

MatLab的特点

- ▶ **MATLAB**是一种简单易学的技术语言和开发环境
- ▶ 应用于各个不同的领域，如图像和信号处理、控制系统、财务建模和计算生物学。
- ▶ **MATLAB**通过专业领域特定工具箱(**Toolbox**)提供专业程序
- ▶ 多种高性能库(**Libraries**)如**BLAS**(Basic Linear Algebra Subprograms)

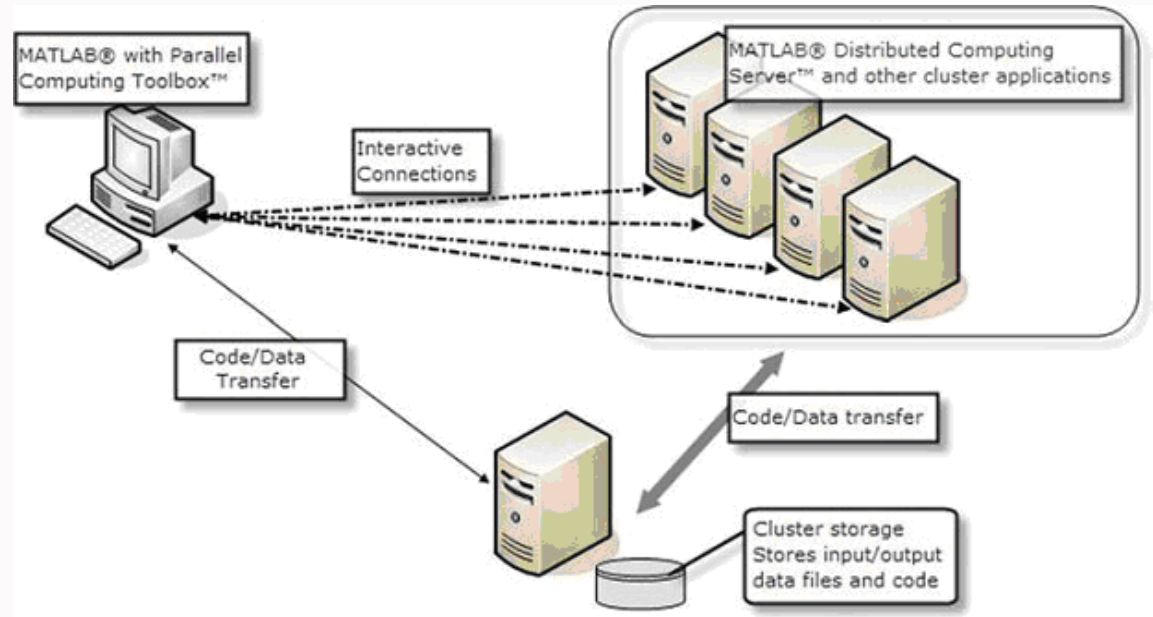
MatLab分布式并行计算架构

➤客户端工具箱 PCT(Parallel Computing Toolbox

➤在多处理器计算环境中使用 MATLAB 和 Simulink 解决计算、数据密集型问题。

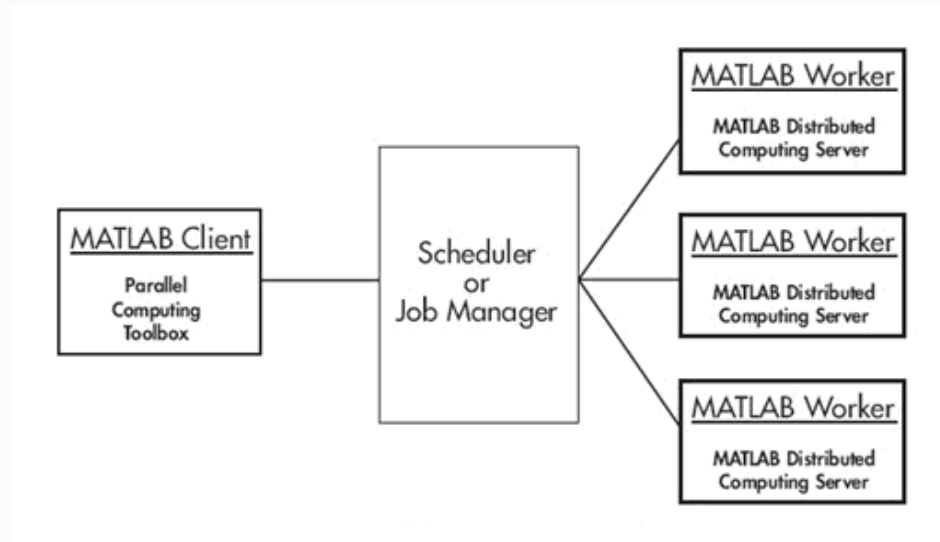
➤MDCS(MatLab Distributed Computing Server

➤使并行计算工具箱应用程序得到扩展，从而可以使用运行在任意数量计算机上的任意数量的worker。



MatLab分布式并行计算架构

- PCT创建任务，提交任务给调度器
- 任务管理器（Job Manager）将客户端提交的任务分配给闲置的节点上
- Worker任务的执行者，对应一个进程或CPU核心



MatLab分布式计算环境设置

- 开机启动MDCE
- 添加参与计算的主机
- 创建任务管理器
- 启动Worker
- 配置调度器
- 创建、提交任务计算

通过Admin Center来完成

The screenshot displays the Admin Center interface with three main sections: Hosts, Job Manager, and Workers. Each section has a corresponding button on the left side.

Hosts Section: The 'Add or Find...' button is highlighted. The table below shows the status of various hosts.

Host		MDCE Service		Job Managers	Workers	
Hostname	Reachable	Cores	Status	Up Since	Name	Count
head	● yes	8	● running	2011-04-21 17:...	jm1	0
node001 (node001.ib.cluster)	● yes	12	● running	2011-04-21 17:...		0
node002.ib.cluster	● yes	—	● unavailable	—	—	—
node003.ib.cluster	● yes	—	● unavailable	—	—	—
node004 (node004.ib.cluster)	● yes	12	● running	2011-04-21 09:...		6

Job Manager Section: The 'Job Manager' button is highlighted. The table below shows the status of the job manager.

Name	Hostname	Status	Up Since	Workers
jm1	head	● running	2011-04-21 17:24	6

Workers Section: The 'Workers' button is highlighted. The table below shows the status of the workers.

Worker				Job Manager			
Name	Hostname	Status	Up Since	Connection	Name	Hostname	
node004_worker01	node004	● idle	2011-04-21 12...	● connected	jm1	head	
node004_worker02	node004	● idle	2011-04-21 12...	● connected	jm1	head	
node004_worker03	node004	● idle	2011-04-21 12...	● connected	jm1	head	
node004_worker04	node004	● idle	2011-04-21 12...	● connected	jm1	head	
node004_worker05	node004	● idle	2011-04-21 12...	● connected	jm1	head	
node004_worker06	node004	● idle	2011-04-21 12...	● connected	jm1	head	

Update: every 2 minutes | Update Now
Last updated: Thu Apr 21 23:12:21 CST 2011

添加主机

Add or Find Hosts [X]

Enter Hostnames or IP Addresses:

head
node001.ib.cluser

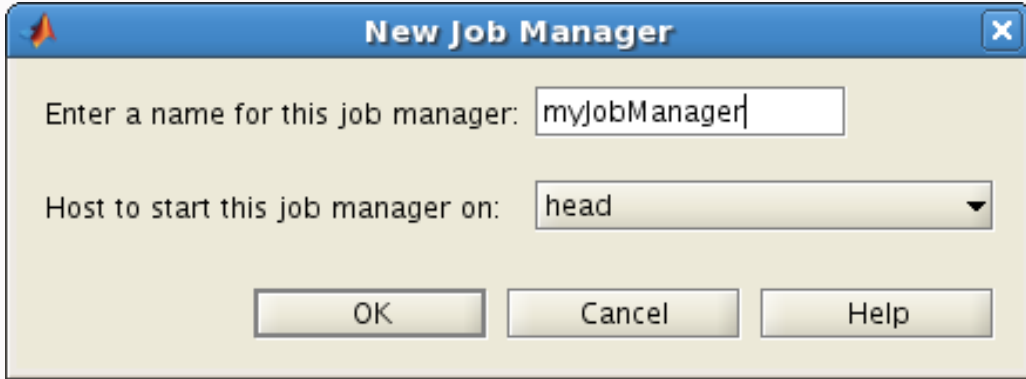
OR

Enter IP Range: [] . [] . [] . [] to [] . [] . [] . []

Tip: If a job manager is running, you need add only the job manager host to this list. Admin Center will add the hosts of all workers connected to it.

OK Cancel Help

创建任务管理器



New Job Manager

Enter a name for this job manager: myJobManager

Host to start this job manager on: head

OK Cancel Help

启动Worker

Start Workers

Hosts
Select hosts for new workers.


Hostname	Cores	Existing Workers
<input type="checkbox"/> head	8	0
<input checked="" type="checkbox"/> node001 (node001.ib.cl...	12	0
<input type="checkbox"/> node004 (node004.ib.cl...	12	6

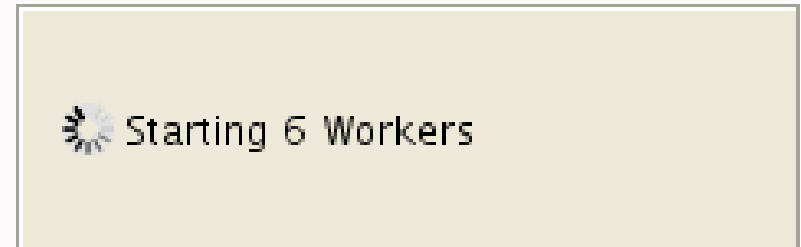
Job Manager
Select the job manager for the new workers.

jm1@head

Workers
Specify how many workers to start.

Start workers per host

 You have requested to start 6 new workers running under this job manager.
The total number of workers monitored by this Admin Center session will be 12.



配置调度器

The screenshot shows the MATLAB 7.10.0 (R2010a) desktop environment. The main window is the Command Window, which displays the following text:

```
New to MATLAB? Watch this Video, see Demos, or read Getting started.  
Warning: Function /root/ffft.m has the same name as a MATLAB built-in. We suggest you rename the function to avoid a potential name conflict.  
Warning: Function /root/ffft.m has the same name as a MATLAB built-in. We suggest you rename the function to avoid a potential name conflict.  
  
MATLAB desktop keyboard shortcuts, such as Ctrl+S, are now customizable.  
In addition, many keyboard shortcuts have changed for improved consistency across the desktop.  
  
To customize keyboard shortcuts, use Preferences. From there, you can also restore previous default settings by selecting "R2009a UNIX Default Set" from the active settings drop-down list. For more information, see Help.  
  
Click here if you do not want to see this message again.  
  
ffft >> |
```

The Command History window shows the following commands and their execution times:

Command	Time	Duration	Status
gac mount	4/21/11 2:18 PM	...	...
gac activate	4/21/11 2:22 PM	...	...
1	4/21/11 2:23 PM	...	...
gac activate	4/21/11 3:43 PM	...	...
gac activate	4/21/11 3:25 PM	...	...
gac mount	4/21/11 6:07 PM	...	...
ffft	4/21/11 11:10 PM	...	...

配置调度器

Configurations Manager

Default	Name	Type	Description	Valid
<input type="radio"/>	jobmanager1	jobmanager		---
<input checked="" type="radio"/>	local	local		---

Configuration Validation

Name: local	Test Stage	Status	Max Time Per Stage
Type: local	Find Resource	--- Not Run	240 Seconds <input checked="" type="checkbox"/> Use Default
Status: ---	Distributed Job	--- Not Run	Details...
	Parallel Job	--- Not Run	Details...
	Matlabpool	--- Not Run	Details...

Buttons: Help, Start Validation

Job Manager Configuration Properties

Configuration name: jobmanagerconfig1

Description: [Empty field]

Scheduler: Scheduler | Jobs | Tasks | Callback Functions |

Scheduler type (Type): jobmanager

Job manager hostname (LookupURL): head

Job manager name (Name): myJobManager

Buttons: OK, Cancel, Help

配置调度器

Job Manager Configuration Properties

Configuration name:

Description:

Scheduler | **Jobs** | Tasks | Callback Functions

Files and paths

Files and directories to copy from client to cluster nodes (FileDependencies):

One entry per line

Directories to add to the workers' path (PathDependencies):

One entry per line

Number of workers

Maximum number of workers that can run job (MaximumNumberOfWorkers):

Minimum number of workers required to run job (MinimumNumberOfWorkers):

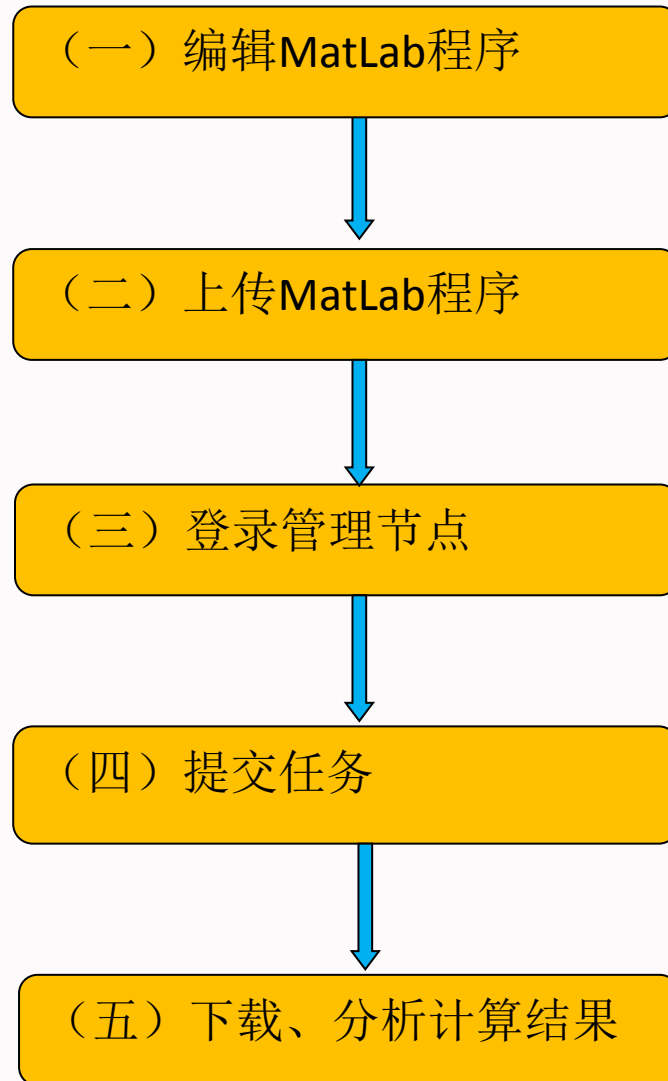
Other job properties

Restart workers before evaluating first task in job (RestartWorker):

Job timeout in seconds (Timeout):

OK Cancel Help

MatLab的使用流程图



(一) 在客户端启动Matlab, 生成.m文件

Applications Places System

1:37 PM



Computer



root's Home



Trash



MatLab

(一) 在客户端启动MatLAB, 生成.m文件

The screenshot displays the MATLAB 7.6.0 (R2008a) environment. The main window is titled "MATLAB 7.6.0 (R2008a)" and shows the following components:

- Workspace:** A table showing the current workspace variables. The variable `sensorObj` is of class `sads_implementations.valueClass.sad` and has a size of `1x1`.
- Variable Editor - sensorObj:** A table showing the properties of the `sensorObj` variable.
- Command Window:** Shows the execution of MATLAB commands: `import sads_implementations.valueClass.*`, `sensorObj=sads(Data, Wavelength, SampleRate, Spacing, Name);`, and `results=magfft(sensorObj, 128);`.
- Editor - C:\Documents\My MATLAB Files\Class examples\R2008a\Comparison of Implemen...:** Shows the source code for the `sads` class and its methods.

Property	Class	Value	Size
c	double	3000000000	1x1
NumSensors	double	16	1x1
NumSamples	double	64	1x1
Data	doubl...	<64x16 d...	64x16
Spacing	double	1.2500	1x1
SampleRate	double	3.3333e+07	1x1
Name	char	'Sensor Ar...	1x23

```
1 classdef sads
2     properties (GetAccess=private) ...
5     properties (Constant) ...
8     properties (Dependent) ...
12    properties ...
18    methods
19        function obj=sads(Data, Wavelength, SampleRate, Spacing, Name) ...
30        function plot(obj) ...
48        function [mags, fflip]=magfft(obj, zeroPadTo) ...
67        function magfftplot(obj, zeroPadTo) ...
80        function angles=doa(obj) ...
91        function obj=steer(obj, theta) ...
99        function NumSensors=get.NumSensors(obj) ...
103       function NumSamples=get.NumSamples(obj) ...
107    end
108    methods (Static) ...
144    end
145    function [maxtab, mintab]=peakdet(v, delta) ...
```

(二) 上传.m文件

58.210.77.162 - default - SSH Secure File Transfer

File Edit View Operation Window Help

Quick Connect Profiles

Local Name Size Type Remote Name Size Type

Local Name	Size	Type	Remote Name	Size	Type
3.5 软盘 (A:)		3.5 英...	cm		Folder
本地磁盘 (C:)		本地磁盘	software		Folder
CD 驱动器 (D:)		CD 驱动器	admin.pfx	3,766	Symbol
本地磁盘 (H:)		本地磁盘	anaconda-ks.cfg	747	CFG 文
'192.168.119.17' 上的...		网络驱...	install.log	18,857	文本文
'192.168.119.17' 上的...		网络驱...	install.log.syslog	3,063	SYSLOG
'192.168.113.211' 上...		网络驱...	yum.cron	6,381	CRON 文
控制面板		系统文...			

上传

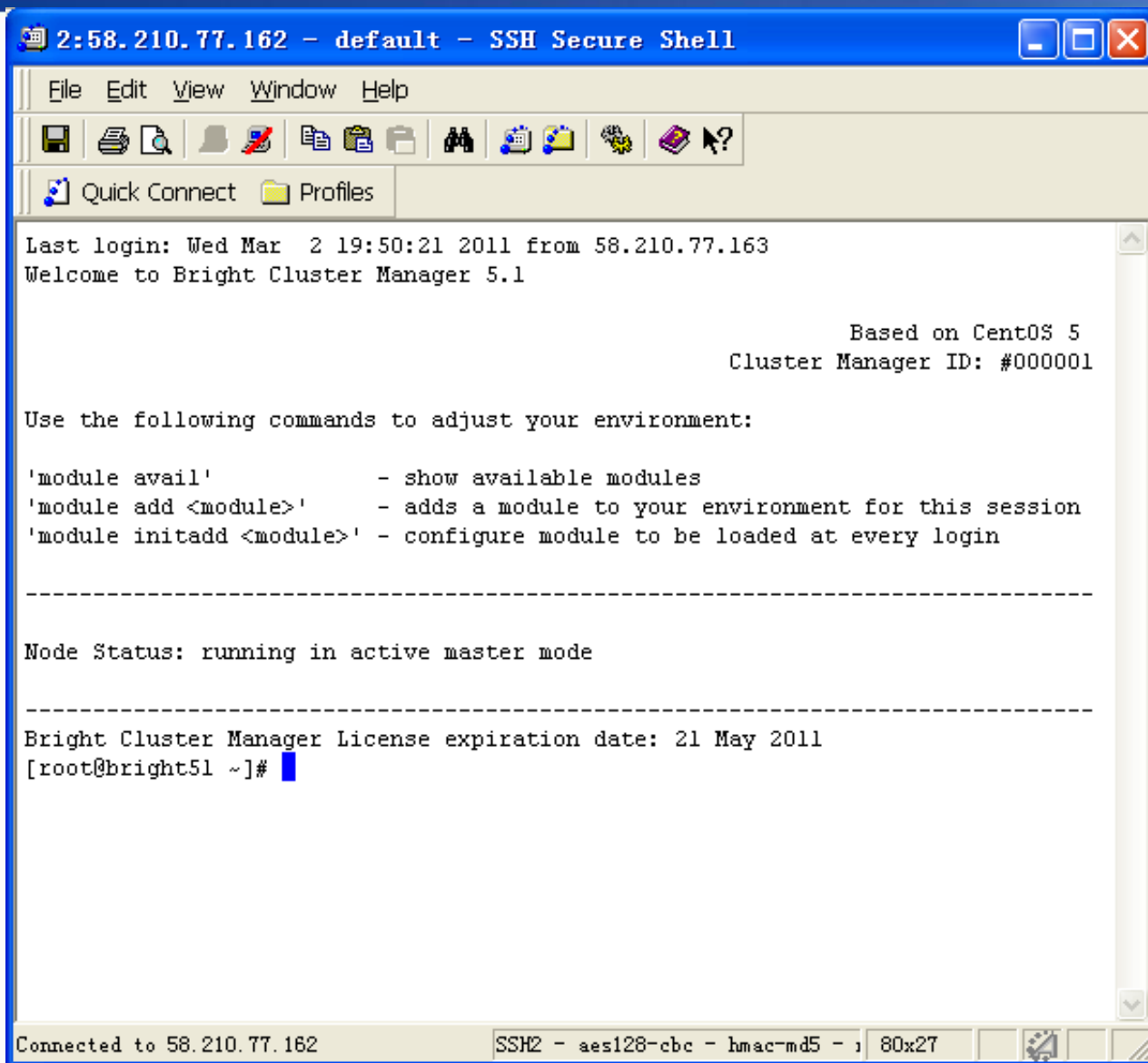
本地文件 远程文件

Transfer | Queue |

Source File	Source Directory	Destination Dire...	Size	Status	Speed	Time
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Connected to 58.210.77.162 - /ro SSH2 - aes128-cbc - hmac-md5 - ; 7 items (32.8 KB)

(三) 登录管理节点



```
2:58.210.77.162 - default - SSH Secure Shell
File Edit View Window Help
Last login: Wed Mar  2 19:50:21 2011 from 58.210.77.163
Welcome to Bright Cluster Manager 5.1

                                Based on CentOS 5
                                Cluster Manager ID: #000001

Use the following commands to adjust your environment:

'module avail'           - show available modules
'module add <module>'   - adds a module to your environment for this session
'module initadd <module>' - configure module to be loaded at every login

-----

Node Status: running in active master mode

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Bright Cluster Manager License expiration date: 21 May 2011
[root@bright51 ~]#
```

Connected to 58.210.77.162 SSH2 - aes128-cbc - hmac-md5 - 80x27

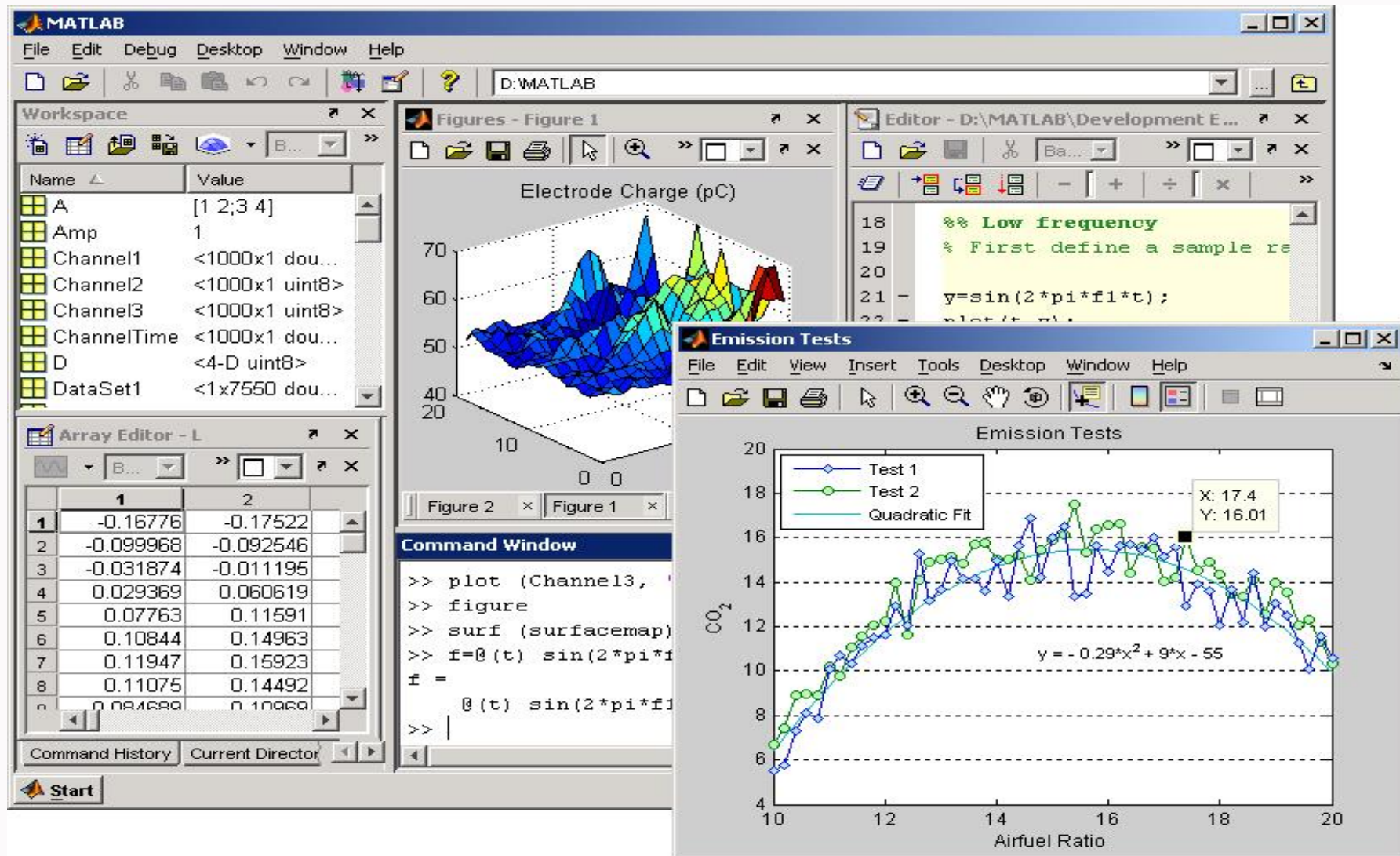
(四) 提交任务

```
$ vim matlab.pbs
```

```
#PBS -N matlab  
#PBS -l nodes=1:ppn=4  
#PBS -j oe  
#PBS -l walltime=30:00:00  
  
NP=`cat $PBS_NODEFILE|wc -l`  
cd $PBS_O_WORKDIR  
MATLAB=/export/local/MATLAB/R20xxx/bin/matlab  
  
$MATLAB -nodisplay -nosplash -nojvm \  
-r "maxNumCompThreads(${NP})" < yourmatlab.m  
>>result.log.${PBS_JOBID}
```

```
$ qsub matlab.pbs
```

(四) 启动并运行MATLAB (可选)



(五) 下载结果文件

58.210.77.162 - default - SSH Secure File Transfer

File Edit View Operation Window Help

Quick Connect Profiles

Local Name Size Type

3.5 软盘 (A:)		3.5 英...
本地磁盘 (C:)		本地磁盘
CD 驱动器 (D:)		CD 驱动器
本地磁盘 (H:)		本地磁盘
'192.168.119.17' 上的...		网络驱...
'192.168.119.17' 上的...		网络驱...
'192.168.113.211' 上...		网络驱...
控制面板		系统文...

Remote Name Size Type

cm		Folder
software		Folder
admin.pfx	3,766	Symbol
anaconda-ks.cfg	747	CFG 文
install.log	18,857	文本文
install.log.syslog	3,063	SYSLOG
yum.cron	6,381	CRON 文

Transfer Queue

Source File	Source Directory	Destination Dire...	Size	Status	Speed	Time
-------------	------------------	---------------------	------	--------	-------	------

Connected to 58.210.77.162 - /ro SSH2 - aes128-cbc - hmac-md5 - ; 7 items (32.8 KB)

本地文件 远程文件

下载