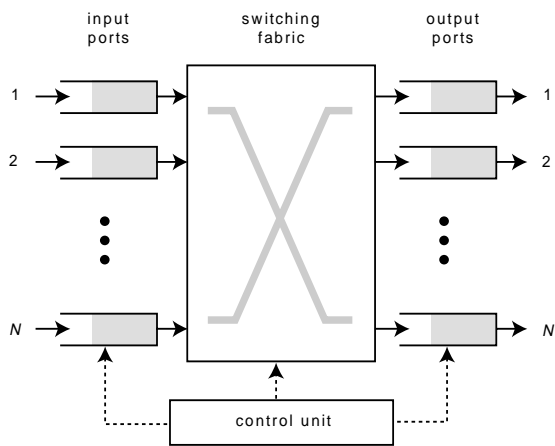


가
(WDM)
(OTDM)
,가
Terabit
가
(MIQ: Multiple Input Queueing) . MIQ
m FIFO
Head-of-Line(HOL) (throughput)
58%
가 (cell)
: , MIQ switch

I.

가
가 ,
(NGI) CA*net3
가
[1],[2]. 1999 'Cyber Korea
21'
가
ATM (back - bone)
가 1998 NTT, JT, KDD, DDI



1.

Giga
Wavelength Division Multi- plexing)
Giga DWDM(Dense

Tera

(WDM)

OTDM(Optical Time Division
Multiplexing) OXC(Optical Cross-
Connect) Terabit /

[3].
가

Line) , OXC, FDL(Fiber Delay

[4].

Terabit

가

(MIQ: Multiple Input-Queued)

. MIQ

m FIFO

FIFO

HOL(Head-of-Line)

(through-put) 58%

(SIQ: Single Input-Queued)

[5]

, MIQ
가 (cell)
,
(1).
II
MIQ
III MIQ
가
IV MIQ 가 가

II. MIQ

가

backplane 가

가

, 가
10G(OC-192) . 1 Tera

가 가 Tera

10G 100

100

Giga

Tera

300 ~ 400

Tera

가

가

가

가

Input-Queued)

(MIQ: Multiple

. MIQ

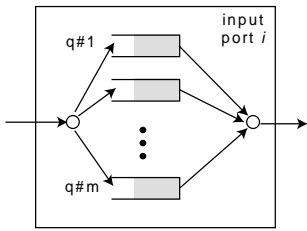
가

, 58.6%

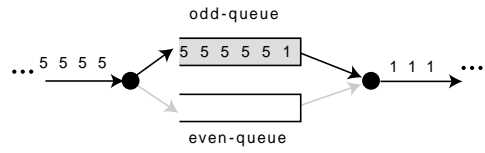
(SIQ: Single Input-Queued)

가

가



2. MIQ



3. Odd-Even

MIQ 가 . FIFO 가 가 N , 1 m N 가 . 2 MIQ i 가 . MIQ $m=1$ FIFO m 0, 2, 4, 6 가 $m=2$ FIFO $m=2$ 가 Odd-Even [6] ~ [8]. , $m=N$ FIFO 가 VOQ (Virtual Output-Queued) m 가 가 [9] ~ [14]. MIQ mN 가 가 SIQ

가 가 , (,), QoS (fairness) m , N/m . 8 x 8 Odd-Even 1, 3, 5, 7 MIQ $m=1$ FIFO m 0, 2, 4, 6 hot-spot (non-uniform) 3 (3 5) even-queue (overflow)가 odd-queue (dynamic) [15] (sequence) 가 가 / VOQ CISCO GSR-12000 [16]가 , AT&T AN2 [9], Charlotte Aranea-1 , Ascend GFR 400/1600 , Nortel Networks Versalar 25000, Digital Equipment GIGA-switch Illinois iPOINT 1)

1) VOQ / NX64000 M160 . CISCO GSR12016 VOQ

III. MIQ

1. MIQ

가 . ATM rule relaxed rule .
 가 . relaxed rule .
 (unit time slot) ,
 [17] (uni-form)

가 .
 strict
 2)
) 1
 가
 (uni-form)

2. Relaxed rule

가 가 , 가
 (general switching constraints)

Relaxed rule

1
 N

가 가
 Relaxed rule
 m

가
 가(internal speedup)

m
 가

VOQ MIQ

(sub-switch) VOQ 가

(randomly)

m=N

가

가

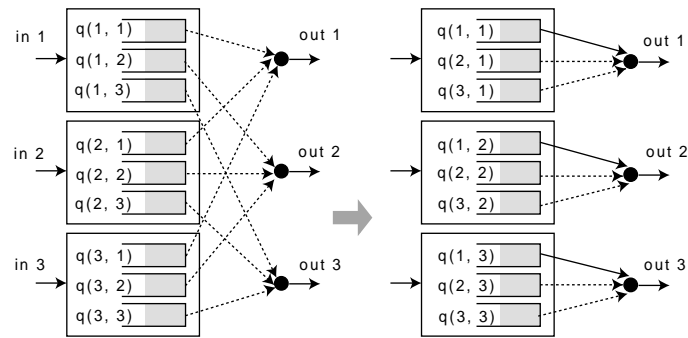
,

4 3x3 VOQ

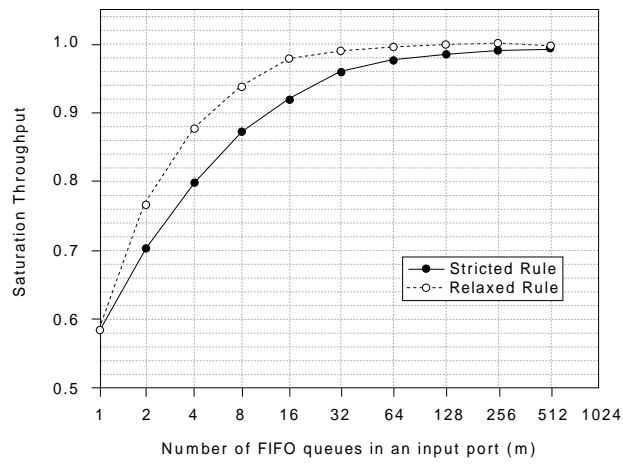
MIQ

4 가

2) [17] restricted rule, free rule



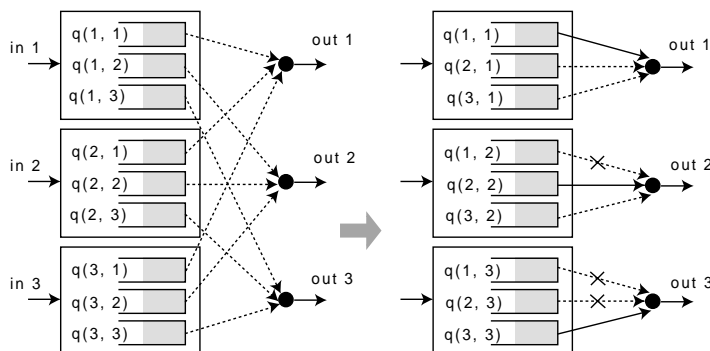
4. Relaxed rule



5. Strict rule Relaxed rule MIQ saturation throughput

가 (virtual)
 3)
 4 $q(i, j)$ i j 가 .
 $q(1, 1), q(1, 2), q(1, 3)$, saturation throughput T_r ,
 가 가 가
 $T_r = m + 1 - \sqrt{m^2 + 1}$ (1)
 가 가 가
 [17]~[19]. 5
 saturation throughput (m:
 bifurcation parameter)
 Relaxed rule saturation

3) N 가 N



6. Strict rule

throughput (T_r)
 saturation throughput
 1.0, $m=4$ 90%
 throughput
 (mean packet delay)
 (packet loss probability)

$$T_s = \frac{1}{m} \sum_{i=1}^m T_i = \frac{1}{m} \delta_m \quad (2)$$

[17]

3. Strict rule :

$$T_i = m - \delta_{i-1} + 1 - \sqrt{(m - \delta_{i-1})^2 + 1} \quad (3)$$

$$\delta_i = \begin{cases} 0, & i=0 \\ T_j & i=1 \\ j=1 \end{cases} \quad (4)$$

가
 ,
 MIQ
 ,
 가
 ,
 6
 request

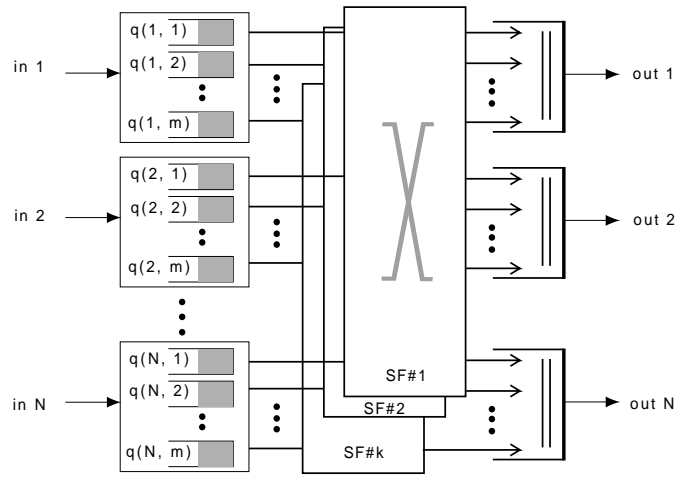
(2) , Strict rule
 saturation throughput 5 m

Relaxed rule m 가
 saturation throughput 1.0
 , $m=1$

request가
 6 $q(1, 1)$
 가 , 1
 request가

(T_r) throughput
 가 T_r
 throughput (2) (3) saturation δ
 가 (3) (1) $T-1$
 , δ_{i-1} i
 , δ_i 0 (3)

saturation throughput T_s



7. multi-plane

(1) 가 가

가 .

(mean packet delay)
(packet loss probability) [17],[18] multi-plane 가 7 , [22]

[17] [23] 가 2 [22]

가

IV. MIQ

가 /

II

VOQ 가 가

VOQ 가 (N)

(linearly) (exponentially)

가 VOQ 가

VOQ

[18],[19],[21]

가

2 4 5 (MIQ)

가 1 2 가

가 20%

(N) 가 (m)가
 strict rule $m = 1 \dots N$
 relaxed rule

MIQ 가
 2 4
 multi-plane 가

[]

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