TRIANGLE
A platform for mobile services and apps testing

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TRIANGLE testbed

• TRIANGLE offers an end-to-end framework devoted to testing and benchmarking of mobile applications, services and devices.

• Built of commercial and open source components and equipment

• Full experiment automation and customized design
TRIANGLE project developments

• Testbed

• Testing methodology. Component management and configuration, measurement processing, computation of QoE, KPI and/or TRIANGLE mark...

• Test cases. Experiment definition: KPI to measure, scenario, equipment, etc...
  • Specify custom test case for experiments, or selection among set of pre-built test cases.

• Easy remote access through web portal, also low level access for advanced users
TRIANGLE architecture

Low level access

Test Automation Platform
- TAP Driver UXM
- TAP Driver Quamotion WD
- Command-line tools
- TAP Driver AT4 Controller
- TAP Driver Power Analyzer
- TAP Driver OML Server

Quamotion WebDriver
ADB
AT4 Controller

High level access

Triangle Portal
- Portal database server

Triangle Control and Management Framework

OML Server
OML database server

N6705B – DC power analyzer

UXM – eNodeB emulator
RF connection
Battery connections

AT4 Agent
TestelDroid (Android)
UE (Android)
TRIANGLE components

**RAN**
- UXM eNodeB emulator
- SDR cards (e.g. OAI compatible)
- Commercial and open source eNBs
- Commercial and open source UEs

**EPC**
- Commercial: Polaris Networks
  - Release 13
  - Network impairments
  - Modular
- Open source
  - Different implementations: NextEPC, OAI

**VIM**
- Openstack for deployment of VMs

**SDN**
- OpenvSwitch
TRIANGLE features

- Power consumption analysis at UE
- Downlink channel emulation (UXM)
- Carrier aggregation
- NB-IoT support
- LTE – WiFi integration (LWIP)
TRIANGLE testbed
TRIANGLE access procedure

1. Register online
2. Select your profile:
   - App Developer
   - Device Maker
   - Operator
   - Researcher
3. Online Training:
   - Webinar
   - One2One Sessions
   - Email
4. Book the Testbed
5. Ship your device
   Or Upload App
6. Travel to Triangle facilities
   (Optional)
7. Use Triangle facilities:
   - In person
   - Remotely
8. Get Results!

Support via email and in our facilities

www.triangle-project.eu
5GENESIS Málaga platform

One of the first three 5G experimentation facilities funded by EU

29 partners from 12 countries:
Thank you for your attention
Any question?