2025/02/26 [for version 5.0]

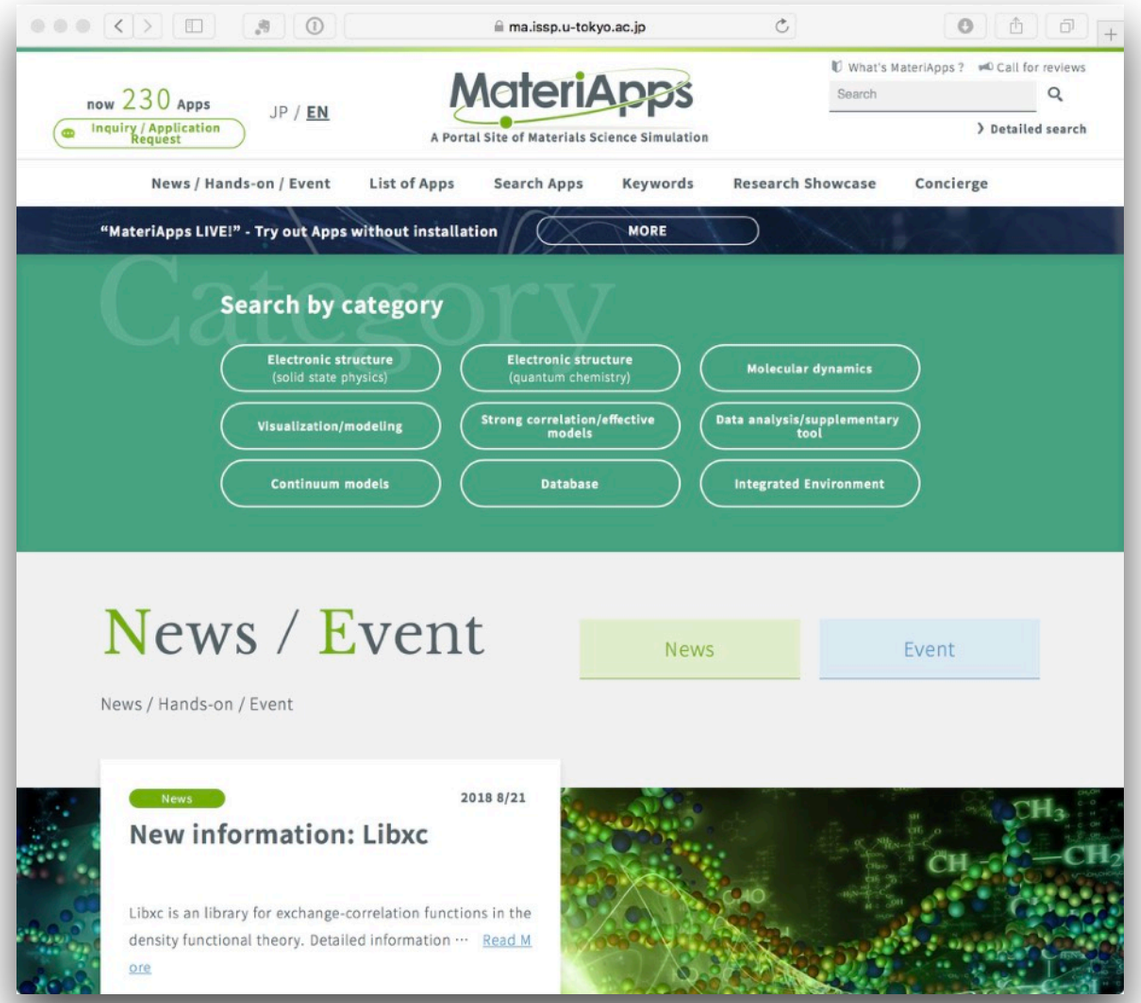
How to setup MateriApps LIVE!

MateriApps LIVE! Development Team

MateriApps

MateriApps — a Portal Site for Materials Science Simulation

- **Aiming at the community formation through the promotion of application**



since May 2013

- Introducing 320+ materials science applications and tools
- Finding applications
  - search tags: features, targets, calculation methods/algorithms
- Information of applications
  - brief introduction, link to official pages, information installation, usage, etc
- Information of hands-on sessions, software update, etc
- Glossary of keywords, Concierge, Reviews
- 17,000+ page views / month, 6,500+ unique visitors / month (FY2023)

Applications on MateriApps

- Introducing 320+ materials science applications and tools

DFT
AkaiKKR☆
OpenMX☆
xTAPP☆
ABINIT☆
...

Quantum Chemistry
FMO☆
SMASH☆
GAMESS☆
DC☆...

Molecular Dynamics
MODYLAS☆
Gromacs☆
ERmod☆
MDACP...

Lattice Models
ALPS☆
DSQSS
BLOCK
DMRG++

Continuum Simulation
ANSYS Multiphysics
Octa ...

Data Analysis
CLUPAN☆
phonopy☆

Visualization
fu☆
TAPIOCA☆

Database, Integrated Environment
Machine Learning, Quantum Computing

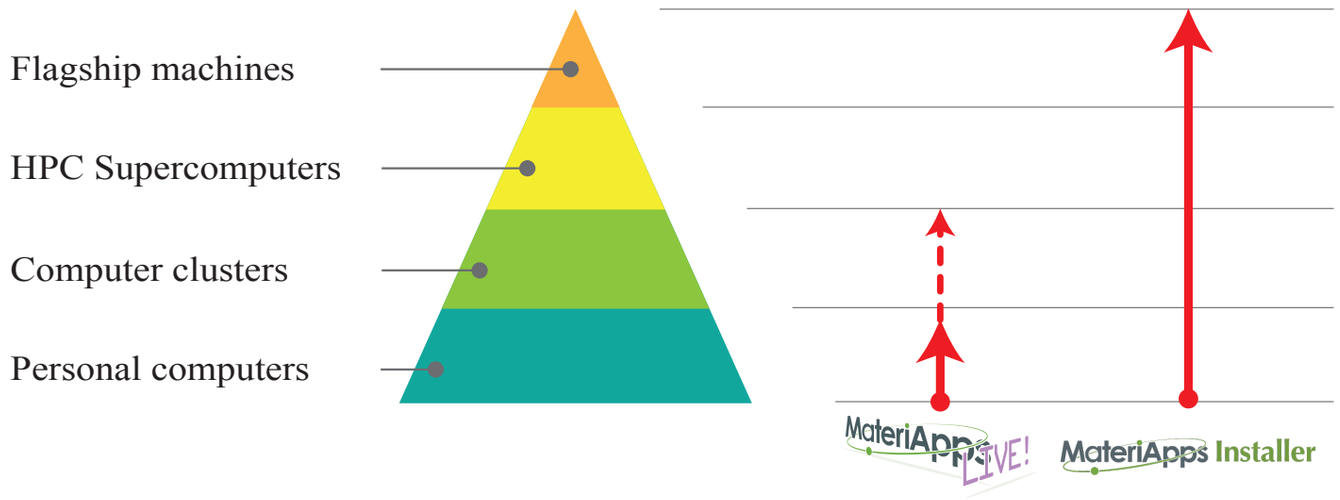
☆ included in MateriApps LIVE!

Current status in computational materials science

- From developers' viewpoint
  - New algorithms should be implemented and used. Or, it will be forgotten ever existed.
  - It cost much to write and update documents
  - Development of software itself is hardly considered as scientific achievements
- From users' viewpoint
  - What kind of applications? Who develop them? Which application should I use for my problem?
  - Manual and documentation are not well prepared.
  - How to evaluate the accuracy of results?
- Goal of MateriApps project
  - Forming of community in the field of computational materials science through the promotion of open source software

What MateriApps will provide

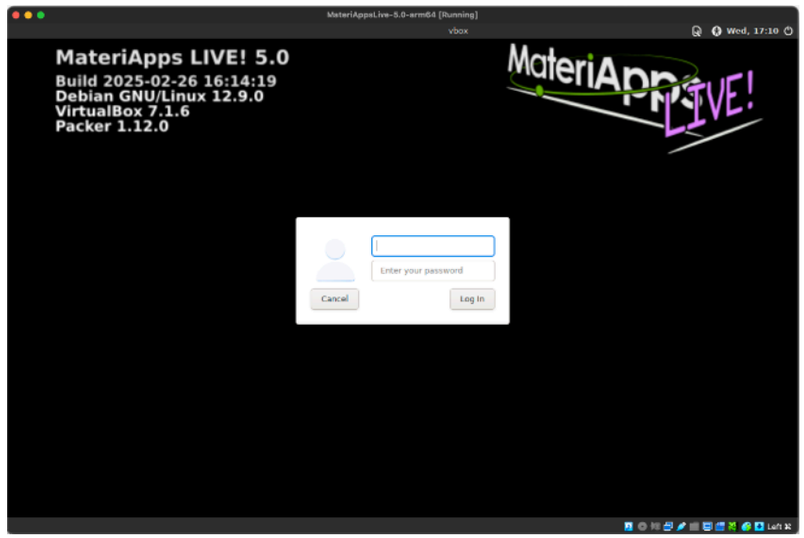
- To find and learn application software
  - catalog of application/tool on MateriApps web
- To start using application software
  - MateriApps LIVE!
- To active use application software
  - pre-installation to Fugaku, supercomputers, etc: MateriApps Installer



- Infrastructure for easily starting materials science simulations for theoreticians, experimentalists, researchers in companies, students, and more…

What's MateriApps LIVE!

- Debian Linux running on a virtual machine (VirtualBox/Docker)
  - works on Windows and Mac (Intel/Apple Silicon)
  - just boot and get ready for materials science simulations without installation
- Version 5.0 was released in February 2025
- Pre-installed applications and tools
  - abinit, AkaiKKR, ALAMODE, ALPS, CONQUEST, Feram, DCore, DSQSS, HΦ, LAMMPS, mVMC, OCTA, OpenMX, Quantum ESPRESSO, PHYSBO, SMASH, TeNeS, xTAPP, etc
  - OVITO, ParaView, Tapioca, VESTA, XCrysDen…
  - GUI installer for CASINO, GAMESS, and VMD
- Available from MateriApps LIVE! webpage
  - c.a. 15,000+ copies distributed since July, 2013



MateriApps LIVE! is useful for ...

- Hands-on sessions using MateriApps LIVE!
  - MateriApps LIVE! Tutorials
  - HΦ, xTAPP, ALPS, DCore, mVMC, ALAMODE, DDMRG, DSQSS, SALMON, CASINO, TeNeS, etc.
- Practices in lectures
  - Computational Physics
  - Computer Experiments (UNIX + C, LaTeX, VCS)
- Used by experimentalists, researchers in private companies
- Used by researchers in the field of computer science

- Easy setup (c.a. 15min) without no troubles
- Useful for operation check, trouble shooting, user support

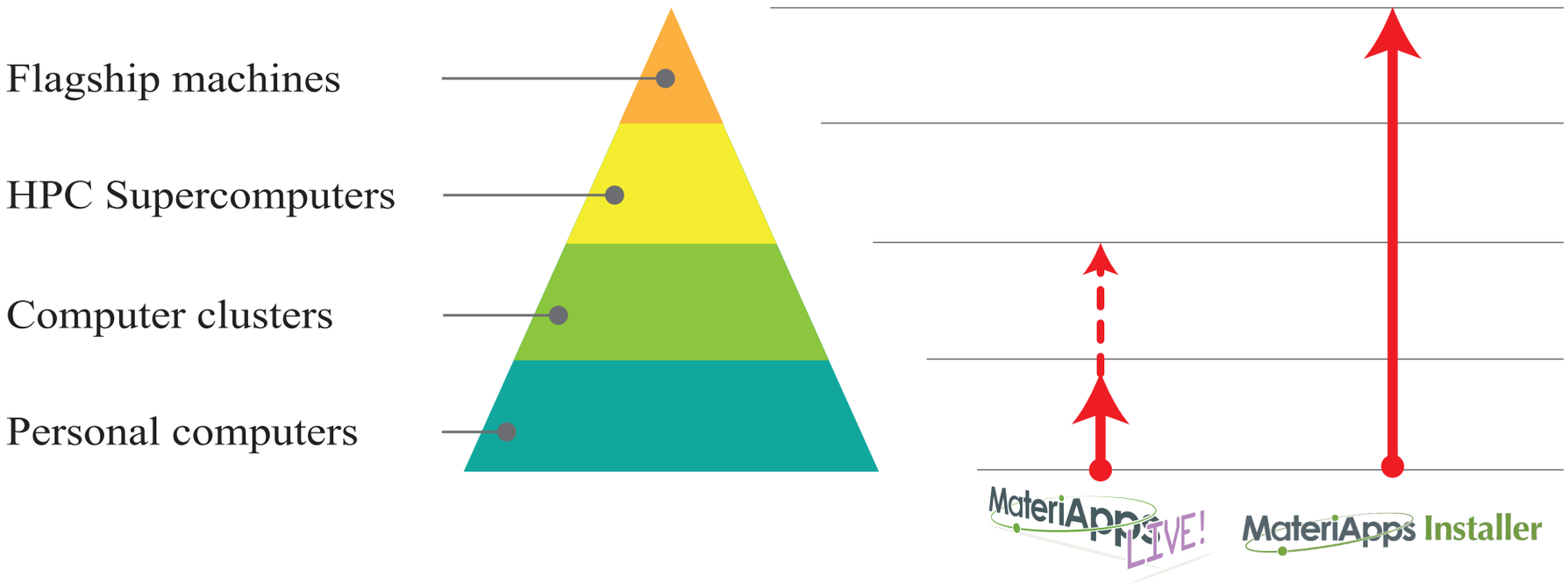
Materials Science Simulation by MateriApps LIVE!

- Introduction / Setup
- First-principles band calculation (OpenMX / Quantum ESPRESSO / xTAPP)
- Simulation of solution by molecular dynamics (LAMMPS / Gromacs)
- Lattice model simulation (ALPS / HΦ / mVMC)
- Quantum chemistry calculation (in preparation)

- Hands-on materials are available at https://github.com/cmsi/MateriAppsLive/wiki/MaLiveTutorial (currently only in Japanese)

Wanna larger-scale simulations?

- For Debian/Ubuntu Linux workstations
  - Debian package for MateriApps LIVE! can be used
  - https://github.com/cmsi/MateriAppsLive/wiki/UsingMateriAppsInDebian
  - (Can also be installed on Google Colab)
- For PC clusters, clouds, supercomputers at ISSP and IT centers, Fugaku, etc
  - MateriApps Installer https://ma.issp.u-tokyo.ac.jp/app/268



VirtualBox edition vs. Docker edition

- VirtualBox edition
  - Pros
    - Many visualization tools (Ovito, Paraview, Vesta, etc.) run on the virtual machine
    - Note: Vesta only works on Windows and macOS Intel
  - Cons
    - Uses much memory
- Docker edition
  - Pros
    - The startup is faster after the second time
    - Uses less memory
  - Cons
    - Some visualization tools do not work

MateriApps LIVE! (VirtualBox edition)

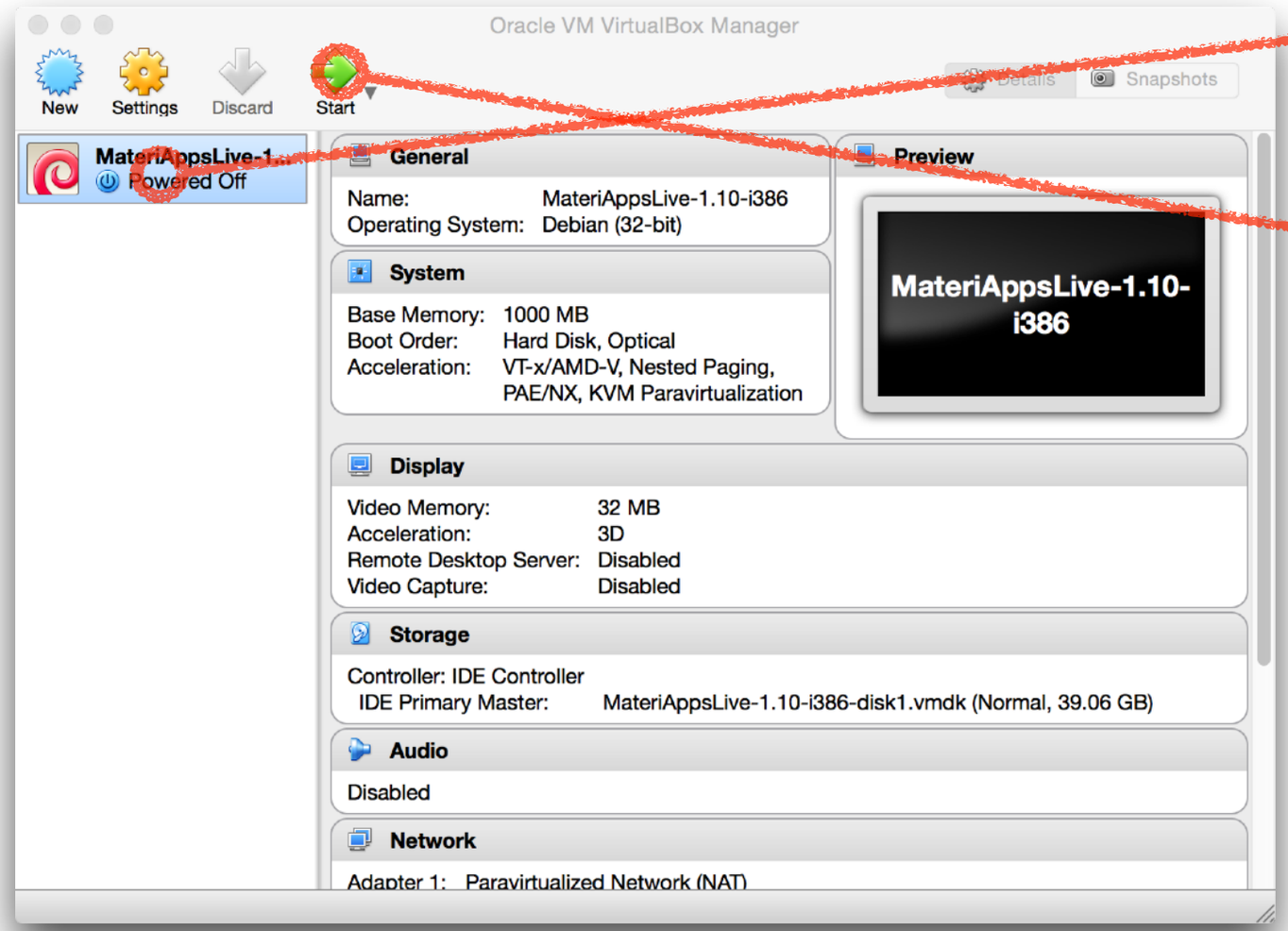
- Files
  - setup-en.pdf (English), setup.pdf (Japanese)
    - this document
    - https://speakerdeck.com/wistaria/how-to-setup-materiapps-live
  - README-en.html, README.html
    - https://github.com/cmsi/MateriAppsLive/wiki/MateriAppsLive-ova-en
  - VirtualBox 7.1 Installer: VirtualBox-*-Win.exe (Windows), VirtualBox-*-OSX.dmg (macOS Intel), VirtualBox-*-OSXArm64.dmg (macOS Apple Silicon)
    - available at https://www.virtualbox.org/wiki/Downloads
  - MateriApps LIVE! VitualBox Diskimage: MateriAppsLive-*-amd64.ova (Windows / macOS Intel), MateriAppsLive-*-arm64.ova (macOS Apple Silicon)
    - available at https://github.com/cmsi/MateriAppsLive/wiki/download

Let's get started (VirtualBox edition)

- ✓ Download distribution files
- ✓ Install VirtualBox by double-clicking the installer
  - For Windows: VirutalBox-*-Win.exe
  - For macOS: VirtualBox-*-OSX.dmg (Intel), VirtualBox-*-OSXArm64.dmg (Apple Silicon)
- ✓ Import MateriApps LIVE!
  - double-click MateriAppsLive-*.ova
  - VirtualBox will start automatically and import window will open. Then press “import” button
  - VirtualBox Manager window will appear in two or three minutes

- Host (host OS): operating system (Windows, Mac OS X, etc) on which VirtualBox is running
- Virtual machine (guest OS): operating system (= MateriApps LIVE!) running on VirtualBox

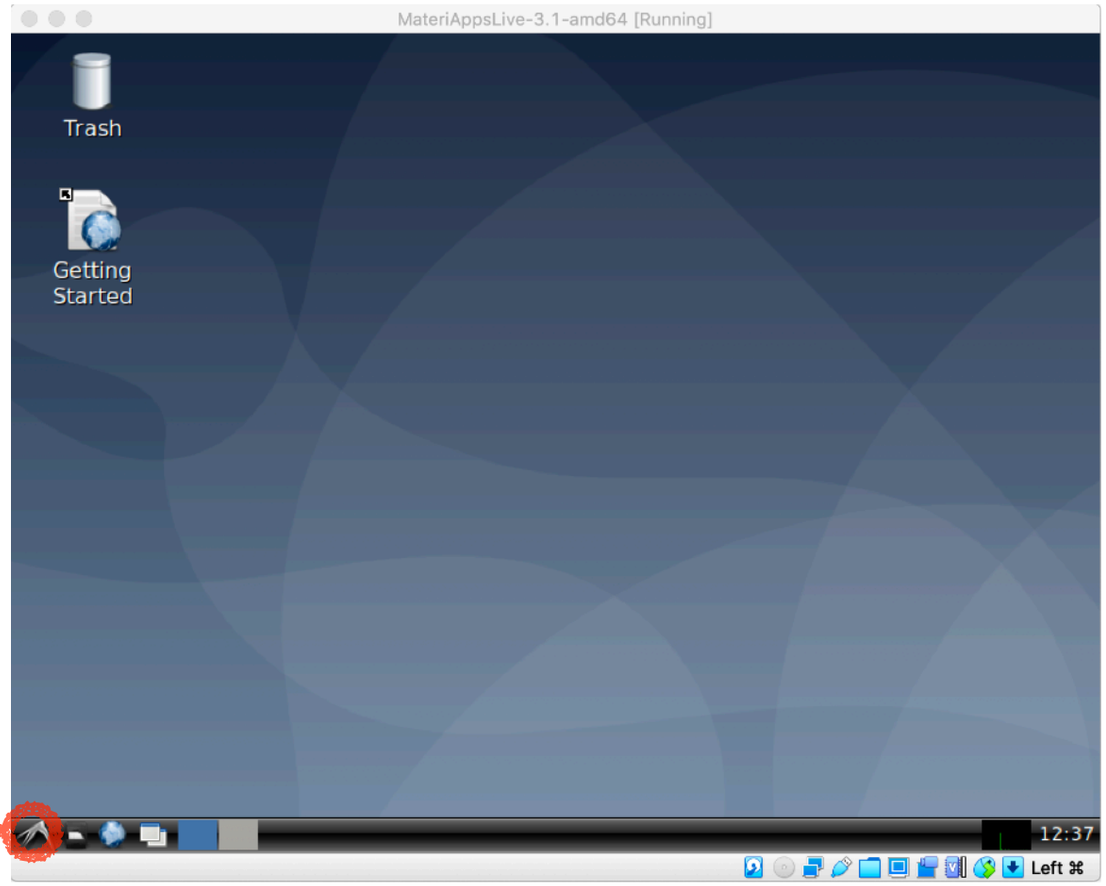
Booting virtual machine (VirtualBox edition)



1. Choose “MateriAppsLive…”
2. Press “Start” button.
3. Wait until login window will appear.

Login to MateriApps LIVE! (VirtualBox edition)

- Login by using
  - User name (login): *user*
  - Password: *live*
- Desktop (right) will appear



- start menu
- How to open a terminal window

  start menu ⇒ “System Tools” ⇒ “LXTerminal”

- How to shutdown the virtual machine

  start menu ⇒ “Logout” ⇒ “Shutdown”

Keyboard, resolution setting (VirtualBox edition)

- ✓ Using Japanese keyboard
  - start menu ⇒ “System Tools” ⇒ “Switch to Japanese Keyboard Layout”
  - check if “@” key works correctly
- ✓ Changing resolution and scale of the virtual machine window
  - Resolution (number of pixels): “800 x 600” by default
  - Scale (pixel density): “200%” by default
  - The resolution and scale can be changed from the “View” menu ⇒ “Virtual screen 1” of the host OS
  - When using visualization software such as VESTA, OVITO, ParaView, set the resolution to “1024 x 768” or higher
  - If characters are small and difficult to see, increase the scale

File sharing, copy & paste (VirtualBox edition)

- ✓ File sharing between host OS and virtual machine
  - shutdown the virtual machine, if it is running
  - choose MateriAppsLive-* in VirtualBox Manager window, then “Settings”
  - open “Shared Folders” tab and click “+” on the right
  - click “v” on the right of “Folder Path”, choose “Other…”, and select the folder to be shared
  - check “Auto-mount” box and press “OK”. Then press “OK” again
  - the folder specified above can be accessed as /media/sf_... after restarting the virtual machine
- ✓ Copy & Paste: How to paste strings copied from a PDF file on host OS?
  - right click on terminal window ⇒ “Paste”
  - or press “V” with “shift” and “control” keys
  - right click ⇒ “Copy”, or “shift + control + C” to copy a string

MateriApps LIVE! (Docker edition)

- Files
  - setup-en.pdf (English), setup.pdf (Japanese)
    - this document
    - https://speakerdeck.com/wistaria/how-to-setup-materiapps-live
  - README-en.html, README.html
    - https://github.com/cmsi/MateriAppsLive/wiki/MateriAppsLive-docker-en
- Docker Desktop installer (for macOS)
  - available at https://www.docker.com/
- XQuartz installer (for macOS)
  - available at https://www.xquartz.org/
- MateriApps LIVE! Docker script
  - https://malive.s3.amazonaws.com/malive.sh

Let's get started (macOS Docker edition)

- ✓ Download and install Docker Desktop
- ✓ Download, install, and setup XQuartz
- ✓ Set up the shared folder
- ✓ Download and execute MateriApps LIVE! Docker script
  - curl -L -O https://sf.net/projects/materiappslive/files/docker/malive.sh
  - sh malive.sh

- Ref. https://github.com/cmsi/MateriAppsLive/wiki/GettingStartedDocker-en

Let's get started (Windows Docker edition)

- ✓ Install WSL2 (Windows Subsystem for Linux 2)
- ✓ Set up the Docker repository and execute apt-get
- ✓ Set up the shared folder
- ✓ Download and execute MateriApps LIVE! Docker script
  - curl -L -O https://sf.net/projects/materiappslive/files/docker/malive.sh
  - sh malive.sh

- Ref. https://github.com/cmsi/MateriAppsLive/wiki/GettingStartedDocker-en

MateriApps planning & production

- Administration:
  - Center for Computational Materials Science, Institute for Solid State Physics, University of Tokyo (ISSP-CCMS)
- MateriApps Development Team
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  - (contract) Academeia (Yusuke Konishi, Masashi Noda, Gotai Yamada)
- Cooperation:
  - Research Organization for Information Science and Technology (RIST)
  - Professional development Consortium for Computational Materials Scientists (PCoMS)
  - Data creation and utilization-type MaTerial R&D project (DxMT)