Compute Canada’s Resource Allocation Competition 2021 (RAC 2021):
BEST PRACTICES

Patrick Mann, Director of Operations
WestGrid

https://westgrid.github.io/trainingMaterials/getting-started
1. Intro to WestGrid and Compute Canada
2. What is the RAC?
3. RAC Stats
4. RAC Overview and admin details
5. RAC Updates and changes
6. RAC Tips and best practices
7. RRG (first hour)
8. RPP (second hour)
9. Questions and discussion
Canada’s National ARC Platform

- Compute Canada Member institution
- Compute Canada national data centre host

Total users 15,994
National Host Sites

**Arbutus (University of Victoria)**
- OpenStack cloud computing
- 14,968 (456 nodes)
- 5.7 PB persistent Ceph storage
- 146,944 GB RAM

**Cedar (Simon Fraser University)**
- General purpose computing, multiple node types
- 94,528 CPU cores
- 14 petaflops peak performance
- 1,352 GPU devices
- 23 PB /project storage
WestGrid User Community: A snapshot

**Location**
- 54%
- 31%
- 8%
- 7%

**Research Area**
- Environmental and Earth Sciences: 8%
- Chemistry and Biochemistry: 10%
- Humanities, Social Sciences, and Business: 6%
- Physics and Astronomy: 15%
- Engineering, Math, and Computer Science: 35%
- Medical, Biological, and Life Sciences: 26%

**Position**
- Faculty: 37%
- Doctoral Student: 24%
- Master's Student: 12%
- Undergrad: 4%
- Researcher: 8%
- Postdoc: 9%

3282+ active roles (as of June 2020)
**WestGrid Training, Outreach & Support**

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 Online Autumn School</td>
<td>8 days, 8 different courses - focused on getting started / introductory topics.</td>
<td>Registration still open! <a href="https://autumnschool.netlify.app">https://autumnschool.netlify.app</a></td>
</tr>
<tr>
<td>2020 Online Summer School</td>
<td>May-July 2020: 300 registrants, 321 people on the waiting list, three repeat courses were open to everyone on the waitlist</td>
<td></td>
</tr>
<tr>
<td>Regional workshops (4-day series)</td>
<td>SFU (28ppl) in March 2020, UVic (35ppl) in December 2019</td>
<td></td>
</tr>
<tr>
<td>Community Town Halls</td>
<td>4 since January 2020</td>
<td></td>
</tr>
<tr>
<td>National Support</td>
<td>WestGrid: 19,434 tickets (Sep 1/2019 to Sep 1/2020), 35% of CC</td>
<td></td>
</tr>
</tbody>
</table>

**Questions?**
Want to host a training event at your institution?
training@westgrid.ca
[https://westgrid.github.io/trainingMaterials/courses](https://westgrid.github.io/trainingMaterials/courses)

**2019 Training**

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Attendees</th>
<th>Attendee-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-person events</td>
<td>37</td>
<td>537</td>
<td>2,104</td>
</tr>
<tr>
<td>Online events</td>
<td>52</td>
<td>1775</td>
<td>4,550</td>
</tr>
</tbody>
</table>
Resource Allocation Competition (RAC)

Overview
Changes from 2020
Resources for 2021

This presentation is a WestGrid-provided best practices guide for the Compute Canada Resource Allocation Competition (RAC). It does not replace the official RAC documents and PIs should carefully review the Compute Canada official documentation. In cases of conflict between these slides and the official RAC documents, the official RAC documents take precedence.
Resource Allocation Competitions (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.

~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
175 recipients from institutions based in Western Canada
(15% increase from 2019)
On average, in 2020 RAC recipients at WestGrid Member institutions received 41% of total Compute requested, 24% of GPUs requested and 95% of total storage requested.

Percentage of request amounts allocated in RAC 2020

On average across Canada, WG RAC projects received:
- 40% of total Compute ask
- 26% of total GPUs ask
- 86% of total Storage ask
Total value of WG allocations: **$11.8 million**
(32% of total value)

Total value of all allocations: **$32.6 million**

- 1 Core-year: $121.34
- 1 GPU-year: $2,435.89
- 1 TB project storage per year: $54.96
- 1 TB of nearline per year: $25.66
- 1 vCPU year: $80.93
- 1 TB Ceph (cloud) storage per year: $117.70
# WestGrid RAC 2020 Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>WG Applications received</td>
<td>186</td>
<td>32% of CCF total. CCF=590</td>
</tr>
<tr>
<td>Number of successful WG applications</td>
<td>181</td>
<td>97% success rate</td>
</tr>
<tr>
<td>WG RRG applications received</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>WG RRG Fast Track</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>RPP applications received or continuing</td>
<td>48</td>
<td>RPP 2018, RPP 2019, RPP 2020</td>
</tr>
<tr>
<td>Average science score out of 5</td>
<td>3.5</td>
<td>Range: 1.0-&gt;4.7. CCF average=3.5</td>
</tr>
<tr>
<td>Average CPU scaling</td>
<td>45%</td>
<td>CCF=45%</td>
</tr>
<tr>
<td>CPU allocations</td>
<td>62,366 CY</td>
<td>CCF=181,687</td>
</tr>
<tr>
<td>GPU allocation</td>
<td>669 GY</td>
<td>CCF=1,938</td>
</tr>
<tr>
<td>Storage Allocation</td>
<td>43 PB</td>
<td>CCF=100 PB</td>
</tr>
</tbody>
</table>
**RAS vs RAC - What do you need?**

**RAS: Rapid Access Service**
Default resources available to any user with a Compute Canada account

- **Start using RAS:** Apply for a CC account
- **Is RAS Enough?**
- **Apply for RAC**

**RAC: Resource Allocation Competition**
Annual competitive process to allocate resources based on scientific excellence

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### Compute Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Max RAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute</td>
<td>50 Core Years</td>
</tr>
<tr>
<td>Storage</td>
<td>10 TB</td>
</tr>
<tr>
<td>GPU</td>
<td>10 GPU years</td>
</tr>
</tbody>
</table>

### Cloud Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Max RAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute</td>
<td>80 vCPUs</td>
</tr>
<tr>
<td>Persistent</td>
<td>25 vCPUs</td>
</tr>
<tr>
<td>General (block) storage</td>
<td>10 TB</td>
</tr>
<tr>
<td>Shared filesystem storage</td>
<td>10 TB</td>
</tr>
<tr>
<td>Object storage</td>
<td>10 TB</td>
</tr>
</tbody>
</table>

**Use the RAS for tests and prototypes**
- Learn about the systems (early-stage / new users)
- Run prototypes/test jobs, and if possible production jobs
- Acquire performance statistics
- Predict future requirements
### RAS and Default Details

<table>
<thead>
<tr>
<th>Cluster Resource</th>
<th>Default (Automatic)</th>
<th>RAS (by request)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Opportunistic</td>
<td></td>
<td>At each site</td>
</tr>
<tr>
<td>GPU</td>
<td>Opportunistic</td>
<td></td>
<td>At each site</td>
</tr>
<tr>
<td>/project storage</td>
<td>1 TB</td>
<td>Up to 10 TB per group</td>
<td>At each site</td>
</tr>
<tr>
<td>/nearline storage</td>
<td>None</td>
<td>Up to 10 TB per group</td>
<td>At each site</td>
</tr>
</tbody>
</table>

See [Cloud RAS Allocations](#)
## Competitions: RRG and RPP

<table>
<thead>
<tr>
<th>Research Platforms and Portals Competition</th>
<th>RPP</th>
<th>Scientific gateways</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>● Provide service to a community of users</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Datasets and Toolsets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Generally in the cloud (may include compute)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Multi-year (up to 3 years)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources for Research Groups Competition</th>
<th>RRG</th>
<th>Classic HPC with jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>● Jobs submitted through a scheduler.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● May also ask for cloud resources.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Special purpose only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Annual - Fast-track for year-to-year continuity.</td>
</tr>
</tbody>
</table>

**Documentation & competition information:**
https://www.computecanada.ca/research-portal/
Go to “Accessing Resources” then “Resource Allocation Competitions”

**Recommendation:** Consult with support staff.
- support@westgrid.ca
- rac@computecanada.ca
- support@computecanada.ca
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. **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 remaining resources after RAC.
- Small, short jobs!
- Long or large jobs may wait in the queue for significant periods.

*Note:* Cloud (RPP) is different
RAC 2021 Structure

Unchanged from 2020

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

**RRG**
- New application
- Continuing

**RPP**
- New application
- Repeating (multi-year)

**Online form and Template**
- Scientific and Technical reviews.
- Fast-track (invitation)
- Reuse science score from previous RRG.
- Reuse science score from original RPP.

**Progress Report**
- Technical review.

**Scientific and Technical reviews.**
## 2021 RAC Key Dates

<table>
<thead>
<tr>
<th>Event</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Track submission</td>
<td>Sep 23, 2020</td>
<td>Oct 28, 2020</td>
</tr>
<tr>
<td>(Invitations sent before Sept.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRG &amp; RPP full application submission</td>
<td>Sep 23, 2020</td>
<td>Nov 5, 2020*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11:59 PM EST</td>
</tr>
<tr>
<td>RPP Progress Report submission*</td>
<td>Nov 10 2020</td>
<td>Dec 11, 2020</td>
</tr>
<tr>
<td>Award letters sent*</td>
<td></td>
<td>Mid Mar 2021</td>
</tr>
<tr>
<td>RAC 2020 Allocations implemented*</td>
<td></td>
<td>Mid Apr 2021</td>
</tr>
</tbody>
</table>

*No extensions or appeal process!

**IMPORTANT:** The program for special requests of ARC resources for COVID-19 research ends on **March 31, 2021**. If you received one of these allocations and you expect your need for resources will continue beyond April 2021, **you must submit an application to the 2021 Resource Allocation Competitions.**
2020 RAC had the highest number of applications in history: 590 projects 16% more than 2019!

For 2020, the RAC was able to award:
- 40% of total CPUs requested
- 86% of total storage requested
- 26% of total GPUs requested
- 99% of total virtual CPUs requested

2021 RAC will be another competitive year!
### System Resources

<table>
<thead>
<tr>
<th>System</th>
<th>Cores</th>
<th>GPUs</th>
<th>Storage</th>
<th>GPUs Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cedar (GP)</td>
<td>94,528</td>
<td>1,352</td>
<td>23 PB</td>
<td>NVidia P100, V100 GPUs</td>
</tr>
<tr>
<td>Graham (GP)</td>
<td>41,548</td>
<td>536</td>
<td>12 PB</td>
<td>NVidia P100, V100 and T4 GPUs</td>
</tr>
<tr>
<td>Béluga (GP)</td>
<td>34,880</td>
<td>688</td>
<td>2.6 PB</td>
<td>NVidia V100 GPUs</td>
</tr>
<tr>
<td>Niagara (LP)</td>
<td>80,640</td>
<td>0</td>
<td>2 PB</td>
<td>RAS requires a request.</td>
</tr>
<tr>
<td>Arbutus (cloud)</td>
<td>17,272</td>
<td>0</td>
<td>5.7 PB</td>
<td>Default requires a request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical cores. Generally hyperthreaded.</td>
</tr>
<tr>
<td><strong>GP Cloud partitions</strong></td>
<td>Cloud partitions are available on GP systems for special purposes.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Prediction:** we’ll have roughly 60% of CPU asks and 25% of GPU asks! Very competitive!
All applications submitted to the RAC are peer-reviewed and scored. The final RAC score is based on the following:

- the scientific excellence of the specific research project for which computational resources are being requested;
- the scientific and technical feasibility of the proposed research project;
- the appropriateness of the resources requested to achieve the project’s objectives;
- the likelihood that the resources requested will be efficiently used.

Every year a cutoff score is determined, below which no allocation is granted. 

For RAC 2020, the minimum overall score required to receive an allocation was 2.5/5
Scaling is applied to CPU and GPU requests.
- Not applied to persistent Cloud requests (web servers, database servers, …)
- Not applied to storage

Science Chairs Meeting (February)
- Disciplinary committee chairs present results.
- Discussion of anomalies and discrepancies.

Scaling Function based on Science score and available resources

Applied to CPU and GPU asks
<table>
<thead>
<tr>
<th>RAC 2019</th>
<th>Cutoff was a science score of 2.3/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAC 2020</td>
<td>Cutoff was a science score of 2.5/5</td>
</tr>
<tr>
<td>RAC 2021</td>
<td>Expect a slightly higher cutoff</td>
</tr>
</tbody>
</table>

*** Scaling is required due to insufficient resources, which makes the RAC a very competitive process.***
<table>
<thead>
<tr>
<th>RAC 2021 Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional resources</strong></td>
</tr>
<tr>
<td>Mix of GPUs: V100, T4, P100</td>
</tr>
<tr>
<td>Cloud services: Object storage and shared filesystem storage</td>
</tr>
<tr>
<td><strong>New science review committees</strong></td>
</tr>
<tr>
<td>Some committees have been split due to increased workload.</td>
</tr>
<tr>
<td><strong>RPP and RRG Evaluation Criteria</strong></td>
</tr>
<tr>
<td>Stronger focus on feasibility</td>
</tr>
<tr>
<td>● Efficient computational methods, methodology, expertise of team, resource justification, ..</td>
</tr>
<tr>
<td>Increased emphasis on funding sources</td>
</tr>
<tr>
<td>● Section in the templates for funding details.</td>
</tr>
<tr>
<td><strong>Decreased page limits</strong></td>
</tr>
<tr>
<td>Generally 8 pages (decreased from 10)</td>
</tr>
<tr>
<td><strong>No out-of-round</strong></td>
</tr>
<tr>
<td>RAS is the only avenue for non-RAC requests in 2021</td>
</tr>
</tbody>
</table>
## RAC 2021 Committees

<table>
<thead>
<tr>
<th>2021 committees</th>
<th>2020 committees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Astronomy, Astrophysics and Cosmology</td>
<td>1. Astronomy and Subatomic Physics</td>
</tr>
<tr>
<td>2. Bioinformatics</td>
<td>2. Bioinformatics, Neuroscience and Medical Imaging</td>
</tr>
<tr>
<td>3. Chemistry, Biochemistry and Biophysics</td>
<td>3. Engineering, Mathematical and Computer Sciences</td>
</tr>
<tr>
<td>5. Engineering</td>
<td>5. Environmental and Earth Sciences</td>
</tr>
<tr>
<td>6. Environmental and Earth Sciences</td>
<td>6. Humanities and Social Sciences</td>
</tr>
<tr>
<td>8. Nano, Materials and Condensed Matter</td>
<td></td>
</tr>
<tr>
<td>9. Neurosciences, Medical Imaging and Medical Physics</td>
<td></td>
</tr>
<tr>
<td>10. Subatomic Physics, Nuclear Physics and Space Physics</td>
<td></td>
</tr>
</tbody>
</table>

About 90 reviewers!
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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.”
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.
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 about the research goals and objectives.
● Justify how the resources will be used to accomplish or those goals & objectives.
● Citation rates of recent work help justify science.
  ○ There is a “References” section in the templates which does not count against the page limit.
● 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 is planned, using specific details.

- **Use tables** to provide resource details by project. There are lots of recommended examples in the templates!
- If it is difficult to predict usage then emphasize the areas of uncertainty.

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### RRG template: Section 5.1 Resource Request Summary

<table>
<thead>
<tr>
<th>Resource</th>
<th>Project 1</th>
<th>Project 2</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Members</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Core years</td>
<td>200</td>
<td>180</td>
<td>380</td>
</tr>
<tr>
<td>GPU years</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>…..</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>

Be consistent with the web forms!

“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 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.”
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).
- “Committee members must not impart, refer to or consider information about the applicants that does not appear in the application and the provided Canadian Common CV (CCV).”

“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!

Science Impact → Solution techniques and challenges → The technologies to be used → The resource ask

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.

- Quite a few of these last year!
- Forms and descriptions have been updated to (hopefully) make things more clear
- 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 (RRG)

Best Practices

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Resources for Research Groups

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

Criteria (Changed from RAC 2020)

1. Research Methods (70%)
   a. Outline, Outcomes, Methodology, & technical justification

2. Resource Management (30%)
   a. Funding, Capacity and expertise of the team, Management
<table>
<thead>
<tr>
<th>Research Methods</th>
<th>70%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Outline</strong></td>
<td></td>
</tr>
<tr>
<td>• Well-defined and clear research problem, with importance and benefits clearly evident.</td>
<td></td>
</tr>
<tr>
<td>• Well-defined and clear overall goals and objectives</td>
<td></td>
</tr>
<tr>
<td>• Well-defined and clear deliverables: aligned with the goals, and feasible.</td>
<td></td>
</tr>
<tr>
<td><strong>Expected Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>• Presents anticipated outcomes and the means by which they will be measured.</td>
<td></td>
</tr>
<tr>
<td>• Clearly describes the relevance and impact of the outputs and results.</td>
<td></td>
</tr>
<tr>
<td>• Likely to lead to advances in the research area.</td>
<td></td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td></td>
</tr>
<tr>
<td>• Appropriate tools, methods and approaches.</td>
<td></td>
</tr>
<tr>
<td><strong>Progress over Past Year</strong></td>
<td></td>
</tr>
<tr>
<td>• Evidence of progress with emphasis on utilization of CCF resources</td>
<td></td>
</tr>
<tr>
<td><strong>Resource Justification</strong></td>
<td></td>
</tr>
<tr>
<td>• Well-justified resource requests.</td>
<td></td>
</tr>
<tr>
<td>• Reasonable for achieving the project objectives.</td>
<td></td>
</tr>
<tr>
<td>• Estimates of number of runs (“experiments”) and approx request per run</td>
<td></td>
</tr>
<tr>
<td>Resource Management</td>
<td>30%</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Computational expertise of the Team</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Research and Computational Expertise</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **Management Strategy** |     | ● A “solid” management structure  
● Roles and responsibilities are clearly identified. |
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Research Outline (1 page)</td>
<td>Outline the research problem for which Compute Canada resources are being requested. Its importance/relevance as well as your general objectives.</td>
</tr>
<tr>
<td>2 Expected Outcomes</td>
<td>Outcomes and results, how they will support the objectives and lead to advances in the research area.</td>
</tr>
<tr>
<td>3 Methodology</td>
<td>Describe the tools, methods, and approaches.</td>
</tr>
<tr>
<td>4 Progress over past year</td>
<td>Outcomes and impacts. If possible, also include performance or success metrics. Highlight any notable RAC-enabled research. In addition to CCV.</td>
</tr>
<tr>
<td></td>
<td>● opportunity to highlight any particular contributions, and also to add anything new</td>
</tr>
<tr>
<td>5 Resource Request Justification</td>
<td>Technical details of your computational and/or storage needs.</td>
</tr>
<tr>
<td>6 Funding</td>
<td>Table listing funding sources.</td>
</tr>
<tr>
<td>7 Computational Expertise</td>
<td>A table of required expertises and the team members bringing suitable expertise.</td>
</tr>
<tr>
<td>8 Management strategy</td>
<td>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.</td>
</tr>
</tbody>
</table>
Description of the research problem.

- Previously this was a more comprehensive “Research Plan” but is now focussed on goals, objectives and deliverables

“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”
2. Expected Outcomes

Outcomes and Outputs.
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.*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype sample analysis pipeline</td>
<td>Sample ingestion to mass spec and chromatography. Results stored and translated to standard format. Application of analysis module Identification of biomarkers.</td>
</tr>
<tr>
<td>ML analysis</td>
<td>Develop ML analysis module from above results.</td>
</tr>
<tr>
<td>Thesis defence</td>
<td>Jane Doe thesis built on the ML analysis.</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
3. Methodology

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

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

½ page recommended, so not much room for details.

● A single table would be useful.

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.
4. 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.

- Criteria specifically mention use of CCF resources.

“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.”
## 5. Resource Request Justification

### The critical section!
Carefully justify the resource ask.

<table>
<thead>
<tr>
<th>5.1 Resource Request Summary</th>
<th>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.</th>
</tr>
</thead>
</table>
| 5.2 Compute Requests         | 5.2.1 System Selection  
5.2.2 Size of Compute Request  
5.2.3 Memory requirements  
5.2.4 Code Details  
5.2.5 Code Performance and Utilization |
| 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.

3 ½ pages
5.2.2. Compute Request

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"
### 5.2.2 Compute Request

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of jobs</th>
<th>Duration of job (hrs)</th>
<th>Cores per job</th>
<th>Memory per core (GB)</th>
<th>Total Core-Year Requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>10,000</td>
<td>22</td>
<td>8</td>
<td>2</td>
<td>200.78</td>
</tr>
<tr>
<td>Production</td>
<td>2</td>
<td>768</td>
<td>1024</td>
<td>8</td>
<td>179.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong> 380</td>
</tr>
</tbody>
</table>

- **Tough to estimate**, but hopefully you have previous experience or have run tests.
- Breakdown into small/medium/large can be useful.
  - Maybe development requires many small jobs? With a few major production jobs afterwards?
- We realize these are sometimes extreme guesstimates.
  - *We don’t use these for anything during the actual RAC year.*
- But does show the reviewers that there is some understanding of the resources required.
5.2.3 Memory Requirements

- Memory is a limited resource.
- We’re seeing increased numbers of big mem jobs.
- We have a few “fat” nodes but not a lot.
- Note that the scheduler uses “core equivalents” in “charging” for jobs.
  - ie) if a 1 core job requires all the memory on a 40 core node then the scheduler charges for 40 cores and your priority is decreased accordingly for the build-up period (usually a week).
  - [https://docs.computecanada.ca/wiki/Allocations_and_resource_scheduling](https://docs.computecanada.ca/wiki/Allocations_and_resource_scheduling)

So please remember to include a table which summarizes your memory use.
- And as usual this emphasizes your understanding of the methods and apps you use. Good for the reviewers!
5.2.4 Code Details

Provide details about the codes.

- name
- key reference publication
- essential numerical methods used
- serial/parallel and the type of parallelism

Again shows familiarity and experience with your applications and codes.

*Note: separate section (next) for performance description.*
5.2.5 Performance Estimates

Provide performance estimates.

- RAS - default resources are available for testing and prototyping.
- **Performance tables or charts** 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)
### 5.3 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.

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

**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!*).
6. Funding Available

*New this year.* Requested by reviewers.
- Gives some idea that the science has already been reviewed.
- And that there are resources available for the project.

If no funding then provide some explanation of the plan
- *ie) early-stage researchers may be applying for funds.*

<table>
<thead>
<tr>
<th>Project</th>
<th>Funding Source</th>
<th>Grant</th>
<th>Grant Expiry</th>
<th>Award</th>
<th>Portion allocated to this project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>NSERC</td>
<td>Discovery grant</td>
<td>07-30-2023</td>
<td>C$250,000</td>
<td>C$50,000</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Expertise of the Team

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

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.*
Aimed at big projects with big teams: “Required when the Team includes more than the PI”

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Core-years</th>
<th>GPU years</th>
<th>/project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jane Smith</td>
<td>Post-doc, Machine Learning and Tensorflow</td>
<td>1,000</td>
<td>10,000</td>
<td>100 TB</td>
</tr>
<tr>
<td>John Smith</td>
<td>Ph.D Student, CFD simulations</td>
<td>2,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For **complex projects**, it can be useful to include additional details, such as:
- Change Management approach
- Overview of a Governance model

“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.”
Resource Links

- Ask a question:
  - About RAC: rac@computecanada.ca
  - About CCV: ccv@computecanada.ca

- Find an answer:
  - General RAC information
  - RRG Guide
  - RPP 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!
Questions?

Discussion?
This presentation is a WestGrid-provided best practices guide for the Compute Canada Resource Allocation Competition (RAC). It does not replace the official RAC documents and PIs should carefully review the Compute Canada official documentation. In cases of conflict between these slides and the official RAC documents, the official RAC documents take precedence.
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.

Emphasis is on creating scientific gateways which provide services to a community of users.

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

Generally we expect RPP’s to primarily require cloud resources.

“A Research Platform or Portal is a set of community-developed tools, applications, and data that are integrated via a gateway or a suite of applications, usually in a graphical user interface, that is further customized to meet the needs of a specific community. Platforms and portals enable entire communities of users associated with a common discipline to use national resources through a common interface.”
RPP Annual Report

Process

1. Notices sent in November, with reports due in January.
2. Progress report is reviewed by CCF 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

If the RPP annual report is not received by the deadline, *then the allocation for the current year will not be renewed.*

https://www.computecanada.ca/research-portal/progressreport/
Reminder: we have a small dev team who can help with RPP development. Feel free to contact us.

support@westgrid.ca
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.
1. Research community provided with datasets and toolsets.
   a. who / 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.
| Project Justification (50%) | **Project Description, objectives and impact**  
● Problem or need is clearly presented  
● Objectives and goals clearly described  
**Use**  
● Value of the platform for targeted communities  
**Outcomes**  
● Clear timeline for delivery of outcomes  
**Progress over last year**  
● Achievements, outcomes or evidence of progress particularly in previous use of CCF resources  
**Resource Request Justification** |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resource Management (50%) | **Funding is available to support the team and the project.**  
**Team has sufficient expertise.**  
**Management strategy for the portal.**  
● Provide access to a community and can manage users, technologies, data sets, etc. |
The **RPP Application Template (Word)** is quite comprehensive. Have a look!

| 1 Project Justification | 1. Project description, objectives and goals  
| 2. Use of the Platform/Portal  
| 3. Expected Outcomes  
| 4. Progress over the Past Year  
| 5. Resource Justification (with subsections) |
| 2 Resource Management | 6. Funding  
| 7. Team Configuration and Expertise  
| 8. Management Strategy |
1. Project Description, Objectives & Goals

Basic description of the platform or portal and what it will do.

- The problem or need that each RPP will address.
- The general objectives and specific goal(s) of the RPP.
2. Use of the platform/portal

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

- Timelines for delivery over the 3 years of a typical RPP
- List of outcomes/deliverables/milestones
- Metrics or performance indicators

<table>
<thead>
<tr>
<th>Year 1 (2021-2022)</th>
<th>Year 2 (2022-2023)</th>
<th>Year 3 (2023-2024)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assemble team</td>
<td>Dataset ingestion layer</td>
<td>Analytics engine</td>
</tr>
<tr>
<td>Architecture and Proof of concept</td>
<td>Basic searchable interface</td>
<td>Community development</td>
</tr>
<tr>
<td>KPI development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gantt chart always looks good!
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.
4. Progress over the last year

Most projects are continuing. So important to emphasize progress:

- Is there an existing user community?
  - How big is it?
  - What have they accomplished?
- Conferences, papers, theses, breakthroughs
- Solution of particularly difficult development or operational problems.
- ...

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

- Criteria specifically mention use of CCF resources.

“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.”
5.1 RPP Resource Justification

Usual table but generally focussed on cloud resources.

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute Cloud VCPU</td>
<td>100</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Persistent Cloud VCPU</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Volume and snapshot storage</td>
<td>10 TB</td>
<td>10 TB</td>
<td>5 TB</td>
</tr>
<tr>
<td>Object storage</td>
<td>Not used</td>
<td>5 TB</td>
<td>50 TB</td>
</tr>
<tr>
<td>Shared filesystem storage</td>
<td>Not used</td>
<td>Not user</td>
<td></td>
</tr>
</tbody>
</table>

Additional cluster resources ..... (if required)

Consistent with the forms!

Note: total requirements, not additional on top of existing usage.
Details of the cloud ask in the summary. Tables are good!
- Feel free to customize the descriptions and table formats depending on the specific requirements

<table>
<thead>
<tr>
<th>Use</th>
<th>Instances</th>
<th>VMs</th>
<th>Storage</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web front-end</td>
<td>2</td>
<td>2-core VM’s with 4 GB</td>
<td>100 GB persistent for temporary data</td>
<td>2 x external IPs</td>
</tr>
<tr>
<td>Database server</td>
<td>4</td>
<td>16 core VM’s with 60 GB</td>
<td>1 TB local</td>
<td>internal</td>
</tr>
</tbody>
</table>
5.3 Storage and Compute Resources

This is aimed more at additional cluster resources

- if jobs are to be hived off to clusters.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of jobs</th>
<th>Duration of job (hrs)</th>
<th>Cores per job</th>
<th>Memory per core (GB)</th>
<th>Total Core-Year Requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>10,000</td>
<td>22</td>
<td>8</td>
<td>2</td>
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<td>1024</td>
<td>8</td>
<td>179.43</td>
</tr>
</tbody>
</table>

| Total      |                |                       |               |                     | 380                        |

- Tough to estimate, but hopefully you have previous experience or have run tests.
5.4 Choice of specific resources
- Any preferred locations?

5.5 High demand periods
- Do you expect any particular periods of high demand?
- How will the portal react?
- i.e.) load balancing, kubernetes, ...

Not required: may not be relevant to the particular project.
New this year. Requested by reviewers.

- Gives some idea that the science has already been reviewed.
- And that there are resources available for the project.

If no funding then provide some explanation of the plan
- ie) early-stage researchers may be applying for funds.

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Grant</th>
<th>Grant Expiry</th>
<th>Award</th>
<th>Portion allocated to this project</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Team Configuration and Expertise

Can the team do the job?
- Development, Operations and Management

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Allocation to Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jane Doe</td>
<td>Sr Architect</td>
<td>100%</td>
<td>Dev team lead and architecture</td>
</tr>
<tr>
<td>Name 2</td>
<td>Asst Prof</td>
<td>50%</td>
<td>Science Lead</td>
</tr>
<tr>
<td>Name 3</td>
<td>Jr Developer</td>
<td>50%</td>
<td>Front-end Javascript developer Provided by CANARIE-funded institutional resources.</td>
</tr>
</tbody>
</table>

...
8. Management Strategy

How will the project be managed?

- Project lead?
- Development lead?
- Operations manager?
- Communications lead? (outreach to the user community)
- Science advisory council?
- Change management procedure?
- User support?

Smaller projects may manage this through a single PI, but large projects may have significant management requirements.
● 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!
Questions?

Discussion?
Extra Slides
COVID Requests

Summer 2020: special program for COVID requests
● This will end with the RAC 2020 year (March 30, 2021)

Continuing and new COVID requests will now be considered in the normal RAC 2021 process.
● Include a sentence or two in the description if the project involves COVID research
If you are reasonably happy with your 2020 allocation, then Fast Track preferred. Very straightforward and requires no further work on your part!

- Fast Track applications cannot be delegated:
  - PIs must complete the application themselves.
- Proposals with score < 3.0 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)
No Out-of-Round for 2021

- RAS is the only avenue for non-RAC
- CC did create a COVID process summer 2020.

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)
As usual, we are not able to meet demand by a very wide margin.
GPU Allocation Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply</th>
<th>Need</th>
<th>Allocated</th>
<th>% of need awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>2,552</td>
<td>12,885</td>
<td>1,936</td>
<td>26%*</td>
</tr>
<tr>
<td>2019</td>
<td>1,644</td>
<td>6,555</td>
<td>1,331</td>
<td>20.3%</td>
</tr>
<tr>
<td>2018</td>
<td>976</td>
<td>4,092</td>
<td>840</td>
<td>20.5%</td>
</tr>
<tr>
<td>2017</td>
<td>1,420</td>
<td>2,790</td>
<td>1,047</td>
<td>37.5%</td>
</tr>
</tbody>
</table>

GPUs are in high demand!
GPUs and Machine Learning

- **Major increase in GPU asks!**
  - Machine Learning is the major use
  - Increasing demand for production training
  - Current exponential increase in demand - expected to continue!

- **A mix of GPU resources**
  - Some users are not specifying which ones. The default is generally the V100’s so P100’s can go unused.

### GPU Resources

<table>
<thead>
<tr>
<th></th>
<th>Graham</th>
<th>Cedar</th>
<th>Béluga</th>
<th>Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V100 (72)</td>
<td>P100 (584)</td>
<td>V100 (688)</td>
<td>Virtual GPU (preliminary service)</td>
</tr>
<tr>
<td></td>
<td>P100 (320)</td>
<td>V100 (768)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T4 (144)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GPU requests will require very strong justifications.**
Second year that we have not had enough storage!

- But allocations are significantly underutilized and we have added storage so not too bad.
  - Cedar: 84% of allocation used but this year capacity increased from 14 PB to 21 PB.
  - Usage: currently ~50% of total available

<table>
<thead>
<tr>
<th>Type</th>
<th>2020 Supply (TB)</th>
<th>2020 Need (TB)</th>
<th>2020 Allocated (TB)</th>
<th>Allocated / Need</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>57,030</td>
<td>56,867</td>
<td>40,732</td>
<td>72%</td>
<td>Project-based, backed up</td>
</tr>
<tr>
<td>dCache</td>
<td>14,804</td>
<td>10,200</td>
<td>10,200</td>
<td>100%</td>
<td>Special projects (LHC, ..)</td>
</tr>
<tr>
<td>Cloud</td>
<td>4,280</td>
<td>3,920</td>
<td>3,062</td>
<td>78%</td>
<td>Platforms and Portals</td>
</tr>
<tr>
<td>Nearline</td>
<td>67,800</td>
<td>43,347</td>
<td>44,650</td>
<td>103%</td>
<td>Tape - 2 replicas</td>
</tr>
<tr>
<td>Total</td>
<td>143,914</td>
<td>114,334</td>
<td>98,645</td>
<td>86%</td>
<td></td>
</tr>
</tbody>
</table>
WestGrid online autumn school

https://autumnschool.netlify.app

Hands-on introductions to essential tools & skills:

- four consecutive Mondays and Tuesdays: November 2-3, 9-10, 16-17, 23-24
- 8 days = 8 courses: Bash command line, Version control with Git, HPC, Basics of Python, Deep learning with PyTorch, Parallel programming in Chapel, Scientific programming in Julia, 3D scientific visualization
- more introductory/streamlined materials compared to the summer school
- open to participants from all institutions
- register once, attend any course(s) you like - registration now open

$20-$30 / person
Registration now open!
Co-hosting 2021 SciVis Contest with IEEE Vis

Earth’s Mantle Convection

- Announcement: late October 2020
- Submission deadline: July 31, 2021
- Winning team notification: September 10, 2021

In this Contest, participants will create novel approaches and state-of-the-art visualizations to assist domain scientists to better understand the Earth’s mantle convection processes:

- Visualize stagnated or diverted cold slabs (descending mantle material) and hot plumes (rising mantle material) at 660 km and 1600 km depths
- Visualize correlations between the physical variables and the flow patterns

https://scivis2021.netlify.app

- Dataset from the U of Toronto
- Simulation conducted on Niagara
- Covers 500 Myrs geological time
National vs. regional roles

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

Currently, WestGrid has seven Member Institutions.
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 17,000 researchers across Canada. No fees. Large requests based on a merit-based access system.