Met Office

Hands-on sessions

https://github.com/stfc/PSyclone/blob/master/tutorial/practicals/LFRic/building_code/README.md

LFRic layers and what we are working on

1. Creating and calling kernels

2. Using built-ins

3. Time evolution of a field (time-permitting)

LFRic Driver layer overview – not for hands-on tutorial

Driver layer: set up and control of a model run

- Set up of the LFRic object stack: **global 2D mesh → partition → local 3D partitioned mesh → function space → field**
- Model initialisation (science configurations, initial data)
- Controls of a model run (e.g. time-step loop, checkpoint) includes wrappers to external libraries (e.g. YAXT, XIOS)

Simplified example in Tutorial 3

LFRic layers for hands-on tutorials

- **Algorithm layer**: Operations on whole field (and other) objects using ***invoke*** DSL syntax
- **Kernel layer**: Operations on field (and other) object data using ***metadata*** DSL syntax and ***loops*** to update data
- **PSy layer**: From algorithms to kernels
  - **Unpacks and access object data via accessor classes (*proxy*)**
  - **Calls kernels for each column**
  - Shared and distributed memory parallelism *(see sessions on distributed and shared memory support)*

Tutorial 1, Part 1: Create simple kernels to update fields on specific LFRic function spaces

https://github.com/stfc/PSyclone/tree/master/tutorial/practicals/LFRic/building_code/1_simple_kernels/part1

- Open the README.md document in a browser tab
- Open the LFRic kernel structure document in a browser tab
- Open a terminal, make sure that the hands-on environment is working and navigate to

  `tutorial/practicals/LFRic/building_code/1_simple_kernels/part1`

- We will follow steps in the README.md document

Tutorial 1, Part 2: Create simple kernels to update fields on generic LFRic function spaces

https://github.com/stfc/PSyclone/tree/master/tutorial/practicals/LFRic/building_code/1_simple_kernels/part2

- Open the README.md document in a browser tab
- Open the LFRic kernel structure document in a browser tab
- Open a terminal, make sure that the hands-on environment is working and navigate to

  `tutorial/practicals/LFRic/building_code/1_simple_kernels/part2`

- We will follow steps in the README.md document

Tutorial 2: Using built-ins

https://github.com/stfc/PSyclone/tree/master/tutorial/practicals/LFRic/building_code/2_built_ins

- Open the README.md document in a browser tab
- Open the PSyclone LFRic (Dynamo 0.3 API) built-ins documentation in a browser tab
- Open a terminal, make sure that the hands-on environment is working and navigate to

  `tutorial/practicals/LFRic/building_code/2_built_ins`

- We will follow steps in the README.md document

Tutorial 3: Time evolution of a field on a planar mesh

https://github.com/stfc/PSyclone/tree/master/tutorial/practicals/LFRic/building_code/3_time_evolution

- Open the README.md document in a browser tab
- Open a terminal, make sure that the hands-on environment is working and navigate to

  `tutorial/practicals/LFRic/building_code/3_time_evolution`

- We will follow steps in the README.md document

Met Office

Questions?

Acknowledgements

LFRic team, GungHo Atmospheric Science team and other LFRic developers

esiwace
CENTRE OF EXCELLENCE IN SIMULATION OF WEATHER AND CLIMATE IN EUROPE

ESiWACE2 has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823988

Links and references

- LFRic: https://code.metoffice.gov.uk/trac/lfric/wiki
- LFRic container recipes (to be hosted on https://github.com/MetOffice):
  - https://github.com/eth-cscs/ContainerHackathon/tree/master/LFRIC
  - https://github.com/tinyendian/lfric_reader
- PSyclone and fparser
  - https://github.com/stfc/PSyclone
  - https://psyclone.readthedocs.io
  - https://github.com/stfc/fparser
  - https://fparser.readthedocs.io
- PSyclone in LFRic: https://code.metoffice.gov.uk/trac/lfric/wiki/PSycloneTool
- GHASP (GungHo Atmospheric Science): https://code.metoffice.gov.uk/trac/lfric/wiki/GungHoScience
- stylist: https://github.com/MetOffice/stylist
- Adams et al. (2019), *LFRic: Meeting the challenges of scalability and performance portability in Weather and Climate models*, Journal of Parallel and Distributed Computing,132, 383-396