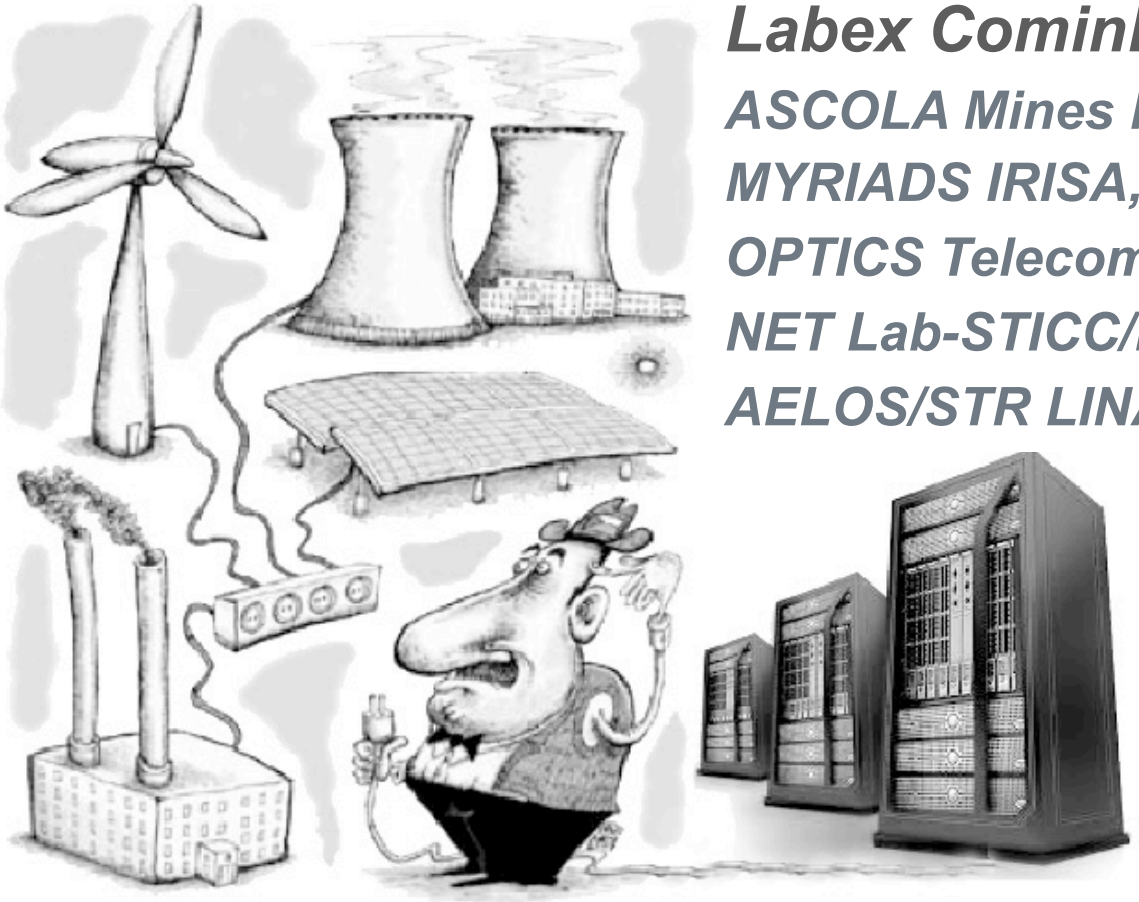
EPOC : Energy Proportional and Opportunistic Computing system

MINES Nantes



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ASCOLA Mines Nantes, INRIA, LINA

MYRIADS IRISA, INRIA

OPTICS Telecom Bretagne

NET Lab-STICC/MOM ENIB

AELOS/STR LINA, IRCCyN

Project 2013-2017

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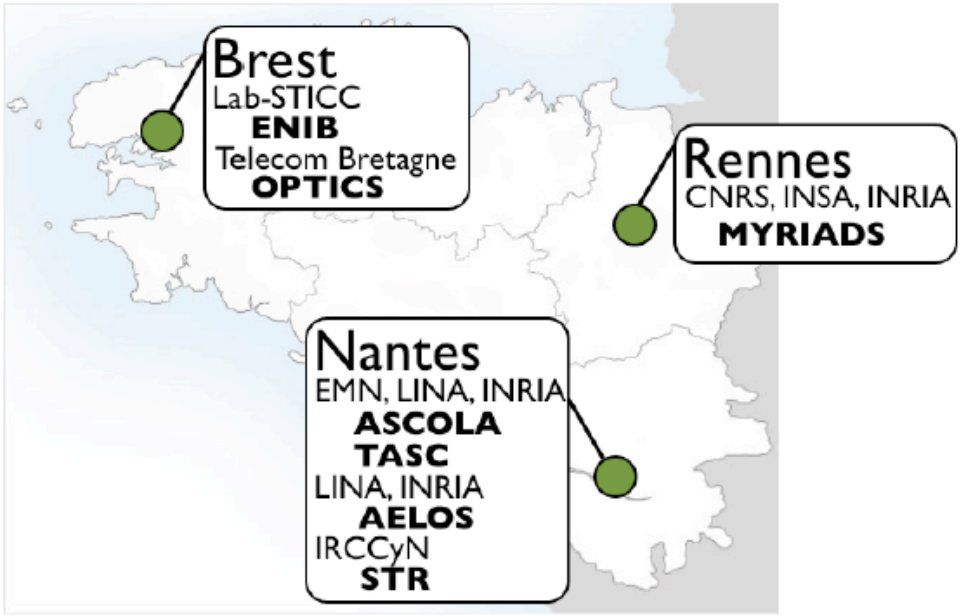
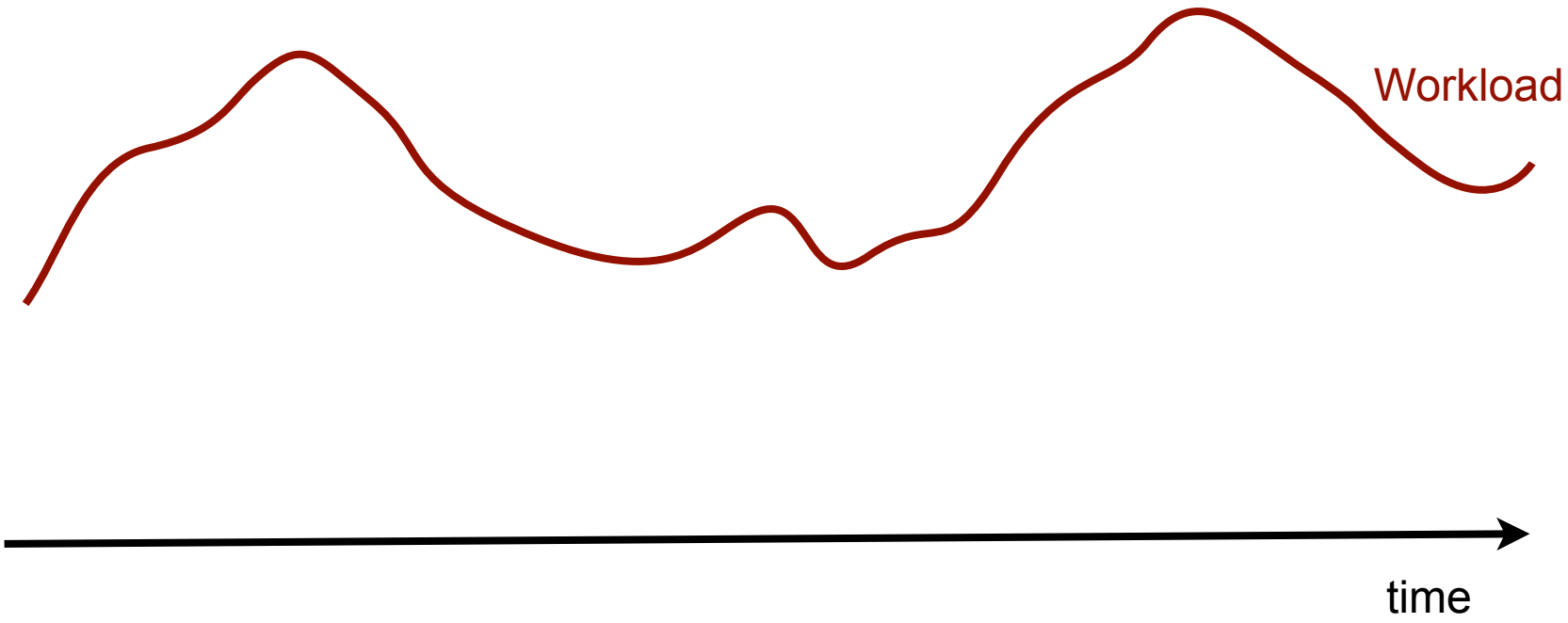
4 Phd

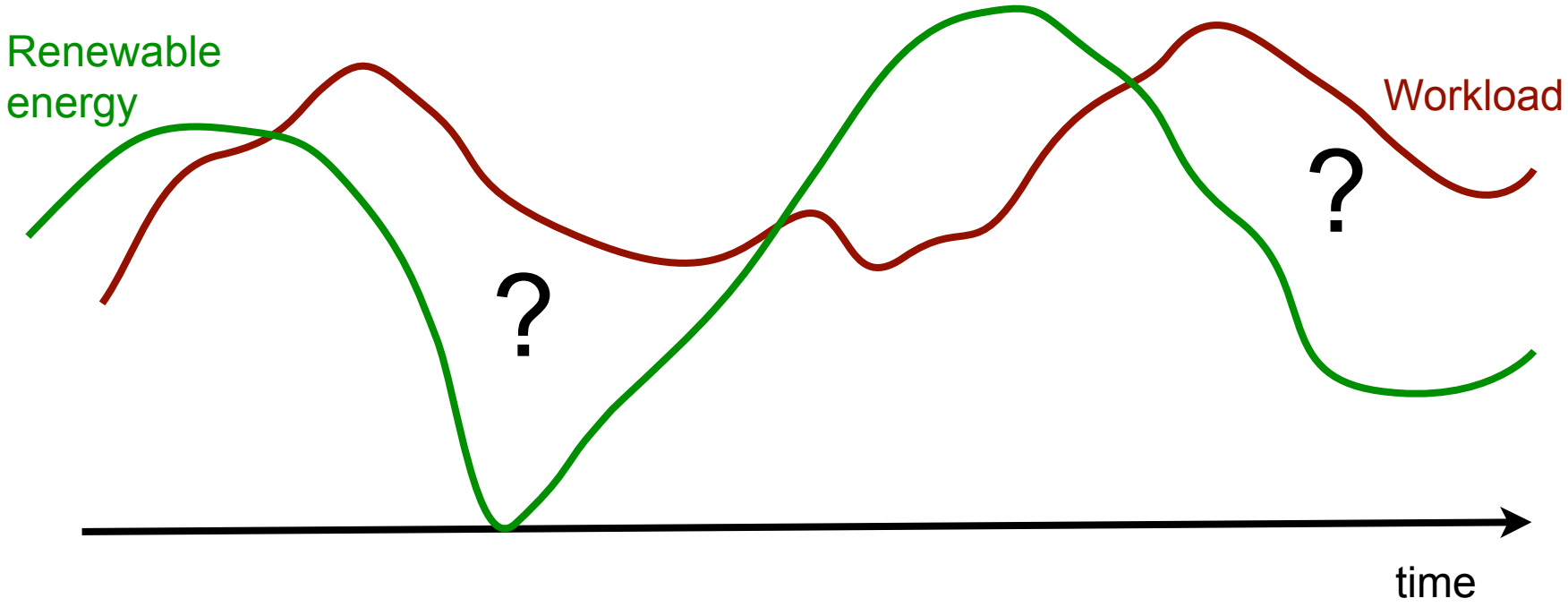
Labex CominLabs/Bretagne
470 Ke



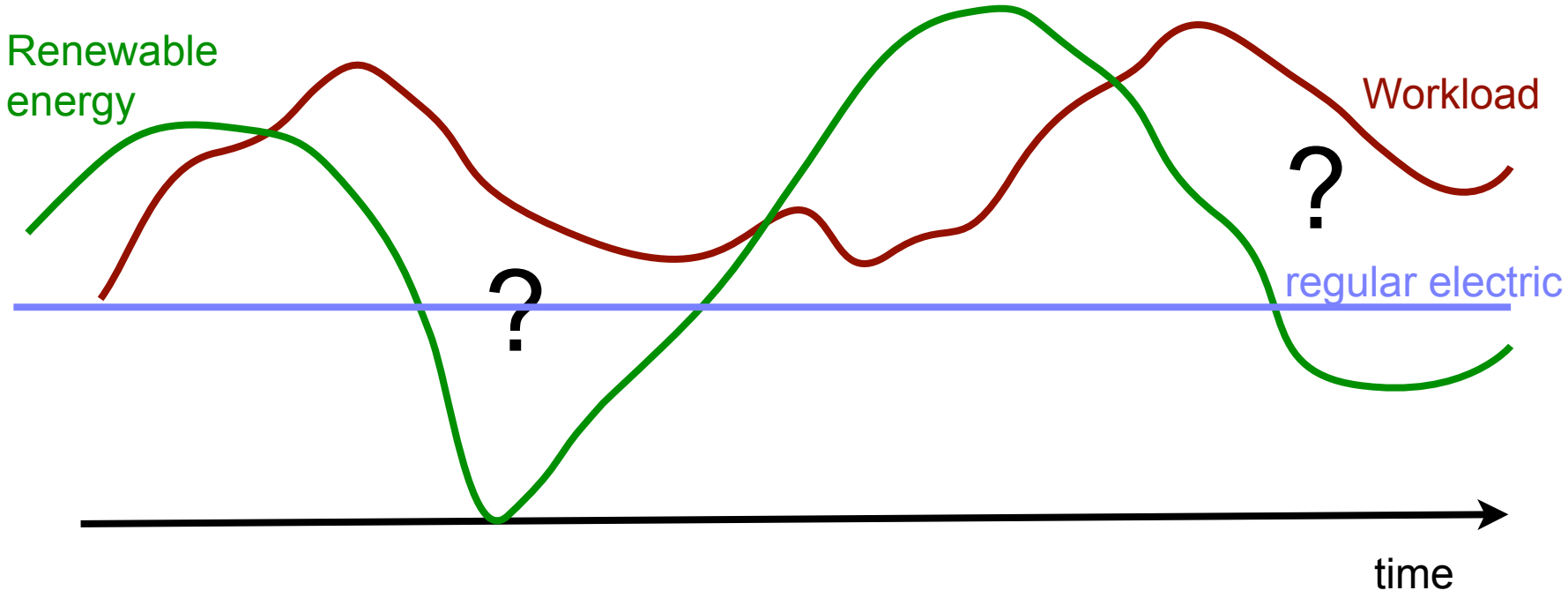
Problem



Problem



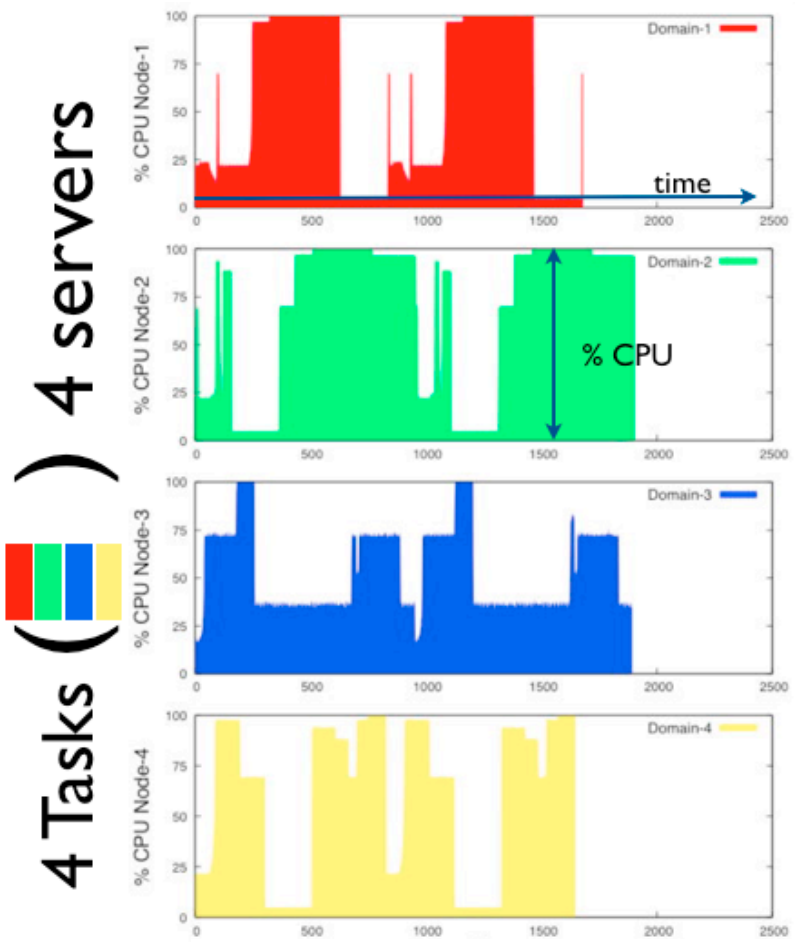
Problem



Main focus

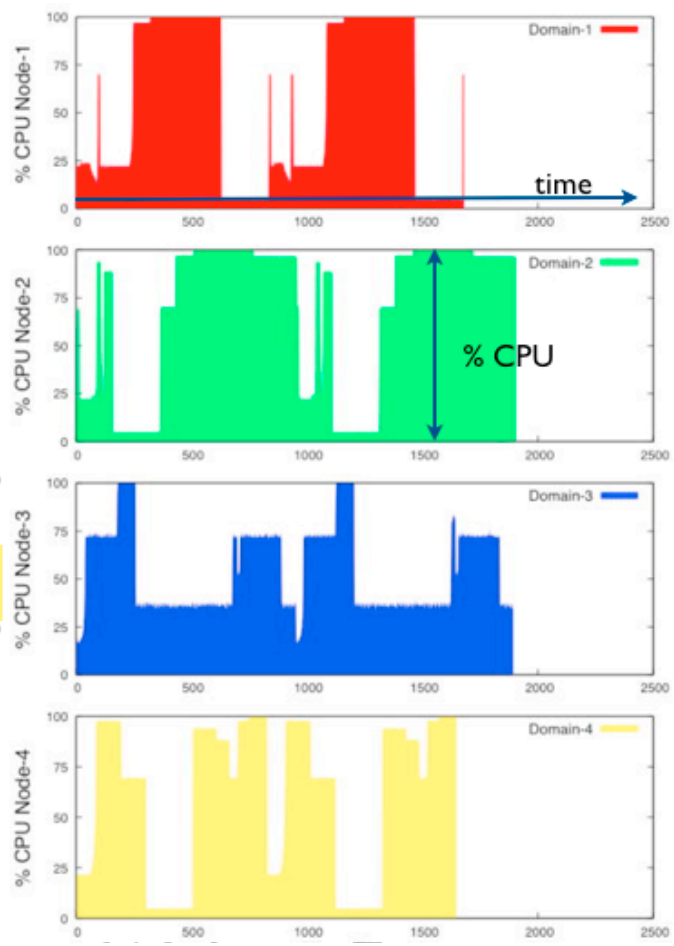
- **Cloud Computing**
  - Servers, virtualization, QoS,
- **Energy-aware task execution**
  - from the hardware to application's components
  - context of a mono-site data center
  - connected to the regular electric Grid and to renewable energy sources
- **Challenge**
  - Design a clever cloud's resource management which takes advantage of renewable energy availability to perform opportunistic tasks, then exploring the trade-off between energy saving and performance aspects in large-scale distributed system

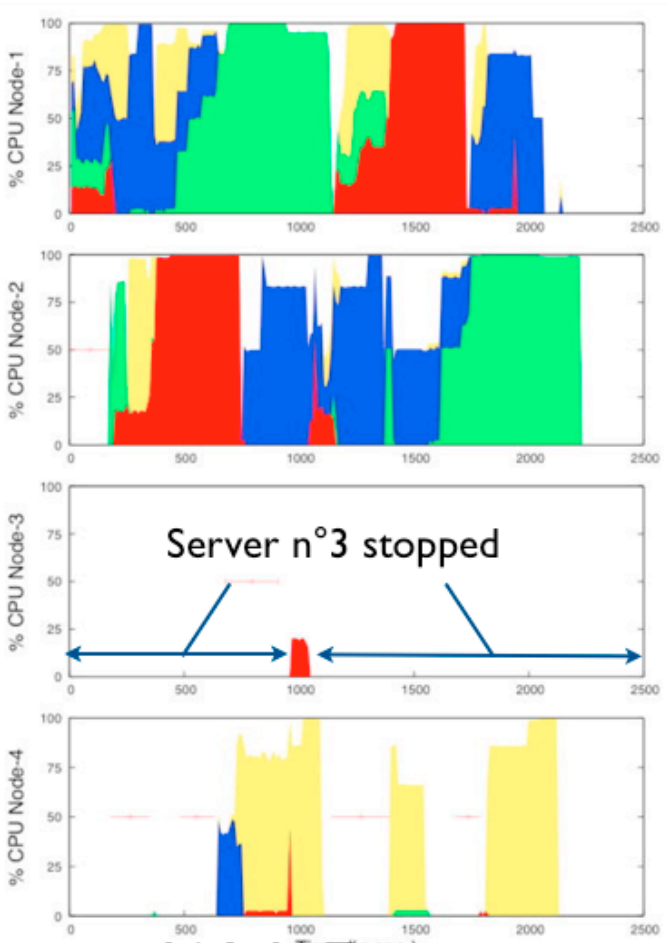
Palaeolithic : Dynamic Consolidaton



Palaeolithic : Dynamic Consolidaton

4 Tasks ( ) 4 servers





4 Tasks, 3 or 4 Servers
Consumption is reduced by 25%

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Palaeolithic : Dynamic Consolidaton

Workload-driven
without application coordination
mainly based on few dimensions
on homogenous platform,
focus on one concern
for a given time

Challenges

- Spatio-temporal distribution of tasks
- Workload-driven vs Power-driven
- Virtual Machine migration take time and bandwith
- Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...
- Validation

Challenges

MYRIADS,ASCOLA,STR-AELOS

- **Spatio-temporal distribution of tasks**
  - Machine learning
  - Renewable energy model
  - Task model
  - DC Model
- **Workload-driven vs Power-driven**
- **Virtual Machine migration take time and bandwith**
- **Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...**
- **Validation**

Challenges

MYRIADS,ASCOLA

- **Spatio-temporal distribution of tasks**
- **Workload-driven vs Power-driven**
  - SLA: formal contract between a service provider and a service consumer on an expected QoS level
  - Dynamic component reconfiguration to find the “good” trade-off between SLA and the resources consumption
- **Virtual Machine migration take time and bandwith**
- **Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...**
- **Validation**

Challenges

ASCOLA,OPTICS, NET

- **Spatio-temporal distribution of tasks**
- **Workload-driven vs Power-driven**
- **Virtual Machine migration take time and bandwith**
  - Migration optimization
  - Optical network
- **Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...**
- **Validation**

Challenges

ASCOLA,TASC

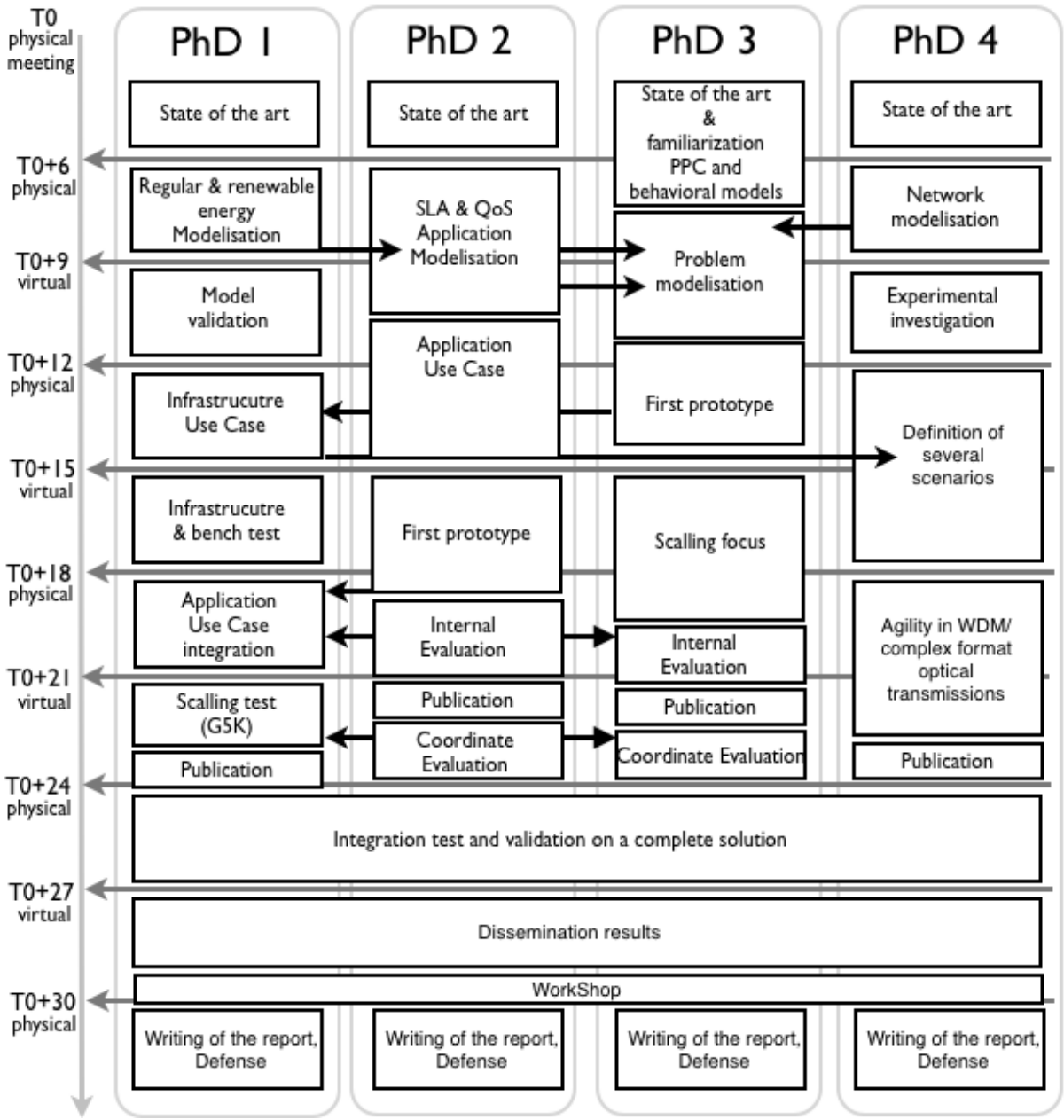
- **Spatio-temporal distribution of tasks**
- **Workload-driven vs Power-driven**
- **Virtual Machine migration take time and bandwith**
- **Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...**
  - Constraint solver
  - multi-dimensional bin packing scalability
- **Validation**

Challenges

MYRIADS,ASCOLA, OPTICS, NET

- **Spatio-temporal distribution of tasks**
- **Workload-driven vs Power-driven**
- **Virtual Machine migration take time and bandwith**
- **Virtual Machine Placement Problem is similar to the multi-dimensional bin packing problem know to be NP-Hard ...**
- **Validation**
  - Simulation : Find/collect weather traces
  - Prototype : Design a dummy DC

Workplan


T0 physical meeting
PhD 1
PhD 2
PhD 3
PhD 4
State of the art
State of the art
State of the art & familiarization PPC and behavioral models
State of the art
T0+6 physical
Regular & renewable energy Modelisation
SLA & QoS Application Modelisation
Network modelisation
T0+9 virtual
Problem modelisation
Model validation
Experimental investigation
T0+12 physical
Application Use Case
Infrastrucutre Use Case
First prototype
Definition of several scenarios
T0+15 virtual
Infrastrucutre & bench test
First prototype
Scalling focus
T0+18 physical
Application Use Case integration
Internal Evaluation
Internal Evaluation
Agility in WDM/ complex format optical transmissions
T0+21 virtual
Scalling test (G5K)
Publication
Publication
Coordinate Evaluation
Coordinate Evaluation
Publication
T0+24 physical
Integration test and validation on a complete solution
T0+27 virtual
Dissemination results
WorkShop
T0+30 physical
Writing of the report, Defense
Writing of the report, Defense
Writing of the report, Defense
Writing of the report, Defense

Conclusion

- **Many Questions ...**
  - few answers
- **Started on October 2013**
  - 2 PhD started
  - 1 coming soon
  - 1 in October 2014
- **First traces on irradiance**
  - from 2005 to 2012
- **Heterogeneous partners**
  - Identify challenging collaboration
- **First results on 2014**
  - I Hope ;-)