Effect of Number of Drop Precedences in Assured Forwarding

draft-goyal-diffserv-dpstdy-01.txt

Mukul Goyal, Padmini Misra, Raj Jain

The Ohio State University

Columbus, OH 43210-1277

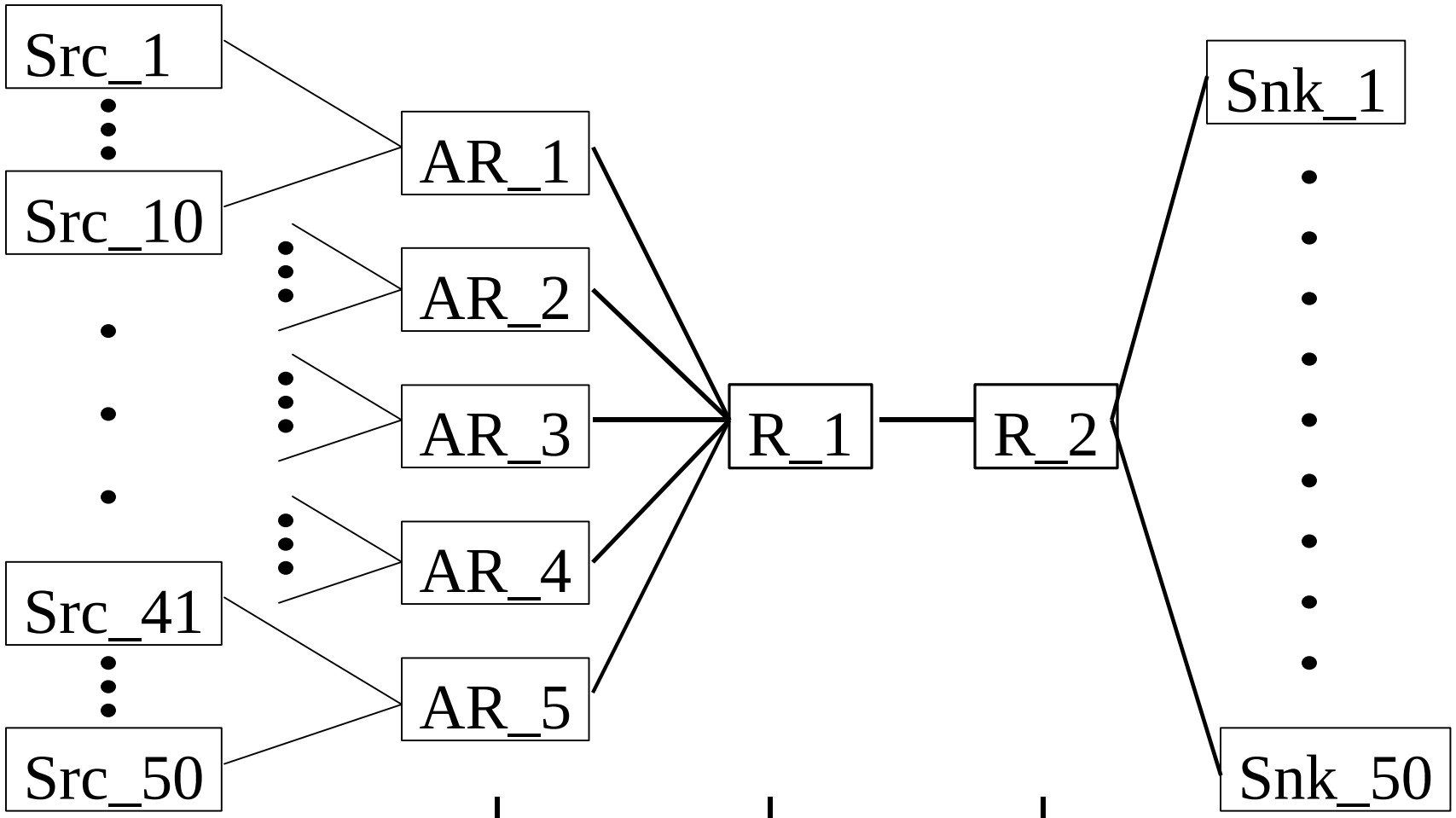
Jain@cis.ohio-state.edu

These slides, ID, and a paper are available on-line at

http://www.cis.ohio-state.edu/~jain/ietf/dpstdy.htm

- Simulation Configuration
- Single Rate and Two Rate Marking Methods
- Results

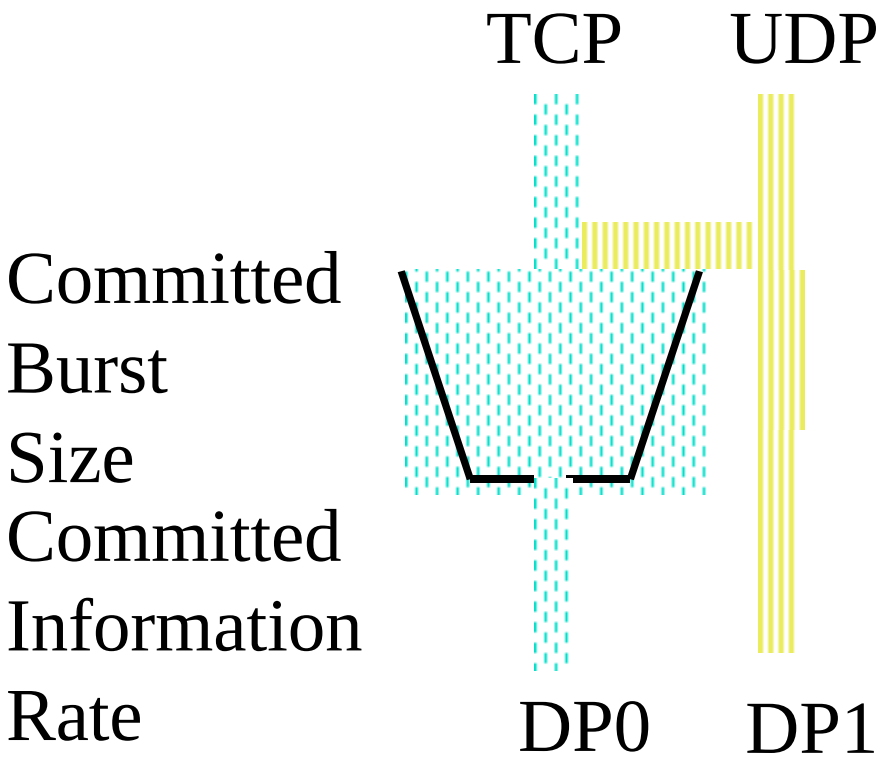
Simulation Configuration



Link Parameters

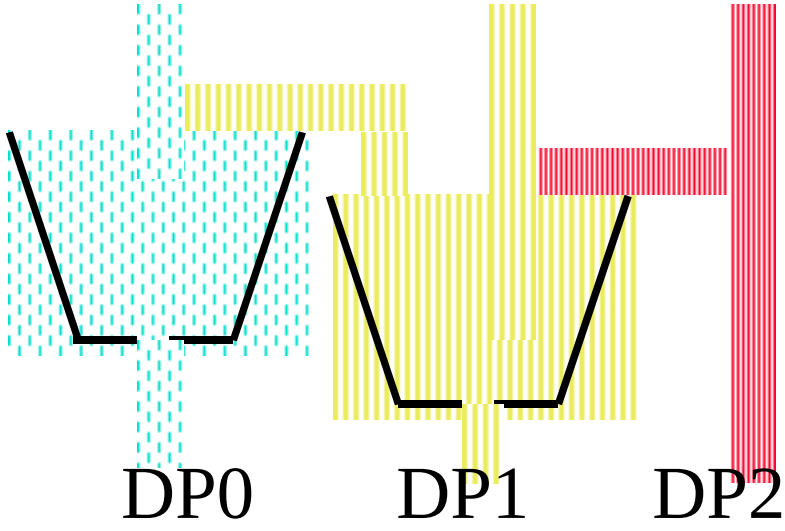
	Link B/W	Link Delay	Drop Policy
Between Src_i & AR_i	10 Mbps	1 μs	DropTail
From AR_i to R_1	1.5 Mbps	5 μs	DropTail w marker
From R_1 to AR_i	1.5 Mbps	5 μs	DropTail
From R_1 to R_2	1.5 Mbps	30 ms	RED_n
From R_2 to R_1	1.5 Mbps	30 ms	DropTail
Between R_2 & Snk_i	1.5 Mbps	5 μs	DropTail

Two Drop Precedences



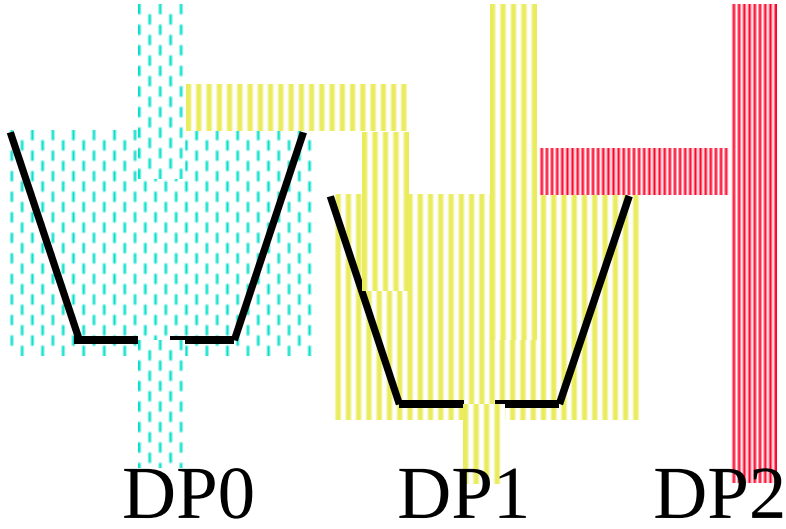
- All UDP packets are marked DP1
- TCP packets up to CIR are marked DP0
- Overflowed TCP packets are marked DP1

3 DPs: Single-Rate Marking



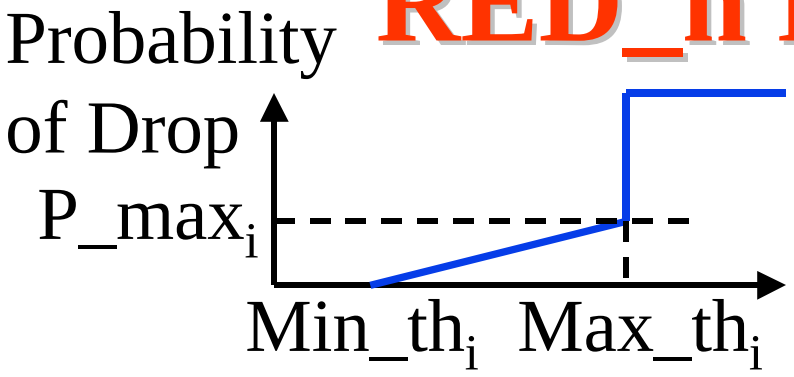
- Tokens generated at "Token Generation Rate" (TGR)
  Tokens go to DP0 bucket, if DP0 full go to DP1 bucket
- Parameters: TGR, DP0 Bucket Size, DP1 Bucket size
- Color Aware ⇒ Excess packets overflow to next DP
  We analyzed color-aware only.

3 DPs: Two-Rate Marking



- Tokens in DP0, DP1 buckets generated independently.
- Parameters: TGR0, TGR1, DP0 Bucket Size, DP1 Bucket Size
- Color Aware ⇒ Excess packets overflow to next DP
  We analyzed colore aware only.

RED_n Parameters



RED_n = Random Early Drop with n drop precedences

Q_n = Packet of prec ≤ n

	No D.P.	2 D.P.	3 D.P.
Min Thresh(dp0)	20	20	20
Max Thresh(dp0)	40	40	40
Min Thresh(dp1)	N/A	20	20
Max Thresh(dp1)	N/A	40	40
Min Thresh(dp2)	N/A	N/A	20
Max Thresh(dp2)	N/A	N/A	40
Drop Prob. (dp0)	1/30	1/30	1/30
Drop Prob. (dp1)	N/A	1/20	1/20
Drop Prob. (dp2)	N/A	N/A	1/10

Single-Rate Marker Parameters

	No D.P.	2 D.P.	D.P.
1: TGR	N/A	192 kbps	192 kbps
2: TGR	N/A	256 kbps	256 kbps
DP0 Bucket Size	N/A	8 kB	4 kB
DP1 Bucket Size	N/A	N/A	4 kB

Two-Rate Marker Parameters

	No DP	2 DP	3 DP
1:TGR0+TGR1 in kbps	N/A	192	64+128
2:TGR0+TGR1 in kbps	N/A	256	128+128
DP0 Bucket Size	N/A	8 kB	4 kB
DP1 Bucket Size	N/A	N/A	4 kB

Results: Single-Rate Marker

UDP Rate Mbps	# of DP's	CIR kbps	Max TCP	Min TCP	Avg TCP	Max UDP	Min UDP	Fair-ness
1.28	No	N/A	0.64	0.05	0.21	299	297	.10
1.28	2	192	26	14	20	124	119	.49
1.28	3	192	25	12	20	123	116	.51
1.28	2	256	27	16	23	98	92	.66
1.28	3	256	26	20	23	99	89	.66

1. W/O DPs, TCP is punished for good behavior
2. Fairness is also poor.
3. Three DPs give the same perf for TCP as two DPs

Results: Single-Rate Marker

UDP Rate kbps	# of DP's	CIR kbps	Max TCP	Min TCP	Avg TCP	Max UDP	Min UDP	Fair ness
128	No	N/A	28	10	21	109	106	.57
128	2	192	32	7	25	75	73	.80
128	3	192	31	14	25	76	74	.79
128	2	256	32	17	28	49	47	.95
128	3	256	33	22	28	49	47	.96

1. TCP rate is controlled by UDP rates
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Results: Two-Rate Marker

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1.28	3	192	24	11	19	135	130	.43
1.28	2	256	26	19	23	98	93	.66
1.28	3	256	26	13	23	95	89	.68

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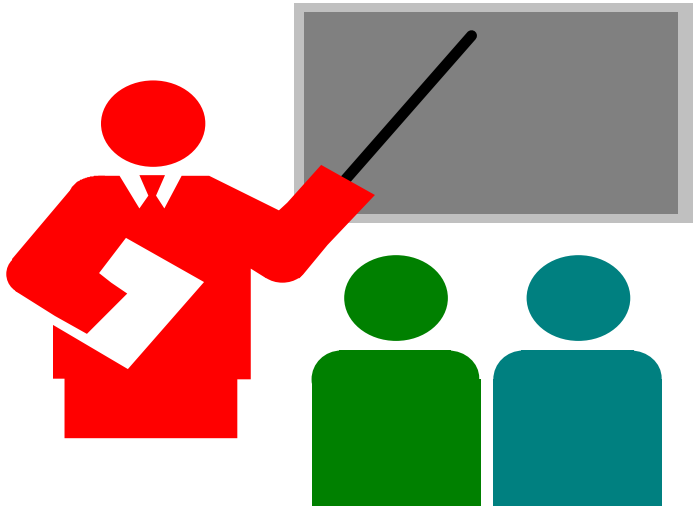
Summary



1. W/O DPs, TCP is punished for good behaviour
2. Fairness is also poor.
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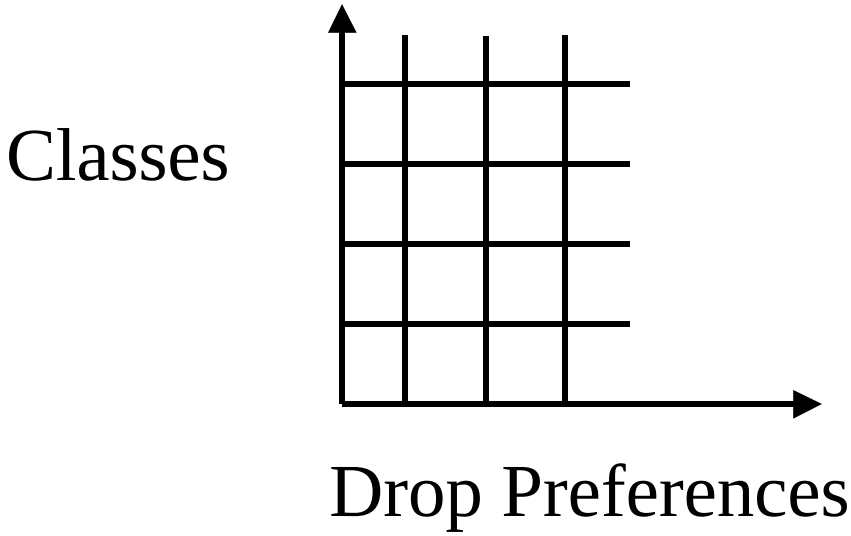
Reason: TCP does not distinguish between loss of packets of different drop precedences

Conclusion



- We have two dimensions of control
  - Classes = Queues
  - Drop Preferences = Right to enter the queue
- Classes ⇒ Directly controls bandwidth allocation

Conclusion (Cont)

- DPs $\Rightarrow$ Controls buffer allocation
  $\Rightarrow$ Indirectly affects bandwidth allocation
  - Depends upon the arrival pattern
    $\Rightarrow$ Random $\Rightarrow$ Not Reliable
- Given a limited number of PHB's, it is better to have more classes than more DPs