How to use Matlab R2021b in interactive session on Sabancı University HPC Cluster

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This tutorial will guide you how to send and run Matlab scripts interactively from a remote client machine (such as a windows labtop) to the Sabanci HPC cluster (such as TosunHPC).

Prerequisites:

- You need to have an HPC Supercomputer account to execute your Matlab scripts on the HPC clusters. If not already got it, to request an HPC account you need to send an email to <u>suhpcadmin@sabanciuniv.edu</u> stating your work area subject, the tool that you will use (matlab) and your current academic advisor. In return you will receive your Cluster host address (e.g. tosun.sabanciuniv.edu), your QOS (e.g. debug) and partition (e.g. debug), HPC username and HPC password.
- You need to install Matlab version R2021b to your computer. If not already installed, please install Matlab R2021 by following the instructions given here (may need an update): <u>https://mysu.sabanciuniv.edu/it/en/software/matlab</u>
- 1. Create a matlab directory on the HPC cluster to store matlab files for HPC.
 - Login to your HPC account with your HPC username and password. You can use a terminal like putty or Mobaxterm for this purpose.
 - Create your matlab folder in your HPC account.
 - sacir@login:~\$ mkdir matlab
 - sacir@login:~\$ cd matlab
 - sacir@login:~/matlab\$ pwd

/cta/users/sacir/matlab (this will be used as
RemoteJobStorageLocation in the following sections)

- 2. Create a directory (e.g. matlab) on your local computer to store matlab files and wrapper files
 - a. Make a new directory (e.g. matlab) (e.g. on your Desktop) (we will need this path as **JobStorageLocation** later in this document)
 - b. Download the *matlab-parallel-slurm-plugin-main.zip* wrapper files to the matlab directory you just created. And unzip it. You can download this file at <u>https://su-hpc-tutorials.readthedocs.io/en/latest/matlab/matlab/#</u>
 - So at the end you must have the ".m" wrapper files must be inside matlab-parallelslurm-plugin-main directory (e.g. C:\Users\suuser\Desktop\matlab\matlab-parallelslurm-plugin-main)
- 3. Start Matlab.



4. As probably your computer does not resolve back to an ip address like a subdomain ,at the Matlab command prompt run these commands to notify Matlab about your ip address. This step is not critical to send jobs to HPC but necessary if you want to pass the Validation test fully in the following steps in this document.

ip = java.net.InetAddress.getLocalHost.getHostAddress().string
pctconfig('hostname',ip);

- 5. Go to Home -> Add-Ons -> Get Add-Ons
- 6. Search for "Parallel Computing Toolbox"



7. Click on Parallel Computing Toolbox link and click Install and click Continue.



8. Click on Next, Accept the license agreement. Click Next and confirm the download.



9. Click Close and launch the program.



10. Next we need to setup our HPC profile which will enable us to send jobs to Sabanci HPC systems. For that, select Home -> Parallel -> Create and Manage Clusters



11. Choose "Add Cluster Profile" and select "Generic"

🣣 Cluste	er Profile Man	ager											
Q Discover Clusters	Add Cluster Profile 🕶	Create Cloud Cluster	Lmport	<i>V</i> Edit	i Duplicate	A Rename	lt Export	Validate	Anage Licenses & Alerts Test Cloud Connectivity	(2) Help			
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ocal (defa	MATLAB Jo Use a MATL	bb Scheduler AB Parallel Serv	ver cluster	r running	g MATLAB Job								
	Local Use the cores on your machine							The local cluster					
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	LSF PBS Pro												
	Slurm					hreads to use on each worker 1 (default)							
	Torque												
	Generic Use this to support all other schedulers or nonshared file systems using ssh as a submission tool through a submission host							bred on the client determined at run					
	FILES AND FOLDERS												

- 12. Choose "Edit" and fill in the sections.
 - a. For Description, enter the name of the cluster (e.g. TosunHPC)
 - b. For JobStorageLocation, use the path you created in Step 2.
 - c. For NumWorkers, enter the number of CPU cores you would like to use.
 - d. For *ClusterMatlabRoot* enter /cta/capps/matlab/R2021b if using TosunHPC cluster and /opt/ohpc/pub/apps/matlab/R2021b if using SunHPC cluster.
 - e. For OperatingSystem, select unix.
 - f. For HasSharedFileSystem, select False.
 - g. For PluginScriptsLocation enter the path to the directory containing the wrapper files (*matlab-parallel-slurm-plugin-main*) you downloaded and extracted.
 - h. To the AdditionalProperties section enter the following items
 - i. AdditionalSubmitArgs --qos=<enter your qos here>
 - ii. AuthenticationMode Password
 - iii. ClusterHost <your cluster host address> (*tosun.sabanciuniv.edu* for TosunHPC, sunhpc.sabanciuniv.edu for SunHPC)
 - iv. Partition <enter your partition here>
 - v. RemoteJobStorageLocation /cta/users/sacir/matlab (obtained at Step 1)

Description of this shortes	(
Jescription of this cluster Description	TosunHPC							
Folder where job data is stored on the client	C:\Users\suuser\Desktop\matlab							
JobStorageLocation	Default is current working folder							
Number of workers available to cluster	8							
NumWorkers	Default is inf							
Number of computational threads to use on each worker	Use default							
lumIhreads	Default is 1							
Root folder of MATLAB installation for workers	/cta/capps/matlab/R2021b							
JUSTETMATIADKOOT	Default is <matlabroot></matlabroot>							
License number (Optional: Used only if this cluster uses online								
Icensing) LicenseNumber								
Cluster uses online licensing	Use default		~					
RequiresOnlineLicensing	******							
CLUSTER ENVIRONMENT								
Cluster nodes' operating system	unix							
operatingsystem	Default is client operating system							
Job storage location is accessible from client and cluster nodes	false v							
HASSNAFEDFILESYSTEM	Default is true							
SCHEDULER PLUGIN								
Folder containing scheduler plugin scripts PluginScriptsLocation	suuser\Desktop\matlab\matlab-parallel-slurm-plugin-main Browse							
Additional properties for plugin scripts	Name	Value	Туре					
AdditionalFroperties	AdditionalSubmitArgs	qos=debug	String \sim					
	AuthenticationMode	Password	String 🗸					
	ClusterHost	tosun.sabanciuniv.edu	String ~					
	Partition	debug	String \vee					
	RemoteJobStorageLocation	/cta/users/sacir/matlab	String 🗸					
		Add	Remove					

utomatically send code files to cluster. Data files or folders	Use default	~				
uust be listed in the AttachedFiles property. utoAttachFiles	Default is true					
lanually specify files and folders to copy from client to cluster odes (One entry per line) ttachedFiles						
	A	dd				
lanually specify folders to add to the workers' search path One entry per line) dditionalPaths						
RKERS						
nge of number of workers to run job	Usedafaultt	_				
mWorkersRange	Default is [1 inf]					
turn command window output	Use default	~				
ptureDiary	Default is false					
anually specify environment variables to copy from client to orkers (One entry per line) vironmentVariables						

- 13. Complete the profiler wizard by pushing the Done button.
- 14. As the wizard completes we need to make sure we set-up the HPC profile correctly.
- 15. Choose the profile you just created and push the **Validate** button. As the tests are fired up the cluster will prompt you to enter your HPC username and password.

📣 Cluster Profile Manager			
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	createCommunicatingJob)	Not run	
	reateCommunicatingJob)	Not run	
	t (parpool) 🛛 🚮 Enter	password — 🗆	×
	to use: Use d Enter the 'tosun.sal	password for user 'sacir' on banciuniv.edu': OK Ca	ncel

16. As the profiling is now finished, you are now ready to submit your script to the cluster. For this select the cluster that you will submit the job to. In our case we choose TosunHPC cluster by selecting Home -> Parallel -> Select a default cluster -> TosunHPC
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3					Rew Variable	»	🚽 Analyze Code	Ħ	Preferences	?	👸 Communit
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1 2 3	tio n = A =	: = 200; = 500;							Monitor Jobs Parallel Preferences		
4	%A	= gpuArray	(A);								

You can now send your computations to the HPC cluster. If you will be using an .m file then please make sure your .m file is in the path. You can send additional parameters to the cluster from the command line too. For descriptions of these parameters please refer to Matlab documentation.

Troubleshooting

Here are solutions to a few very common errors that you may experience:

1. " s in the future"

Make sure your computer's time is close to the time of the cluster. You can see the time of the cluster with "*date*" command in the HPC cluster terminal.

2. " sbatch: error: Batch job submission failed: Invalid qos specification"

Make sure you are submitting your job to a partition that you are allowed to submit.

 "Error using getRemoteConnection (line 180) Could not find remote host tosun.sabanciuniv.edu . Check the hostname is correct and this machine is connected to the same network." At the profile replace ClusterHost with the ip address. (section 12) h) iii above). For tosun.sabanciuniv.edu it is 10.3.5.102. For SunHPC it is 10.3.6.201

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