

Multi-disciplinary Inter-domain Monitoring: The benefits of the INTERMON project for Service Providers

MOME

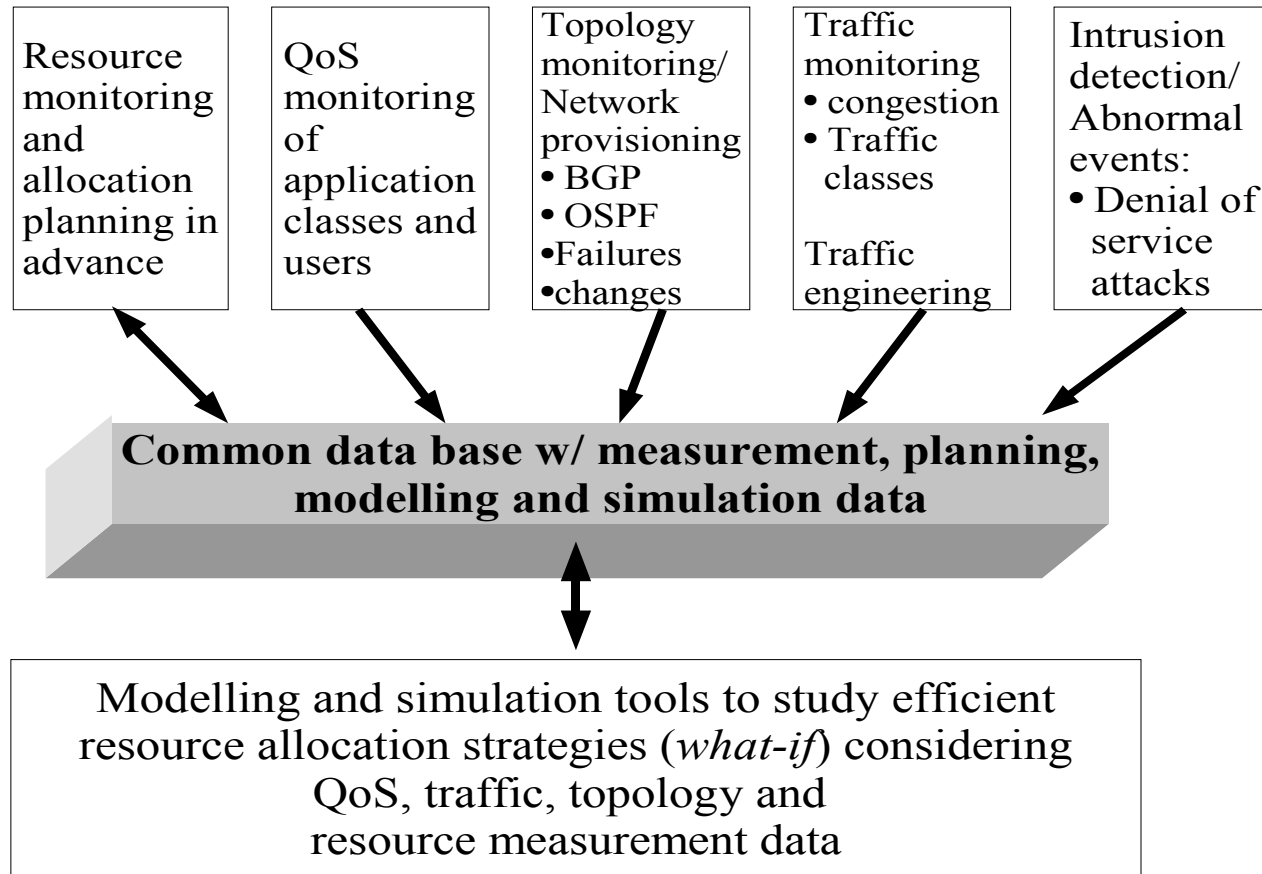
Pedro A. Aranda Gutiérrez
Telefónica I+D
<mailto:paag@tid.es>



A far reaching target

- | A Service Provider's dream
 - | integrated measurement and modelling framework
 - | long term monitoring and analysis of Quality of Service
 - | Consider the different factors impacting on the performance of the broadband infrastructure:
 - | Network provisioning
 - | Resource usage and planning,
 - | Topology and routing behaviour
 - | Traffic engineering
 - | Abnormal events.
- | Value added compared with today's Network Management Systems
 - | Optimise resource planning and management decisions with feedback from live network

A far reaching target

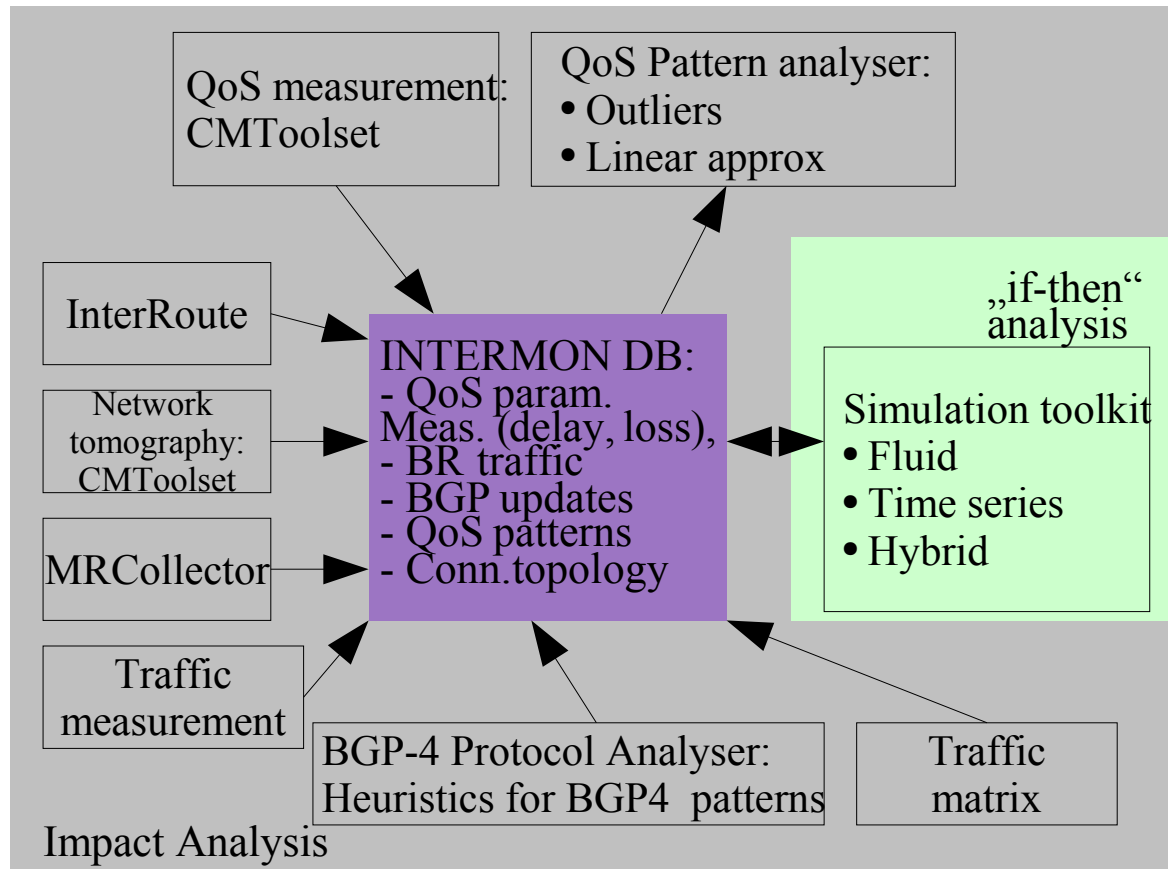


The challenge is INTER-DOMAIN

- | Each domain in under independent management.
- | Network policy is a well hoarded secret:
 - | source of differentiation
 - | part of a provider's branding.
- | Needs topological data
 - | BGP-4 data are considered confidential by Service Providers.
 - | Only partial views obtained at Internet Exchange Points are publicly available
 - | Oregon Route Views
 - | RIPE-NCC Routing Information Service
 - | Another tool is network tomography, but
 - | traceroute or traceroute-alike traffic
 - | Often blocked
 - | Due to security concerns : coordinated DoS attacks in the past
 - | It reveals the internal network infrastructure

- | INTERMON project
 - | Activities between 2002 and 2004
 - | Integrated toolkit for interdomain QoS measurement, monitoring and simulation
 - | covers a wide spectrum of approaches to interdomain network management
 - | day-to-day operations
 - | long term network planning activities.
 - | Cooperation between Service Providers is promoted, but not mandatory.
 - | Integration around a central, distributed database
 - | Measurement tools
 - | analysers
 - | simulators
 - | Components contribute data to the database
 - | Measurement tools, analysers & simulators
 - | Components retrieve data to perform their tasks
 - | analysers & simulators

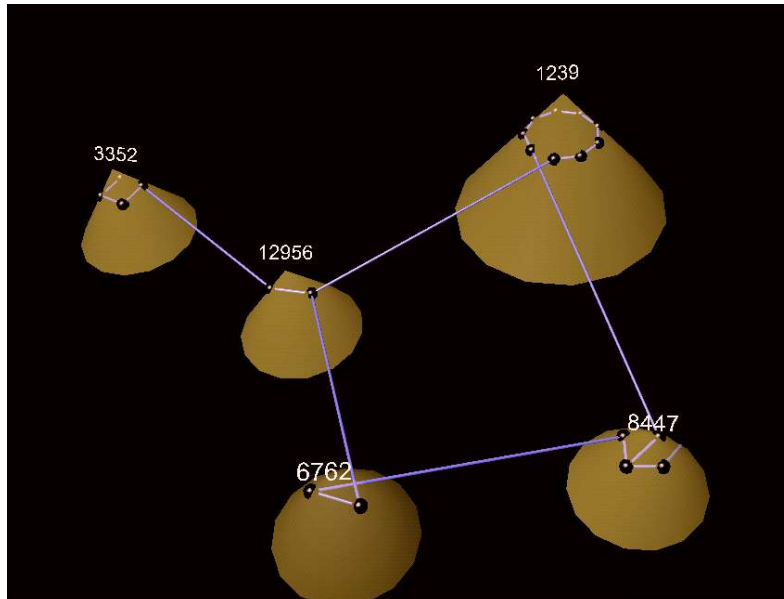
INTERMON architecture



Topology analysis in INTERMON

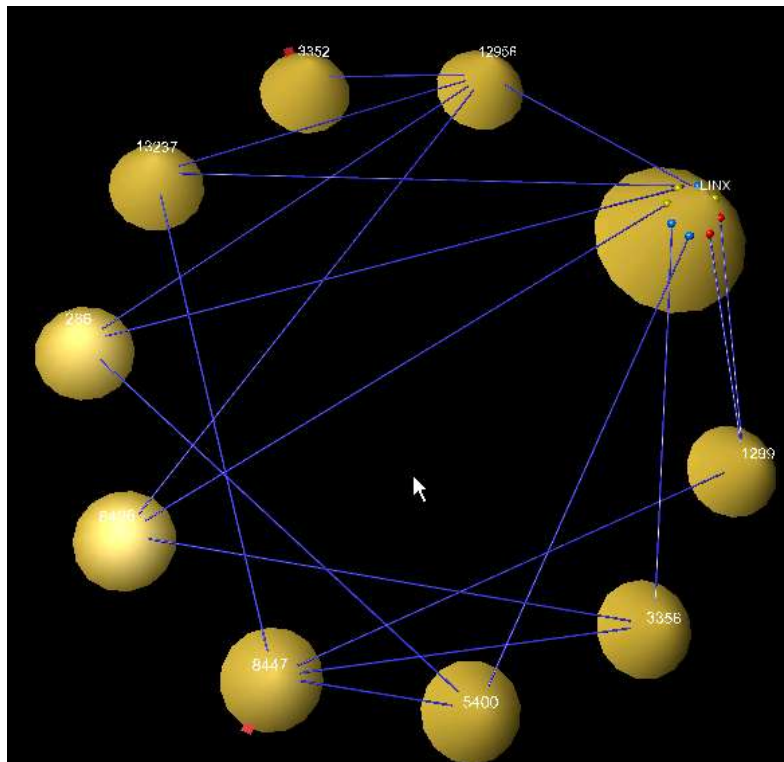
- | Two complementing components
 - | **CMToolset**
 - | Based on ICMP data (à la traceroute)
 - | Discovers the actual network path(s) of an end-to-end connection by actively probing the network.
 - | Fine-grained analysis of alternative topologies
 - | Active topology probing drawbacks
 - | impacts on network performance
 - | poses a certain risk on the network infrastructure:
 - | Distributed Denial of Service Attacks
 - | **InterRoute**
 - | Based on BGP-4 data, information at Autonomous System level
 - | Discovers all feasible paths of an end-to-end connection going through an Internet Exchange
 - | BGP-4 routing information extracted from public routing information repositories (i.e. RIPE-NCC).
 - | Scope of the publicly available BGP-4 routing data is limited

CMToolset topologies



- | Based on ICMP data
- | Actual network path(s) of an end-to-end connection by actively probing the network.
- | Fine-grained analysis of alternative topologies

InterRoute topologies



- | Autonomous System level
- | All feasible paths going through an Internet Exchange
- | Extracted from public routing information repositories.
- | Scope of the publicly available BGP-4 routing data is limited

INTERMON: Comparison

- | Network tomography allows InterRoute to select the BGP-4 routing data repository best suited for a specific end to end scenario.
- | It also singles out the end to end paths used by the traffic from all possible paths computed by InterRoute.
- | Specific strengths
 - | Behavioural information for most or all intermediate routers can only be obtained by means of network tomography
 - | Precise time information for specific routing events can only be computed by InterRoute
 - | When exactly did the end-to-end path change?
- | Both approaches are complementary

INTERMON: lessons learnt

- | Network measurement data are vital in next generation NMS technologies
- | Most measurements had to be done by the project
 - | Not unique for INTERMON
- | Network models are derived by combining different measurements
- | Routing repositories were extremely useful
 - | this should be just a first step
- | Other measurement data should also be kept in repositories to allow the development of new network models

Follow up activities

- | MOME
 - | Distributed Network Measurement Data and Tools Repository
 - | Coordination of measurement projects has synergistic effect:
 - | Measurements performed by one project can be reused by others
- | Further down the road:
 - | Enhancements to BGP4+ for ISP level multihoming in Ipv6 networks
 - | How is it being implemented?
 - | Solution as compatible as possible with current best practices
 - | Simulation of proposed solution
 - | Show how solution copes with real network situations
 - | Assess the benefits of their deployment during the design stage
 - | And this is just an example ...

Questions?



Thank you

