

Towards a more systematic approach for interdomain traffic engineering



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State-of-the-art of interdomain TE

- **“Route optimization” techniques** (InterNap, RouteScience, Opnix, Proficient, Radware,...)
- **Features in BGP routers for multiple-link load balancing** (load-sharing and BGP multipath)
- **ISP's interdomain TE is primitive :**
 - **change some route's attribute**
 - **check impact on traffic**
 - **accept or try again**

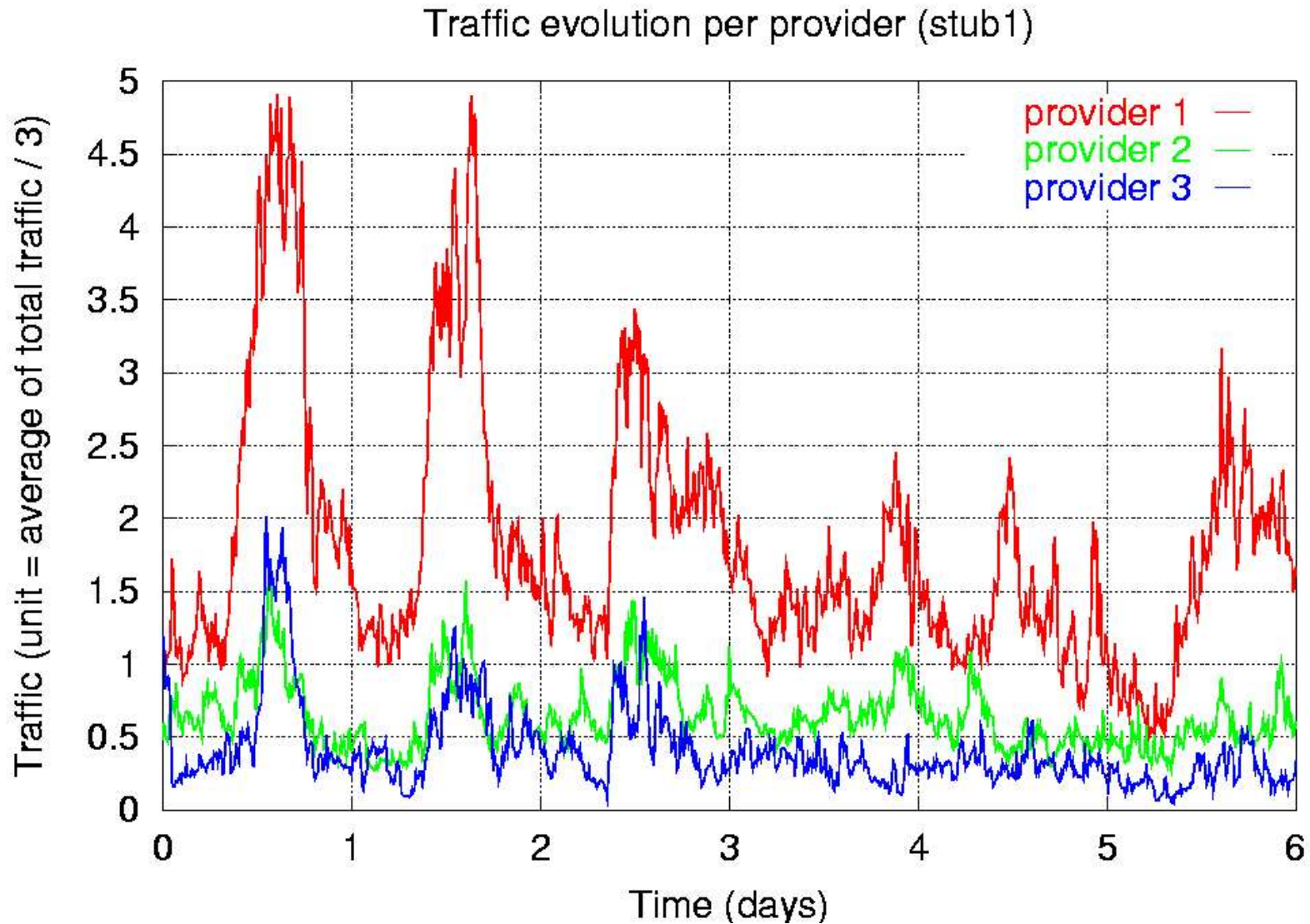
Problem statement

- **Objective 1** : minimize changes to be performed to best route BGP choice
- **Objective 2** : optimize objective function defined on traffic sent to BGP neighbors (or next hop)
- **Objective 3** : deal with objectives 1 and 2 in near real-time (a few minutes)

Main issues

- **Optimizing both traffic distribution and minimizing burden on BGP is NP-hard**
- **Tracking traffic over small timescales**
- **Uneven traffic distribution among neighbors found by BGP (tie-breaking)**

BGP as a poor traffic-balancer



BGP decision process of stubs

BGP decision process

1. highest local-pref
2. shortest AS path
3. lowest origin type
4. lowest MED
5. eBGP over iBGP
6. lowest IGP cost
7. lowest router-id



prefer peers over providers



Internet is shallow



not set

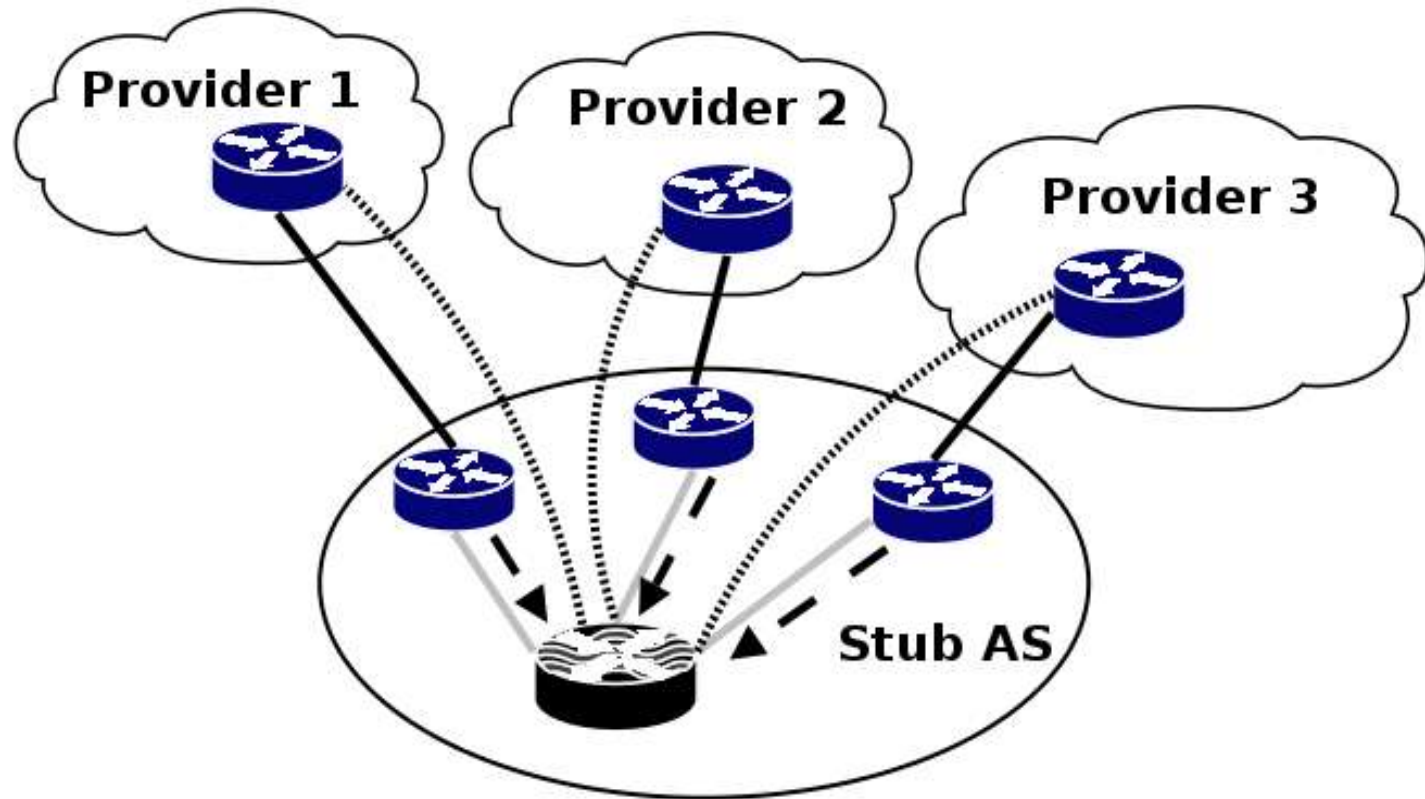
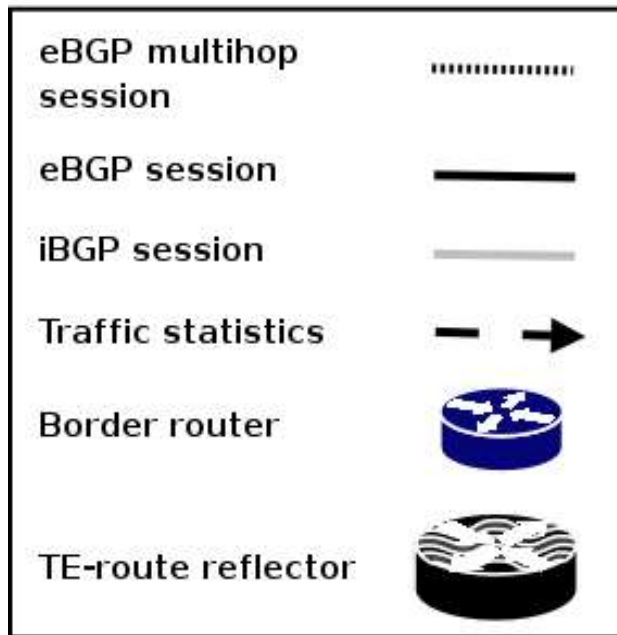


what's IGP ?



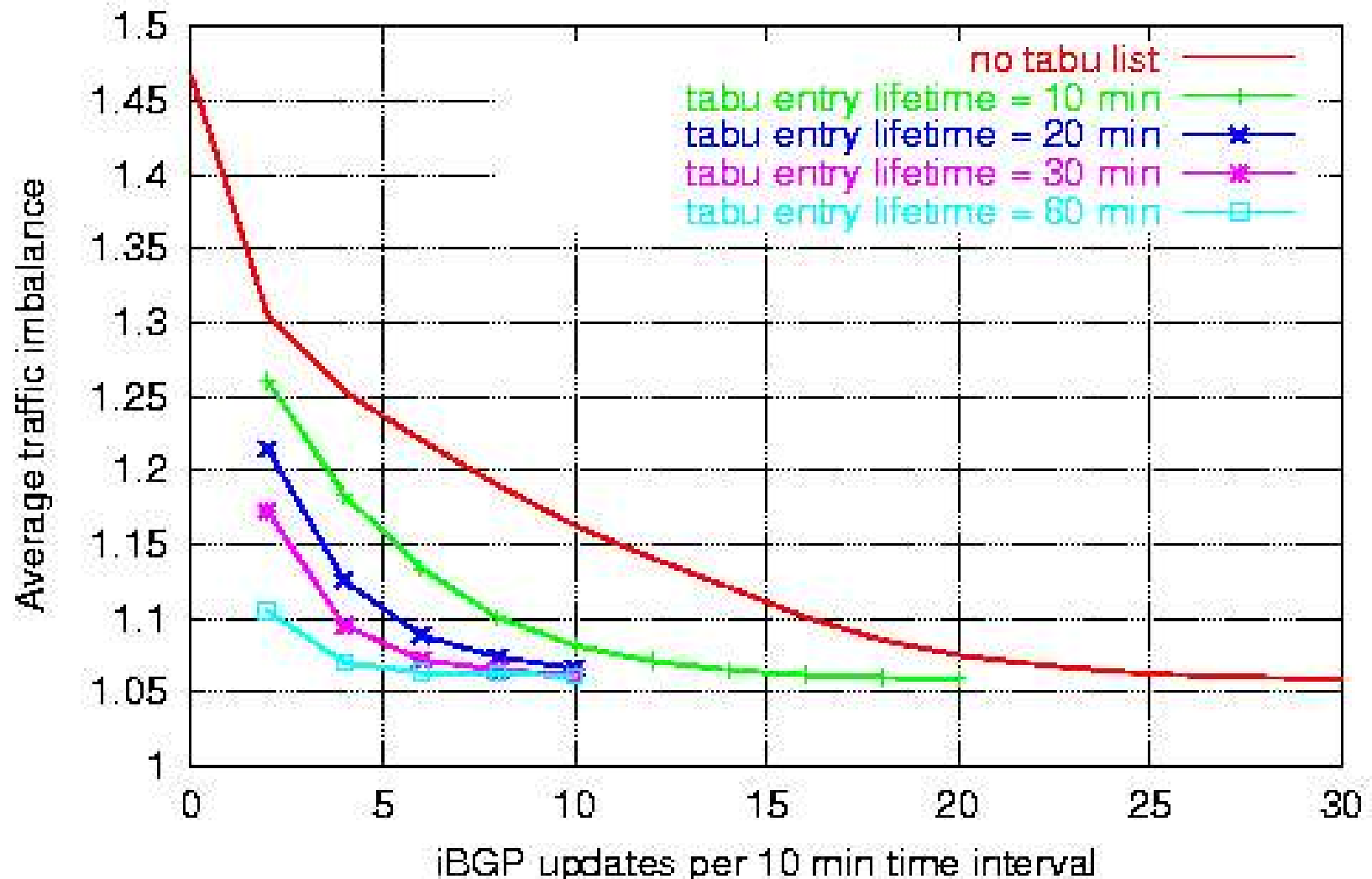
deterministic

Solution for stubs



Simulation results

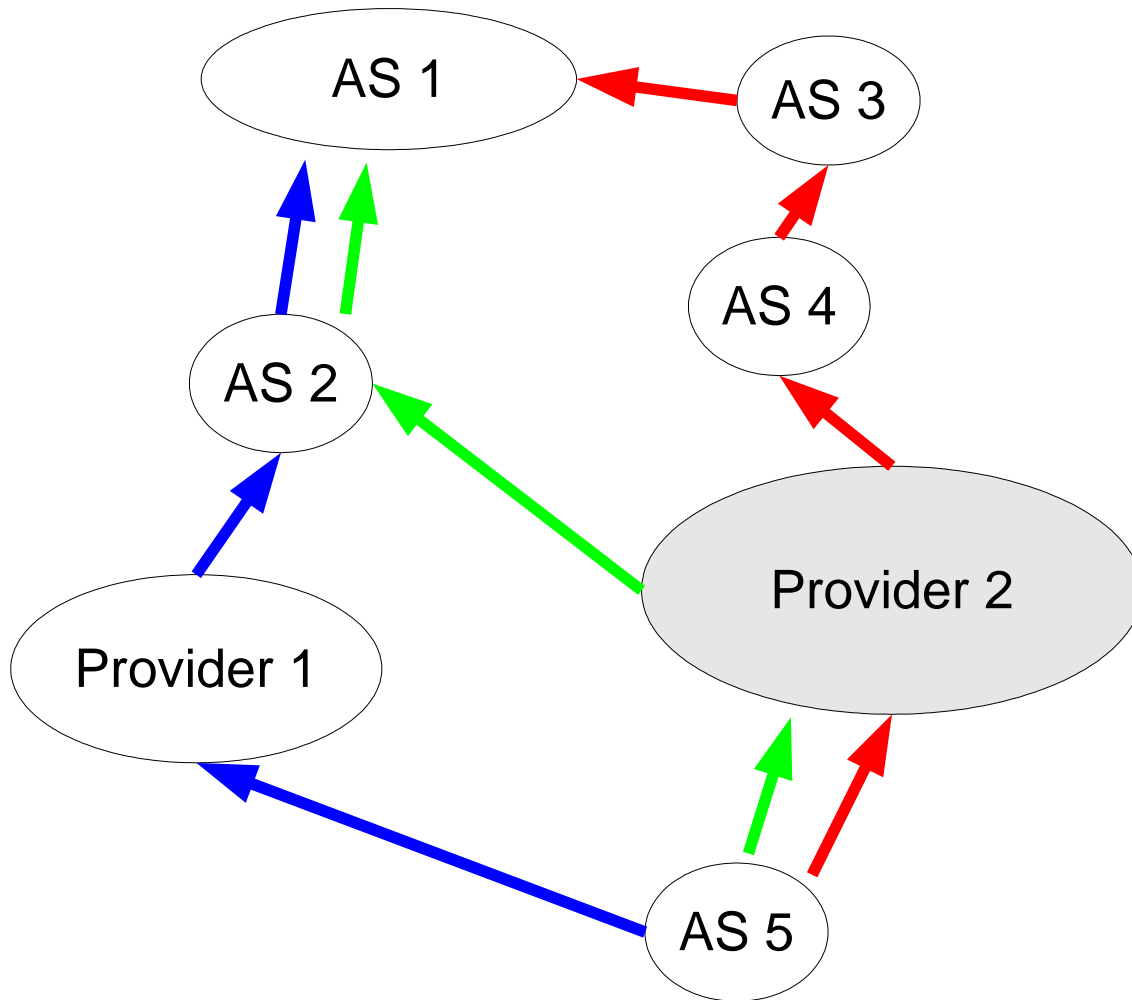
Performance of tabu list method (stub2)





Open issues

- **Global impact of systematic interdomain TE by stubs :**
 - **interaction between outbound and inbound traffic ?**
 - **impact on transit ASes traffic matrix ?**
 - **perverse effects on BGP ?**
- **Is systematic interdomain TE desirable at all ?**

Transit ASes



best route for AS 5 before tweaking	
best route for AS 5 after tweaking	
expected best route by provider 2	