An Intelligent Measurement Plane for the Internet

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The mPlane project

- mPlane is an FP7 Integrated Project
  - started in November 2012, 3 years project
  - 11.2+ Mú cost ï 7.2 Mú EC funding
  - 16 partners (8 industrial, 8 research)

- Goal: design and demonstration of an ñntelligent measurement plane for the Internetò
  - mPlane is about **large scale network measurements,**
  - and **intelligent analysis** for troubleshooting support
  - **embedding measurement into the Internet as an additional capability**

Who we are

Consortium

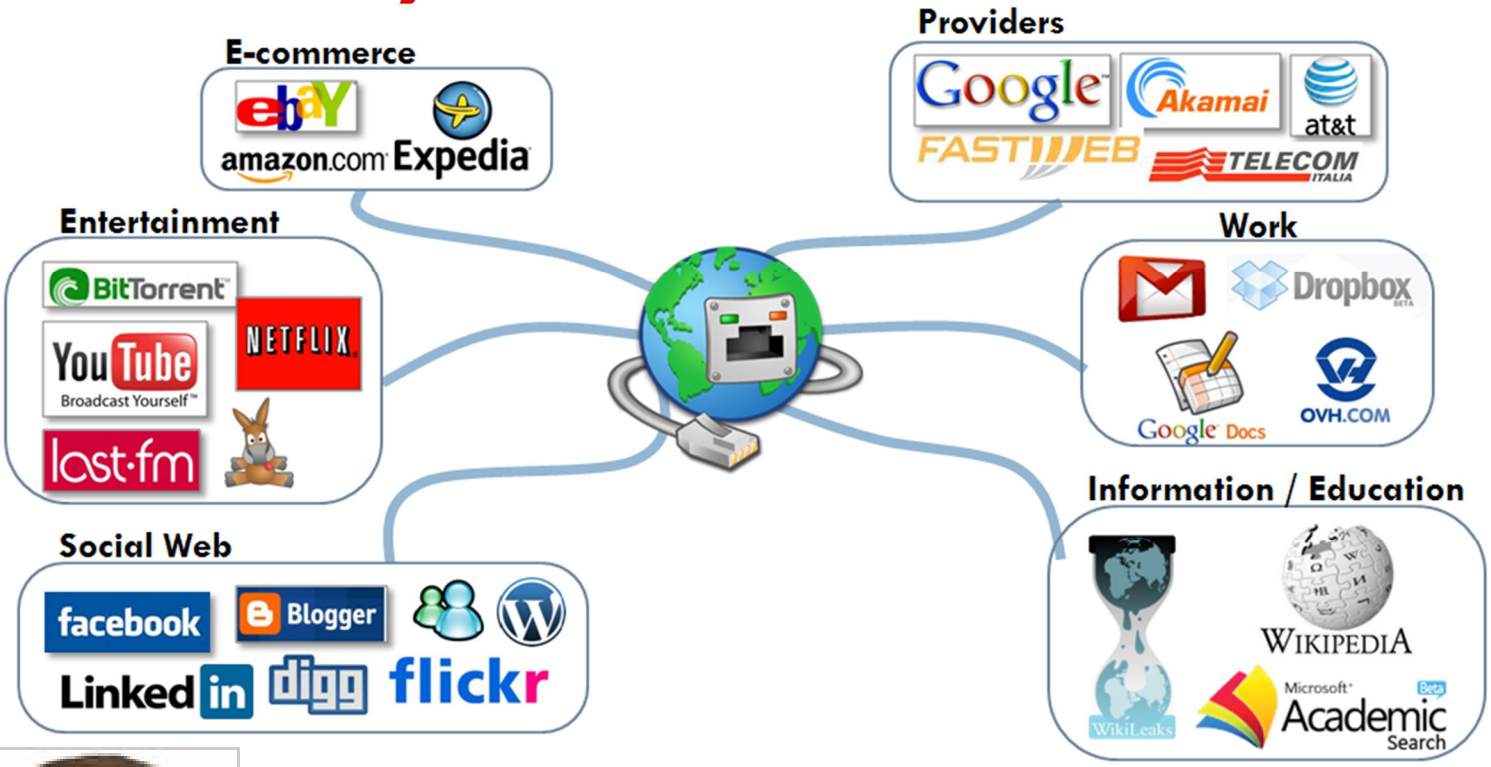
General Coordinator
Prof. Marco Mellia
Politecnico di Torino - IT

Technical Coordinator
Dr. Saverio Niccolini
NEC Europe

- 3 Constructors
- 3 Operators
- 2 SMEs
- 2 Research Centers
- 6 Research Groups

Which problem(s) mPlane wants to solve

The nowadays Internet



*ñThe Internet is the first thing that humanity has built that humanity doesn't **understand**, the largest experiment in **anarchy** that we have ever had.ò*

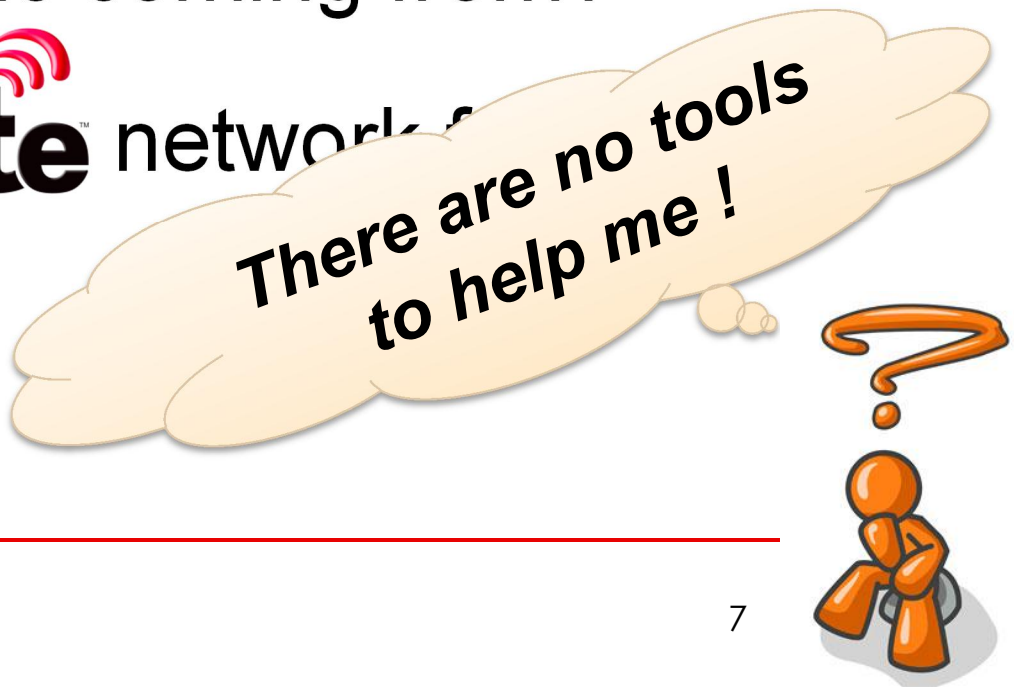
Eric Schmidt ï ex Google Exec. Chairman

A complicated technology…

- **Internet:** *different technologies are combined to offer a plethora of services*
- *We sorely **miss the technology to understand** what is happening in the network and thus to optimize its performance and utilization*
- ***Specially when something goes wrong!***

A complicated technology…
…that no one controls and understands

- Why Skype is not working?
- Which is the best ISP in my area?
- Where is YouTube traffic coming from?
- How to optimize my LTE network ?



mPlane

mPlane motivation

- The **Internet** is a **global interconnection of networks**
  - **No single organization** operates, administers or **governs it**
  - It is omnipresent thanks to its **diversity**, but it is **vulnerable and fragile w.r.t. performance**
- In case of ñfailureò, **who can tell whatôs going wrong?**
  - Each **ISP** may have a figure of **what happens inside its network**
  - But what if the failure depends on other ISPs? Or on the content provider? Or on the CDN? Or on user equipment?
- Today, **the web is a tangle**
  - Nobody really understands what happens today in the Internet
  - How to predict what will happen tomorrow?

- We need an intelligent system that **collects, analyzes**, **provides visibility to support** better management: **an oracle that provides answers!**

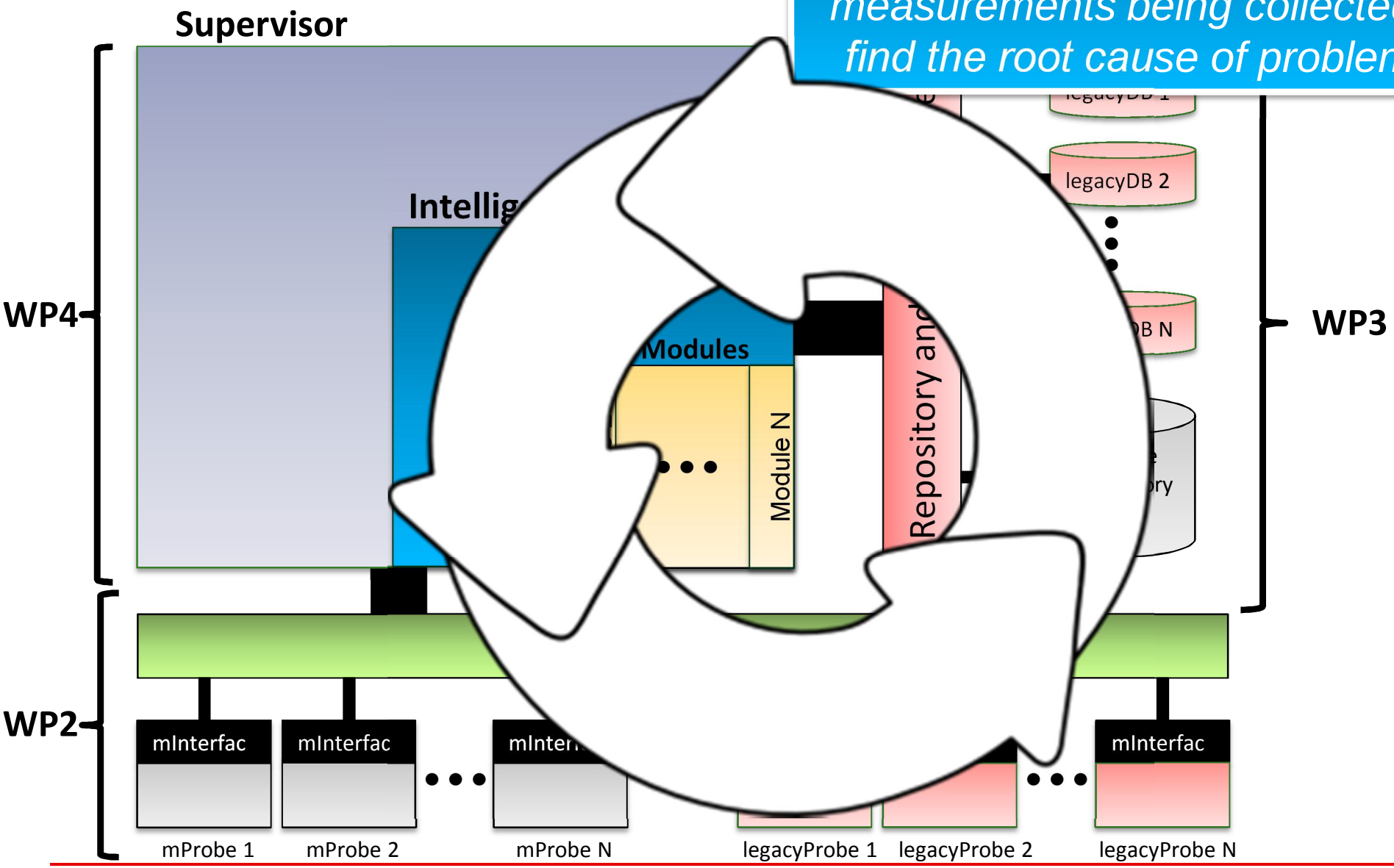
How can mPlane solve the problem(s)

mPlane in a slide

- Build a distributed, open, standard measurement infrastructure for the Internet
  - **Probes (WP2) ï get the data**
    - **Build on existing tools/methodologies**
    - Offer a **flexible, programmable,** open platform to run and collect **passive, active, hybrid measurement**
  - **Repositories (WP3) ï store and preprocess the data**
    - **Collect measurements** in a standard way
    - **Pre-process large amounts of data** in efficient ways
    - **Grant access to interested parties** (ISP, content providers, end-users, regulation agencies, etc.) subject to authorization rules
  - **Intelligent reasoner (WP4) ï dig into the data**
    - Mine automatically the data and **extract useful information**
    - **Drill down to the root cause of a problem**
    - Allows **structured, iterative, and automated analysis**

mPlane in a picture

The mPlane architecture will allow to iteratively drill down into the measurements being collected to find the root cause of problems.



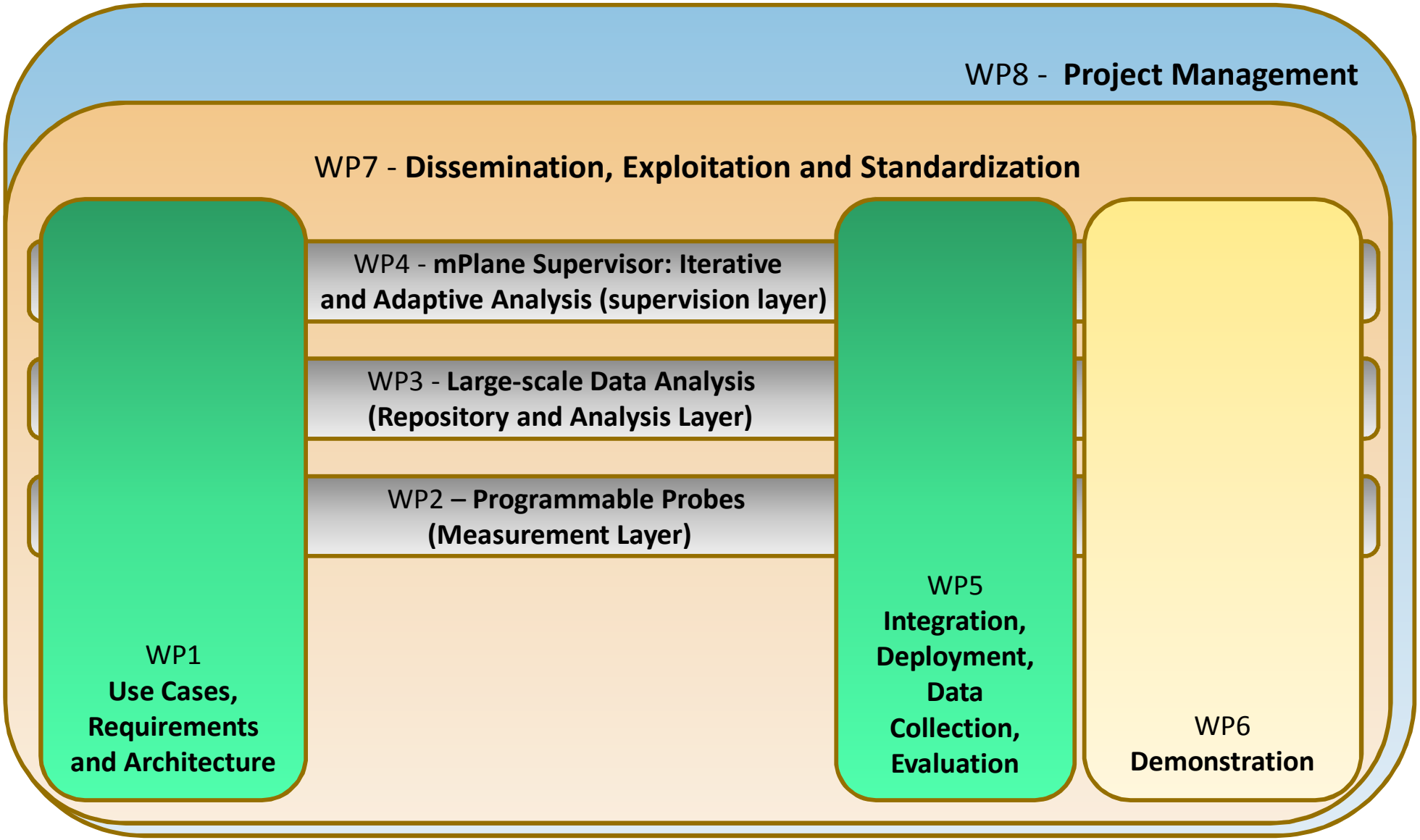
Who benefits from mPlane?

- mPlane benefits everyone:
  - **ISPs** get a fine-grained picture of the network status, empowering effective management, operation, and troubleshooting.
  - **Content and Application providers** gain powerful tools for handling performance issues of their delivery systems and applications.
  - **Regulators** and end-users can verify adherence to SLAs, even when these involve many parties.
  - **Customers** of all kinds can objectively compare network performance, improving competition in the market.
  - **The Research Community** gets a system to accelerate the pace of research driven by Internet measurements

mPlane Use Cases:

- Cloud Services Troubleshooting
- Mobile Network Performance Troubleshooting
- Web Browsing QoE Troubleshooting
- Traffic Anomaly Detection and Diagnosis
- Multimedia Content Delivery Troubleshooting
- Content Popularity Estimation
- Inter ISP ï CDN Collaboration
- SLA Verification and Certification

mPlane WPs'organization



Collaborating Institutions

Collaborating Institutions - CI

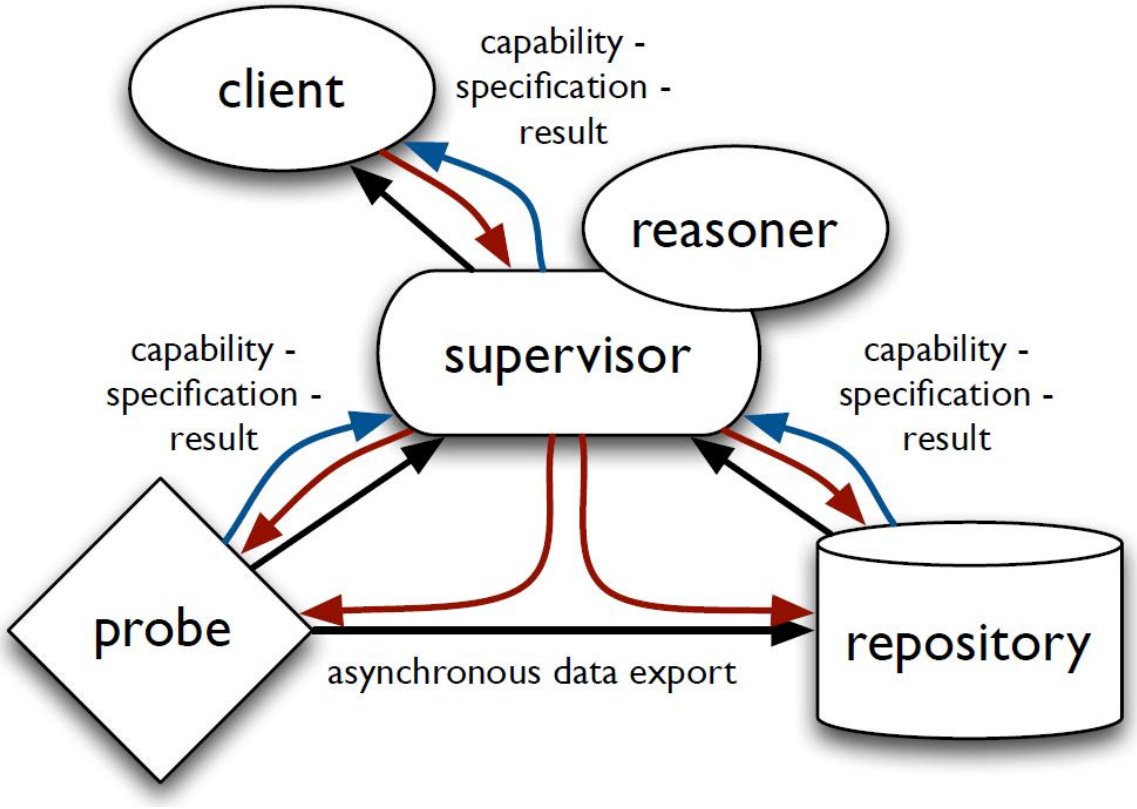
- mPlane foresees the **collaboration** with **external partners**
  - To **strengthen** the **standardization** effort in mPlane
  - To allow **larger deployment** of the mPlane system
  - To enable external partners to **get in touch with mPlane** technology
- Collaborating institutions have **no commitment**
  - No bureaucracy, no deliverable, no deadline
  - They can have access to results and technology preview
  - They can collaborate with partners
  - **They get no funding** (but **each partner can offer support**)
- **Request of participation** of a CI shall be submitted at any time, and requires approval from the General Assembly

Preguntas


Fragen
Domande
Galdera
Otázky
Questions
Spørgsmål
Pertanyaan
kysymykset
Frågor
Spørsmål
Cwestiynau
вопросы
Preguntes
Sorular
Въпроси
Vragen
Pytania

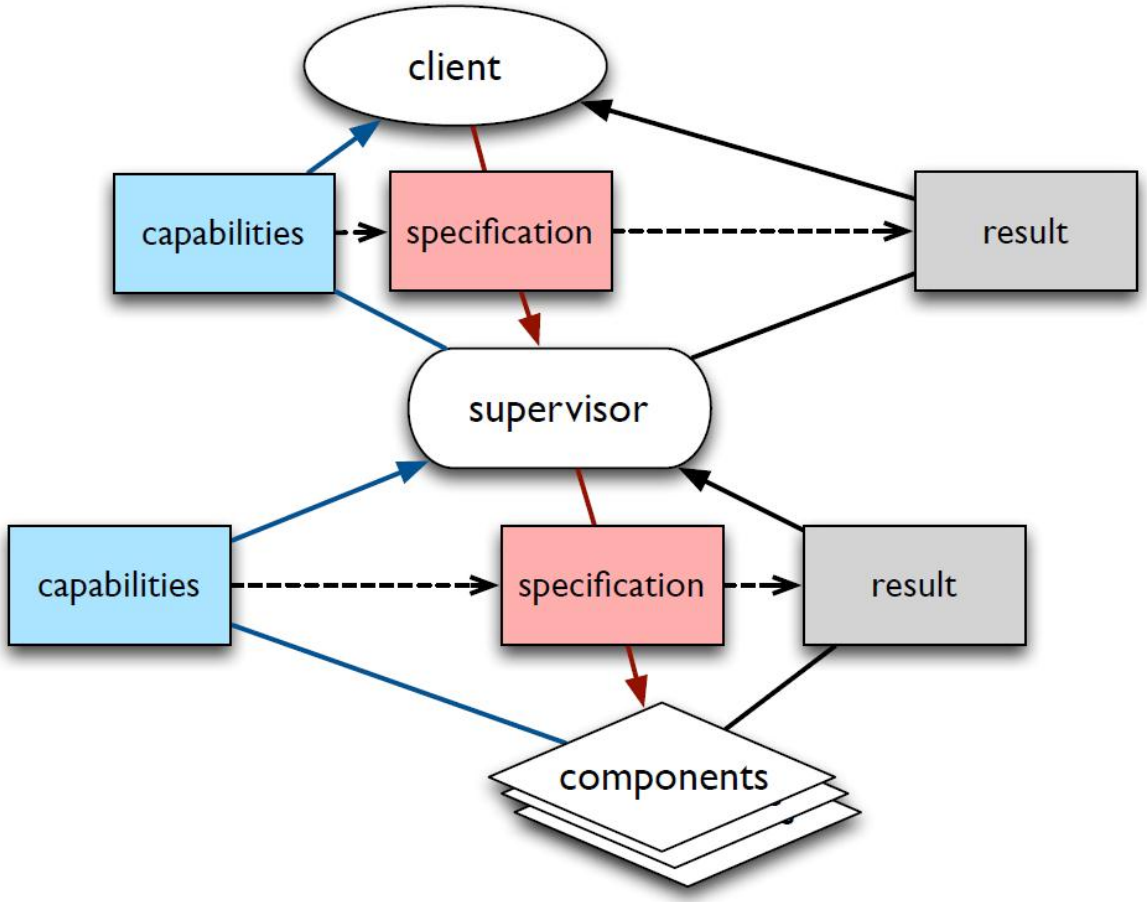
Some mPlane Architectural Details

An Overview on mPlane's Architecture



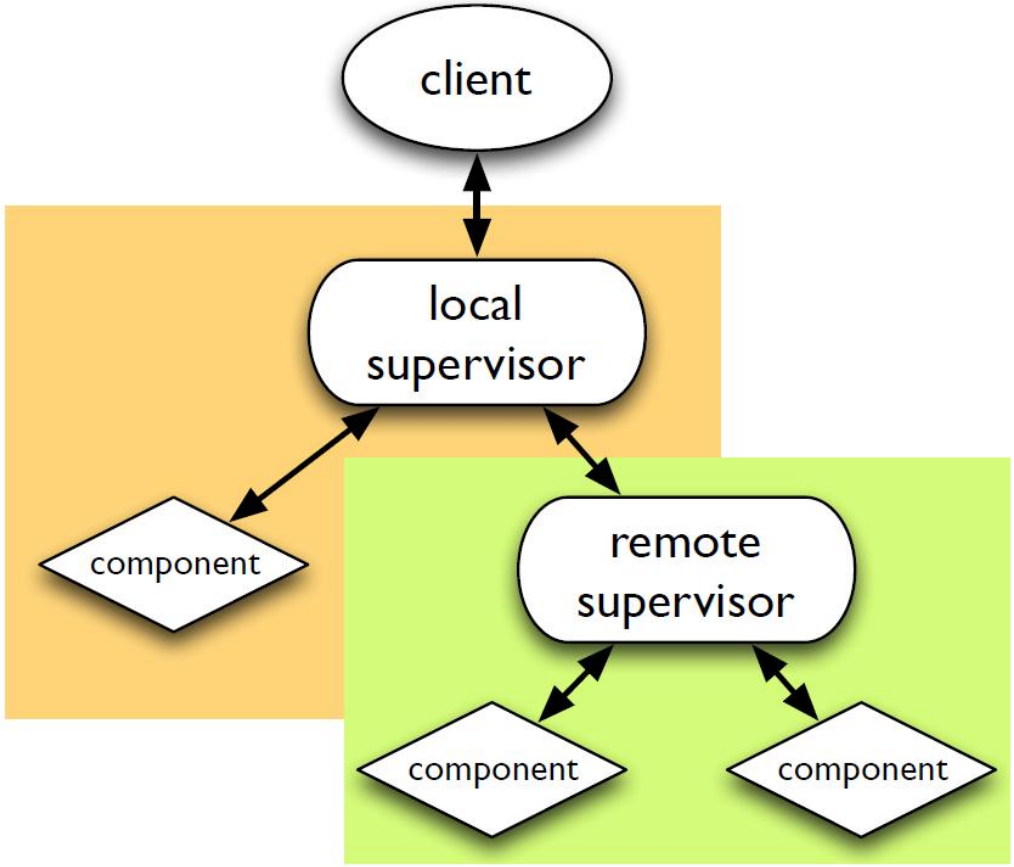
- **Components** and **interactions** in mPlane:
  - **blue lines** are **capabilities** announcements,
  - **red lines** indicate **control messages**,
  - **black lines** correspond to **data flows**.

mPlane Workflow: how it works?



- **Capabilities** define the tasks a component can perform.
- **Specifications** consist of a description of which measurement have to be performed, how, and when.
- **Components announce their capabilities** when registering to the supervisor

Measurement Federation in mPlane



- **Federation** in mPlane through **inter-supervisor connections**.
- Supervisors in each domain handle **supervisors in external domains as clients**.

More about CIs

CI – Request of participation

- **Request of participation** of a Collaborating Institution shall be submitted by a Party to a prior formal evaluation of the General Assembly
- This **request shall contain** the following elements
  - a **profile** of proposed Collaborating Institution
  - a description of the relevance of the **Collaborating Institutionôs contribution** to the Project
  - a **plan of activities** and an estimation of the man/effort for the full duration of the Project
- The **final decision** on the inclusion of the Collaborating Institution shall be taken by the **General Assembly**

CI - Terms of participation

- The CI will participate in the activities of mPlane according to the terms defined in the CI Agreement
- The CI shall participate in the Project activities and/or take part of results according to the proposed plan of activities
- The CI will not be refunded for the expenses incurred in the participation in mPlane activities
- The mobility of researchers from Collaborating Institutions may be funded by the hosting mPlane Party