Data Warehouse Performance

W.H. Inmon Ken Rudin Christopher K. Buss Ryan Sousa

Technische Universität Darmstadt FACHBEREICH INFORMATIK				
BIBLIOTHE	<u>K</u>			
Inventar-Nr.: 799-00268				
Sachgebiete: H. 2 / Jomo	H. 2/ Jamo			
Standort: \(\lambda \lambda \l	<i>222</i> L			

WILEY COMPUTER PUBLISHING

Fachbereichsbibliothek Informatik TU Darmstadt



John Wiley & Sons, Inc.

New York • Chichester • Weinheim • Brisbane • Singapore • Toronto

Contents

Acknowledgment	ls .	XÌ
Preface		xiii
Chapter One	Introduction to Data Warehouse Performance	1
	Measuring Performance	2
•	Productivity and Performance	2 3
	Data Volumes and Performance	4
	Why the Growth of Data?	5
)	Data Gets in the Way	6
,	Finding Hidden Data	6
	User Expectations and Performance	10
	Education and Performance	12
	Achieving Performance	13
	When Should Performance Be Considered?	13
	Summary	15
PART ONE US	age, Data, and Performance	
Chapter Two	User Community and Performance	19
	Know Your End Users: Farmers and Explorers	19
	The World of the Explorer	22
	Profile of Execution	26
	World of the Farmer	27
	Typing the Farmer and the Explorer	30
	Clerical verșus Management	31

	Casual versus Power	32
	Predefined versus Ad Hoc	32
	Summary versus Detailed	33
	Simple versus Complex	34
	Summary	34
Chapter Three	Farmers and Explorers	37
	Optimizing for the Explorer	39
	Subsetting and Removing Data	40
	Creating a Living Sample	42
	Exploration Warehouse	44
	Optimizing for The Farmer	54
	Strategic Approaches to Performance	55
	Tactical Approaches to Performance	57
	Operational Approaches to Performance	64
	Summary	72
Chapter Four	Data Marts	75
	What is a Data Mart?	<i>7</i> 5
	Data Mart Community	<i>7</i> 7
	Data Mart Appeal	<i>77</i>
	Data Mart Source	79
	Building the Data Mart First	80
	Different Kinds of Data Marts	81
	Loading the Data Mart	82
	Metadata in the Data Mart	84
	Data Modeling for the Data Mart	85
	Purging the Data Mart	86
	Data Mart Contents	87
	Structure within the Data Mart	87
	Performance in the Data Mart	90
	Monitoring the Data Mart Environment	91
	Summary	92
Chapter Five	Dormant Data	95
	Understanding Dormant Data	96
	Summary Tables and Dormant Data	98
	Misjudgment of History and Dormant Data	98
	Reality of Requirements and Dormant Data	98
	Insistence of Detail and Dormant Data	99

	Contents	1

	Calculating Dormant Data	99
	Finding Dormant Data	101
	Removing Dormant Data	102
	Selecting Data to be Removed	103
	Determining the Probability of Access	105
	Summary	107
Chapter Six	Data Cleansing	109
	How Dirty Data Gets In	109
	Cleansing Dirty Data	111
	Cleansing the Legacy Environment	111
	Cleansing at the Point of Integration	113
	Cleansing after Loading	114
	Different Kinds of Audits	116
	Managing Required Resources	116
	Cleansing Data Over Time	119
	Bounded Referential Integrity	120
	Summary	122
Chapter Seven	Monitors	125
	Activity Monitors	125
	Finding Dormant Data	127
	Understanding Dormant Data	129
,	Removing Dormant Data	130
	Capturing Activity Information	131
	Reviewing the Output	136
	Resource Governors Versus Query Blocking	138
	Resource Governors—Nothing New	138
	Why Are Resource Governors Inadequate?	138
	Query Blocking	142
	Monitoring Data Content	143
	Data Warehouse Alarm Clock	147
	Summary	150
PART TWO Plat	tform and Performance	
Chamter Fight	Commonante of the High Boufermones Blatters	4
Chapter Eight	Components of the High-Performance Platform	155
	Performance Chain	156
	Scalability Requirement	156

	Parallelism and Its Relationship to Performance	159
	What Is Parallelism?	159
	Types of Parallelism	162
	High-Performance Hardware	166
	Symmetric Multiprocessors (SMPs)	167
	Clusters	170
	Massively Parallel Processors (MPPs)	174
	Nonuniform Memory Access (NUMA)	178
	High-Performance Databases	182
	Parallel Queries	182
	Shared-Disk and Shared-Nothing Database Architectures	186
	Other Parts of the Performance Chain	190
	The Extract/Transform/Load Component	190
	End-User Access Tools	193
	Scalable Application Frameworks	194
	Summary	196
hapter Nine	imes Building a High-Performance Platform	197
	System Architecture	198
	Three-Tiered Architectures	199
	Two-Tiered Architectures	204
	The Solution: Scalable Data Marts	206
	Building a Balanced Hardware System	210
	Estimating the Business Requirements	211
	Determining the Technical Configuration	213
	Iterate	216
	Designing the Physical Database for Performance	218
	Denormalizing the Database	219
	Indexing Your Data	226
	Designing Your Disk Layout	232
	Taking Advantage of I/O Parallelism	234
	Striping Techniques	234
	Table Partitioning Techniques	242
	Optimizing the Queries	248
	Execution of an SQL Query	249
	Effects of Parallelism	251
	CPU Utilization	253
	Query-Optimization Questions	254
	Summary	256

Vii

Chapter Ten	Advanced Platform Topics	259
	Building a Performance Assurance Environment	259
	Defining the Performance Assurance Metrics	260
	Building Performance Assurance Tests	263
	Very Large Database (VLDB) Issues with Data	
	Warehousing	270
	Custom Code Requirements	271
	One-In-A-Million Odds Occur Frequently	272
	Statistical Effects	273
	Algorithm Changes	274
	Exceeding Batch Windows	277
	X Data Warehouses and the Web	278
	Web Access Means More Users	280
	Web Access Means More Data	282
	Data Warehouses and Data Mining	283
	Data Mining Requires Scalability	284
	The Basics of Scalable Data Mining	286
	imes Data Warehouses and Object-Relational Databases	287
	Scalable Performance for Complex Data Types	288
	Scalable Functionality	290
	Scalability Issues Regarding Object-Relational Technology	290
	Summary	294
PART THREE	Service Management and Performance	
Chapter Eleven		
	Contract	299
	Service Management Defined	300
	Business Need for Service Management	302
	The Service Management Contract	304
	Creating the Service Management Contract	305
	Step 1: Establish Relevant Data Warehouse Resources	
	Inventory or Services Catalog	307
	Step 2: Characterize Usage of Data Warehouse Resources	308
	Step 3: Determine Current or Projected Service Levels	308
	Step 4: Understand the Customer's Requirements	309
	Step 5: Determine Cost and Feasibility of Customer's	
	Requirements	310

0

	Step 6: Create the Service Management Contract Step 7: Track Compliance to the Service Management Contract Summary	311 319 320
Chapter Twelve	Putting the Service Management Contract in Motion	323
	Putting the SMC in Context	324
	Organization Layer	325
	Service Dimensions Layer	325
	Service Reporting Layer	327
	Data Warehouse Administration (DWA)	
	Organization Layer	327
	Service Administrator	329
	Measuring the Right Metrics	329
	DWA May Not Be In IT	330
	Challenges Existing DW Support Structure	330
	Service Reporting Layer	333
	Service Dimensions Layer	335
	Query Response Time Dimension	336
	User Concurrency Dimension	343
	Data Storage Dimension	348
	System Availability Dimension	351
	Data Currency Dimension	356
	Data Quality Dimension	364
	Summary	369
PART FOUR Pieci	ng Together the Elements	
Chapter Thirteen	Delivering a High-Performance Data Warehouse Environment	373
	·	375
	Case Study Overview	376
	Company Background Changing Business Landscape	376
	Marketing Challenges	377
	Justifying the Data Warehouse Environment	378
	Building the Team	378
	Scoping the Three- to Six-Month Deliverable	380
	Delivering the Data Warehouse Environment	383
	Assess the Capabilities	384

	Contents	ix
	Aligning the Users, Workload, and Capabilities	388
	Design the Databases	390
	Data Mart and Exploration Warehouse Designs	393
	Data Mart Design	394
	Exploration Warehouse Design	400
	Data Warehouse Design	404
	Configure the Hardware	415
	Servicing the Data Warehouse Environment	418
	Summary	420
Recommende	ed Reading	421
	Articles	421
	Books	429
	Book Reviews	430
Index		431

)