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Accelerating CUDA C++ Applications with Multiple GPUs

LRZ | 30 November 2021

Overview



- This course is co-organised by LRZ and NVIDIA Deep Learning Institute (DLI).
- NVIDIA Deep Learning Institute (DLI) offers hands-on training for developers, data scientists, and researchers looking to solve challenging problems with deep learning.
- By participating in this course, you'll:
 - Use concurrent CUDA streams to overlap memory transfers with GPU computation
 - Utilise all available GPUs on a single node to scale workloads across all available GPUs
 - Combine the use of copy/compute overlap with multiple GPUs
 - Rely on the NVIDIA Nsight™ Systems Visual Profiler timeline to observe improvement opportunities and the impact of the techniques covered in the workshop
- The lectures are interleaved with many hands-on sessions using Jupyter Notebooks. The exercises will be done on a fully configured GPU-accelerated workstation in the cloud.



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DLI Mission: Help the world to solve the most challenging problems using AI and deep learning

We help developers, data scientists and engineers to get started in architecting, optimizing, and deploying neural networks to solve real-world problems in diverse industries such as autonomous vehicles, healthcare, robotics, media & entertainment and game development.

Lecturers



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- **Lecturer:**

- Dr. Momme Allalen (LRZ)

- **Technical Assistant:**

- Dr. Volker Weinberg (LRZ)

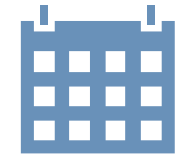
All instructors and assistants are NVIDIA certified University Ambassadors.



Tentative Agenda



- 10:00 - 10:15 Welcome and Introduction
- 10:15 - 12:00 Lecture 1: Introduction & Main Objectives
- **12:00 - 13:00 Lunch break**
- 13:00 - 14:45 Lecture 2: Copy/Compute Overlap
- **14:45 - 15:00 Coffee break**
- 15:00 - 16:00 Lecture 3: Multiple GPUs



Workshop Webpage

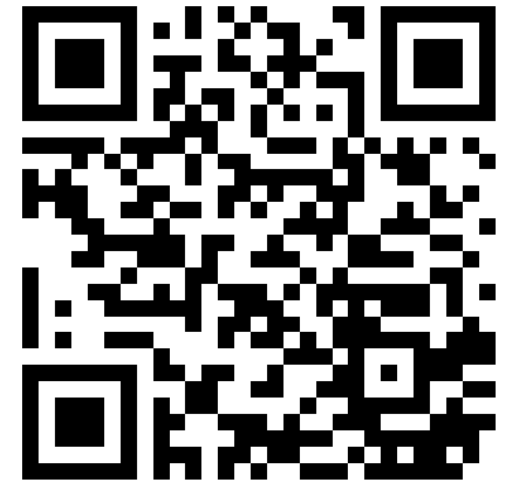


- All slides will be made available during the workshop under:

- <https://tinyurl.com/materials-hdli2w21>

- Further information on:

- Agenda
- Training Setup
- Slides
- Documentation

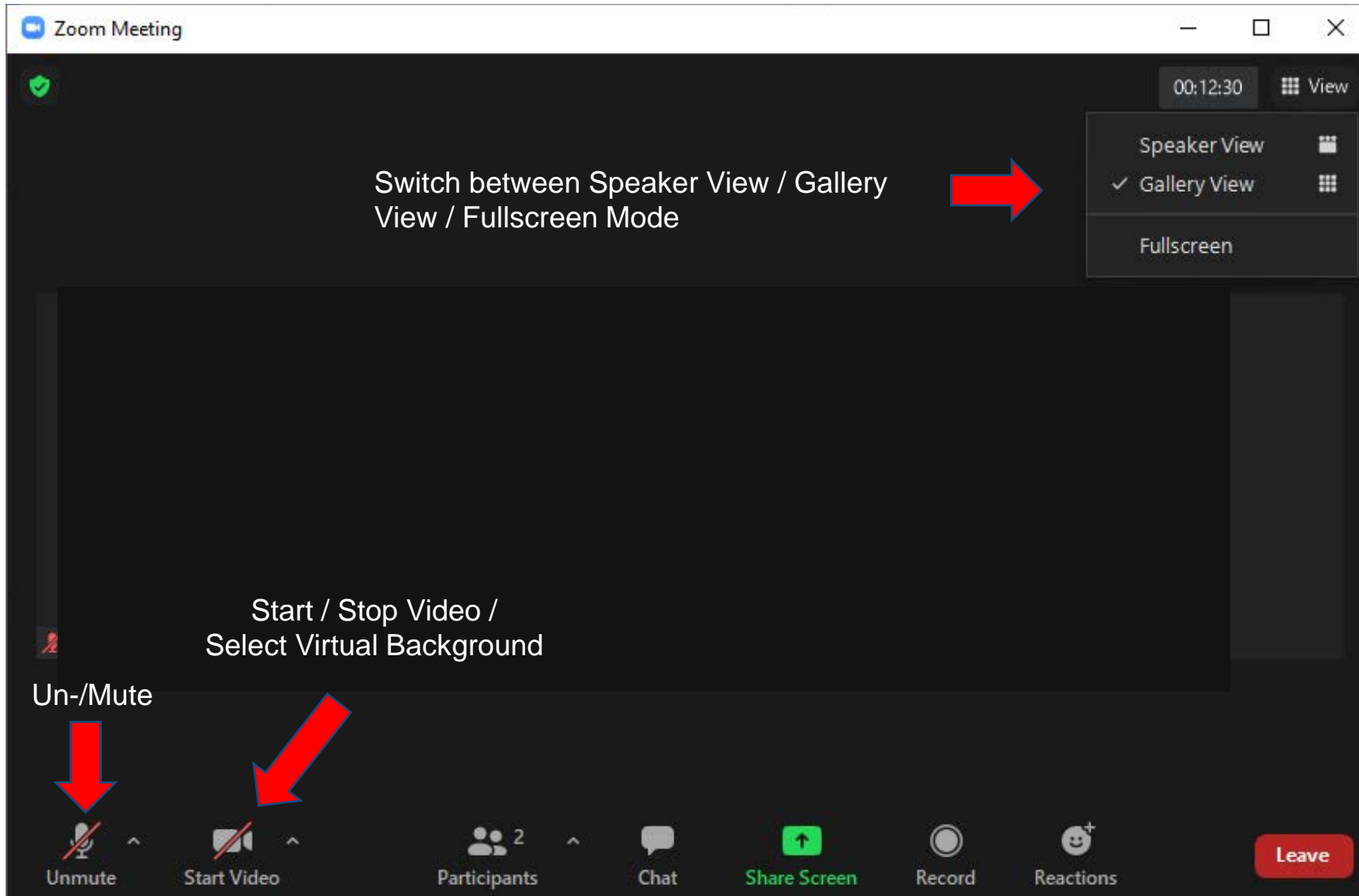


Training Setup

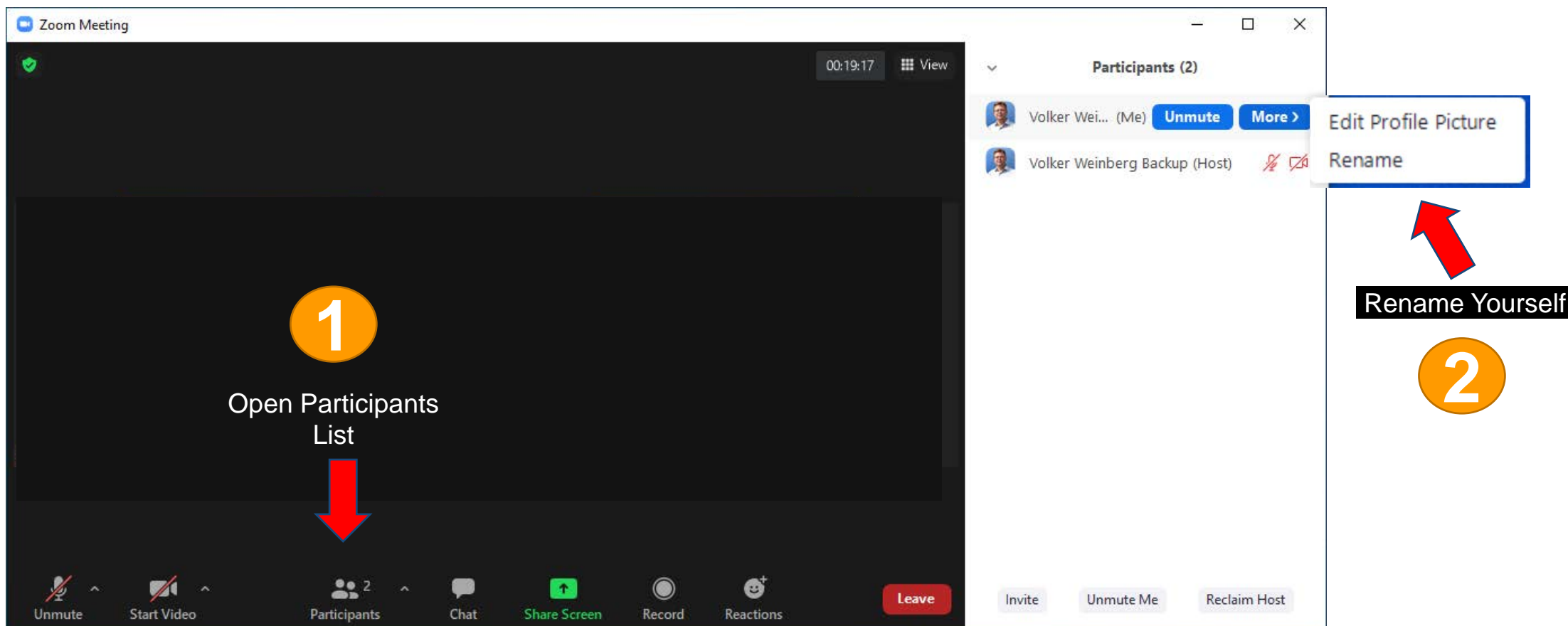


- To get started, follow these steps:
- Create an NVIDIA Developer account at <http://courses.nvidia.com/join> Select "Log in with my NVIDIA Account" and then "Create Account".
- If you use your own laptop, make sure that WebSockets works for you:
Test your Laptop at <http://websocketstest.com>
 - Under ENVIRONMENT, confirm that "WebSockets" is checked yes.
 - Under WEBSOCKETS (PORT 80]. confirm that "Data Receive", "Send", and "Echo Test" are checked yes.
 - If there are issues with WebSockets, try updating your browser.
We recommend Chrome, Firefox, or Safari for an optimal performance.
- Visit <http://courses.nvidia.com/dli-event> and enter the event code provided by the instructor.
- You're ready to get started.

- To ensure a pleasant experience with Zoom Meeting, we encourage participants to **download and install the latest Zoom application** via <https://zoom.us/download>.
- If you have problems with your computer audio, you can also **join by phone**.
Find your local number: <https://lrz-de.zoom.us/j/aeaPLRITtm>



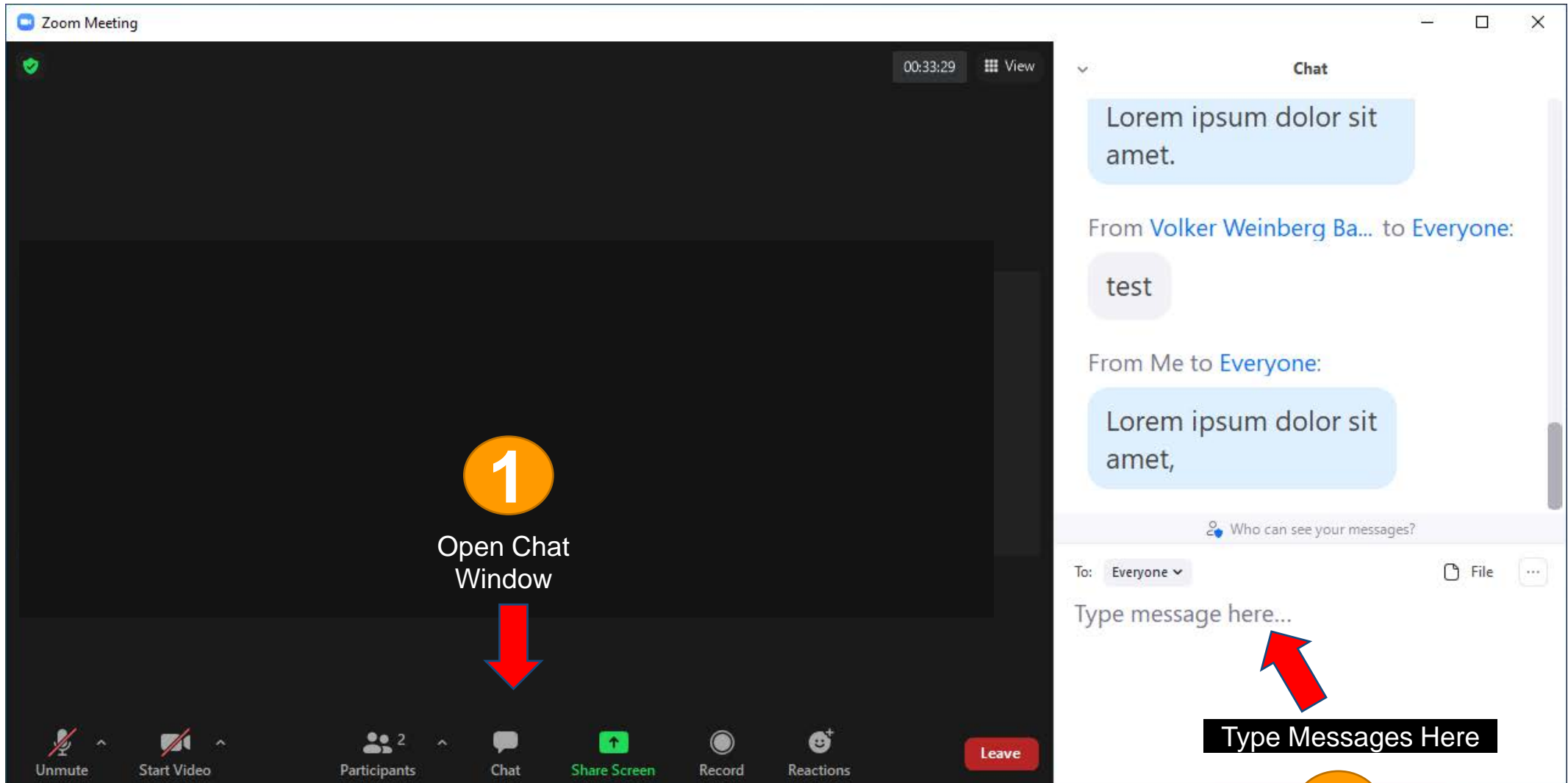
Kindly use “first-name family-name (institute)” as your screenname.



The screenshot shows a Zoom Meeting window with a dark background. In the top right corner, there is a 'Participants (2)' panel. The first participant is 'Volker Wei... (Me)' with an 'Unmute' button and a 'More >' button. The second participant is 'Volker Weinberg Backup (Host)'. A context menu is open over the 'More >' button for the first participant, showing 'Edit Profile Picture' and 'Rename' options. A red arrow points from the 'Rename Yourself' text to the 'Rename' option. In the bottom left of the meeting window, there is a 'Participants' icon with a '2' next to it. A large orange circle with the number '1' is positioned above the 'Participants' icon, with the text 'Open Participants List' below it. A red arrow points from this text down to the 'Participants' icon. In the bottom right of the meeting window, there is a 'Leave' button. In the bottom right of the 'Participants' panel, there are 'Invite', 'Unmute Me', and 'Reclaim Host' buttons. A large orange circle with the number '2' is positioned below the 'Rename Yourself' text.

1
Open Participants List

2
Rename Yourself



Zoom Meeting

00:33:29 View

Chat

Lorem ipsum dolor sit amet.

From Volker Weinberg Ba... to Everyone:

test

From Me to Everyone:

Lorem ipsum dolor sit amet,

Who can see your messages?

To: Everyone

Type message here...

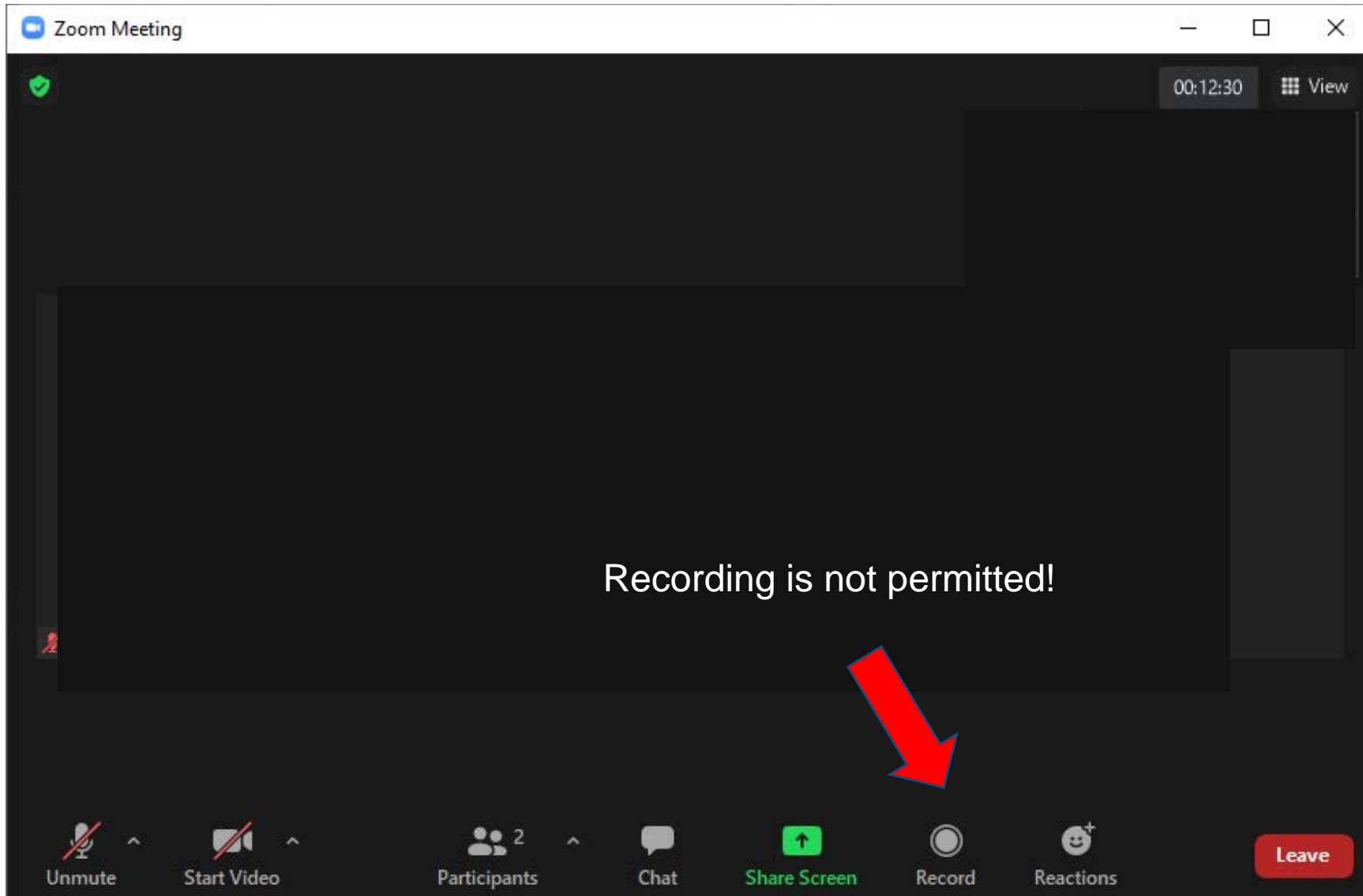
Unmute Start Video Participants 2 Chat Share Screen Record Reactions Leave

1

Open Chat Window

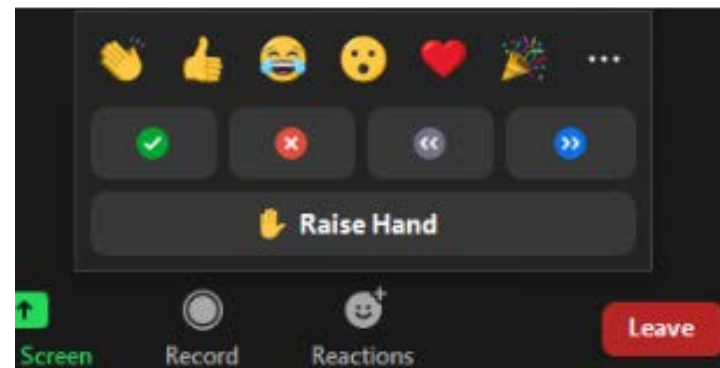
2

Type Messages Here



- Use **chat window** to ask questions **during the presentations**.
- In **Q&A sessions**:
 - You can also **raise your hand** if you have questions.
 - If you do not mind, please **show your video when asking questions** to make this workshop as interactive as possible.
- **Push to Talk**: The Push to Talk feature allows you to remain muted throughout the Zoom meeting and only if you hold down the spacebar you will be unmuted.

- **Instant Feedback:**



And now ...



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Enjoy the course!