



# CANFAR

Exploring the universe one byte at a time

To determine the structure of the universe and our place in it, astronomers study the night sky with ever more powerful telescopes. Dozens of these telescopes positioned at different observatories around the world are combined into large arrays. The end result is thousands of images of any one section of sky.

The Canadian Advanced Network for Astronomical Research (CANFAR) powers the world's first dedicated cloud-computing Platform for astronomy. It allows scientists to combine these images with complex computer algorithms to tease out tiny astronomical details. The raw data is massive but the results are insightful; they confirm the presence of planets circling distant stars and let astronomers see back in time to the formation of the earliest galaxies.

CANFAR also lets scientists take this sophisticated astronomy data one step further with simulations about changes in the cosmos. In one example, scientists can mimic galaxy formation to see if millions of swirling stars can explain unsolved mysteries like dark matter. They can also simulate the last moments of dying stars to see how these cataclysms formed the atomic elements that make up life on earth.

## Worldwide leader in astronomy research

Contributions from observatories around the globe are needed for astronomy to advance, but this makes for a complicated coordination challenge with quantities of data that are impractical to contain on a single computer. CANFAR, as a Software Platform, helps manage this distributed "big data", allowing scientists to focus on astronomy research instead of solving data-management nightmares.

As a result, CANFAR is at the heart of some very critical and widely referenced research, research that benefits every observational astronomer. In fact, astronomy is one of Canada's great success stories and Canadians are recognized within the academic community as being among the leaders in this field.

## Collaboration and contribution

CANFAR is the result of collaboration between the University of Victoria, the University of British Columbia, the University of Alberta, and the National Research Council Herzberg Institute of Astrophysics, with support from CANARIE. It builds on a previously funded CANARIE project of the same name.

This project has created a number of Research Software Services that are now available to the broader research community through the CANARIE Software Registry. They include software for managing users and groups, searching large distributed files, and importing, managing, and sharing large images.

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*CANFAR powers the world's first dedicated cloud-computing Software Platform for astronomy. It allows scientists to combine thousands of images of any one section of the sky with complex algorithms to tease out tiny astronomical details. The results not only confirm the presence of planets circling distant stars, but let astronomers study the formation of the earliest galaxies and even simulate changes in the cosmos.*

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# Technical Details

## Platform: Canadian Advanced Network for Astronomical Research

Description	Provides astronomers easy access to very large resources for both storage and processing, using a cloud based framework; allows astronomers to run processing jobs on a set of computing clusters, and to store data at a set of data centres.
Creator(s)	CANFAR at the University of Victoria
Research Subject	Astronomy
Managed Version <sup>i</sup>	Yes - Requires registration with CANFAR here: <a href="http://www.canfar.net/docs/register/">http://www.canfar.net/docs/register/</a>
Self-hosted Version <sup>ii</sup>	No
Cloud Support	Yes
Host OS	Linux
Licence	GNU General Public Licence
Details	<a href="http://canarie.ca/software/canfar-en">canarie.ca/software/canfar-en</a>

## Contributed Services:

	Batch Cloud Processing Service	Group Management Service	Virtual File Persistence Service	Virtual Storage Service
Description	A RESTful web service interface to the CANFAR Condor processing system	A RESTful web service interface to access control operations such as group definition, group membership and member privileges.	A RESTful web service that is the primary file object storage and retrieval interface for data collections. This service can be used to upload, check availability, download, and delete files.	A RESTful web service implementation of most of the International Virtual Observatory Alliance (IVOA) VOSpace-2.0 recommended interface to user managed storage.
Category	Resource/Cloud Management	User Management/Authentication	Data Storage and Retrieval	Data Storage and Retrieval
Research Subject	Multi-Discipline	Multi-Discipline	Multi-Discipline	Multi-Discipline
Managed Version <sup>i</sup>	Yes - Requires registration with CANFAR here: <a href="http://www.canfar.net/docs/register/">http://www.canfar.net/docs/register/</a>	Yes - Requires registration with CANFAR here: <a href="http://www.canfar.net/docs/register/">http://www.canfar.net/docs/register/</a>	Yes - Requires registration with CANFAR here: <a href="http://www.canfar.net/docs/register/">http://www.canfar.net/docs/register/</a>	Yes - Requires registration with CANFAR here: <a href="http://www.canfar.net/docs/register/">http://www.canfar.net/docs/register/</a>
Self-deployed Version <sup>ii</sup>	No	No	No	No
Cloud Support	Yes - runs on OpenStack	Yes	Yes	Yes
Host OS	Linux	Linux	Linux	Linux
Licence	GNU General Public Licence	GNU General Public Licence	GNU General Public Licence	GNU General Public Licence
Details	<a href="http://canarie.ca/software/bcps">canarie.ca/software/bcps</a>	<a href="http://canarie.ca/software/gms">canarie.ca/software/gms</a>	<a href="http://canarie.ca/software/vfps">canarie.ca/software/vfps</a>	<a href="http://canarie.ca/software/vss">canarie.ca/software/vss</a>

<sup>i</sup>Managed version: Creators host a live instance of the software on their infrastructure, available for use by others

<sup>ii</sup>Self-deployed version: Users host a private instance of the software on their own infrastructure