European Commission

Horizon 2020
European Union funding
for Research & Innovation

Measuring Mobile Broadband Networks in Europe

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EU H2020 Project

Partners: Simula(coordinator), Celerway(Norway), Telenor(Norway), IMDEA (Spain), KaU(Sweden), NET1(Sweden), POLITO(Italy), Nextworks(Italy)

Budget: 6.5M €

Mobile broadband (MBB) networks

- Underpins a lot of vital operations of the modern society




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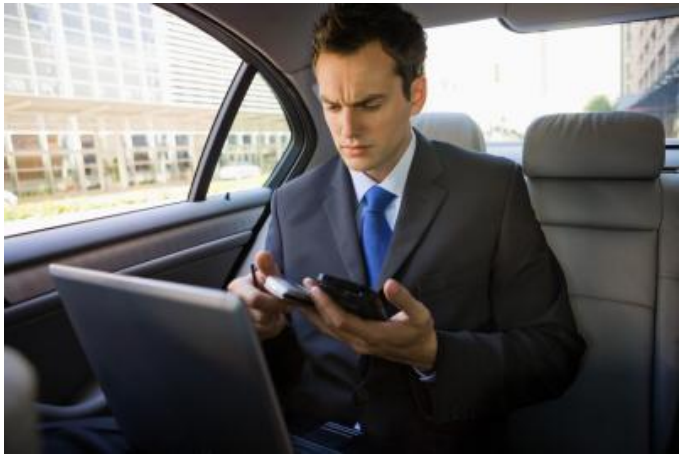
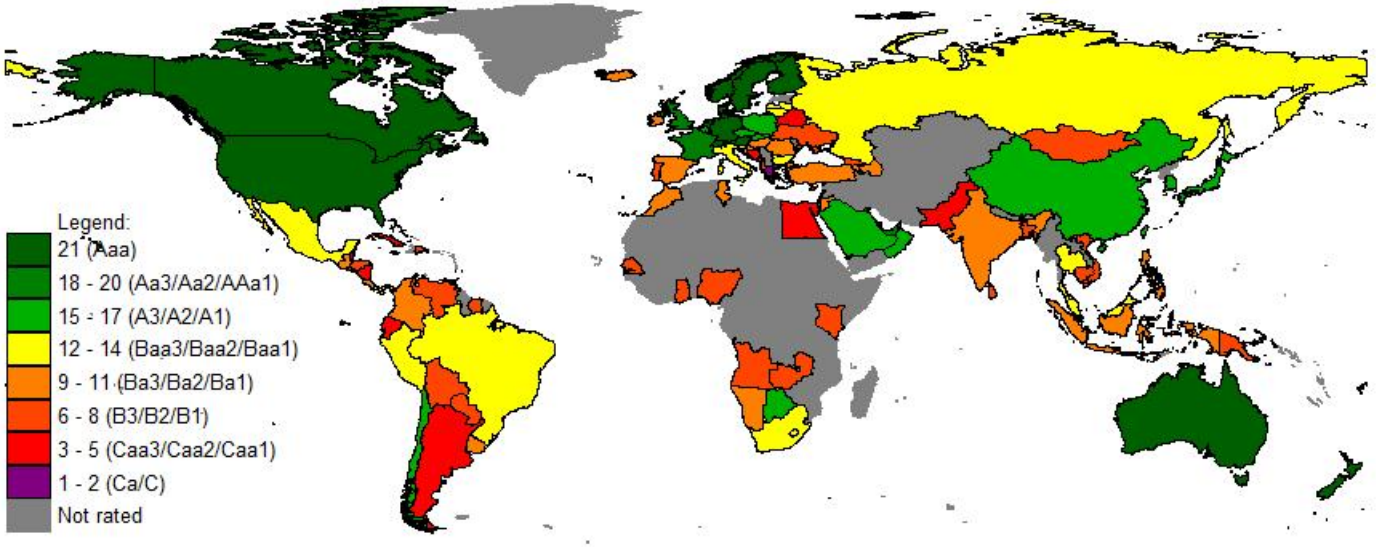
- The popularity of mobile devices combined with high-capacity 3G and 4G mobile networks, has radically changed the way most people access and use the Internet.



Moody's of MBB Networks



Objective data on the performance and stability of MBB (user's perspective)?

- Price, bandwidth, reliability and application performance

MONROE: a unique platform for measurements and experiments in operational MBB networks

- Design, build and operate an **open**, **European-scale**, and **flexible** platform to run experiments on operational 3G/4G Mobile Broadband networks with WiFi connectivity
- Use the platform for:
  - identification of key MBB performance parameters, thus enabling **accurate**, **realistic**, **persistent** and **meaningful** monitoring and performance assessment
  - examination and evaluation of **innovative protocols and services** for MBB networks

Who can benefit from MONROE?

Regulators and society at large: (Nkom)

- Assess the stability and performance of MBB networks to guide regulations and spur competition

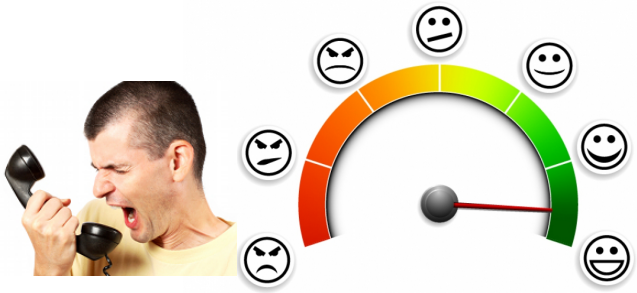
Users/consumers:

- Make informed choices on which network provider to choose

Who can benefit from MONROE?

Operators: (Telenor, NET1 and Telefonica)

- Discover and monitor configuration/operational problems using the information on performance from the users' perspective
- A good alternative to expensive and time consuming drive-tests that identifies the coverage holes
- Help with more accurate frequency planning, more cost-efficient investments, and better network utilization



Who can benefit from MONROE?

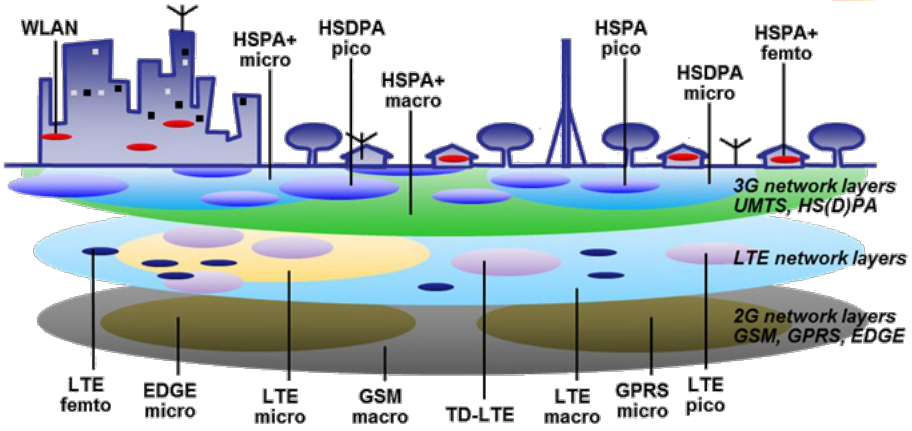
Organizations and businesses: (Nextworks, Celerway and LiveU)

- Transport/logistic companies and emergency services can assess the quality of their services that depend heavily on mobile networks in their operations

Who can benefit from MONROE?

Researchers, innovators and experimenters: (All academic partners, University of Wisconsin-Madison, Celerway and Telenor)

- Evaluate the performance of novel applications or protocols in a real operational setting



MONROE

- Build on the existing NorNet Edge infrastructure, consisting of 200 dedicated operational nodes spread across Norway
- Extend the Coverage to 4 European Countries (Norway, Sweden, Spain, Italy)
  - Comparison of different configurations, regulations, frequencies and operator strategies in and among different countries

MONROE

- Nodes on buses, trains and trucks
  - Impact of mobility
  - Rural vs City
- 3MBB operators and WiFi
  - Experimenting on different access technologies
  - Explore new ways of combining them to increase performance and robustness
  - New opportunities, i.e., 4G/WIFI handover

Capability and Functionality Extensions

- Linux based measurement boxes :
  - Allows kernel modifications
  - Different demanding applications
- Provides an user access and experiment scheduling interface through FP7 FED4FIRE
  - Scheduling based on the privileges and data quotas
- Compatible to FP7 mPlane architecture
  - External experiments will be run via mPlane template
  - Core experiments will be collected at mPlane backend providing mPlane a fresh wireless dataset

Use Case 1: KEY MBB Parameters

Performance assessment and monitoring of mobile broadband (MBB) networks

- Network Tomography: Performance and Reliability Parameters
  - Latency, packet loss, bandwidth, etc…
- Traffic analysis
  - Monitor and report live traffic statistics
- Route analytics: Network Topology Inference / Analysis
  - Path dynamics, Internet routing data, prefix geolocation

Use Case 2: Application Performance

Service-oriented measurements

- Performance Measurement for Video on Demand and Video Conferencing Systems
- Performance measurements of Web traffic
- Assessment of Online Gaming performance
- Effect of the background traffic on the application performance
- Study how Quality of Experience (QoE) can be estimated from objective metrics

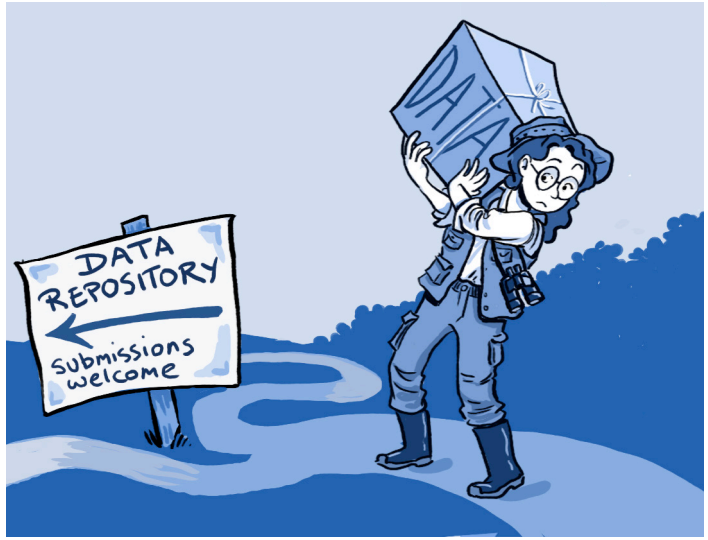
Use Case 3: Novel Services and Protocols

Examination and evaluation of innovative protocols and services for MBB networks

- Evaluation of path support for MPTCP, ECN, TCP Fast Open, etc.
- Protocol Performance Optimizations
- Traffic offloading between MBB and WIFI
- Multipath Performance Measurements

OPEN DATA and OPEN Source

- **OPEN DATA**
  - provide open data whenever possible to enable not only the consortium members but all interested entities benefit from the MONROE platform.
  - In order to access the open data measurement results, APIs for storage of and access to open data will be defined
- **OPEN Source Software (OSS)**
  - All components of the system design developed will be released as OSS



External Users

- Platform is **open** to external users:
  - external users are incorporated early on in the design process.
  - provide **Experiments as a Service (EaaS)**: flexible high-level scripts to execute experiments, collect results, and analyze data

First Open Call

- To be announced Early 2016
- Up to 150k € support
- Experiments
- Extensions to the testbed (HW and SW)

Current Status and Timeline

- Started March 1st 2015 (will run 3 years)
- Currently working on
  - System design and proof-of-concept implementation
  - HW selection

- Prototype implementation is ready in March 2016
- Testbed open to external users in June 2016
- Testbed open to all users in March 2017


WHO
WHAT
WHERE
WHEN
WHY
HOW
QUESTIONS
ANSWERS