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The MOME Workstation as a Platform for Automatic Measurement Data Analysis

MOME

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Outline

- | IST-MOME project
- | The MOME database
- | The MOME data analysis workstation
- | Exemplary analysis results
- | Conclusions

Measurement and Monitoring Cluster (IST-MOME): Coordination Action



Co-ordinate activities in the area of IP monitoring and measurement

Measurement Tools

- | evaluate & promote interoperability
- | provide information

Measurement Data

- | select format
- | provide database
- | collect
- | convert
- | disseminate

Measurement Standardisation

- | identify potential
- | collect plans
- | co-ordinate joint contributions

Build a knowledge exchange platform

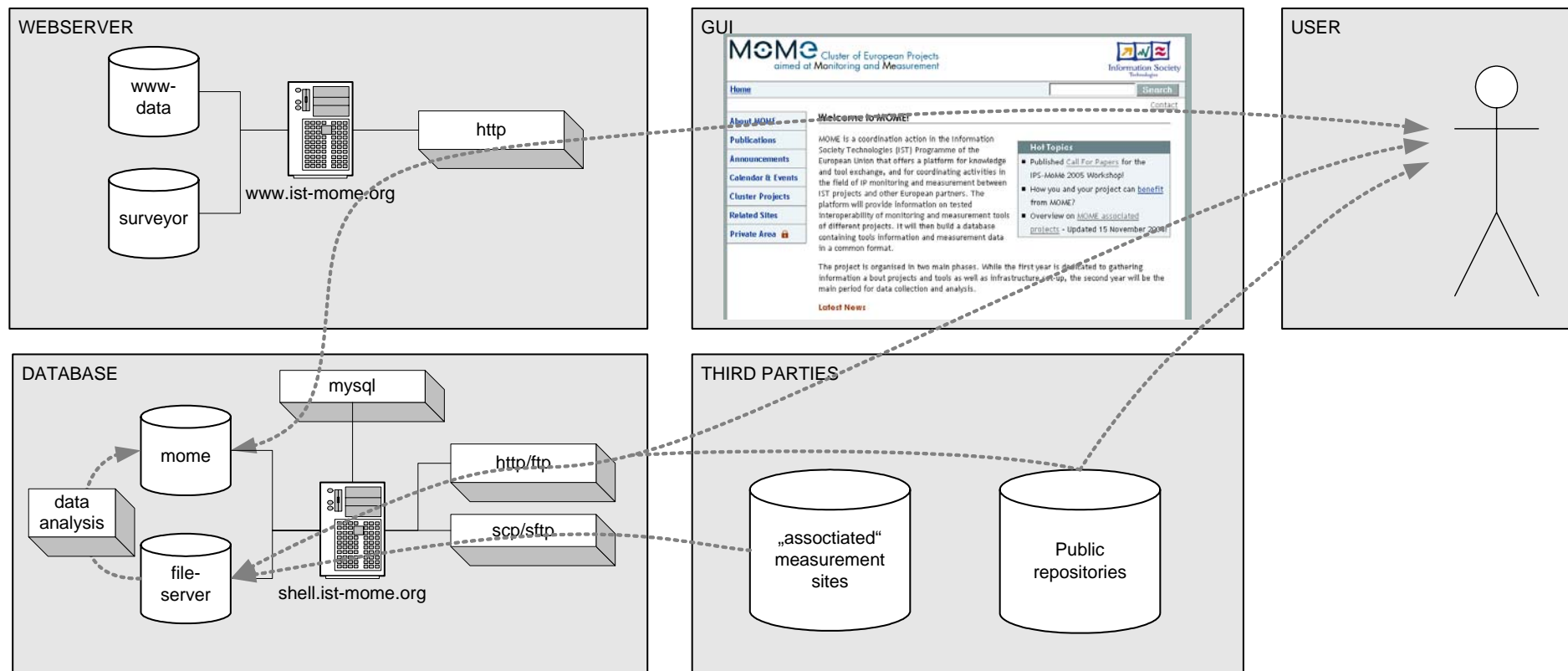
- | Workshops, conferences
- | Dissemination activities
- | The MOME database (measurement data and tools)

Motivation: The need for measurement data

- | Developing new measurement and monitoring methods
- | Developing architectures of measurement and monitoring systems
- | Developing algorithms for network and traffic control functions supported by measurements
- | Developing and validating realistic traffic models
- | Validating the offered level of QoS

MOME assists researchers in finding and retrieving the measurement data and tools that are most appropriate for their purposes

MOME system

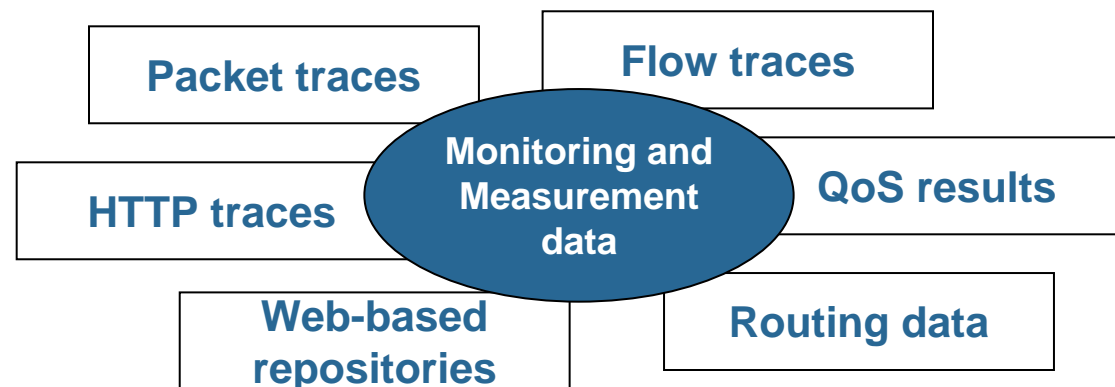


<http://www.ist-mome.org>

<http://www.ist-mome.org/database/>

Meta-data paradigm

- | MOME database stores the meta-data
- | „Data about data“
 - | Description of measurement environment and scenario
 - | Statistical information about the captured traffic
 - | Link to the repository, where data is actually stored



The MOME meta-data model – packet traces

Packet traces

Dataset name	FH-SBG 2005-01-28@18:00
Data type	PacketTrace
File size	15.6MB
File compression	bz2
Start time	2005-01-28 18:00:00
End time	2005-01-28 18:59:00
Duration	0:59:00
Description	Trace FH Salzburg
Dataset location	URL: http://shell.ist-mome.org/traces/PacketTrace/2005-01-28@18:00.pcap.bz2
MD5 Sum	a12627bcb53164aa22e3e742014886ed
Tool	tcpdpriv
Submitted by	fh-sbg @ 2005-01-29 00:18:00
Last Update	2005-02-02 17:30:08
Availability	local copy

Network Type	WAN Access Network
Collector Location	AT, Salzburg, FH Salzburg
Traffic Type	Operational Traffic, Educational Institution
Link Protocol	X.21
Link Speed	4.0Mbps
Capture Mode	mirror port
Filter Rules	none
Trace Anonymisation	-P99 -A50
Capture Platform	Linux 2.6.9
Data Format	libpcap
Additional Info	2x2Mbps X.21 connections



Raw data

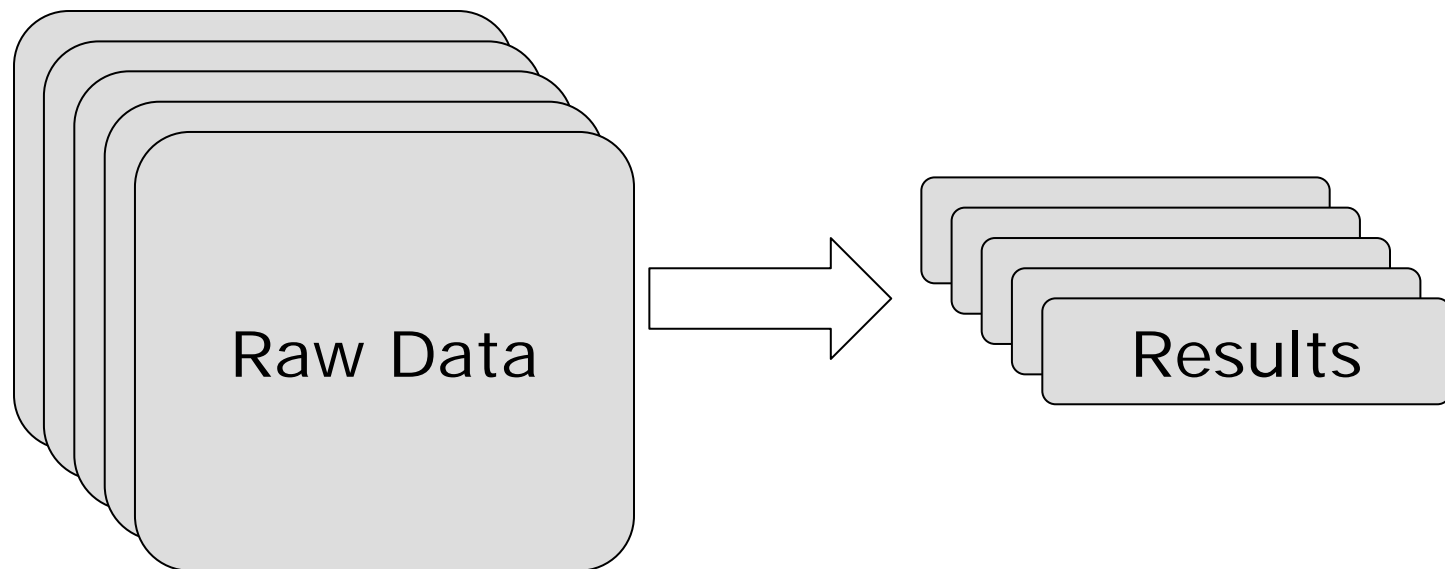
Motivation: Measurement data analysis

- | Added value from analysis of data
 - | Enhancing the description of data
 - | To help in finding the interesting measurement data

- | To show how measurement data can be processed
 - | Selected most valuable analysis results

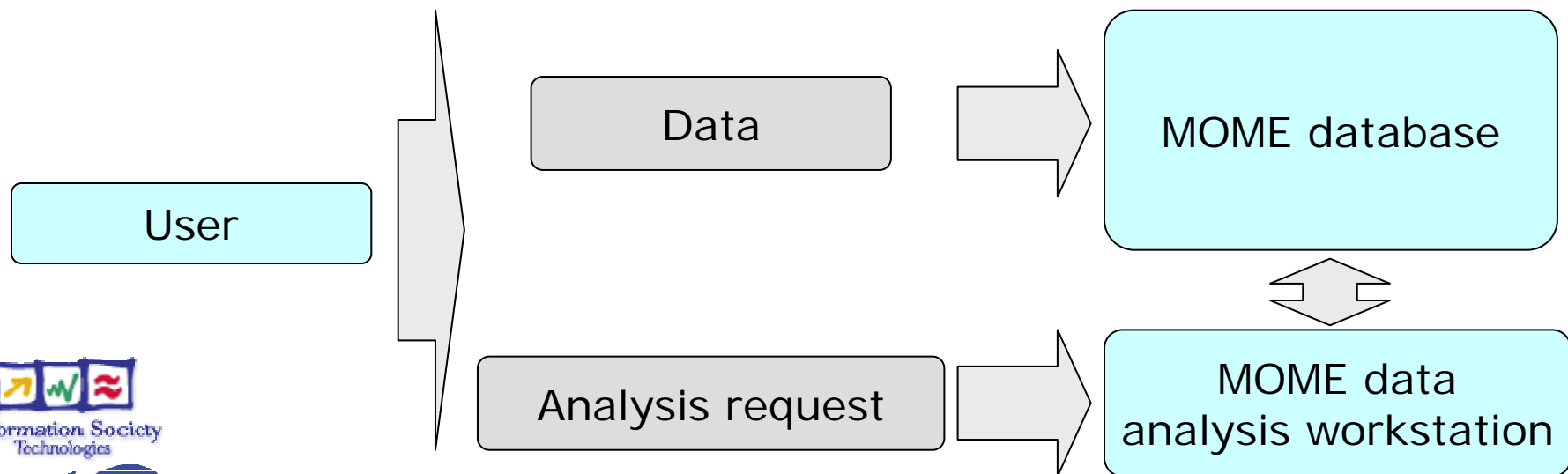
Motivation: Measurement data analysis

- | “Meta-data”: no storage of data itself
 - | Large amount of space for raw data
 - | “Small” size of analysis results – “meta-data” model

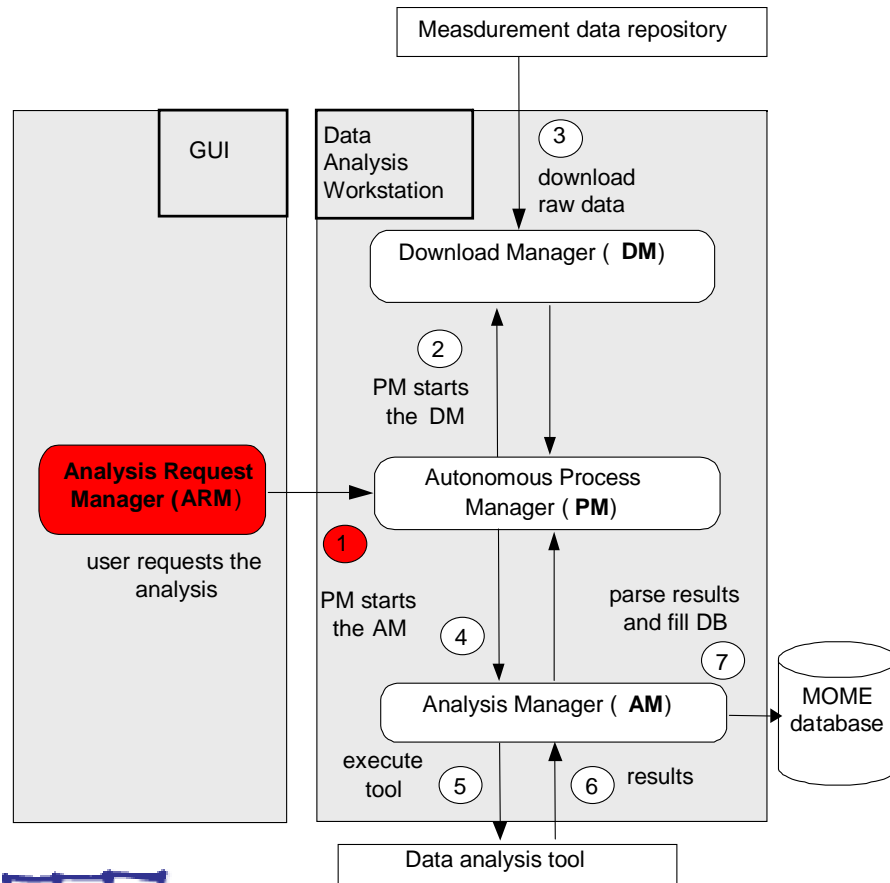


MOME Data analysis

- | Assist researchers in analyzing the measurement data
- | The platform for automatic analysis for measurement data referenced in the MOME database
 - | Data provided by the user
 - | Analysis requested by the user
 - | Results stored in the MOME database



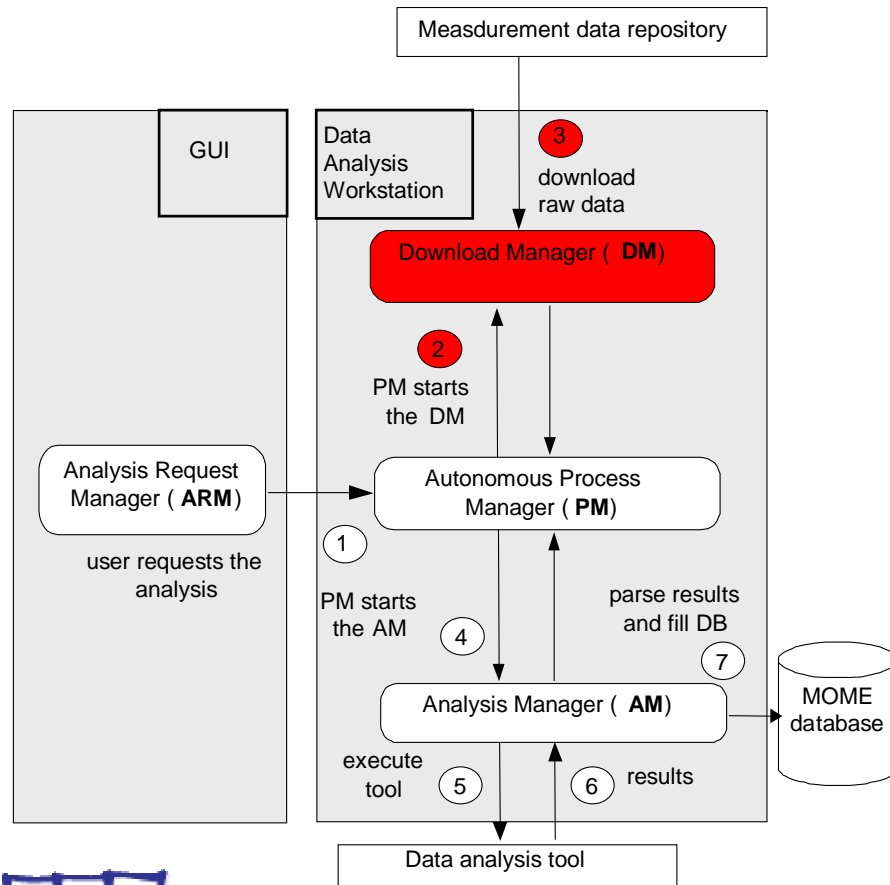
Data analysis framework operation



User requests the analysis of measurement data using request manager

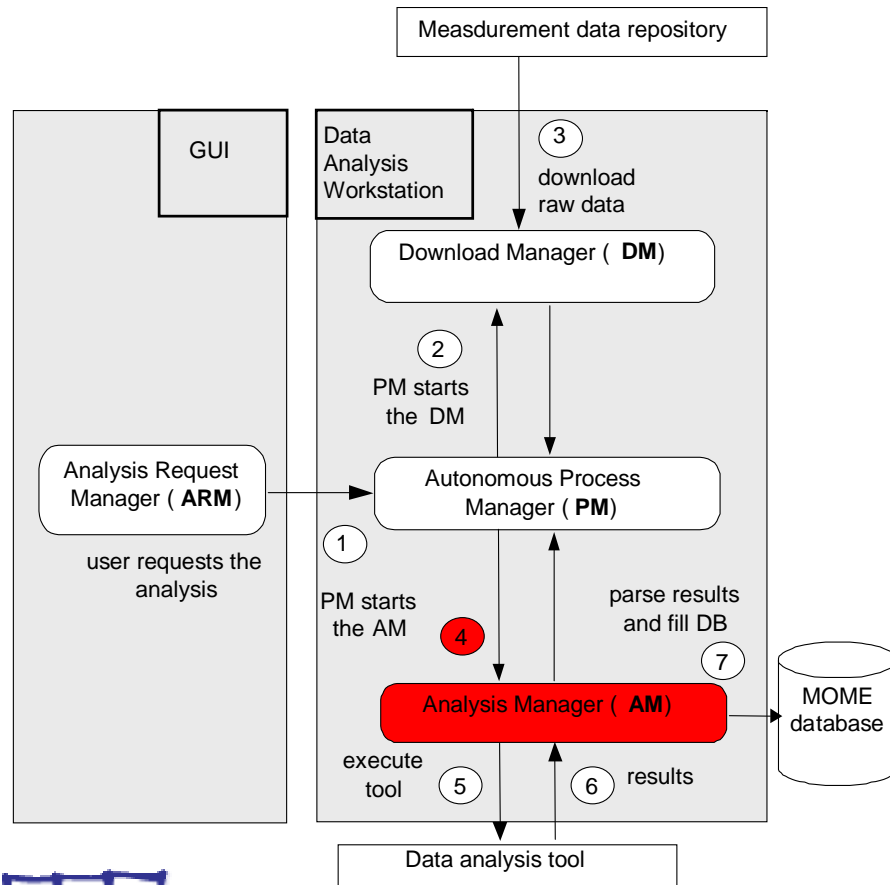
- | Analysis type
- | Measurement data

Data analysis framework operation



- | Analysis request is forwarded to Download Manager (DM) if disk space is available
- | DM downloads the measurement data

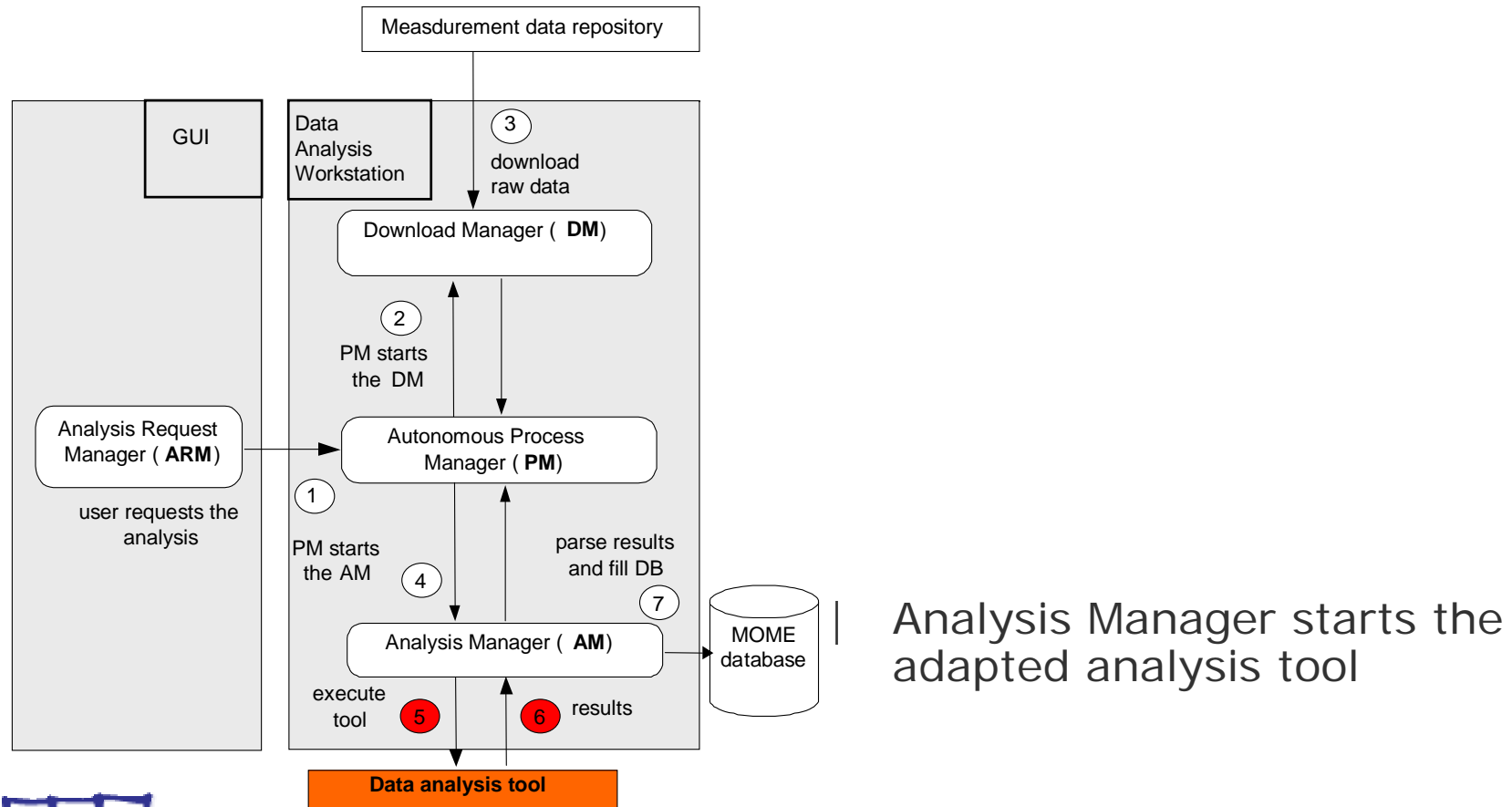
Data analysis framework operation



| Analysis request is sent to Analysis Manager

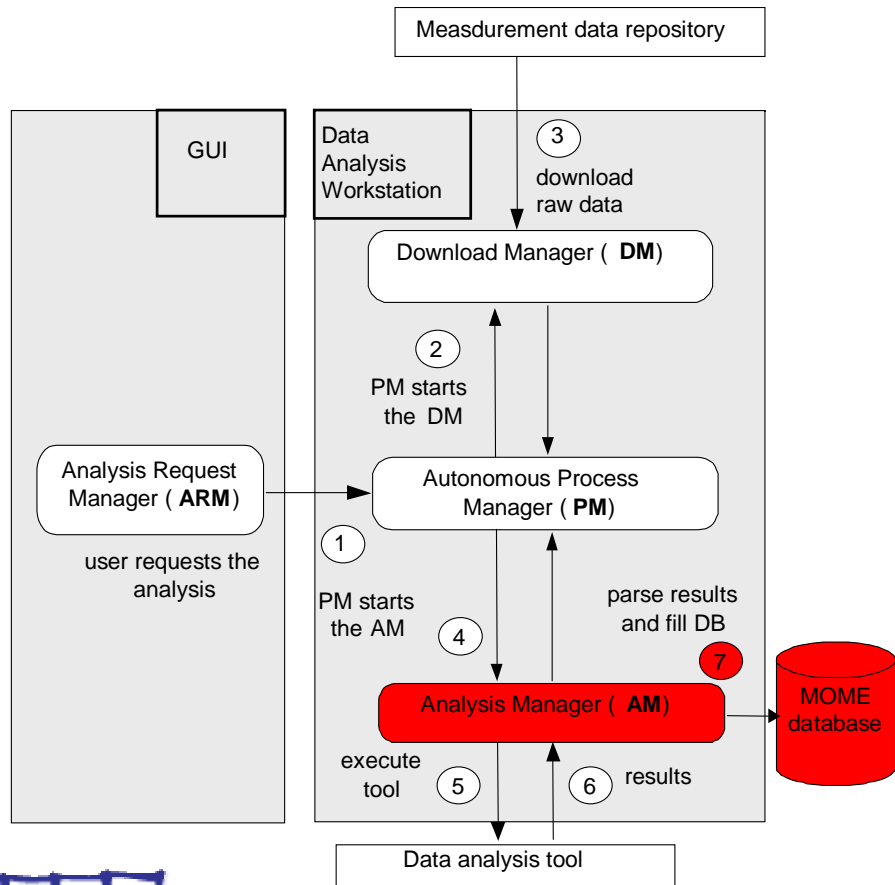
- | Analysis type
- | Local file name

Data analysis framework operation



Analysis Manager starts the adapted analysis tool

Data analysis framework operation



The Analysis Manager updates analysis results in database

- | Values
- | Graphs

MOME data analysis workstation current status

| Currently basic analysis of packet traces

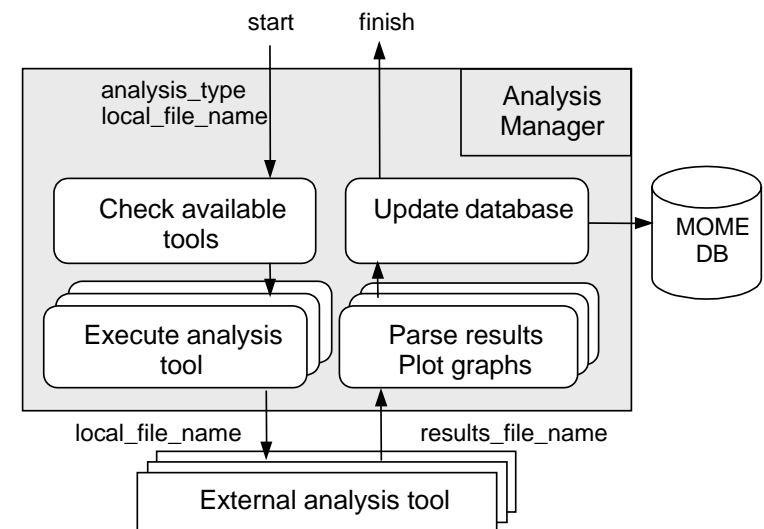
| Available trace formats

- | libpcap packet for Ethernet
- | DAG (ERF) for Ethernet

| Available analysis

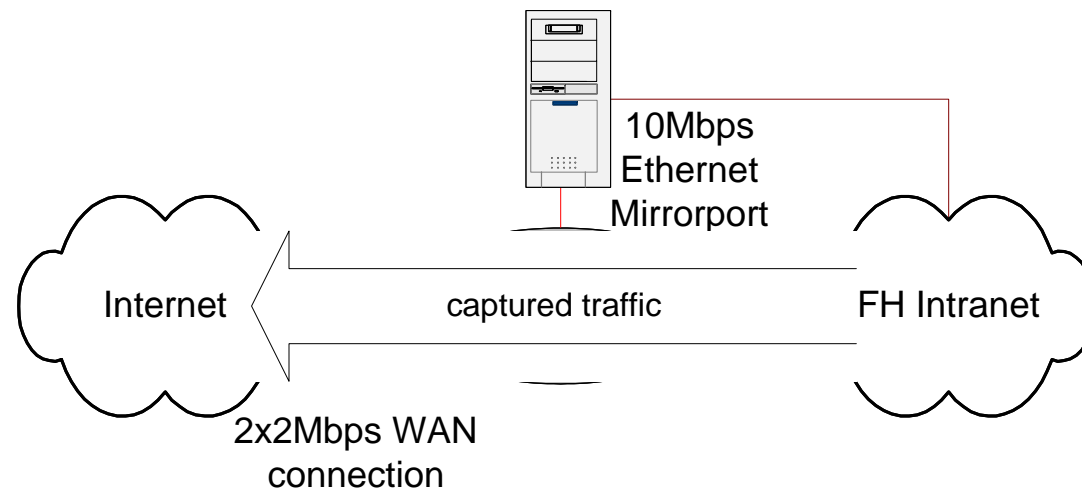
- | General statistics
- | Bit rate plots

| Possibility for incorporating of new analysis tools



Case study: Analysis of data from associated measurement site

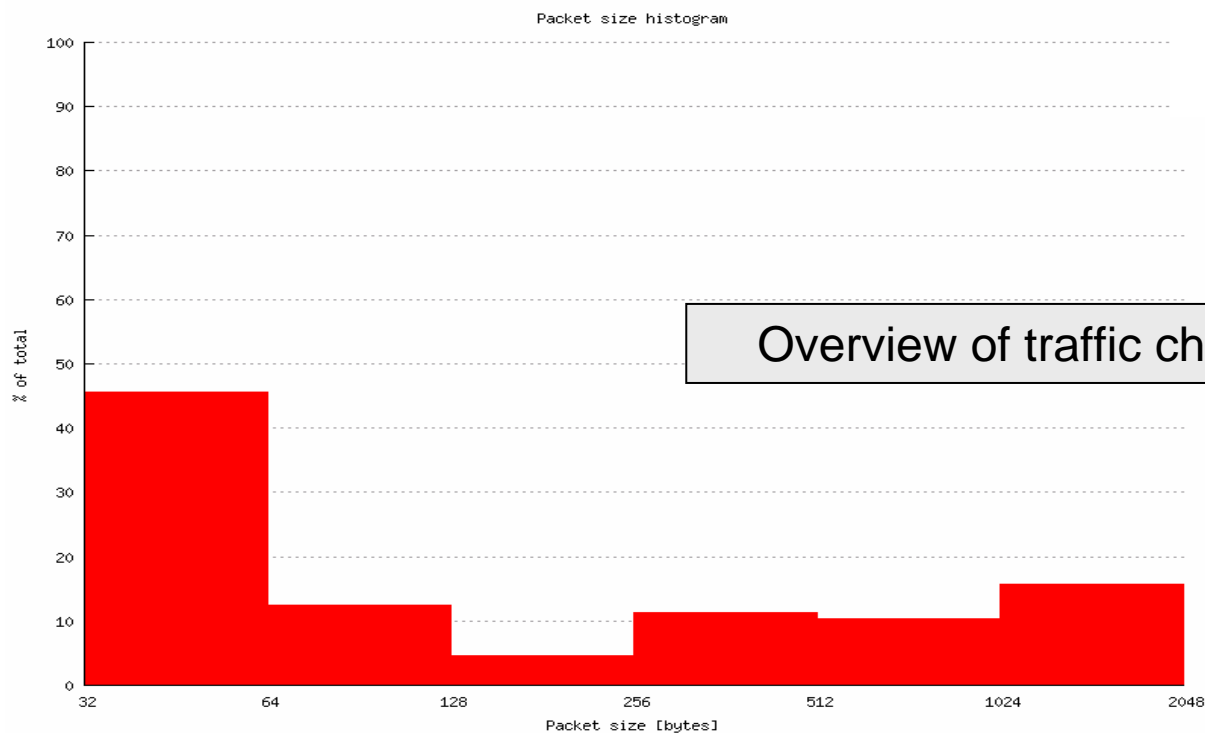
- | Packet-level traces collected continuously at the „associated“ measurement site in FH Salzburg
 - | 4 Mbit/s link, single direction
- | Automatic uploading and annotation of traces in MOME database
 - | More than 1000 hours of traces collected



Exemplary analysis results (1)

Basic statistical parameters

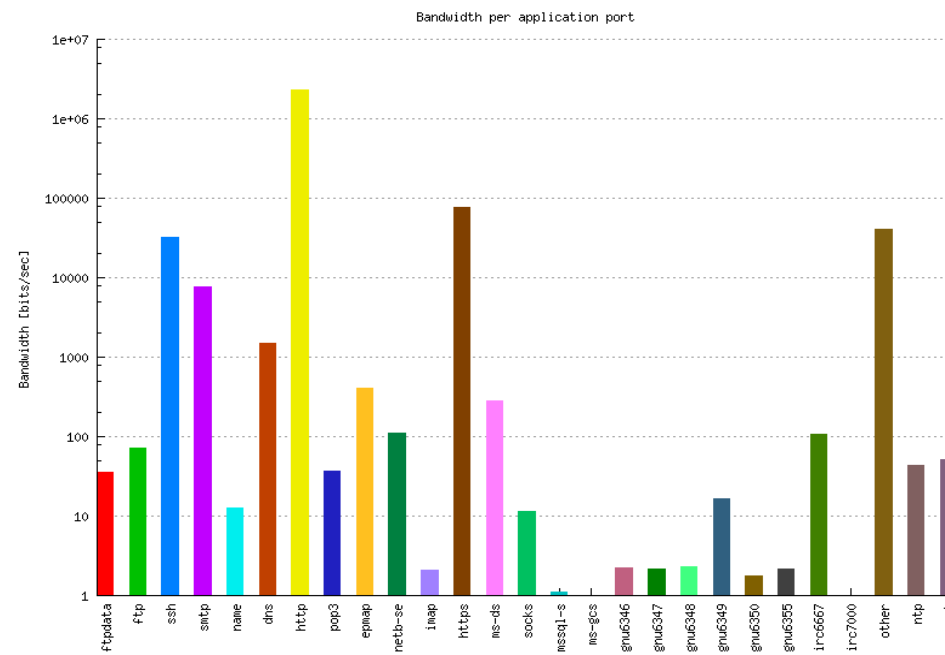
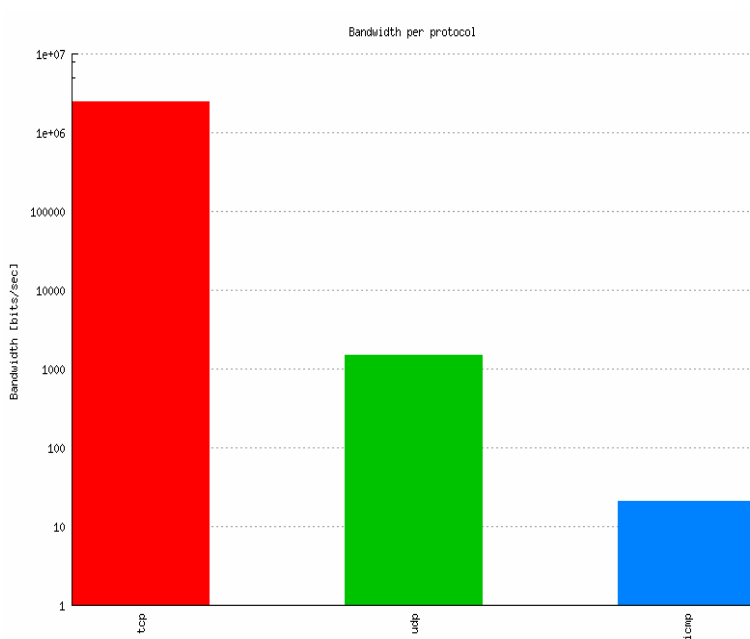
Traffic rate, averaged over entire trace duration, in bit/s	2442547
Average packet inter-arrival time in sec	0.003186
Average packet size in bytes	972.7
Average packet arrival rate in pkt/sec	313.89



Overview of traffic characteristics

Exemplary analysis results (2)

Average bit rate classification



Per protocol

Per application

Overview of traffic nature

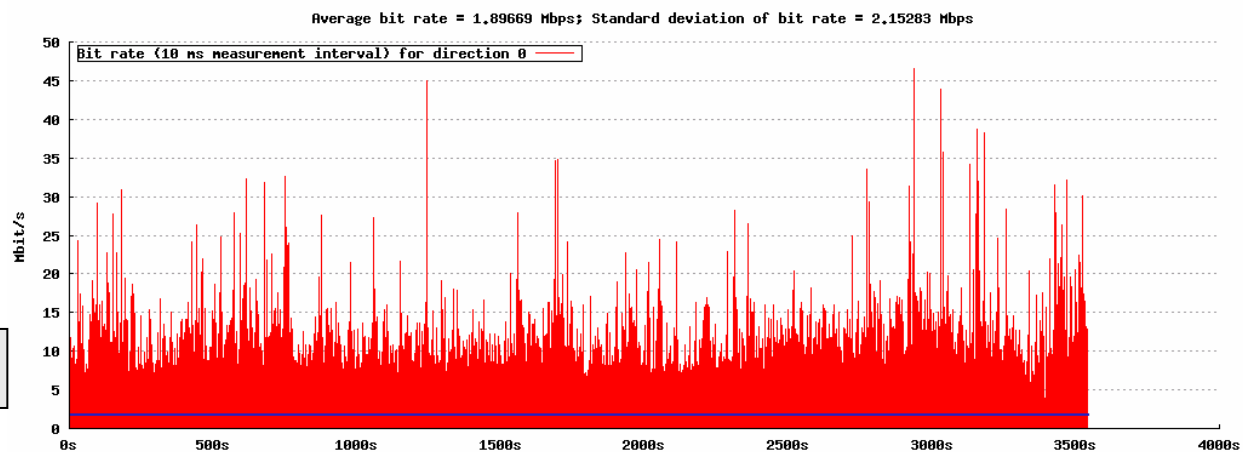


Exemplary analysis results (3)

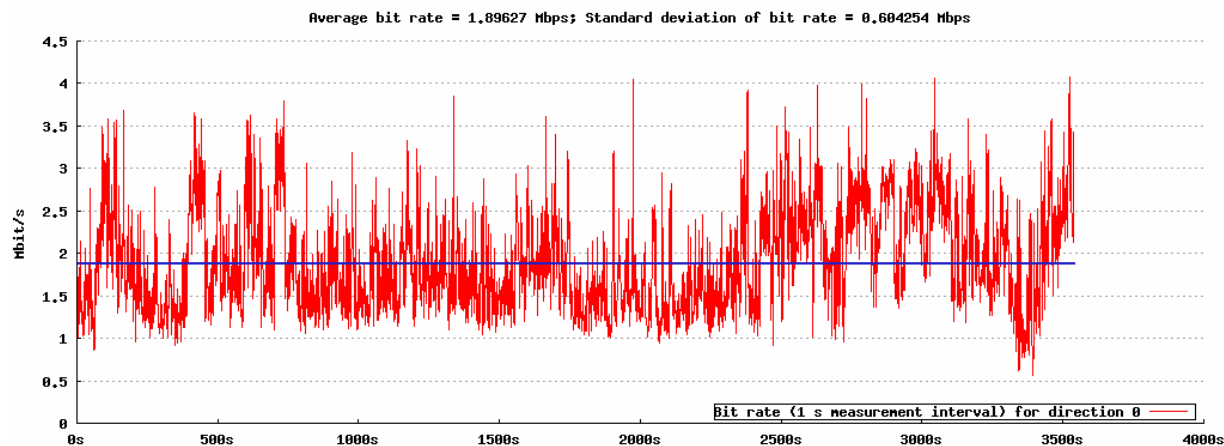
| Time-plot of bit rate

10ms intervals

Variability of traffic

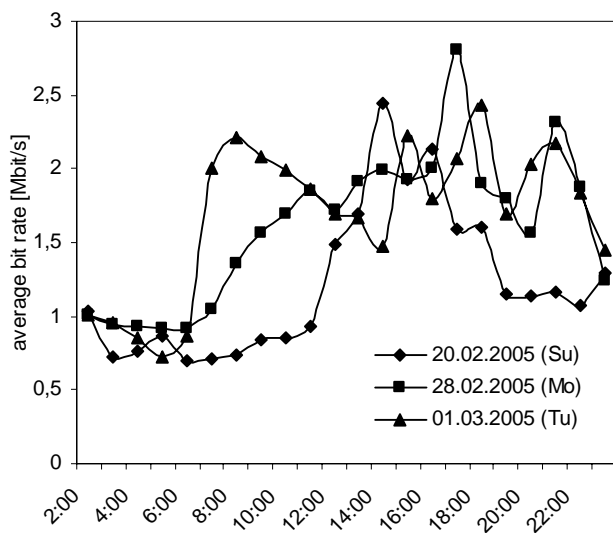


1s intervals

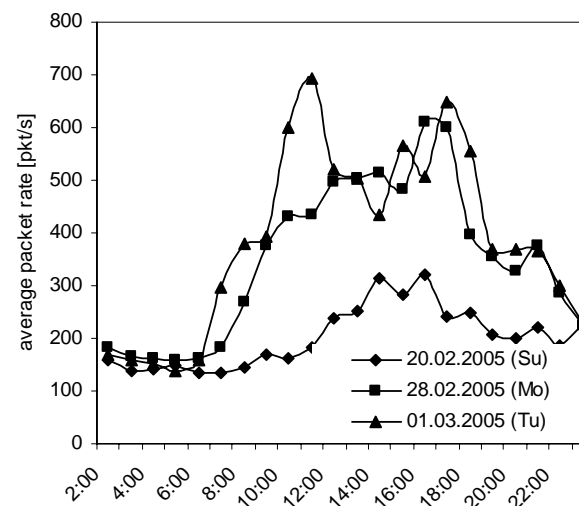


Exemplary analysis results (4)

- | Parameters calculated with „tcpdstat” tool
 - | Daily graphs from analysis of 1-hour long traces collected during three days in February and March 2005



Average bit rate



Average packet rate

Daily trends

Conclusion

- | MOME database collects the information about available tools and data
 - | Available online <http://www.ist-mome.org/database/>
 - | Free access to all data

- | Framework for automatic analysis of measurement data
 - | Basic tasks implemented
 - | Valuable information about the contents of packet traces
 - | Extensible for new analysis tools

- | Open for Co-operation
 - | Share information about tools
 - | Share measurement data

Thank you!

MOME

Questions?

