

BGP is not safe

- **BGP is not guaranteed to converge on a stable routing. Policy inconsistencies can lead to “livelock” oscillations.**

See “Persistent Route Oscillations in Inter-domain Routing” by K. Varadhan, R. Govindan, and D. Estrin. ISI report, 1996

- **BGP is not guaranteed to recover from network failures.**

“What's it going to take?”

Static analysis of routing policies

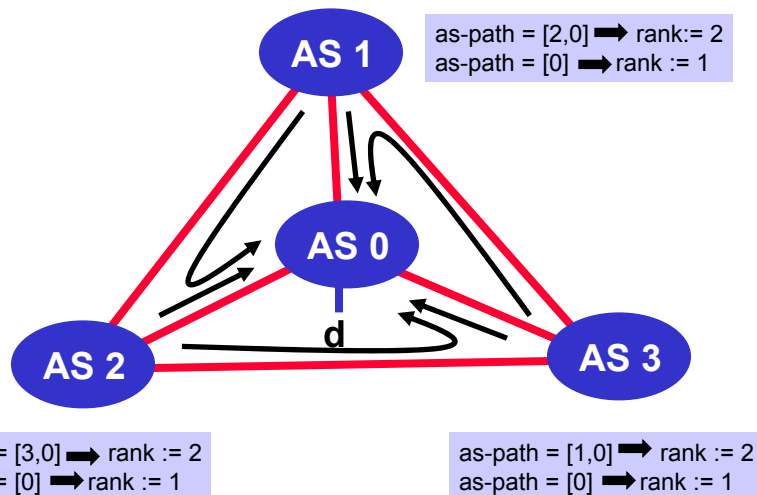
Dynamic detection of policy-induced livelock

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1

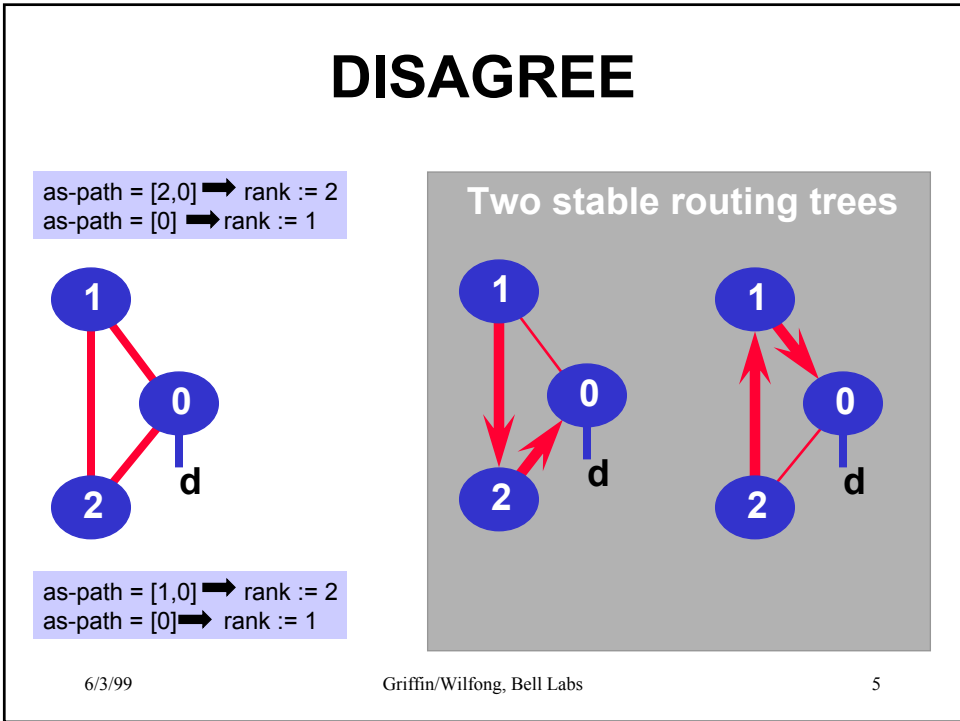
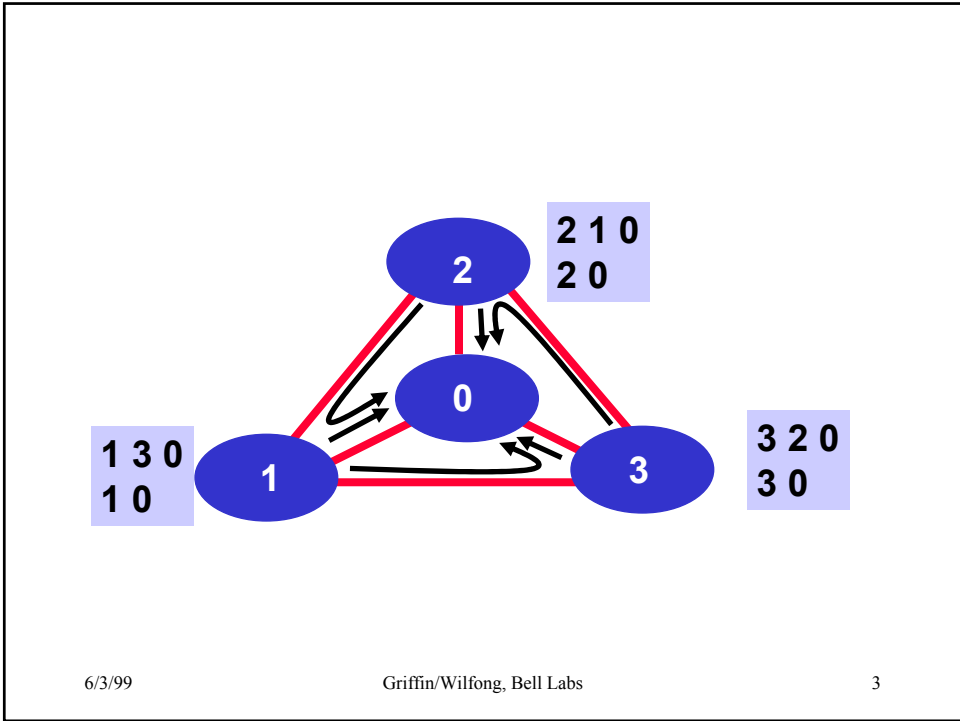
BAD GADGET



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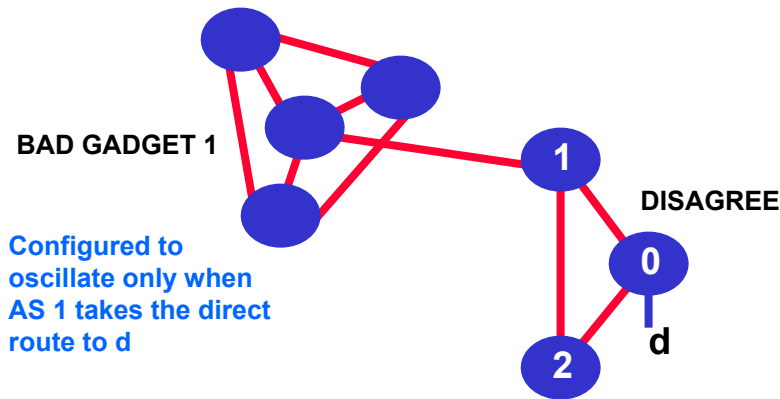
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2



PRECARIOUS

This system has a unique solution, and a “TRAP”



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6

Complexity Results

- **REACHABILITY** : “Can AS v obtain a route to destination d originated by AS w ?”
[NP-complete]
- **ASYMMETRY** : “Does there exist a routing in which the path from AS w to AS v is not the reverse of the path from AS v to AS w ?”
[NP-complete]
- **SINGLE DESTINATION SOLVABILITY** : “Given a BGP system, having a single destination, does it have a stable routing tree?”
[NP-complete]
- ...

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7