

Estimating Required Bandwidth using Flow Measurements

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1. Bandwidth provisioning

- Rules of thumb: traffic average + % of average.
- Better approaches require measurements at the packet level, but they may result in scalability issues.
- Base formula: $C(T, \varepsilon) = \rho + \frac{1}{T} \sqrt{(-2 \log \varepsilon) \cdot v(T)}$

where, for a given link, the required capacity C at timescale T is calculated by adding to the mean ρ a safety margin that depends on the traffic variance $v(T)$.

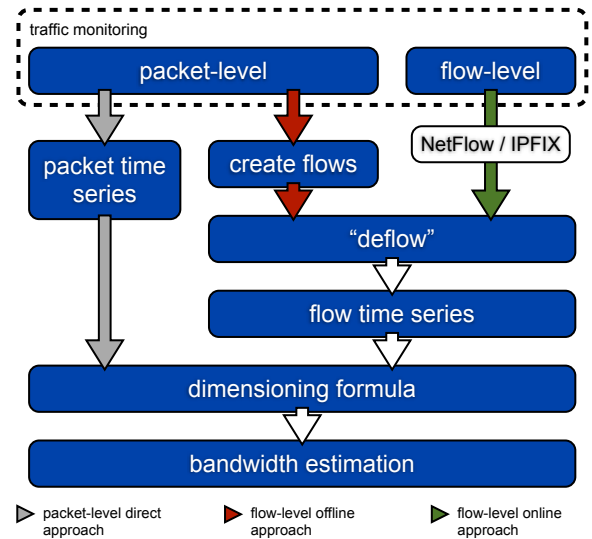
2. Flow measurements

- Flow is a "set of packets that share common properties and pass at an observation point".
- + Scalable alternative to packet measurements.
- + NetFlow / IPFIX enabled equipment is available.
- Provide information at a coarser granularity.



3. Approach

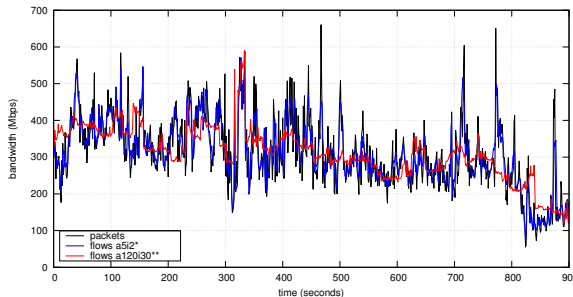
- Try to reuse existing dimensioning formulas by extracting traffic statistics information from flow-level measurements.



4. Results

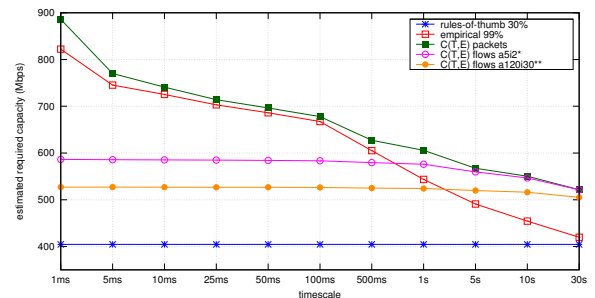
- Rules-of-thumb (30%) completely under estimated bandwidth requirements in this example.
- Due to the assumption, in our approach, of uniformly bytes within the flow duration, the consequences of averaging in flows are clear when comparing packet and flow time series.
- From 1 second to higher timescales flow-based estimations are as good as packet-based ones. Timescales at milliseconds are hard for flows.

Comparison between packet and flow time series.

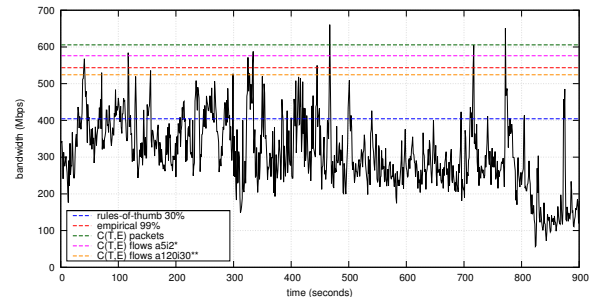


*a5i2: flows with active timeout of 5 seconds and inactive timeout of 2 seconds; **a120i30: flows with active timeout of 120 seconds and inactive timeout of 30 seconds.

Calculated estimations using different approaches at timescales from 1ms to 30s.



Calculated estimations using different approaches at timescale as 1s, plotted with the packet-level traffic time series.



5. Conclusions

- At higher timescales (from 1 second) our approach is able to correctly estimate required capacity.
- Future work: improve flow-based estimations at lower timescales (down to milliseconds).