McIDAS-X 2020.1 on Windows 10 Instructions

Updated March 2021

McIDAS-X 2020.1 includes preliminary support of McIDAS-X on Windows 10 with Windows Subsystem for Linux (WSL) installed.

This document contains instructions for installing the preliminary release of McIDAS-X on Windows 10 systems. This document is available online at:
https://www.ssec.wisc.edu/mcidas/preliminary-release-of-mcidas-x-on-windows-10-systems/

If you elect to install this package, please report any bugs or problems you encounter to the McIDAS Help Desk.

In subsequent versions, full support is anticipated and these instructions will be added to the *McIDAS-X User's Guide*, which is available online at:
https://www.ssec.wisc.edu/mcidas/doc/users_guide/

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Copyright Statement

Section I - System Requirements

McIDAS-X version 2020.1 includes preliminary support on Windows 10 workstations. Subsequent versions will contain full support.

There are two configuration options for installing McIDAS-X on Windows 10 workstations: single-user and muti-user. The differences between those options are detailed in Section II below.

Before choosing and completing those instructions, you must ensure that the workstation is configured to meet the system requirements for running McIDAS-X. The table below lists the operating system and compiler software required to install and run McIDAS-X 2020.1 on Windows 10 computers.

Vendor	Operating System	Fortran Compiler	C Compiler	X Server / X Window System
Microsoft®	Windows®10 with Windows Subsystem for Linux (WSL)	*gfortran* 7.4.0	*gcc* 7.4.0	see here

The bullets below contain additional workstation configuration information mainly for administrators, such as details about port 112 use, system stack size and memory usage.

- ADDE data requests from clients to remote servers require the use of port 112. Upon receiving a data request from a client, the server gathers the requested data, packages it, then sends it back to the client through the same open connection. Therefore, you must ensure that port 112 on your workstation is configured to allow outbound requests.

- Some systems have a hard stack size limit that is too small for decoding large grids. This results in McIDAS-X commands like GRDDISP giving an *Error: Unix system stack size on server machine insufficient for grib decoding* message when trying to display those grids. If the message occurs while accessing a remote dataset, we recommend that you contact the server administrator and request that they increase the hard limit to 20480 or larger on the server machine using the instructions in the *Linux Workstations* section of Preparing the Workstation. If it occurs while accessing a local dataset, run the command **!ulimit -H -s** in the McIDAS-X session to view the current setting for the hard limit, then contact the McIDAS Help Desk to report the current value and request the instructions for increasing the hard limit to 20480 or larger on your local workstation.

- Each McIDAS-X session can have up to 9,999 frames. However, not all workstations can reasonably accommodate one or more users running sessions with thousands of frames. This is because system performance is reliant on several factors, including how much memory the workstation has, how many frames are created, how large the frames are, and how many graphics are drawn on the frames. For additional details and an example with calculations, see the *Memory Usage* section in the [Preparing the Workstation page](#) in the 2020.1 *McIDAS-X User's Guide*.

Section II - Configuration Options

There are two configuration options for installing McIDAS-X on Windows 10 systems:

- Single-User Configuration
- Multi-User Configuration

In the single-user configuration, each user builds and installs their own version of McIDAS-X. There is no Windows System Administrator needed to install McIDAS-X.

The single-user configuration is simpler to complete, but does not allow multiple users to access a shared installation of McIDAS-X binaries and data files. A workstation can have multiple user accounts that are set up using the single-user configuration. However, each user needs to maintain their own version of the McIDAS-X software, including installation of future releases.

The single-user configuration is best for users who maintain their own software, without a Windows System Administrator, and do not need to share data files with other users.

In the multi-user configuration, a Windows System Administrator must install and maintain the release versions of McIDAS-X. The main advantage is that it has one shared account where the McIDAS-X software is installed and everyone shares those binaries and associated data files. Each user still retains their own McIDAS-X environment; they just share the standard core software that is required for all users.

The multi-user configuration is generally better for workstations with multiple users who will be running McIDAS-X, or who prefer to have a Windows System Administrator maintain their software installations.

To install McIDAS-X on your Windows 10 workstation using **the single-user configuration**, proceed to [Section III](#).

To install McIDAS-X on your Windows 10 workstation using **the multi-user configuration**, proceed to [Section IV](#).

Section III - Single-User Configuration Instructions

This section contains the instructions for a single-user configuration. For a multi-user configuration go to [Section IV](#).

To install and run the single-user configuration on McIDAS-X on your Windows 10 workstation, complete the procedures below.

- Preparing the Workstation
- Preparing the **mcidas** Account
- Preparing the Main User Account

Procedure 1 - Preparing the Workstation

Complete the instructions below to enable and install WSL 2.

1. Log in to your user account in Windows 10.

2. Enable and install WSL 2 by completing steps 1-4 in the **Manual Installation Steps** at https://docs.microsoft.com/en-us/windows/wsl/install-win10. The four steps are: enable the Windows Subsystem for Linux; check requirements for running WSL 2; enable virtual machine feature; download (and run) the Linux kernel update package. A restart may be required after the Linux kernel update.

   After the Linux kernel update, proceed to Procedure 2 below. In Task 1 you will complete steps 5 and 6 in the Manual Installation Steps of the Microsoft document.

Procedure 2 - Preparing the mcidas Account

Each account in Windows 10 runs a separate instance of Ubuntu. The single-user configuration requires two accounts in Ubuntu: the main user account (e.g., **mcuser**) and the **mcidas** account.

The main user account is created in Task 1 below. It is the account that is automatically logged in when an Ubuntu shell is started from Windows 10, and is the account used to run McIDAS-X.

The **mcidas** account is created by the main user in Task 2 below, and it is the account that is used to build and install the McIDAS-X software.

Task 1:
Complete the steps below to acquire and install Ubuntu® and create the main user account.

Then you will update the Linux package repositories and install the packages required to build McIDAS-X.

1. Log in to your user account in Windows 10.

2. Set the default WSL version for your account to WSL 2 and then install Ubuntu by completing steps 5-6 in the **Manual Installation Steps** at https://docs.microsoft.com/en-us/windows/wsl/install-win10. The bullets below provide additional guidance.

    ●   When asked to "Install your Linux distribution of choice," acquire Ubuntu from the *Microsoft Store*. If there are multiple matches to choose from, select the one without a version number in order to get the current version. Then complete the instructions to install Ubuntu.

    ●   After the Ubuntu install is complete, you will be prompted to create a user account. The account, which will have **sudo** privileges, is the main user account and should NOT be named **root** or **mcidas** or **mcadde**. Instead, choose a name suitable for a McIDAS-X user; we suggest either your Windows login or **mcuser**.

3. In an Ubuntu shell while logged in as the user you created in the previous step (e.g., **mcuser**), run the three **sudo** commands below (the last is all one line) to update the Linux package repositories and to install the packages required to build McIDAS-X.

    sudo apt update
    sudo apt upgrade
    sudo apt install bison build-essential cmake csh flex gfortran libncurses5
        libncurses5-dev libx11-dev libxext-dev libxpm-dev libxt-dev

Task 2:
Complete the steps below to create the **mcidas** account in Ubuntu then login to the **mcidas** account and obtain, build and install McIDAS-X 2020.1.

1. Open an Ubuntu shell and run command **whoami** to verify that you are logged in as the main user account (created in step 2 of Task 1 above).

2. Run the four **sudo** commands below to create the **mcidas** account and its home directory.

    sudo useradd -s /bin/bash -U mcidas
    sudo passwd -d mcidas   (*password expiry information changed* is a normal response)
    sudo mkdir -p /home/mcidas
    sudo chown mcidas:mcidas /home/mcidas

3. Use **sudo** to login as **mcidas**.

   Type: **sudo -u mcidas -i**

   Note: Use the **sudo -u mcidas -i** command whenever you need to login to the **mcidas** account to make changes to the McIDAS-X software (e.g., complete the initial install below or later upgrade to a newly released version).

4. Proceed to these pages in the *McIDAS-X User's Guide* to obtain, build and install McIDAS-X 2020.1:

   - [Obtaining McIDAS-X 2020.1](#)
   - [Building and Installing McIDAS-X 2020.1](#)

   You do not need to complete the [Installing the McIDAS-X 2020.1 ADDE Remote Server page](#) because a limitation in WSL prevents network services like *xinetd* from running. Therefore, the McIDAS-X ADDE remote server is not supported on Windows 10 with WSL systems. [Removing the Previous Version of McIDAS-X](#) also does not apply because there should be no previous installation of McIDAS-X on Windows 10 workstations.

Procedure 3 - Preparing the Main User Account

The McIDAS-X software is installed in the **mcidas** account. However, you can not run McIDAS-X as user **mcidas**. Instead, you must run it in the main user account you created in [step 2 of Task 1 above](#). Complete the instructions below to configure it for running McIDAS-X.

1. Open an Ubuntu shell and run command **whoami** to verify that you are logged in to the main user account.

2. Modify the environment variable **PATH** in your **$HOME/.profile** file. Insert **$HOME/mcidas/bin** and **/home/mcidas/bin**, in that order, at the beginning of your **PATH**. Also set the environment variable **DISPLAY** to the value recommended for WSL 2. Both of these can be done by adding the set of lines below.

```
# recommended PATH setting for McIDAS-X:
export PATH=$HOME/mcidas/bin:/home/mcidas/bin:$PATH

# recommended DISPLAY setting for McIDAS-X due to WSL 2:
export DISPLAY=$(grep -m 1 nameserver /etc/resolv.conf | awk '{print $2}'):0.0
```

   Note: The changes above will take effect the next time you open an Ubuntu shell logged into the main user account.

This completes the McIDAS-X installation. The bullets below contain additional information for users, such as tips about starting and configuring McIDAS-X, information about X servers, and accessing and editing files in the Ubuntu (WSL) and Windows environments.

- See the Starting McIDAS-X page in the *McIDAS-X User's Guide* for information about ways to start a McIDAS-X session. For McIDAS-X on Windows 10 an X server is required, so a typical procedure to start McIDAS-X is for the user (in their own account) to start the X server, then open an Ubuntu shell and run the command **mcidas**. The Configuring McIDAS-X Sessions with .mcidasrc page has information the user can use for tailoring McIDAS-X sessions to their preferences.

- We do not require use of a specific X server. Microsoft recommends *VcXsrv*. We have successfully used it with McIDAS-X on Windows 10. Other X servers, including *Xming* and *X-Win32*, have also been used with McIDAS-X. Here are recommended actions for two issues that could be encountered:
  - If you receive a *No protocol specified* or *Can't open display* error when starting McIDAS-X, check the configuration options for the X server and select the option to Disable Access Control (which means that connections from all clients are accepted). This is required because the virtual network in WSL 2 causes the McIDAS-X X11 connection to appear to be coming from another network.
  - When running McIDAS-X, if you encounter cursor movement or rendering problems when using cursor-based commands like CUR, PC or CM, you may find that setting or unsetting the **-noXCursor** flag in your $HOME/.mcidasrc file improves performance.

- Although you are able to access files created and used by McIDAS-X in both the Ubuntu (WSL) environment and Windows environment, it is important that you do all editing of McIDAS-X files in the Ubuntu environment. For example, if you need to manually edit one of the files, you should not use a Windows program like *Notepad* to edit it. Instead, you should use an Unix editor like *vi*, *ex* or *view* in an Ubuntu shell to make the changes.

- To list, copy and move McIDAS-X files, start an Ubuntu shell and use standard Unix commands like **ls**, **cp** and **mv**. Aliases like **~** and **$HOME** are available. For example, the command **ls -l ~mcidas/data/*.ET** lists the enhancement files included in the core McIDAS-X package, and you can list all of the AREA files in your account's mcidas/data directory with any of these commands:
  ls -l $HOME/mcidas/data/AREA*, **ls -l ~/mcidas/data/AREA***,
  ls -l ~*user*/mcidas/data/AREA* (where *user* is your Ubuntu account name).

- If you have files on the workstation that you would like to copy to the McIDAS-X environment or vice-versa, we recommend you do it from an Ubuntu shell. For example, if you previously ran McIDAS-X for Windows 7 on the workstation and have ***.ET** enhancement files in the **C:\Users*user*\mcidas\data** directory (where *user* is your Windows account name), you can copy them to your McIDAS-X environment by running a command sequence similar to that below.
  cd $HOME/mcidas/data
  cp /mnt/c/Users/*user*/mcidas/data/*.ET .

Section IV - Multi-User Configuration Instructions

This section contains the instructions for a multi-user configuration. For a single-user configuration go to [Section III](#).

To install and run the multi-user configuration on McIDAS-X on your Windows 10 workstation, complete the procedures below.

- Preparing the Workstation
- Preparing the **mcidas** Account
- Preparing a User Account

Procedure 1 - Preparing the Workstation

Complete the instructions below to enable and install WSL 2.

1. Log in to your user account in Windows 10.

2. Enable and install WSL 2 by completing steps 1-4 in the **Manual Installation Steps** at https://docs.microsoft.com/en-us/windows/wsl/install-win10. The four steps are: enable the Windows Subsystem for Linux; check requirements for running WSL 2; enable virtual machine feature; download (and run) the Linux kernel update package. A restart may be required after the Linux kernel update.

   Do **not** complete steps 5 and 6 now; they will be done in Procedures 2 and 3 below.

Procedure 2 - Preparing the mcidas Account

Each account in Windows 10 runs a separate instance of Ubuntu. Using a shared **mcidas** account requires the System Administrator to create a **mcidas** account in Windows 10 and to set security permissions on a folder in its home directory to allow all Windows 10 McIDAS-X users to read and write to it.

Complete the three tasks below to prepare the **mcidas** account in Windows 10 and Ubuntu so that users can run McIDAS-X in the multi-user configuration.

Task 1:
Have the Windows System Administrator create a **mcidas** account in Windows 10.

Task 2:
Have the Windows System Administrator complete the steps below to create a shared folder in the **mcidas** account in Windows 10 where other users can read and write.

1. Create a folder in \Users\mcidas named **Ubuntu**.

2. Right-click the **Ubuntu** folder, select **Properties**, then click the **Security** tab.

3. Click the **Edit…** button to change permissions, then click the **Add…** button to assign permissions for other Windows 10 users.

4. Add individual users, or all Windows 10 users with **[COMPUTER_NAME]\Users**.

5. In the **Permissions for Users** section, give each user (or all Windows 10 users) full control by checking all of the boxes below the **Allow** heading.

Task 3:
Complete the steps below to make and configure the **mcidas** account in Ubuntu, then obtain, build and install McIDAS-X 2020.1.

1. Log in to the **mcidas** account in Windows 10.

2. Set the default WSL version for the **mcidas** account to WSL 2 and then install Ubuntu by completing steps 5-6 in the **Manual Installation Steps** at https://docs.microsoft.com/en-us/windows/wsl/install-win10. The bullets below provide additional guidance.

   ● When asked to "Install your Linux distribution of choice," acquire Ubuntu from the *Microsoft Store*. If there are multiple matches to choose from, select the one without a version number in order to get the current version. Then complete the instructions to install Ubuntu.

   ● After the Ubuntu install is complete, you will be prompted to create a user account. The account, which will have **sudo** privileges, should be named **mcidas**.

   Complete the remaining steps (3-5) in an Ubuntu shell while logged in as the user you created above (i.e., **mcidas**).

3. Run the three **sudo** commands below (the last is all one line) to update the Linux package repositories and to install the packages required to build McIDAS-X.

> **sudo apt update**
> **sudo apt upgrade**
> **sudo apt install bison build-essential cmake csh flex gfortran libncurses5**
>   **libncurses5-dev libx11-dev libxext-dev libxpm-dev libxt-dev**

4. Proceed to these pages in the *McIDAS-X User's Guide* to obtain, build and install McIDAS-X 2020.1:

   ● Obtaining McIDAS-X 2020.1
   ● Building and Installing McIDAS-X 2020.1

   You do not need to complete the Installing the McIDAS-X 2020.1 ADDE Remote Server page because a limitation in WSL prevents network services like *xinetd* from running. Therefore, the McIDAS-X ADDE remote server is not supported on Windows 10 with WSL systems. Removing the Previous Version of McIDAS-X also does not apply because there should be no previous installation of McIDAS-X on Windows 10 workstations.

5. Run the **sudo** command below (all one line) to use **rsync** to mirror the contents of **/home/mcidas** to the shared location so they are accessible by other users of this workstation.

> **sudo rsync -avP --delete --delete-excluded --exclude="mcidas????.?*"**
>   **/home/mcidas /mnt/c/Users/mcidas/Ubuntu/home**

   Note: In the future, when you upgrade to a newer version of McIDAS-X software (e.g., 2021.1), log in to the **mcidas** account in Windows 10 and open an Ubuntu shell, then complete steps 4 and 5 above to complete the upgrade and run the **rsync** command.

Procedure 3 - Preparing a User Account

The multi-user configuration uses a shared **mcidas** account where the McIDAS-X software is installed, and all of the McIDAS-X users on the workstation share those binaries and associated data files. The users will run McIDAS-X in their own main user account that they create in step 2 of Task 1 below and use the shared account to access the standard core software.

Have each user complete the two tasks below to configure their account to run McIDAS-X using the multi-user configuration.

Task 1:

Complete the steps below to acquire and install Ubuntu and create and configure the main user account. The main user account is the one that is automatically logged in when an Ubuntu shell is started from Windows 10, and is the account used to run McIDAS-X.

1. Log in to your user account in Windows 10.

2. Set the default WSL version for your account to WSL 2 and then install Ubuntu by completing steps 5-6 in the **Manual Installation Steps** at https://docs.microsoft.com/en-us/windows/wsl/install-win10. The bullets below provide additional guidance.

   ● When asked to "Install your Linux distribution of choice," acquire Ubuntu from the *Microsoft Store*. If there are multiple matches to choose from, select the one without a version number in order to get the current version. Then complete the instructions to install Ubuntu.

   ● After the Ubuntu install is complete, you will be prompted to create a user account. The account, which will have **sudo** privileges, is the main user account and should NOT be named **root** or **mcidas** or **mcadde**. Instead, choose a name suitable for a McIDAS-X user; we suggest either your Windows login or **mcuser**.

   Complete the remaining steps (3-5) in an Ubuntu shell while logged in to the main user account you created above (e.g., **mcuser**).

3. Run the three **sudo** commands below (the last is all one line) to update the Linux package repositories and to install the packages required to build McIDAS-X.

   sudo apt update
   sudo apt upgrade
   sudo apt install bison build-essential cmake csh flex gfortran libncurses5
   **   libncurses5-dev libx11-dev libxext-dev libxpm-dev libxt-dev**

4. Run the two **sudo** commands below to create a **mcidas** user.

   sudo useradd -s /bin/bash -U mcidas
   sudo passwd -d mcidas   (*password expiry information changed* is a normal response)

5. Run the **sudo** command below to link the newly created **mcidas** user's home directory to the shared location established in Task 2 above.

   sudo ln -s /mnt/c/Users/mcidas/Ubuntu/home/mcidas /home/mcidas

Task 2:

Complete the steps below to configure the environment of the main user account.

1. Open an Ubuntu shell and run command **whoami** to verify that you are logged in to the main user account.

2. Modify the environment variable **PATH** in your **$HOME/.profile** file. Insert **$HOME/mcidas/bin** and **/home/mcidas/bin**, in that order, at the beginning of your **PATH**. Also set the environment variable **DISPLAY** to the value recommended for WSL 2. Both of these can be done by adding the set of lines below.

```
# recommended PATH setting for McIDAS-X:
export PATH=$HOME/mcidas/bin:/home/mcidas/bin:$PATH

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export DISPLAY=$(grep -m 1 nameserver /etc/resolv.conf | awk '{print $2}'):0.0
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Note: The changes above will take effect the next time you open an Ubuntu shell logged into the main user account.

This completes the McIDAS-X installation. The bullets below contain additional information for users, such as tips about starting and configuring McIDAS-X, information about X servers, and accessing and editing files in the Ubuntu (WSL) and Windows environments.

● See the Starting McIDAS-X page in the *McIDAS-X User's Guide* for information about ways to start a McIDAS-X session. For McIDAS-X on Windows 10 an X server is required, so a typical procedure to start McIDAS-X is for the user (in their own account) to start the X server, then open an Ubuntu shell and run command **mcidas**. The Configuring McIDAS-X Sessions with .mcidasrc page has information the user can use for tailoring McIDAS-X sessions to their preferences.

● We do not require use of a specific X server. Microsoft recommends *VcXsrv*. We have successfully used it with McIDAS-X on Windows 10. Other X servers, including *Xming* and *X-Win32*, have also been used with McIDAS-X. Here are recommended actions for two issues that could be encountered:
  ○ If you receive a *No protocol specified* or *Can't open display* error when starting McIDAS-X, check the configuration options for your X server and select the option to Disable Access Control (which means that connections from all clients are accepted). This is required because the virtual network in WSL 2 causes the McIDAS-X X11 connection to appear to be coming from another network.
  ○ When running McIDAS-X, if you encounter cursor movement or rendering problems when using cursor-based commands like CUR, PC or CM, you may find that setting or unsetting the **-noXCursor** flag in your $HOME/.mcidasrc file improves performance.

● Although you are able to access files created and used by McIDAS-X in both the Ubuntu (WSL) environment and Windows environment, it is important that you do all editing of McIDAS-X files in the Ubuntu environment. For example, if you need to manually edit

one of the files, you should not use a Windows program like *Notepad* to edit it. Instead, you should use an Unix editor like *vi*, *ex* or *view* in an Ubuntu shell to make the changes.

- To list, copy and move McIDAS-X files, start an Ubuntu shell and use standard Unix commands like **ls**, **cp** and **mv**. Aliases like **~** and **$HOME** are available. For example, the command **ls -l ~mcidas/data/*.ET** lists the enhancement files included in the core McIDAS-X package, and you can list all of the AREA files in your account's mcidas/data directory with any of these commands:
  ls -l $HOME/mcidas/data/AREA*, **ls -l ~/mcidas/data/AREA***,
  ls -l ~*user*/mcidas/data/AREA* (where *user* is your Ubuntu account name).

- If you have files on the workstation that you would like to copy to the McIDAS-X environment or vice-versa, we recommend you do it from an Ubuntu shell. For example, if you previously ran McIDAS-X for Windows 7 on the workstation and have ***.ET** enhancement files in the **C:\Users*user*\mcidas\data** directory (where *user* is your Windows account name), you can copy them to your McIDAS-X environment by running a command sequence similar to that below.
  cd $HOME/mcidas/data
  cp /mnt/c/Users/*user*/mcidas/data/*.ET .