



---

# 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

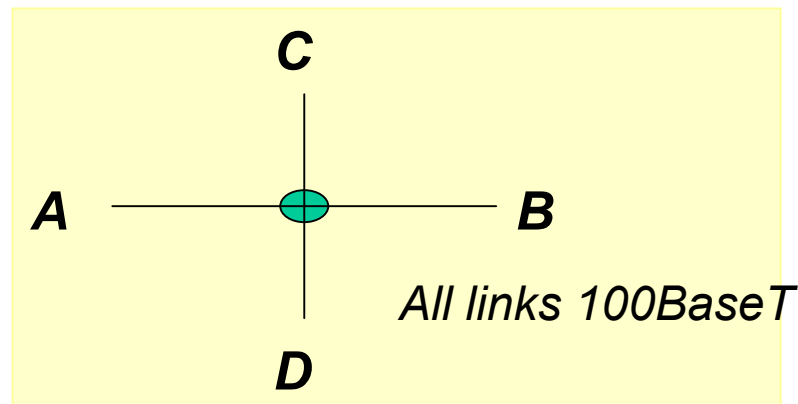
- Known network model needed for
  - Path Calculation (~constraint based routing)
  - Admission control / SLS negotiation
  - Might be combined with diagnostic functionality (e.g. alarm analysis)

- 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

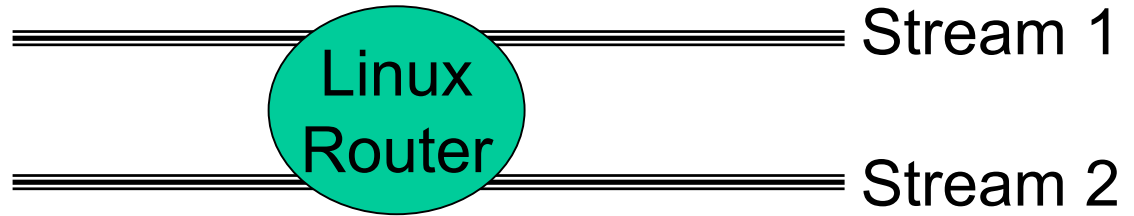
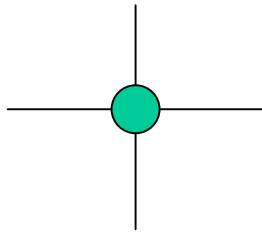
theory: streams independent: so 100Mb/s throughput from A=>B and C=>D



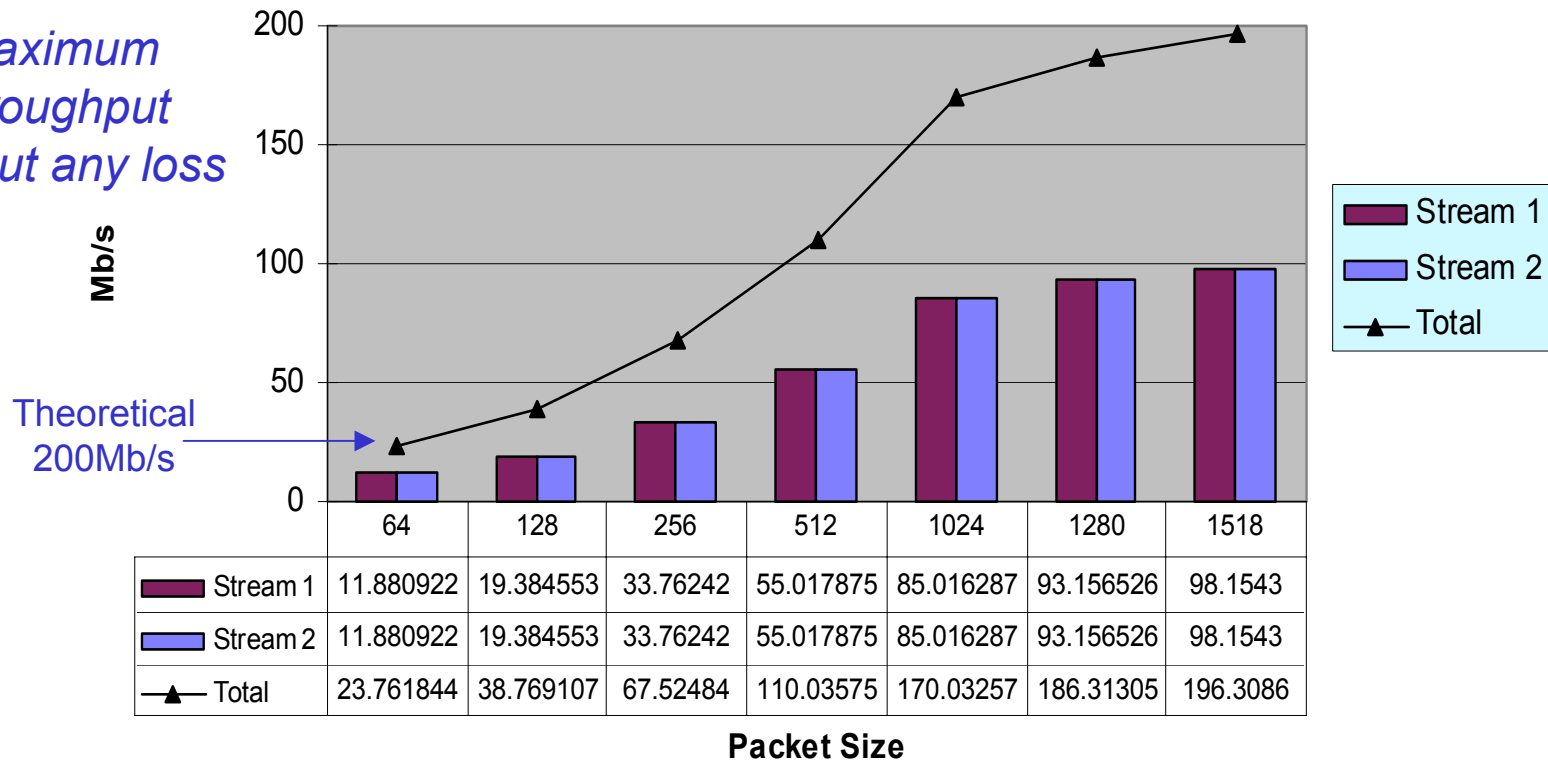
practical: well... depends on the packet sizes / Network element / etc.



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



Maximum throughput without any loss





# How to Measure Traffic Engineered Networks

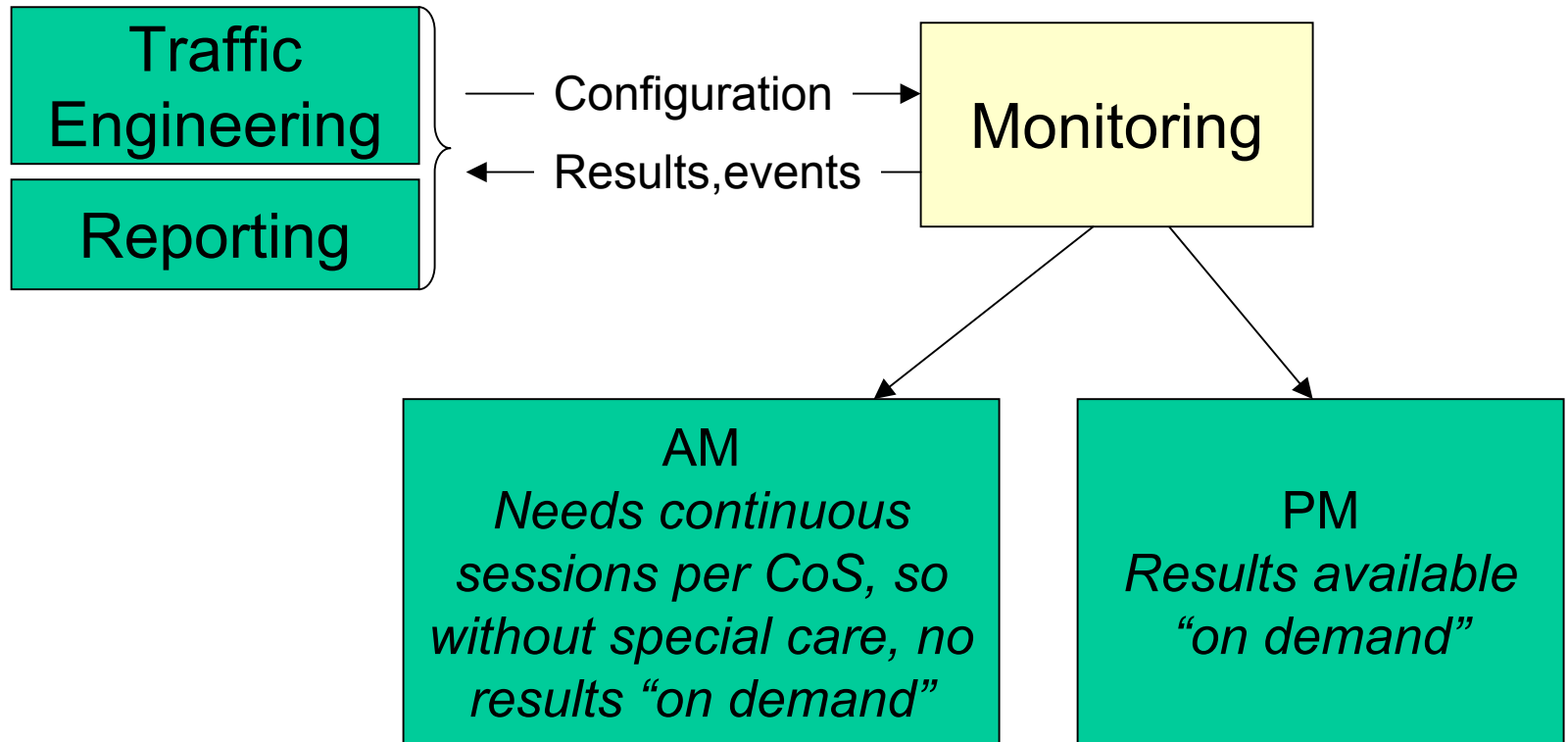
---

- 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

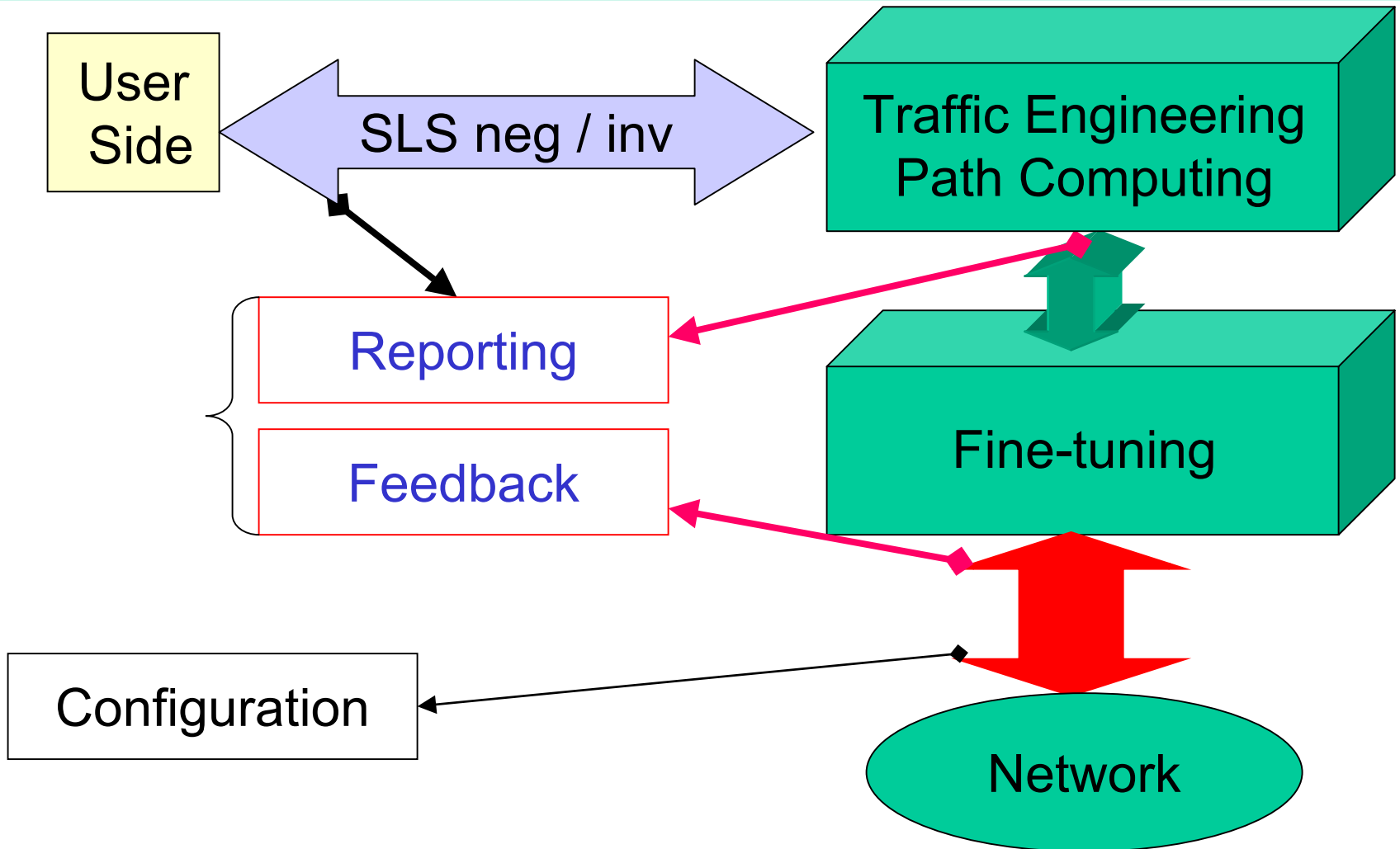
- Synchronization between passive and active
  - Result = 1 set of measured data (active results U passive results)







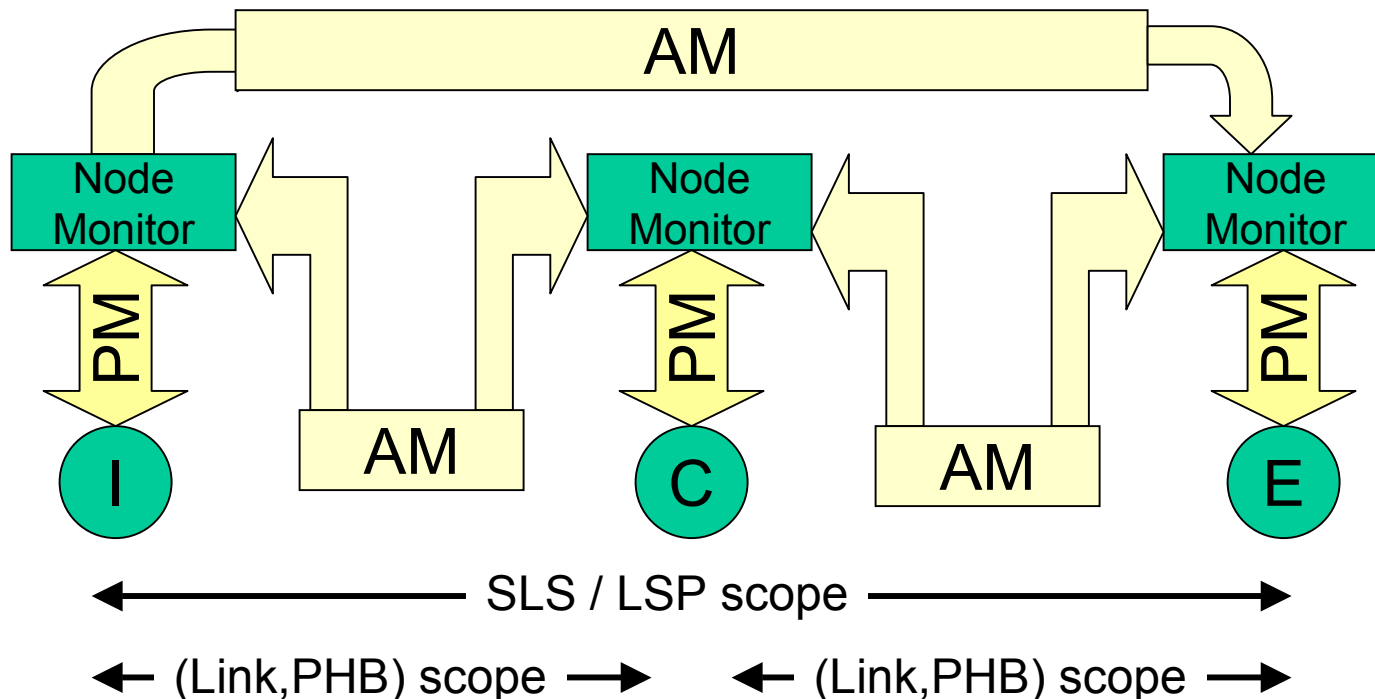
# Tequila works in 2 levels





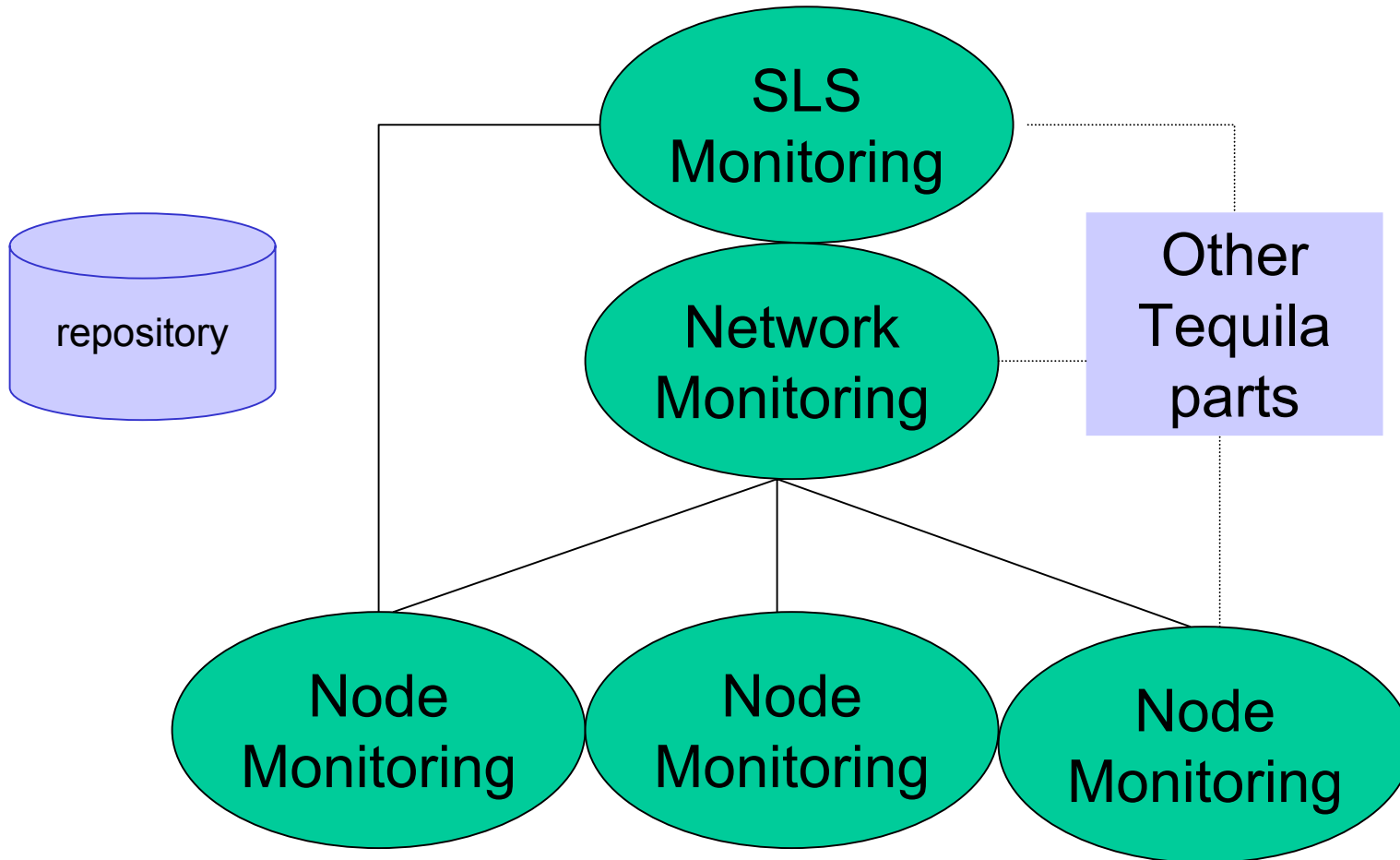
# Scope problem: The Tequila Approach

- hop-by-hop and end-to-end
  - hop-by-hop, e.g. for calculating constraint based routes (per link characteristics)
  - End-to-end, e.g. for SLS monitoring
  - and at every hop: passive monitoring (per LSP/per PHB,...)





# Monitoring in Tequila



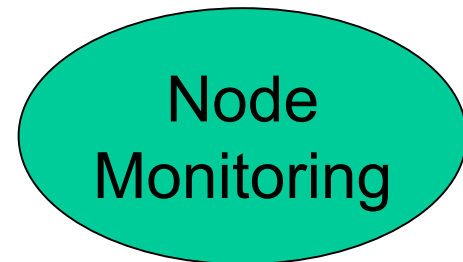


# Monitoring in Tequila

## *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

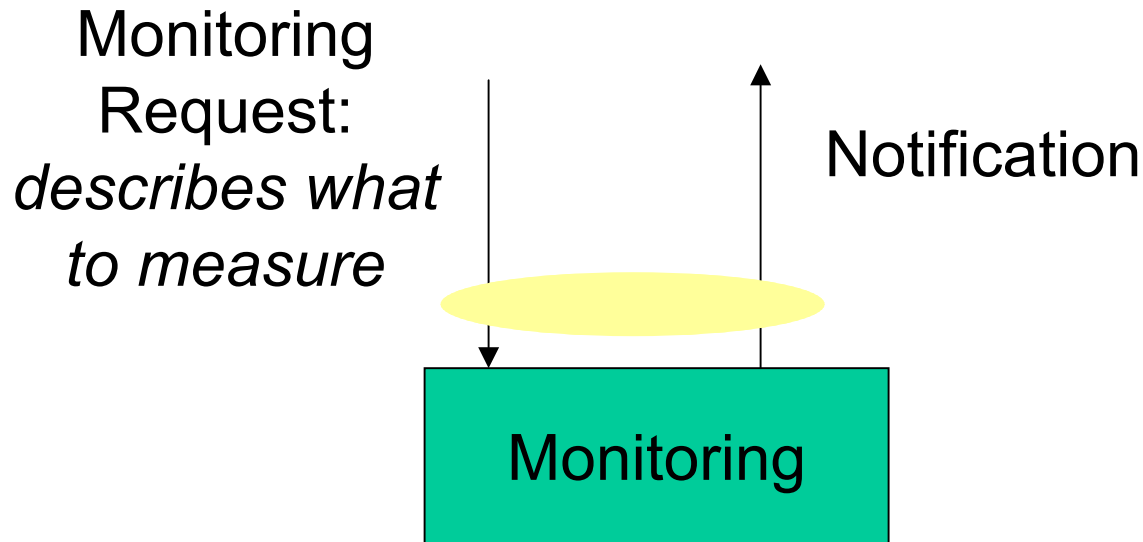




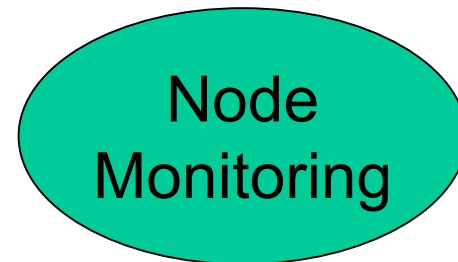
# Monitoring in Tequila

## *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

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

**SLS  
Monitoring**



# Monitoring in Tequila

