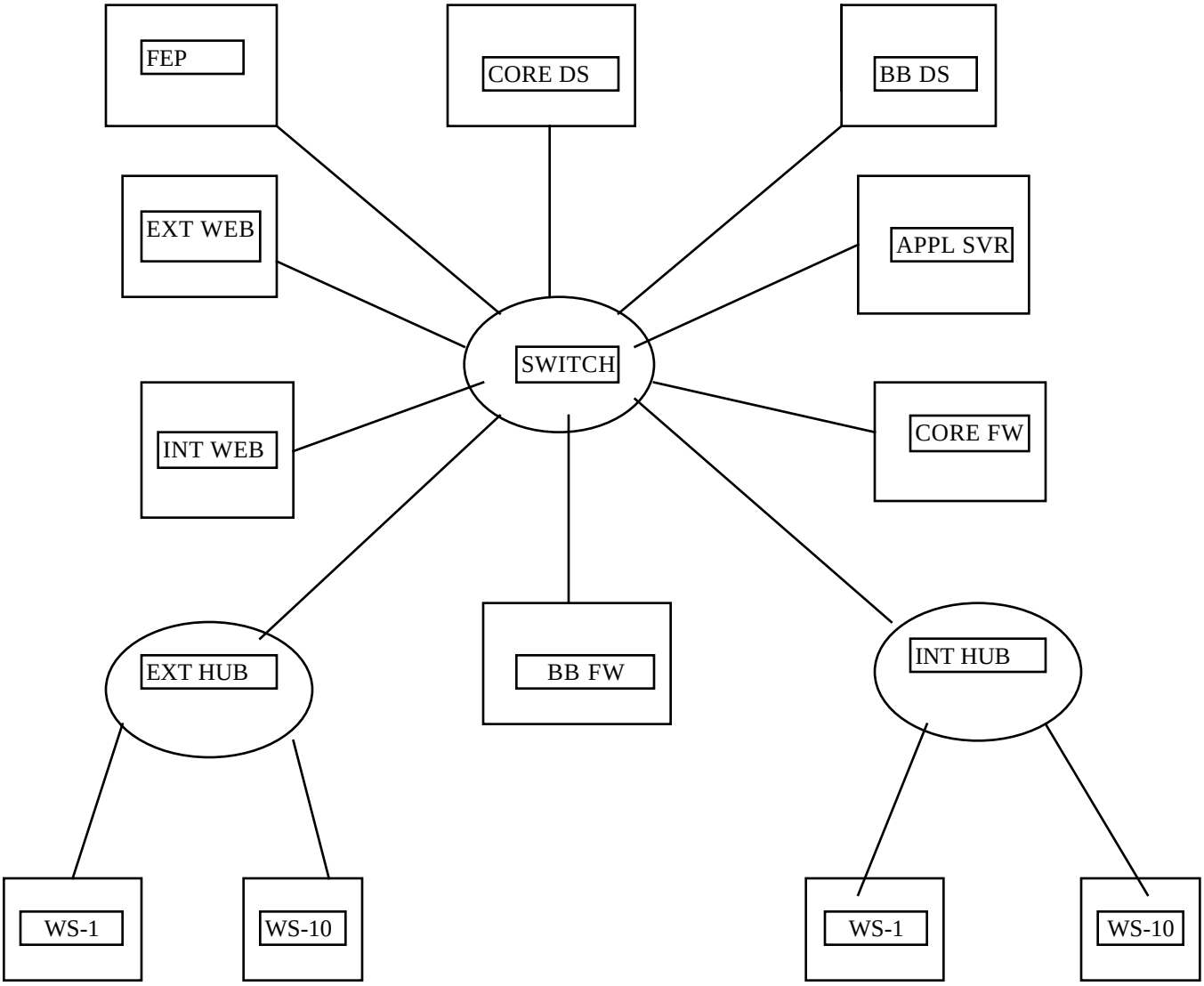

FIGURE 1 RELEASE 1 ARCHITECTURE

NODE HARDWARE SERVICE RATE PARAMETERS

Node	CPU	Disk
FEP	HP 712/100; 4 CPUs 117.2 SPECint92/CPU	1 disk drive Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 6.5 MB/sec
Core Data Server	SGI XL2; 2 CPUs 303 SPECint92/CPU	20 disk drive RAID Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 5*6.5 MB/sec
Backbone Data Server	SGI XL; 4 CPUs 303 SPECint92/CPU	20 disk drive RAID Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 5*6.5 MB/sec
Internal Web Server	SGI Indy-2; 1 CPU 140.2 SPECint92/CPU	1 disk drive Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 6.5 MB/sec
External Web Server	SGI Indy-2; 1 CPU 140.2 SPECint92/CPU	1 disk drive Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 6.5 MB/sec
User Workstation	Sun Sparc 20/71 (typical) 1 CPU 125.8 SPECint92/CPU	1 disk drive Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 6.5 MB/sec
Core Firewall	Sun Sparc 20/71; 1 CPU 125.8 SPECint92/CPU	not relevant
Backbone Firewall	Sun Sparc 20/71; 1 CPU 125.8 SPECint92/CPU	not relevant
Application Server	SGI Indy-2; 1 CPU 140.2 SPECint92/CPU	1 disk drive Average seek = 8.5 msec Average rotation = 4 msec Transfer rate = 6.5 MB/sec

COMMUNICATIONS LINK SERVICE RATES

Node Pair	**Transfer Rate (Mbps)**
FEP - Switch	100
Core Data Server- Switch	100
Backbone Data Server- Switch	100
Internal Web Server- Switch	100
External Web Server- Switch	100
Internal User Workstation- Switch	100
Core Firewall- Switch	100
Backbone Firewall- Switch	100
Internal User Workstation - Internal Hub	10
External User Workstation - External Hub	10
Backbone Firewall - External Hub	155

SERVICE DEMAND INPUT PARAMETERS

NODE	S/W CI	K INSTRUCTIONS	DISK IO (BYTES)	NETWORK IO (BYTES)
FEP	FE COTS ETR	8766986		
	Minor Frame Archive ETR	14611644	416880000	208440000
	FE COTS RT	42068.412		
	Minor Frame Archive RT	70114.02		70000
	Route Engr Data ISP	14020		10865
	Route Engr Data ISIS - RT CDF	21030		162500
	Route Engr Data ISIS - Recorded	21030		5200000
	Update Time	21.03		
FW	Firewall COTS	129.1248207		
CORE DS	File Server	1000	208440000	
BB_DS	ISP Server	28040		10865
	UNIX ISP Client	785.12		
	Record Stream Data - RT	2250	162500	
	Record Stream Data - ETR	2250	5200000	
	ORACLE - record data	750	1200	
	ORACLE - query data	750	401072	
	Merge TLM Files	2250	1600000	
	Archive Stream Data	150	54166.66667	
	Manage Data Requests	150		
	Perform Data Retrieval	3250	1000000	1000000
WEB SERVER	ISP Server	11216		1086.5
	UNIX ISP Client	785.12		
	JAVA ISP Client	785.12		
	WebServer- Data Analysis	1402	300000	300K applets/5 MB
	Web Server - RT display	1402	200000	200000
	GUI Server- Data Analysis	1402		5000-User/200-Appl_svr
	GUI Server- display setup	1402	10000	10000
	GUI Server- RT display	1402		10865
APPL SERVER	Analysis Job Management	1200		
	Build Analysis Request	1200	1000000	
	Generate Analysis Product	3880		
	Manage Analysis Data	1240		200
	Convert & Deliver Product	1200	20000000	10000000
	PVWAVE	1720	13000000	
USER WS	Analysis Web Browser	701000	300000	400
	RTD Web Browser - setup	1402000	200000	
	RTD Web Browser - disply	1402000		

WORKLOAD FREQUENCIES AND EXECUTION FLOWS

Workload	Frequency	Input Data Quantity	Execution Flow
RT MF Archive	20 hrs/day	NASCOM 4800 bits/block @ 56 Kbps	NASCOM -> FEP -> Core DS
ETR MF Archive	3/day	NASCOM 4800 bits/block @ 1.544 Mbps for 18 min	NASCOM -> FEP -> Core DS
RT Archive	1/sec	CDF container = 40 IP packets = 1.3 Mb	FEP -> BB DS
Recorded Archive	3/day	CDF container = 41.6 Mb	FEP -> BB DS
RT ISP Display - Internal	1/sec	ISP packet = 10,865 Bytes	FEP -> BB DS -> Internal Web Svr -> Internal WS
RT ISP Display - External	1/sec	ISP packet = 10,865 Bytes	FEP -> BB DS -> External Web Svr -> External WS
Setup RT ISP Display - Internal	2/day/user	200 Bytes	Internal WS -> Internal Web Svr
Setup RT ISP Display -External	2/day/user	200 Bytes	External WS -> External Web Svr
Analysis Request - Internal	200/day	200 Bytes	Internal WS -> Internal Web Svr -> Appl Svr -> BB DS*
Analysis Request - External	200/day	200 Bytes	External WS -> External Web Svr -> Appl Svr -> BB DS*
Time Input	7/sec	32 bits	FEP & Core DS

BASELINE RESOURCE UTILIZATION RESULTS

Node	CPU Utilization	Disk Utilization
FEP	13.6% per CPU	9%
Core Data Server	< 1% per CPU	< 1%
Backbone Data Server	6.1% per CPU	3.1%
Internal Web Server	5%	< 1%
External Web Server	5%	< 1%
User Workstation	6.4%	< 1%
Core Firewall	12.8%	N/A
Backbone Firewall	8%	N/A
Application Server	< 1%	7.8%

BASELINE WORKLOAD DELAY RESULTS

Workload	Delay
RT MF Archive	1.5 seconds/1 MB
ETR MF Archive	6.7 minutes per recorder dump
RT Archive	< 1 second/CDF Container
Recorded Archive	1.1 seconds/CDF Container
RT ISP Display - Internal	1 second/update
RT ISP Display - External	1 second/update
Setup RT ISP Display - Internal	12 seconds/setup
Setup RT ISP Display - External	12 seconds/setup
Analysis Request - Internal	29.5 seconds per request
Analysis Request - External	29.5 seconds per request
Time Input	<1 second/input

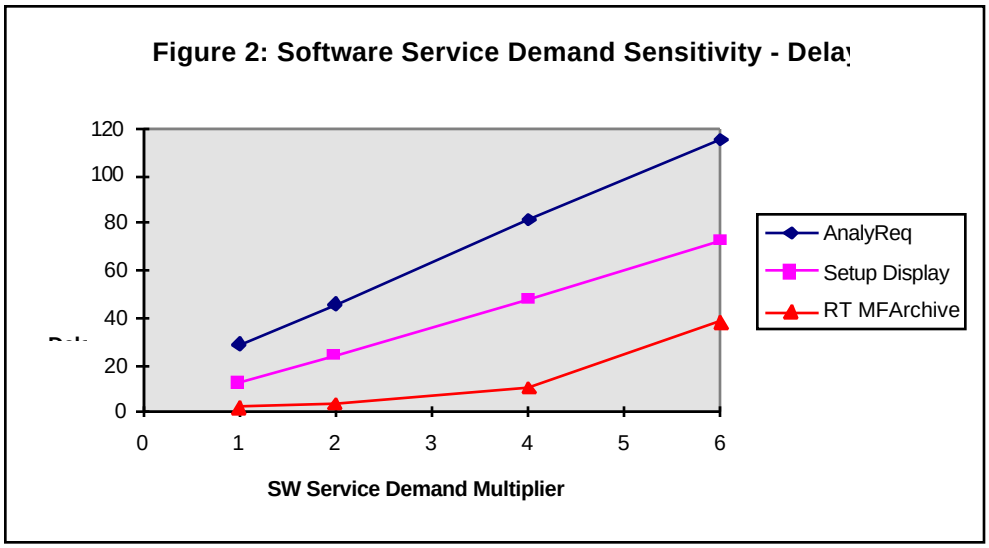
Figure 2: Software Service Demand Sensitivity - Dela
120
100
80
60
40
20
0
0
1
2
3
4
5
6
SW Service Demand Multiplier
AnalyReq
Setup Display
RT MFArchive

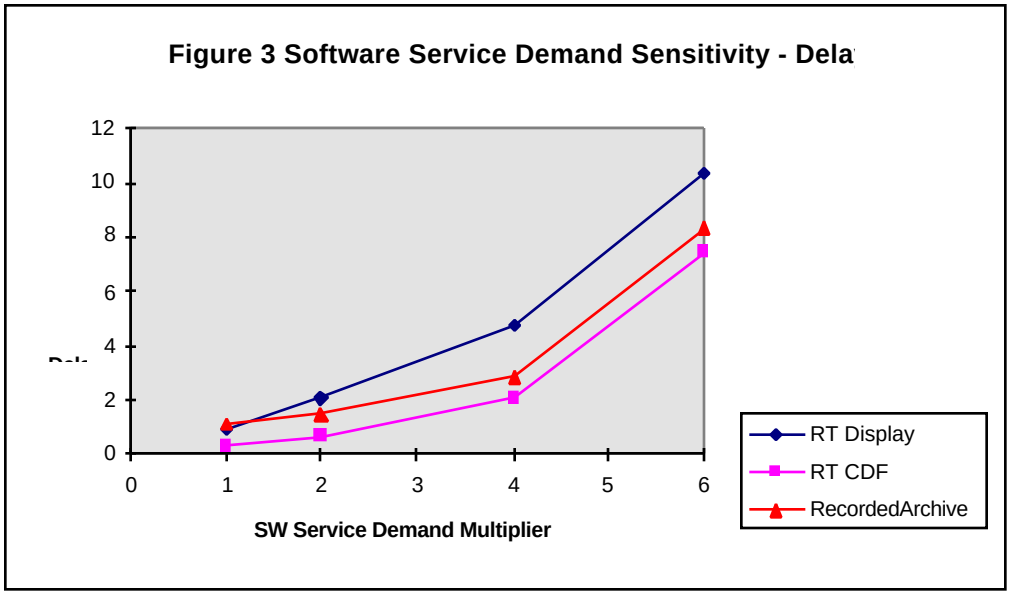
Figure 3 Software Service Demand Sensitivity - Dela
12
10
8
6
4
2
0
0
1
2
3
4
5
6
SW Service Demand Multiplier
RT Display
RT CDF
RecordedArchive

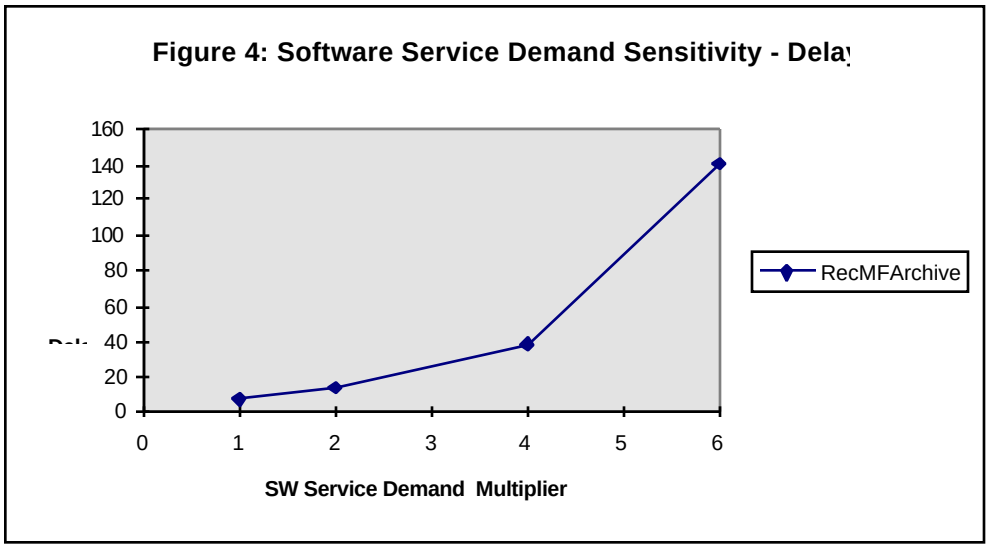
Figure 4: Software Service Demand Sensitivity - Dela
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
SW Service Demand Multiplier
RecMFArchive

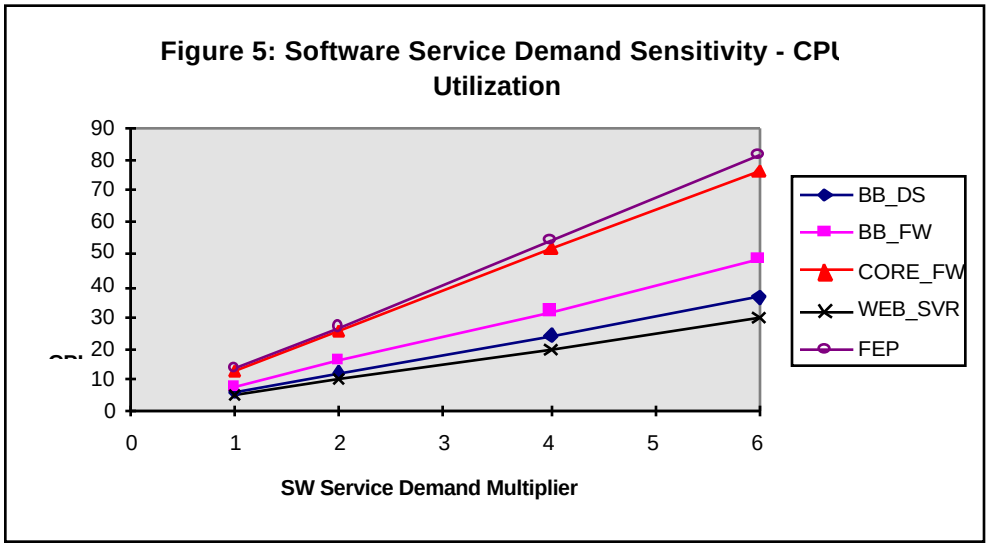
Figure 5: Software Service Demand Sensitivity - CPU Utilization
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
SW Service Demand Multiplier
BB_DS
BB_FW
CORE_FW
WEB_SVR
FEP

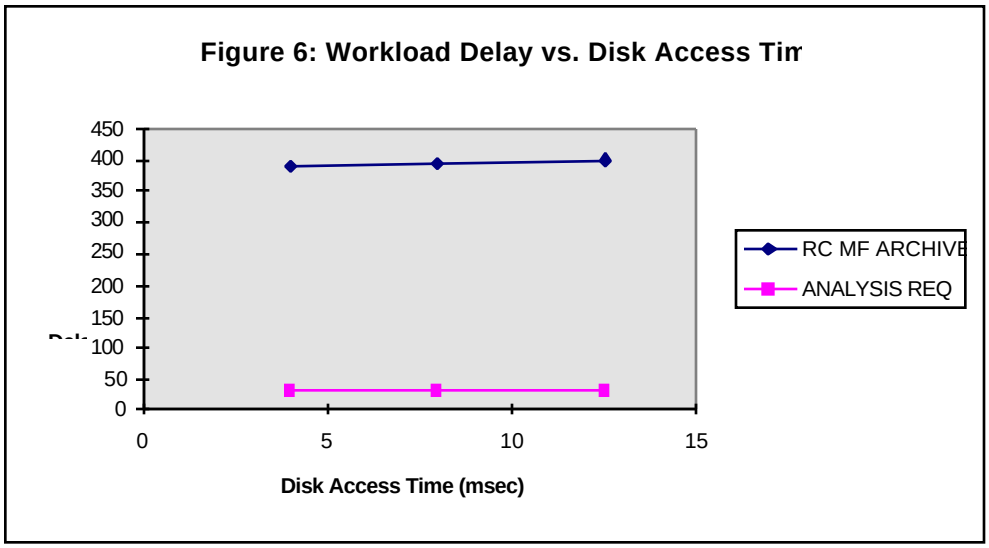
Figure 6: Workload Delay vs. Disk Access Tim
450
400
350
300
250
200
150
100
50
0
0
5
10
15
Disk Access Time (msec)
RC MF ARCHIVE
ANALYSIS REQ

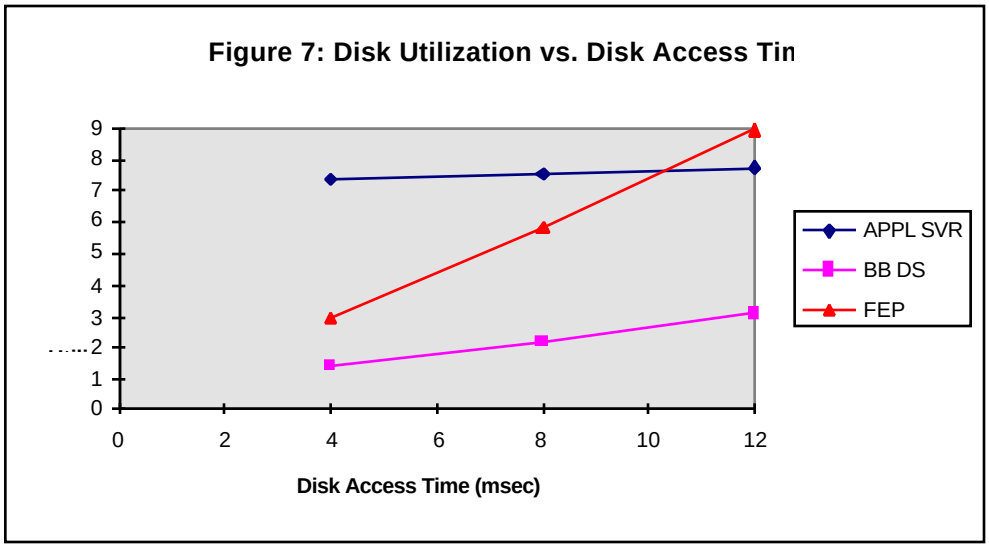
Figure 7: Disk Utilization vs. Disk Access Tin
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Disk Access Time (msec)
APPL SVR
BB DS
FEP

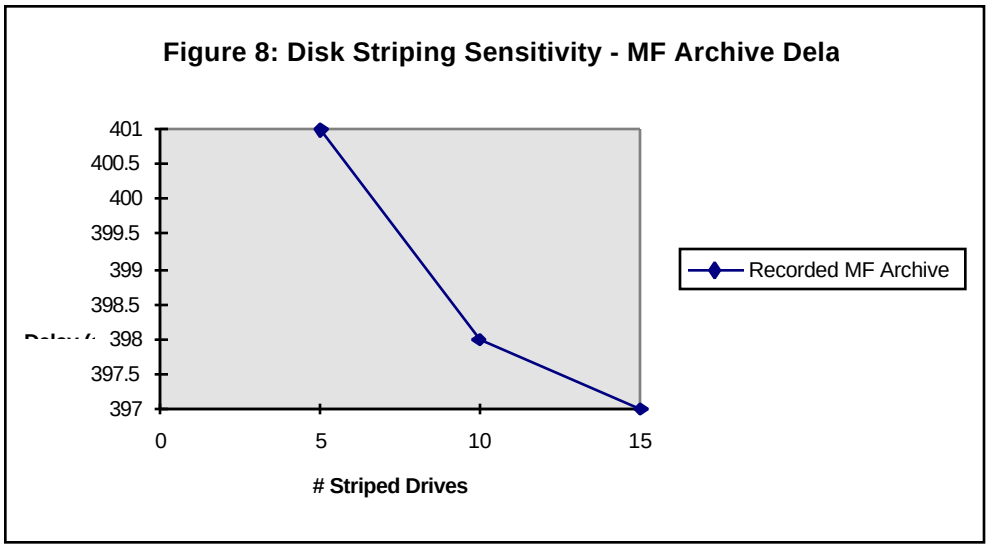
Figure 8: Disk Striping Sensitivity - MF Archive Dela
401
400.5
400
399.5
399
398.5
398
397.5
397
0
5
10
15
Striped Drives
Recorded MF Archive

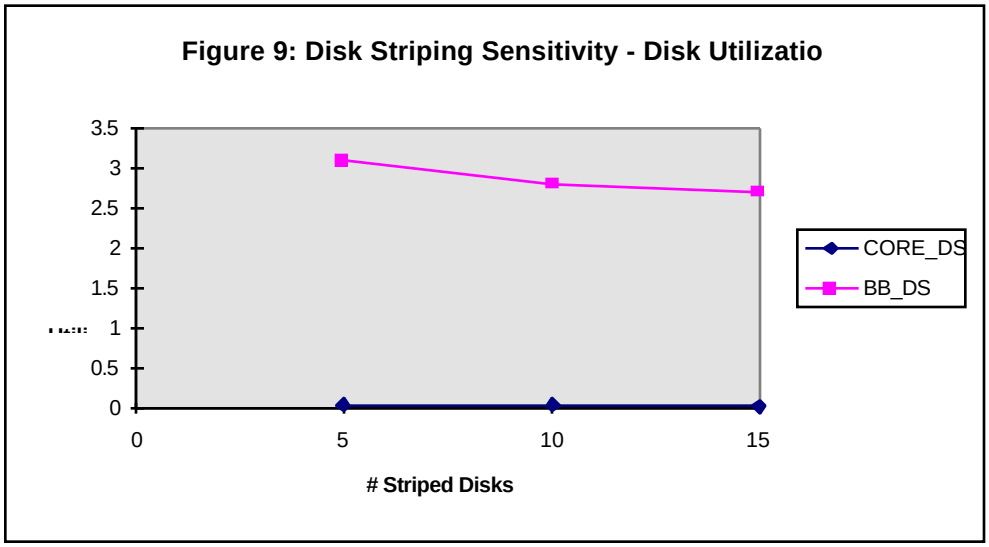
Figure 9: Disk Striping Sensitivity - Disk Utilizatio
3.5
3
2.5
2
1.5
1
0.5
0
0
5
10
15
Striped Disks
CORE_DS
BB_DS

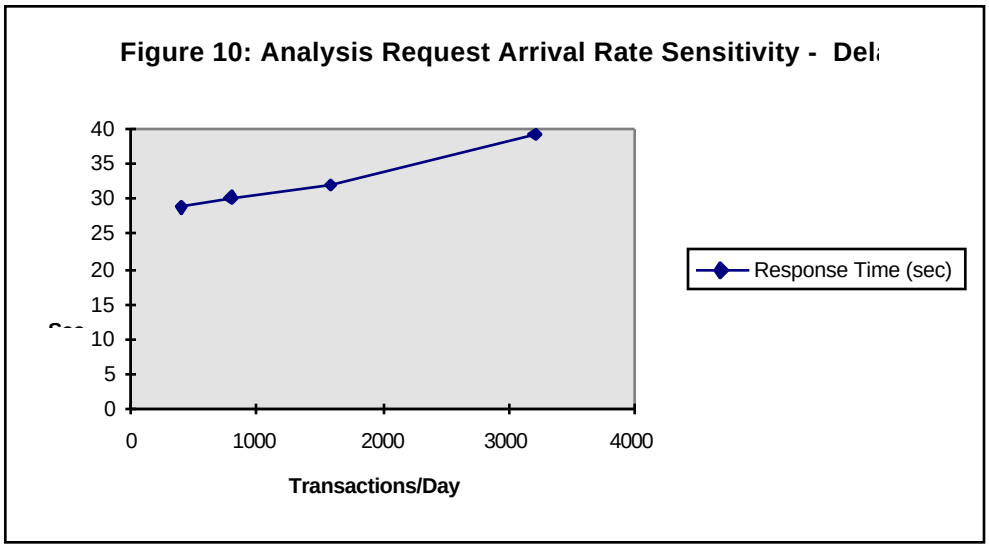
Figure 10: Analysis Request Arrival Rate Sensitivity - Del
40
35
30
25
20
15
10
5
0
0
1000
2000
3000
4000
Transactions/Day
Response Time (sec)

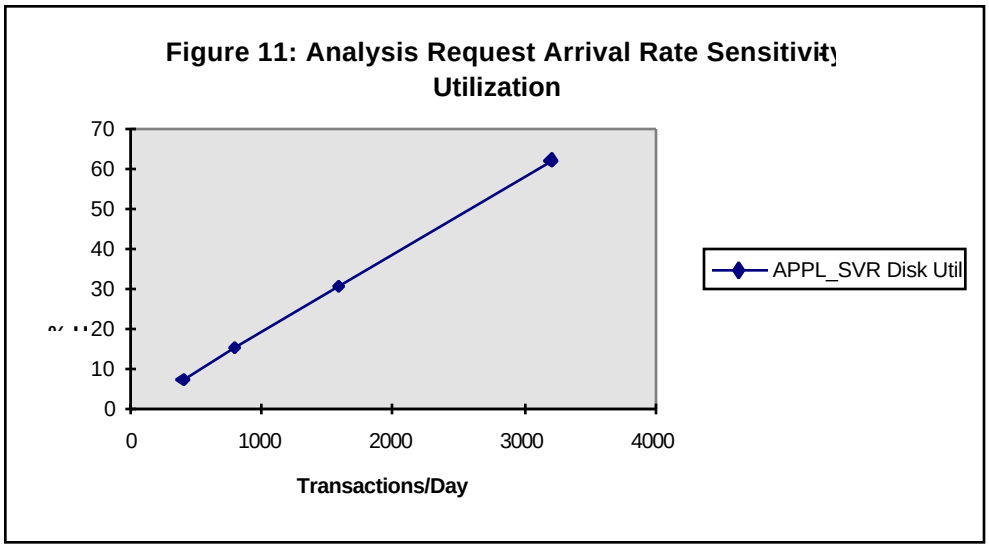
Figure 11: Analysis Request Arrival Rate Sensitivity
Utilization
70
60
50
40
30
20
10
0
0
1000
2000
3000
4000
Transactions/Day
APPL_SVR Disk Util

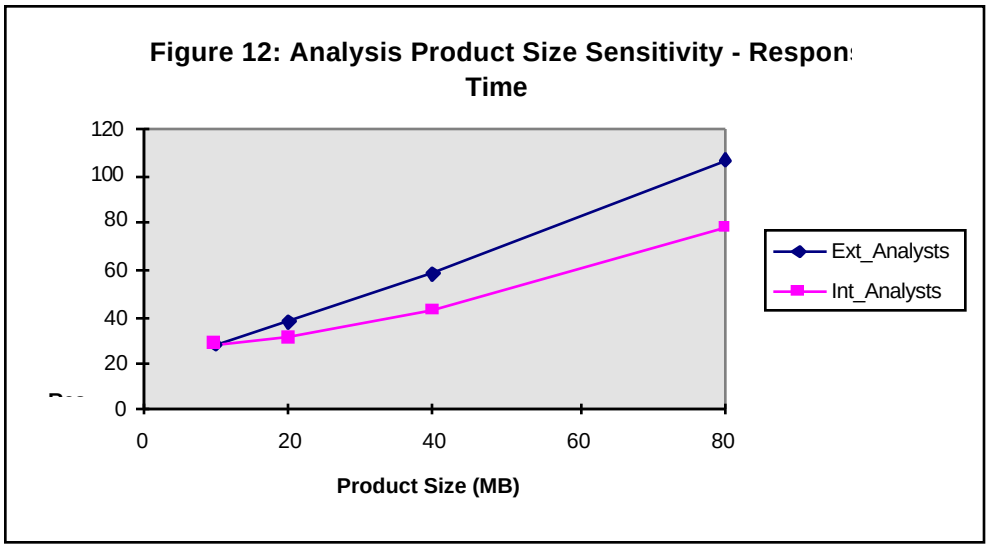
Figure 12: Analysis Product Size Sensitivity - Respon
Time
120
100
80
60
40
20
0
0
20
40
60
80
Product Size (MB)
Ext_Analysts
Int_Analysts

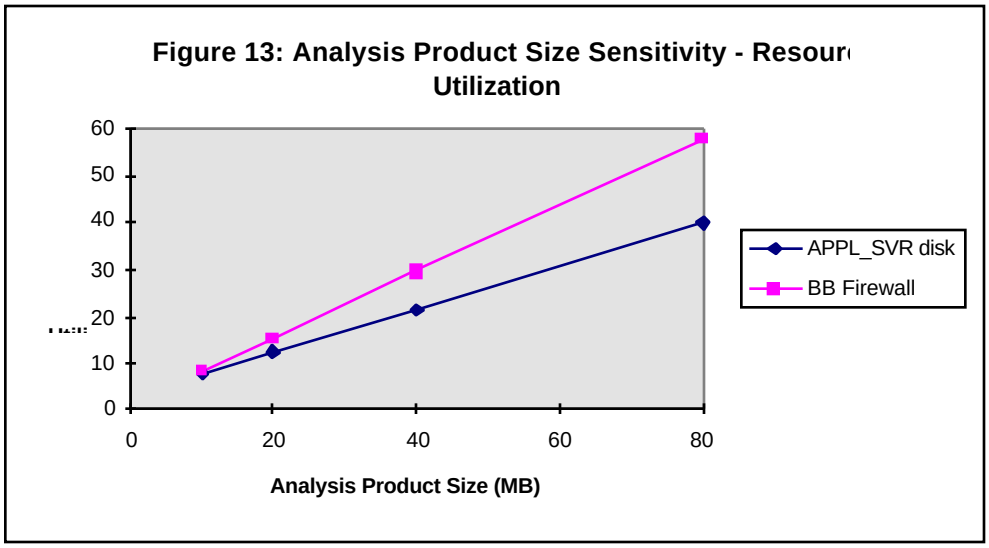
Figure 13: Analysis Product Size Sensitivity - Resour
Utilization
60
50
40
30
20
10
0
0
20
40
60
80
Analysis Product Size (MB)
APPL_SVR disk
BB Firewall