CNRS - INP - UT3 - UT1 - UT2J

Institut de Recherche en Informatique de Toulouse

DELIGHT: WP1, April 2023

Computational methods for estimating energy expenditure in FL architecture

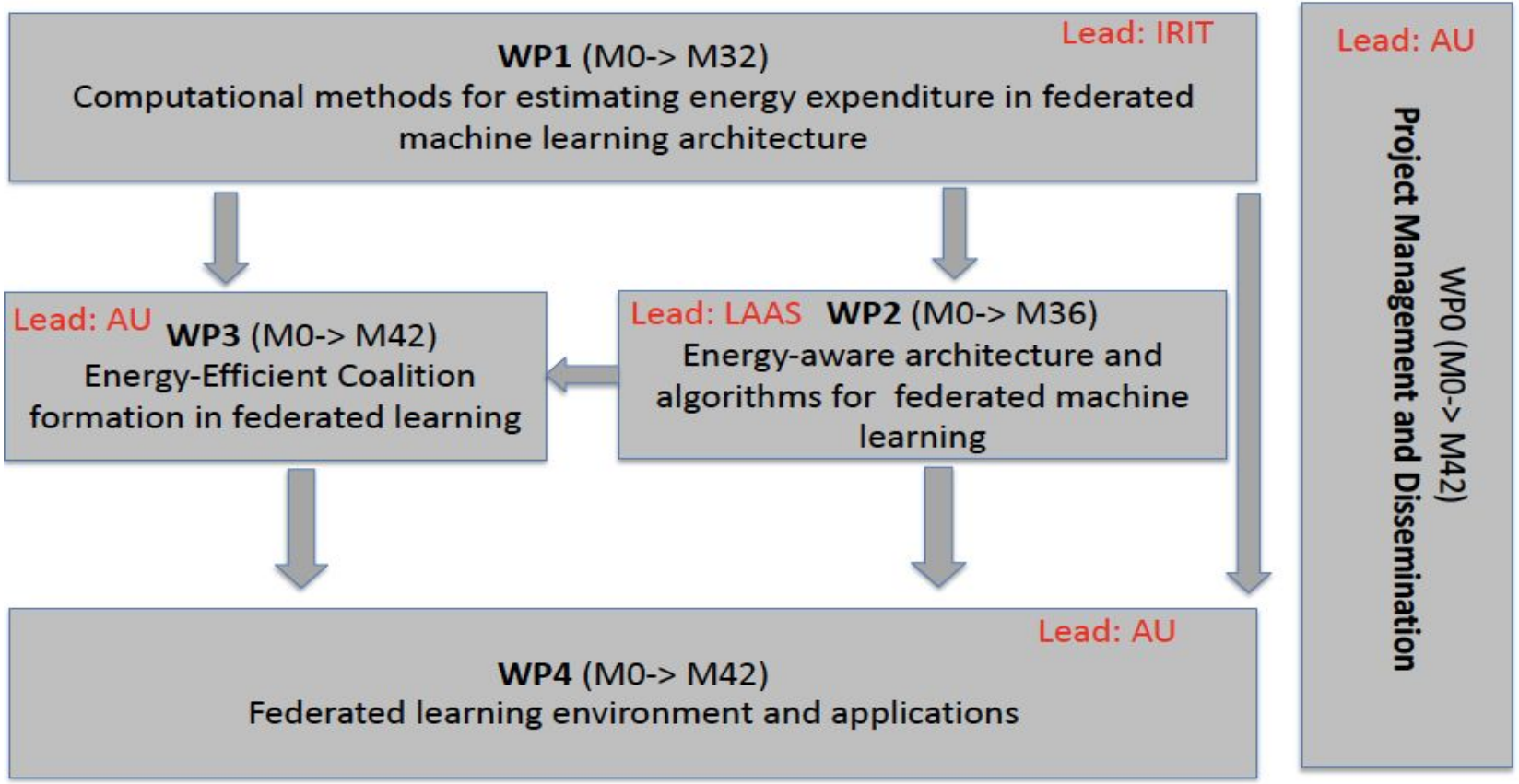


Figure 1 : Interaction between Work Packages

Overview: tasks

- [M0-M18] Task 1.1:
  - Behavioural models of FL systems
  - Lead IRIT
- [M12-M32] Task 1.2:
  - Model of innovative leverages impact on PEC (*Performance, Energy and Carbon footprint*)
  - Lead LAAS
- [M0-18] Task 1.3:
  - Multi-scale metrics for comparison of FL systems
  - Lead AU
- [M12-M42] Task 1.4:
  - Reproducible testing infrastructure
  - Lead IRIT

[M0-M18] Task 1.1, IRIT: Behavioural models of FL systems

PEC models of basic FL operations

- Hardware measures: Network, memory, processor, power
- Software environment: libraries, FL configuration
- Hardware environment: DVFS, number of servers

Quality:

- Speed, precision

Produced dataset will be of use for the other WPs

[M12-M32] Task 1.2 (LAAS): Model of innovative leverages impact on PEC

Similar approach as Task 1.1 but one step further

- FL-specific leverages
  - Changes in the dataflow, computational precision, frequency and timing of communications
- Carbon impact
  - Use of energy-related leverages
    - Take into account the energy mix
    - Shift resource usage in time
    - Take into account storage systems
  - LCA?

[M0-18] Task 1.3 (AU): Multi-scale metrics for comparison of FL systems

Going beyond classical system-wide metrics (precision, performance, energy):

- Fairness
- Privacy
- Robustness

To add : some local - node wide - metrics

Developed in parallel with first version of models (in Task 1.1)

Provide some reference scenarii to demonstrate the metrics

[M12-M42] Task 1.4 (IRIT): Reproducible testing infrastructure

Goals:

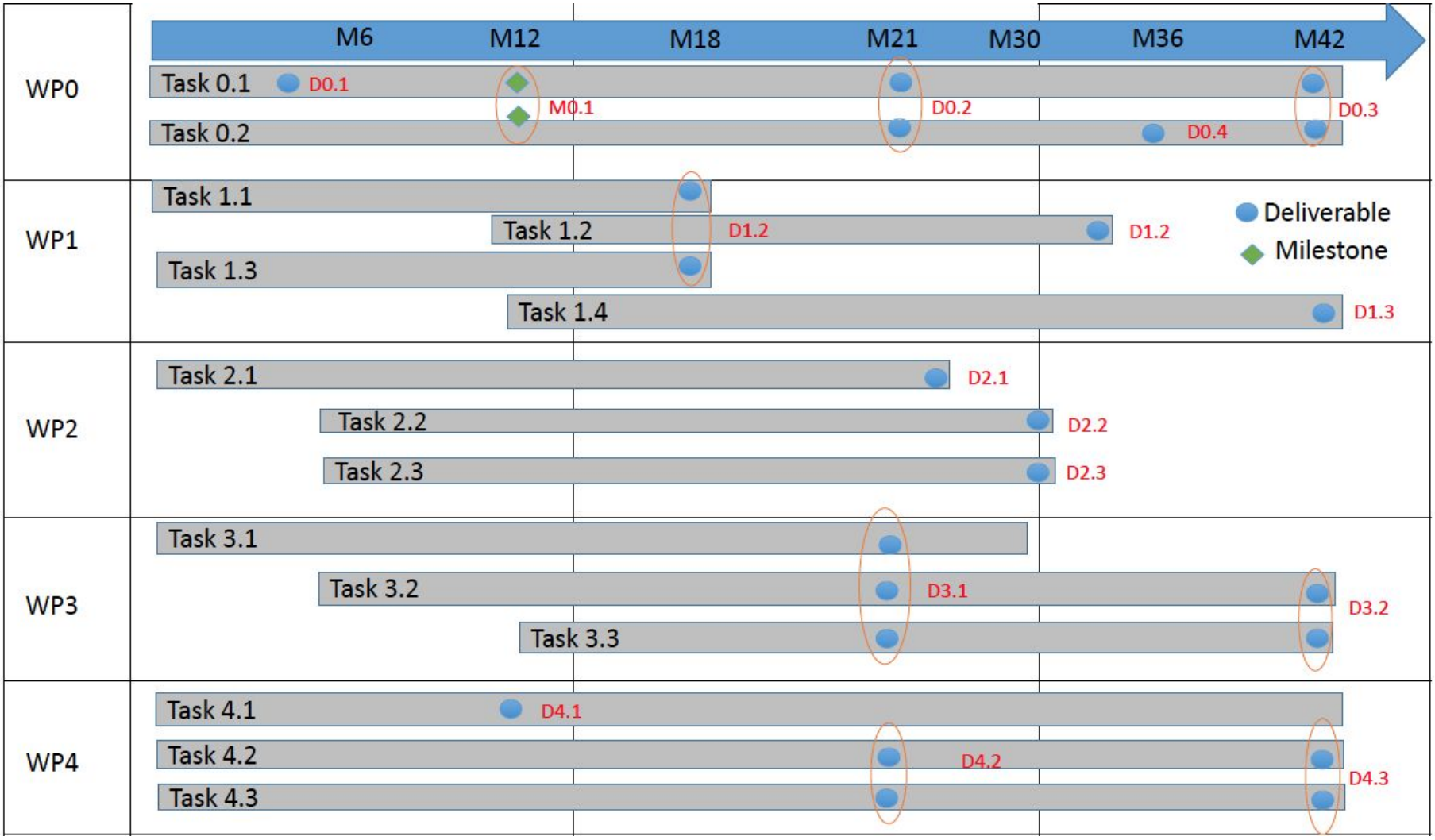
- Reproducible results
- Open Science

Means

- Automated framework for experiments in Grid5000
  - Measure of performance, power metrics

Overview: deliverables

- **D1.1. PEC models for classical leverages (M18)**: Models of the impact of classical mode change (hardware and software) along with FL focused metrics taking into account the specificities such as Robustness, Fairness and Privacy.
- **D1.2. PEC models for innovative leverages (M32)**: Update of D1.1 to include new leverages such as changing the flow, content and precision of data.
- **D1.3 DELIGHT reproducible testing infrastructure (M42)**: Software and documentation supporting the reproducible testing infrastructure.


M6
M12
M18
M21
M30
M36
M42
WP0
Task 0.1
D0.1
M0.1
D0.2
D0.3
Task 0.2
D0.4
WP1
Task 1.1
Task 1.2
D1.2
D1.2
Task 1.3
Task 1.4
D1.3
Deliverable
Milestone
WP2
Task 2.1
D2.1
Task 2.2
D2.2
Task 2.3
D2.3
WP3
Task 3.1
Task 3.2
D3.1
D3.2
Task 3.3
WP4
Task 4.1
D4.1
Task 4.2
D4.2
D4.3
Task 4.3

Current actions

- IRIT: M1 Internship on experiments on Flower starting 08/05/2023
  - Will be of use for T1.1 and for T1.2/T1.3 later on
- IRIT: M2 Internship on experiments on Flower starting 01/07/2023
  - Same. Might continue on PhD if successful
- Other ?

To start soon

- T1.1 (IRIT): Data acquisition for a first version of a Flower model
- T1.3 (AU): Work on metrics

Goal

- D1.1. PEC models for classical leverages (M18)