

BEREC's NN QoS Work Overview

QoS monitoring in the context of net neutrality

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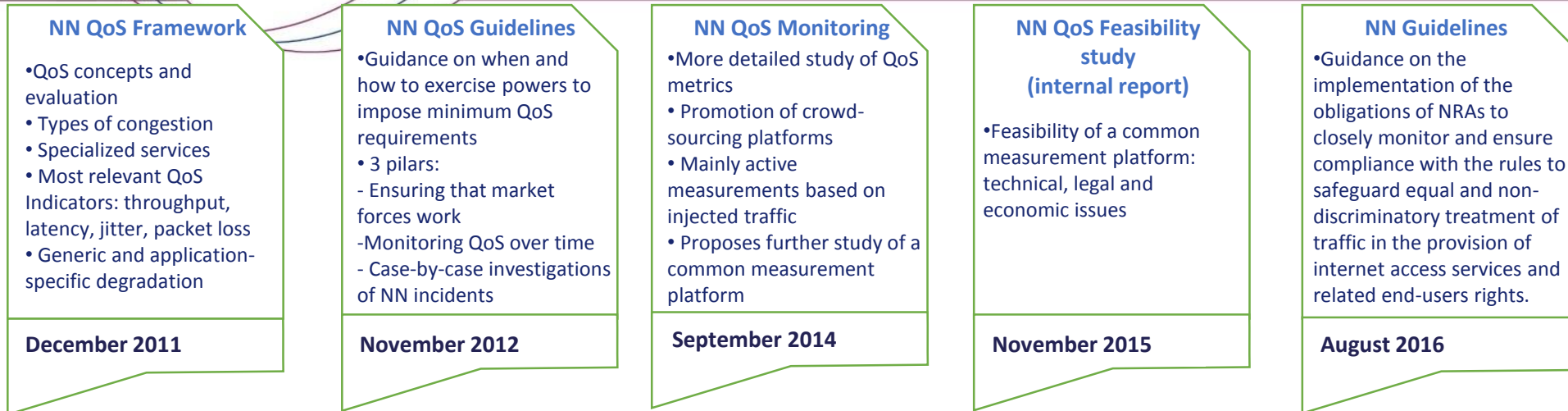
NN measurement Tool Advisory Committee member

International Seminar on Quality of Telecommunication Services

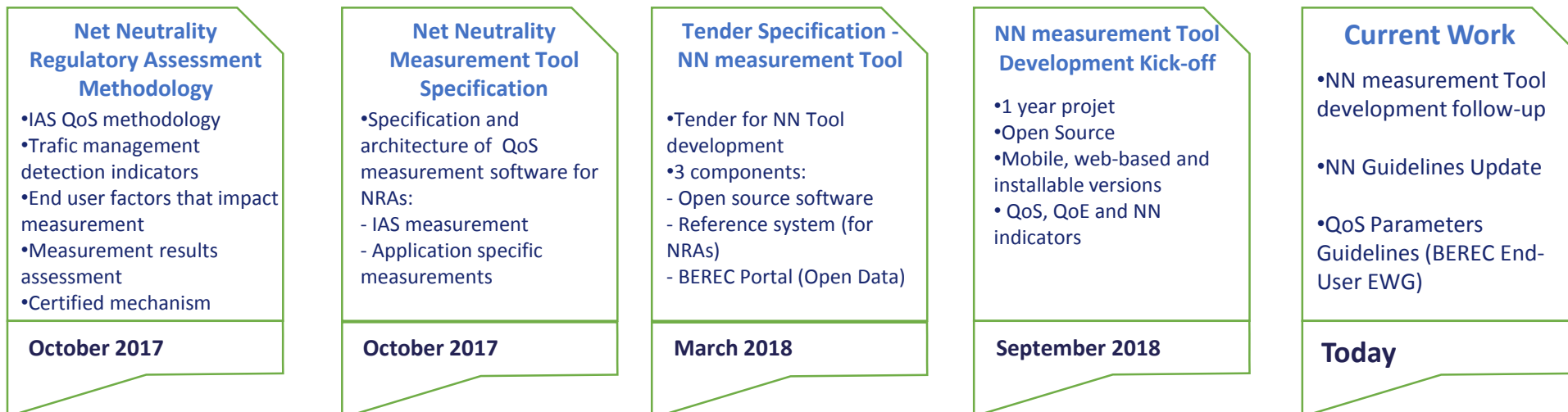
20 and 21 August 2019, Lima, Peru

Agenda

1. BEREC NN QoS activities
2. QoS measurement objectives and challenges
3. IAS NN/QoS indicators and measurement architecture



TSM Regulation - EU 2015/2120



Measurements can be used for the following purposes:

- Empowering the end user to validate the commitments made to them from their IAS provider.
- Monitoring the general IAS quality and confirming that the performance of IAS is developing sufficiently over time when taking into account technological evolution.
- To support the detection of traffic prioritisation and/or throttling of selected applications compared to other applications running over IAS.
- NRAs may also use the data to increase transparency (e.g. interactive maps showing performance in a geographic area).

1. **A harmonized measurement methodologies** of basic performance parameters (speed, delay, jitter, packet loss)
 - **Significant variations** in current existing measurement tools
 - **There is no single best tool** for doing the measurements;
 - The tools architecture (e.g. servers location and configuration) may also impact measurements
 - What are the “best practices” ?
2. **A toolbox for monitoring NN violations**
 - **Different traffic management practices** may be used, and each practice require a different detection method: e.g. Port based blocking/throttling port numbers or using DPI, traffic shaping, etc.
 - **Few tool available at the time** that are supported by the community of developers
 - Need to monitor over time on different time scale

3. A well characterised user environment

- User environment have a great impact on measurement in crowdsourcing solution
- Many factors may affect measurement results :
 - CPE level:
 - Performance of the modem
 - Type of the line (Wifi, Ethernet)
 - Access technology (Fiber, cable, copper)
 - Radio connection quality
 - Cross-traffic
 - User's terminal level:
 - Performance of the user's terminal (CPU, RAM load)
 - Version of the computer operating system
 - Simultaneous usage of other software like antivirus and firewalls
 - Cross traffic
- Those parameters should be assessed whenever possible (using APIs for example)

4. A robust Measurement results assessment

- **Data validation** is needed in order to avoid impacting the quality of measurements (e.g. user environment impact evaluation, fraud attempts detection, etc.)
- Robust sampling methodology is required in order to aggregate statistics over population groups.
- Measurement tool should provide transparency over the post-processing and aggregation used

BEREC considered international/European standards and recommendations from ETSI, ITU and IETF

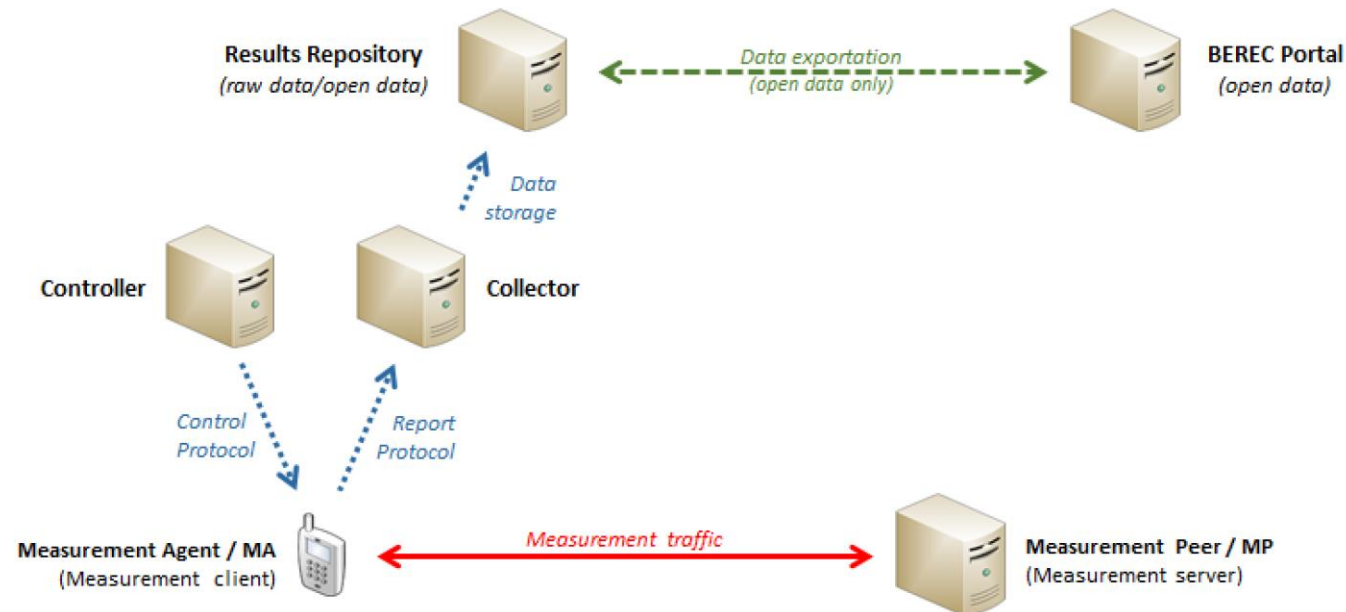
- Although several standards exist for quality metrics, BEREC believes that there is a need to further specify and clarify metrics and corresponding measurement methods.
- Within area of Internet communication, IETF has a central role and continues to develop IP technology. Therefore, IETF has a particularly important position regarding IP quality measurement.

In BoR (17) 178: Net Neutrality Regulatory Assessment Methodology Report, BEREC defines the way different QoS and NN indicators should be measured**What to monitor?**

- Measuring Internet access service quality
 - Speed measurement based on IP packet payload
 - Delay and delay variation measurements
 - Packet loss measurements
- Traffic management practices that impact individual applications
 - Connectivity measurements
 - Blocked ports
 - IP addresses blocking
 - DNS manipulation and HTTP proxy blocking
 - Traffic management practices impacting QoS of individual applications
 - Web browsing
 - Video streaming

In BoR (17) 179: Net neutrality measurement tool specification, BEREC defines the architecture of the monitoring solution

- Use of existing standards, open source software and open data
 - IETF LMAP architecture (RFC 7594)
- Crowdsourcing-based solution
- Active measurements
- Guaranteeing security and respecting privacy
- Providing indications on test servers location and configuration
- Defining how measurement results should be presented



Relationship with QoS measurement and Net Neutrality

- Measurement of QoS/QoE indicators to detect NN infringement?

BEREC advocates adoption of existing standards and architectures.

- Developing a collaborative framework for multi-NRA monitoring, specifying methodology for overall system governance

Need to harmonize the measurement methodology and the monitoring architecture

- Provide comparable results

What about reliability of measurement?

- End user environment should be assessed
- Education of end users on effects of end user environment is important
- Test servers location can impact the measurement

... Representativeness of results?

- Measurement result assessing is important
- Statistical representativeness (e.g. robust sampling, aggregation) is a key to have meaningful results

Transparency of the methodology is key to better assessment of QoS

Thank you

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QoS from an end-user perspective

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1. QoS parameters Guidelines
2. Transparency requirements
3. BEREC NN measurement Tool

Background

- EEC Article 104 - By 21 June 2020, in order to contribute to a consistent application of this paragraph and of Annex X, **BEREC shall**, after consulting stakeholders and in close cooperation with the Commission, **adopt guidelines detailing the relevant quality of service parameters, including parameters relevant for end-users with disabilities, the applicable measurement methods, the content and format of publication of the information, and quality certification mechanisms.**

BEREC is actually working on Guidelines detailing QoS parameters

- For Internet access services (IAS) and Interpersonal communication services (ICS)
 - For IAS: parameters based on the ones defined already by BEREC (Open Internet EWG)
 - For ICS: parameters based on ETSI and ITU standards (relative to voice services, customer services, etc.)
- QoS parameters relevant for disabled end-users
- Publication of information
- Quality certification mechanisms

Article 4 of the European Regulation 2015/2120 states that all ISPs shall ensure that their contracts contain:

- information on the **impact of the applied traffic management measures** on the quality of the internet access services, on the privacy of end-users and on the protection of their personal data;
- a clear and comprehensible explanation as to how any **volume limitation or speed may impact the use** of content, applications and services;
- a clear and comprehensible explanation of the impact of **specialized services** on the internet access services provided;
- a clear and comprehensible **explanation of the remedies available to the consumer** in the event of discrepancy.

Article 4 of the European Regulation 2015/2120 states that all ISPs shall also ensure that their contracts contain:

- a clear and comprehensible explanation the different speeds:

	Fixed networks	Mobile networks
Minimum speed	The lowest speed that the ISP undertakes to deliver except in cases of interruption of the IAS (§143 BEREC NN Guidelines)	-
Normally available speed	The speed that an end-user could expect to receive most of the time when accessing the service (§148 BEREC NN Guidelines)	-
Maximum speed	The speed that an end-user could expect to receive at least some of the time (§145 BEREC NN Guidelines)	Estimated maximum speed in different locations in realistic usage conditions (§153 BEREC NN Guidelines)
Advertised speed	Speed constrained by a realistic maximum speed (§151 BEREC NN Guidelines)	

Certified mechanism

- The Regulation 2015/2120 defines that an end user may use a **monitoring mechanism certified by the NRA** to check that the actual performance meets what has been specified in the contract.
 - This **measurement information can be used for triggering the remedies** available to the consumer in accordance with national law.
 - This entails a decision on whether the subscription meets the different speed values defined in the contract and whether there is a significant discrepancy, continuous or regularly recurring.
 - The **Regulation does not define how the certification should be done.**
 - If the NRA provides a monitoring mechanism for this purpose it should be considered as a certified monitoring mechanism.
- ➔ BEREC measurement tool as a certified mechanism?

Objective: developing a harmonised measurement framework

- Same methodology
- Reduced cost compared to individual development
- Flexibility to adopt

→ Development of a “crowdsourced” measurement Tool to be used by different European NRAs

The tool will be **Open Source** and **Open Data**

- All parts of the tool will become Open Source
- Only Open Source components may be used

Based on LMAP architecture (RFC 7594)

Synergy with EU commission and with European broadband mapping platform

The measurement tool will provide the possibility to do cross-border measurement

Project overall timeline



The measurement is carried out for IPv4 and IPv6

QoS indicators

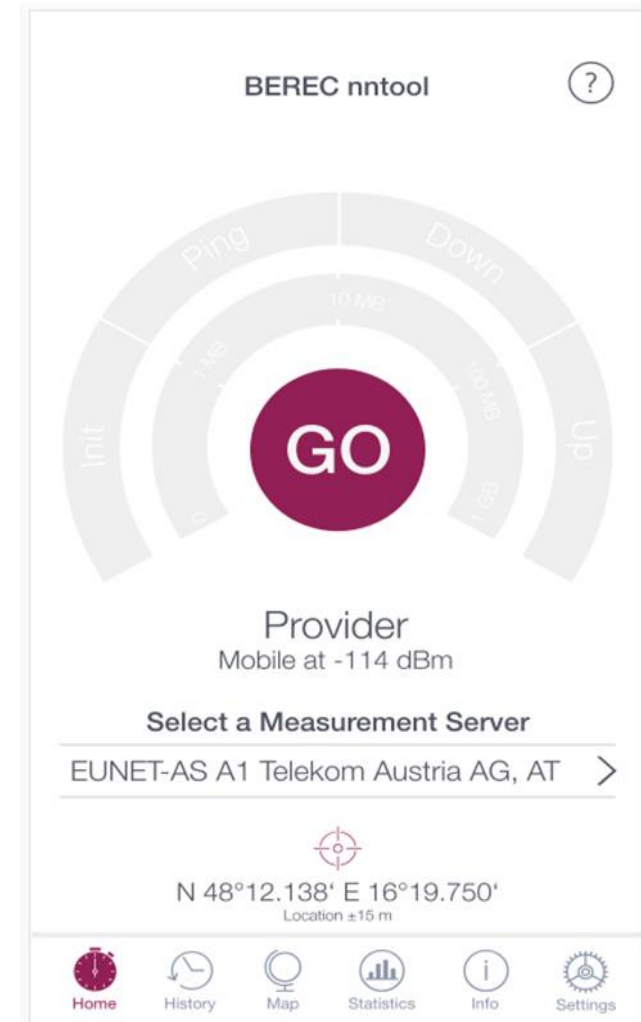
- IAS speed measurements
- Delay and delay variation /Jitter
- Packet loss

QoE indicators

- Web browsing performance
- Video/Audio streaming
- ...

NN indicators

- Blocked IP addresses
- DNS manipulation
- Proxy detection
- ...



3 components

1. Open source software

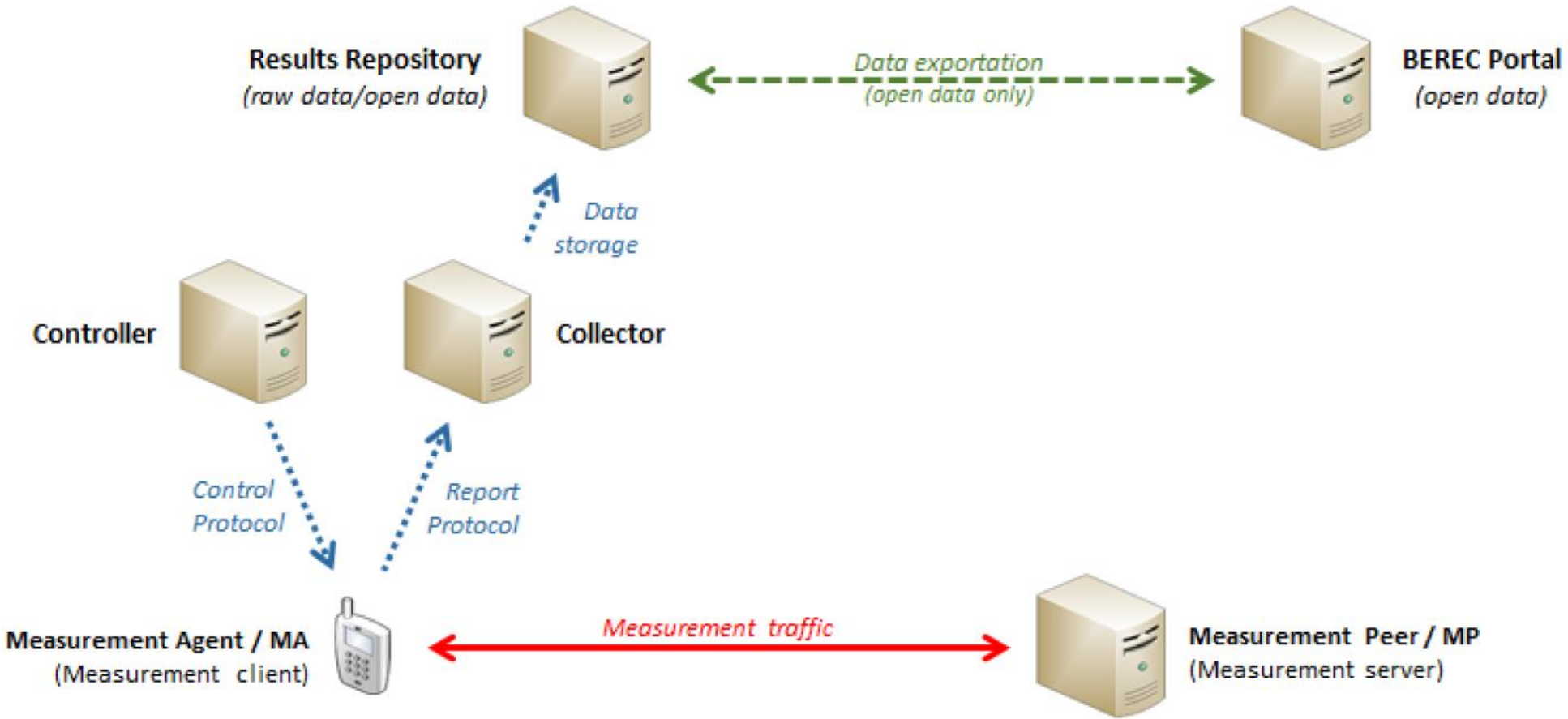
- based on the Requirements,
- installed on the Reference measurement system,
- can also be reused by NRAs, thus creating a federated system.

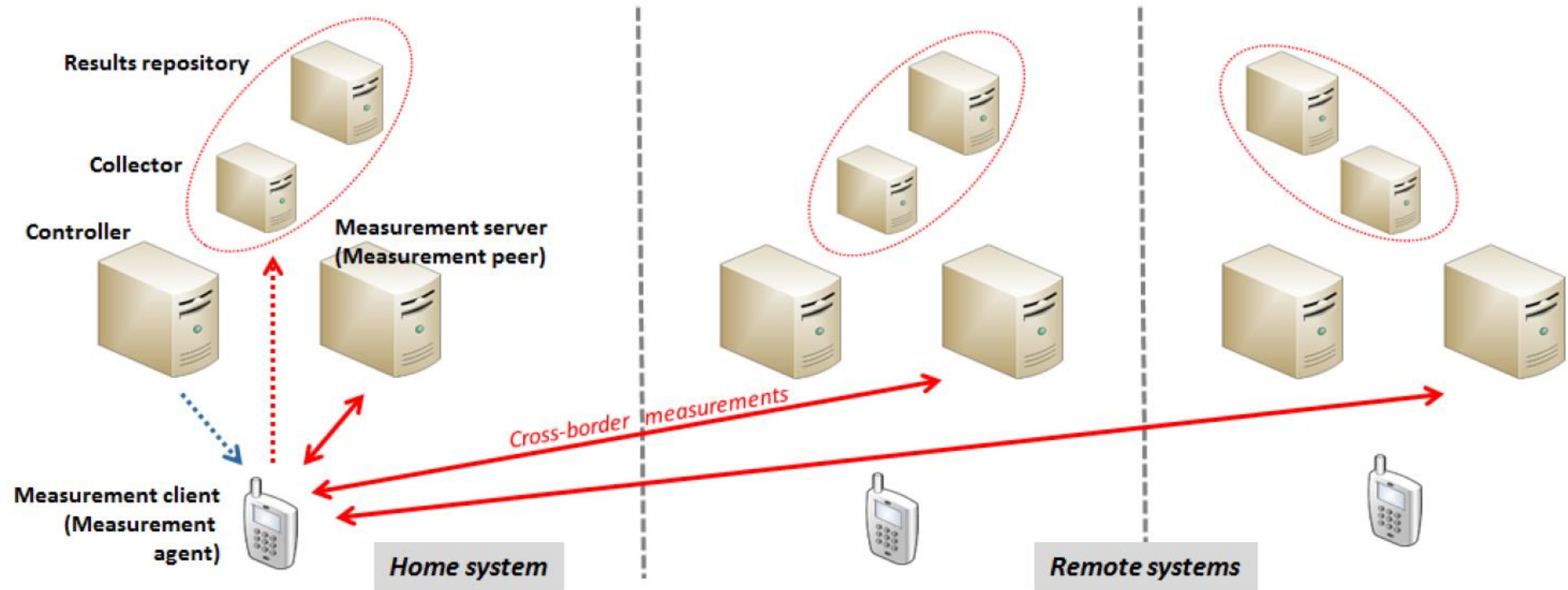
2. Reference measurement system

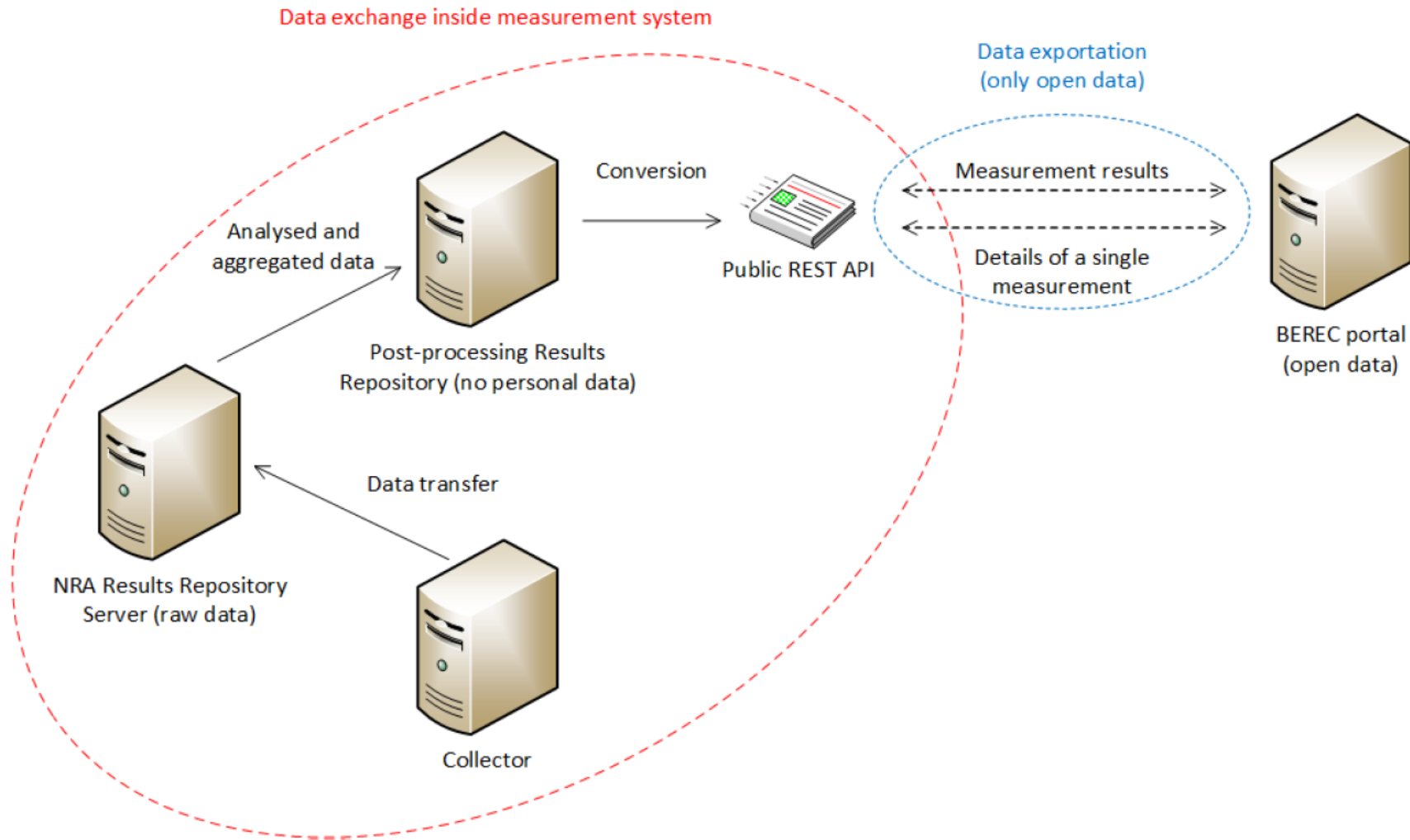
- running this open source software,
- providing a measurement tool to end users,
- making measurement results available as Open Data,
- is the basis for an initial proof-of-concept,
- can subsequently function as a reference implementation for NRAs.

3. BEREC portal, a system which

- collects Open Data,
- processes measurement results to create statistics, maps and reports,
- makes that information available as Open Data.







Covered by BEREC Tool

Open source software

- Server
- Mobile Apps (Android, iOS)
- Browser Client
- Data collection & Open Data interface
- Data visualization on a map, statistics

Reference system and BEREC portal

- Hardware
- Connectivity and hosting
- Terms and conditions

- **BEREC measurement tool will be available by the end of this year for NRAs that want to adopt it**

Up to NRAs

Full integration

- Translations, design/branding
- Hardware for NRA system
- Hosting/connectivity for NRA system
- Operation of NRA system
- Terms and Conditions for NRA system

Possibly:

- Integration of modules to existing NRA system

EU NRAs collaboration in order to harmonize QoS measurement

- More countries involved in implementing the tool → more impact
- More resources for further development and a possibility to use what others have done → each NRA don't have to do all the development alone

Use of the same measurement methodology

- Better comparability of the result

Different interesting features:

- Possibility of cross border measurements
- Net Neutrality indicators measurements

There are still issues to tackle:

- Reliability of the results (potential representativeness issues associated with the crowdsourcing approach)
- User environment impact on the measurement

Thank you

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