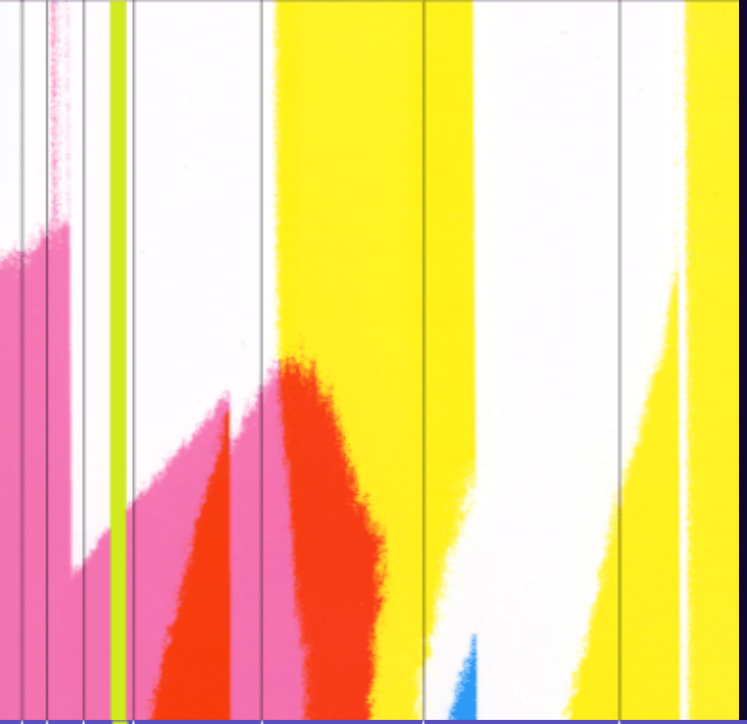

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Dir: Thierry Turletti – Walid Dabbous

Experimental Methodology for Real Overlays

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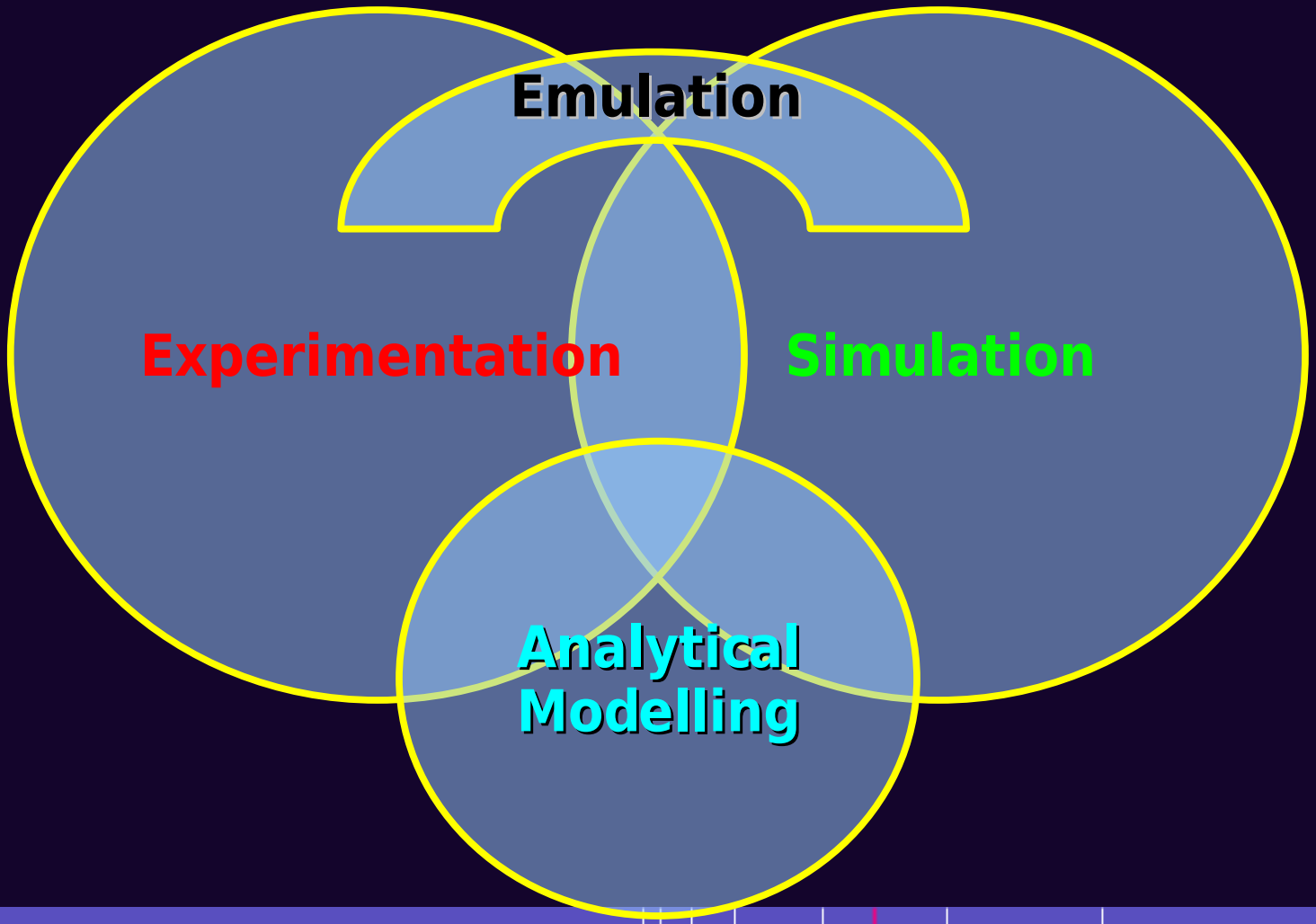
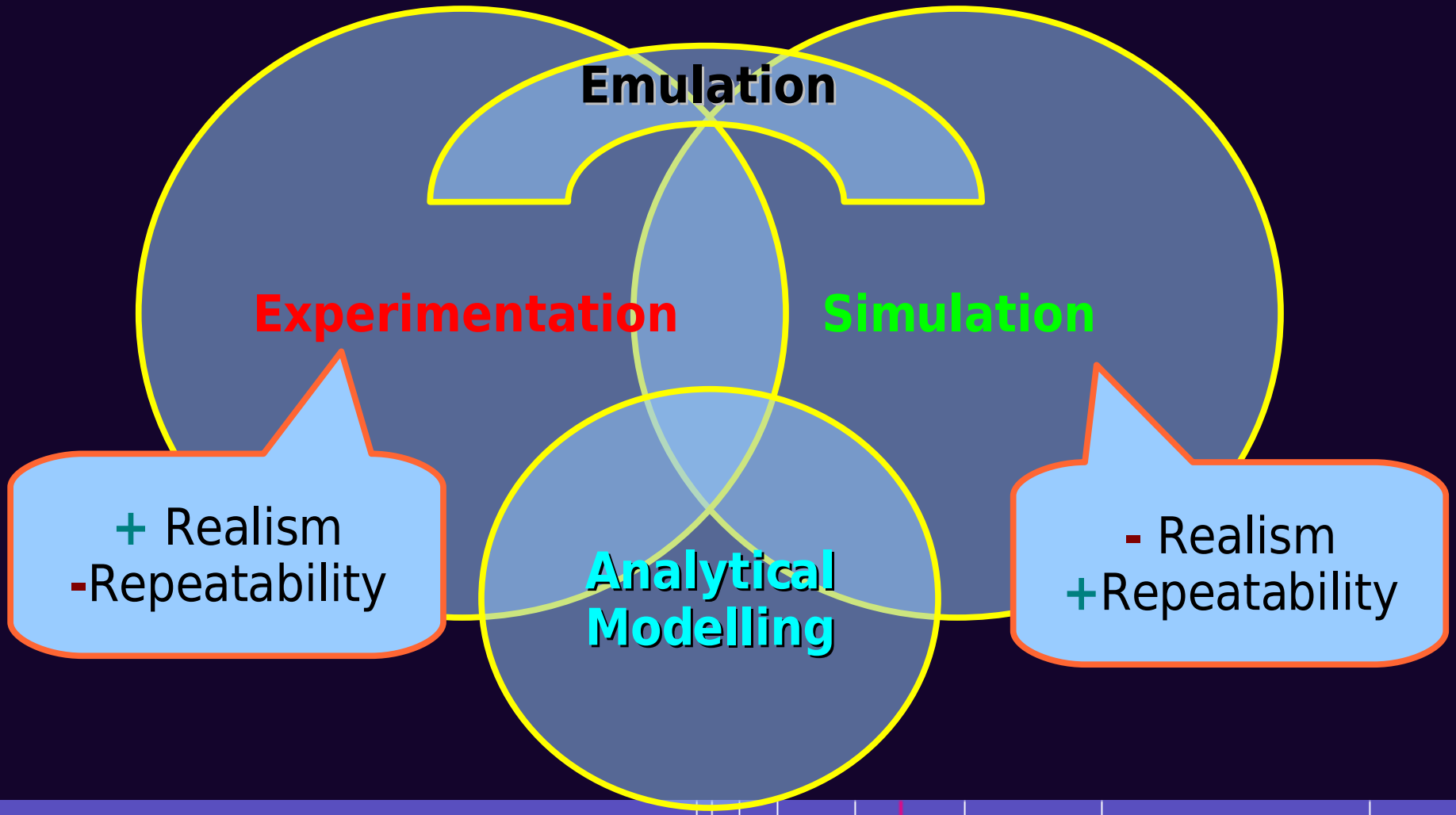
Algorithm and Protocol validation methods



Algorithm and Protocol validation methods



Validation flavors

Experimentation	Emulation	Simulation
- Physical reality	- Simulated PHY	- Model representation
- Deployment in Large Scale	- Virtual nodes	- Possibly more scalable
- Real traffic	- Generated traffic	- Synthetic traffic
- Failures, unexpected events	- Controllable depending on layer emulation	- Fully controllable & Ideal conditions

Using validation - examples

Experimentation

- For algorithm/protocol deployment
- For PHY and MAC layer proposals
- For wide scale real world tests

Emulation

- For small scale experiments
- For testing under controlled conditions
- For flexible infrastructure experimentation

Simulation

- For large scale systems
- For protocols and algorithms where there is no current physical support
- For proof of concepts
- For proposals where the underlying models are accurate

Validation flavors

Experimentation

- Network environment parameters
- Exogenous Traffic generation

Emulation

- Virtual Environment
- Injected traffic

Simulation

- Adjustable Parameters
- Fully controllable traffic

Example: Bittorrent protocol

Experimentation

- Create customized clients
- Test the clients on Planetlab

Emulation

- Create clients running on virtual nodes
- Generate traffic

Simulation

- Create nodes with the algorithm
- Create synthetic background traffic

Example: Rate adaptation mechanism

Experimentation

- Change driver code
- Capture and analyze traffic on a WLAN

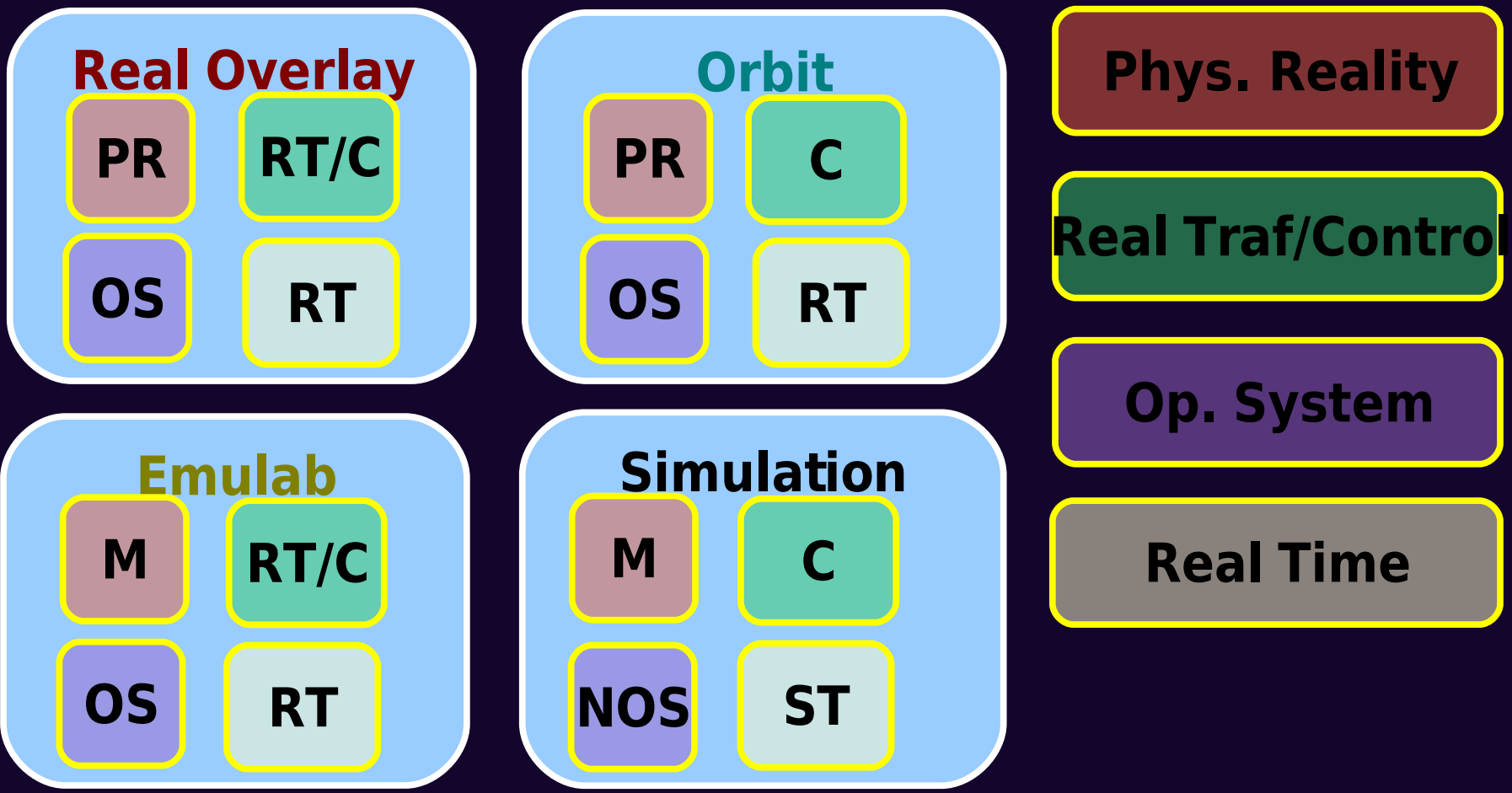
Emulation

- Create a virtual device and a driver
- Use a virtual configurable channel

Simulation

- Create nodes with the rate adaptation algorithm
- Analyze the behavior with a channel model

Current snapshot



What is missing?

Why experimentation is not as common?

-It is difficult to set up an experimental network

- Improve PlanetLab

- Experiments are not fully repeatable

- Need for a measurement tool and infrastructure

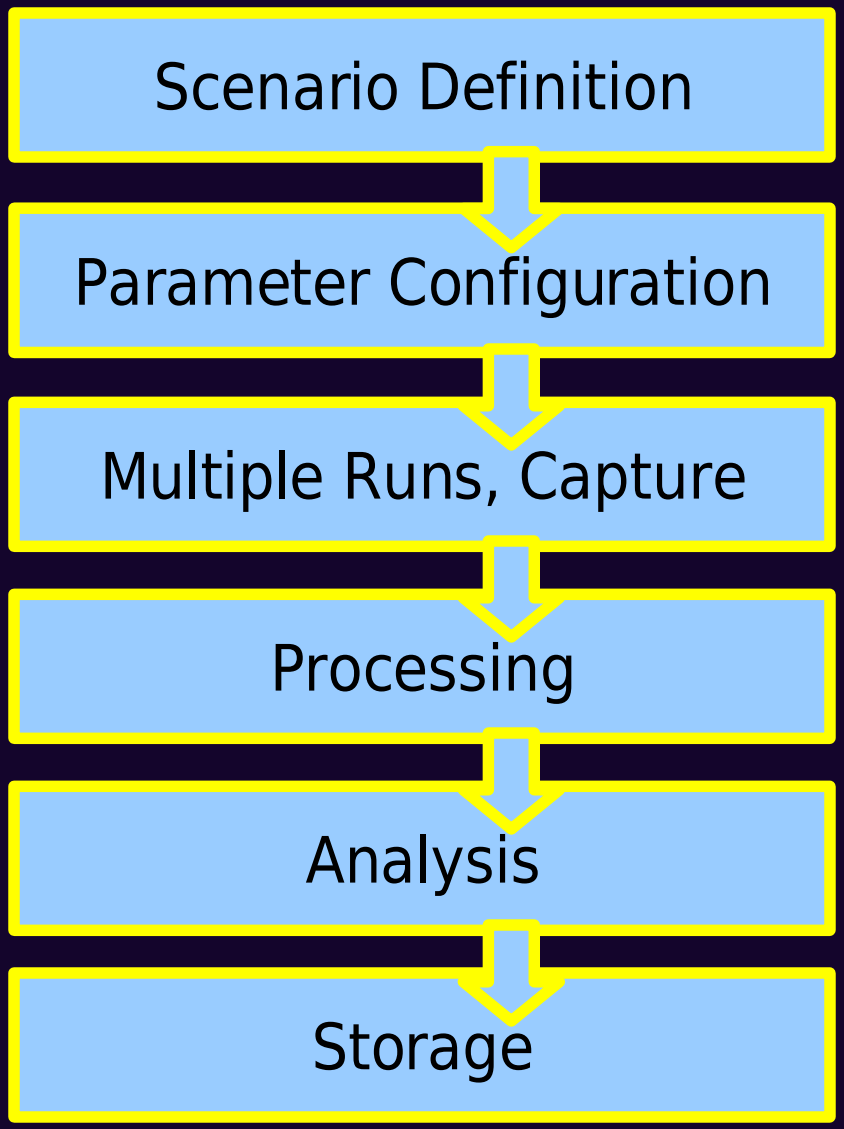
- Experimentation is not as flexible as simulation

- Use simulation and/or experimentation

-It's more expensive

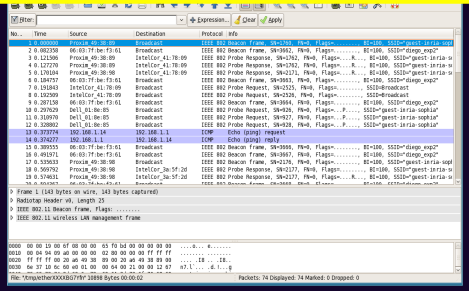
- Federated platforms reduce the cost

The methodology

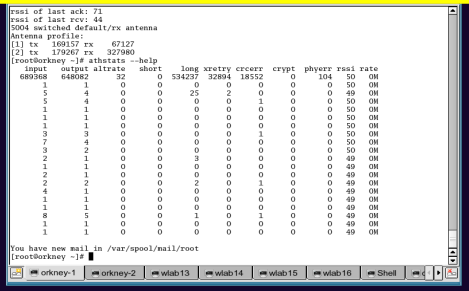


The data sources

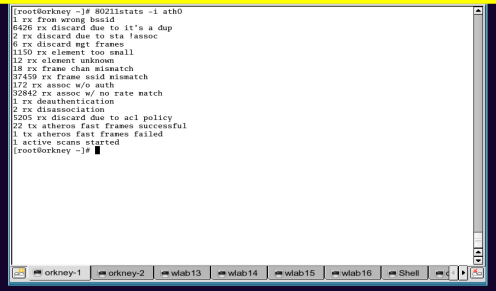
Packet Logs



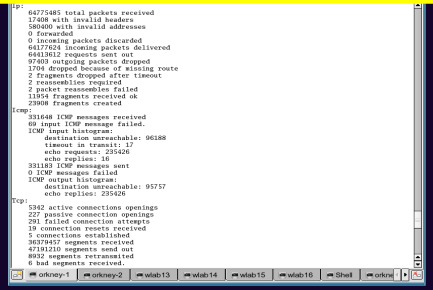
PHY Level statistics



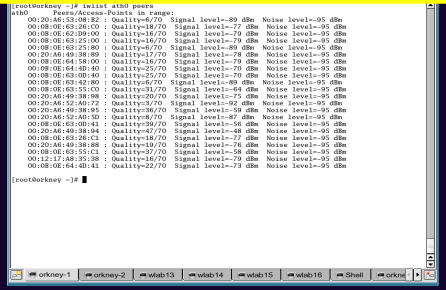
MAC Level statistics



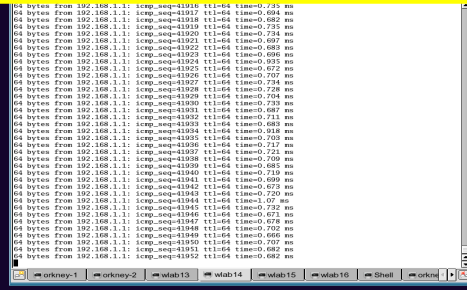
TCP/IP statistics



Access Point statistics



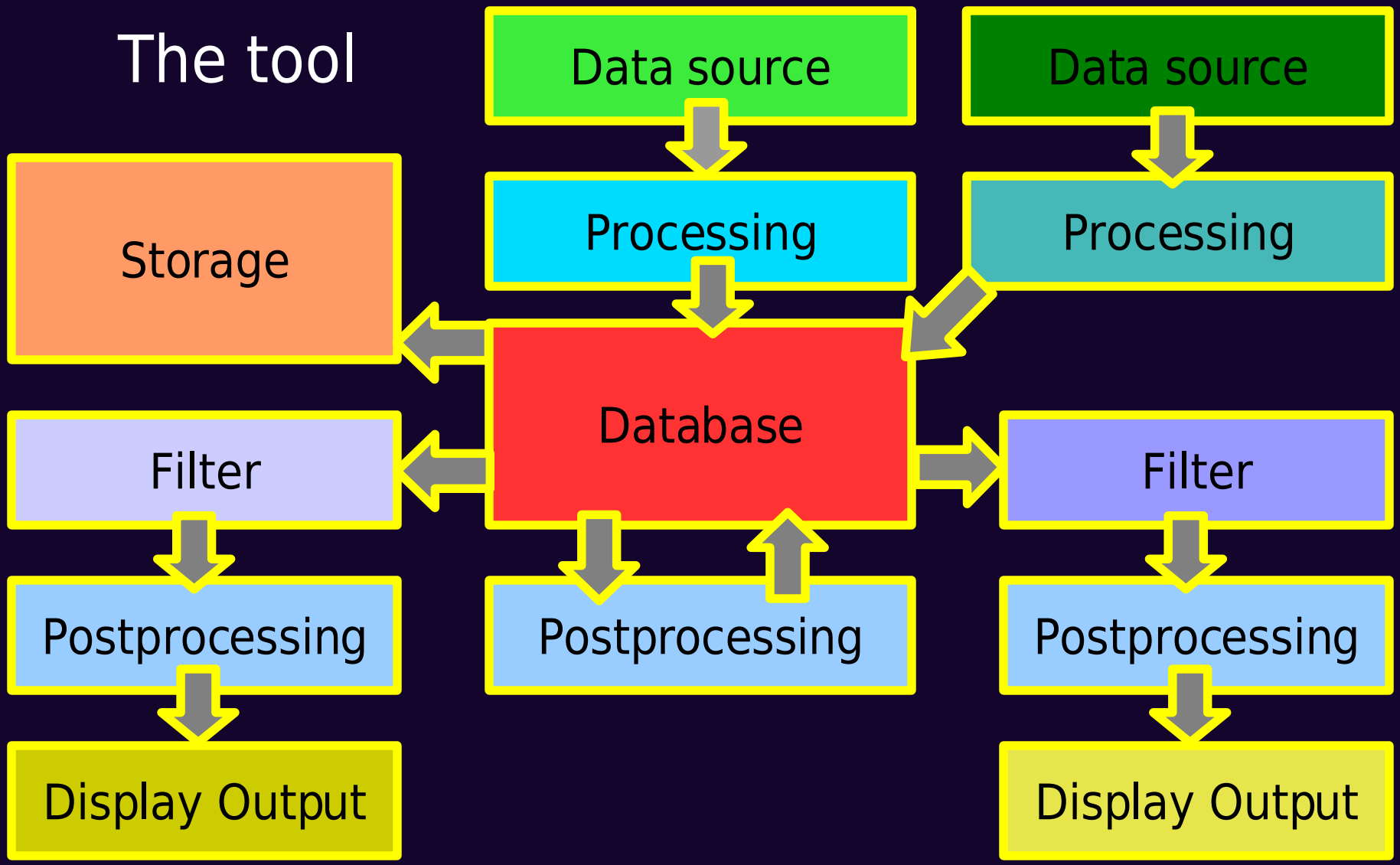
Application statistics



The measurement challenges

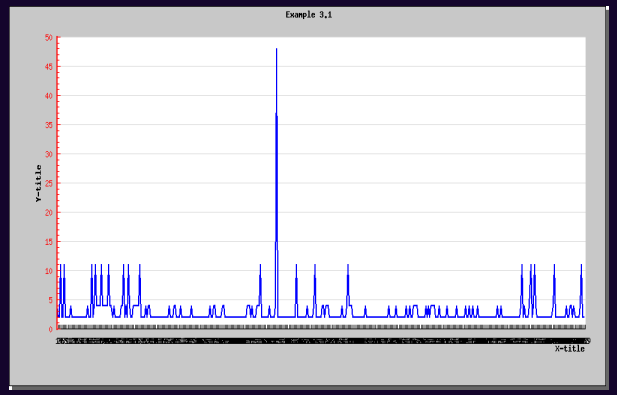
- Accurate representation of events
- Data fusion from sources (sensors!)
- Structures to standardize the data
- Instrumentation of interfaces and applications
- Common syntax to process data
- Platform calibration
- Easier, faster, cheaper, smarter...

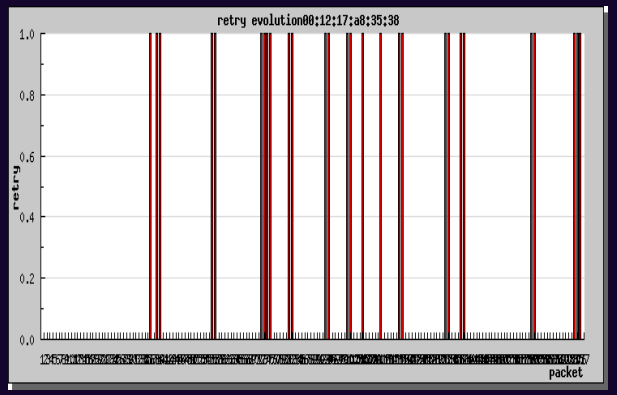
The tool

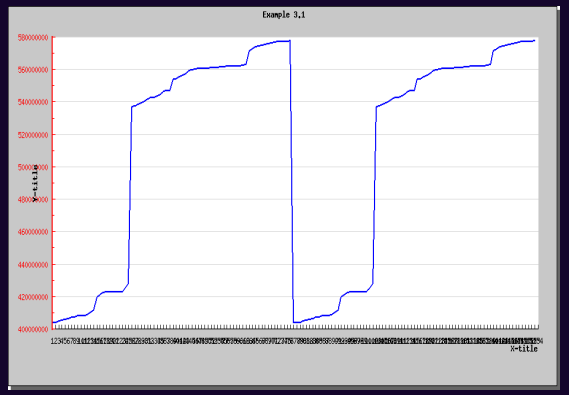

Data source
Data source
Storage
Processing
Processing
Database
Filter
Filter
Postprocessing
Postprocessing
Postprocessing
Display Output
Display Output

Still cooking

- Experimentation scheduling - beta
- Data processing - alpha
- Output generation – basic functionality.
- Integration – coming soon







SELECT retry from wlan where addr="00:1B:11:1B:96:22";

SELECT rate from radiotap where mactime<9000 and mactime>1000;

Thank You for Your Attention!