



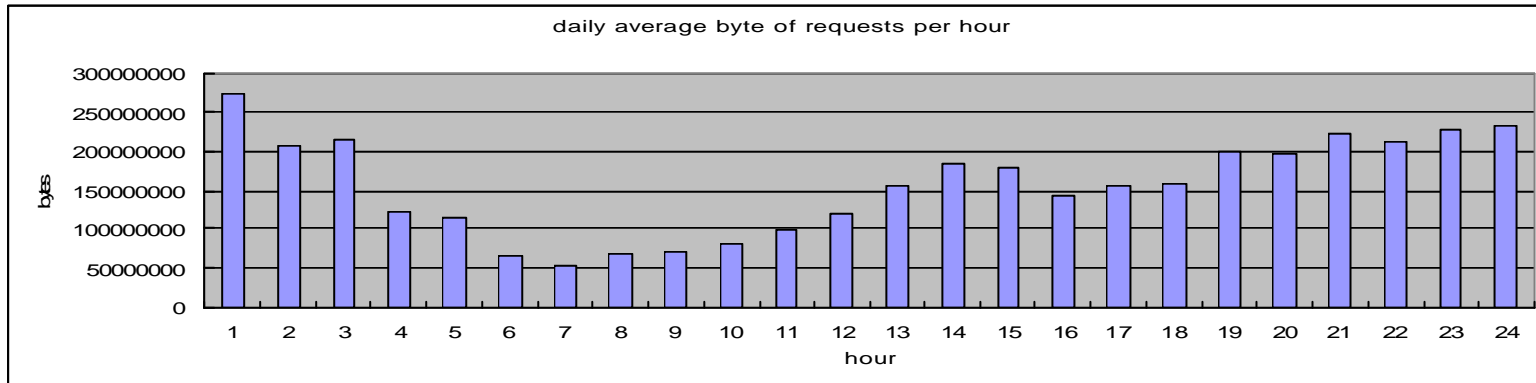
DPNM Lab, GSIT, POSTECH
Email: shk@postech.ac.kr



-
-
-
-
-
-
-

(1)

- Internet World-Wide Web
- Web traffic 가
- Peak periods periods off-peak periods



- peak periods off-peak periods



—

-
- - Server-initiated prefetching (Azer Bestavros, 1996)
 - Client-initiated prefetching (V. Padmanabhan, 1996)
 - Proxy-initiated prefetching (Li Fan, 1999)
 - - Deterministic prefetching (Z. Wang, 1996)
 - Statistical prefetching (Tomas M. Kroeger, 1997)
 - - Prefetching for Response Time Reduction (V. Padmanabhan, 1996)
 - Prefetching for Balanced Bandwidth Usage
 - **A Statistical, Proxy-initiated and Batch Prefetching for Balanced Bandwidth Usage**



-

-

-

-

-

-



-

- 가
 - (expiration time)
 - (reference count)

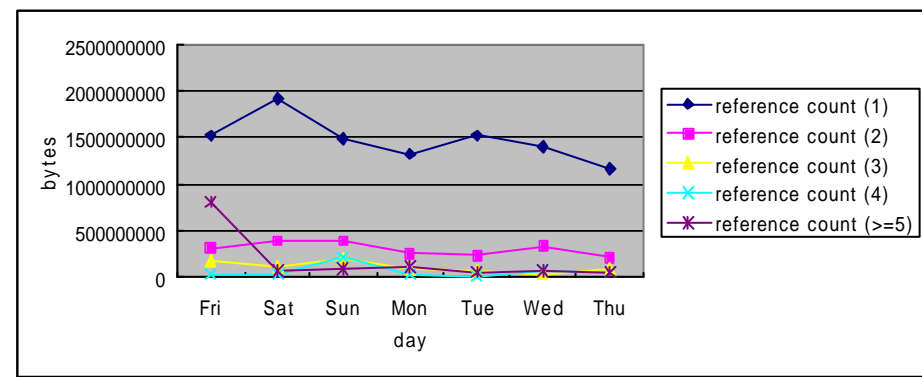
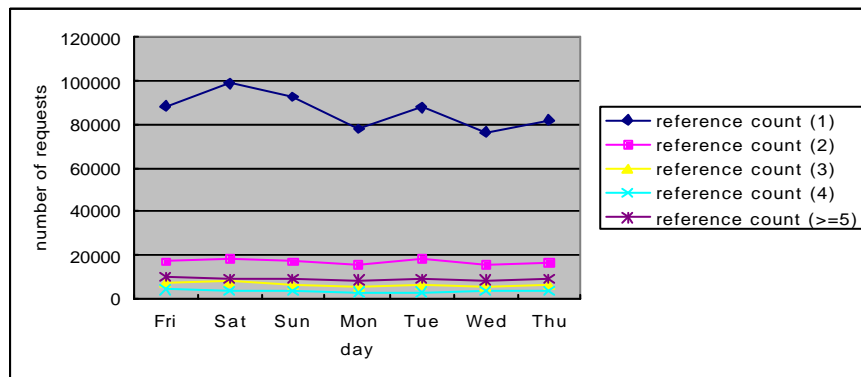
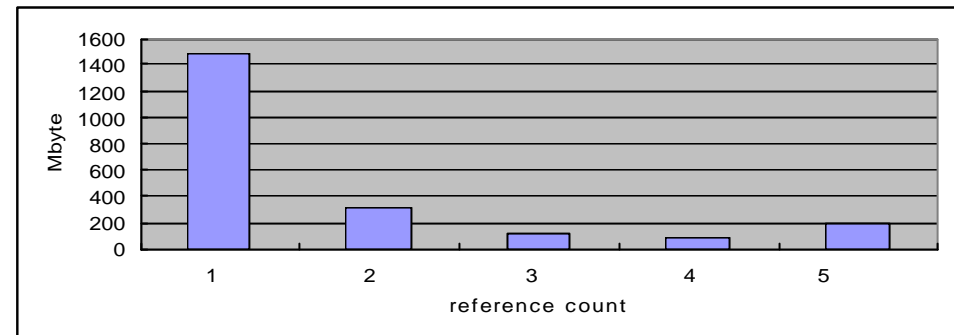
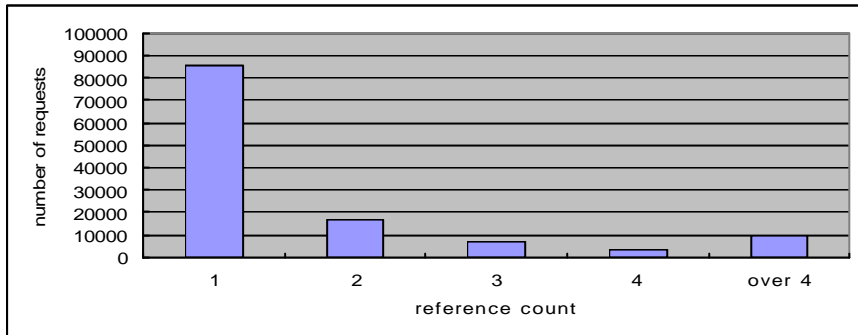
- 가 가 ,

Web Traffic Trace(1)

- : 16 subnet
- : 1999.10.15 () - 1999.10.28 (), 2
- : CacheRaQ (Cobalt Network)
- : 447
- : 54.96 %
- : 31.42 %
- : 4,077,308
- : 50.2 Gbyte

	(%)	(%)
1	86,227 (70.75 %)	1479.75 Mbyte (68.12 %)
2	16,690 (13.69 %)	310.79 Mbyte (14.31 %)
3	6,462 (5.3 %)	118.20 Mbyte (5.44 %)
4	3,451 (2.83 %)	74.01 Mbyte (3.41 %)
5	9,053 (7.43 %)	189.52 Mbyte (8.72 %)
Total	121,883 (100 %)	2172.27 Mbyte (100 %)

Web Traffic Trace(2)



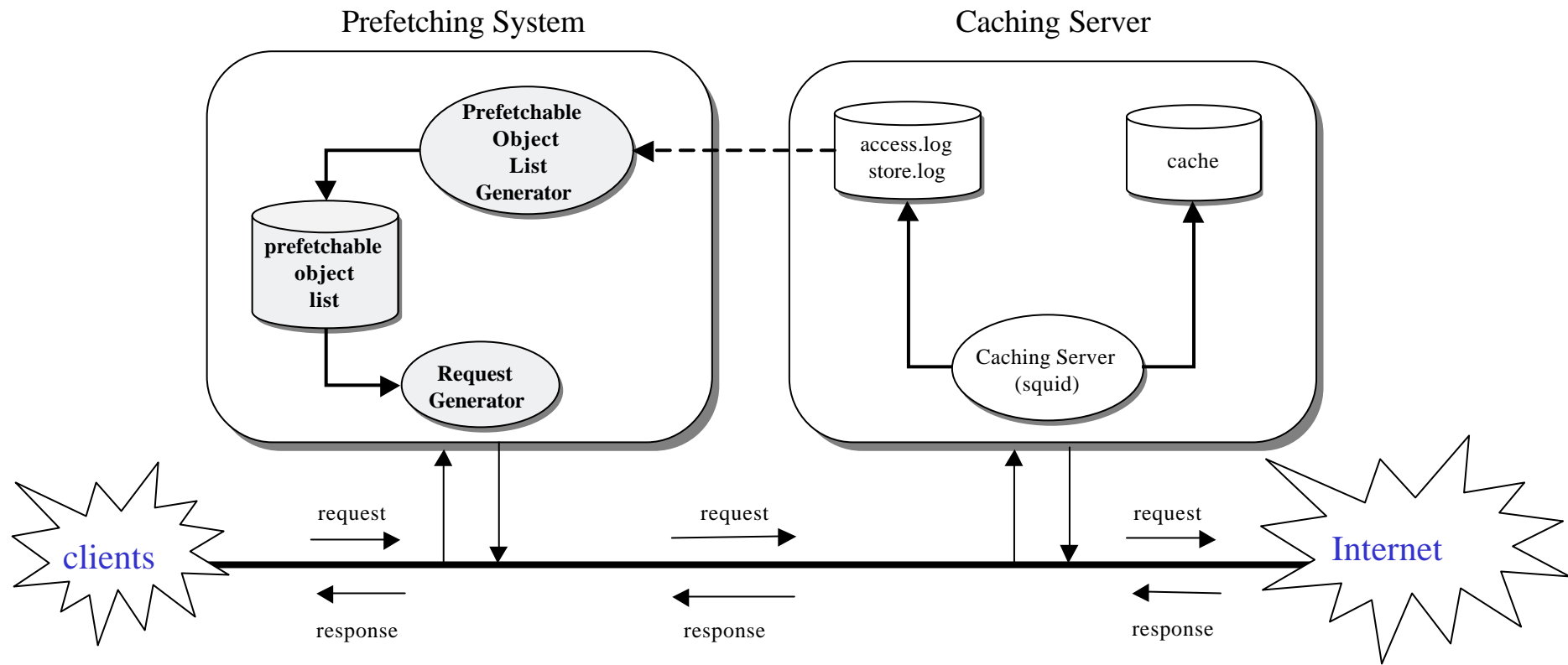


- - 1 day

-

- - off-peak periods
 - 80%
 - 04:00 - 13:00, 9

- - off-peak periods



Prefetchable Object List Generator

- prefetchable object list
 - “access log”
 - Squid refresh algorithm
 - refresh algorithm
- “store log”

- prefetchable object list

Reference Count	URL	Byte
-----------------	-----	------

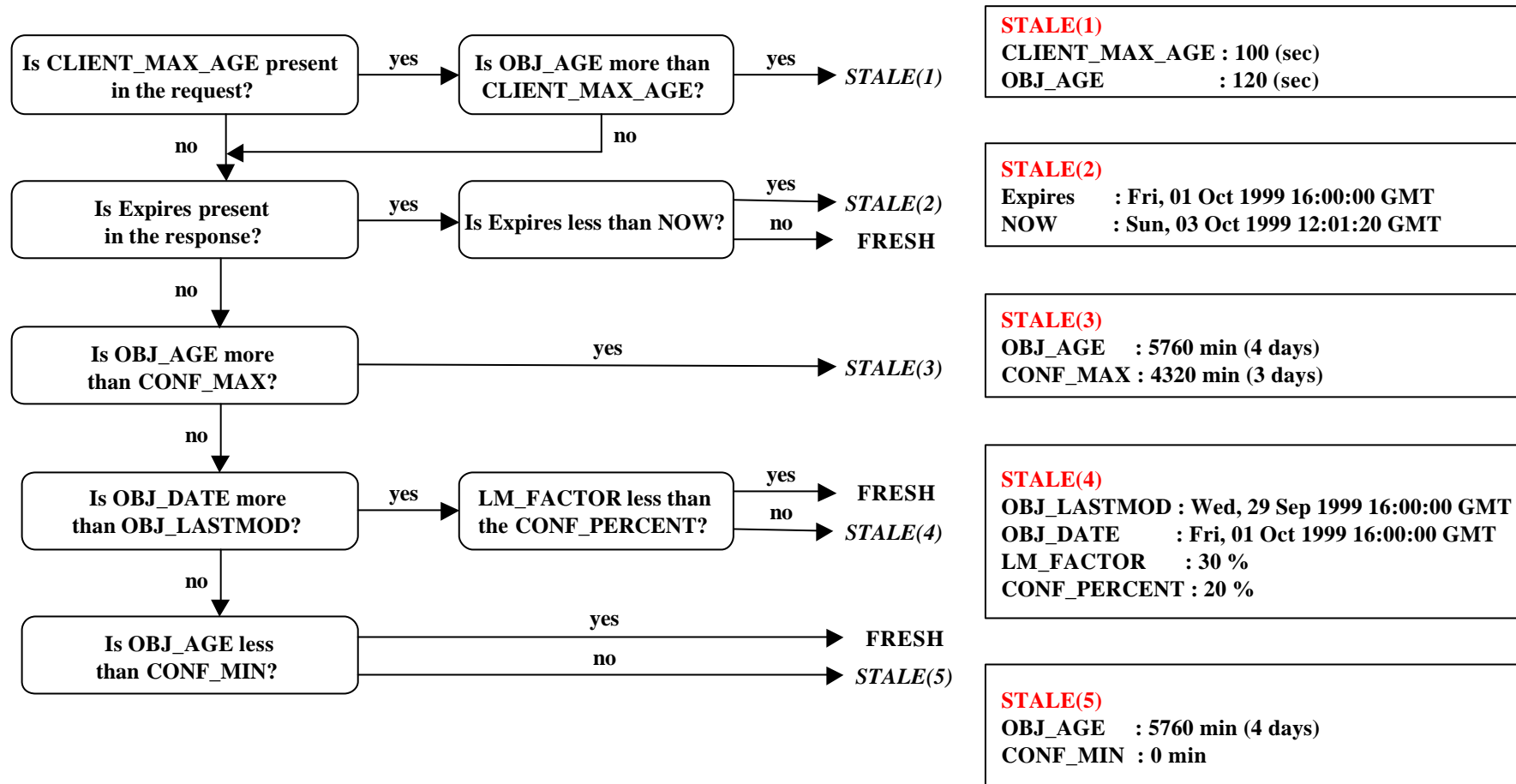
- Access Log

Time	Elapsed	Remotehost	Code/Status	Byte	Method	URL
------	---------	------------	-------------	------	--------	-----

- Store Log

Time	Action	Status	OBJ_DATE	OBJ_LASTMOD	Expires	Type	Len	Method	URL
------	--------	--------	----------	-------------	---------	------	-----	--------	-----

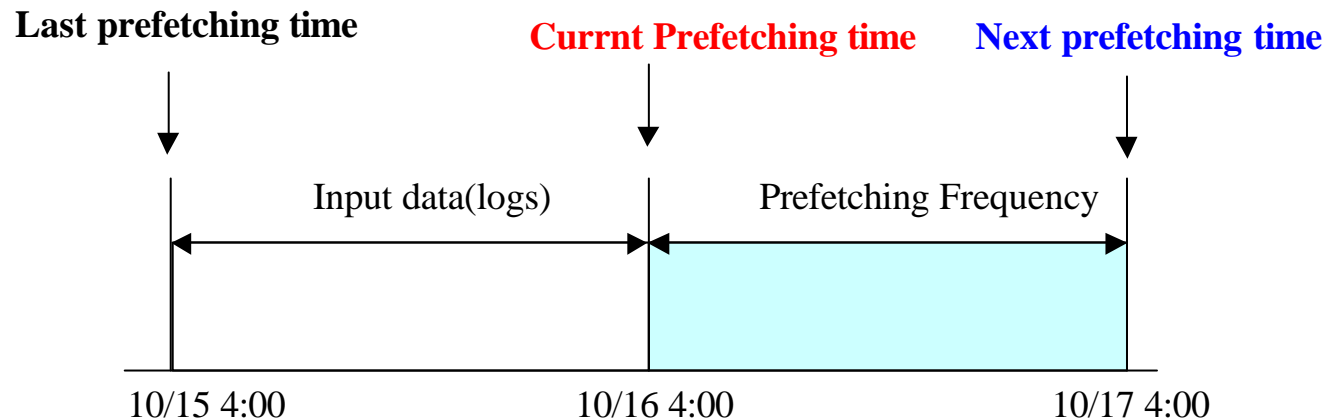
Refresh Algorithm(2)



Freshness

- Squid refresh algorithm CLIENT_MAX_AGE
 - CLIENT_MAX_AGE

- $NOW = \text{Current Prefetching Time} + \text{Prefetching Frequency}$
 - Current Prefetching Time :
 - Prefetching Frequency :

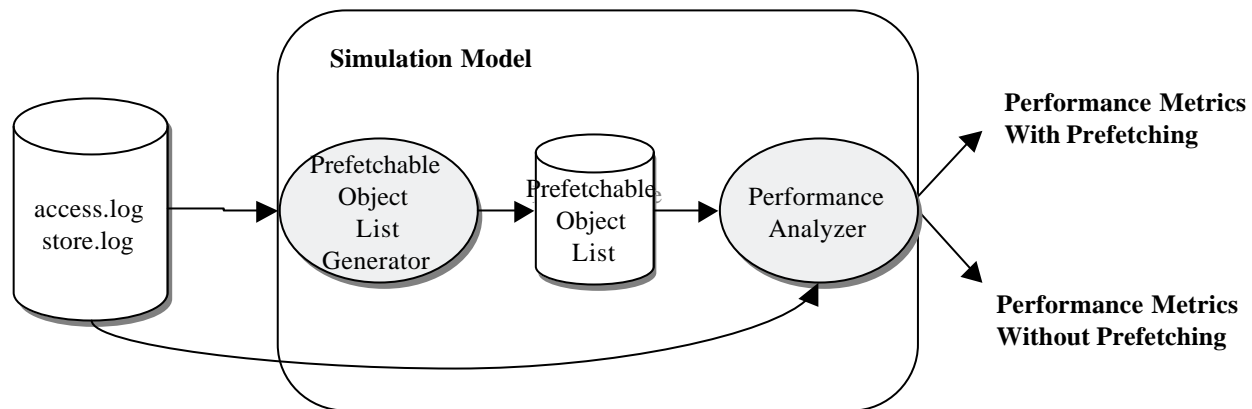


Request Generator

- Prefetchable Object List HTTP
- off-peak periods HTTP requests Web server
- Web client
- “wget”
 - HTTP command-line Web client
- Crontab off-peak periods

- **Input Parameter**

- Logs : access log and store log (1999.10.15 - 1999.10.28, 2)
- : Off-peak periods (04:00 - 13:00)
- : 1 day
- : 1 , 2 , 3 , 4 , 5
- : off-peak peirods
- refresh algorithm parameter
 - OBJ_DATE, Expires, OBJ_LASTMOD, NOW, CONF_MAX, CONF_MIN, CONF_PERCENT

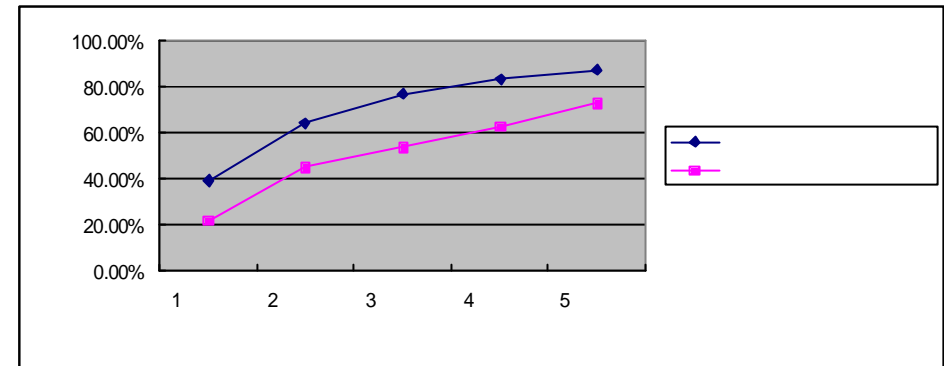
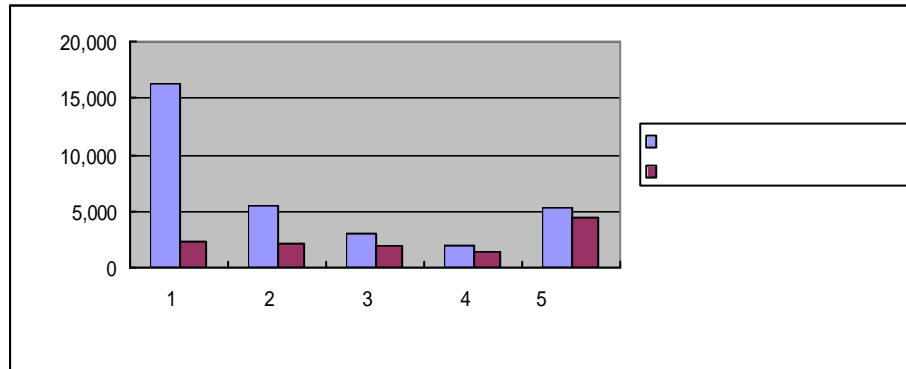


- Performance Metrics

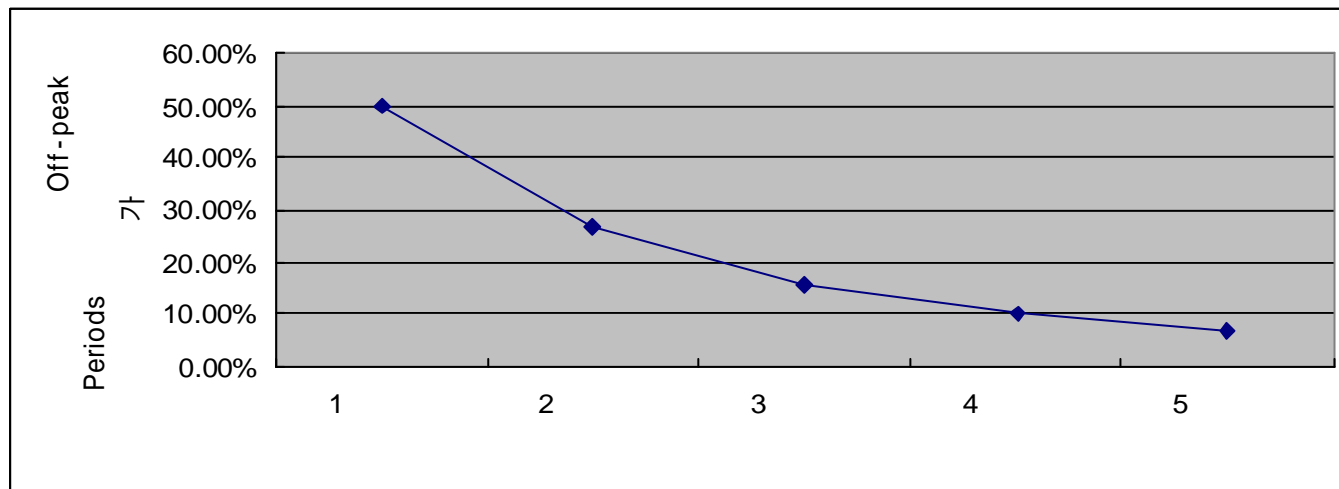
- Request Saving
 -
- Bandwidth Saving
 -
- Accuracy
 -
 -
- Wasted Bandwidth

- Accuracy & Wasted Bandwidth

• Accuracy

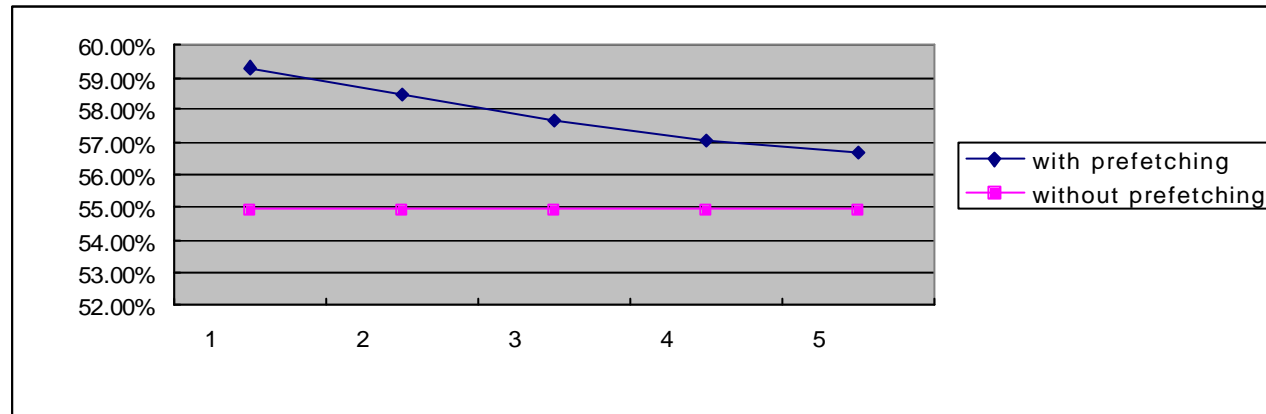


• Wasted Bandwidth

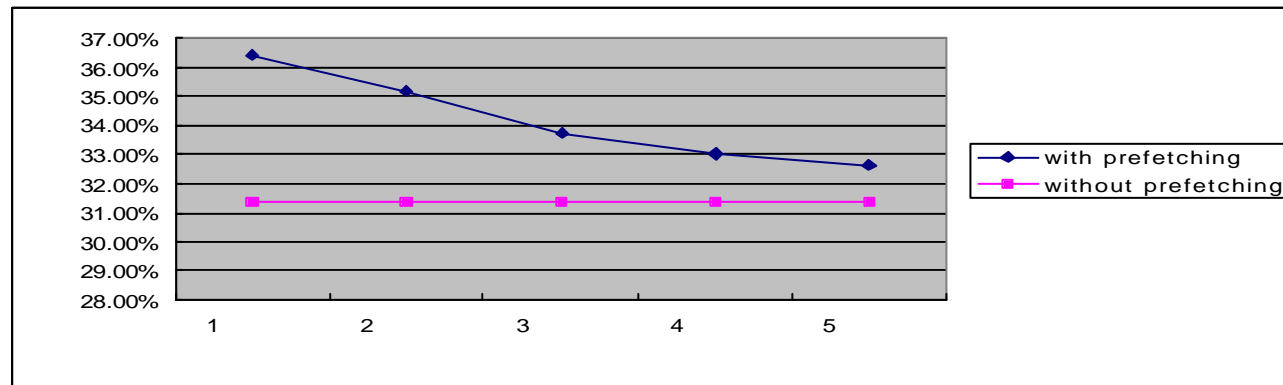


- Request Saving & Bandwidth Saving

•Request Saving



•Bandwidth Saving



- Summary

- 가

- E_p
 $E_p \approx B_s / B_w$

E_p :

B_s : (Mbyte)

B_w : (Mbyte)

- Bandwidth Saving

-

	B_s (Mbyte)	B_w (Mbyte)	E_p	Bandwidth Saving	Wasted bandwidth
1	189.16	670.72	0.28	5.01 %	17.8 %
2	141.82	172.65	0.82	3.78 %	4.6 %
3	85.65	74.47	1.15	2.27 %	2.0 %
4	60.08	35.91	1.67	1.59 %	1.0 %
5	45.06	16.97	2.66	1.19 %	0.5 %

- 2

- Off-peak periods

peak periods

—

2

	Request saving	Bandwidth saving	Wasted bandwidth	Accuracy	
				Prefetched object hit rate	Prefetched byte hit rate
2	3.53 %	3.78 %	4.6 %	64.3 %	45.1%

—

— peak periods

: 20.52 Kbps

—

add-on feature

가가

-

- real-time list

Prefetching Object List Generator