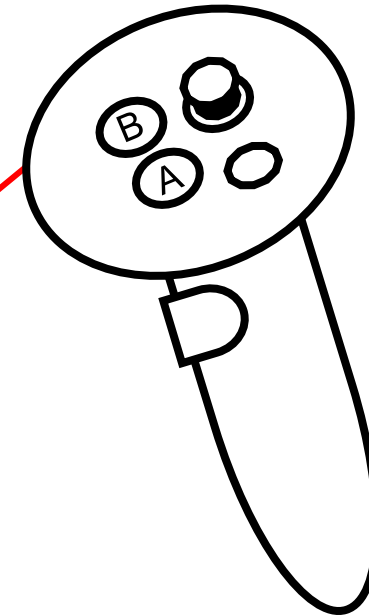
1) On Left Hand Control click **X button** to open Main Menu



2) Main Menu opens on your left hand



3) Use Right Hand Control to select

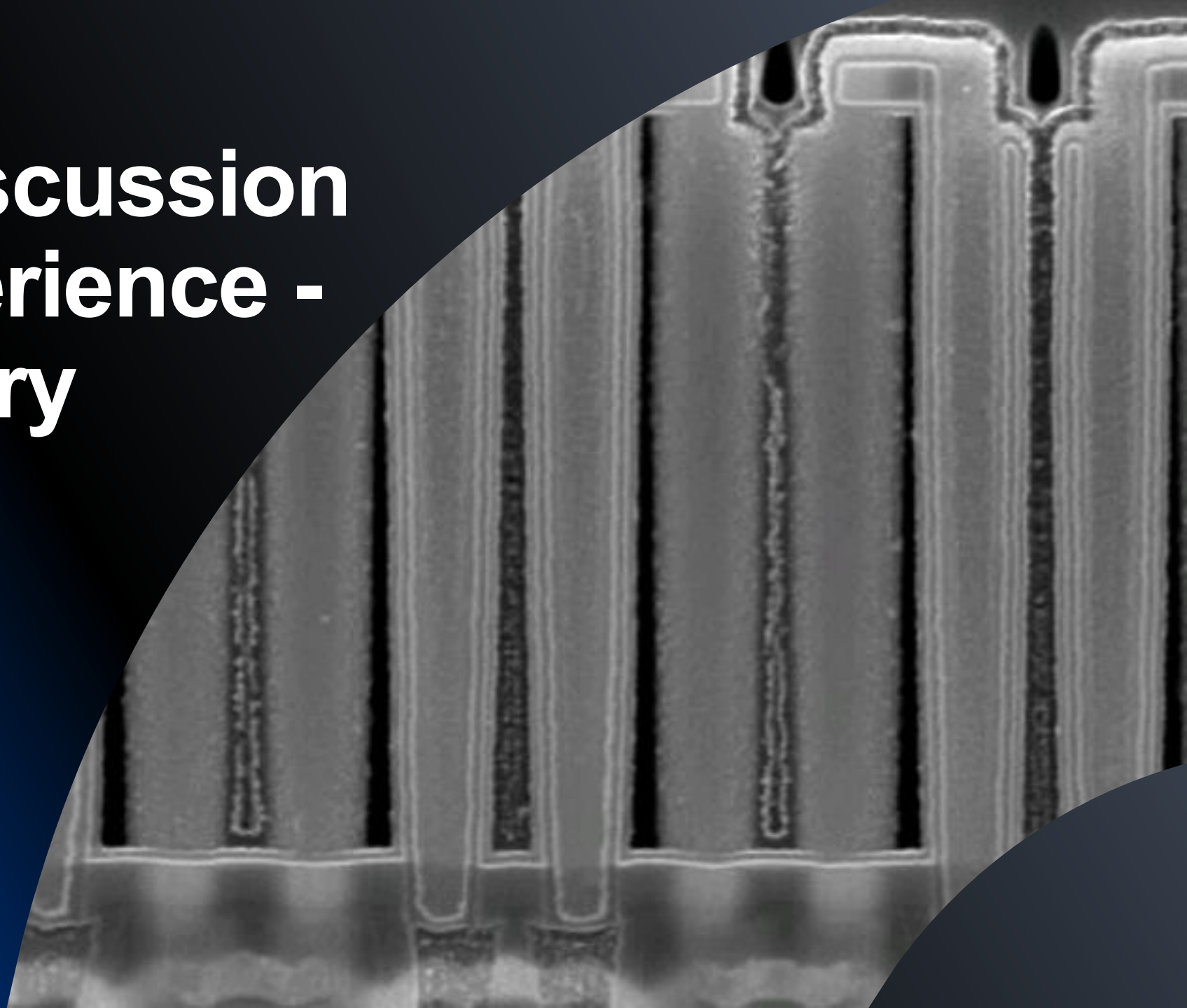


Trigger:
Point, Press and
release

Note: to exit Main Menu click on **X button** again

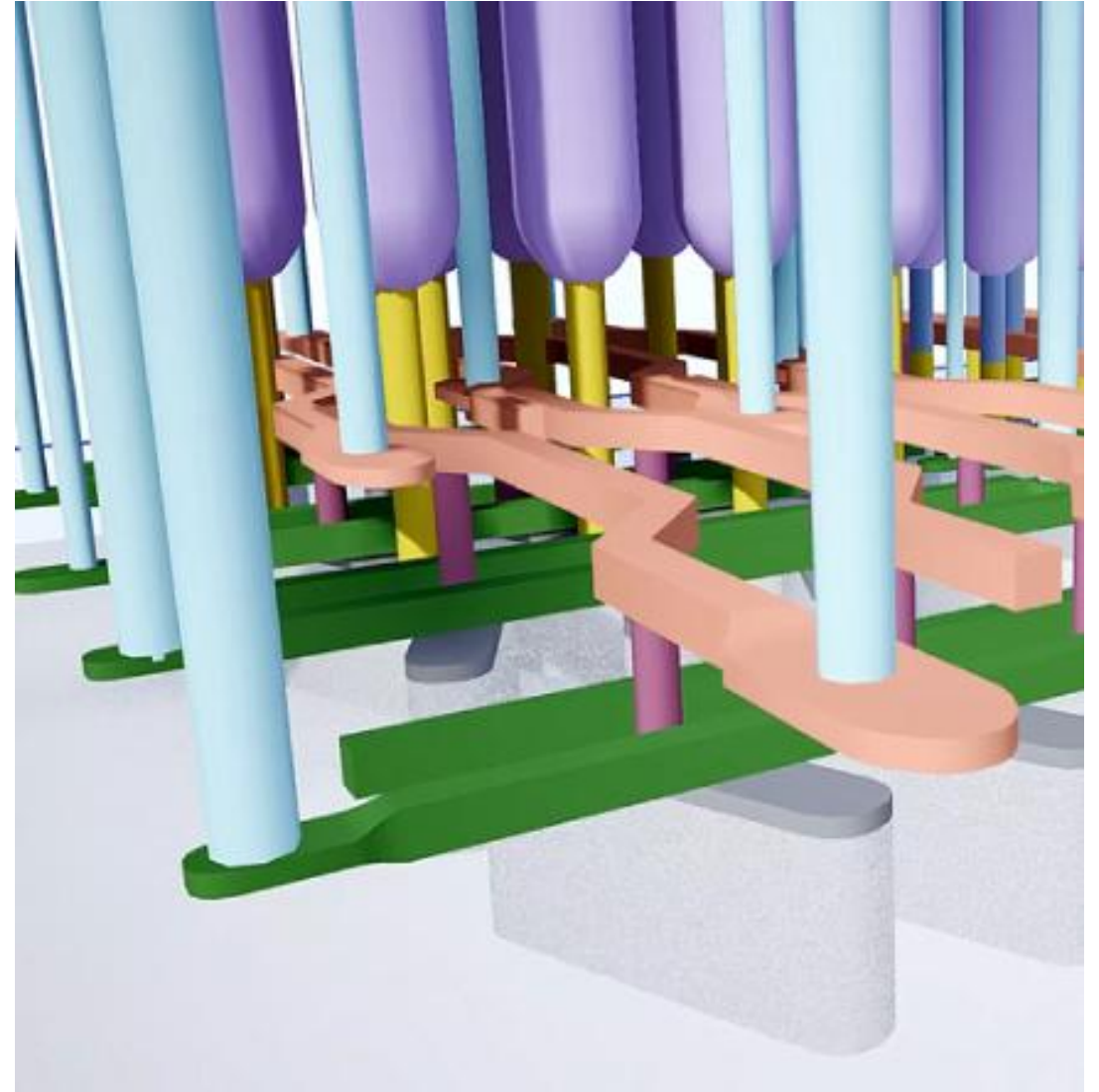
Topics for discussion after VR experience - DRAM Memory

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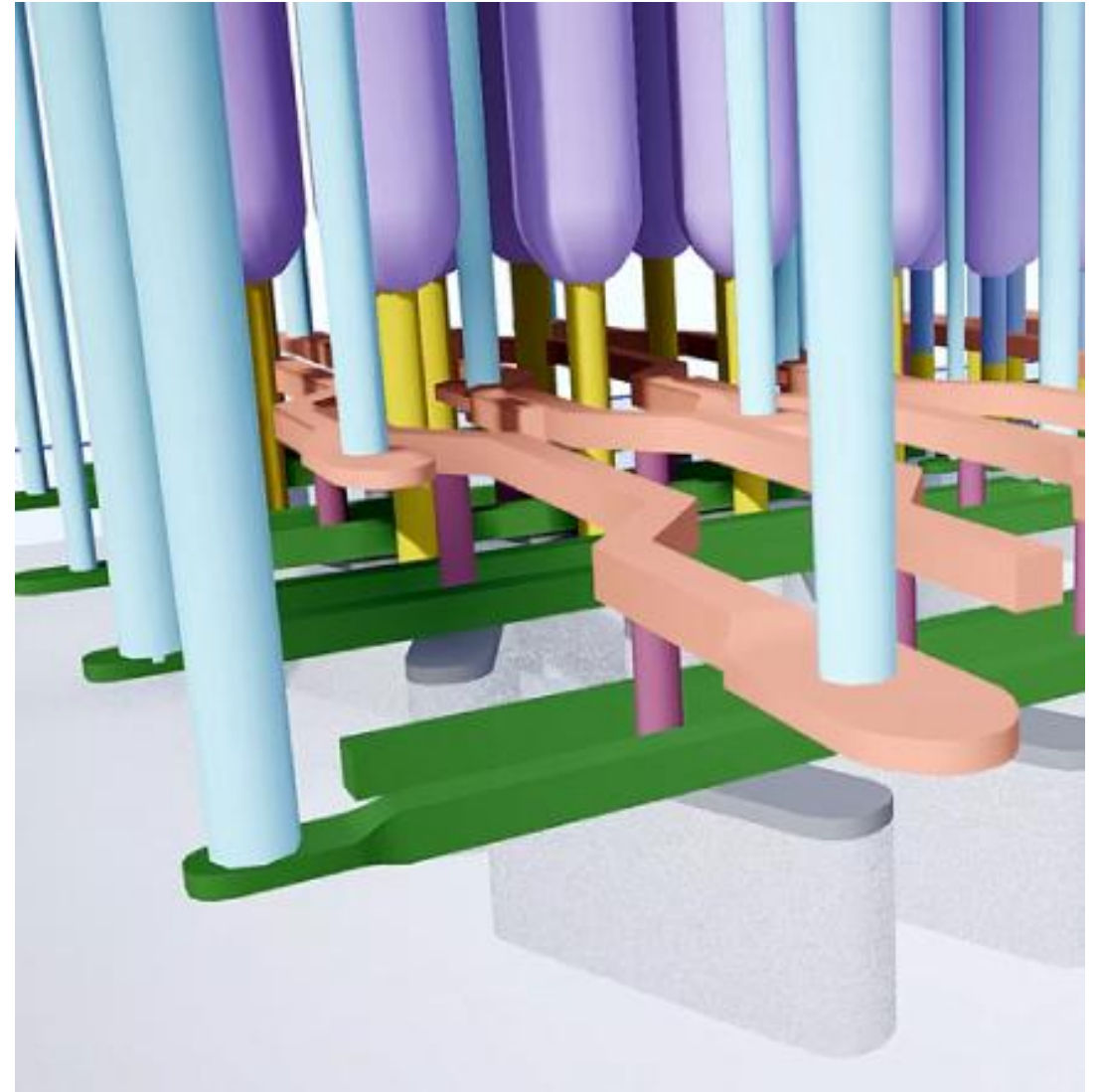
DRAM memory discussion/disclaimers

- Memory arrays **do not** have open gaps between components/structures. All devices/structures are protected by insulation and are all **compacted** (crunched) together.
- Cylindrical connections such as **cell contacts** and **digitline contacts** are **much shorter** than shown and not actually cylinders (cylinder shape was convenient to illustrate contact but it is not the actual shape of some contacts).

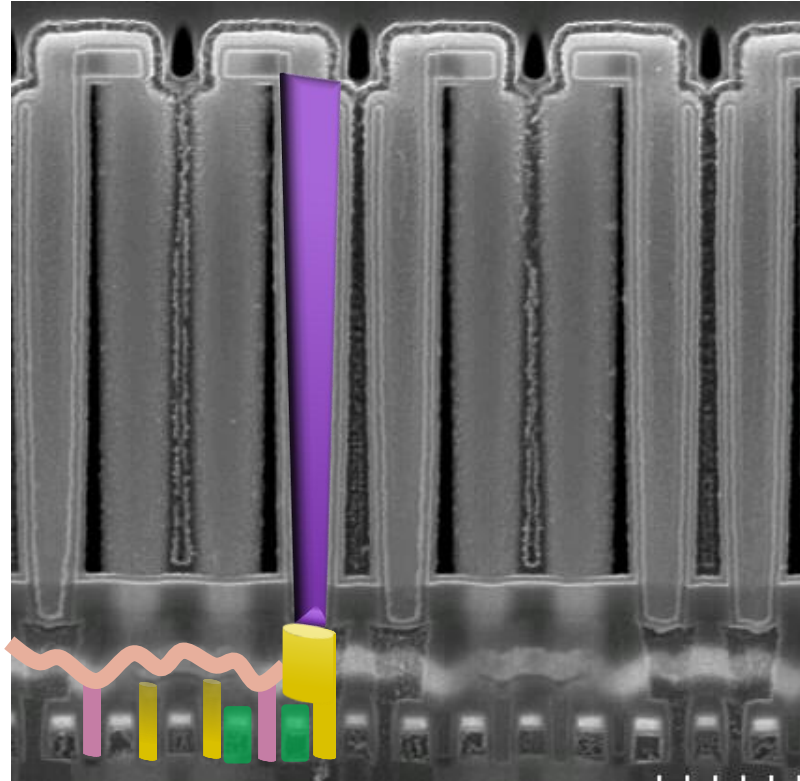


DRAM memory discussion/disclaimers

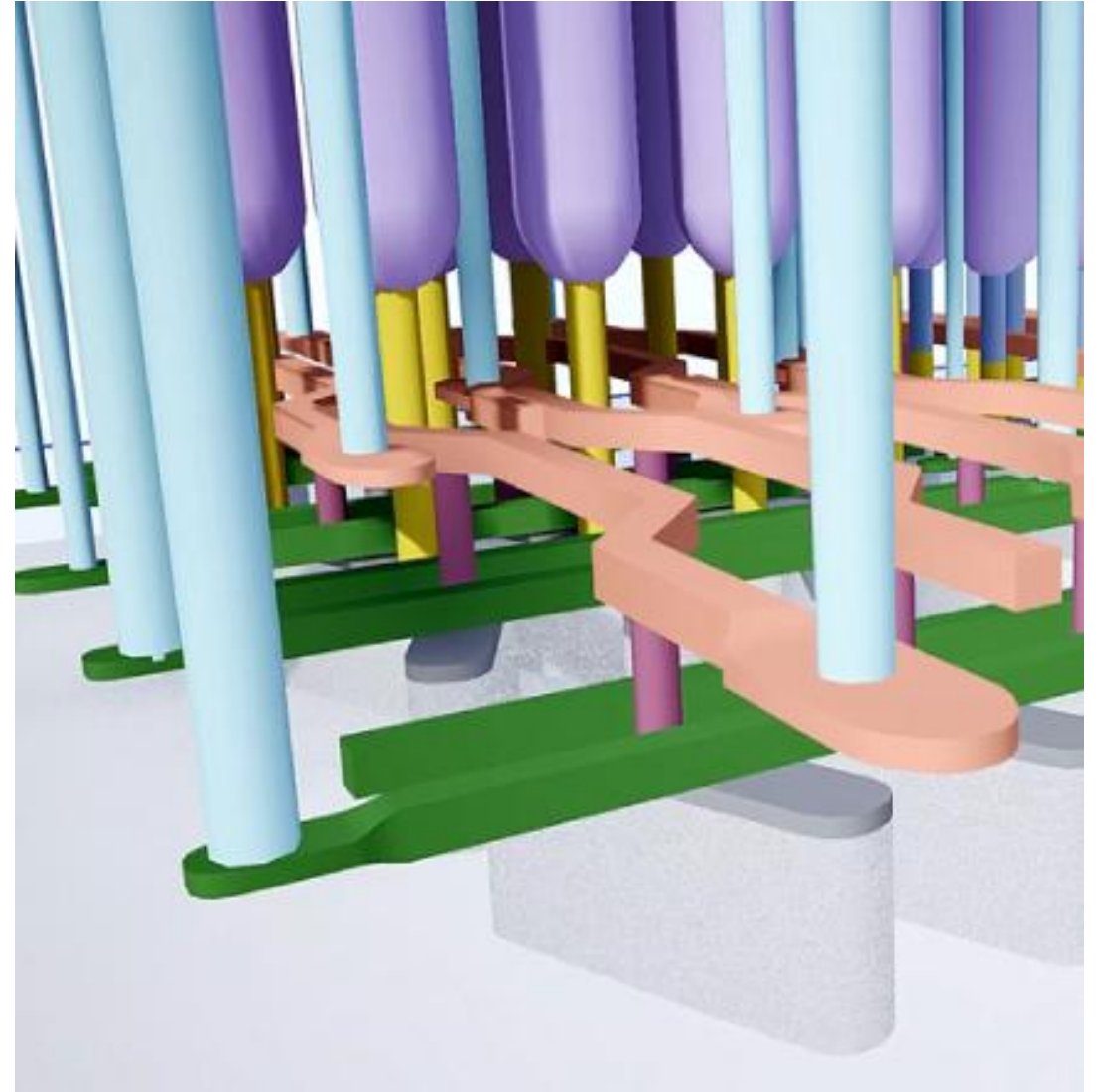
- The **wordlines** today are buried *below* the silicon surface. The wordlines shown here are built on top of the silicon which is an older technology to facilitate the explanation.
- Current **capacitors** are taller and skinnier than shown. They have a high 'aspect ratio'. What is aspect ratio?
- Today, **digitlines** are straight (no weaving). Best for tiny features, tight control, and repeatability.



DRAM memory discussion



This Scanning Electron image of an older DRAM memory array (similar to the technology shown in the VR experience) may have some recognizable features. What can you identify?



Topics for discussion after VR experience - Equipment Tech

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Fab Equipment Tech Role

 **CMP (Chemical Mechanical Planarization) is one of 10 fab areas**

 **Equipment Technician roles in all 10 fab areas**

- See list of areas on the right

 **What Do Equipment Technicians Do?**

- Maintain, troubleshoot, and calibrate advanced fab equipment

 **Education or Experience**

- Ideal candidates familiar with one or more: electrical & mechanical systems, mechatronics, robotics, microelectronics, reading and interpreting schematics

 **No Fab Experience? No Problem!**

- Most roles do not require prior fab experience
- On-the-job training is provided

 **What Makes a Great Equipment Technician?**

- Strong troubleshooting and problem-solving aptitude
- Good communication and teamwork skills

 **Ready to Join?**

- Check out current openings: careers.micron.com

Fab Areas

- CMP (Chemical Mechanical Planarization)
- CVD (Chemical Vapor Deposition)
- Diffusion
- Dry Etch
- Implant
- Metrology
- Photolithography
- PVD (Physical Vapor Deposition)
- RDA (Real-Time Defect Analysis)
- Wet Process

Multiple delivery formats

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Created for Micron by Copilot

Three versions for broad access

1 Virtual Reality version



2 Desktop / laptop version



3 Video version



Virtual Reality version

- The most immersive experience
- This is the version described in this document
- This version provides the same interactivity as the desktop / laptop version
- Close caption can be turned on or turned off in the VR version – similar to the desktop / laptop version
- These are some scenarios where the VR version may not be a good approach. In these cases, the other versions may be a better fit.
 - Participant has vertigo (VR not recommended)
 - Participant gets dizzy when using VR headsets
 - Participant needs to wear glasses that cannot fit in VR headset
 - No VR headsets/not enough VR headsets for all participants



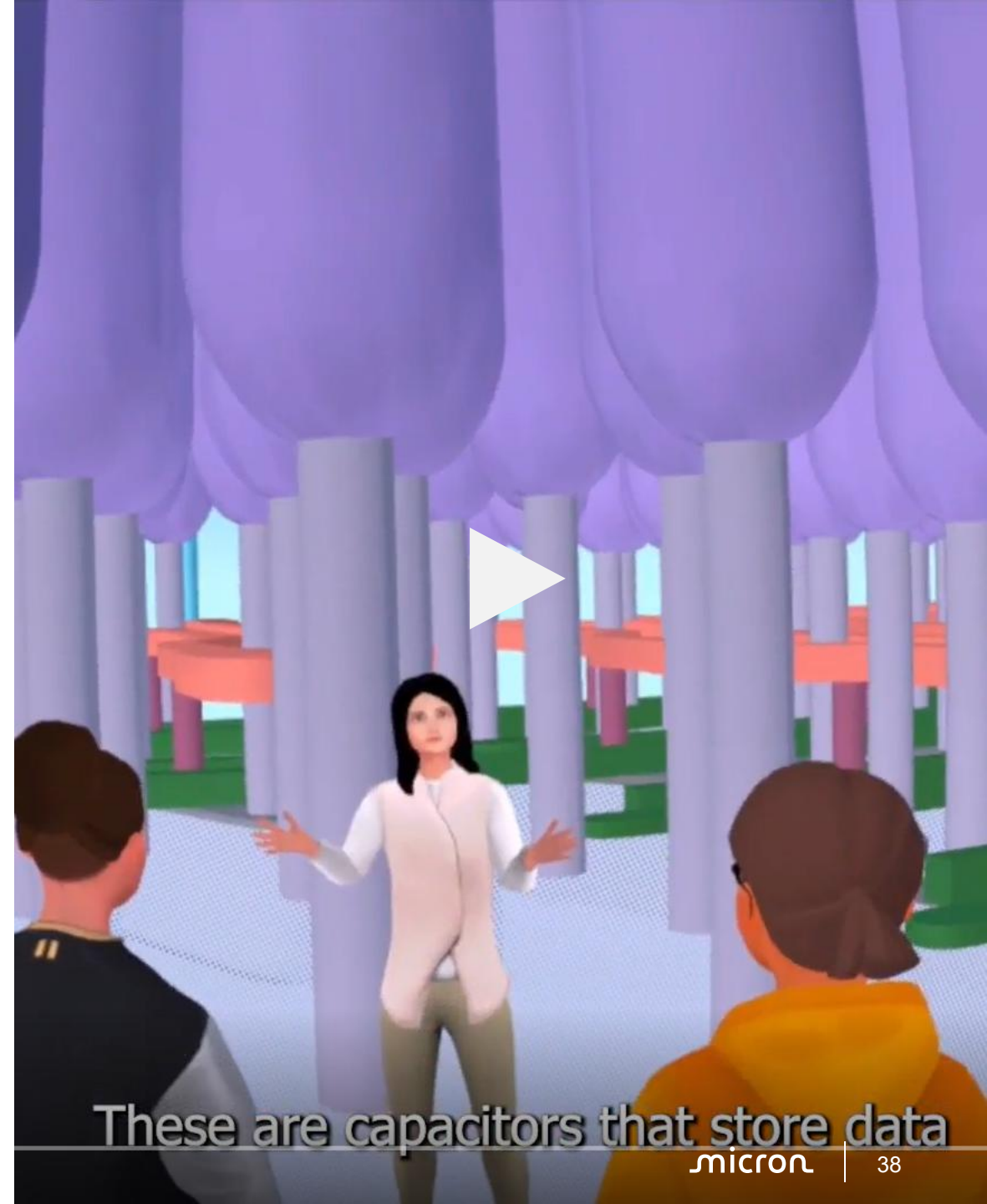
Desktop / laptop version

- A desktop/laptop version of the experience is provided. This version provides the same interactivity as the VR version.
- Close caption can be turned on or turned off in the desktop/laptop version – similar to the VR version
- These are some scenarios where the desktop/laptop version can be a good approach
 - Participant has vertigo (VR not recommended)
 - Participant gets dizzy when using VR headsets
 - Participant needs to wear glasses that cannot fit in VR headset
 - No VR headsets/not enough VR headsets for all participants
- A separate installation/facilitator guide is provided for the desktop/laptop version
- It is recommended to use **an external mouse** for this version - although participants using a touchpad have also provided good feedback
- When facilitating multiple participants in a shared space, it is also recommended to provide **headphones** to each participant.



Video version

- Besides the virtual reality experience, there are two mp4 **videos** of the experience that can be watched in a desktop, laptop, tablet, etc.:
 - Video without close captions
 - Video with close captions
- These are some scenarios where video version can be a good approach
 - Participant has vertigo (VR not recommended)
 - Participant gets dizzy when using VR headsets
 - Participant needs to wear glasses that cannot fit in VR headset
 - No VR headsets/not enough VR headsets for all participants
- Drawback: the videos do not have interactivity
- Advantage: the videos can be paused, rewind, fast forward, and watched at different speeds (the VR version does not have these options)



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