Welcome to the LArSoft Tools and Technology Workshop

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on behalf of the
LArSoft Team

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Fermilab

Tools and technologies

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Tools and technologies

- Want things that
    - make our work easier,
    - help us produce better code,
    - makes our code run faster/more efficiently
- Will explore four things today
    - Parallel computing
    - Continuous integration
    - A new build system for art / LArSoft
    - Debugging and profiling tools

Why these?...

Parallel computing

- Computing power continues to increase, but:
  - It **does not** make code run faster
    - An important consideration with increasing data volumes and complexity
  - Memory demands per core exceeds capacity for available production machines
    - No evidence that this is changing

  Parallel computing can mitigate some of this
  - Requires properly structured code

- Goal: to introduce the technology, and coding considerations that will allow LArSoft to utilize it

Parallel computing

- Speakers

  - **Chris Jones**

    - Framework and S/W Technology group leader in SCD Sci S/W Infra Dept

    - Main architect, developer of CMS multi-threaded data processing framework

    "Introduction to multi-threading"

  - **Jim Amundson:**

    - Head of SCD Scientific Software Infrastructure Dept

    - Head of Community Proj for Accel Science and Sim (ComPASS), which focuses on accelerator simulation on supercomputers.

    - Principal architect of accelerator simulation tool Synergia

    "Vectorization and LArSoft"

Continuous integration

- The practice of committing code, testing entire software stack frequently during development

  – Use automated tools to run tests, collate results

- LArSoft CI: finds many bugs in committed code

  – Prevents it from getting into releases, or spoiling stability of development environment

- Want this system to be a developer-level tool

  – Make it a tool for physics-level validation

- Goal: describe features (some new) that can make the system useful to us all on daily basis

Continuous integration

- Speaker

  – **Vito di Benedetto**

    - SCD Distributed Computing Solutions Dept, User Support group
    - Developer and operations for CI system

    "LArSoft CI system overview"

New LArSoft build system

- art / LArSoft are adopting a new build system!
  - Needed to improve portability, support Mac OSX, Ubuntu 16 LTS
- But this is a **huge change**, right?
  - Short answer: Yes!

- Goal:
  - Introduce you to the new system
  - Identify the things that change, those that won't
  - Explain what you need to know to use it

New LArSoft build system

- Speaker

  - **Jim Amundson**

    - Still Head of SCD SSI department...

    - Author of SoftRelTools2, the build system used by CDF and D0 for Run II, and LArSoft prior to MRB. Still in use today by NOvA.

      "Spack build system"

Debugging and profiling tools

- ...Because we all write slow, buggy code
  - One of the most requested sessions from the community

- We have powerful tools to assist
  - Can get far beyond print statements, module-level timing services, inline timing commands

- Goal:

  - Describe some of the tools available

  - Provide some guidance on techniques, interpretation of results

Debugging and profiling tools

- Speakers

  - **Paul Russo**

    - Developer in SCD SSI, Framework and Software Technology group

    "Debugging tutorials"

  - **Soon Yung Jun**

    - SCD Comp Phys Developer in SCD Physics and Detector Sim Group
    - Coordinator of G4 Testing and QA Working Group
    - Primary developer for GeantV, the next generation HEP detector simulation using parallel architectures

    "Profiling tutorials"

The schedule

	Introduction to concurrency	*Dr. Christopher JONES*
10:00		
	DIR/ Curia II-WH2SW (AM), Fermilab	09:30 - 10:30
	morning break	
	DIR/ Curia II-WH2SW (AM), Fermilab	10:30 - 10:45
	Vectorization and LArSoft	*Dr. James AMUNDSON*
11:00		
	DIR/ Curia II-WH2SW (AM), Fermilab	10:45 - 11:15
	Updated CI system	*Vito DI BENEDETTO*
	DIR/ Curia II-WH2SW (AM), Fermilab	11:15 - 12:00

Note: all lectures will be recorded and cataloged on http://larsoft.org

Lunch: 12:00 to 1:30 pm

The schedule

Move to WH7X for the afternoon session!

The schedule

	SPACK build system	*Dr. James AMUNDSON*
14:00	*DIR/ Curia II-WH2SW (AM), Fermilab*	13:30 - 14:15
	SPACK and CI working Session	
	Racetrack-WH7X - Wilson Hall 7th fl Crossover, Fermilab	14:15 - 14:45
	Break	
	Racetrack-WH7X - Wilson Hall 7th fl Crossover, Fermilab	14:45 - 15:00
15:00	**Debugging Tutorials** *Paul Russo*	
	Racetrack-WH7X - Wilson Hall 7th fl Crossover, Fermilab	15:00 - 15:45
	Profiling Tutorials	*Soon Yung JUN*
16:00	*Racetrack-WH7X - Wilson Hall 7th fl Crossover, Fermilab*	15:45 - 16:45
	Wrap Up	*Dr. Erica SNIDER*
	Racetrack-WH7X - Wilson Hall 7th fl Crossover, Fermilab	16:45 - 17:00
17:00		

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Workshop notes

- ## Networking topics:

  - Things you want to talk about

  - Things you want to ask about

  - Topics for the next LArSoft Workshop or other LArSoft issue

  Write ideas on the posters

  Gather and discuss them over lunch and during work times

Workshop notes

- Breaks
  - Coffee, donuts, biscotti in the morning
  - Brownies and cookies in the afternoon
  - Cafeteria for other things
  - Best coffee:
    - WH11NE by the elevators.
    - WH3NW behind the elevators
- Drinks / dinner after the workshop?
  - Meet at Frontier Pub
  - Decide on where to go for dinner / order out (?)

- Let's get this started!