THE ADVANCED RESEARCH COMPUTING LANDSCAPE IN BRITISH COLUMBIA AND CANADA

Navigating HPC, ARC and DRI

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AGENDA

- Alphabet Soup

- Advanced Research Computing in BC and Canada

- The UBC model for ARC and Researcher Engagement

- Recommended Resources
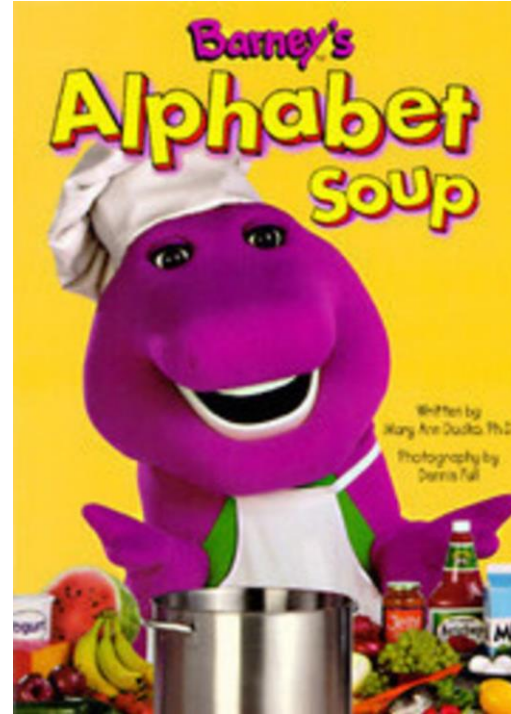
ALPHABET SOUP

HPC, ARC AND DRI – OH MY!

Photo Credit: Hit Entertainment Limited

WHAT IS HIGH PERFORMANCE COMPUTING (HPC)?

- Industry-standard term to describe "really fast" computers – typically much faster than general purpose computers

- Performance measured in Floating Point Operations per Second (FLOPS)

- Typically refers to a "cluster" of independent computers interconnected via high-bandwidth, low-latency network & high performance storage ("supercomputer")

- Often used to describe massively parallel (multi-core, multi-computer) workloads

- Usually implies a scheduling & resource management software layer

WHAT IS ADVANCED RESEARCH COMPUTING (ARC)?

- HPC! CPUs! GPUs! Accelerators! Big Data! Cloud! RDM! BBQ!

- Computational research requirements exceeding typical desktop computer

- WestGrid **– "*everything beyond a standard desktop workstation*,** *which includes cloud, supercomputers / high performance computing (HPC), data management, and data storage,* **all in support of research**"

- At UBC – "*An Institutionally-dedicated service for researchers across all disciplines working on questions that have large data and computational needs*"

WHAT IS DIGITAL RESEARCH INFRASTRUCTURE (DRI)?

- <u>HPC is a component of ARC, which is a component of DRI</u> – kindasortamaybe?

- Innovation, Science and Economic Development (ISED) Canada terminology

- Leadership Council on Digital Research Infrastructure (LCDRI)

- Compute Canada & Regional Partners (WestGrid, etc.)

- Canada's National Research & Education Network - CANARIE, BCNET, etc.

- Canadian Association of Research Libraries (CARL / ABRC) & Portage Network

IN SUMMARY: HPC, ARC AND DRI ARE…

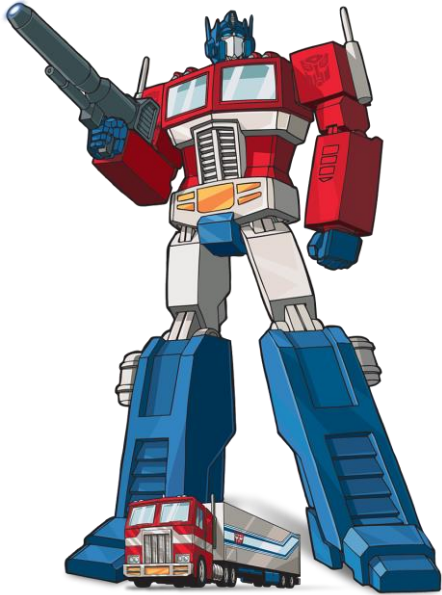# OPTIMIZED RESEARCH HORSE-POWER

Photo Credit: Hasbro Studios

Photo Credit: Hasbro Studios

Photo Credit: Warner Bros.

WHERE AND HOW

OF ARC IN BC AND CANADA

Photo Credit: DHX Media

WHERE DOES ADVANCED RESEARCH COMPUTING HAPPEN?

- Locally – In research labs & units

- Institutionally – Departments, Centres, Institutes, Interdisciplinary orgs, etc.

- Provincially – Clinical academic campuses, regional centres, etc.

- Regionally – WestGrid, Compute Ontario, Calcul Quebec, ACENET

- Nationally – Compute Canada, CANARIE, etc.

WHERE DOES FUNDING FOR ARC COME FROM?

- The Canada Foundation for Innovation (CFI)

- British Columbia Knowledge Development Fund (BCKDF)

- Other granting organizations (CIHR, NSERC, SSHRC)

- Institutions – Universities, Centres, Institutes, etc.

- Charities, Donations, Private Partners & Commercial Partnerships

- Government of Canada Budget 2018 ~$572M investment in DRI

WESTGRID: PAST AND PRESENT

- WestGrid is a regional consortia of ARC providers and innovators in western Canada

- Born from MACI, circa 2001

- Funding from CFI

- Member institutions from Manitoba, Saskatchewan, Alberta and British Columbia

- Recently incorporated as a non-profit

COMPUTE CANADA: PAST AND PRESENT

- Compute Canada is a non-profit organization and national provider of DRI in Canada

- Formed circa 2006 as consortia of HPC consortiums with funding from CFI and NSERC

- Compute Canada is a consortia of regional partners (WestGrid, Compute Ontario, Calcul Québec and ACENET)

- Arbutus launched in 2016, followed by Cedar and Graham in 2017 and Niagara in 2018

- ~35 member institutions, ~200 "staff"

- New Interim CEO as of February 2018, Robbin Tourangeau

NATIONAL ARC SITES IN CANADA

- University of Victoria (BC) – **Arbutus** (7640 cores, ~78TB RAM, 500TB)

- Simon Fraser University (BC) – **Cedar** (58416 cores, 584 GPUs, ~312TB RAM, ~15PB HDD)

- University of Waterloo (Ontario) – **Graham** (32530 cores, 320 GPUs, ~170TB RAM, ? HDD)

- University of Toronto (Ontario) – **Niagara** (60000 cores, ~280TB RAM, ~10PB HDD)

- École de Technologie Supérieure (Quebec) – **Béluga** (RFP out now!)

- Sick Kids Hospital (Ontario) – HPC4Health (~7000 cores)

COMPUTE CANADA: ELEVATOR PITCH

- National service

- Four National systems available today (more coming)

- Available to all academic researchers in Canada free of charge

- Rapid Access Service (RAS) for immediate access

- Resource Allocation Competition (RAC) for annual allocations of significant resources

WESTGRID & COMPUTE CANADA: THE FUTURE

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ARC HAPPENS IN…

LABS, INSTITUTIONS AND GOVERNMENT FACILITIES

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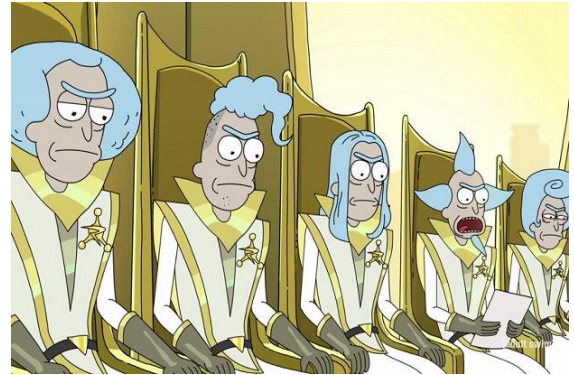

Photo Credit: Comedy Central

Photo Credit: Adult Swim

ARC & RESEARCHER ENGAGEMENT

WHAT'S UP (AT UBC), DOC?

Photo Credit: Warner Bros.

THE UBC ADVANCED RESEARCH COMPUTING MODEL

- Institutionally dedicated <u>free-of-charge</u> service to the UBC research community

- Domain-specific expertise in Life Sciences, Humanities, Arts, Social Sciences, Data Management, Security and Privacy, Systems Administration, etc.

- Pre and post-award consultations – Specifically CFI but others also welcome

- Multi-campus presence (local staff at both UBC Point Grey and UBC Okanagan)

- Collaborate with Regional and National partners

- Collaborate with local IT providers, including Central IT, Faculty IT, Dept IT, Lab IT, etc.

UBC ADVANCED RESEARCH COMPUTING INITIATIVES

- Pursuing local investments in Digital Research Infrastructure at UBC – Very Exciting!
  - Expanding the Advanced Research Computing team
  - Extensible High Performance Computing platform at UBC

- Hosting the WestGrid HPC Summer School @ UBC June 11-14 2018

- Compute Canada Canadian Bioinformatics Help Desk

- Broad community engagement

RECOMMENDED RESOURCES

NEED SOME MORE ARC IN YOUR LIFE?

Photo Credit: DHX Media

NATIONAL & REGIONAL RESOURCES

- Compute Canada – https://computecanada.ca

- WestGrid – https://westgrid.ca

- The Canada Foundation for Innovation – https://innovation.ca

- LCDRI – https://digitalleadership.ca

- Government of Canada Budget 2018 – https://www.budget.gc.ca

- Canada's new Superclusters – http://www.ic.gc.ca/eic/site/093.nsf/eng/00008.html

LOCAL RESOURCES

- UBC Advanced Research Computing – https://arc.ubc.ca

- SFU Research Computing Group – http://www.rcgsfu.ca

- Research Computing at Uvic - https://www.uvic.ca/systems/support/researchcomputing/

- Talk to your VP Research Office or Office of Research Services