

*HDS Storage*



# **Hitachi Freedom Storage™ 7700E Proves its Mettle in DB2 Environment**

By Chuck Centorbi

**For computing as critical as your business**

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The Hitachi Freedom 7700E has proven to be the best storage offering in the industry for DB2 I/O operations. Not only does the Hitachi Freedom 7700E present the most cost-effective and least disruptive solution for large DB2 volumes, it also delivers the best response times. DASD performance has a direct impact on response times and service level agreements. Excellent response times improve both customer image and bottom line revenues. The Hitachi Freedom 7700E is instrumental in helping customers achieve this competitive advantage.

The information presented in this paper is based on an actual customer experience, not on a qualified benchmark. The performance data for the “before” and “after” comparison was gathered over a two-month period in a non-static production environment. Our 7700E customer—one of the largest-volume private credit card processing houses—performs credit card billing, collection, authorization, and itemized statement processing for major retailers of consumer goods. Their business-critical application is a CICS/DB2-based transaction system.

Our customer agreed to evaluate the 7700E to replace RAMAC-1 and RAMAC-3 storage subsystems. They were also evaluating EMC storage products.

The customer wanted:

- To upgrade their storage technology to improve DASD performance on their critical DB2 credit card application
- To replace the lease-expired RAMAC-1 subsystem
- To free up one of the RAMAC-3s for Y2K testing.

The customer's critical DB2 applications ran on a 9672-R94 CPU and consisted of over one hundred 3390-3 DB2 volumes spread across two RAMAC-3 subsystems. Each RAMAC-3 subsystem had four ESCON® channels, 2GB of cache, 128MB of NVS, and approximately 249GB of 3390-3 volumes. Also, the customer had a lease-expired RAMAC-1 subsystem that contained some SMS and system volumes. This RAMAC-1 subsystem had four ESCON channels, 512MB of cache, 8MB of NVS, thirty-two 3390-3 volumes, and thirty 3390-9 volumes.

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Of the one hundred DB2 3390-3 volumes, a small subset of approximately eighteen 3390-3 DB2 volumes contained the consolidated company Name and Address (N&A) indices and tables that were the heart of all their applications. The response times for these volumes were critical, since every application referenced the N&A file. The customer's goal was to get the average response time for the N&A volumes below 20ms, and to achieve 10ms or better response times for the other DB2 volumes.

Three of the eighteen critical DB2 volumes (DB2001, DB2002, and DB2005) which contained indices to the N&A files were the busiest volumes with the worst response times. DB2001 contained the primary index for the N&A file and had the worst response times of the three. As you can see from Table 1, the average response times for DB2001 were between 50ms to 63.6ms and the average response times for DB2002 and DB2005 were between 38ms to 44ms. It should be noted that these are daily average response times provided by the customer; there were many instances during peak intervals that the average response times (as viewed from a real-time performance monitor) exceeded 90ms on DB2001. The average activity rates on each of the volumes were approximately 10 to 12 I/Os per second. Each RAMAC-3 subsystem was performing at the rate of approximately 700 to 1,200 I/Os per second.

The 7700E was configured with three array groups of 6GB hard disk drives (HDDs) for a total of 18 3390-3 volumes, 15 array groups of 9GB drives comprising 36 3390-9 volumes and 144 3390-3 volumes, three ACP pairs, 4GB of cache, and 12 Extended Serial Adapter™ (ExSA™) channels. Eight ExSA channels were connected to the production host and the other four were connected to another host for backup purposes. Two ACP pairs serviced the 9GB drives while one ACP pair serviced the 6GB drives. The total capacity of the 7700E subsystem was 766GB.

The customer migrated 81 3390-3 DB2 volumes, 32 3390-9 SMS volumes, and 22 3390-3 system and spool volumes to the 9GB HDDs immediately, and scheduled a phased move of the critical 18 DB2 volumes to the 6GB HDDs. At the time this paper was written, the customer had migrated seven volumes to the 6GB HDDs. For our reporting purposes, we will summarize the performance improvement from the seven DB2 volumes that were migrated. Additional data on the other 9GB 3390-3 DB2 volumes will be included for your review.

As you can see from Table 1, the seven critical DB2 volumes that were migrated to the 6GB drives achieved a significant response time improvement. The DB2001 volume, which is the most active and important volume, improved by over 70 percent. Average response times improved from the 50ms to 60ms range to consistently fewer than 17ms. The other two critical volumes, DB2002 and DB2005, also improved significantly, respectively obtaining an 82 percent and 59 percent response time improvement. Overall, the seven DB2 volumes that were migrated to the high-performance 6GB HDD obtained significant response time improvements.

Description/Volume	DB2001	DB2002	DB2003	DB2004	DB2005	DB2006	DB2007
RAMAC-3 ↓	55.7	38.5	19.9	16.8	28.2	19.7	17.4
	63.6	46.4	25.7	13.3	33.7	23.1	18.6
	53.2	39.4	26.7	20.8	30.3	22.2	20.0
	50.4	41.1	29.4	20.7	32.7	21.5	20.7
	53.6	43.6	23.3	22.7	40.7	13.1	17.7
	56.4	34.0	26.6	20.2	37.6	15.2	21.2
	57.3	40.0	22.4	20.8	38.1	27.1	18.4
	50.0	35.7	24.9	12.3	36.8	17.9	18.3
	56.4	44.4	14.0	8.5	41.4	15.2	17.2
	52.7	36.4	17.6	23.9	37.0	18.1	21.9
55.1	28.9	18.0	25.2	36.3	19.4	18.7	
RAMAC-3 Migrated to 7700E 6GB Drive ↓	15.1	6.9	8.0	8.5	16.2	11.3	8.4
	16.2	7.0	9.2	8.2	13.0	7.1	6.7
	16.6	7.0	6.3	6.4	17.0	8.1	7.1
	16.0	6.9	6.1	9.3	14.1	10.5	7.6
	14.8	6.8	10.2	5.4	11.2	6.9	6.8
	13.8	6.9	6.6	5.2	13.4	4.7	6.5
	11.5	6.8	9.1	9.3	18.1	9.2	7.8
6GB Drive Improvement	73%	82%	65%	60%	59%	57%	62%

Table 1 Average volume response time for selected days—RAMAC-3 versus 7700E with 6GB hard disk drives

A closer look at the data for the DB2 volumes reveals that all response time components showed improvements; however, the major contributor was the significant reduction in the IOSQ and disconnect times. If you compare the RAMAC-3 response time components to the 7700E response time components in Tables 2 and 3, you can see that the critical DB2001 volume achieved a significant reduction in the IOSQ time and disconnect time on the 6GB HDDs. The IOSQ time decreased from the 40ms range to below 10ms, and the disconnect time decreased from 13ms to around 5ms.

Volume	Response Time	IOSQ Time	Pending Time	Disconnect Time	Connect Time	I/O per second
DB2001	62	42.2	0.9	13.3	5.7	12.75
DB2002	40.5	24.4	0.9	10.3	4.9	12.549
DB2003	25.3	7.1	0.8	14.3	3.1	8.864
DB2004	20.9	3	1.5	9.9	6.5	1.857
DB2005	35.4	16.7	1.3	11.6	5.8	5.285
DB2006	26.8	9.3	0.9	12.1	4.5	3.712
DB2007	21.9	2.5	1.2	14.2	3.9	2.2

Table 2 RAMAC-3 detailed average response time for selected periods

Volume	Response Time	IOSQ Time	Pending Time	Disconnect Time	Connect Time	I/O per second
DB2001	15.7	7.4	0.3	5	3	10.52
DB2002	6.4	0.4	0.3	4.7	1	9.46
DB2003	10.3	1.6	0.8	6.6	1.9	9.25
DB2004	5.2	0.6	0.3	2	2.4	2.32
DB2005	11.2	4.7	0.3	3	3.2	6.36
DB2006	6.9	2	0.3	2.2	2.3	5.41
DB2007	7.1	0.5	0.3	4.3	2	2.36

Table 3 7700E detailed average response time for selected periods

Figure 2 compares the 7700E (excluding the 6GB DB2 volumes) to the RAMAC-3 subsystem for the remaining 81 DB2 volumes on the 9GB HDDs.

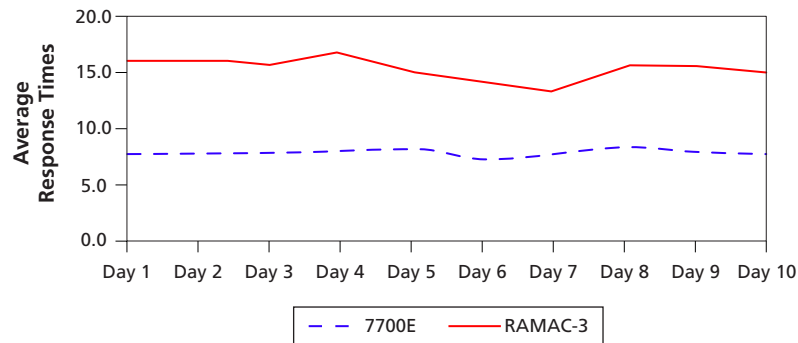


Figure 2 Average response time comparison of 7700E and RAMAC-3.

Our customer was very pleased with the response time improvements delivered by the 6GB HDDs. From their perspective, it was a more cost-effective solution for their DB2 application performance problem, since the other alternative would have been to make significant application changes and DB2 architecture changes with the N&A structures to achieve the desired performance.

Global access, availability across multiple platforms, centralized management, information protection, rapid response to change—these IT capabilities drive the design and development of Hitachi Freedom Storage. Hitachi Data Systems delivers the comprehensive, customizable, manageable, application-enabling hardware and software to help companies align their IT needs with their business requirements. Building and protecting the mission-critical environments of the world's largest corporations is Hitachi Data Systems' primary strength.

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