Deploying OpenAirInterface in R2lab

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Demo Outline

- Deploy a private LTE network **inside the chamber**
- Connect a **commercial** phone (**inside as well**)
  - achieve full IP connectivity / i.e. no phone calls
  - measure bandwidth
- Run spectrum analyzer
- Run scrambler on upstream link, evaluate impact

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How to use testbed

- Side objective
  - illustrate how to use the 2 entry points
- Website : `r2lab.inria.fr`
- Testbed ssh gateway : faraday.inria.fr

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Website

- `r2lab.inria.fr` is the place to go first
- for general information
- for registering
- for booking
- for monitoring

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r2lab.inria.fr

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Demo : the pieces

- 4G network infrastructure, that is
  - HSS (Home Subscriber Server) - *1 regular node*
    - and EPC (Evolved Packet Core) - *1 reg. node*
- eNodeB (4G antenna) - *1 node with USRP*
- 1 commercial phone (Nexus 5)
  - accessible via a dedicated MAC in the chamber

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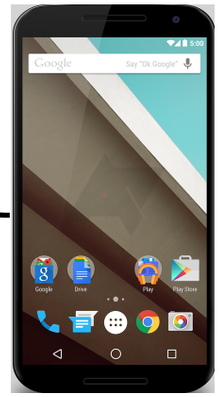
R2LAB

USB

macphone

Nexus 5



UE

fit23

eNB

fit36

fit37

HSS

MME

SGW

PGW

EPC

Internet

fit06

scrambler

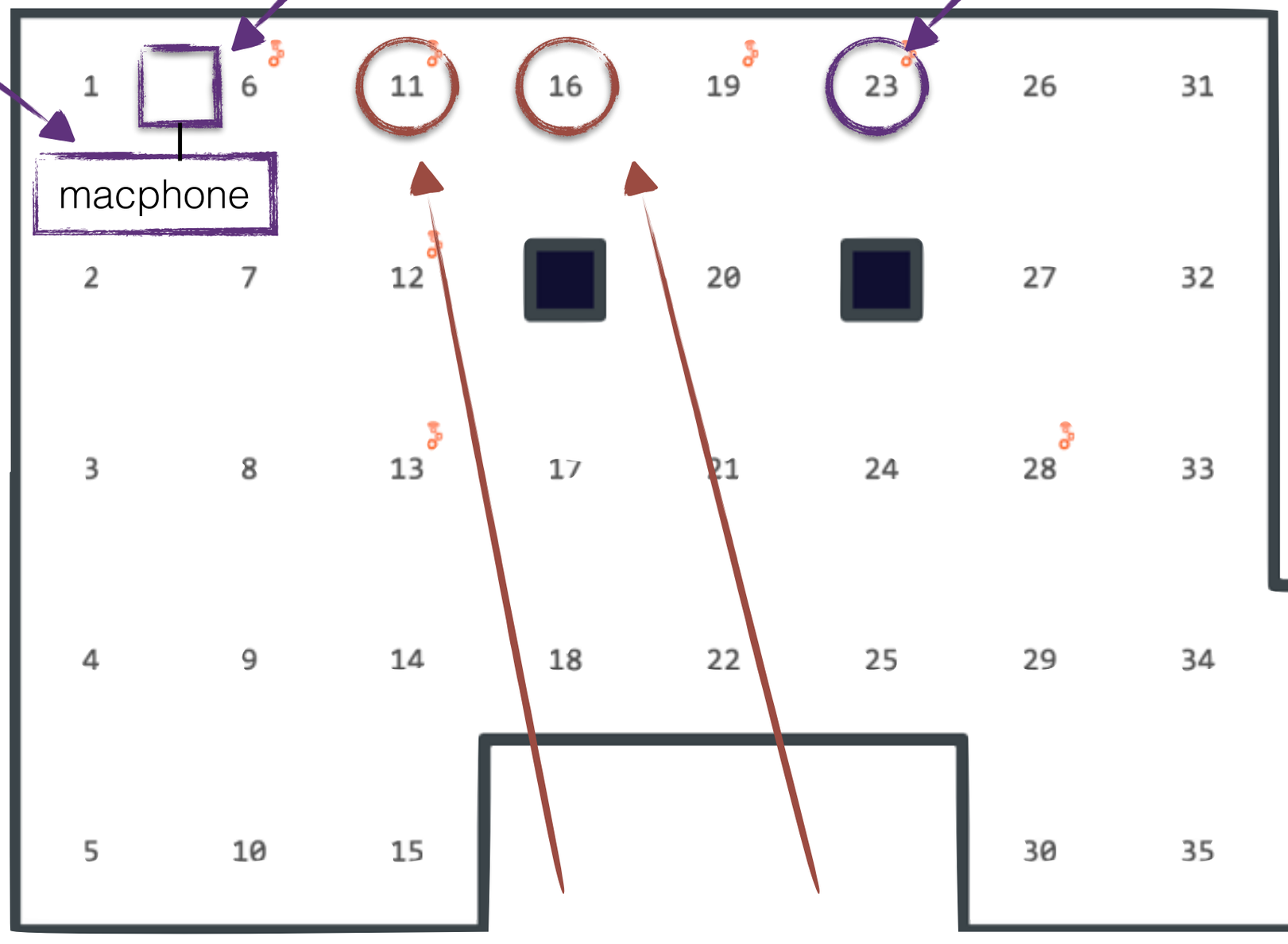
fit11

spectrum analyzer

dedicated mac for controlling the phone

Nexus 5

EnodeB



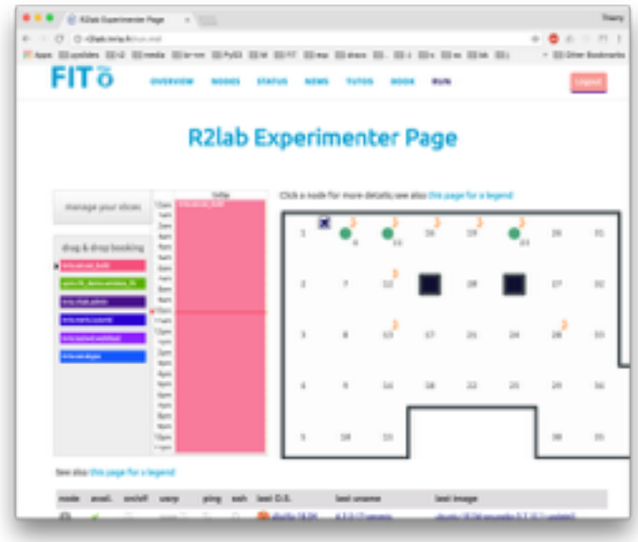
EPC

HSS

vantage points
for spectrum analysis
and scrambling

Visual Elements

- website
  - for overall monitoring
- local terminal
  - for orchestration
- screen sharing to macphone
  - for messing with phone
- ssh -X sessions
  - to view and scramble spectrum



Let’s run it

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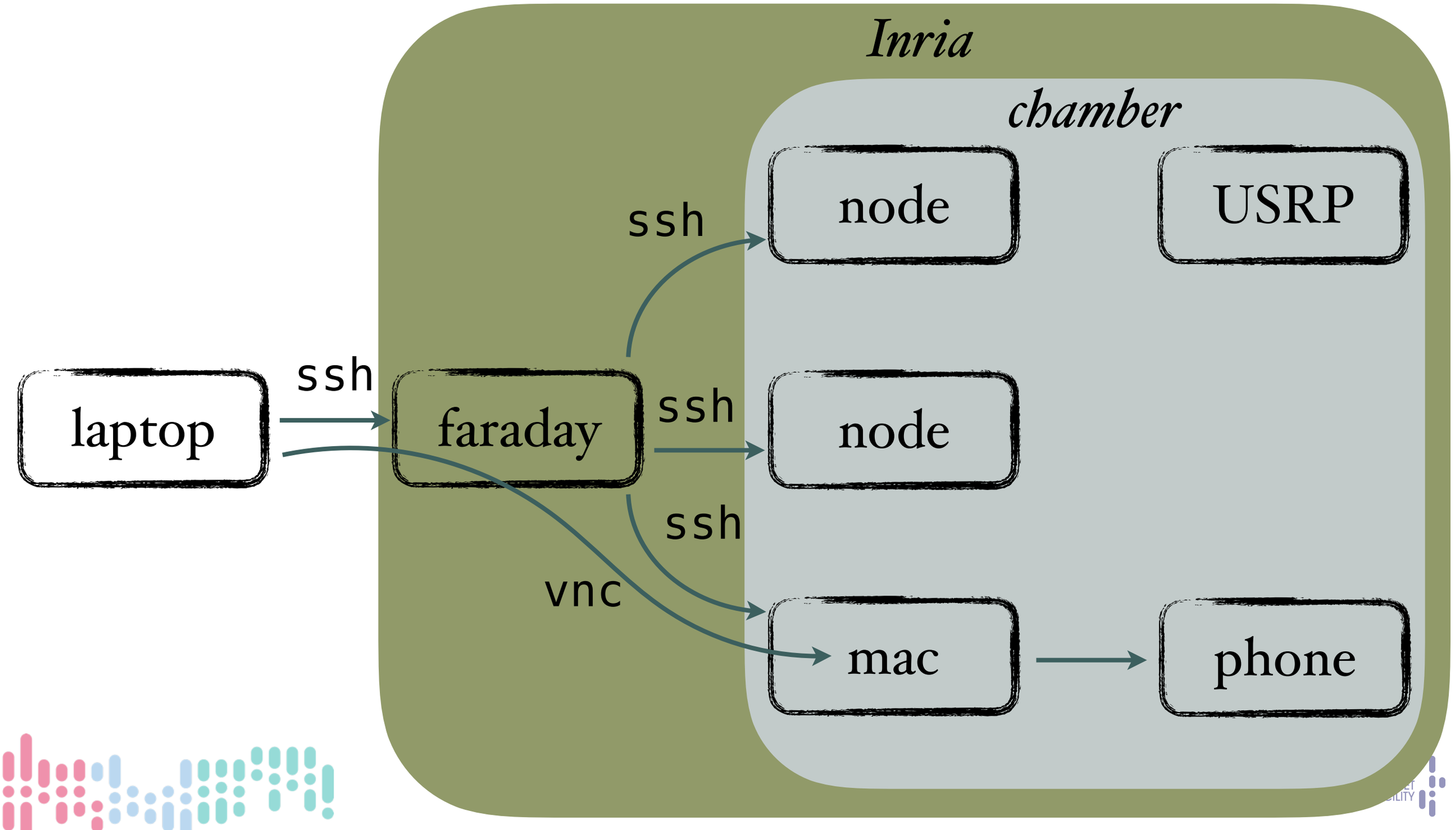
Controlling resources



Inside the scenario

- Core software prebuilt in images
  - OAI : `oai-enb` (radio) and `oai-gw` (infrastructure)
  - stock `gnuradio`
- We are left with
  - loading images on nodes
  - initialize (network interfaces, time sync, …)
  - configure openair
  - run openair

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Typical Orchestration

- running sequentially
  - cannot account for synchronization
    - plus, is a huge waste of time
- need to run everything in parallel
  - but with constraints

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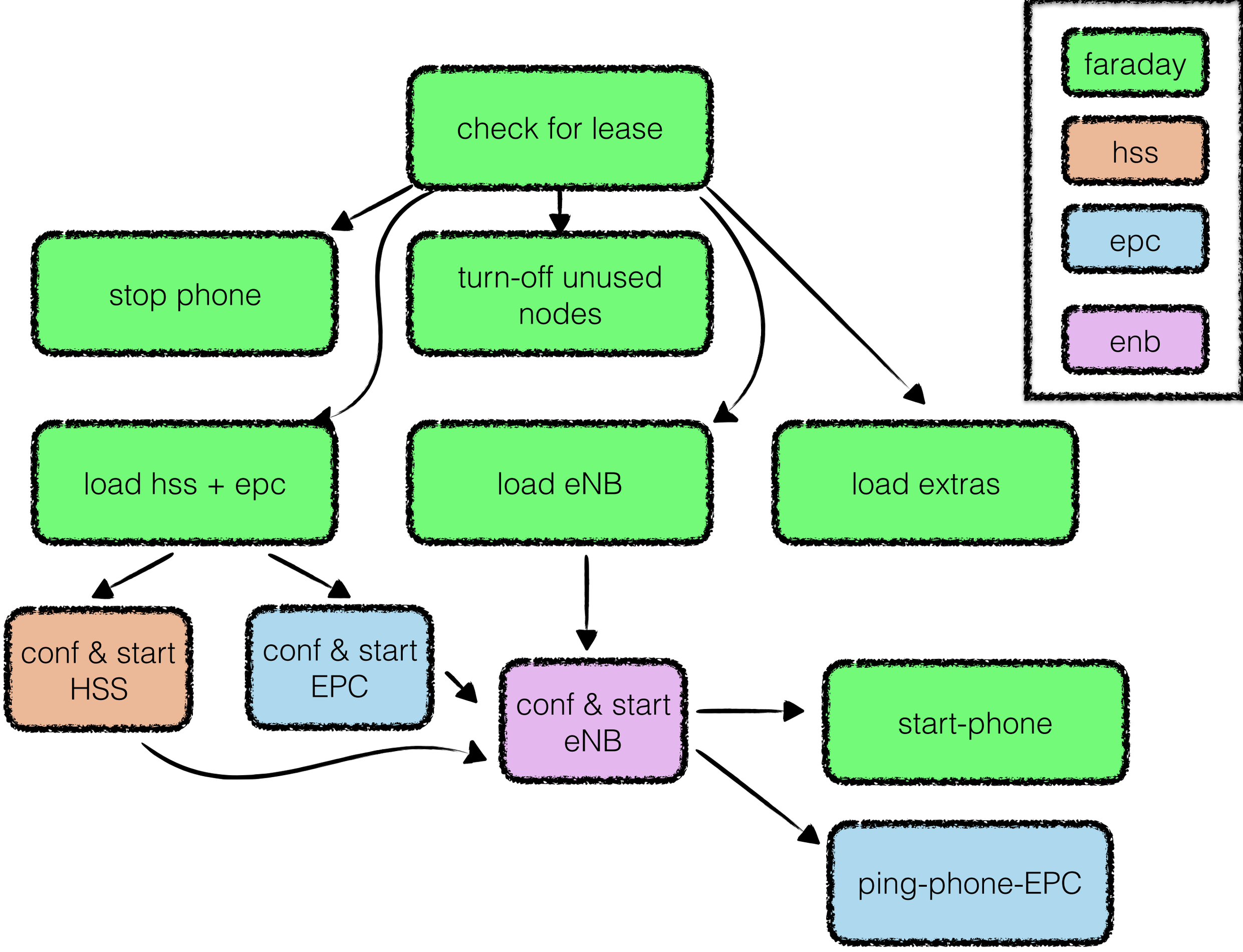
check for lease
stop phone
turn-off unused nodes
load hss + epc
load eNB
load extras
conf & start HSS
conf & start EPC
conf & start eNB
start-phone
ping-phone-EPC
faraday
hss
epc
enb

Our offering

- All this can be done using standard tools
- We do provide a simple set of tools to achieve this
- Based on python's asyncio library
    - single-threaded asynchronous programming
- Together with very small additions of our own
    - `asynciojobs` : micro-scheduler
    - `apssh` : asynchronous parallel ssh

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- Schedules based on ‘**required**’

- Optimizes ssh conn.s

- Single threaded

outline.py

New Open Recent Revert Save Print Undo Redo Cut Copy Paste Search Prefere

```
faraday = SshProxy(hostname = "faraday.inria.fr",
                   username = "onelab.inria.oai.oai_build")

hss = SshProxy(gateway = faraday,
               hostname = "fit37", username = "root")

load = SshJob(node = faraday,
              commands = [
                  [ "rhubarbe", "load", "fit37" ]
                  [ "rhubarbe", "wait", "fit37" ]
              ])

internal_job = Job(anything_else())

start = SshJobScript(node = hss,
                     command = [ "./oai-gw.sh", "start" ],
                     required = (load, local_job))

engine = Engine()
engine.add(load, internal_job, start)
engine.orchestrate()
```

-(Unix)--- **outline.py** All (19,0) (Python) 12:14PM 1.35 Mail

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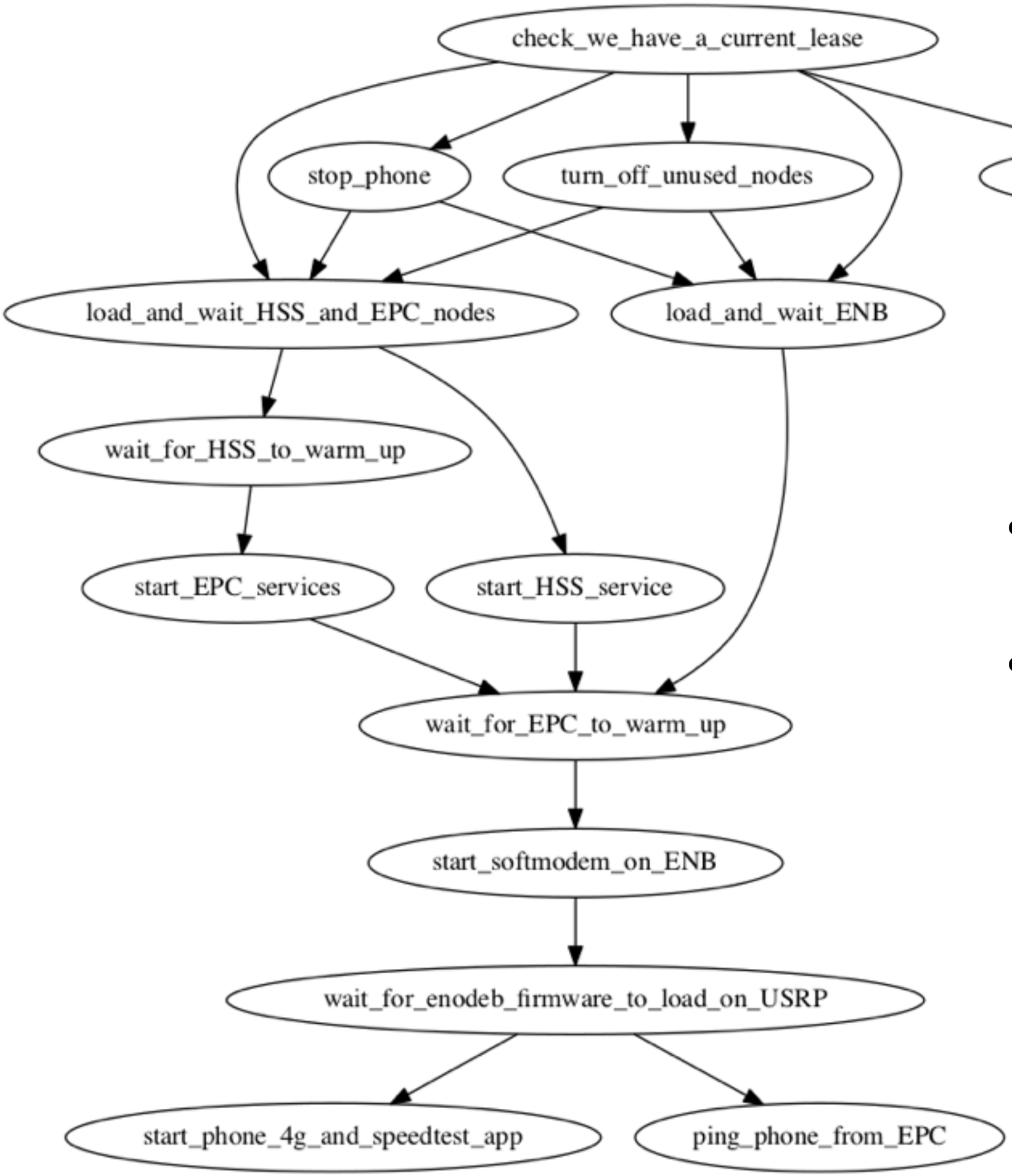

- graphic view
- from oai-scenario.py

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What now ?

- Once testbed is ready, we can
  - start spectrum analyser
  - run a standard speedtest app
    - start a scrambling session from fit06
    - rerun spectrum analyzer to observe effects
- script also takes care of data collection
  - using the exact same paradigm

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Conclusion

- Running a UE in a R2lab node is in the works and will be available shortly

- Also, we may be able to accommodate needs not yet supported

- For any question / suggestion : get in touch at mailto:fit-r2lab-users@inria.fr

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thank you

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backup slide

Internet

em1

faraday

192.168.3.100

192.168.2.100

control

data

EPC

=

MME

+

SPGW

HSS

ENB

192.168.2.23

S6a

S1C/S1U

fit23

fit16

fit19

192.168.3.23

SGI