

PERIODIC TABLE OF DYNAMIC MANAGEMENT OBJECTS

the science of performance tuning SQL with DMVs

- ▶ Presentation by Tim Ford
timothyrford@gmail.com



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DALLAS, TX



Tim's Blog: theSQLAgentMan



The Periodic Table of DMOs



Performance Tuning with SQL Server Dynamic Management Views Book



Glenn Berry's SQL Server Performance Blog



Brent Ozar PLF Wait Stats Goldmine



Ola Hallengren Index Tuning Suite





History



WHAT ARE WE

TALKING ABOUT?

catalog views

dbid

resource

compatibility

systems

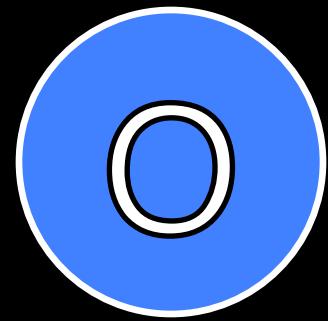
master

tables

sys
views

database_id

sys.dm



Organization



hydrogen 1 H 1.0079	lithium 3 Li 6.941	beryllium 4 Be 9.0122
sodium 11 Na 22.990	magnesium 12 Mg 24.305	
potassium 19 K 39.098	calcium 20 Ca 40.078	
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	
caesium 55 Cs 132.91	barium 56 Ba 137.33	
francium 87 Fr [223]	radium 88 Ra [226]	57-70

scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80
yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [264]	bohrium 107 Bh [269]	hassium 108 Hs [268]	meitnerium 109 Mt [271]	ununnilium 110 Uun [271]	unununium 111 Uuu [272]	ununbium 112 Uub [277]	ununquadium 114 Uuq [289]					

* Lanthanide series

** Actinide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europerium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

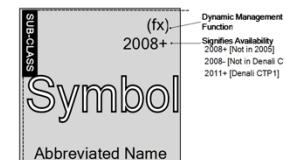


Periodic Table of SQL Server Dynamic Management Objects

ST	SQL Text	Q	Query Plan
eC	Connections	eS	Sessions
eR	Requests	TL	Trx Locks
tAT	Active Trx	tDT	Database Trx
tCT	Current Trx	tST	Session Trx
tsVS	Version Store	tsVG	Top Version Gens
tsDT	Active Spsht DB Trx	tsTS	Trx Snapshot
tsCS	Current Snapshot	xD	Missing Index Details
ixUS	Index Usage Stats	xG	Missing Index Columns
ixOS	Index Operational Stats	xC	Missing Index Groups
ixPS	Index Physical Stats	xGS	Query Transform Stats
QS	Query Stats	QTS	Query Memory Grants
QOI	Query Optimizer Info	QMG	Query Memory Grants
CP	Cached Plans	TQP	Text Query Plan
CPO	Cached Plan Dependent Obj	PA	Plan Attributes
TS	Trigger Stats	PRS	Procedure Stats
PC	OS Performance Counters	RB	OS Ring Buffers
ioPR	IO Pending IO Requests	ioFS	IO Virtual File Stats
WS	OS Wait Stats	WT	OS Waiting Tasks
xeD	OS Dispatchers	xeDP	OS Dispatcher Pools
xeS	XE Sessions	xeST	XE Session Targets
xeSE	XE Session Events	xeSA	XE Session Actions
xeM	XE Map Values	xeP	XE Packages
xeO	XE Objects	xeOC	XE Object Columns
xeSC	XE Session Object Columns		
eBJQ	Background Job Queue	eBJS	Background Job Queue Stats
fAC	Active Catalogs	fH	FD Hosts
fIK	Index Keywords	fKD	Index Keywords By Document
fIP	Index Population	fMB	Memory Buffers
fMP	Memory Pools	fOB	Outstanding Batches
fPR	Population Ranges	fp	Parser
clrD	CLR App Domains	clrA	CLR Loaded Assemblies
clrP	CLR Properties	clrT	CLR Tasks
fsIH	Filestream File IO Handles	fsIR	Filestream File IO Requests
bAT	Broker Activated Tasks	bC	Broker Connections
bFM	Broker Forwarded Messages	bQM	Broker Queue Monitors
bQMS	Broker Queue Monitors	QNS	ON Subscriptions
xmlH	XML Handles		

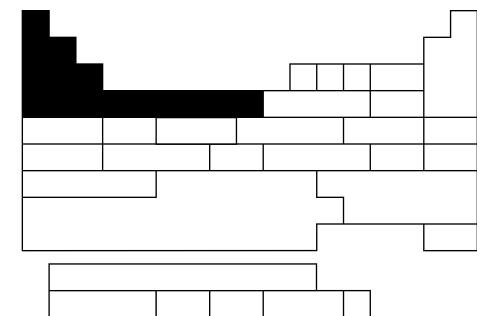
Dynamic Management Objects Classification Key	
USE	Includes Activity (Connections, Sessions, Requests), Locking, Snapshot Isolation, and Transaction-based Dynamic Management Functions and Views.
QRY	Includes both Query and Query Plan-related Dynamic Management Functions and Views.
PFC	Includes CPU, Extended Events, General Instance Performance, I/O, Memory, Resource Governor, and Wait Stats Dynamic Management Functions and Views.
SEC	Includes Auditing, Change Data Capture, and Encryption Dynamic Management Functions and Views.
HA	Includes Clustering, Mirroring, and Replication Dynamic Management Functions and Views.
IDX	Includes Index (and Missing Index) Dynamic Management Functions and Views.
SCR	Includes Backup, Database Information, Referential Integrity, Server Information, and Object Space-related Dynamic Management Functions and Views.
OS	Includes (most) Dynamic Management Objects that return information on memory, worker, task, scheduler, latching and spinlocks inside the SQL OS layer.
FTS	Includes Full-Text Indexing based Dynamic Management Functions and Views.
PHY	Includes Common Language Runtime, FileStream, Service Broker, and XML-centric Dynamic Management Functions and Views.

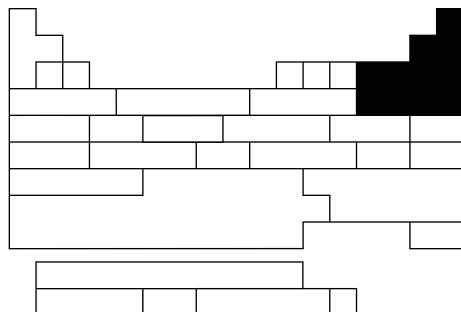
fAC	2008+	fH	2008+	fIK	2008+	fKD	2008+	fIP	2008+	fMB	2008+	fMP	2008+	fOB	2008+	fp	2008+	fPR	
Active Catalogs		FD Hosts		Index Keywords		Index Keywords By Document		Index Population		Memory Buffers		Memory Pools		Outstanding Batches		Parser		Population Ranges	
clrD		clrA		clrP		clrT		fsIH		fsIR		bAT		bC		bFM		bQMS	
CLR App Domains		CLR Loaded Assemblies		CLR Properties		CLR Tasks		Filestream File IO Handles		Filestream File IO Requests		Broker Activated Tasks		Broker Connections		Broker Forwarded Messages		Broker Queue Monitors	
xmlH																		ON Subscriptions	



ACTIVITY	ST (fx)			
	SQL Text			
	eC	eS		
	Connections	Sessions		
	eR	TL	eCr (fx)	
LOCKING	Requests	Trx Locks	CURSORS	Cursors
TRANSACTION	tAT	tDT	tCT	tST
	Active Trx	Database Trx	Current Trx	Session Trx

SNAPSHOT ISOLATION	tsVS	tsVG	tsDT	tsTS
	Version Store	Top Version Gens.	Active Spshtr DB Trx	Trx Snapshot
				tsCS
				Current Snapshot





PLAN STATS		QP	Query Plan (fx)
CP	Cached Plans (fx)	TQP	Text Query Plan
QS	Query Stats 2008+	QOI	Query Optimizer Info (fx)
QTS	Query Transformat'n Stats 2008+	QMG	Query Memory Grants 2008+
CPD	Cached Plan Dependent Objs	PA	Plan Atributes
TS	Trigger Stats	PRS	Procedure Stats

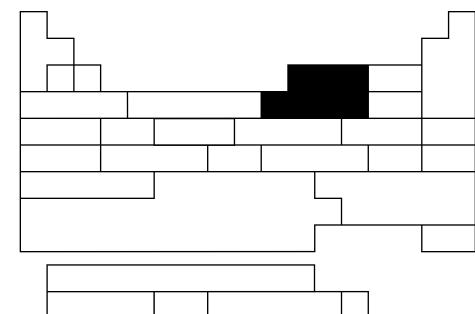
... What are these users doing on my nice clean server?



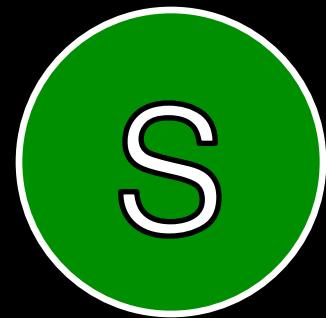
Science Break 1



INDEX USAGE	ixUS Index Usage Stats	INDEX OPERATIONAL (fx)	ixOS Index Operational Stats	INDEX PHYSICAL (fx)	ixPS Index Physical Stats
MISSING INDEXES	xD Missing Index Details	xG Missing Index Groups	xC Missing Index Columns	(fx)	xGS Missing Index Group Stats



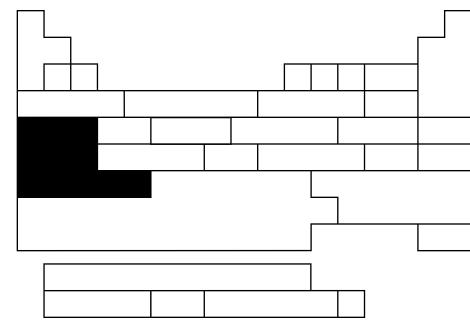
... fun with indexes

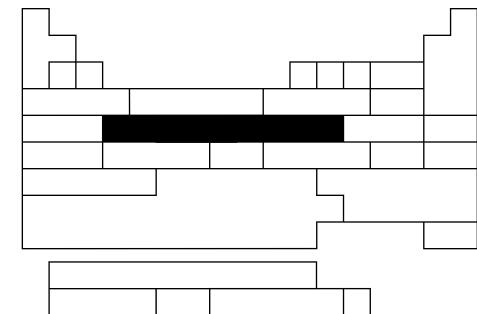
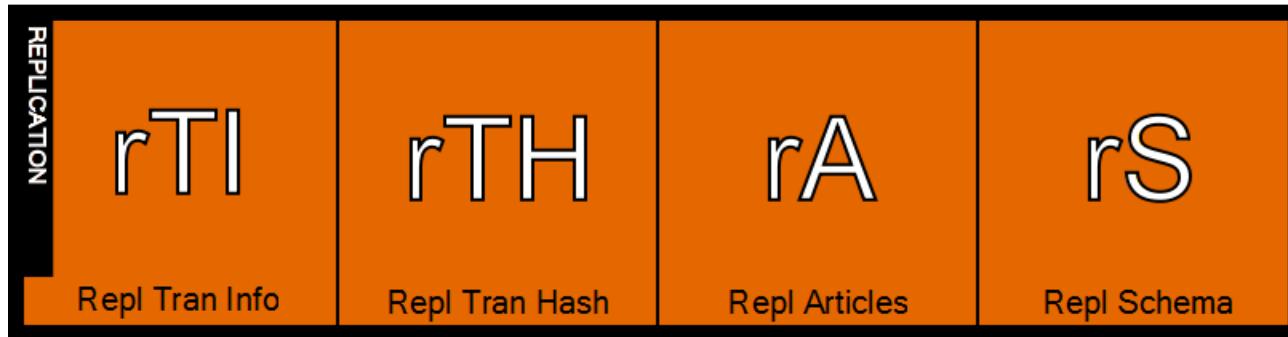
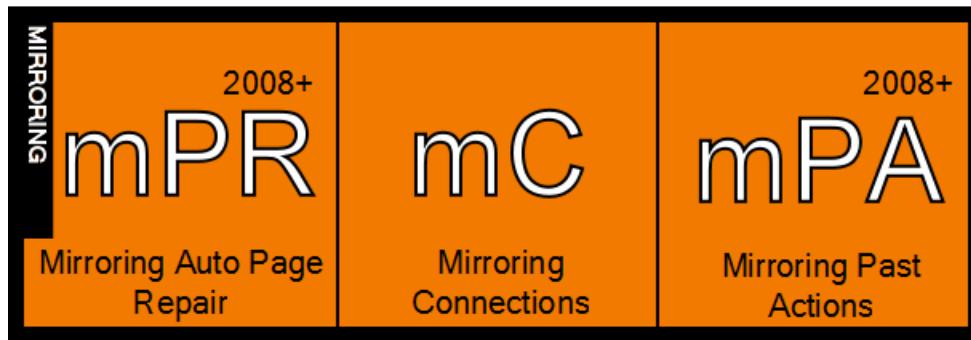
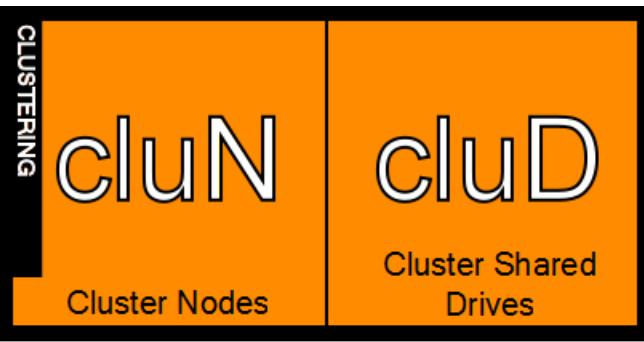


Science Break 2



CHANGE DATA CAPT.	cdcE CDC Errors 2008+	cdcS CDC Log Scan Sessions 2008+	tCTB Commit Table 2008+
AUDITING	aS Server Audit Status 2008+	aA Audit Actions 2008+	aCM Audit Class Type Map 2008+
ENCRYPTION	EK DB Encryption Keys 2008+	cyK Crypt Provider Keys (fx) 2008+	cyS Crypt Provider Sessions (fx) 2008+
	cyP Crypt Provider Properties 2008+	cyA Crypt Provider Algorithms (fx) 2008+	





my oh-my! what a cluster...



Science Break 3



SERVER INFO**oSI**

Sys Info

(fx)
2008+**dSL**

Script Level

2008+

dPSFPersisted SKU
Features**iBT**

Backup Tapes

REFERENT. IDENTITY**RgE**

Referencing Entities

RdE

Referenced Entities

TEMPDB**dPS**

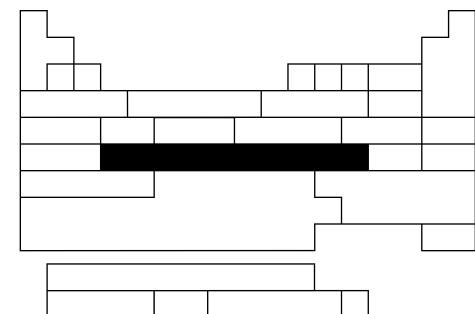
Partition Stats

dSSUSession Space
Usage**dFSU**

File Space Usage

dTSU

Task Space Usage



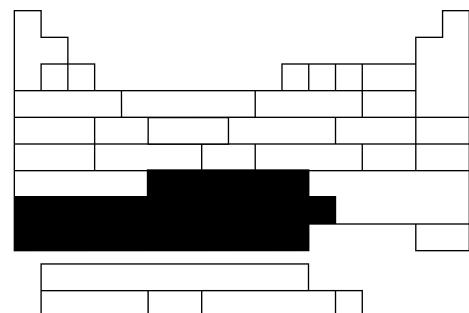
...the MacGyver of DMVs



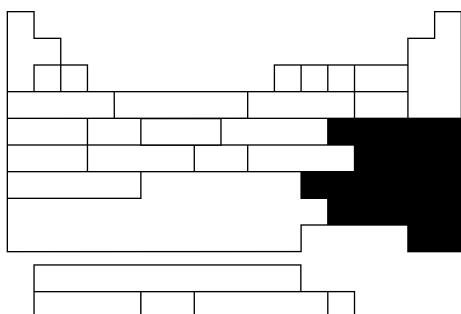
Science Break 4



					OSOS						
					oSK OS Stacks	WLS OS Worker Local Storage	W OS Workers	T OS Tasks	TH OS Threads	SCH OS Schedulers	
oSL Sublatches	oLS Latch Stats	oSS 2008+ Spinlock Stats	oN 2008+ OS Nodes	oBD OS Buffer Descriptors	MA OS Memory Allocations	MB 2008+ OS Memory Brokers	MNS 2008+ OS Memory Node Access Stats	MN 2008+ OS Memory Nodes	oSM 2008+ OS Sys Memory	MP OS Memory Pools	MO OS Memory Objects
oLM Loaded Modules	oH OS Hosts	oCI 2008+ (fx) Child Instances	oVAD 2008+ OS Virtual Address Dump	oPM OS Process Memory	MCH Memory Cache Clock Hands	MCE Memory Cache Entries	MCH Memory Cache Hash Tables	MC OS Memory Clerks	QRS Query Resource Semaphores	MCC OS Memory Cache Counters	



rgC Resource Governor Configuration <small>2008+</small>	rgWG Resource Governor Workload Groups <small>2008+</small>	rgRP Resource Governor Resource Pools <small>2008+</small>	PC OS Performance Counters <small>GENL PERFORMANCE</small>	RB OS Ring Buffers <small>2008+</small>
		ioPR IO Pending IO Requests <small>IODISK</small>	ioFS IO Virtual File Stats <small>(fx)</small>	WS OS Wait Stats <small>WAITS</small>
				WT OS Waiting Tasks <small>2008+</small>
xeD OS Dispatchers <small>2008+</small>	xeDP OS Dispatcher Pools <small>2008+</small>	xeS XE Sessions <small>2008+</small>	xeST XE Session Targets <small>2008+</small>	xeSE XE Session Events <small>2008+</small>
				xeSA XE Session Event Actions <small>2008+</small>
		xeMV XE Map Values <small>2008+</small>	xeP XE Packages <small>2008+</small>	xeO XE Objects <small>2008+</small>
				xeOC XE Object Columns <small>2008+</small>
				xeSC XE Session Object Columns <small>2008+</small>
				eBJQ Background Job Queue <small>STATS</small>
				eBJS Background Job Queue Stats <small>2008+</small>



performance-enhancing... *scripts*



Science Break 5



FULL TEXT INDEX

fAC

Active Catalogs

fH
2008+

FD Hosts

fIK
(fx)
2008+

Index Keywords

fIKD
(fx)
2008+

Index Keywords By Document

fIP

Index Population

fMB

Memory Buffers

fMP

Memory Pools

fOB
2008+

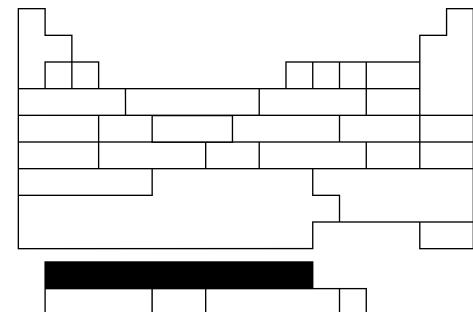
Outstanding Batches

fP
(fx)
2008+

Parser

fPR

Population Ranges



CLR

clrD

CLR App Domains

clrA

CLR Loaded Assemblies

clrP

CLR Properties

clrT

CLR Tasks

FILESTREAM

2008+

fsIH

Filestream File IO Handles

2008+

fsIR

Filestream File IO Requests

SERVICE BROKER

bAT

Broker Activated Tasks

bC

Broker Connections

bFM

Broker Forwarded Messages

bQM

Broker Queue Monitors

QNS

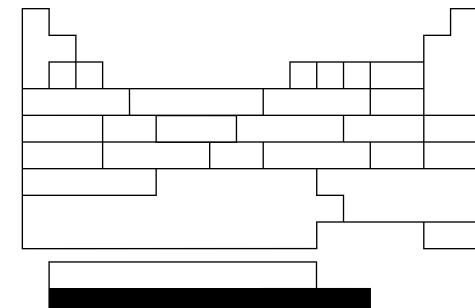
QN Subscriptions

XML

(fx)

xmlH

XML Handles

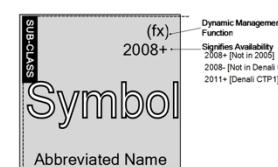


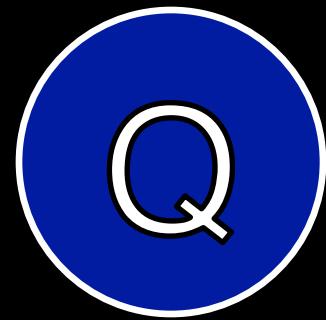
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tAT	tDT	tCT	Active Trx	Database Trx	Current Trx	Session Trx	Version Store	Top Version Gens	Active Spsht DB Trx	Trx Snapshot	Current Snapshot	TQP
cdcE	cdcS	tCTB	CDC Errors	CDC Log Scan Sessions	Commit Table	Cluster Shared Drives	Mirroring Auto Page Repair	Mirroring Connections	Mirroring Past Actions	Repl Tran Info	Repl Tran Hash	xC
aS	aA	aCM	Server Audit Status	Audit Class Type Map	Script Level	dSI	dPSF	iBT	RgE	RdE	rA	xG
EK	cyK	cyS	DB Encryption Keys	Crypt Provider Keys	Crypt Provider Sessions	cyP	cyA	oSK	WLS	W	T	xD
oSL	oLS	oSS	Subslatches	Latch Stats	Spinlock Stats	oN	oBD	MA	MB	MNS	MN	rgC
oLM	oH	oCI	Loaded Modules	OS Hosts	Child Instances	oVAD	oPM	MCH	MCE	MCH	MC	rgWG
fAC	fH	fIK	Active Catalogs	FD Hosts	Index Keywords	fKD	fIP	fMB	fMP	fOB	fP	rgRP
clrD	clrA	clrP	CLR App Domains	CLR Loaded Assemblies	CLR Properties	clrT	fsIH	fsIR	bAT	bC	bFM	rgPC
Symbol	Abbreviated Name											

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fAC	fH	fIK	fKD	fIP	fMB	fMP	fOB	fP	fPR
Active Catalogs	FD Hosts	Index Keywords	Index Keywords By Document	Index Population	Memory Buffers	Memory Pools	Outstanding Batches	Parser	Population Ranges
clrD	clrA	clrP	clrT	fsIH	fsIR	bAT	bC	bFM	bQM
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QNS	xmlH								

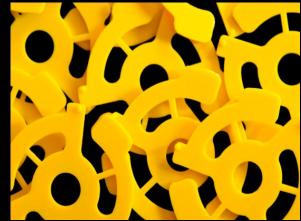




A Little Bit of Q & A



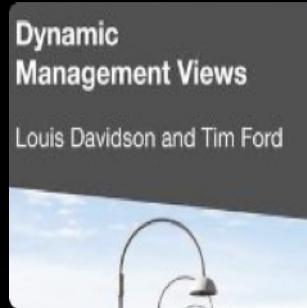
ABOUT ME



B-Side Consulting



theSQLAgentMan.com



achievements

consulting

writing

working