Argonne Training Program on Extreme-Scale Computing (ATPESC)

Performance Tools and Debuggers: Introduction

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EXASCALE COMPUTING PROJECT

National Nuclear Security Administration

U.S. DEPARTMENT OF ENERGY | Office of Science

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Outline

- What is your favorite debugger?
  - printf ?
  - You can have a better debugger on HPC environments
- How do you measure performance of your application on HPC?
  - Wall time (e.g., `$time ./a.out`)?
  - Flop-rate, bandwidth?
  - How to identify performance bottlenecks?
  - Leading profiling tools can help you optimize your code on HPC
- Seven powerful HPC tools in this track
  - Hardware vendor tools
    - Intel VTune and Advisor
    - NVIDIA Nsight System & Nsight Compute
    - AMD ROCm tools: ROC profiler & debugger
  - Cross-platform tools
    - ARM Forge: DDT(debugger) & MAP(profiler)
    - Perforce TotalView(debugger)
  - Open source community tools
    - HPCToolkit
    - TAU

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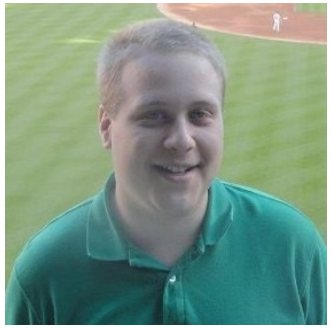
Team for Tools Track

JaeHyuk Kwack
(Argonne)

Scott Parker
(Argonne)

Kevin O'Leary
(Intel)



Max Katz
(NVIDIA)

Suyash Tandon
(AMD)

Ryan Hulguin
(ARM)

Nikolay Piskun
(PERFORCE)

John Mellor-Crummey
(Rice Univ.)

Sameer Shande
(Univ. of Oregon / Paratools)

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Agenda

9:00	*Speaker check-in*	
9:30	Introduction	JaeHyuk Kwack, ANL Scott Parker, ANL
9:40	Intel Vtune/Advisor	Kevin O'Leary, Intel
10:15	NVIDIA Nsight	Max Katz, NVIDIA
10:50	AMD	Suyash Tandon, AMD
11:25	Parallel Sessions:	
	• Break	*All*
	• **ROOM B:** Hands-on: Vtune/Advisor	Kevin O'Leary, Intel
	• **ROOM C**: Hands-on: NVIDIA	Max Katz, NVIDIA
	• **ROOM D:** Hands-on: AMD	Suyash Tandon, AMD
12:10	*Lunch*	

Hardware vendor tool sessions

Cross-platform tool sessions

1:10 p.m.	ARM Forge	Ryan Hulguin, ARM
1:45	TotalView	Nikolay Piskun, PERFORCE
2:20	Parallel Sessions:	
	• Break	*All*
	• **ROOM B:** Hands-on: ARM	Ryan Hulguin, ARM
	• **ROOM C:** Hands-on: TotalView	Nikolay Piskun, PERFORCE
3:05	HPCToolkit	John Mellor-Crummey, Rice University
3:40	TAU	Sameer Shende, University of Oregon / Para Tools, Inc.
4:15	Parallel Sessions:	
	• **ROOM B:** Hands-on: HPCToolkit	John Mellor-Crummey, Rice University
	• **ROOM C:** Hands-on: TAU	Sameer Shende, University of Oregon / Para Tools, Inc.
5:00	*Adjourn*	

Open source community tool sessions

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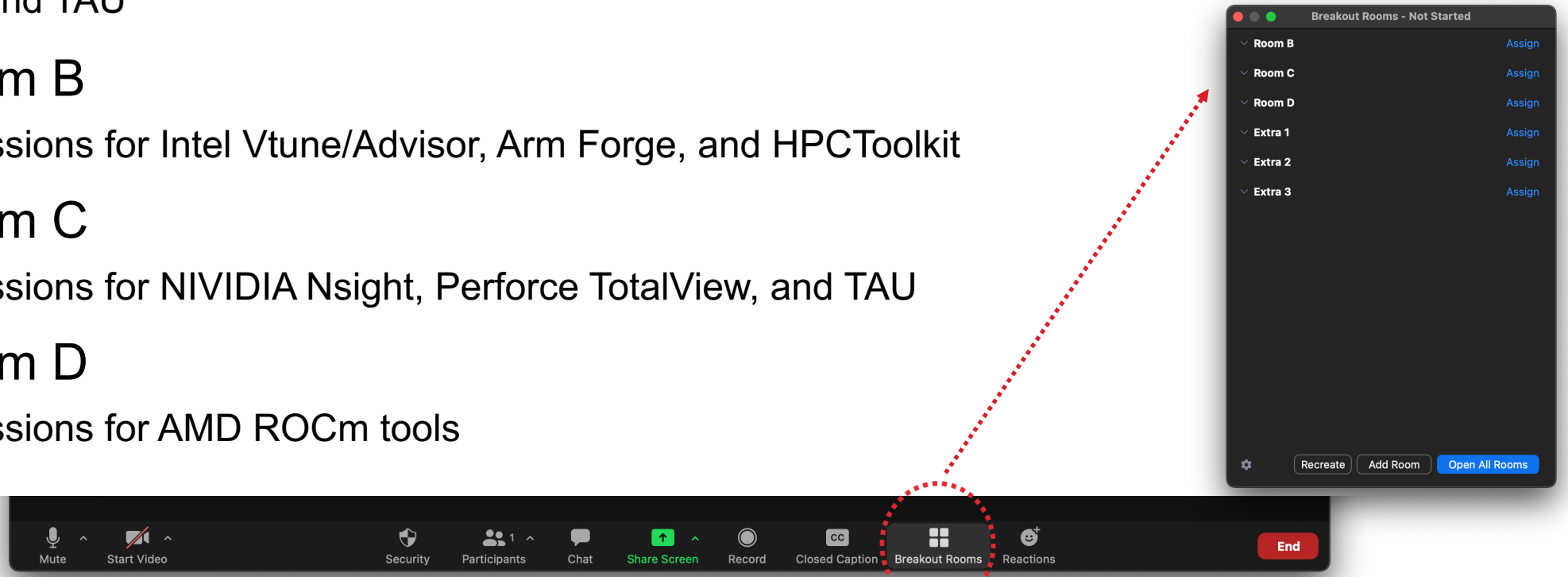
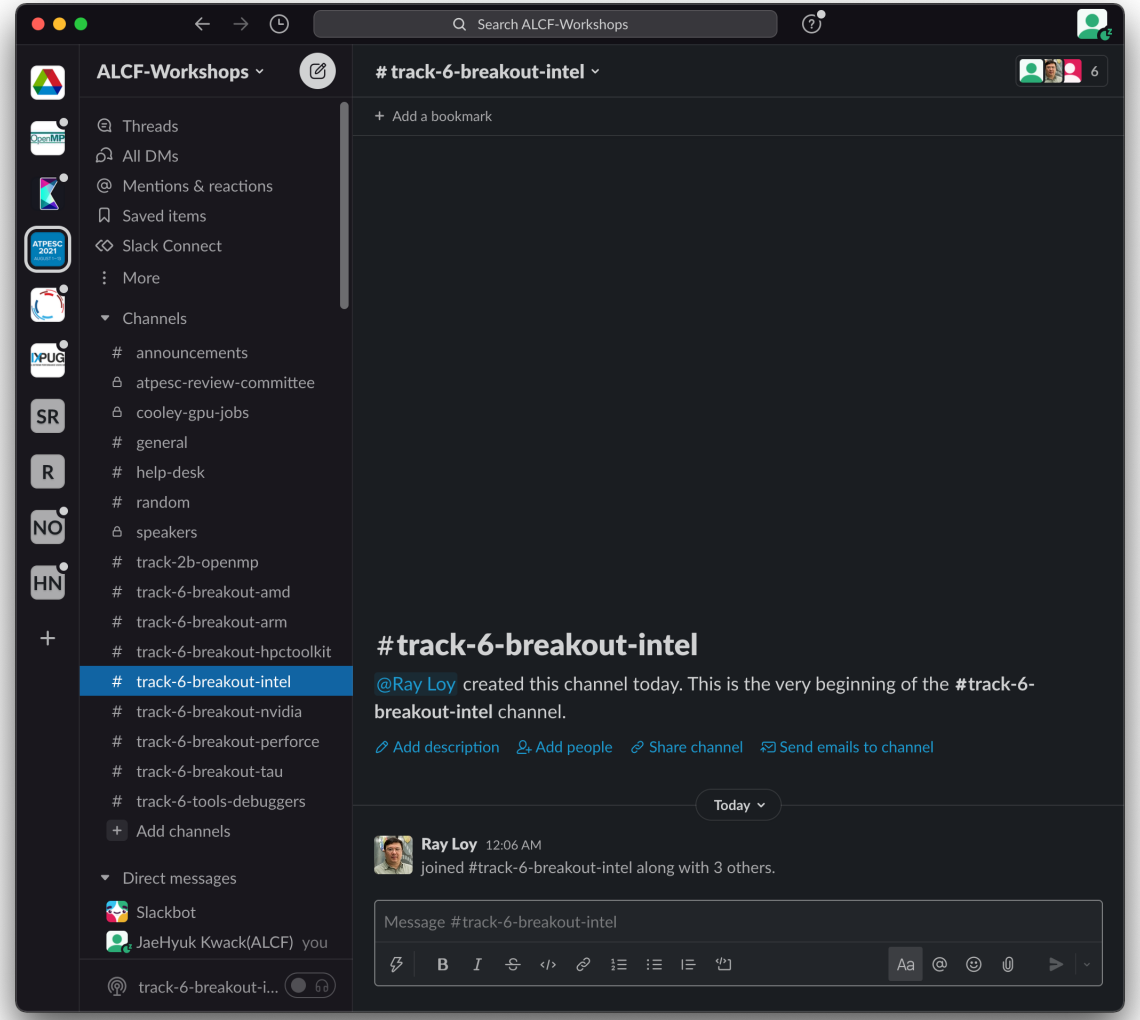
ZoomGov sessions

- Main Room
  - https://exascaleproject.zoomgov.com/j/1616258437?pwd=OUJ3dGJzK2RONW5keW9WK29CQXNWQT09
  - All presentations sessions for Intel Vtune/Advisor, NVIDIA Nsight, AMD ROCm, Arm Forge, TotalView, HPCToolkit, and TAU
- Breakout room B
  - Hands-on sessions for Intel Vtune/Advisor, Arm Forge, and HPCToolkit
- Breakout room C
  - Hands-on sessions for NIVIDIA Nsight, Perforce TotalView, and TAU
- Breakout room D
  - Hands-on sessions for AMD ROCm tools

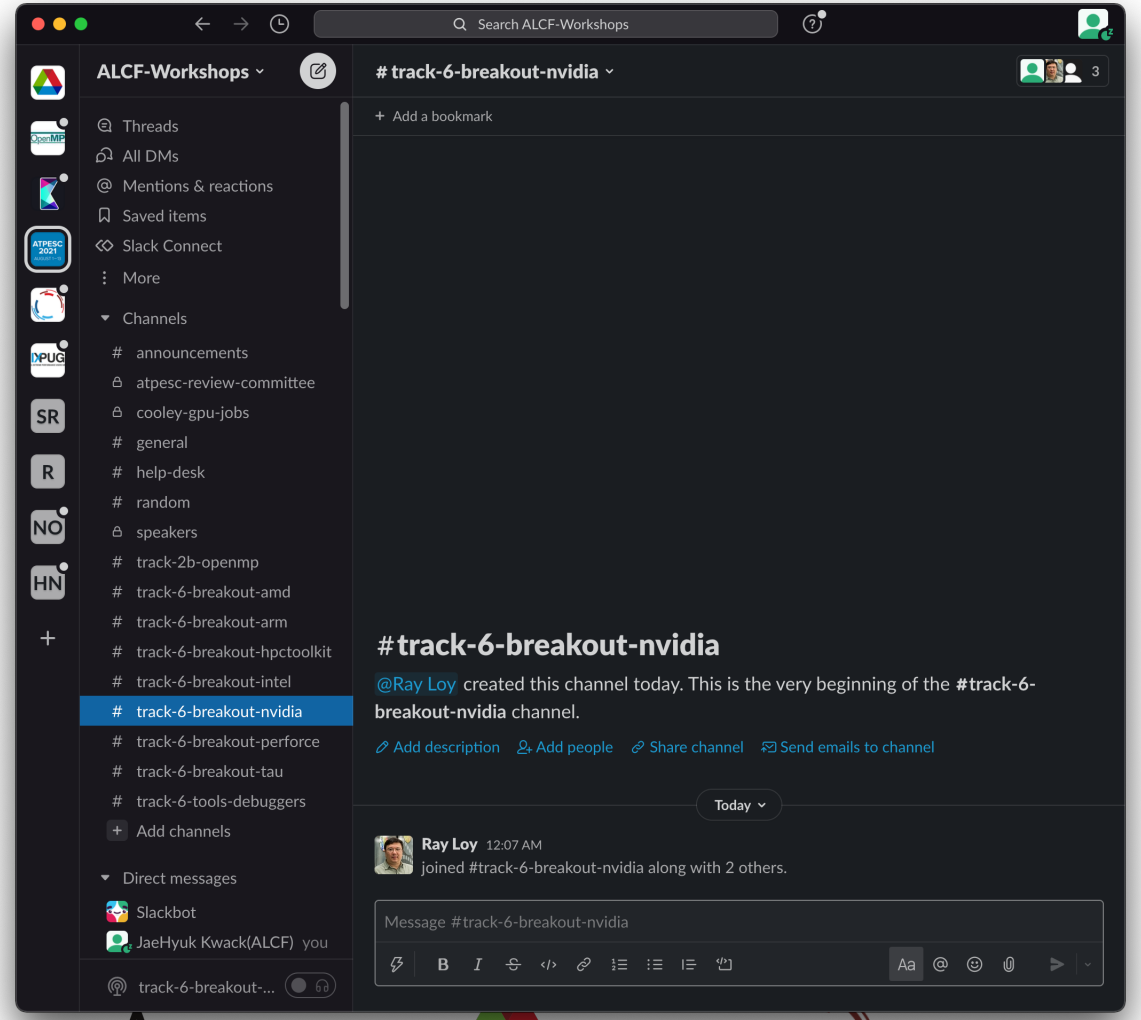


Slack channels for hardware vendor tools

- Intel VTune/Advisor (#track-6-breakout-intel)

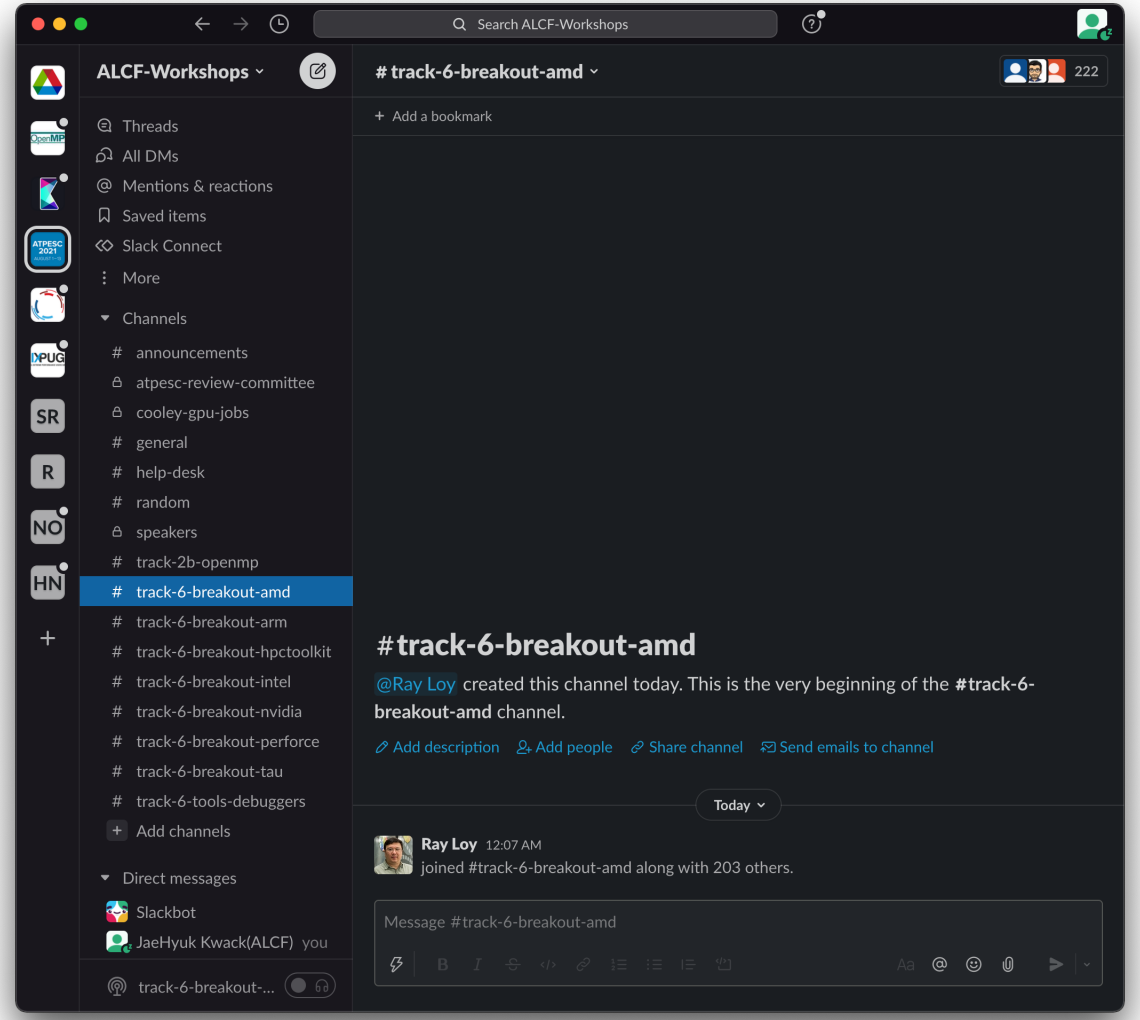


- NVIDIA Nsight (#track-6-breakout-nvidia)



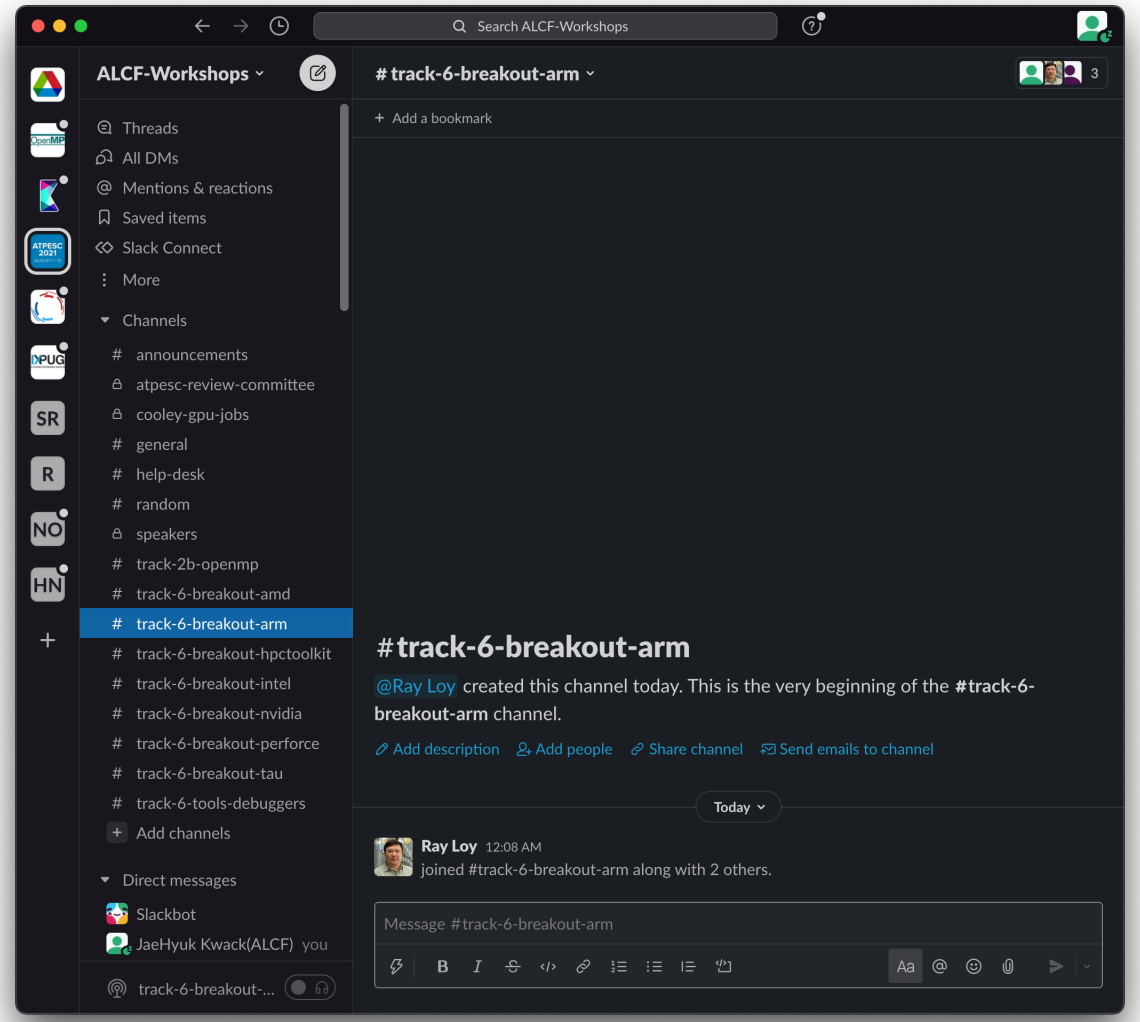
Slack channels for hardware vendor tools

- AMD ROCm Tools (#track-6-breakout-amd)

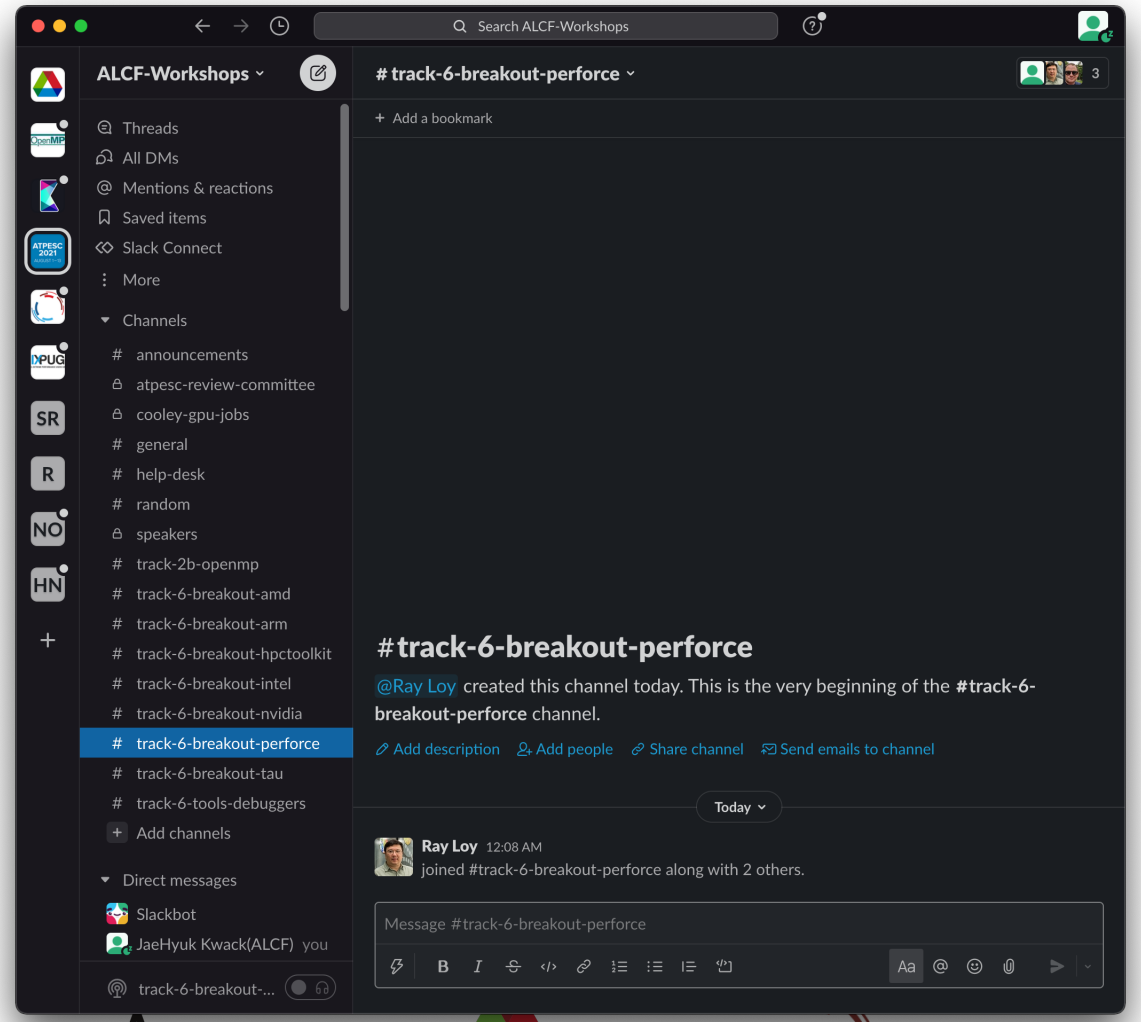


Slack channels for cross-platform tools

- Arm Forge (#track-6-breakout-arm)

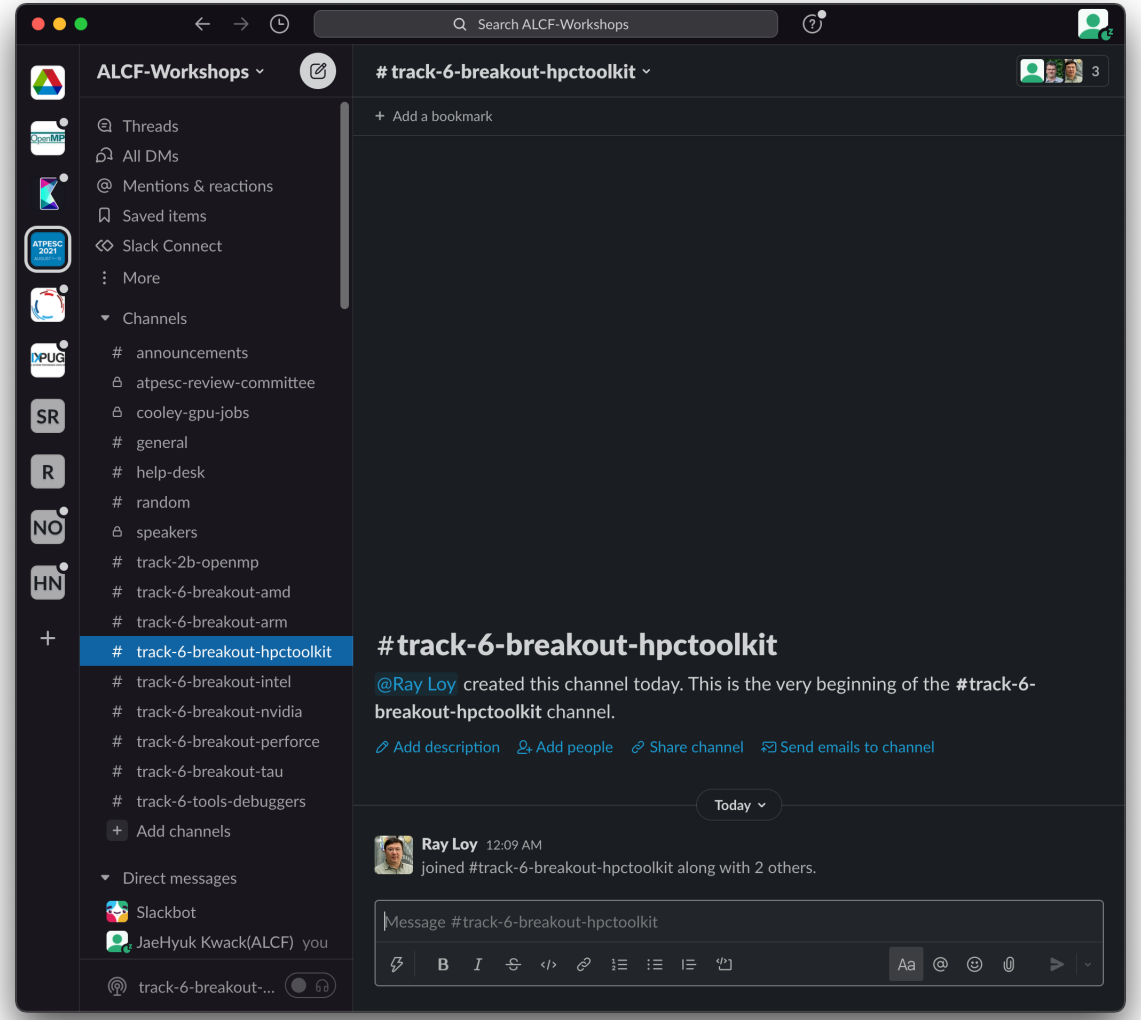


- TotalView (#track-6-breakout-perforce)

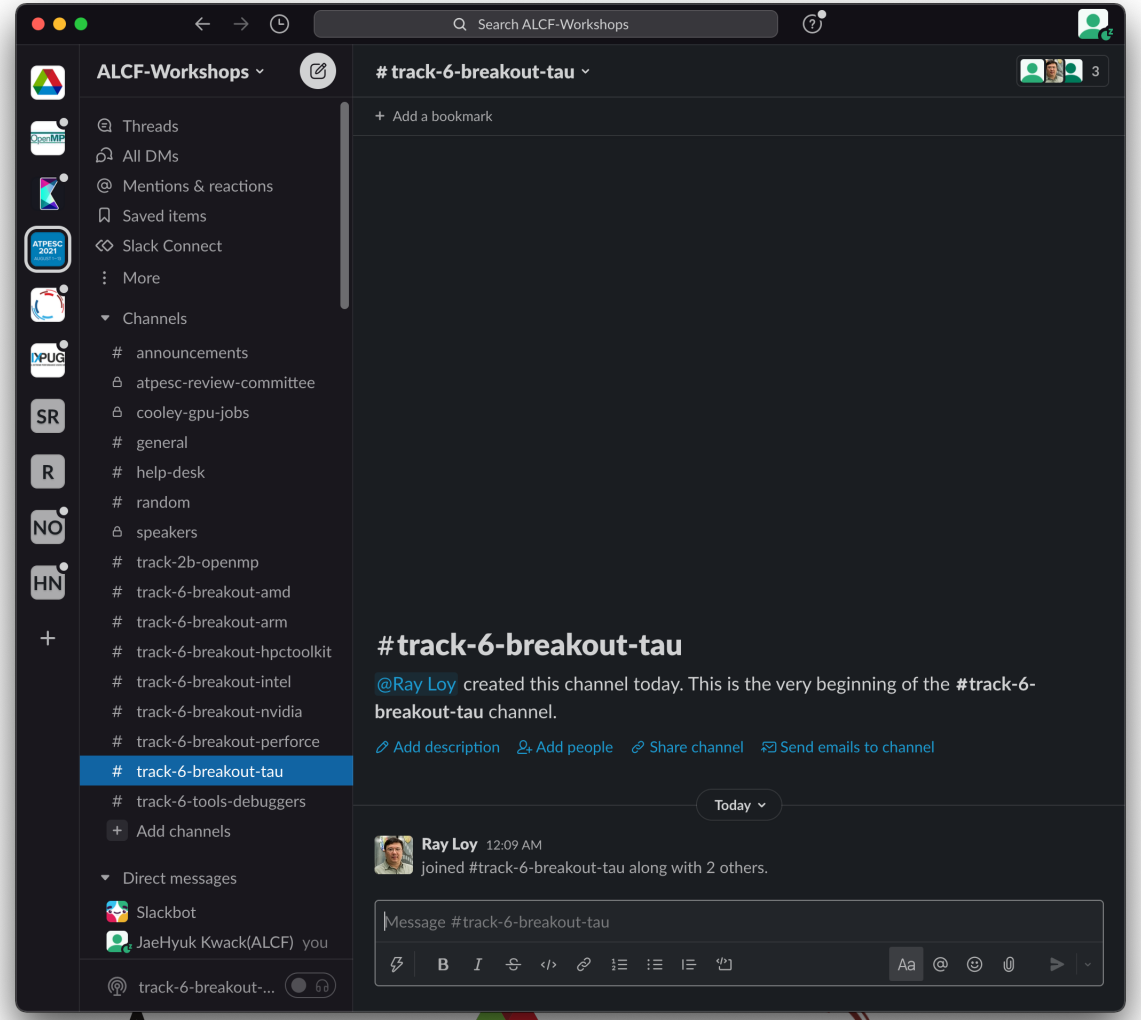


Slack channels for open source community tools

- HPCToolkit (#track-6-breakout-hpctoolkit)



- TAU (#track-6-breakout-tau)



Systems for Hands-on

- System reservation for today
  - Theta: 512 nodes from 9am – 6pm in Central (-q ATPESC2021 -A ATPESC2021)
  - Cooley: 80 nodes from 9am – 6pm in Central (-q training -A ATPESC2021)
  - ThetaGPU: 21 nodes from 9am – 6pm in Central (-q training -A ATPESC2021)
- Intel DevCloud for Intel Gen9 GPUs
  - Instruction: https://devcloud.intel.com/oneapi/get_started/ (e.g., $ qsub -I -l nodes=1:gpu:ppn=2 -d .)
- AMD Accelerator Cloud (AAC) for AMD MI-100 GPUs
  - 2 users/GPU, 40 GPUs in total
  - Instruction: https://anl.app.box.com/notes/844862636734
- ASCENT: no reservation, but usable with the default queue (with –P GEN161)

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Thanks and Enjoy!

Hardware vendor tools hands-on

- 11:25 am (CDT) – 12:10 am (CDT)
- Breakout room B: Intel Vtune/Advisor hands-on
  - Join and use ***#track-6-breakout-intel*** slack channel for discussion
- Breakout room C: NVIDIA Nsight hands-on
  - Join and use ***#track-6-breakout-nvidia*** slack channel for discussion
- Breakout room D: AMD ROCm tools hands-on
  - Join and use ***#track-6-breakout-amd*** slack channel for discussion

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Cross-platform tools hands-on

- 2:20 pm (CDT) – 3:05 am (CDT)
- Breakout room B: ARM Forge hands-on
  - Join and use ***#track-6-breakout-arm*** slack channel for discussion
- Breakout room C: TotalView hands-on
  - Join and use ***#track-6-breakout-perforce*** slack channel for discussion

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Open source community tools hands-on

- 4:15 pm (CDT) – 5:00 am (CDT)
- Breakout room B: HPCToolkit hands-on
  - Join and use ***#track-6-breakout-hpctoolkit*** slack channel for discussion
- Breakout room C: TAU hands-on
  - Join and use ***#track-6-breakout-tau*** slack channel for discussion

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