



Measurements / Monitoring in Tequila



Part I: Measurements and TE

draft-svdberg-temon-00

- Why Measure / Monitor ?
- Measurements in TE
- How to Measure Traffic Engineered Networks

Part II: Measurements and Tequila

- The Tequila philosophy on measurements
- Architecture
- Functionality



Why to Measure / Monitor

Functionality: observation => diagnostic monitoring

- Basic monitoring functionality available for ages:
 - *ping*: calculate round-trip delay and loss by injecting packets in a network
 - *SNMP/MIBs/RMoN*: add counters etc. to network elements to passively monitor what passes

Functionality: reaction => operational measurement

- One step beyond: automated reaction to monitoring results
 - Policy based management: if <event> then <action>



Measurements in TE

- Traffic Engineering (TE): accommodate as many requests as possible traffic by optimally using the available network resources
- One new “keyword”: Multiple Service monitoring
 - Am I providing / receiving the requested service
 - Reporting to the customer: because quality becomes a harder (read: more legally hazardous) part of the provider-client interaction
 - React if something goes wrong
- + “Old” functionality:
 - e.g. driving GUIs for management (e.g. for failure detection and human network analysis etc.)



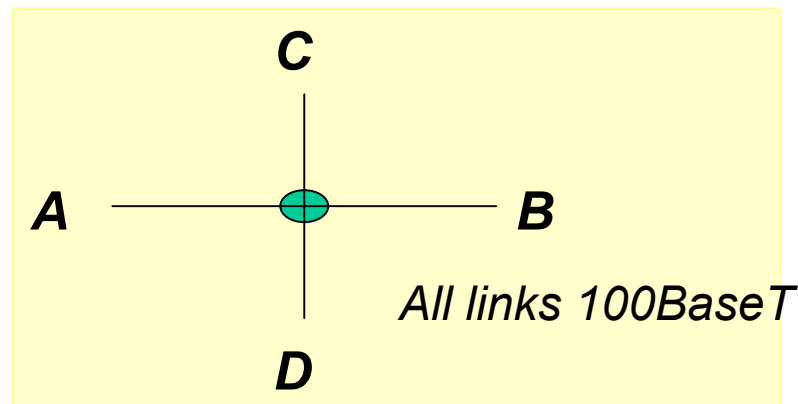
Operational Measurements in TE

- Known network model needed for
 - Path Calculation (~constraint based routing)
 - Admission control / SLS negotiation
 - Might be combined with diagnostic functionality (e.g. alarm analysis)
- Not that obvious to do this pure theoretically

e.g. $\text{loss} = f(\text{link usage, PHB usage, drop algorithms, packet size, ...})$

example: 2 streams crossing a network element paralleltheoretic graph

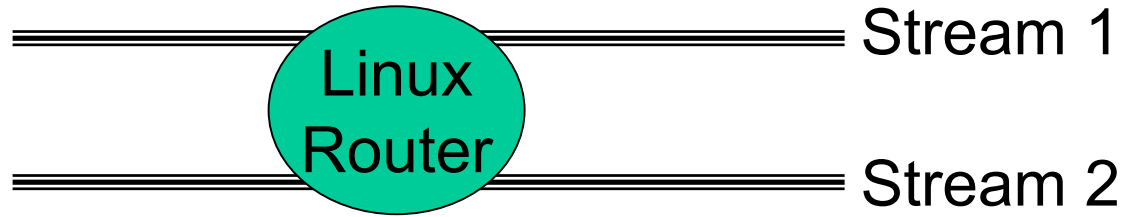
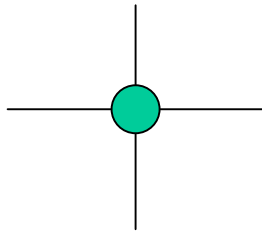
theory: streams independent: so 100Mb/s throughput from $A \Rightarrow B$ and $C \Rightarrow D$



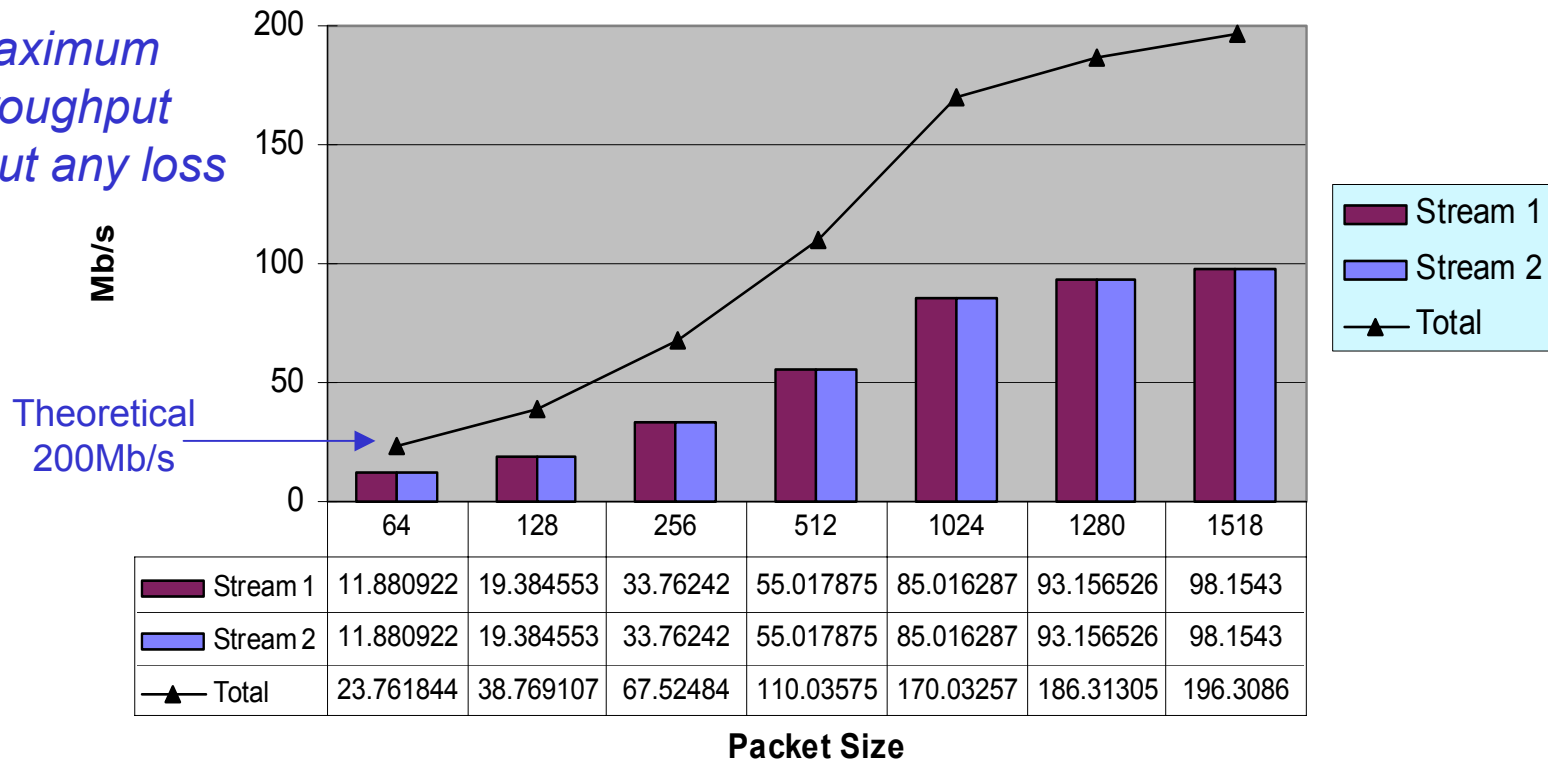
practical: well... depends on the packet sizes / Network element / etc.



EXAMPLE: Influence of parallel streams on the behaviour of a node



Maximum throughput without any loss





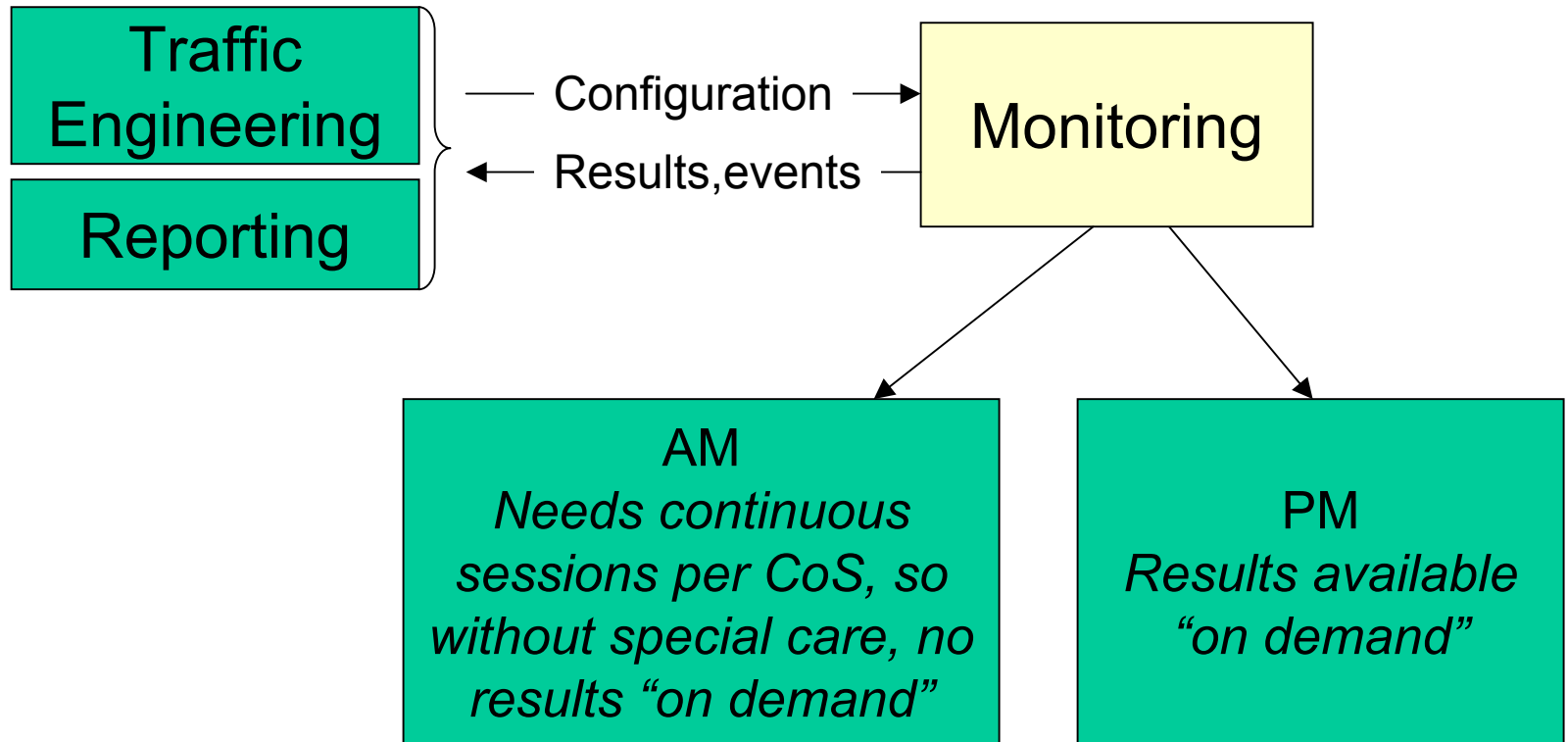
How to Measure Traffic Engineered Networks

- Basics remain the same:
 - passive measurements: read the MIB counters
 - active measurements: inject packets into the network
- BUT
 - if there is more than one class of traffic => every class must be measured
 - different classes might have different measurement requirements
 - One-way issues arise (asymmetric paths)
 - Measurement must take into account multiple technologies:
 - MPLS
 - DS
 - Multipath



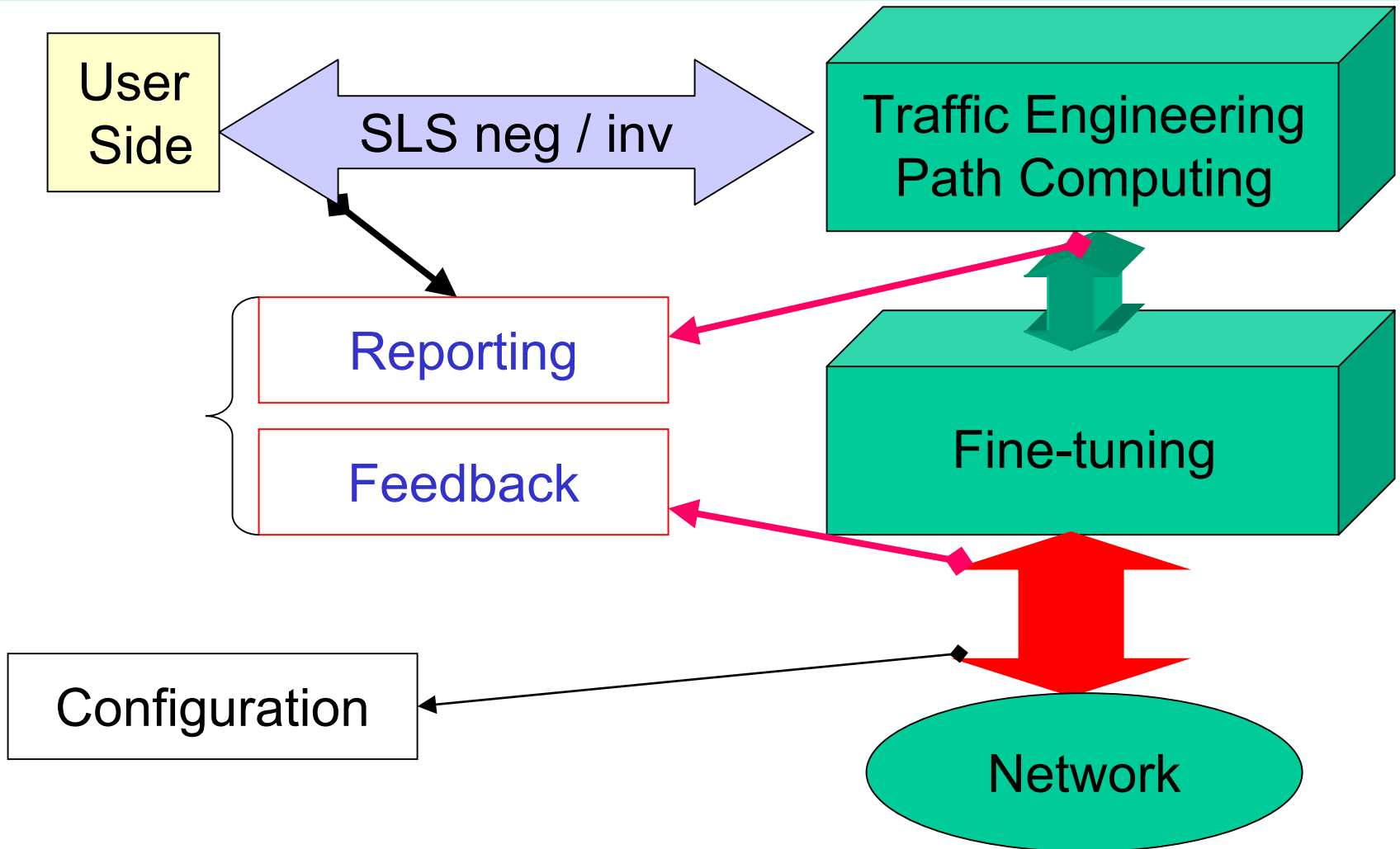
How to Organize Measurements

- Synchronization between passive and active
 - Result = 1 set of measured data (active results U passive results)



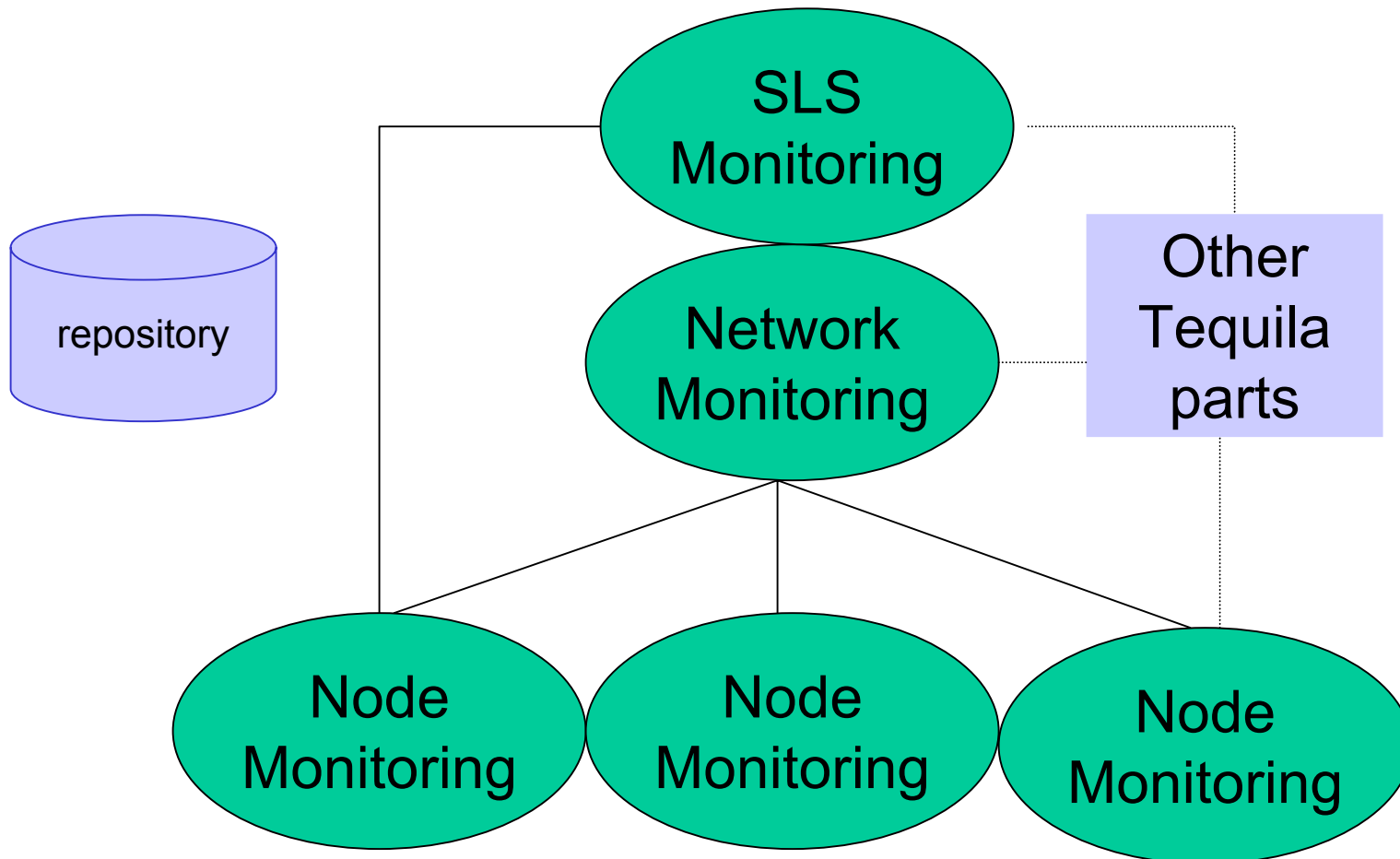


Tequila works in 2 levels





Monitoring in Tequila

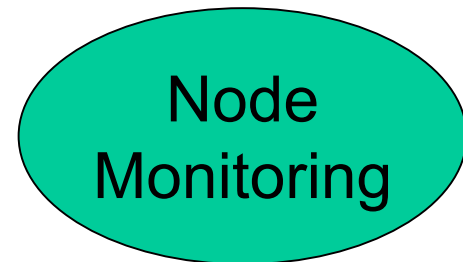




Monitoring in Tequila

Node Monitor

- Distributed (one per node, ie network element)
- Performs and organizes operational measurements
 - *Active*: with its neighbouring or remote nodes
 - *Passive*: on the node it resides
- Performs and organizes diagnostic measurements
 - at the ingress for end-to-end traffic measurements
- To reduce traffic to other Tequila Functional blocks:
 - Events on thresholds
 - Apply basic functions, e.g. EWMA calculation

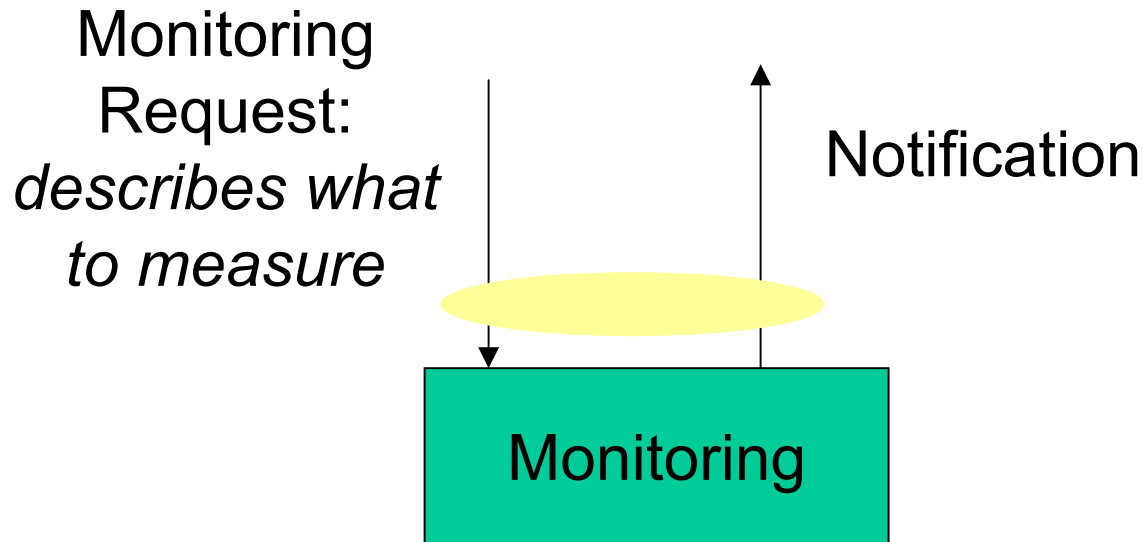




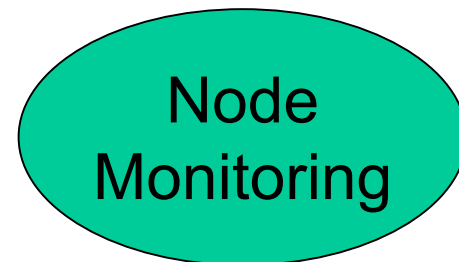
Monitoring in Tequila

Node Monitor

- Implementation Active Monitoring: OWDP
- Subscription-notification paradigm



- Some organisation needed
 - e.g. no multiple OWDP-sessions for the metric, although there are multiple requests for it





Monitoring in Tequila

Network Monitor

- Centralized
 - gathers and processes results from all node monitors
 - does longer term, more complex traffic analysis
 - Knows the network topology, so can act more wisely than the “local vision” node monitors
- Organizes node monitors
 - gets notification if TE activates new state
 - configures affected node monitors

A green oval with a black border containing the text "Networks Monitoring" in black, bold, sans-serif font.

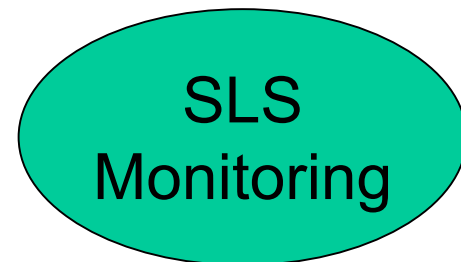
Networks
Monitoring



Monitoring in Tequila

SLS Monitor

- Additional function at the edge nodes
- Monitors end-to-end performance for certain SLSs
 - extra service (reporting to customer)
 - service auditing
- Monitors edge statistics
 - e.g. passive monitoring on the edge for policing statistics
- Uses inputs from edge node monitors and network monitor
- Results => Trigger SLA management





Monitoring in Tequila

