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Dynamic Traffic Management (DTM) for minimization of inter-domain traffic cost

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SmartenIT

Socially-aware Management of New Overlay Application Traffic with Energy Efficiency in the Internet

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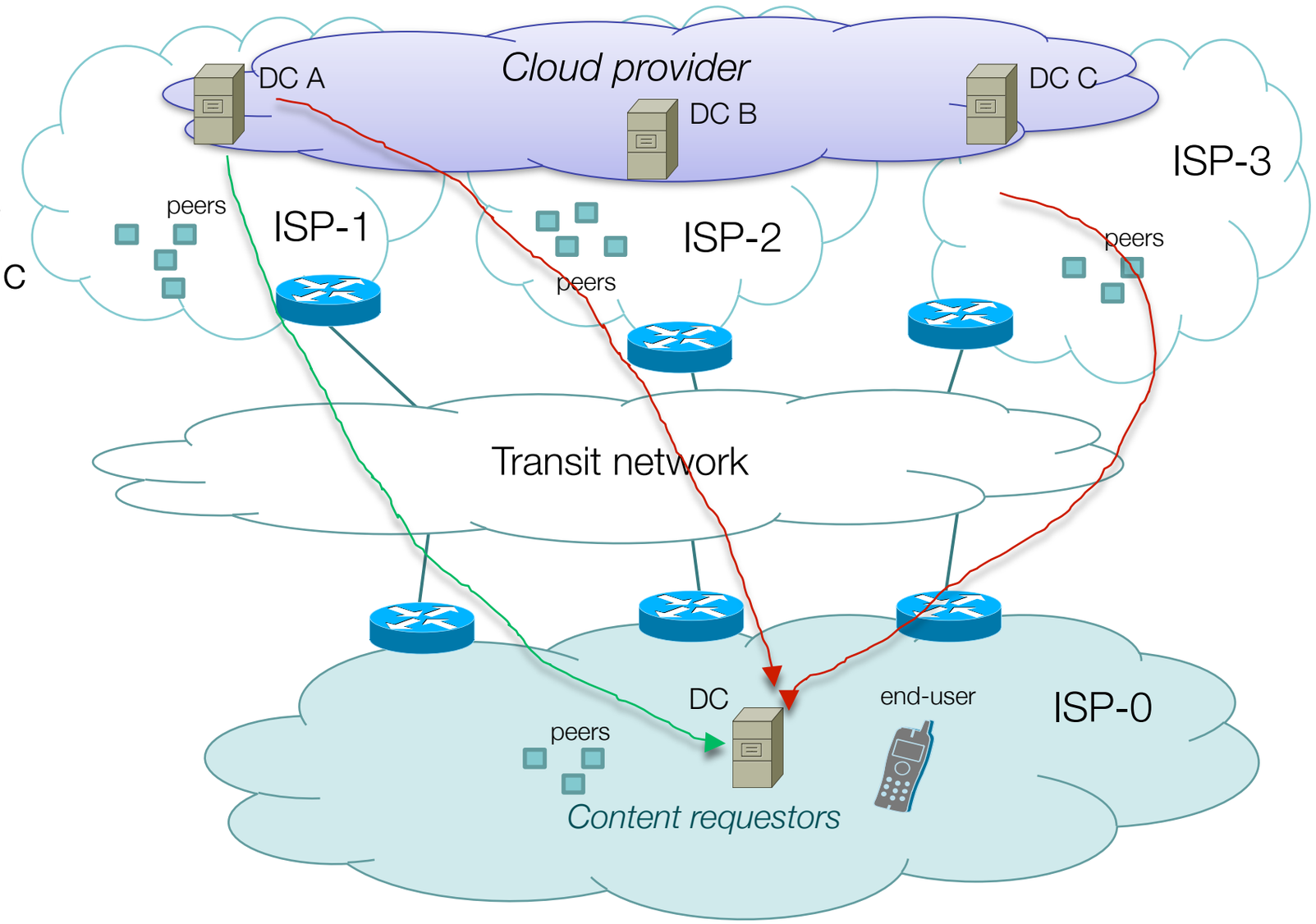
Background

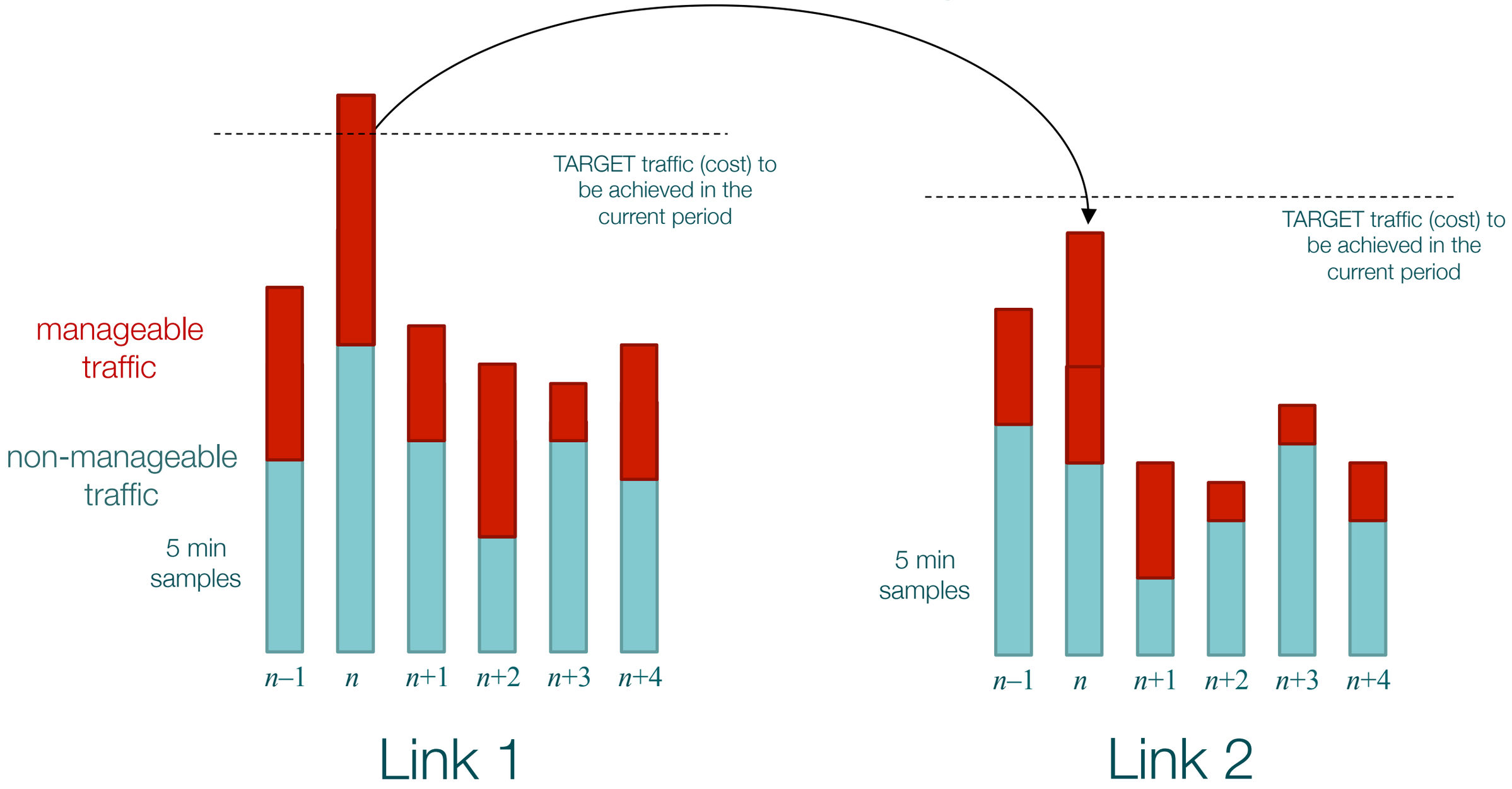
- The content is not available locally
  - The download will generate inevitable inter-domain traffic
- The cost of the downstream traffic depend on the tariff on inter-domain link used
- Optimize total cost of inter-domain traffic



- Manage the traffic:
  - Selection of content source (multiple resources available, communicate with overlay application, e.g. by using ALTO)
  - Select the path, e.g. by using tunnels (might be transparent to or cooperate with overlay)

Traffic management

Total amount of traffic in each period *n* remains the same, but the traffic is differently distributed among two links



Basic assumptions

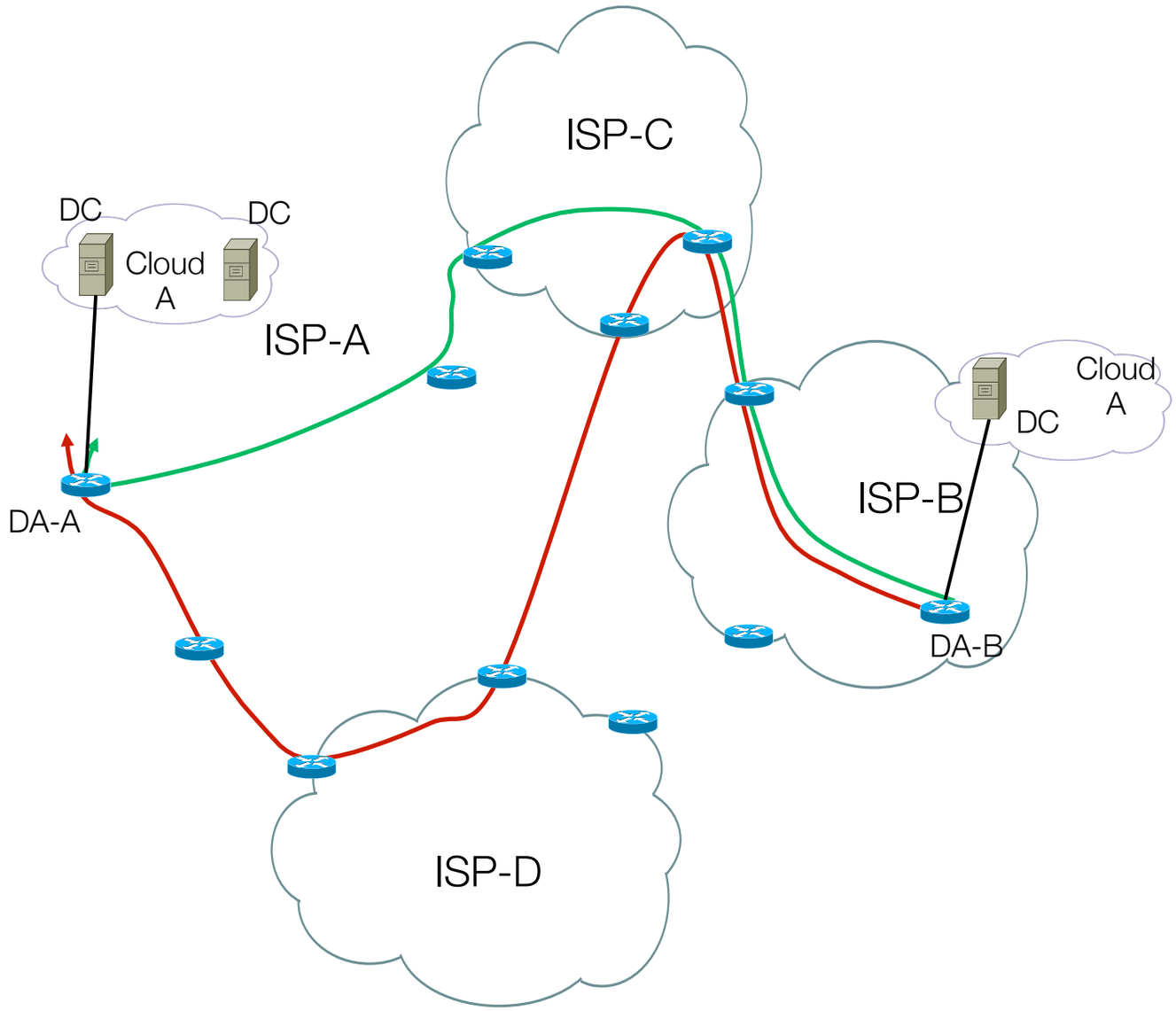
- Tariffs based on total traffic volume or 95th percentile
- Upstream and downstream traffic management

- Find cost-optimal traffic distribution on inter-domain links

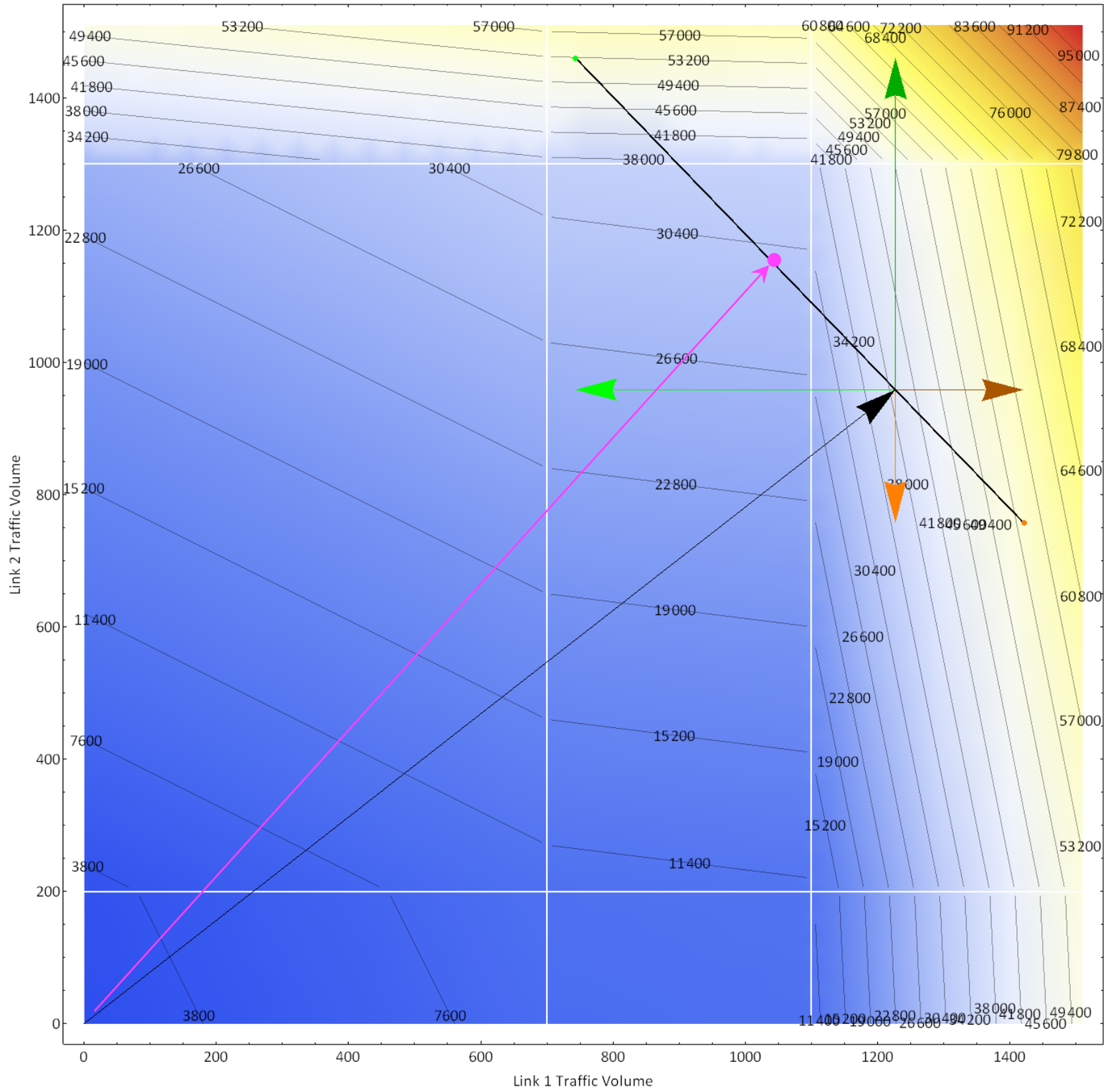
- Goal – minimize cost by the end of accounting period – long time scale
- Influence traffic distribution dynamically on short time scale
- Observe traffic on links
- Periodic measurements and estimation of final cost
- Influence the manageable traffic by selecting path for flows

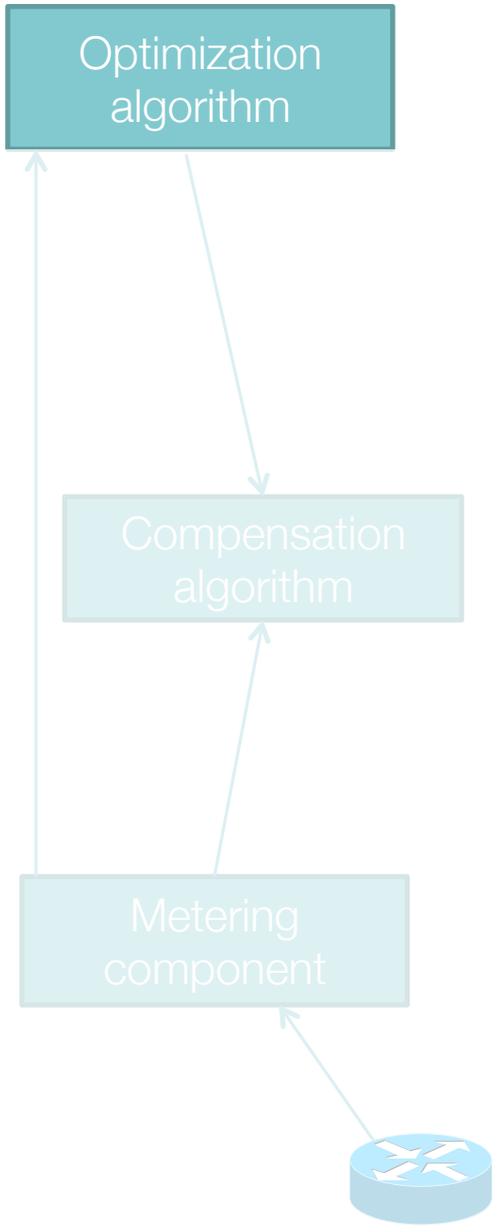
Sample use-case

- Cloud agnostic
- Tunnels (GRE or MPLS) between DAs (Data Center Access router) located in different ISP domains
- Simple management in DAs
  - Recognize flows
  - Choose appropriate interface (tunnel) for the flow
  - SDN controller
- Agreements between ISPs may be needed



DTM – traffic management concept





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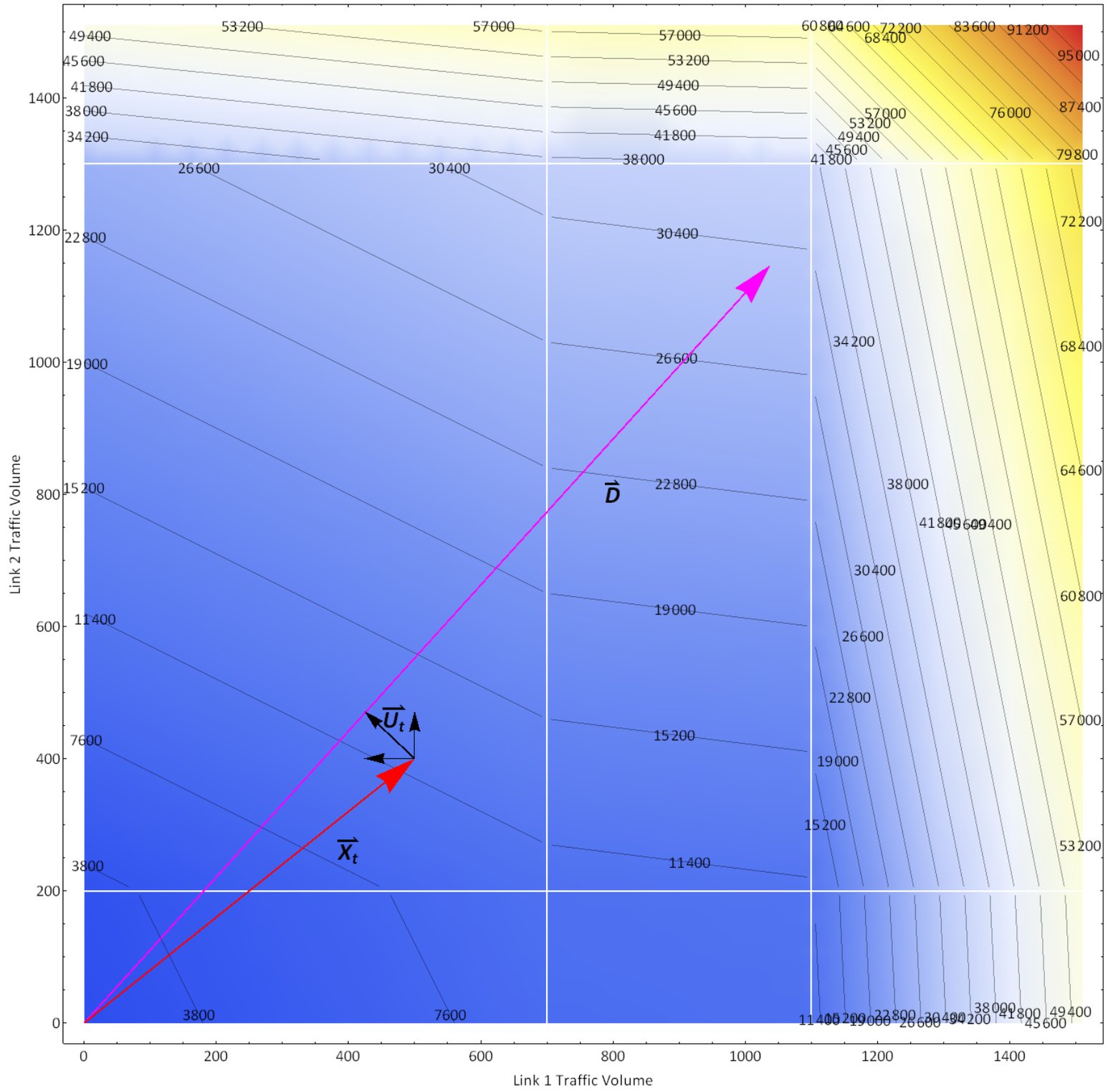
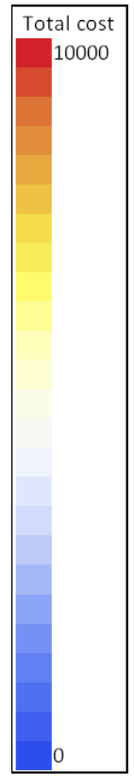




Finds optimal goal vector D_t

Optimization algorithm

Calculates compensation vector U_t e.g. every 5 min and influences path selection

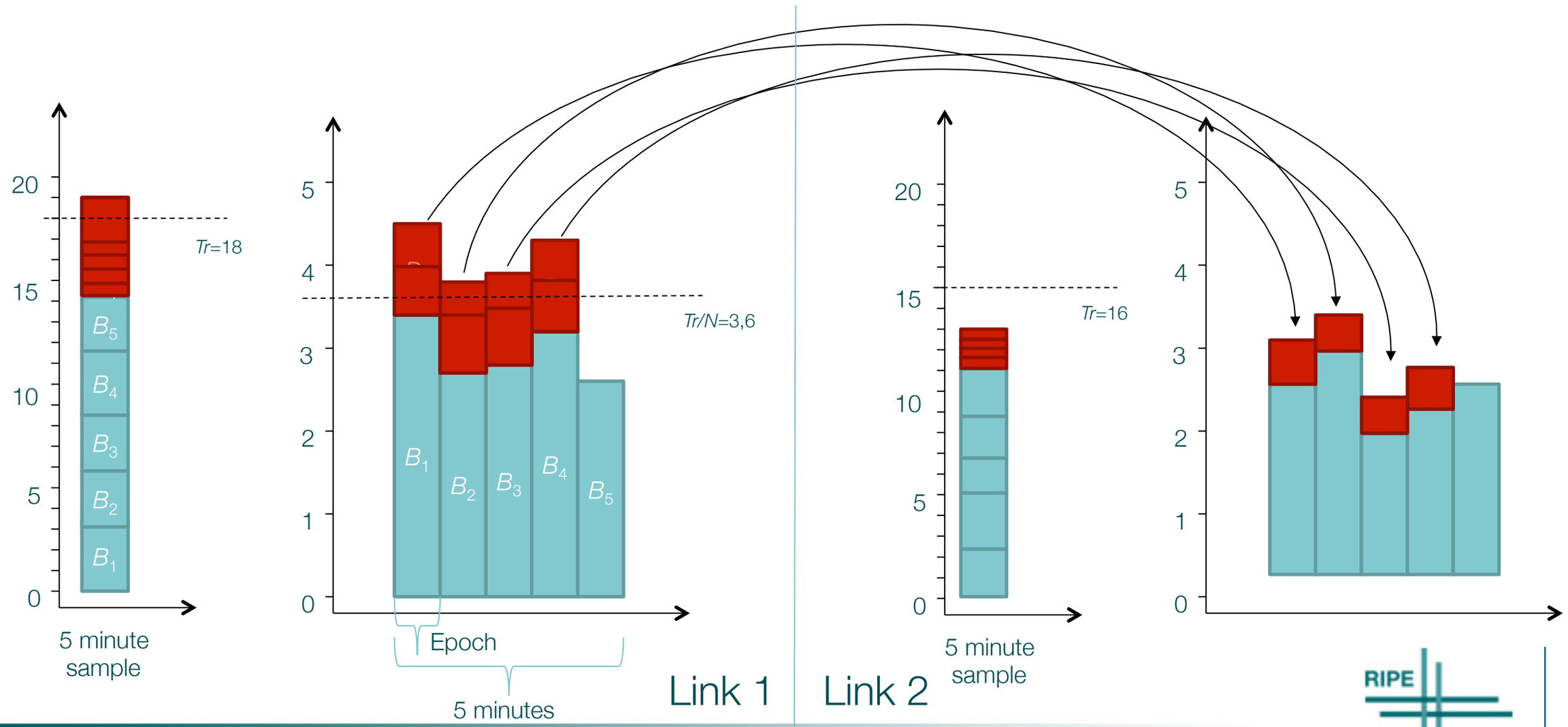
Compensation algorithm

Metering component

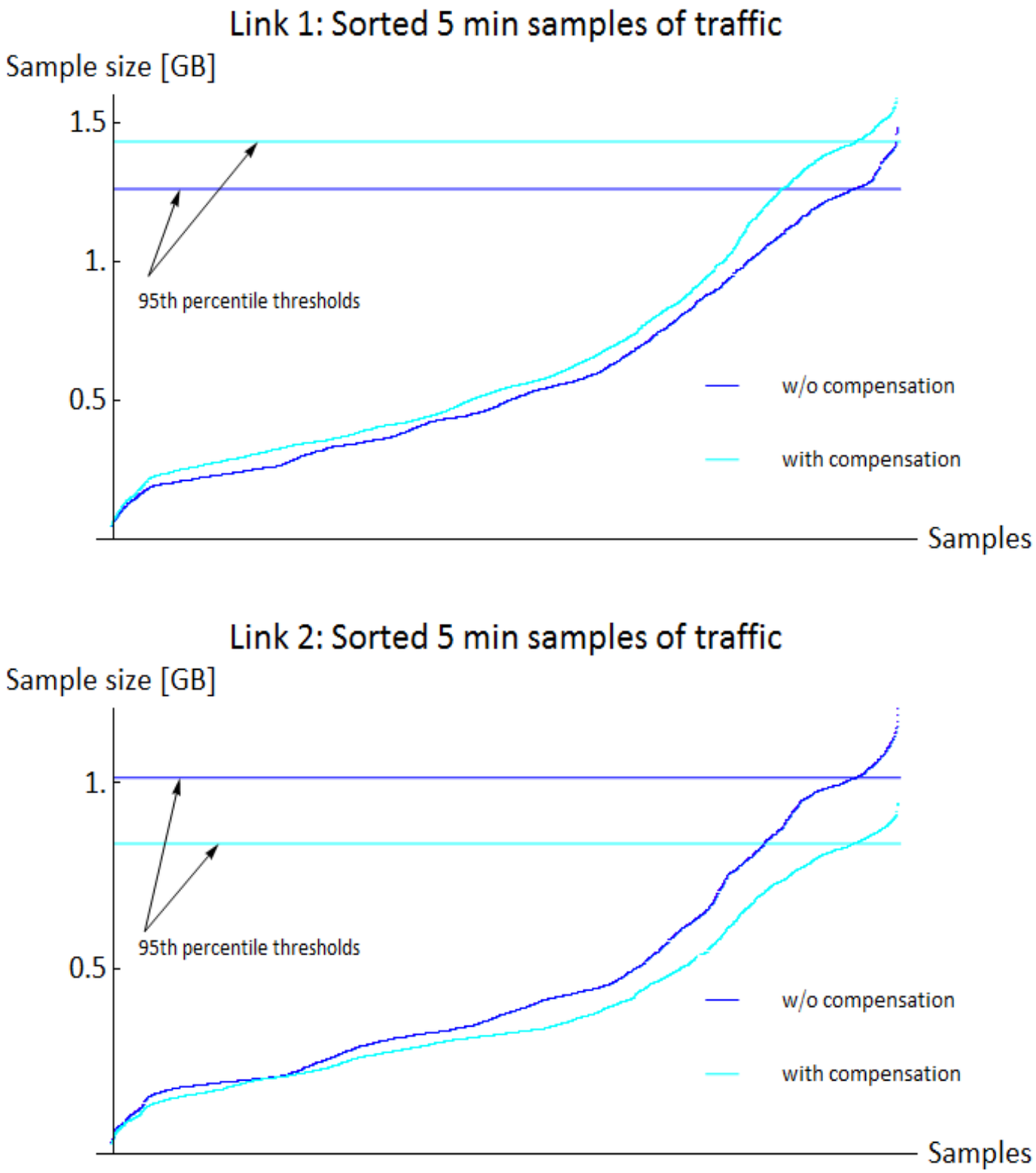
Monitors current traffic on inter-domain links and calculated measured vector X_t
e.g. every 30s
e.g. (modified) NetFlow

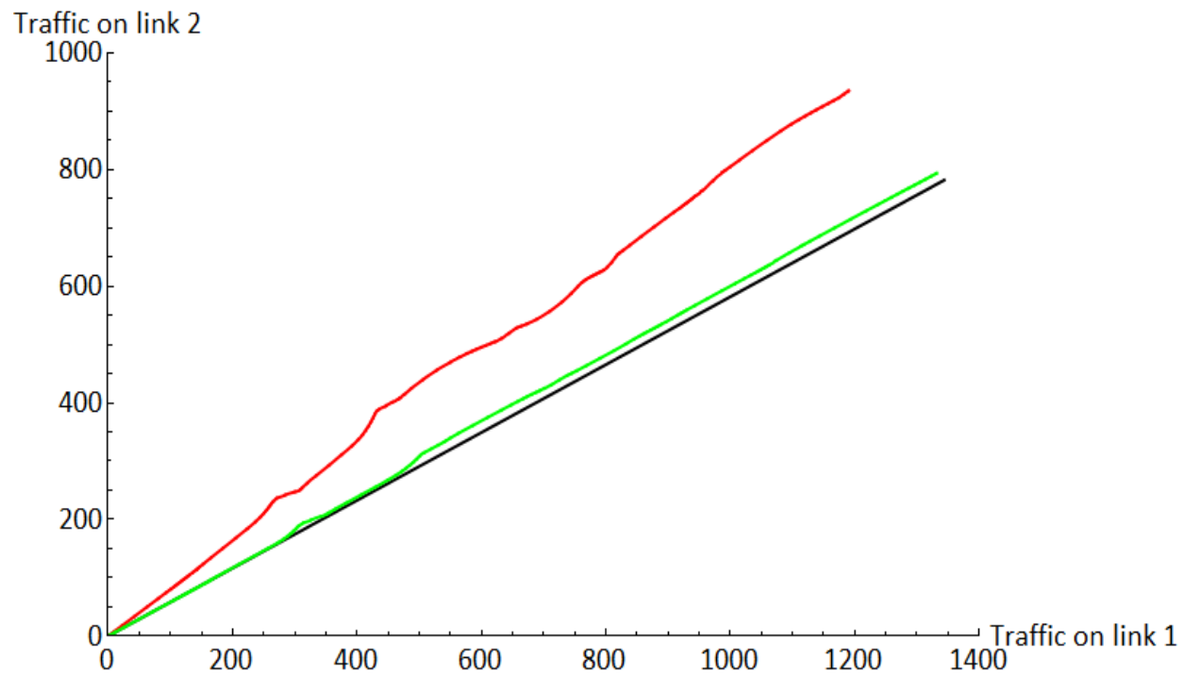
Example more detailed example

- Frequent traffic measurements (per epoch)
  - 5-min slot divided into a number of epochs
- Per epoch reaction: compensation vector is recalculated after each epoch
- The compensation vector says how much traffic should be shifted from one link to the other to keep the sample small enough and achieve target cost (in terms of 95th percentile)



Simulation results – 95th percentile tariff





Cumulated traffic volume on links

- Without compensation
- With compensation
- Goal vector of traffic

Questions?