

Visualizing TCP/IP Network Flows to Control Congestion and Bottlenecks

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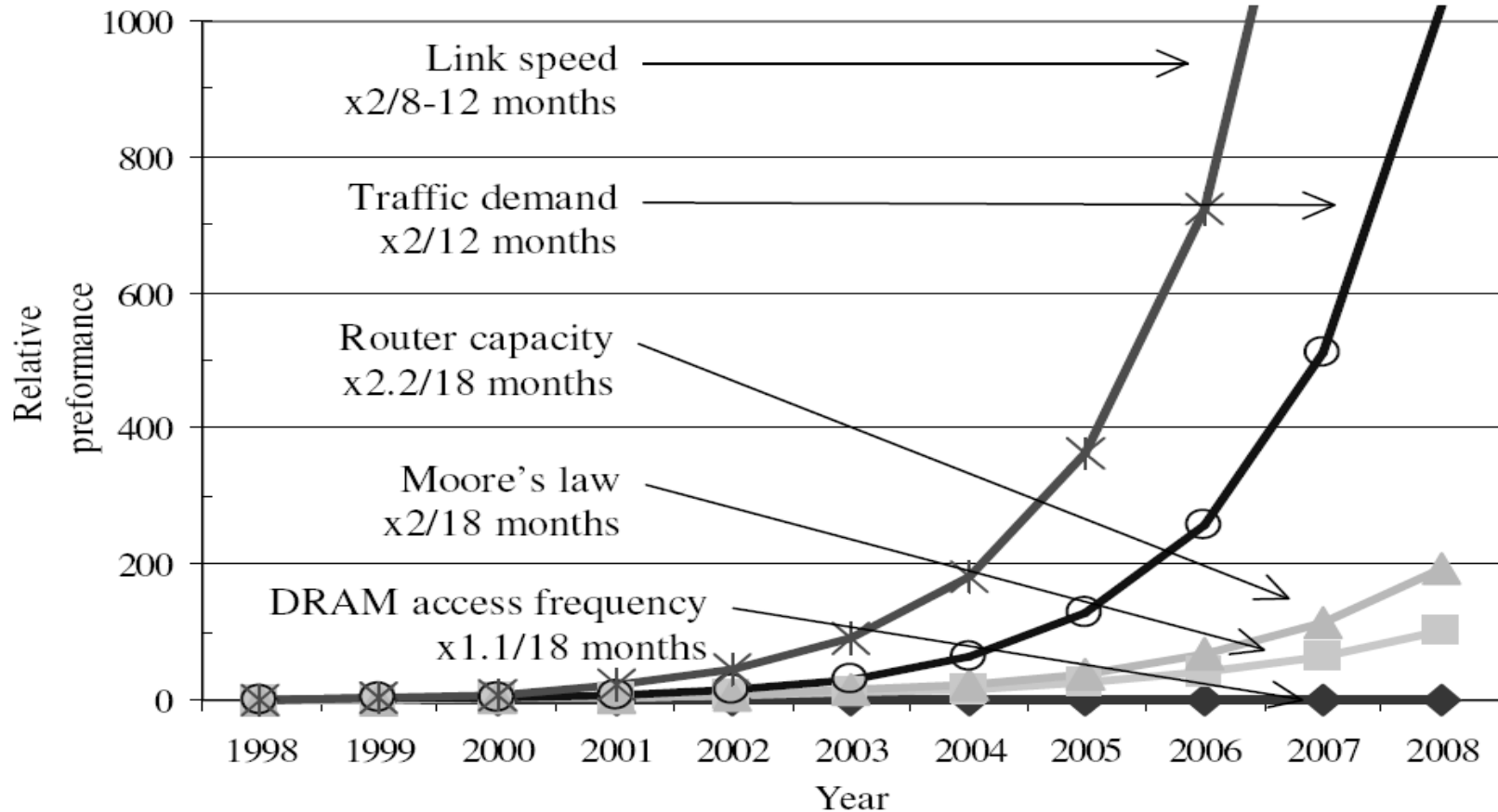
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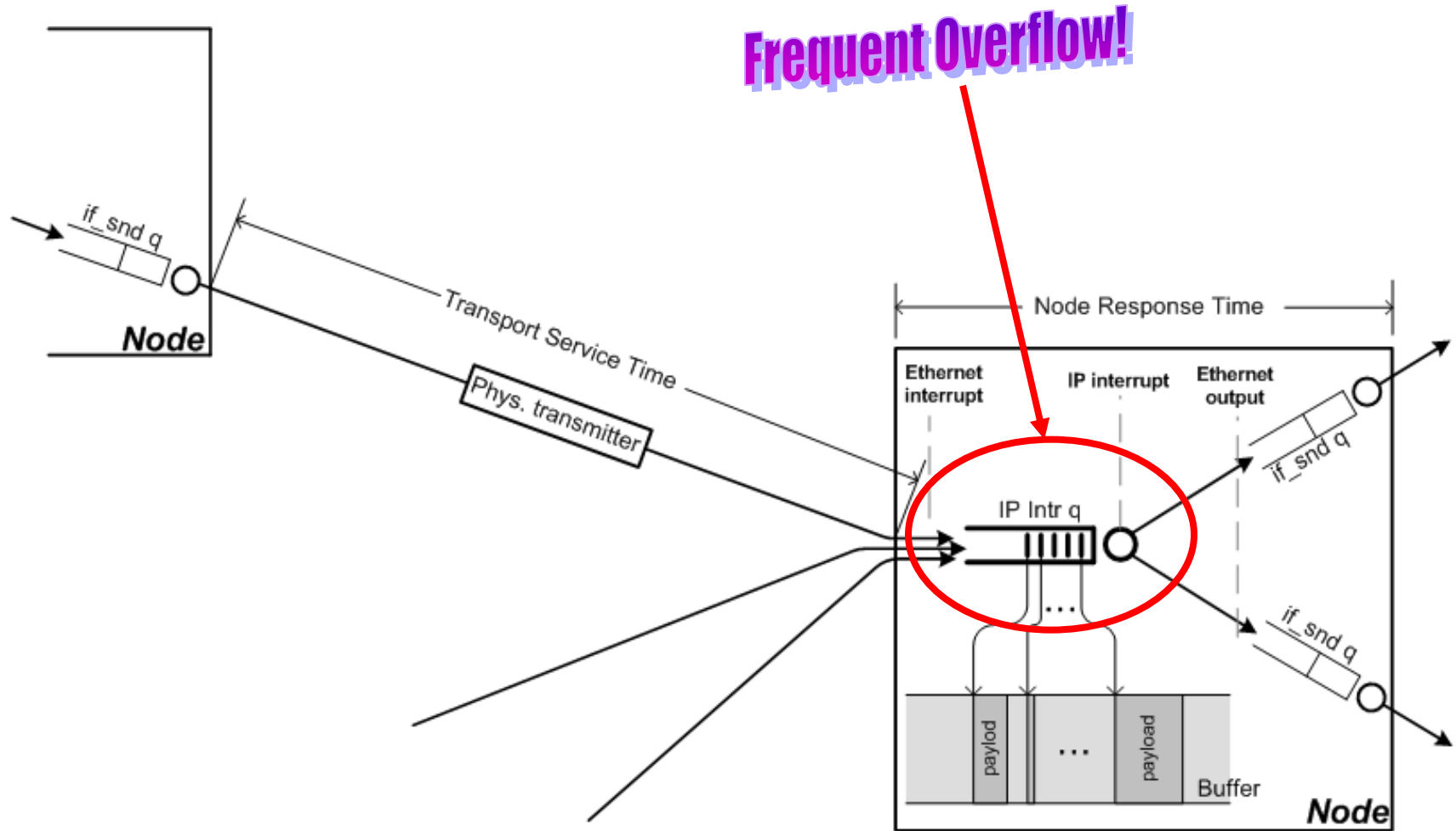
Internet Technological Trends and Bottlenecks



(courtesy to "Pablo Molinero-Fernández, "Circuit Switching in the Internet", PhD thesis, 2004)

Bottlenecks: memory IO, CPU rate on routers and switches ("nodes")

Internet Technological Trends and Bottlenecks (cont.)



i.e. a BSD node, its single IP interrupt queue may suffer from frequent overflow by bursty packet arrivals.

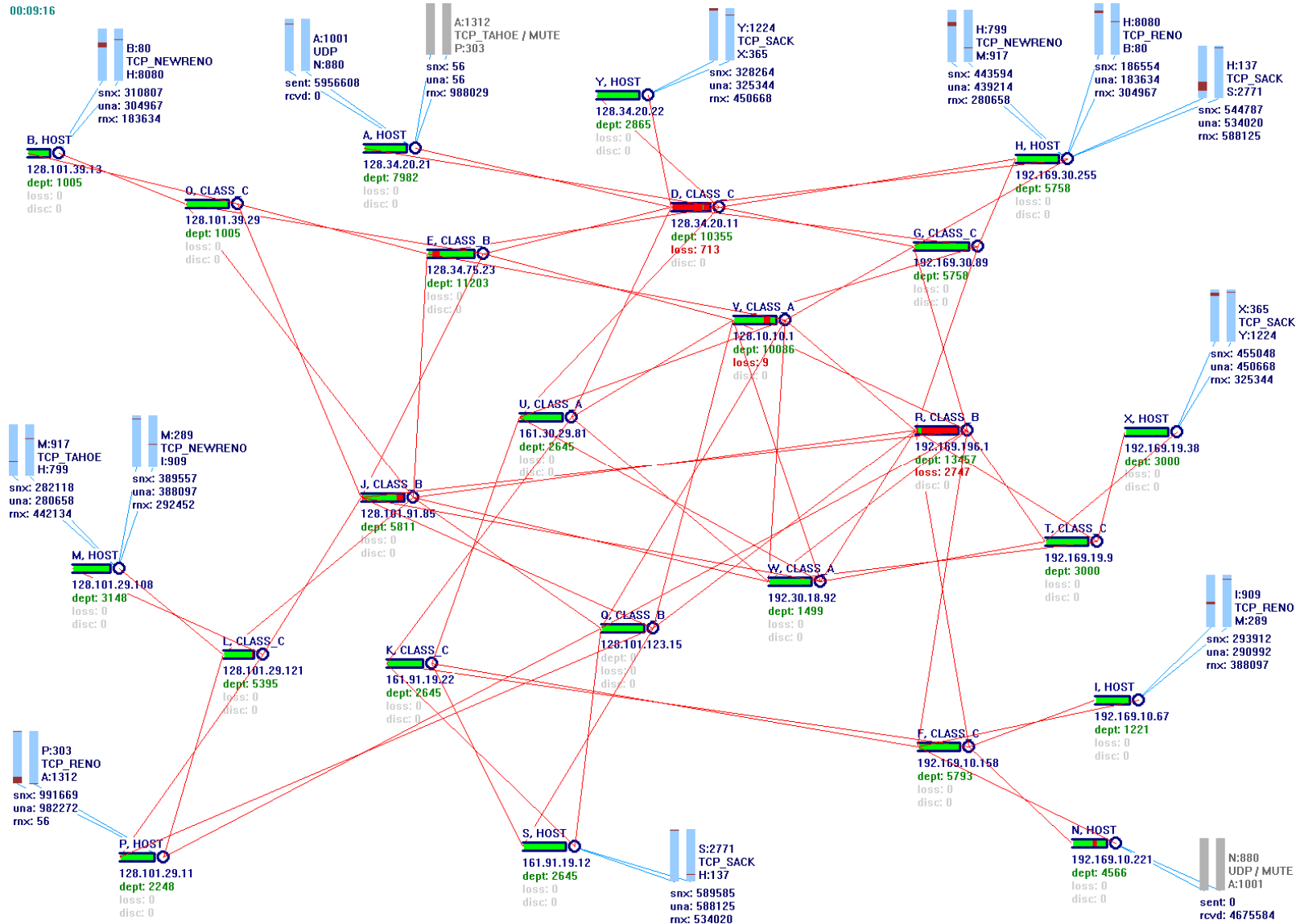
Visualization of Internet

Visualization IP-based Network Simulation (VINS) is designed and developed as a “Node Oriented” network simulator.

- 1) IP Networking
- 2) Socket Hosting and Interfacing
- 3) Node Models (packet service time, queue scheduling etc.)
- 4) Visualization for Flows and Control Variables

Visualization of Internet (cont. i)

Scenario example :



Visualization of Internet (cont. ii)

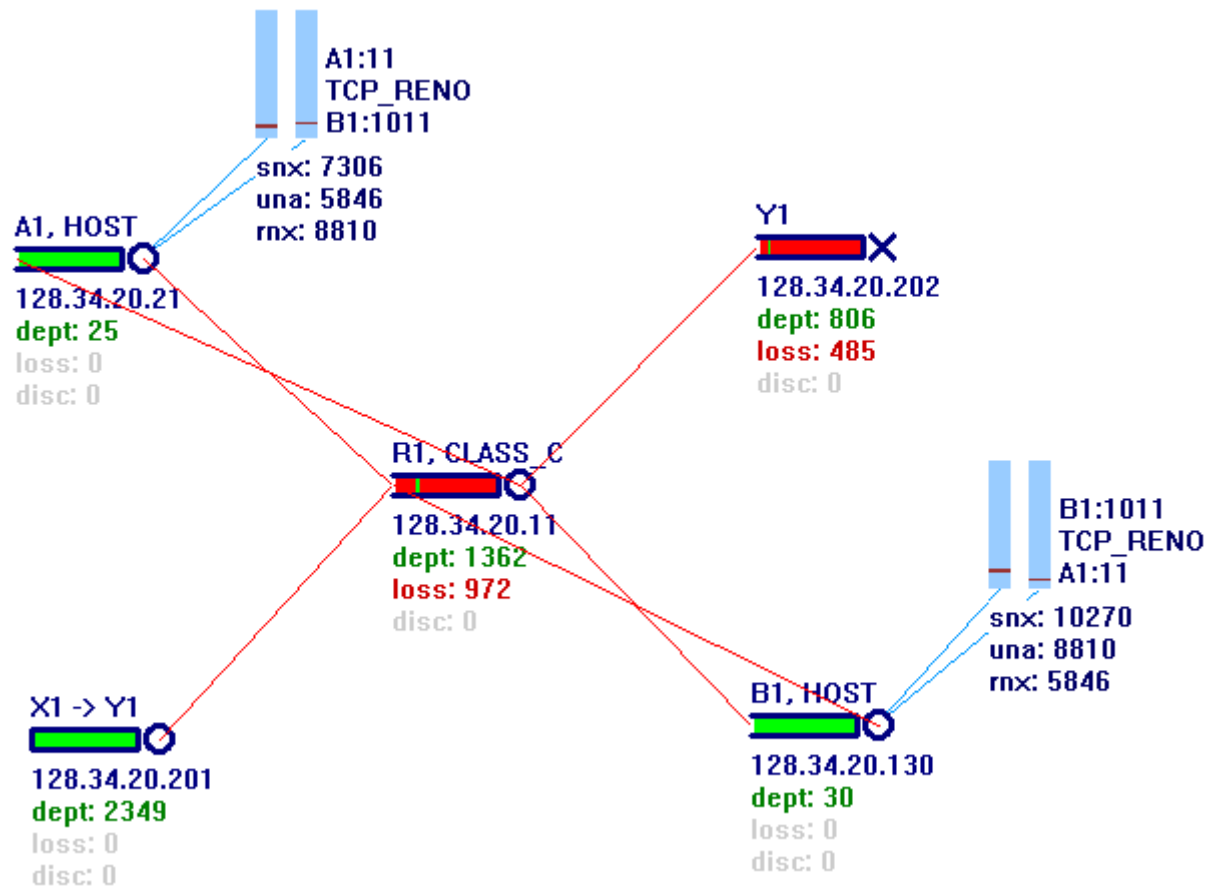
Flow level report example, highlighting asymmetric paths:

Table 1. Routes and Protocols of Streams in Scenario 1

Src.	Route	Dest.	Reachability	Proto	Mode
M:917	M->L->J->R->G->H	H:799	True	TAHOE	TALK
H:799	H->G->R->J->L->M	M:917	True	NEWRENO	TALK
B:80	B->O->E->V->R->G->H	H:8080	True	NEWRENO	TALK
H:8080	H->G->R->J->O->B	B:80	True	RENO	TALK
M:289	M->L->J->R->F->I	I:909	True	NEWRENO	TALK
I:909	I->F->R->J->L->M	M:289	True	RENO	TALK
A:1312	A->D->E->J->L->P	P:303	True	TAHOE	MUTE
P:303	P->L->J->E->D->A	A:1312	True	RENO	TALK
S:2771	S->K->U->W->R->G->H	H:137	True	SACK	TALK
H:137	H->G->R->V->U->K->S	S:2771	True	SACK	TALK
A:1001	A->D->E->V->R->F->N	N:880	True	UDP	TALK
N:880	N->F->R->V->E->D->A	A:1001	True	UDP	MUTE
X:365	X->T->R->V->E->D->Y	Y:1224	True	SACK	TALK
Y:1224	Y->D->E->V->R->T->X	X:365	True	SACK	TALK

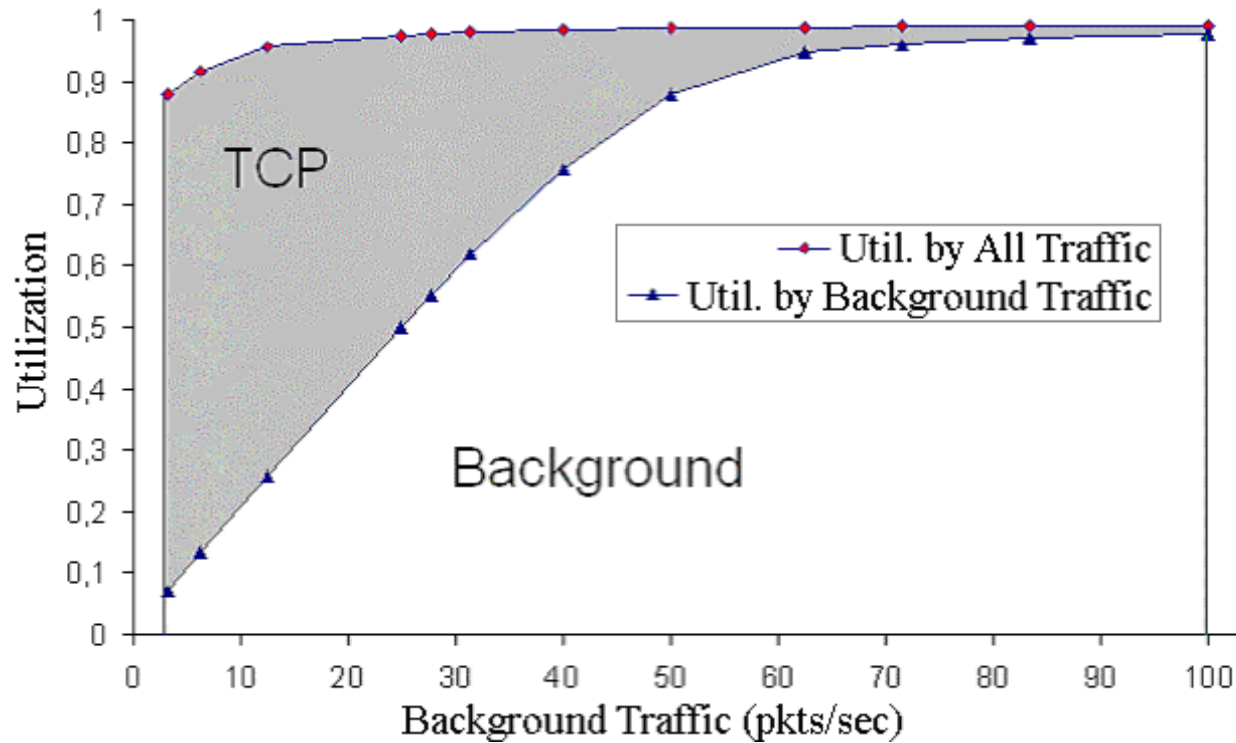
TCP Performance Evaluation

Our method: tune background traffic rate from X1 to Y1, instead of drop and delay packet on link:



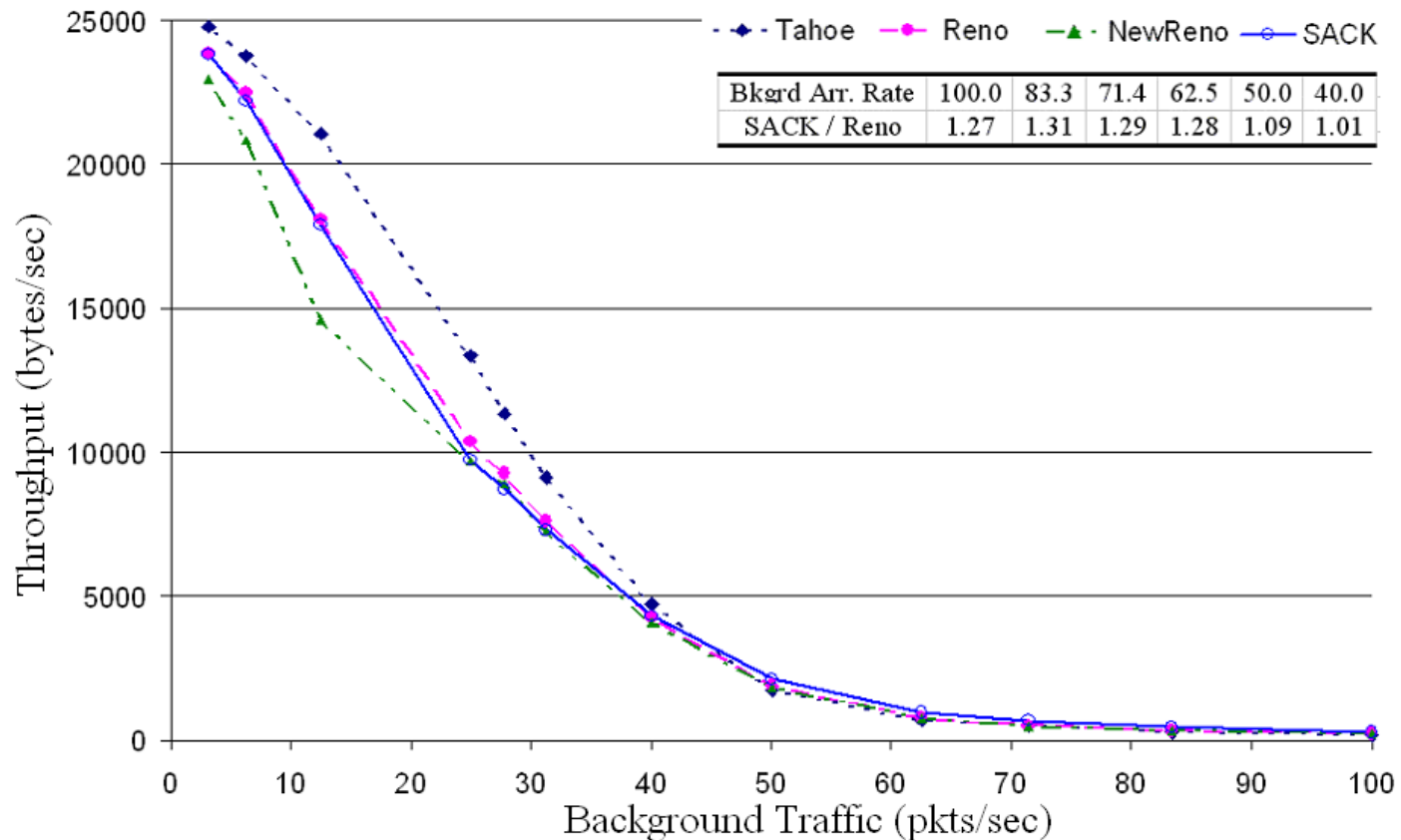
TCP Performance Evaluation (cont. i)

Utilization of node R1 (router):



TCP Performance Evaluation (cont. ii)

Throughput Comparison amongst Tahoe, Reno, NewReno and SACK



Experimental tests shows SACK/Reno ranges between 1.0 and 1.4 (R. Bruyero et al)

Conclusion and Future Work

- Node service rate and its PDF can drastically impact on overall performance of a network.
- Employing different evaluation methods, TCP performance ranking can be different.

We are working on a contention-congestion coexisting network simulator supporting various Ad hoc protocols to find a way accommodating TCP in a large-scale wireless mesh network.

Thanks!