Multi-Homing

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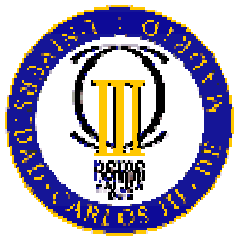
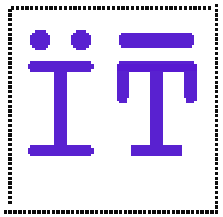
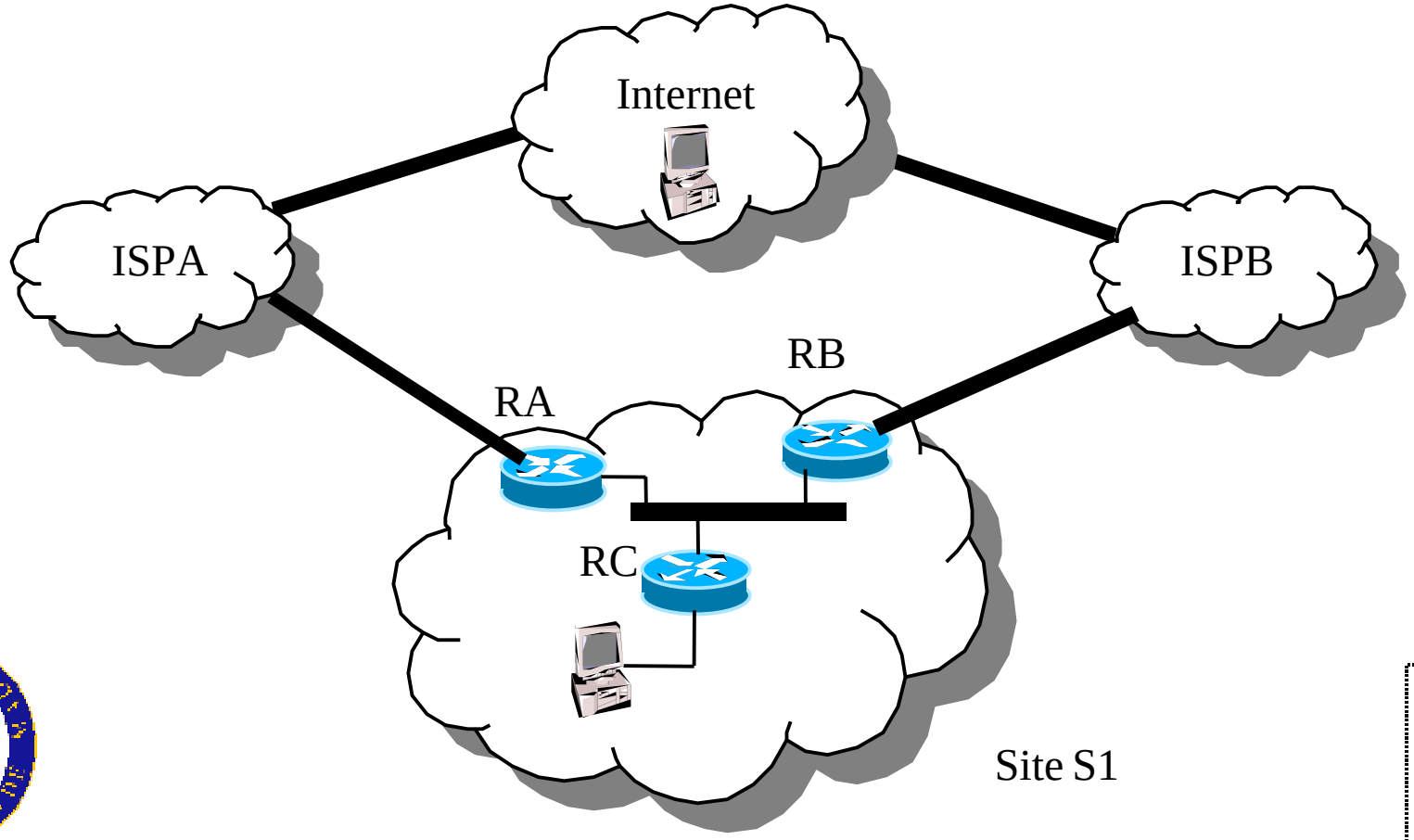




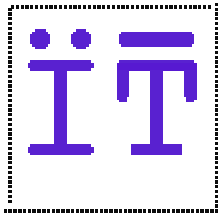
What is site multi-homing?

A site is multi-homed when it connects to more than one IP service provider.

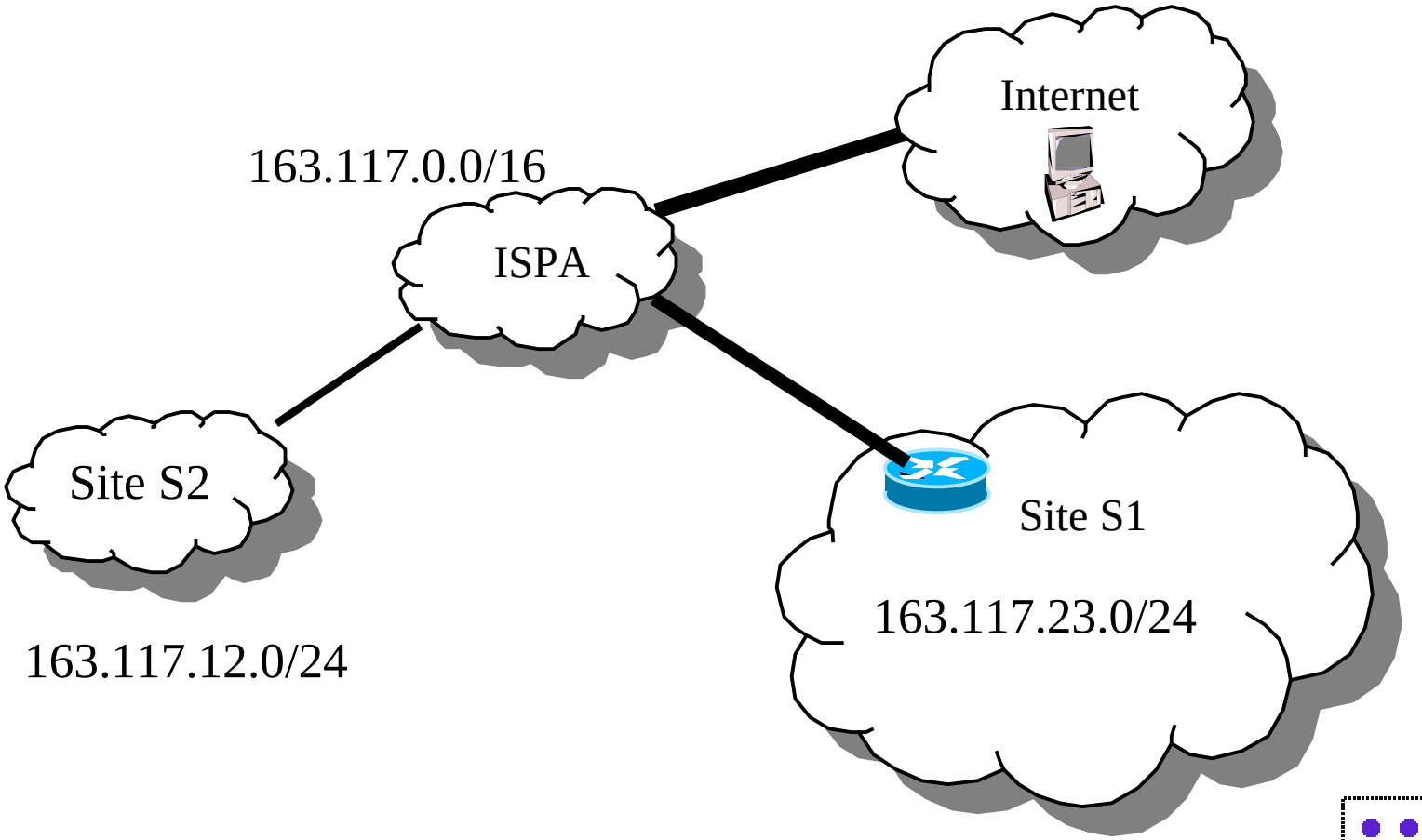


Motivations for multi-homing from multi6

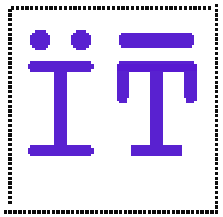
- Redundancy
  - Physical/logical link failure
  - Routing failure
  - Provider failure
- Load sharing/load balance
- Preformance issues such as long term congestion
- Policy



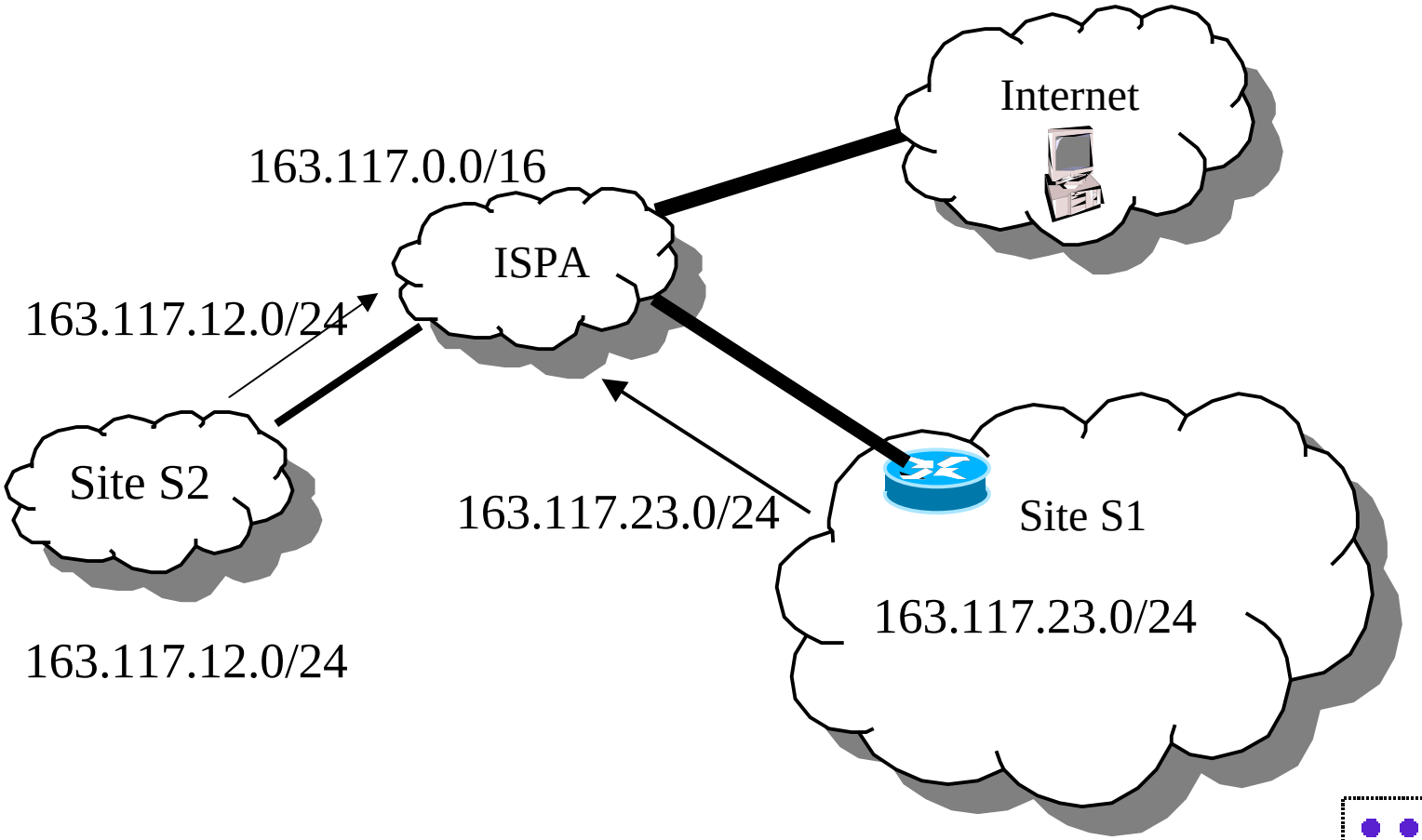
IPv4 multi-homing solutions

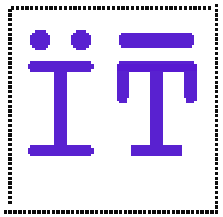


→ BGP routing information



IPv4 multi-homing solutions





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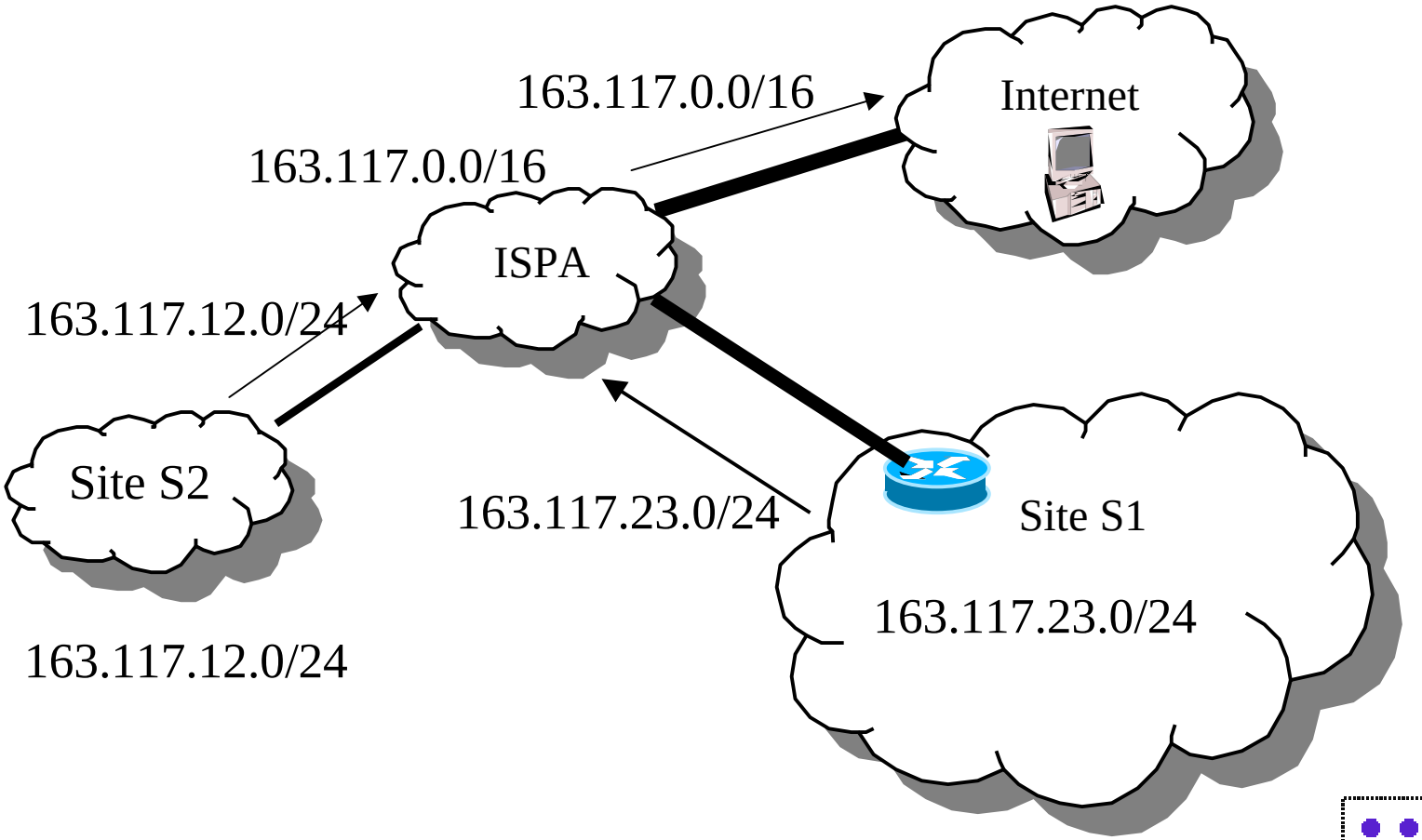
IPv4 multi-homing solutions



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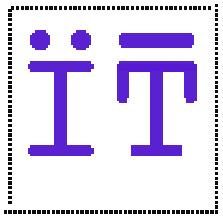
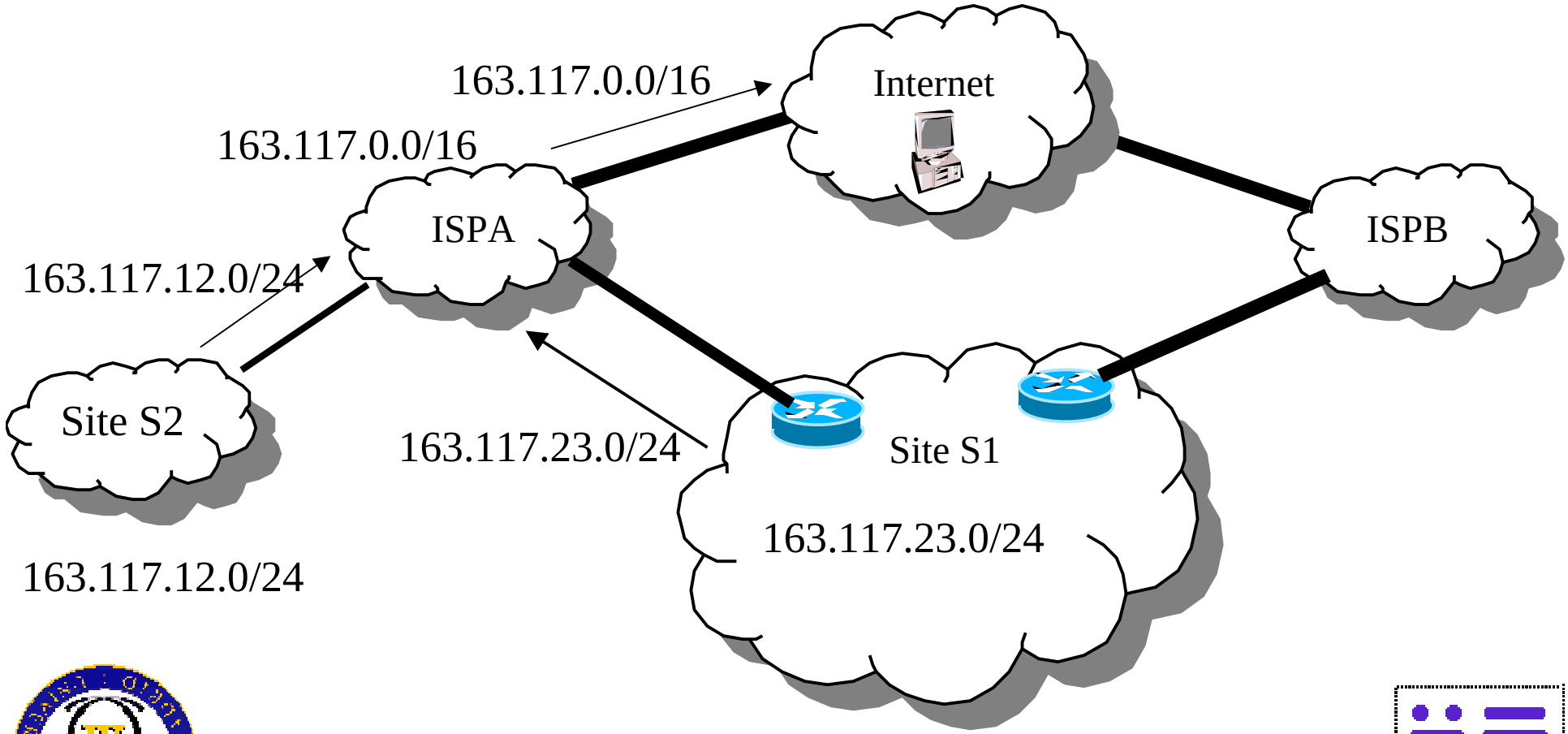
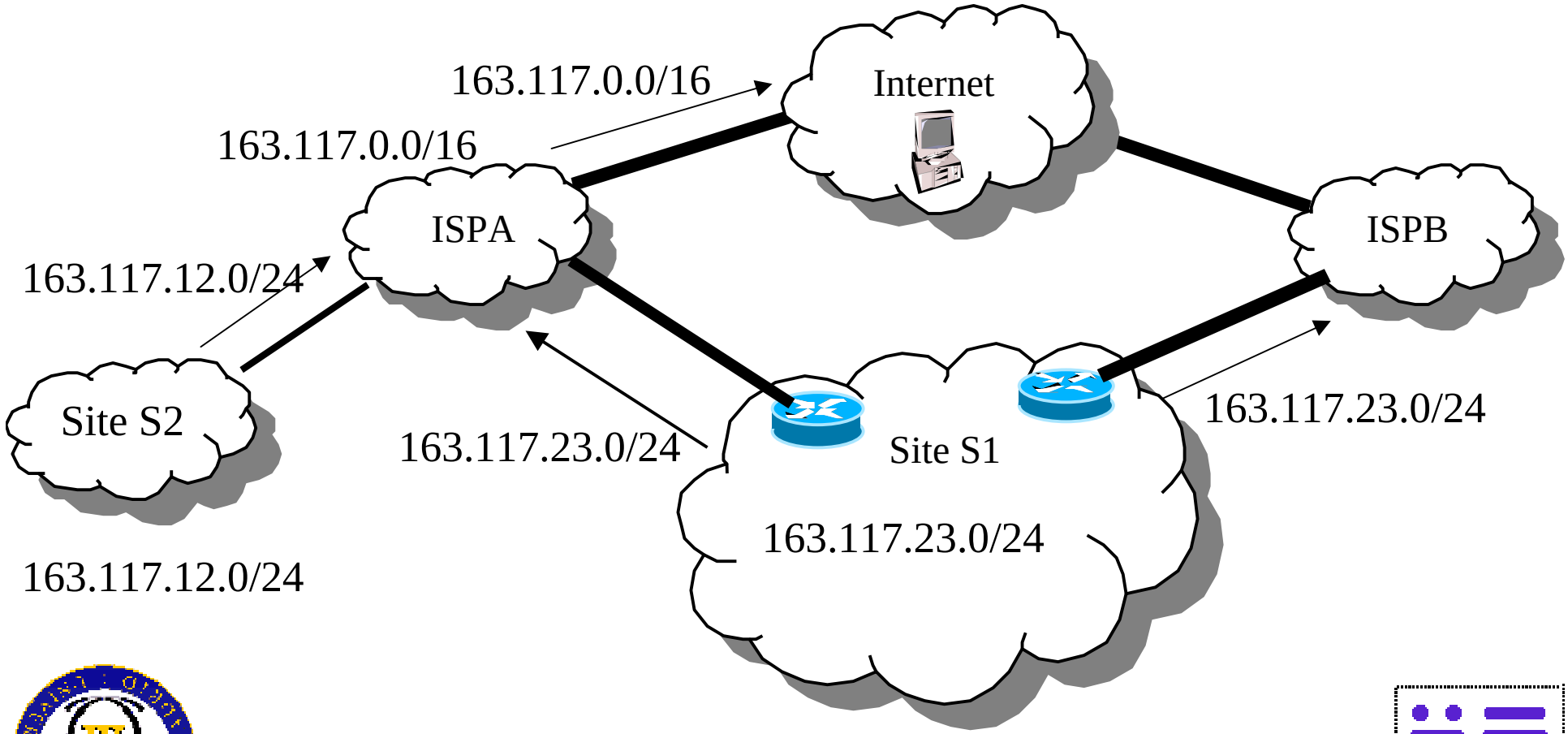


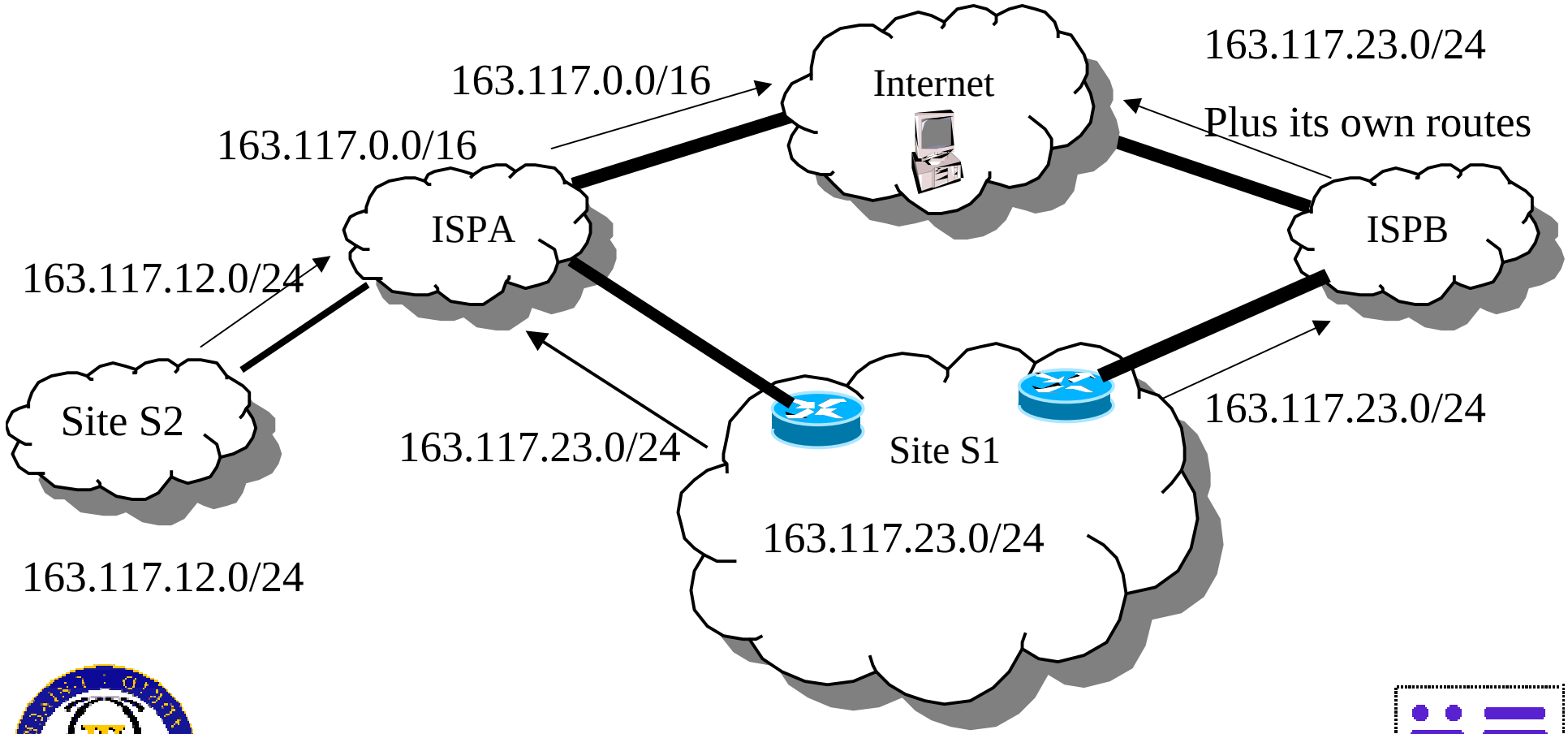
IPv4 multi-homing solutions



IPv4 multi-homing solutions

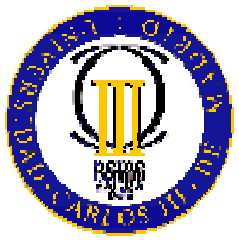


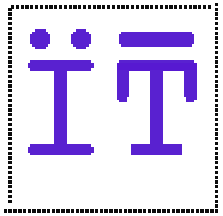
IPv4 multi-homing solutions



Benefits of actual IPv4 multi-homing

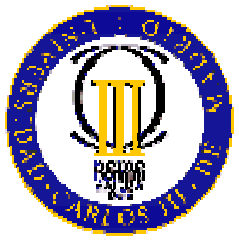
- Simplicity: little more than BGP peer. (depends on the desired features)
- Optimal fault-tolerance:connectivity preserved if there is at least one valid path (including established TCP connections)
- Traffic-engineering based on advertised routes and BGP atributes

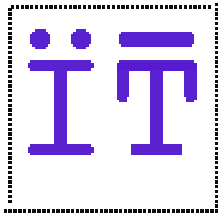




Limitations of IPv4 multi-homing

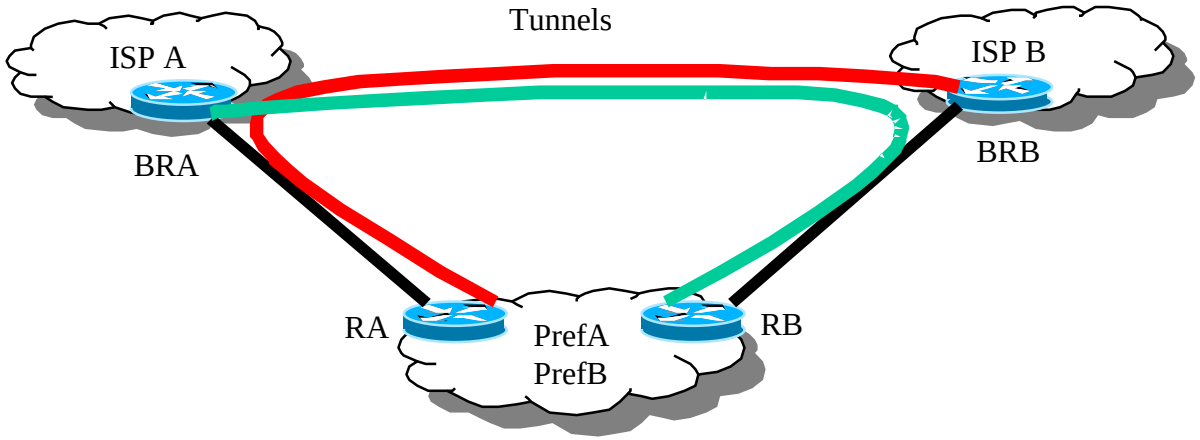
- Routing system scalability: major contributor to BGP routing table size explosion
- Routing table size is precluding fault-tolerance feautures since route withdrawal can take several minutes
- “Tragedy of the commons”

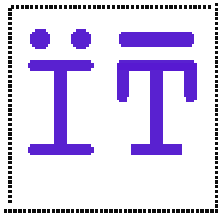




Others IPv4 multi-homing solutions

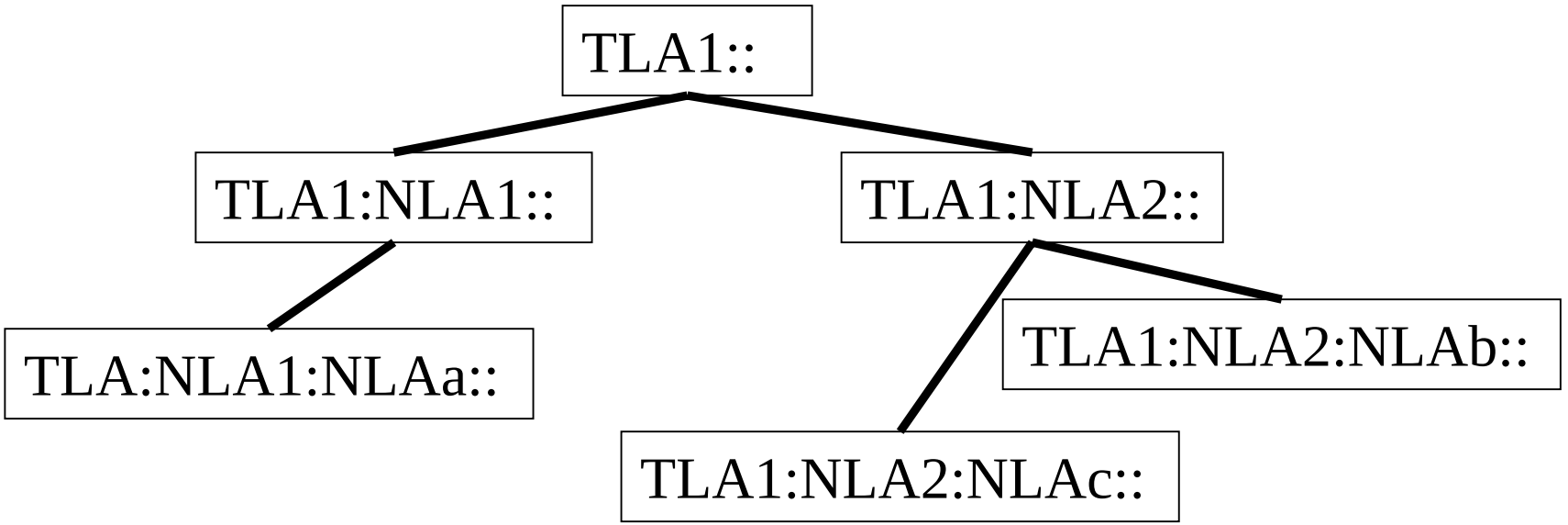
- RFC 2260
  - Limited route injection: route information is only injected in case of failure
  - Tunnels

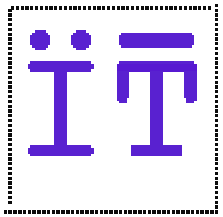




Multi-homing: IPv6 constraints

- Provider based aggregation





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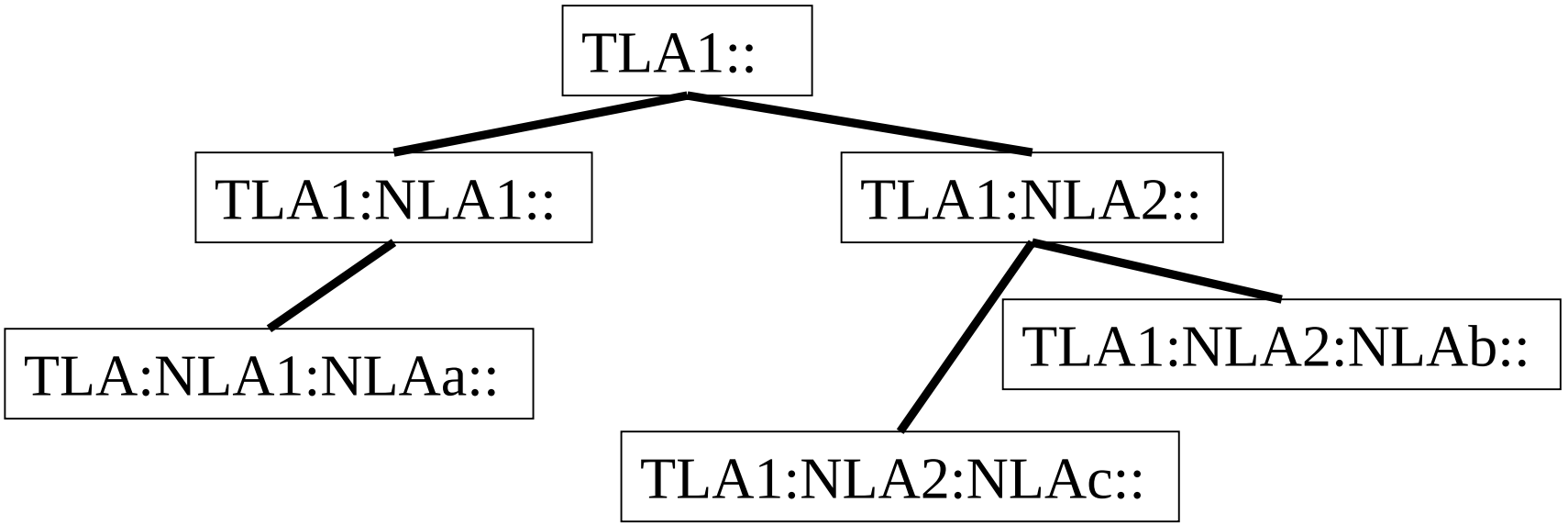
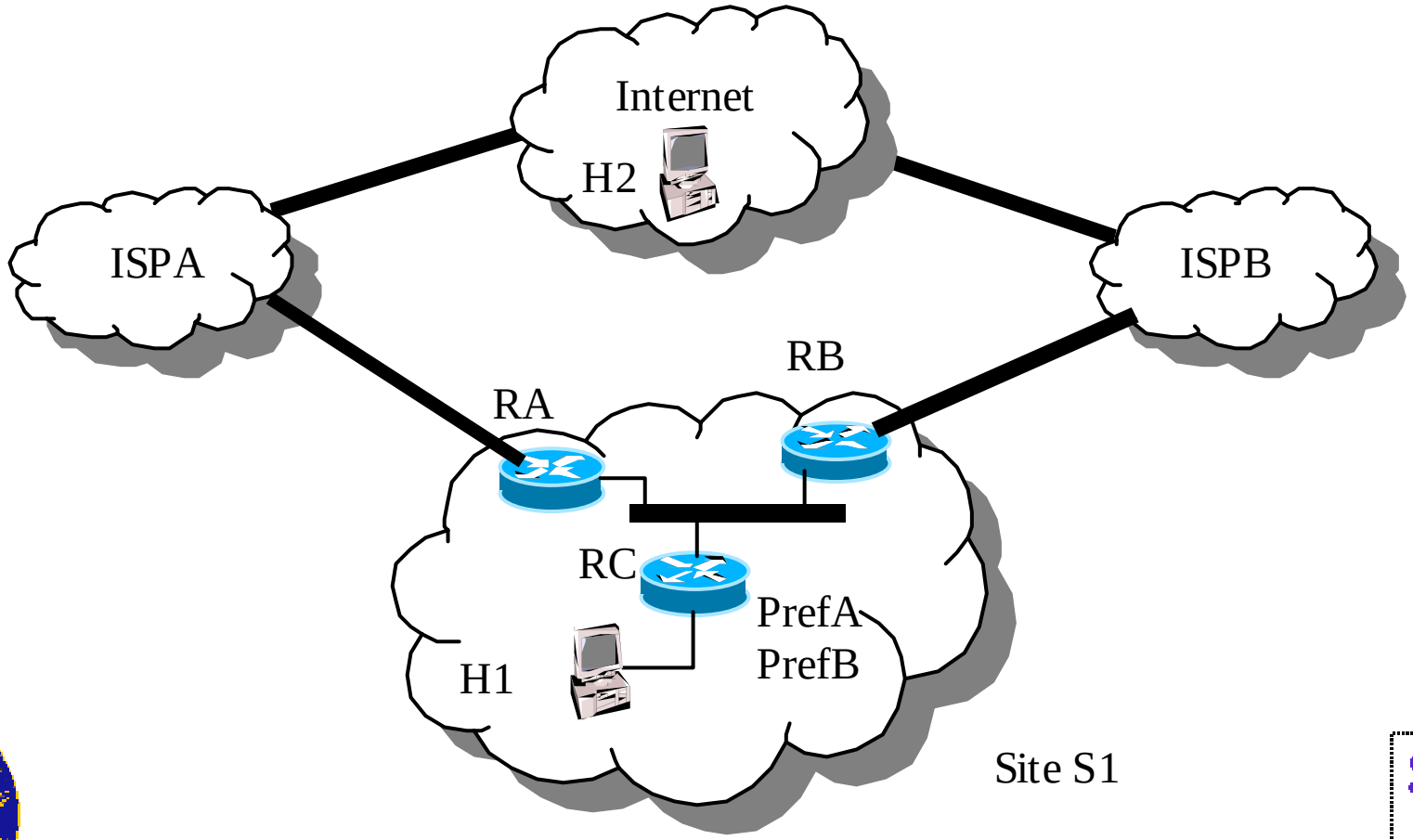


- Preservation of routing system scalability
  - –Prevents route injection over the DFZ
  - –Precludes currently deployed IPv4 solutions

IPv6 multi-homing scenario

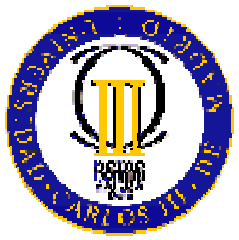


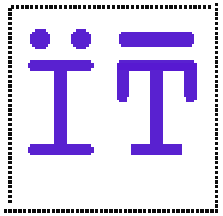
IPv6 site-multihoming requierements

by multi6 (Work in progress)

- IPv4 multi-homing capbalities MUST be supported

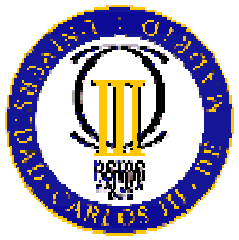
  i.e. Redundancy, Load-sharing, Preformance, Policy, Simplicity, Transport-layer Survivability
- Scalability: must accomodate orders of magnitude more multi-homed sites
- Minor/parallel stack changes on hosts and routers
- No cooperation between different ISPs

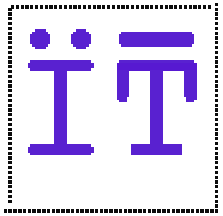




Available IPv6 multi-homing solution

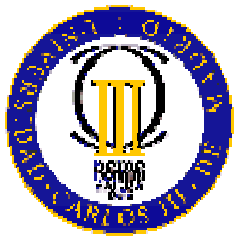
- Tunnels: Based on RFC 2260
- Major limitation:
  - Limited fault tolerance.
- Does not provide tools to achive other goals such as load-sharing, policying, performance.

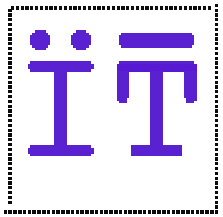




Current status

- Several personal submited solutions will be discussed





References

- J. Abley, B. Black, V. Gill, “IPv4 Multihoming Motivation, Practices and Limitations”, Internet-Draft (Work in progress), draft-ietf-multi6-v4-multihoming-00, 2001.
- B. Black, V. Gill, J. Abley, “Requirements for IPv6 Site-Multihoming Architectures” Internet-Draft (Work in progress) draft-ietf-multi6-multihoming-requirements-02, 2001.