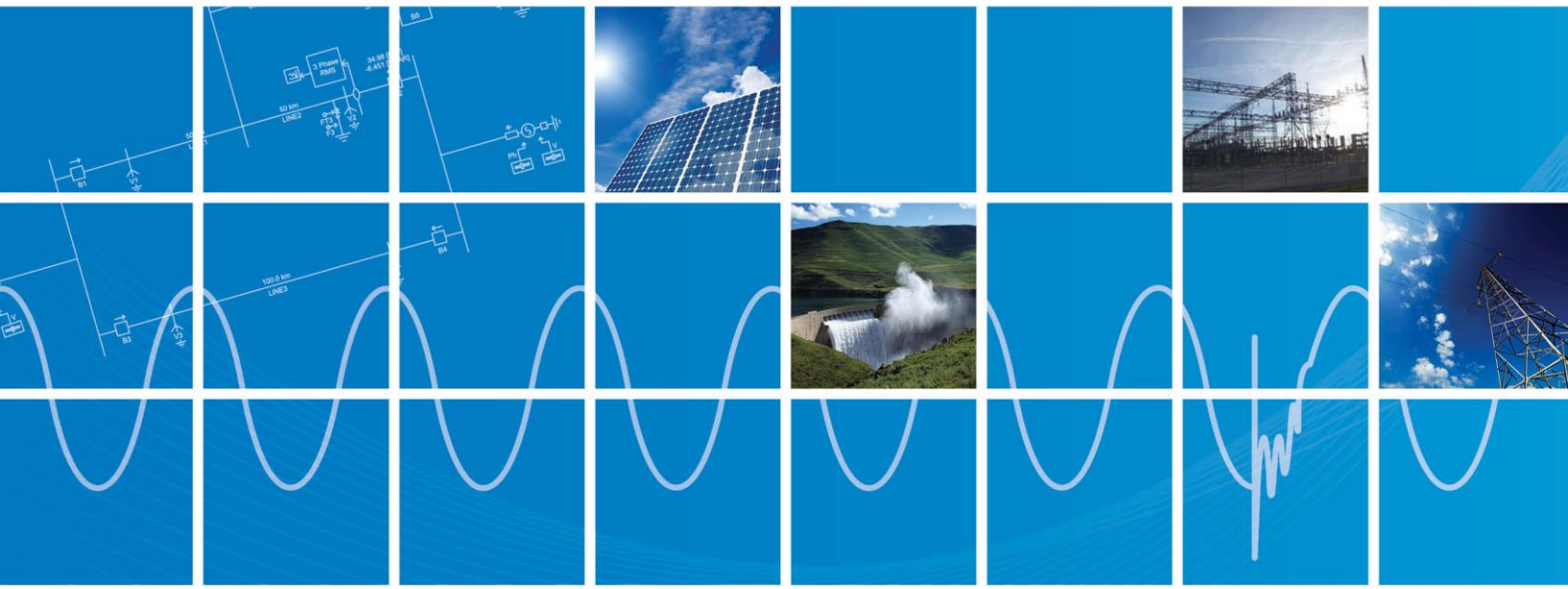
PSCAD™

Getting Started with PSCAD X4 (v4.6.1)

March 1, 2017
Revision 5



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1. Computing Requirements

PSCAD is a numerically intensive power system transients simulator; a fast and efficient personal computer is recommended for best results. PSCAD is supported on any computer running Microsoft® Vista or 7. Windows XP is not supported for versions 4.6.0 and higher.

Category	Recommended
Computer[1]	· Good motherboard with fast front side speed · 8 GB + of fast high quality RAM[2] · Solid state hard drive · 64 bit operating system · 4 + CPU cores with a decent CPU ranking · One USB 2.0 port or internet connection[3]
Operating System[4]	Microsoft® Windows 7, 64-bit
Processor	Generally, the faster the better. We recommend at least a 4-core processor in order to take advantage of Parallel and High Performance Computing. Additional licensed capabilities may be purchased to maximize these features, as discussed in High Performance Computing.
Additional Software	Compatible FORTRAN compiler[5] Microsoft® .NET Framework 4.0 Full[6] Microsoft® Visual C++ 2010 Redistributables[7]
Configuration of Protection Software	The PSCAD machine and corporate anti-virus, firewalls, and policies must permit PSCAD activities[8] Firewall must be configured for certificate licensing[9]
Website Access	For certificate licensing, PSCAD requires access to our license server[10]
Internet Access	Some activities require Internet access[11]
Windows User Privileges	Required Windows user privileges are specified[11]

[1]To obtain specifications for extremely high workloads, please contact The PSCAD Support Desk (support@pscad.com).

[2]Personal computers configured with slower processors and lesser RAM may be used, but slower execution performance will result. In other words, simulation speed increases with processor speed and amount of installed RAM.

[3]Licensing: For PSCAD v4.6 and above, internet-based certificate licensing is available, along with the older lock-based licensing. An internet connection is required only to activate and refresh the license certificate. Once refreshed, PSCAD may be used offline. For the older lock-based licensing, a USB 2.0 port is required for the hardware lock.

[4]Here are some additional notes about Operating Systems:

- PSCAD Software:
  - The PSCAD product is sold as a 32-bit and 64-bit application. On a 64-bit machine, both applications are installed. On a 32-bit machine, only the 32-bit application is installed.
  - It may be possible to also run PSCAD on Windows 8, 8.1 and 10*.
  - It may be possible to also run PSCAD on a virtual machine.
- License Manager Software:
  - The License Manager supports Windows x86 and x64 platforms.
  - It may be possible to also run the License Manager on Windows 8, 8.1, 10*, and Windows Server 2008 and 2016.
  - It may be possible to host the License Manager on a virtual server. The USB lock must be connected; for details, contact support@pscad.com.
- Network Lock-based Licensing: (licensing is performed over the network)
  - PSCAD lock-based licensing is not supported in cloud desktop environments because generally they are not connected to the corporate network.
  - It may be possible to use virtual private network (VPN) to log into the corporate network so that PSCAD can contact the License Manager.
- Local lock-based Licensing: (licensing is installed on the PSCAD client machine)
  - Running PSCAD in a cloud desktop environment is not supported.
  - It may be possible to use a virtual private network (VPN) to log in to a remote machine on which the software and licensing are installed.

*Refer to Resolving PSCAD Issues for known issues and solutions when running PSCAD on Windows 10.

[5] A FORTRAN compiler is required to compile PSCAD cases. The *Intel® Visual Fortran Compiler for Windows 2015* has been shown to provide EMTDC runtime executables that are significantly faster than those built by its predecessors (*Intel Visual Fortran 9 to 11*). The latest *Line Constants Program* is also built with this compiler, with significant speed enhancements as well. This software ("Composer Edition") may be purchased from here, and version 15 (2015) would then be available by logging in on the Intel website. **NOTE**: Using the Intel compiler requires that a compatible version of Microsoft® Visual Studio also be installed. A free edition comes bundled with the compiler, or a commercial edition must be purchased if compiling C-code. Alternatively, the GFortran 95 compiler that comes bundled with PSCAD may be used to compile PSCAD cases with or without C-code, but is not recommended for running larger cases. **NOTE**: The *Intel® Visual Fortran Compiler for Windows* is not supported in the PSCAD Free Edition, which uses only the GFortran 95 compiler. See further details in Section 4.

[6]PSCAD requires that *Microsoft® .NET Framework 4.0 Full* be installed. This framework comes complete with the *Microsoft® Windows 7* operating system and later, but is not included with *Microsoft® Windows Vista*. If not already installed on your computer, the installer will automatically install *Microsoft® .NET Framework 4.0 Full*.

[7]PSCAD requires that *Microsoft® Visual C++ 2010 Redistributables* (either x86 for PSCAD 32-bit or x64 for PSCAD 64-bit) be installed. If not already installed on your computer, the installer will automatically install Microsoft® *Visual C++ 2010 Redistributables.*

[8]When a case is run, one or more executables are generated, which PSCAD then launches in order to run the case. PSCAD and these executables use TCP/IP to communicate with each other for the purposes of simulation control and data collection for plots. These actions must not be prevented by protection software.

[9]For lock-based licensing performed over the network:

- ICMP Ping Echo and ICMP Ping Reply must be enabled on the Firewall for the Host and Client machines.
- Ports 2053 and 2054 must be open on the firewall, with communication protocol TCP/IP and UDP/IP.

[10]PSCAD requires access to our license server to use certificate licensing. Specifically, one or both of the following URL should be added to the whitelists of the anti-virus and firewall software:

- http://licensing.pscad.com:80/Licensing (preferred)
- net.tcp://licensing.pscad.com:443/Licensing (fallback)

[11]Windows Privileges and Access

Task	Required Windows User Privileges	Internet Connection
Installation		
Install MyUpdater	Administrator	Required
Install/Update software using MyUpdater	Administrator	Required
Remove software using MyUpdater	Administrator	Not required
Install software using InstallShield	Administrator	Required
Remove software using InstallShield	Administrator	Not required
Certificate Licensing		
Activate/refresh/release a certificate	User	Required
Lock-based Licensing		
Use the License Update tool	Administrator	[2]
Activate a lock-based license	User	[3]
Start/Stop/Restart the License Manager Service	Administrator	Not required
Use the License Manager Setup Tool	Administrator	[2]
Launching Software		
Launch PSCAD (Windows shortcut)	User	Not required
Launch MyUpdater	[1]	Not required
Launch software from MyUpdater	User	Not required
Diagnostics		
Run the Get Info tool	User	[2]
Run the Fortran Medic tool	Administrator or User	[2]
View log files	User	Not required

1. If MyUpdater will be used to install, update, or uninstall software, user must have Administrator rights. If MyUpdater will be used to just launch software, then a user only requires User rights.
2. Access is required for downloading the latest posted version. No access is required when using the installed version (typically more dated).
3. If license is hosted on a remote server, access is required.

2. Licensing Requirements

2.1 When using Certificate Licensing to run PSCAD

PSCAD requires access to our license server to use certificate licensing. One or both of the following URL should be added to the whitelists of the anti-virus and firewall software:

- http://licensing.pscad.com:80/Licensing (preferred)
- net.tcp://licensing.pscad.com:443/Licensing (fallback)

Certificate licensing supports running PSCAD on a local desktop, or on a remote desktop or over virtual private network (VPN). Certificate licensing is not supported when running PSCAD in a cloud desktop environment.

2.2 When using Lock-based Licensing - License is hosted on the PSCAD Machine

The following are requirements when the PSCAD machine is hosting the license (self-licensing):

- The license database file must be installed on the client machine.
- The Sentinal USB lock must be plugged in on the client machine.
- The PSCAD software must be installed and run on the client machine.

PSCAD lock-based licensing is not supported in a cloud desktop environment.

Although not officially supported, some customers use a virtual private network (VPN) to log in to a remote machine on which the software and licensing are installed.

2.3 When using Lock-based Licensing - License is hosted on a Server

The following are requirements when using the Standalone License Manager:

- On the license host server and PSCAD client machines, ICMP Ping Echo and ICMP Ping Reply must be enabled on the Firewall.
- The protocol for communication between the server and clients is TCP/IP and UDP/IP on port 2053 and 2054.
- The license database file must be installed on the server.
- The Sentinal USB lock must be plugged in on the server.
- The License Manager must be installed on the license host machine.
- The PSCAD client machines must be able to contact and connect to the license server.

PSCAD lock-based licensing is not supported in a cloud desktop environment because generally they are not connected to the corporate network.

Although not officially supported, some customers use a virtual private network (VPN) to log into their corporate network so their PSCAD can contact the License Manager.

3. Scope Boundaries

Any boundaries imposed on your projects will depend mainly on which PSCAD edition you are using. The following tables list the most commonly encountered boundaries.

3.1 PSCAD Imposed Boundaries (all Editions and Compilers)

Description	Boundary
Transformers	Unlimited
Mutually coupled windings	Unlimited
Component Graphical Layers	256
T-Lines/Cables	Unlimited
Conductors per T-line Right-of-Way	30
Cables per Right-of-Way	12
Data signal dimension	1,024
Radio Transmitters/Receivers	1,024
STOR allocations	Unlimited
STORF/L/I/C allocations	Unlimited

3.2 Edition Specific Boundaries

Description	Free	Educational	Professional
Electrical Sub-systems	1	1	256
Electrical Nodes	15	200	Unlimited
Modules	5	64	2,048
Components	1,024	32,768	65,536
Output Channels	256	1,024	2,048

3.3 Free Edition Restrictions

Description	PRO and EDU Editions	Free Edition
Create Definition	✓	×
Edit Definition	✓	×
Import/Export Definition	✓	×
Copy/Paste Definition	✓	×
Commercial FORTRAN Compiler	✓	×
Frequency-Dependent T-Lines	✓	×
MATLAB Interface	✓	×
Graph Watermarks	×	✓

4. Supported FORTRAN Compilers

PSCAD requires a FORTRAN compiler to build and simulate projects. The following commercially available compilers are presently supported:

- Intel® Visual Fortran Compiler for Windows 9.x, 10.x, 11.x, 12.x, 13.x, 14.x & 15.x[1]
- GFortran 95 (v4.2.1 and v4.6.2)[2]

For your convenience, a free FORTRAN compiler, called the *GFortran 95* compiler, is provided on your PSCAD CD. If you have installed the *Free Edition* with your MyCentre account, the *GFortran* compiler is available as a separate download.

If you are the owner of a professional or educational PSCAD license, it is recommended that you purchase the *Intel® Visual Fortran Compiler for Windows* (v15) compiler, mainly for its superior debugging environment and optimization features. Also, has shown to provide EMTDC runtime executables that are significantly faster than those built by its predecessor (*Intel Visual Fortran 9 to 11*); in some cases *twice as fast*. You may purchase the Intel® Parallel Studio XE (Composer Edition) directly from the Intel Corporation from here.

[1]The *Intel Visual Fortran Compiler for Windows* compiler is not supported in the PSCAD *Free Edition*, which uses only the *GFortran 95* compiler.

[2]GFortran v4.2.1 is supported for all versions of PSCAD X4. GFortran 4.6.2 is supported with PSCAD 4.6.0 and onwards.

5. Installing and Licensing PSCAD

5.1 Professional and Educational Editions

Installing your PSCAD software should be a straightforward process. If problems do arise, please contact the PSCAD Support Desk (support@pscad.com) for assistance. Proceed as follows:

a. Insert CD into a compatible optical drive. The installer should start automatically.

b. Follow the instructions given in each, sequential installer dialog.

c. For more detailed instructions on installation, as well as licensing instructions, please refer to the following references:

- If certificate licensing will be used, download Certificate Licensing – WorkGroup Members.
- If lock-based licensing will be used, download Installing and Licensing PSCAD X4.

5.2 Installing the Free Edition

Installing your PSCAD Free Edition software is a simple process. If problems do arise, please request support through the 'Support' tab in your MyCentre account. Proceed as follows:

a. Register a user profile in MyCentre (https://mycentre.hvdc.ca/login).

b. Install the *MyUpdater* tool, which manages your software installation and updates, from the following link on the MyCentre *Home* page:

c. Launch *MyUpdater*, and install or update your PSCAD Free product.

d. Ensure that the *GFortran* product is installed (also via *MyUpdater*).

> **Note**
> Once GFortran is installed, ensure to log out and log in to (or restart) your computer, prior to running a PSCAD simulation with GFortran. This is required to apply the changes to your computer.

e. More detailed instructions may be found here.

5.3 Running the Free Edition

a. Launch the MyUpdater tool.

b. If your PSCAD Free installation is outdated, you will need to first select *Update* before you can run it.

c. If your PSCAD Free installation is up-to-date, select *Run* to launch.

d. The PSCAD Free Edition should automatically be licensed to run.

Notes

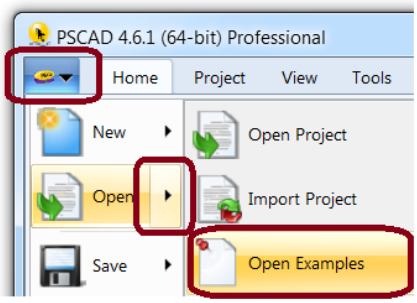
- The certificate will automatically be set to expire in four weeks. However, it will be refreshed to a new four-week period whenever you launch PSCAD online.
- The certificate may be released and returned to MyCentre, so that it may be activated on a different machine. Or it may be retained on your machine so that you may work offline.
- Software updates are regularly published, and are only available when online and logged in on the MyUpdater tool.

e. More detailed instructions may be found here.

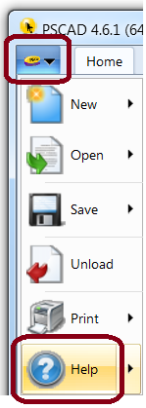
6. Tutorials and Examples to get you started

The following resources may assist new users to become familiar with PSCAD:

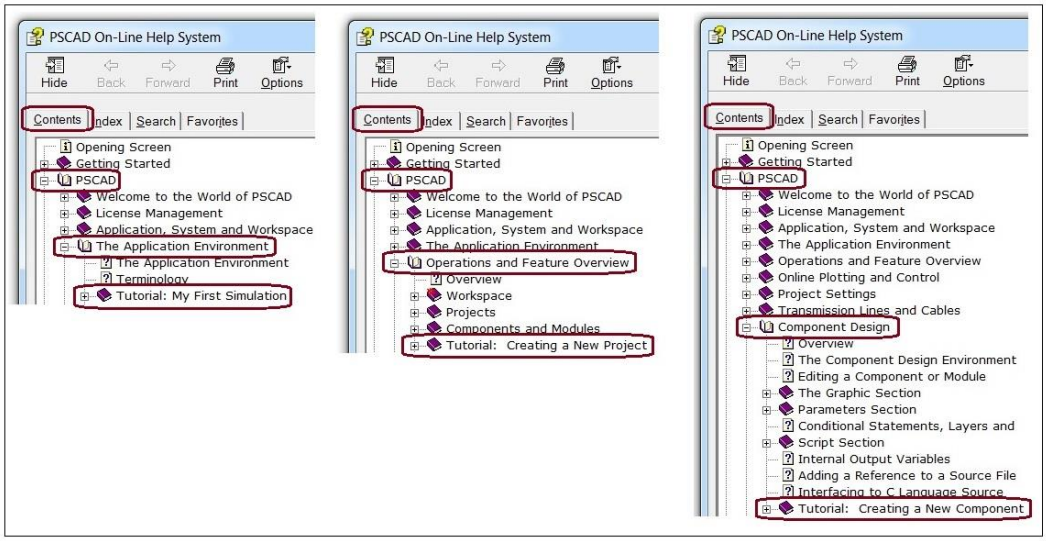
- The Knowledge Base contains videos, user guides, examples, tutorials, webinars, and manuals.
- Examples and tutorial projects to view and run are available through the "PSCAD" start button:



- The Help system provides information on PSCAD tools and features:



- Three tutorials for designing PSCAD cases are available in the Help system:



DOCUMENT TRACKING

Rev.	Description	Date
0	Initial: Content for this manual was taken from the PSCAD v4.6.0 Help System. This manual supersedes “Getting Started PSCAD X4 v4.5 and v4.6”, as that manual was split out into two separate documents, one for each branch (v4.5 and v4.6).	08/Jan/2016
1	Updated to v4.6.1	12/Sep/2016
2	Updated Intel Fortran compiler purchasing information, Updated weblinks, Added new Section 2 (Licensing Requirements), updated remaining section numbers Updated Section 6, Minor formatting	03/Nov/2016
3	Added new Section 2 (Recommendations for using the Parallel Computing Features), updated reminaining section numbers	04/Nov/2016
4	Removed Section 2 (Recommendations for using the Parallel Computing Features) (moved to standalone document), renumbered remaining sections; Update to Section 2.1	12/Jan/2017
5	Further requirements added to Sections 1 and 2; Updated Sections 5 and 6	01/Mar/2017

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