

Compute Canada's Resource Allocation Competition 2020 (RAC 2020): **BEST PRACTICES**



Patrick Mann, Director of Operations
WestGrid

<https://github.com/WestGrid/trainingMaterials>

This Presentation:

<https://github.com/WestGrid/trainingMaterials>

- <https://github.com/WestGrid> and search/click through.
- <https://westgrid.github.io/trainingMaterials/>
 - (Getting Started section)
- <https://westgrid.github.io/trainingMaterials/materials/rac2019changesAndBestPractices.pdf>
 - Detailed RAC 2019 Best Practices guide
 - (with everything from this presentation and more!)

Contact us anytime:

support@westgrid.ca
www.westgrid.ca
docs.computecanada.ca
www.computecanada.ca

1. Intro to WestGrid and Compute Canada
2. What is the RAC?
3. Stats
4. Overall and admin details
5. Updates and changes
6. Tips and best practices
7. Questions and discussion

First, an intro to....



computecanada
regional partner

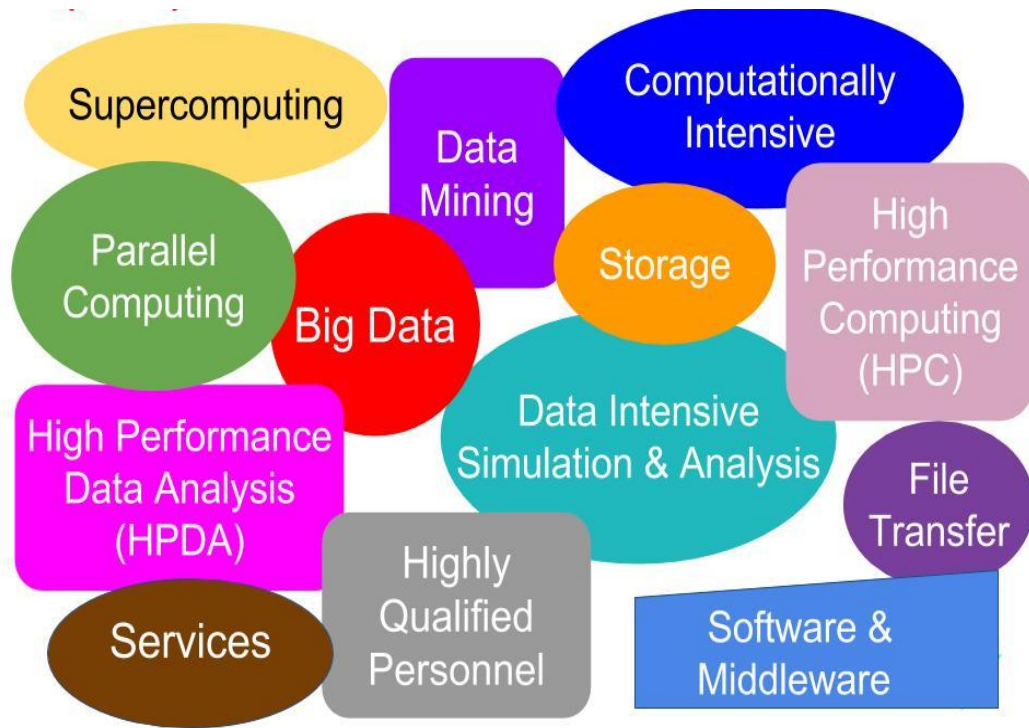
and



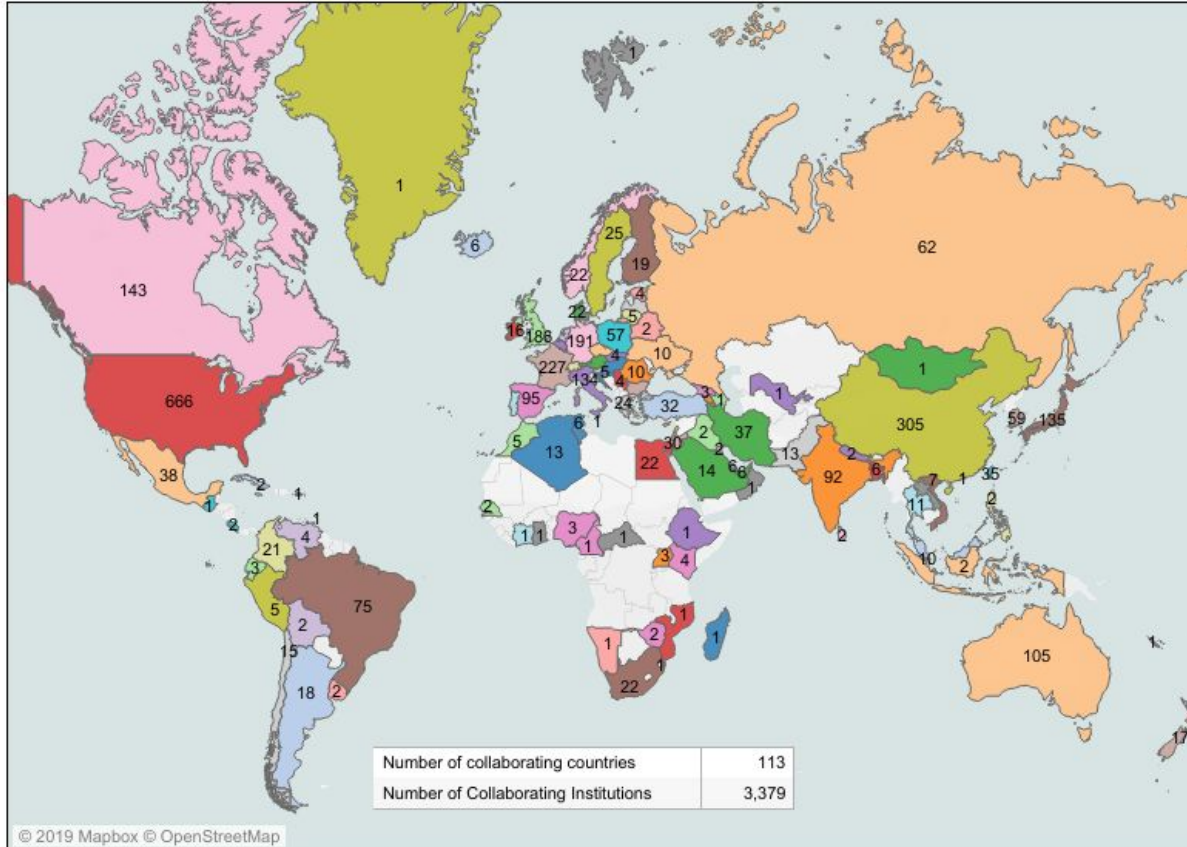
compute | **calcul**
canada | canada

What is 'ARC'?

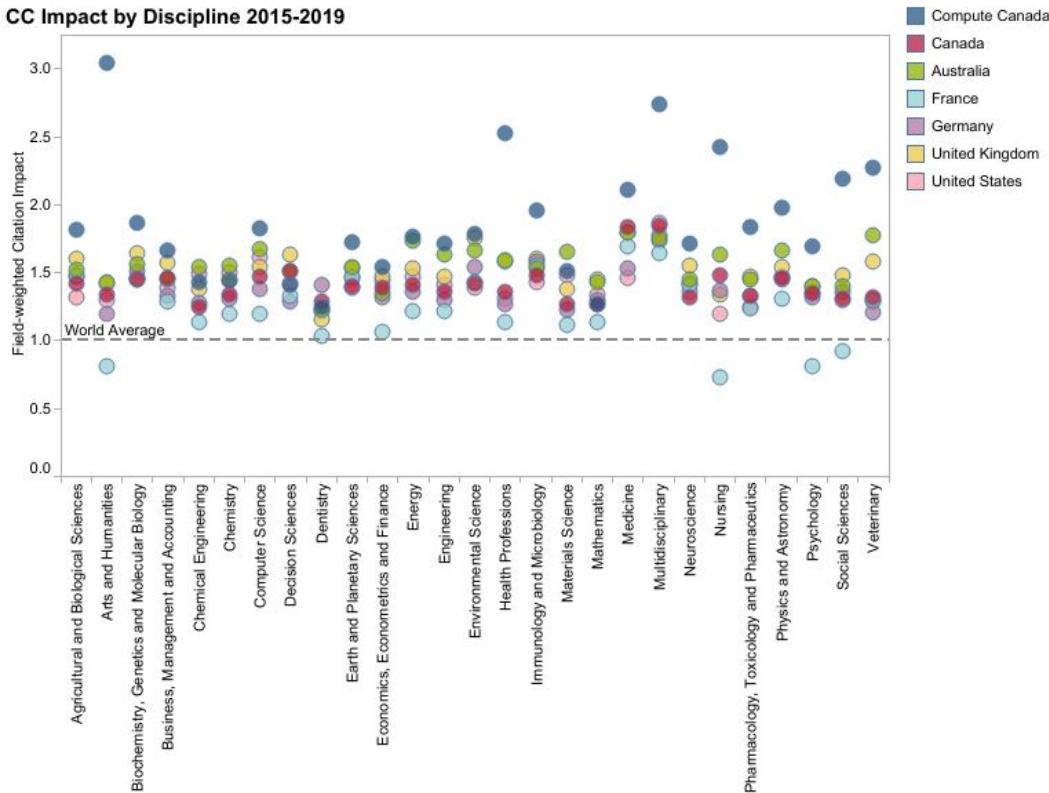
Advanced Research Computing (ARC) is **everything beyond a standard desktop workstation.**



Collaborating Institutions



CC Impact by Discipline 2015-2019



Field-Weighted Citation Impact (FWCI) of CC-enabled papers

- Papers which use CC resources are in blue.
- Canada (red) is well above the world average, and overall comparable to a sample of western countries.
- **CC-enabled papers (blue) are well above in almost all areas!**

Canada's National provider of shared essential Digital Research Infrastructure (DRI)

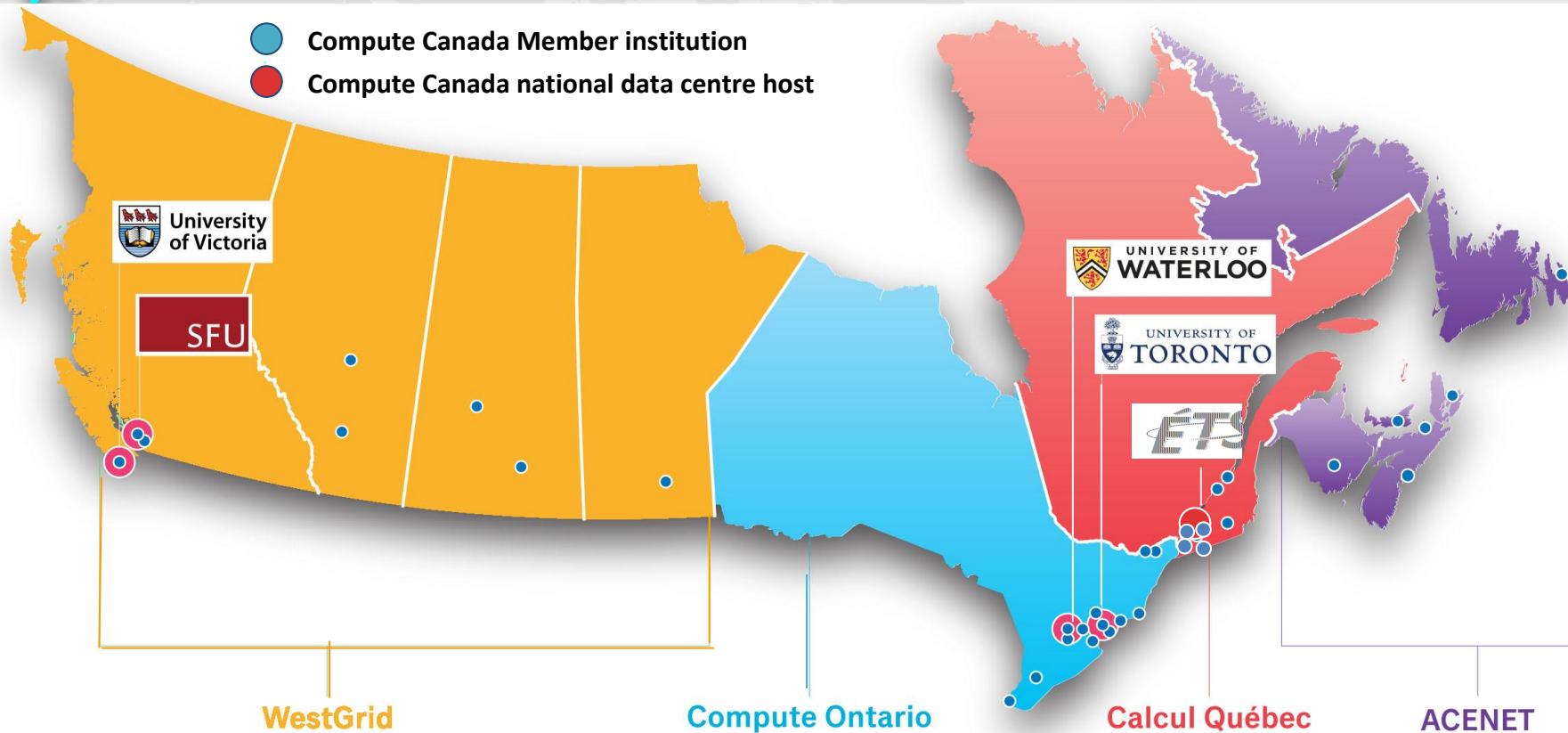
- Not-for-profit corporation. Membership includes 35 of Canada's major research institutions and hospitals.
- Funding is through a federal grant with matching funds from provincial and institutional partners (40% federal / 60% provinces and institutions), which is the basis of the federated Canadian model.
- Provides shared services to More than 12,000 researchers across Canada. No fees. Large requests based on a merit-based access system.



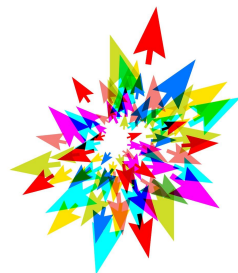


compute
canada | **calcul**
canada

Canada's National ARC Platform



National vs. regional roles



compute | **calcul**
canada | canada

Compute Canada:

- National-scale initiatives:
 - Resource Allocation Competition (RAC)
 - Account renewals, security program
 - Procurement, technology planning (community consultations)
 - Securing funding, advocacy, nat'l/int'l partnerships
- National services
 - The large infrastructure systems: GP, LP, Cloud
 - Research Data Management, Globus, etc.

Regions:

- Local support & infrastructure operations
- User training and support
- Local / regional partnerships
- Addressing institutional & provincial priorities



WestGrid Members

WestGrid is one of Compute Canada's largest regions, spanning four provinces (BC, AB, SK, MB).

Currently, WestGrid has seven Member Institutions.



UNIVERSITY OF
CALGARY



UNIVERSITY OF
SASKATCHEWAN

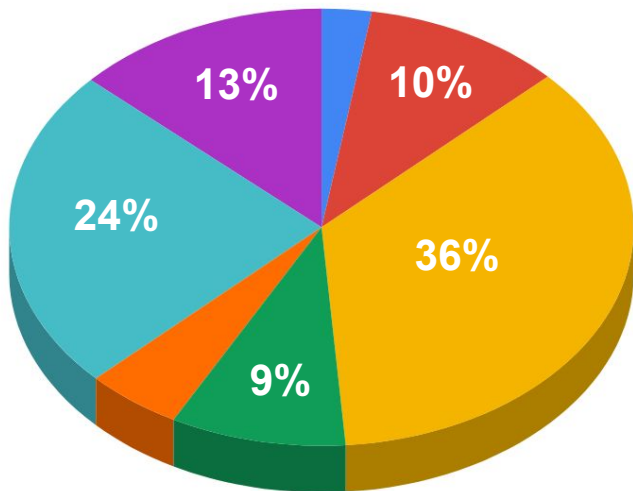


UNIVERSITY
OF MANITOBA

WestGrid Users: A Snapshot

34% Faculty **23%** Doctoral Student **14%** Master's Student **10%** Postdoc
9% Researcher **6%** Undergrad **3%** Other (*External collaborator, Librarian, etc.*)

Research Areas:

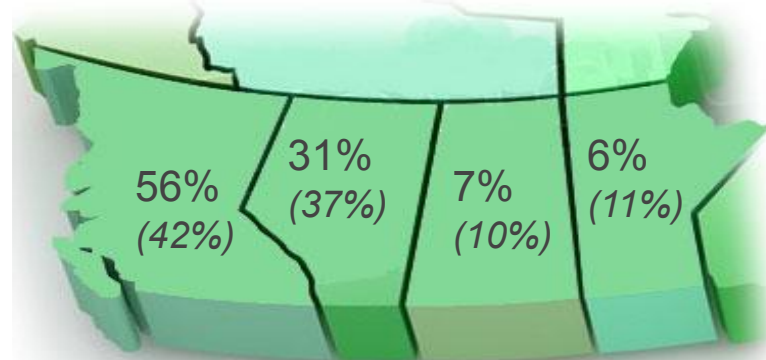


- Agricultural, Food & Nutritional Science
- Chemistry & Biochemistry
- Engineering, Math & Computer Science
- Environmental & Earth Sciences
- Humanities & Social Sciences
- Medical, Biological & Life Sciences
- Physics & Astronomy

3566+ active roles

(positions listed above, as of May 2019)

Home Province:



What we do: National Host Sites

Arbutus (**University of Victoria**)

- OpenStack cloud computing
- 9,048 Physical cores
- 5.7 PB Raw Ceph storage



Cedar (**Simon Fraser University**)

- General purpose computing, multiple node types
- Over 58,000 CPU cores
- 3.6 petaflops peak performance
- 584 GPU NVidia P100's
- 13 PB /project storage





What we do: Training and Support

Regional Summer Schools (4 days)	Summer 2019: UBC (210 ppl), University of Calgary (190 ppl)
Community Town Halls	4 since December 2019
Software Carpentry Workshops	In collaboration with Compute Canada (CC) and institutions
National Support	WestGrid: 14,082 tickets (Jan 1 to Aug 23), 35% of CC
<u>Visualize This! Challenge</u>	Annual competition for visualization excellence. Provided and managed by WestGrid.
Summer Interns	10 internships over last 3 years.

	Number	Attendees	Attendee-hours
In-person events at sites	58	1,767	7,115.5
Online events	9	193	193

RESEARCH COMPUTING WINTER SCHOOL @ UVic

Hands-on introductions to essential tools & skills used in computational research, such as:

- Intro to Linux & the bash command line
- Intro to HPC: Using clusters to speed up your research
- Intro to scientific visualization
- Foundations of parallel programming

<https://tinyurl.com/UVic2019> | info@westgrid.ca

DEC 10 - 13, 2019

\$30 / person

Registration now open!



What we do: Visualize This

2019 VISUALIZE THIS! CHALLENGE

#vizthis2019

Grand Prize:
DELL EMC U3219Q UltraSharp
32" 4K Monitor



Brought to you by:



<https://compute canada.github.io/visualizeThis/>

2019 Theme:
**Remote Parallel
Rendering**

Participants can use their own research data, or we have a “default” dataset for those who would like to participate but don’t have a large dataset.

Deadline:
November 30

What we do: Development Team



Senior Developer: Ikenna Okpala

- 12 yrs experience, ranging from government to medical to e-commerce.
- Subscribes to agile, pair programming (where required), behaviour driven (BDD), DRY, progressive enhancement, and open source approaches



Junior Developer: Steven Bucholtz

- Steven first connected with WestGrid in 2018 through a co-op position via the Canada Summer Jobs (CSJ) program.
- Previous experience as a network analyst, web developer, and quality assurance engineer.

Together, they are building solutions that create, extend, implement, and maintain **scientific gateways** and **advanced computing software tools and databases** for researchers.

Considering a project? Contact us: support@westgrid.ca

What we do: Advocacy

RAC	Compute Canada's national Resource Allocation Competitions. WestGrid Director of Operations is a co-lead. WestGrid staff provide admin and communications support. WestGrid team provides regional expertise: Scheduling lead (Kamil Marcinkowski, UofA) + Cloud lead (Ryan Enge, UVic).
Management	WestGrid's CEO is a member of Compute Canada's senior management group
Council of CTOs	Compute Canada's national committee addressing overall technical strategy. WestGrid's Director of Operations is a member.
Science Leadership Council	Compute Canada's senior science / strategy committee. Led by WestGrid team member - John Simpson, UofA & includes Alex Razoumov, WestGrid Visualization & Training Coordinator.
CCDB	WestGrid contributes ½ FTE on the Compute Canada DataBase (CCDB) dev team.
Policy and Security	Security Council includes WestGrid team members (Scott Baker, UBC). Policy development by WestGrid Director of Operations.
National Teams	WG has members on most national teams: Research Support, Monitoring, Storage, ...

Resource Allocation Competition (RAC)

Overview

Changes from 2019

Resources for 2020

Best practices

This document is a WestGrid-provided best practices guide for the Compute Canada Resource Allocation Competition (RAC). It does not replace the official RAC documents and PI's should carefully review the Compute Canada official documentation. In cases of conflict between this Best Practices Guide and the official RAC documents, the official documents take precedence.

Resource Allocation Competition (RAC): Compute, storage and cloud allocations on Compute Canada national systems

~80% allocated through RAC competitive process.

- Applicants must be eligible to hold a grant from a Canadian granting agency.

Outside of the RAC process...

~20% of Compute Canada national resources are reserved for opportunistic use.

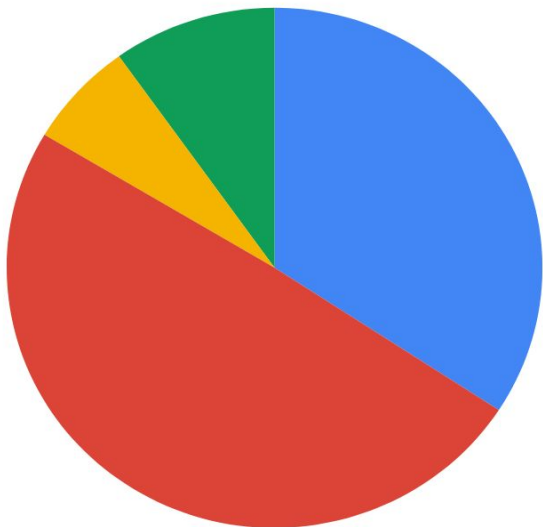
- Available to all CC users - [Rapid Access Service](#) (RAS).
- Any researcher / student at a Canadian institution can become a Compute Canada user.
 - No application required beyond request for an account:
https://ccdb.computecanada.ca/account_application

Allocations in Western Canada

In 2019, 152 projects were based in Western Canada.

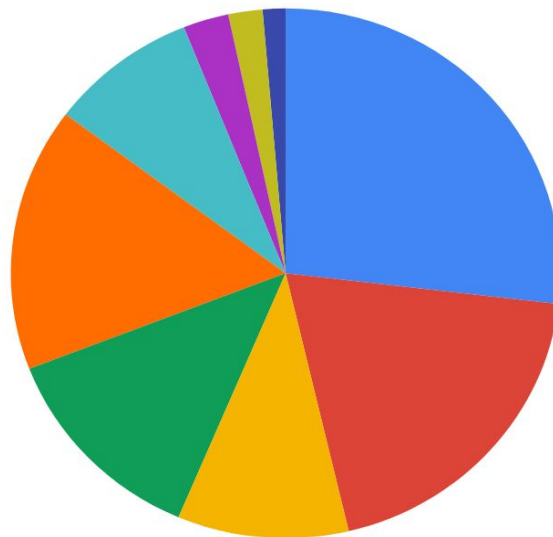
Number of 2019 RAC Awards by Province

- AB
- BC
- MB
- SK



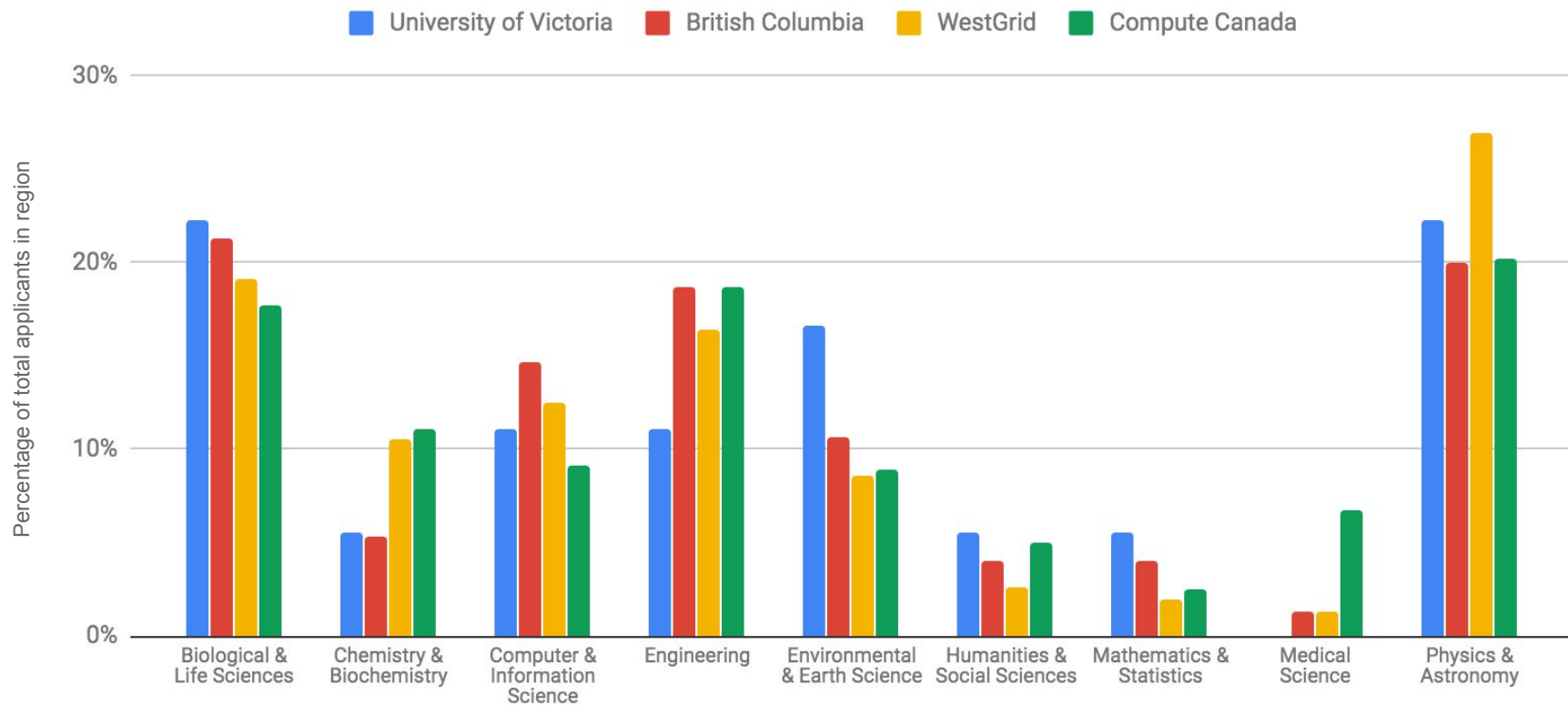
2019 RAC Projects in Western Canada by Research Area

- Physics & Astronomy
- Biological & Life Sciences
- Chemistry & Biochemistry
- Computer & Information Science
- Engineering
- Environmental & Earth Science
- Humanities
- Mathematics & Statistics
- Medical Science



Research area breakdowns (2019)

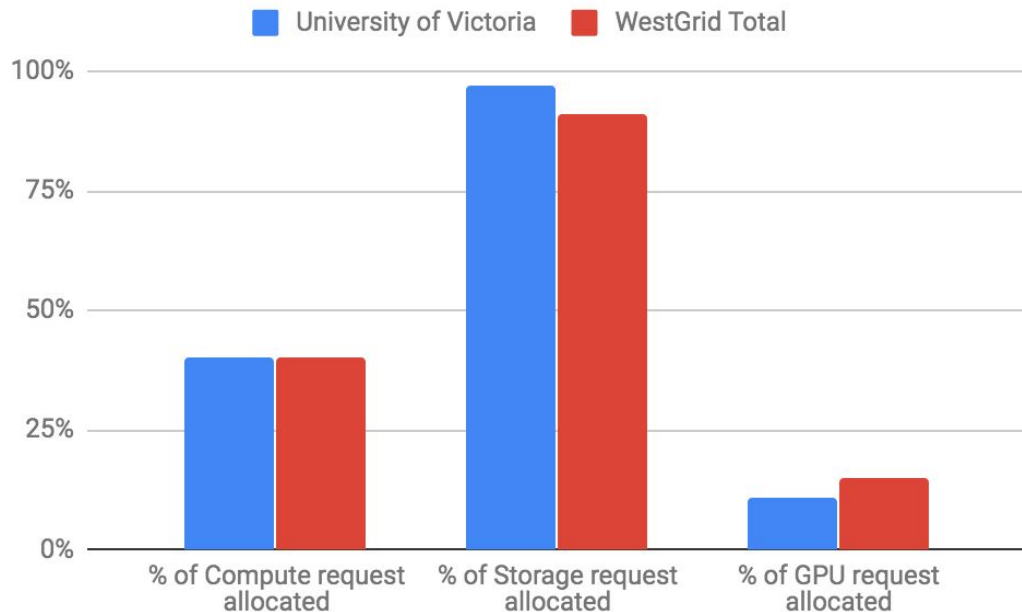
Research areas of applicants from UVic, BC, Western Canada & Compute Canada



Name	Department	Project Title
Arif Babul	Physics and Astronomy	Computing the Universe: Unified Modeling of Galaxies and Hot Diffuse Gas in Group and Cluster Environments
Ben Koop	Biology	Diversity of all Pacific salmon genomes
Benoît Pirene	Ocean Networks Canada	Ocean Networks Canada: A Science Support Facility
Caren Helbing	Biochemistry and Microbiology	Informatics on Sentinels of the Environment (INFO-SENSE)
Christoph Borchers	Biochemistry and Microbiology	Data and Cloud Resources for Proteomics
Falk Herwig	Physics and Astronomy	Large-scale three-dimensional simulations of stellar convection in massive stars throughout their evolution and cosmic times
Francis Zwiers	Pacific Climate Impacts Consortium	Portals for High Volume Climate Data and Services Delivery <i>and</i> Hydro-climate Projections for British Columbia, Canada
Irina Paci	Chemistry	Fabrication and properties of complex materials
Julio Navarro	Physics and Astronomy	UVic ARC Computing: From planets to stars to galaxies to cosmology
Kwang Moo Yi	Computer Science	Interpretable Deep Systems for Computer Vision, Astronomy, and Biomedical Imaging
Michael Eby	School of Earth and Ocean Sciences	Constraining carbon cycle processes over the last glacial cycle
Peter Oshkai	Mechanical Engineering	Green Technologies for Canadian Marine Applications
Ralph Evins	department of civil engineering	BESOS
Randy Sobie	Physics	Belle II Experiment at the KEK Laboratory
Raymond Siemens	English	Digital Social Scholarship Incubator (DSSI), 2019-2021
Xuekui Zhang	Mathematics and Statistics	Development of Novel Statistical Methods and software in Complex Genomics Data
Yvonne Coady	Computer Science	Virtual worlds for data analytics

RAC 2019 allocations

In 2019, recipients at UVic received **40% of total compute requested, 98% of total storage requested, and 11% of GPUs requested.**



Nationally, RAC 2019 recipients across the country received on average:



40% of CPU requests
(Legacy system retirements in 2018-19 resulted in decreased supply for 2019 allocations.)



75% of storage requests
(Legacy system retirements in 2018-19 resulted in decreased supply for 2019 allocations.)



20% of GPU requests
(Requests for GPUs have increased 4-fold since first becoming available in 2015.)

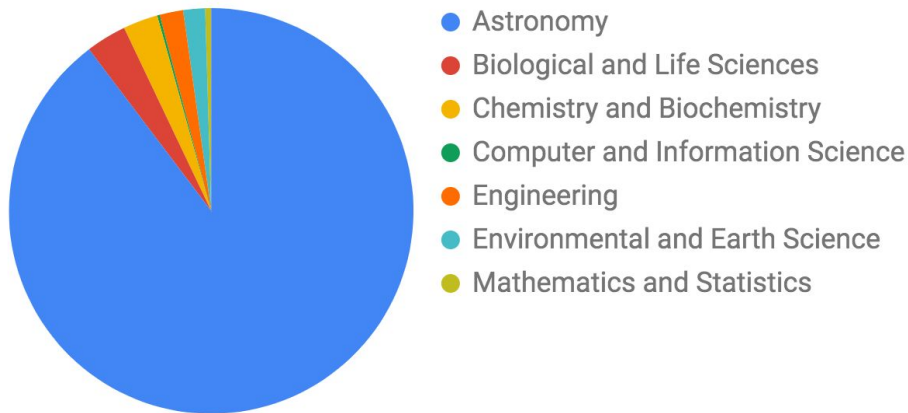
RAC 2019 allocation values

Total value of allocations at UVic:
\$1.8 million

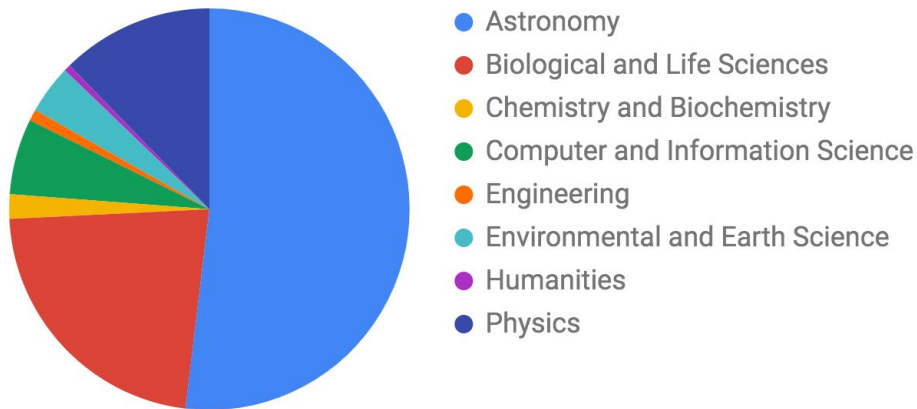
(43% of total value in BC)

Total value of allocations across BC
(UVic, SFU, UBC): **\$4.3 million**
(41% of total value in Western Canada)

Total Compute Allocation (core years) by research area



Total storage allocation (TB) by research area



UVic RAC 2019 Results

Applications received	18	11.8% of WG total (UBC had 40!)
Number of successful applications	18	100% success rate!
RRG applications received	8	WG: 126
RRG Fast Track	4	WG: 59
RPP applications received or continuing	6	WG: 31
Average science score out of 5	3.53	WG average: 3.4, Range: 1.9->4.8
Average CPU scaling	33%	WG average: 36%
CPU allocations	10,470 CY	18.3% of WG total
GPU allocation	15 GY	WG: 538
Storage Allocation	4.065 PB	13.8% of WG total (29 PB)

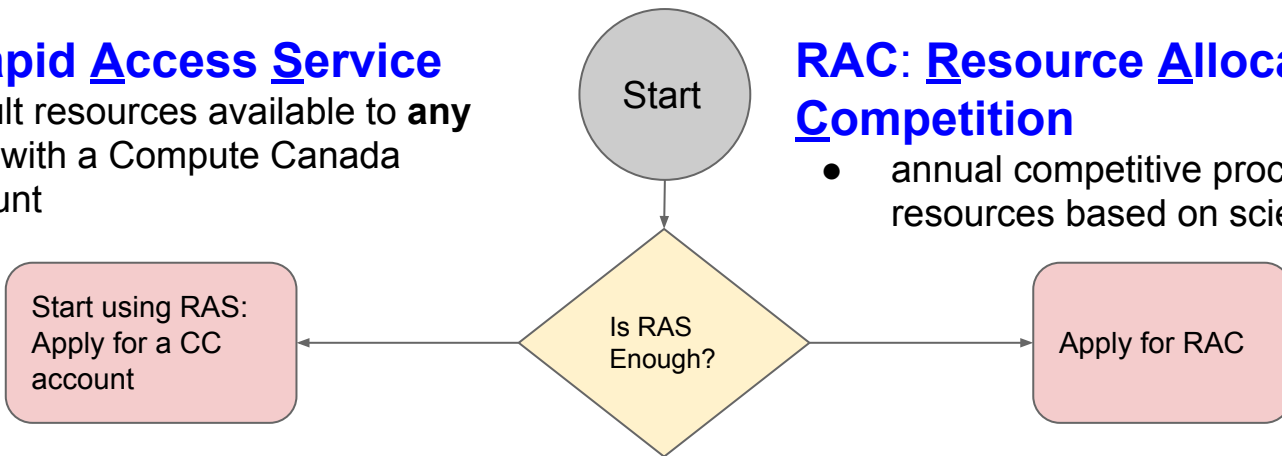
RAS vs RAC - What do you need?

RAS: Rapid Access Service

- default resources available to **any user** with a Compute Canada account

RAC: Resource Allocation Competition

- annual competitive process to allocate resources based on scientific excellence



Service	Max RAS
Compute	50 Core Years
Storage	10 TB
GPU	10 GPU years
Cloud Compute	80 vCPUs
Cloud Persistent	10 vCPUs
Cloud (block) storage	1 TB

RAS and Default Details

Resource	Default (Automatic)	RAS (by request)	Comment
CPU	Opportunistic		At each site
GPU	Opportunistic		At each site
/project storage	1 TB	Up to 10 TB per group	At each site
/nearline storage	None	Up to 10 TB per group	At each site
Cloud storage	None	Up to 10 TB	See Cloud RAS Allocations
Cloud compute	None	Up to 80 vCPU	
Cloud persistent	None	Up to 10 vCPU	

Competitions: RRG and RPP

RAC is broken into two competitions:

<u>Research Platforms and Portals Competition</u>	RPP	Scientific gateways <ul style="list-style-type: none">• Provide service to a community of users• Datasets and Toolsets• Generally in the cloud (may include compute)• Multi-year
<u>Resources for Research Groups Competition</u>	RRG	Classic HPC with jobs submitted to the big clusters. <ul style="list-style-type: none">• Jobs submitted through a scheduler. May also ask for cloud resources <ul style="list-style-type: none">• Special purpose only. Annual <ul style="list-style-type: none">• Fast-track for year-to-year continuity.

Priorities and Allocations

Our usual warning: we translate a compute allocation into a **scheduling priority**. This priority is defined such that on average with continuous job submission a user will be able to use their allocation over the year.

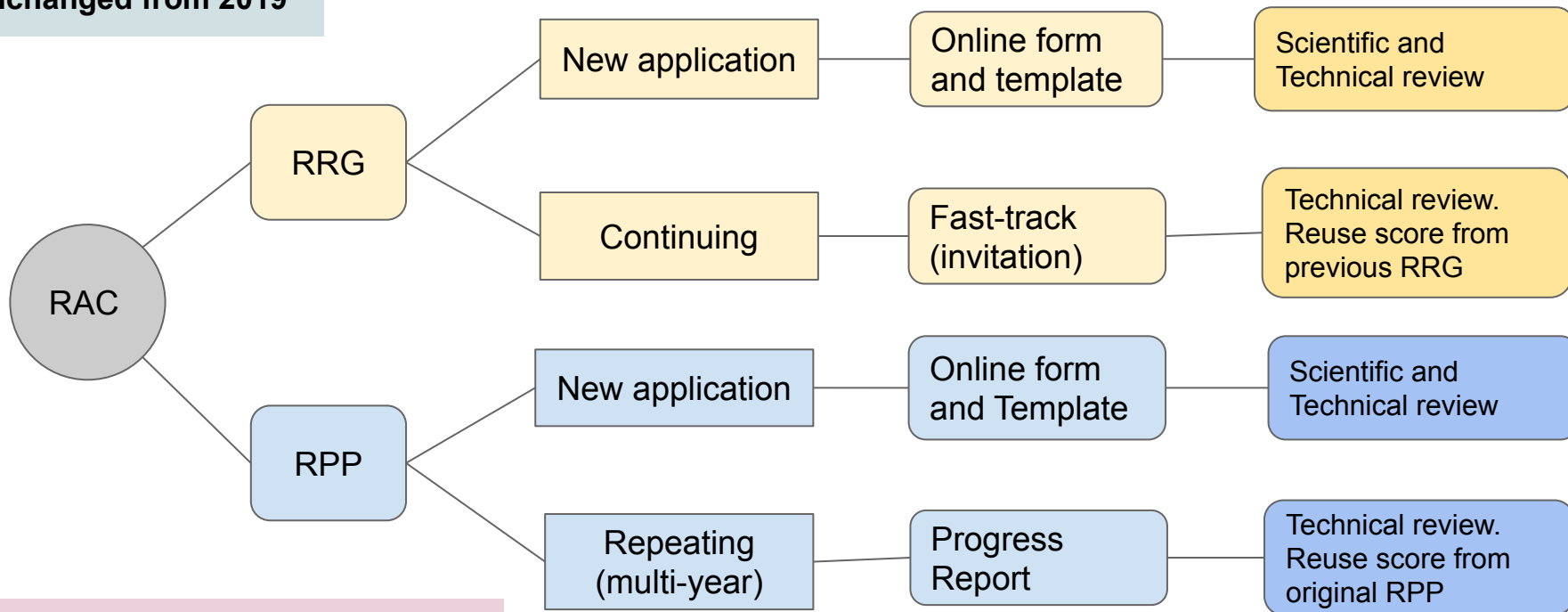
- Intermittent use will result in approximately pro-rated total usage.
- Allocations do not accumulate. Priority stays the same. **If you don't use it you lose it!**

RAS (default) compute is **not an allocation**. Priorities are evenly distributed across the resources remaining after RAC, so use is opportunistic.

- Jobs will run in the “holes”.
- Small, short jobs!
- There are few holes for long or large jobs.

RAC 2020 Structure

Unchanged from 2019



RRG: Resources for Research Groups.
RPP: Research Platforms and Portals.

2020 RAC Key Dates

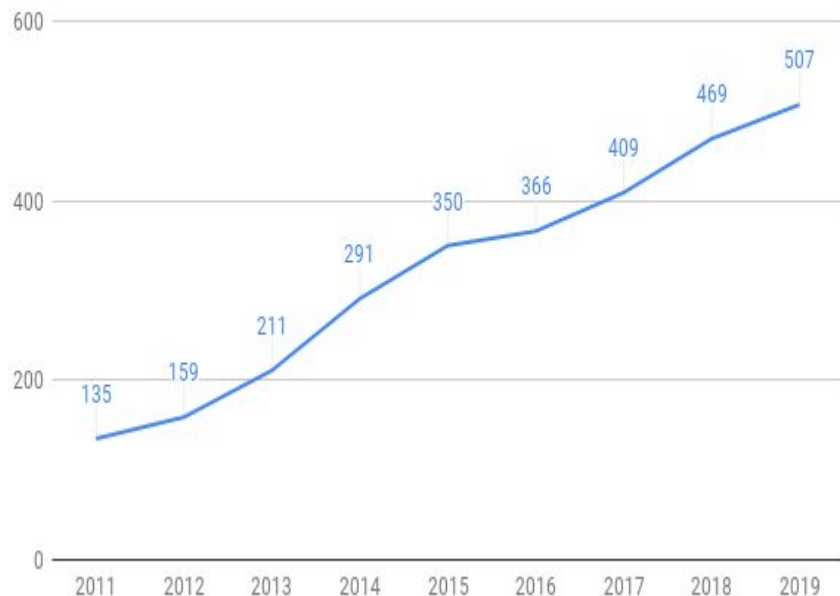
	Start	Finish
Fast Track submission (Invitations sent before Sept.24)	Sep 24, 2019 NOW OPEN!!	Oct 24, 2019
RRG & RPP full application submission	Sep 24, 2019 NOW OPEN!!	Nov 7, 2019** 11:59 PM EST
RPP Progress Report submission*	November 2019	Jan 30, 2019*
Award letters sent*	Mid Mar 2019	Late Mar 2019
RAC 2020 Allocations implemented*	Mid Apr 2019	

** Final dates to be confirmed.*

**** No appeal process!**

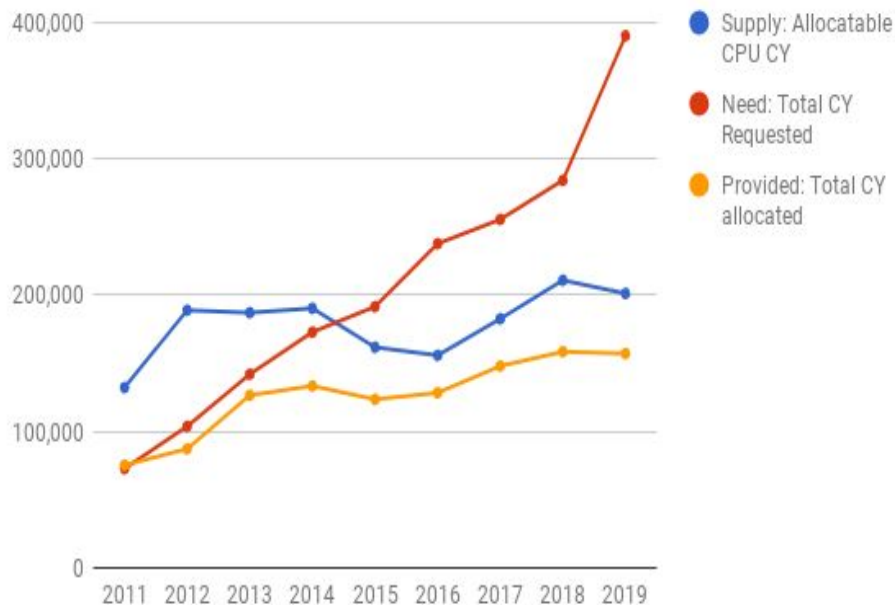
Under Pressure

Applications submitted to the RAC



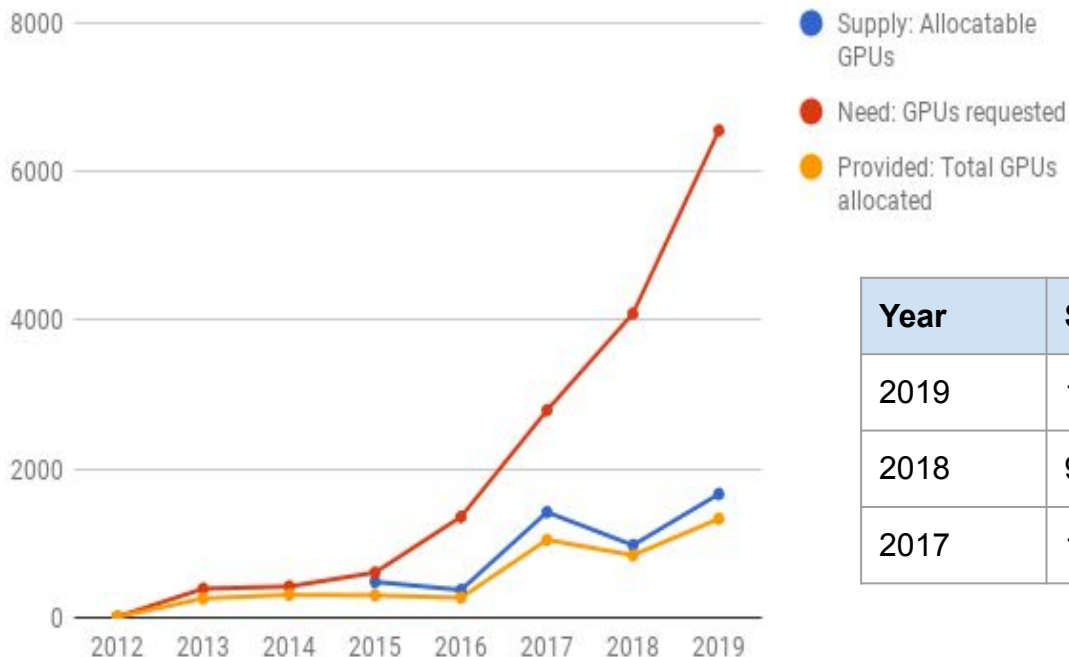
[RAC 2019 Results](#)

CPU Allocation Trends



About 24% year on year increase in amount.

GPU Allocation Trends



GPUs are in very high demand.

The new funding will allow for significant increases, but the demand is rocketing up!

Year	Supply	Need	Allocated	
2019	1,644	6,555	1,331	20.3%
2018	976	4,092	840	20.5%
2017	1,420	2,790	1,047	37.5%

GPUs and Machine Learning

- **Major increase in GPU asks!**
 - Machine Learning is the major use
 - Increasing demand for production training
 - So expect demand to increase, possibly drastically.
- Cedar and Graham have NVidia P100's, Béluga has V100's

GPU requests will require very strong justifications.

Good news!

Compute Canada's request last year for "Transition Funding" was successful!

- CC made a case for transition funding between now and the "new organization" (2022)
- March 2018 - announcement made for a \$572M investment for Digital Research Infrastructure

The Ministry of Innovation, Science and Economic Development Canada (ISED) has [announced](#) that it will **"Invest \$50 million in the immediate expansion of Advanced Research Computing (ARC) capacity at up to five existing national ARC host sites"**.

Compute Canada has been working with ISED and expects substantial new resources to be installed in the next six months, hopefully available for the RAC 2020 year. Details have not been announced yet, so keep an eye on the Compute Canada website.

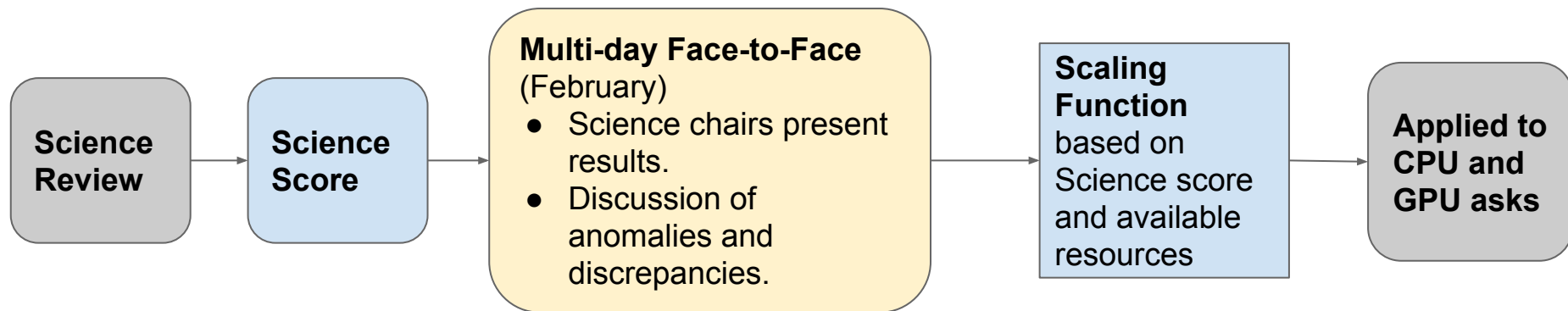
RAC 2020 Resources

System	Cores	GPUs	Storage	
Cedar (GP)	58,416	584	13 PB	NVidia P100 GPUs
Graham (GP)	33,472	320	12 PB	NVidia P100 GPUs
Béluga (GP)	34,880	688	2.6 PB	NVidia V100 GPUs
Niagara (LP)	60,000	0	2 PB	RAS requires a request.
Arbutus (cloud)	9,048	0	5.7 PB	Default requires a request. Physical cores. Generally hyperthreaded.
GP Cloud partitions				Cloud partitions are available on GP systems for special purposes.

Prediction (including \$50M): **we'll have roughly 70% of CPU ask and 40% of GPU asks!**
Very competitive!

Scaling is applied to CPU and GPU requests.

- Not applied to persistent Cloud requests (web servers, database servers, ...)
- Not applied to storage



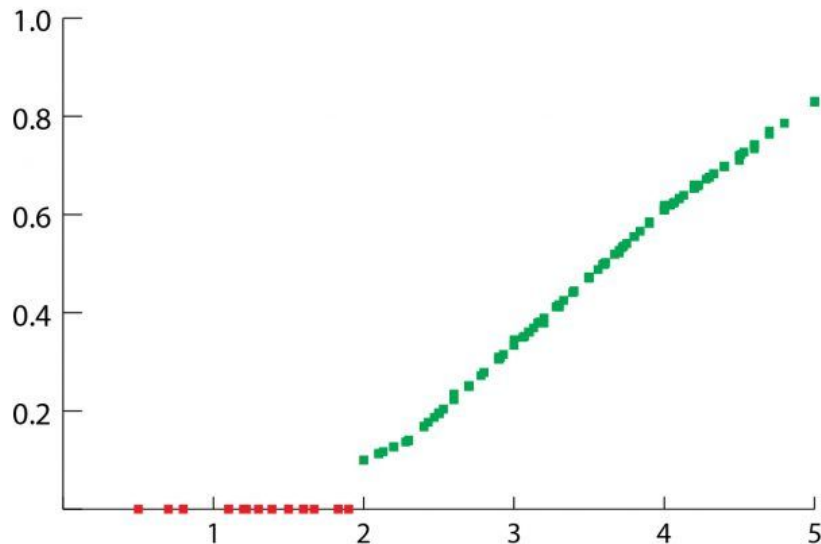
RAC 2018	Scaling dependent only on science score. <ul style="list-style-type: none">• Cutoff was at score of 2.0 (of 5)• Top score (4.8) received ~ 83% of compute ask• Bottom score (2.0) received ~ 10% of compute ask
RAC 2019	Researchers and Reviewers: Large requests should be scaled down. <ul style="list-style-type: none">• So a 2 dimensional scoring function.• Cutoff was a science score of 2.3

$$\zeta(s, A) = \xi(s, A)[\beta + (1 - \beta) \exp(-\alpha A)]$$

A = ask
s = score
 $\xi(s)$ = base scaling
 $\alpha = 0.01$
 $\beta = 0.73$

- CFI mandates allocations based on excellence
- Peer-review process to determine SCIENCE SCORE
- High Score = Less Scaling

CPU Scaling for RAC 2018



*** Scaling is required due to insufficient resources, which makes the RAC
a very competitive process.***

If you are reasonably happy with your 2019 allocation, then Fast Track preferred. Very straightforward and requires no further work on your part!

- Invitations sent mid-September
- **Fast Track applications cannot be delegated:** Pls must complete the application themselves.
- Proposals with **score < 2.5** from previous year have not been invited.
 - That was really too low to get anything reasonable so we recommend a proposal re-write.

Fast Track Process: Score from previous year is inserted into this year's scaling and allocation decisions.

- **No guarantee that your allocation will remain the same.**
(But generally it's pretty similar)

Out-of-Round & Early-Stage

New faculty can apply for an **Out-of-Round** And support for major breakthroughs

- **Up to April 30 only** (last year it was July 30)
- Send request to rac@computeCanada.ca
- A full RAC process, includes science reviewers. Responses can be a month or more depending on availability of reviewers.

Most resources are already allocated, so generally we can only respond to smaller asks.

Large asks must be well-justified.

Use the RAS for tests and prototypes

1. Early-stage or new users get an account and learn about the systems.
2. Run prototypes or test jobs, and if possible production jobs
3. Acquire performance statistics
4. Predict future requirements
5. Create a well-justified RAC application. (out-of-round or regular)

RAC 2020 Changes

RPP and RRG Evaluation Criteria	The scores are now on a 5-point decimal scale with a new set of categories and descriptions. Stronger focus on management and necessary expertise.
Management plan	Focussing on the capabilities of the team. Governance for larger teams and projects.
No explicit HQP section	This has been integrated into the management plan.
Decreased page limits	Generally 10 pages (decreased from 12)

RAC Details

Page Limits, PDF, 2nd Contact

Page limits are enforced

PDF only

Secondary Contact Person

PI's are encouraged to appoint a secondary contact person so that important communications don't go astray.

"I don't understand why, but it seems necessary to continuously emphasize to applicants to closely follow the instructions, including page limits (people ignore this!) and the necessary components."

RPP Focus on Gateways

The Research Platforms and Portals (RPP) Competition enables communities to develop research projects that improve access to shared datasets, enhance existing online research tools and facilities, or advance national or international research collaborations.

Note: Emphasis is on **creating scientific gateways which provide services to a community** of users. Compute Canada will no longer entertain RPP requests for pure compute or storage.

Pure compute and storage requests must now be in the RRG competition. Continuing **multi-year asks should make use of the fast-track process.**

Process

1. Notices sent in November, with reports due in January.
2. Progress report is reviewed by Compute Canada staff.
3. Science score of the original RPP application is inserted into the normal allocation process, together with any requested updates to the original resource request.
4. **All new and continuing platforms and portals are then allocated through the normal process.**
 - a. The current year's scaling is applied!
 - b. **So no guarantee of an allocation identical to the previous year.**

CC strives to keep the allocations consistent from year-to-year

IMPORTANT: If the RPP annual report is not received by the deadline, *then the allocation for the current year will be left to expire and not renewed.*

Not supposed to be particularly lengthy

- Compute Canada wants to see evidence of uptake by the community of users.

New Development Projects

1. Creation of the development team.
2. Development effort with prototypes in operation.
3. Identification of issues & challenges encountered, and plans for mitigation including revisions to the project plan and schedule.
4. Evidence of uptake: (number of hits, number of users, number of downloads/uploads, etc.)

Continuing Projects

1. Evidence of continuing usage: (# of hits, # of users, total downloads/uploads, storage utilization, etc.)
2. Evidence of marketing effort.
3. User breakdown between Canadian and international users.
4. Research outcomes associated with the platform (ex. # of papers acknowledging / citing the gateway).
5. Usage (compute, storage, and cloud) within 50% of the predicted estimates. Usage below this limit may result in a prorated cut to the next year's allocation.
6. Expected changes in support levels from CC. Requests for increases in CC support must be justified.

Tips & Best Practices

No Appeal Process

There is no appeal process.

If the reviewers misunderstand a proposal (which does happen) there is no way of correcting or amplifying the proposal.

Need to get it right the first time.

- Science reviewers are experts in their discipline, BUT - not necessarily experts in the specific sub-discipline or area of any particular project.
 - For details see list of committees and chairs on [CC RAC pages](#)
- Very wide range of RAC proposals do not allow for area experts. **You cannot assume that your proposal is going to be read by someone who works directly in the area or field of the project.**

Avoid lots of detailed jargon.

Write for a discipline expert, but not for the specific area.

Use the Templates!

We strongly recommend that PIs use the templates.

- [RRG Application Template](#)
- [RPP Application Template](#)

Summaries and details are in the following sections.

Always mentioned by reviewers.
Certainly feel free to customize within the templates, but follow the overall structure.

Justify your Request

- Address the ***evaluation criteria*** (details to follow)
- Provide details on ***significance*** and ***impact of research***.
- Citation rates of recent work help justify science.
- Justify why/how the resources will be used to accomplish/support the science.
- Poor proposals generally do not provide sufficient information, or have mixed technical requirements into the research justification.
 - Very difficult to decipher for both science and technical reviewers, and results in poor scores.

“Please improve motivation of why the proposed calculations are important, and what is to be learned and/or what other science depends on the results.”

Avoid ‘over asks’

*“People **should not over ask** to compensate for scaling as the committee is smart enough to know what is a reasonable ask for various types of calculations and applicants do not want to be penalized. The ask should fit with both the calculations to be done and the size of the research group.”*

*“Requests that were **obviously too large** - especially for new groups, or those trying to run new models, etc, or with newly starting students - in all cases, we know there is significant overhead in getting things working, starting students will take courses, etc., - so don't make it seem like you will be doing full production runs from day 1”*

- Not much to add to the comments!
- There have been very large asks which upon examination are really not very well justified. Committees have made recommendations for drastic cuts.
- Committees are aware of issues with applicants trying to game the system.

Provide Adequate Details

Clearly explain **WHAT** the science is, using specific details.

- **Use tables** to provide resource details by project
- If it is difficult to predict usage then emphasize the areas of uncertainty.

Project	Team Members	Estimated Core-Years	/project Storage	Memory/ core	Comments
Project 1	Student X	10,000	100TB	4 GB	...
Project 2	Students Y, Z	5,000	50TB	32 GB	...
Totals:		15,000	150TB		

“The technical justification did not show a calculation of the computing and storage needs. Providing a table with this information, as suggested in the guidelines, would have made this section stronger.”

Provide ALL the information asked for, but ONLY what is asked for.

- **Use the templates!**
- Answer the specific questions and provide only those details requested.
- Do not re-use submissions from other proposals or competitions.
 - **RAC focusses on research computing.** Most other proposals are looking for funding!
 - Students and Postdocs can write sections (they are the experts) but the overall proposal needs an experienced, guiding hand.
- Be clear, avoid jargon - reviewers are not experts in all sub-domains.
- Take time to edit and review the application before submitting it.

“The proposal is very long. The very detailed scientific justification is more reminiscent of a NSERC proposal. For next year, I recommend to shorten the science part, and to work out more clearly the purpose of the CC usage, and the results that will be enabled by the CC Allocation.”

Canadian Common CV (CCV)

Keep your CCV up to date!

1. CCV is used by the review committees - quality of the PI and his/her research.
Keep your bibliography up-to-date to ensure that reviewers are aware of the latest (and greatest!) work.
 2. CC relies on the CCV for bibliographic analyses used both for annual reporting, and for funding proposals.
The Field Weighted Citation Index (FWCI) is a key component of the metrics presented by CC.
- Required for RRG and RPP full applications (update not required for Fast Tracks or progress reports).
 - [CCV Submission Guide](#)

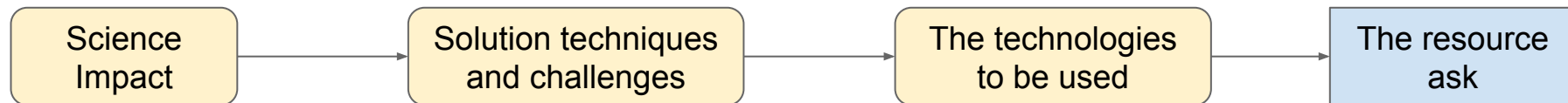
"It is critical also to update the information on the CCV. (...) emphasize that this shows their contributions and gives weight to their proposal and that the expertise exist in order to succeed. Several times this year we saw CCVs that were inconsistent with what we know about applicants, but we have to go with what is submitted. This includes up to date publications and grants. Sometimes we have seen CCVs that are over a year old. This also simply does not look good to the reviewers."

"Progress over the past year is missing. Based on the CCV, most of the group's publications were enabled through Compute Canada resources, so that information should have been accessible and would have been relevant to include."

"We often missed full CVs of PIs and co-PIs, making it difficult to evaluate the PIs past contributions"

There should be a thread or narrative used to present a well-connected and justified story.

This has been emphasized by reviewers!



The team (HQP, RPP management, ..) supports the science, the technologies and the ask.

Discrepancies in the Asks

Very important: Ensure there are NO discrepancies between the resources requested in your technical justification document and the online application.

The application form takes precedence.

- Seems to happen a number of times every year.
- Requests on the form are not consistent with the technical justification.
- The form values are inserted automatically in the master spreadsheet.
 - The master spreadsheet is the basis for the rest of the process!
- Be careful - we have missed or mistaken the resource requests in the past.

Resources for Research Groups

- Aimed at job-based use of the big clusters.
- Simple cloud asks are also available.

Emphasis

1. **Quality of Science (60%)**
 - a. includes impact & technical justification
2. **Quality of the Team (40%)**
 - a. reputation, publishing record, expertise

RRG Evaluation Criteria

Merit of the Proposal	60%	Research Plan <ul style="list-style-type: none">Well-defined and clear research problem, with importance and benefits clearly evident.Well-defined and clear goals“Ambitious”, “feasible”, “ground-breaking” Methodology <ul style="list-style-type: none">Appropriate tools and methods. Outcomes <ul style="list-style-type: none">Clearly outlines the expected outcomes and objectives.Clearly describes the relevance and impact. Resource Justification <ul style="list-style-type: none">Well-justified resource requests.Reasonable to achieve the project objectives.Strategy for effective use is outlined in the management plan.
Quality of the Team	40%	Combined expertise of the Team as a whole <ul style="list-style-type: none">Includes PI, Co-PI(s) and HQP. Research and Computational Expertise <ul style="list-style-type: none">Expertise is sufficient to deliver the project. Management Plan (NEW) <ul style="list-style-type: none">A “solid” management structure, Roles and responsibilities are clearly identified.

RRG Template - Outline

	Section	Description
1	Research Plan	Outline the research problem for which Compute Canada resources are being requested. Its importance/relevance as well as your general objectives.
2	Progress over last year	Highlight any notable RAC-enabled research. <i>In addition to CCV.</i> <ul style="list-style-type: none">• <i>opportunity to highlight any particular contributions, and also to add anything new</i>
3	Methodology	Describe the tools, methods, and approaches.
4	Expected Outcomes	Outcomes and impacts. If possible, also include performance or success metrics.
5	Resource Justification (See below for details!)	This section addresses the technical details of your computational and/or storage needs.
6	Computational expertise of the team	A simple table for the required expertise and the related resource providers.
7	Management Plan (new)	A table showing the team members with their positions and resource requirements. Extra information as applicable showing the relationship between sub-projects, team leads, resource use, etc.

Description of the science, methodology and solution techniques.

“[Lacked an] explanation of the big picture science and why it is important”

“Made clear the objectives and big picture science questions, even for non-specialists in their sub-genre”

“Both the science and the details (at appropriate level) are important - make sure they are both there and balanced”

Progress over the Last Year

Most projects are continuing. So important to emphasize progress:

- Conferences
- Papers
- Theses
- Breakthroughs
- Solution of particularly difficult programming or operational problems.
- Nobel prizes
- ...

This is a great opportunity to highlight important progress during the previous year.

“Progress over the past year was not mentioned. This is key for sure and goes along with what I said above about having an up-to-date CV. It is critical to show the group has the expertise and status in the field to achieve the research goals.”

The usual table(s) describing the proposed methods and tools/applications/..

Hard to find the right balance: not too technical, but enough for the reviewers to understand the basics.

Comments about the suitability of the methods are always good. We want to ensure you know what you're doing, and have put some thought into choosing good, efficient approaches.

Provide details of the numerical and computational techniques used.

- Describe the **numerical and computational techniques**. Expect reviewers to be computationally literate, but not experts in your particular field.
- Explain the way these techniques will **address the science and the challenges**.
- Explain any development of **new or revised approaches**.
- Provide details of any **software packages** required.
- Show that team members are **experienced and familiar** with the performance characteristics of such packages.
 - If the packages are new to the research team then describe the approach for **familiarization**. If possible describe any tests that the team may undertake.

Expected Outcomes

Outcomes and Impacts.

As usual table(s) are a nice clean way of providing this kind of information.

Actual measurable performance or success metrics are useful, but probably more germane to platforms and portals.

Outcome	Comments
Prototype sample analysis pipeline	Sample ingestion to mass spec and chromatography. Results stored and translated to standard format. Application of analysis module Identification of biomarkers.
ML analysis	Develop ML analysis module from above results.
Thesis defence	Jane Doe thesis built on the ML analysis scheduled for completion.
...	

Resource Justification

A critical section!

Carefully justify the resource ask.

Template breaks this down:

5.1 Summary

5.2 Compute

5.3 Storage

Details in following slides

Resource Justification Subtopics

5.1 Resource Request Summary	The usual table summarizing each resource (CPU, GPU, Storage, ..) Ensure it's consistent with the CCDB forms. Nice to include a column with short comments explaining the need.
5.2 Compute Requests	5.2.1 System Selection 5.2.2 Code and Application Details 5.2.3 Code Performance and Utilization 5.2.4 Memory requirements 5.2.5 Size of request
5.3 Storage requests	5.3.1 Details 5.3.2 Performance and Utilization 5.3.3 Size of request

Some room for customization to highlight the particular requirements of your project.

Resource Justification

Explain the projects being worked on and the required resources.

- Tabulate the number and size of the needed runs/jobs/virtual machines
- Again **tables** and breakdowns really add to the proposal.
 - Sub-tasks or sub-projects, phases, team members, ..
- If it is difficult to predict usage then emphasize the areas of uncertainty.
 - early research issues where details are still to be worked out
 - administrative issues like onboarding graduate students or postdocs who have not yet worked out a detailed research plan.

“Clear use of tables, that linked people/projects and computational needs”

“Clear explanations of computational needs and costs, with details, yet not getting bogged down in the very (too) technical”

Performance Estimates

Provide performance estimates.

- RAS - default resources are available for testing and prototyping.
- Performance tables really help the reviewers, and make the proposal look good!
- Particularly important for applications which are scaling up.
 - Parallel performance? Scaling graphs for test runs? ...
- Don't forget storage
 - **Lots of i/o is always an issue in HPC:** the shared filesystems are high performance but it's never enough.
 - Scratch is fast, but local disks are faster (and more difficult to distribute)

Resource Justification: Storage

Table of storage types and justifications. Projects can be very unique so feel free to customize, but keep the table format if all possible. Can add amplifying comments afterwards as necessary.

Use	Type	Amount	Need
Database	/project	100 TB	Needs to be online for access by continuing analysis jobs
Generated results	/project	10 TB	Online cache for application of machine learning training. Training jobs cycle through as data is produced.
Long-term (Tape)	/nearline	200 TB	Offline for archived storage of all generated results.

Performance details show expertise and familiarity:

- Bandwidth, IOPS.
- Very large numbers of files or particularly impressive i/o requirements (*talk to CC support!*)

Special considerations can also be helpful:

- Bursty or particularly variable use.
- Special backup, security or availability requirements (*talk to CC support!*)

Expertise of the Team

This is a new section for 2020. Something like:

Expertise	Description of Providers
Machine Learning	New Postdoc position currently being advertised
Parallel programming for CFD finite element methods	3rd year PhD student developing FEM codes.
Job submission optimization for large groups of jobs	Provided by regional experts
...	...

The idea is to show a reasonable, mid-level breakdown of the **expertise required**, showing a clear understanding of the **project requirements and a plan for sufficient staffing**.

- Expertise providers may include external resources like the local IT services, or departmental staff.

Note: The Management Plan (next section), should include a more detailed breakdown that describes each team member, their contribution to the project, and the related resource requirements.

Management Plan

Name	Position	Core-years	GPU years	/project
Jane Smith	Post-doc, Machine Learning and Tensorflow	1,000	10,000	100 TB
John Smith	Ph.D Student. CFD simulations	2,000	0	0
...				

For **complex projects**, it can be useful to include additional details, such as:

- Change Management approach
- Overview of a Governance model

Reviewers from RAC 2019 noted that “*proposals with multiple PIs that didn’t link the group members were a problem. Both the individual parts and the integration between parts of a project should be explained.*”

Research Platforms and Portals (RPP)

Cloud

WestGrid RPP Support

Reminder from previous slide: we have a small dev team who can help with RPPs. Feel free to contact us.



support@westgrid.ca

The Research Platforms and Portals (RPP) Competition enables **communities** to develop research projects that improve access to **shared datasets**, enhance existing online **research tools** and facilities, or advance national or international **research collaborations**.

There have been quite enthusiastic ideas with big asks, but in practice the user community is quite specialized and uptake is dependent on the user interfaces and the services offered. Such asks are critically reviewed and the allocation may be decreased.

In addition to being a useful gateway with a user community the project team must have the skills and ability to **develop, operate and manage the gateway**.

Pure compute and storage requests must now be in the RRG competition.
Continuing multi-year asks should make use of the fast-track process.

RPP Review Overview

1. Research community provided with datasets and toolsets.
 - a. what is the user community?
 - b. what is being provided?
2. Development and Management
 - a. Is the team capable of developing and managing a major platform/portal system in the cloud?
 - b. Are the requested resources reasonable for the predicted user community?

The current cloud resources are **IaaS** (“**Infrastructure as a Service**”) resources.
So it is completely up to the project team to design and implement a suitable architecture.

RPP Template

The [RPP Application Template \(Word\)](#) is quite comprehensive. Have a look!

1 Strategic Plan (40%)	Research problem and justification Goal, Alignment and Impact Use of the Platform/Portal Expected Outcomes Resource Justification
2 Management Plan (60%)	Quality of the Team Development and operations Management

NO specific HQP section this year

- Integrated with management plan

Strategic Plan (40%)

Research Problem and Justification	<ul style="list-style-type: none">• The research problem or need that the platform/portal will address is clearly presented.• The importance/relevance of the platform/portal for Canada is well justified.• The general objectives of the platform/portal are clear.
Goal, Alignment and Impact	<ul style="list-style-type: none">• The project goal is clearly stated and aligns with the goals of Compute Canada.• The research area of focus is of importance and will generate benefits to Canada.• The expected impacts have been clearly explained.
Use of the Platform/Portal	<ul style="list-style-type: none">• The applicant has clearly explained the added value from the creation of the proposed platform or portal for the identified communities.• Creation of the research platform/portal is being driven by the research community targeted.• If applicable – The application details the level of interaction between Canadian and international research groups.
Expected Outcomes	<ul style="list-style-type: none">• The application presents a clear timeline for the delivery of the anticipated outcomes over the entire duration of the requested allocation and has indicated the means by which they will be measured.• The outcomes presented are of relevance and importance, and will benefit the users of the platform/portal
Resource Justification	<ul style="list-style-type: none">• Tables detailing the components, their resource requirements and rationale.• Usually broken down into resource types (CPU, GPU, storage, cloud, ...)

Management Plan (60%)

Quality of the team	<ul style="list-style-type: none">• How will the teams be constituted (dev, operations and management)? Is there a plan to hire necessary staff?• Is there a governance structure? Where are responsibilities and reporting?
Development and operations of the Platform/Portal	<ul style="list-style-type: none">• What is the design of the portal (if it's a new project) and how will it be created?• If it's already in operation how is it doing? Any lessons learned that need to be addressed?• Lots of details to be addressed as necessary:<ul style="list-style-type: none">○ Data sharing, privacy and confidentiality○ user/group/project management○ resource management, ...○ Is the design scalable? What happens if the community grows?• How is performance being evaluated? Any metrics or KPI's.
Management of the Platform/Portal	<ul style="list-style-type: none">• How will the portal be managed? Resources need to be allocated to users/projects. Are there fair methods of providing access to the identified user community?• How will users be attracted? How will the portal be marketed?• How will users/projects be evaluated to ensure the portal supports excellent research.• The reporting framework presented will ensure information collected on the users of the portal will provide the ability to track impacts (scientific, HQP, social, etc.) and the participants are maximizing the benefits of the resources to meet the expected outcomes of the application.

We encourage phased plans, with for instance performance indicators showing a well-justified and strong understanding of the issues involved with not only technical development, but also governance, marketing and communications.

If possible define performance and success metrics. It's always useful to have a nice table defining your Key Performance Indicators (KPIs)

Especially startups - lots of large, enthusiastic but unjustified estimates.

- Start small.
- Briefly address marketing and communications.

Development plan

- Assembling the team, Development practices, Gantt chart, ...
- Architecture, including monitoring and reporting.

RPP Impact Best Practices

1. Identify the **audience/community**.
 - a. Who would be interested in using the proposed platform or portal?
 - b. Why are they interested?
 - c. Is the community national in scope? International?
2. What is the **size of the community**?
 - a. justify any such estimates.
3. What kinds of research would you expect the community to carry out?
 - a. examples of exciting projects that would make use of the portal/platform.
4. Are there any **agreements** in place that would put conditions on the request?
 - a. For instance the Atlas High-Energy physics project is part of the Large Hadron Collider collaboration, and must satisfy international agreements.

RPP Dev & Operations

1. Carefully describe the server architecture.
 - a. Feeds into the resources ask.
2. Describe any security/privacy concerns or requirements
 - a. steps that will be taken to satisfy such requirements.
3. Is the architecture scalable?
 - a. Refer to the size of the community to justify any scalability issues or plans.
4. Demonstrate the expertise and capability of your staff.
 - a. A portal or platform requires system management so identify the staff resources necessary to both develop and operationally manage your proposed system.
5. Special requirements?
 - a. Cloud or tape based backups
 - b. Particularly large memory requirements
 - c. Performance or response requirements
 - d. Redundancy and Reliability requirements. For instance multi-site architectures.
 - e. ...

- **Ask a question:**

- About RAC: rac@computecanada.ca
- About CCV: ccv@computecanada.ca

- **Find an answer:**

- [General RAC information](#)
- [RPP Guide](#)
- [RRG Guide](#)
- [Technical Glossary](#)
- [Frequently Asked Questions](#)
- [CCV Guide](#)

Contact us anytime:

support@westgrid.ca

www.westgrid.ca

docs.computecanada.ca

www.computecanada.ca

Questions?

GOOD LUCK!

Reminder: Open Discussion after
this

Open Discussion

- **Competitive scoring process**
 - Scaling function: Is this the right way to go? Maybe ranking is preferred.
- **Storage requests can't be scaled.**
 - How do we handle these?
- **What happens when a continuing project terminates**
 - PI moves to another job/country?
 - Project completes or is no longer making progress?
 - What do we do with the data?
- **Discrepancies between disciplinary review committees**
 - Should we move everyone to the average?
 - Digital humanities is still relatively small, so statistics are unreliable.
 - Some fields really have some outstanding PIs (Noble prize winners) which skew results.
- **Can we dump out-of-round? Very time-consuming.**
- **Annual full proposals are very time-consuming for PIs**
 - Current approach (RAC 2019: 3 year RPP's, and fast-track RRG's for almost everyone.
 - Is this reasonable?