



SQL Performance Suite Overview

Steve Thomas – Wednesday May 30th – 2.07

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Agenda

REVIEW OF RELEASE 19 FEATURES

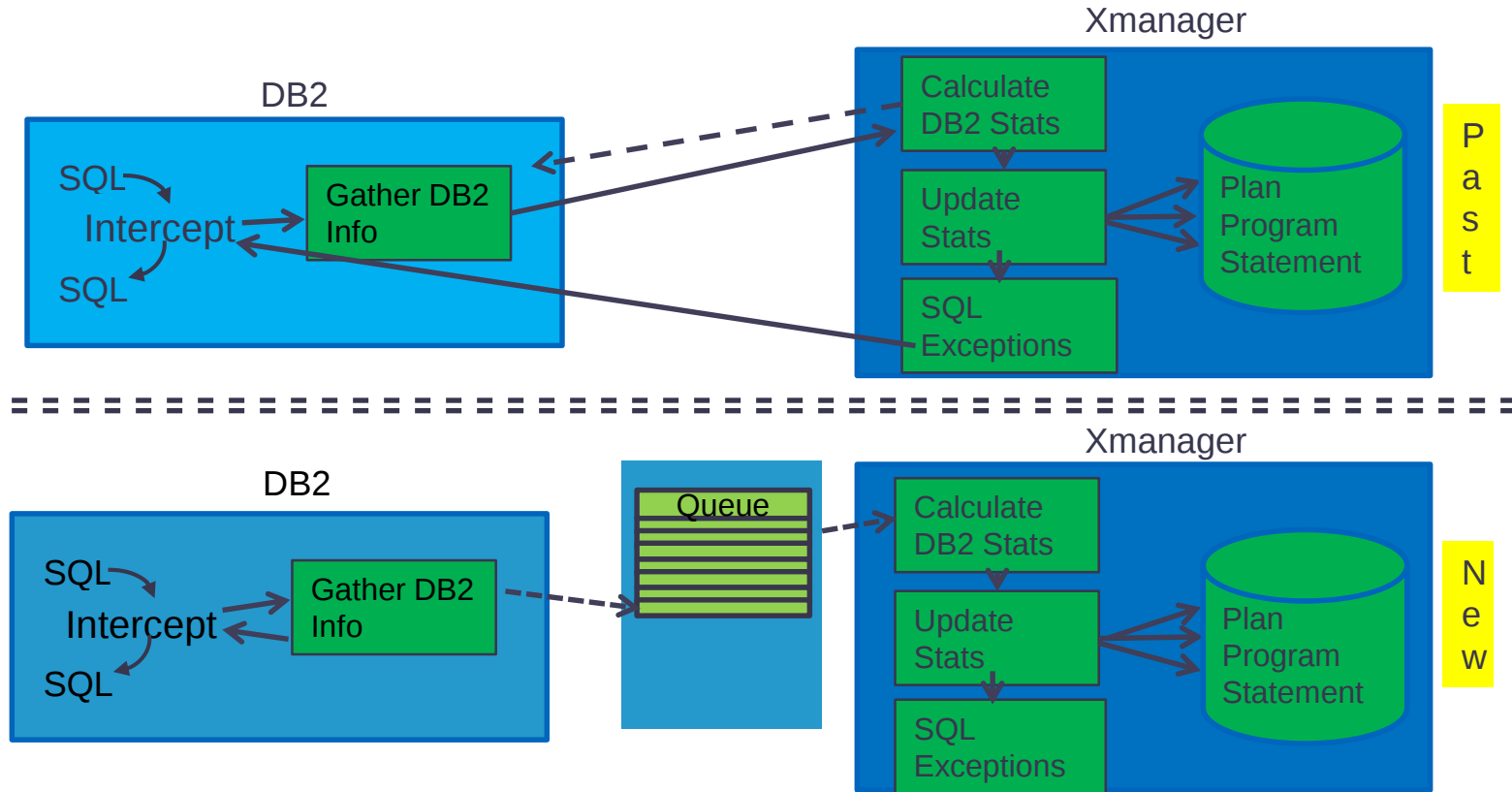
MAINFRAME TEAM CENTER – DB2 PERFORMANCE ANALYSIS

MAINFRAME OPERATIONAL INTELLIGENCE

OTHER RELEASE 20 FEATURES

Q&A

Detector – Collection method update (r19 post GA PTF)



Collection Task Parameters (PDT PARMLIB member)

- **USECOLLTASKS**

“N” – Collection tasks will not be used. This is the default.

“Y” or “A” – Use collection tasks. If collection task initialization fails “Y” results in collection termination, “A” collection continues as if “N” was specified.

- **USEZIIP**

“Y” – zIIP enable the collection tasks. If zIIP enablement fails collection tasks continue as if “N” was specified. This is the default.

“N” – Collection tasks will not run on the zIIP.

- **COLLTASKSCNT** specifies how many collection tasks to start.

“0” - Calculated by “($\#CP + \#zIIP \text{ online}$)/2 rounded down” with a minimum of 2 and a maximum of 5. This is the default.

“1 thru 20” – Overrides the calculated number of collection tasks.

- **MAXQ** specifies queue elements in overall collection tasks

Implemented in PTF RO95921 for 19.0 and RO96580 for 20.0

Default is 10000 when COLLTASKSCNT is 4 or less

15000 when COLLTASKSCNT is 5 or greater

Max is 120000

SSID Collection Status

```
19.0 ----- DETECTOR Collection Status Display
COMMAND ==> _
```

```
S -Current Interval Data  H -Historical Data  C -Collection Information
I -Initialize Collection  T -Term Collection
```

SSID	SYSTEM	CSTATUS	SQL-STMTS	ABENDS	LOSTDATA	PDT-XM-CP
DB2G	CA31	ACTIVE	2391185	1	0	00:11.955464
DD2G	CA31	INACTIVE				
DH3G	CA31	INACTIVE				
D10A	CA31	INACTIVE				
D11A	CA31	INACTIVE				
D12A	CA					
PP4A	CA					

```
19.0 ----- DETECTOR Collection Status Display ----- 15/12/01 17
COMMAND ==> _ SCROLL ==> C
```

```
S -Current Interval Data  H -Historical Data  C -Collection Information
I -Initialize Collection  T -Term Collection
```

SSID	PDT-XM-ZIIP	SRVCLASS	SDATE	STIME	INTTM	TIMLM	AUTO	EXT
DB2G	00:29.996596	NOTINPOL	15/11/29	22:18:04	01:00	00:00	YES	YES
DD2G								
DH3G								
D10A								
D11A								
D12A								
PP4A								

```
19.0 ----- CA-Detector Main M
OPTION ==> _
DB2 SSID ==> D10A USERID ==> MATS
-----
1  SSID current interval data
2  SSID historical interval data
3  SSID collection status
4  Maintain collect/report profiles
5  Initialize SSID collection
6  Terminate SSID collection
7  Create/Initialize datastore
8  SSID, Active thread, SQL trace display
```

Detector Collection Detail Display ("C" line command)

```
19.0 ----- DETECTOR Collection Detail Display ----- 15/12/01 17:14
Command ==> _ Scroll ==> CSR
DB2 SSID ==> DB2G Collection/Interval ==> C
LINE 35 OF 127
Interval Date ==> 15/11/29 Interval Time ==> 22:18:03 Elapsed Time ==> 01-18:53
-----
HV/SQL 4K + 32K RELEASED --> 5611932 (C)
QBAC CELLS IN POOL --> 98
QBAC COPY INITIALIZATIONS --> 65062 (C)
ITS CELLS IN POOL --> 286
ITS CELLS ADDED TO STACK --> 8393785 (C)
ITS CELLS REMOVED FROM STACK --> 8393620 (C)

Xmanager Address Space
JOBNAME --> PTX9898X
ASID (HEX) --> 006B
XMANAGER SERVICE CLASS --> NOTINPOL
DISPATCHING PRIORITY (HEX) --> 00E6
TOTAL CP USAGE --> 00:42.951526 (C)
TOTAL ZIIP USAGE --> 00:31.316290 (C)
TOTAL ZIIP ON CP --> 00:01.633048 (C)
DEMAND PAGING RATE (PER SEC) --> .0 (C)
WORKING SET SIZE --> 31.07M
LOW PVT USER ALLOC / LIMIT --> 1.05M 7.97M 13.3%
E-PVT USER ALLOC / LIMIT --> 33.39M 1.08G 3.0%
ABAR PRIVATE ALLOC / LIMIT --> 15M 6383.99G
ABAR (G) COMMON --> 8M

LPAR Information
SMF ID --> CA31
SYSTEM MAINTENANCE LEVEL --> Z/OS 2.1.0
CP PROCESSORS ONLINE --> 4
ZIIP PROCESSORS ONLINE --> 2
CP UTILIZATION --> 60
ZIIP UTILIZATION --> 6
REAL STORAGE AVAILABLE --> 71.83G
DEMAND PAGING RATE (PER SEC) --> .0 (C)
CSA ALLOC / LIMIT --> 2.37M 4.39M 54.1%
ECSA ALLOC / LIMIT --> 337.55M 720.78M 46.8%
```

Detector Collection Detail Display (continued)

```
19.0 ----- DETECTOR Collection Detail Display ----- 15/12/01 17:17
Command ==> _ Scroll ==> CSR
DB2 SSID ==> DB2G Collection/Interval ==> C
Interval Date => 15/11/29 Interval Time => 22:18:03 Elapsed Time => 01-18:53
-----

Queue processing subtask statistics - collection totals
Tsk Processed      Lost      CP-CPU      zIIP-CPU      zIIP-on-CP      Eleme>
-----
00      1550024      0 00:00.000907 00:07.031620 00:00.267213 1406>
                                THREAD
                                TIMER      97>
                                RETRY      46>
01      1620004      0 00:00.000095 00:07.348356 00:00.204671 1478>
                                THREAD
                                TIMER      95>
                                RETRY      46>
02      5098505      0 00:00.000198 00:16.033548 00:01.158943 4739>
                                THREAD
                                TIMER      110>
                                RETRY      248>

Collection options from PARMLIB(PDT)
COMPAT      --> N      USECOLLTASKS      --> Y
BUFSINPRVT  --> N      COLLTASKSCNT      --> 3
LATCH       --> Y      USEZIIP           --> Y

Interval time and time limit collection options:
Interval Time      --> 01:00
Round Interval     --> N
Sysplex Interval   --> 01:00      Use Sysplex Interval Time --> N
Time Limit         --> 00:00

Collection externalization options:
Externalize        --> Y
High Level         --> PDTDBA.R19PDT
Datastore Name     --> MATSA02

Start or restart automatic collection option:
Auto start         --> Y

Collection options:
Triggered SQL      --> Y      Plan Excl/Incl List --> N
```

Updated Queue Processing

- Originally each collection task had a max of 650 queue entries
 - However z/OS does not dispatch to us evenly
- Changed to queue of 10,000 or more elements shared among all tasks which absorbs the flooding of SQL work when we are not dispatched
 - Implemented in PTF RO95921 for 19.0 and RO96580 for 20.0
 - Use latest maintenance or ensure these are applied:
 - 19.0 - RO96922
 - 20.0 - RO97707

CA Subsystem Analyzer

Improving Collection Performance in r19

- Getpage Collection Sampling
- Volume and Extent option
- Together these options can reduce Subsystem Analyzer overhead by up to 50%

GETPAGE Collection Sampling

Delivered Feature

95% Confidence Level of within 1% of real value

Sampling Rate	Highly Accurate Getpage Count
-----	-----
3%	300,000 or more
6%	150,000 or more
12%	70,000 or more
25%	30,000 or more
50%	10,000 or more
100%	No minimum

BENEFITS

- Dramatic reduction in CPU overhead
- Less impact DB2 Applications
- Customers can now run full-time collection to obtain performance data

PAIN

- Current GetPage monitoring is highly important but can be costly for some systems
- Customers may need to turn off Subsystem Analyzer during times of peak system workload, thus losing visibility into performance metrics when it may be needed the most

SOLUTION

- Read only Nth GetPage activity
- Accurate metrics for objects with high activity
- Good enough metrics for objects with low activity

Volume and Extent Collection option

- Disabling volume and extent data collection reduces Subsystem Analyzer collection overhead.
 - Reduces Collection Workload by 6.5%, Application Overhead by 1.3%
 - Option added to the Initialize Subsystem Analyzer Collection display.
- Xmanager modify command START(SSA)
 - New keyword/parameter VXT(Y|N)

CA Plan Analyzer - Virtual Index management

Virtually create or drop an index to see affects in Explain

Delivered Feature

```
19.0 ----- PPA Virtual Index Table Maintenance ----- 2017/03/16 20:08
COMMAND ==>
VIXCreator ==> GROJE07 > Level ==> COLUMN Enable ==> *
Table ==> T% > Creator ==> GROJE07 > Mode ==> *
----- GROJE07
LOCATION ==> LOCAL DB2 SSID ==> D11B Version ==> V11CM

Table
Index
Cmd Column Creator Type Mode Enable
-----
TEST3 GROJE07 Table
TEST3I GROJE07 Type-2
CHAR1 CHAR
CHAR2 CHAR
VI_01_TEST3 GROJE07 Type-2 CREATE YES
CHAR1 CHAR
***** BOTTOM OF DATA *****
```

BENEFITS

- **Easily Use new IBM feature:** Remove manual efforts from interacting with DSN_VIRTUAL_INDEXES table.
- **Quicker Identification of new Indexes:** Better determine what new or existing Indexes should be changed.

PAIN

- Performance of SQL is heavily dependent on Indexes.
- Creating or Dropping real indexes can be costly and has major impact to existing workload.
- IBM created the Virtual Index feature, but interacting with the process is a manual and disjointed process.

SOLUTION

- Using Virtual Index Table Maintenance, you can easily interact with the DSN_VIRTUAL_INDEXES table.
- Easily turn on and off Virtual Index usage.
- Virtual Index info integrated with Access Path reports.

Other SQL Performance changes in r19

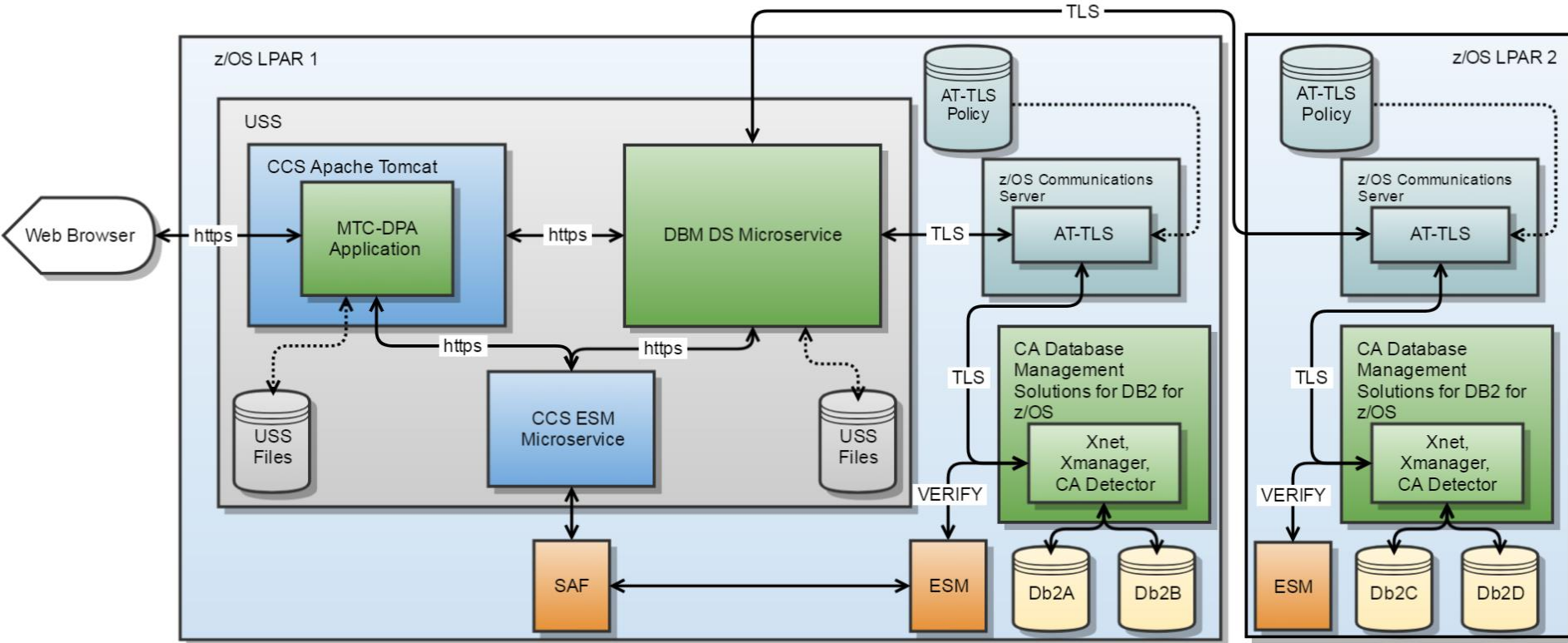
- Updated Main Menu – more intuitive
- Rebind Compare Analysis (RCA) – RC/Query via QECOMP
 - Current explain + Future explain + compare and show what-if REBIND)
- DB2 Accelerator Profile Management
- Access path reporting when no PLAN_TABLE
 - Via EXPLAIN PACKAGE
- Support for New DB2 Bind and DML options in Parsing
 - Many are related to Archive Options, Query Acceleration
- Simplified Statistics Migration
- And more...

MTC – DB2 Performance Analysis

The new Detector Graphical User Interface

- GA with 20.0 iR4 (April 2018)
- Uses CA Common Services r14.1 features:
 - CA ESM Microservice
 - Robust service that can handle modern implementation
 - Allow for AT-TLS encryption of network traffic
 - CA Common Services Tomcat
 - Web Service service that runs the GUI App
- CA DB2 Tools Data Services
 - Full REST API interface
 - Integrates with existing Xmanager and Xnet tasks

Architecture



Future UI Development focus

- SQL Errors
- Actual Graphics (Line & Pie charts)
- SQL Exceptions
- Tables and Indexes from Subsystem Analyzer
- Explain
- Intelligence Experience (Integration with other CA products)

Some history of CA Analytics for DB2

- CA recognized the potential value of Machine Learning several years ago
 - Two parallel development streams were started
 - One stream for System Metrics developed into MTC – Operational Intelligence (MOI)
 - The other involved DB2 SQL Performance data – Performance Analytics for DB2
- Customer validation on delivery platform as well as content
 - Performance Analytics for DB2 was going to be a SaaS solution
- Strong feedback - customers wanted ON-PREMISE solution
 - Result was that MTC – OI became our adopted delivery platform
- Now working on providing Transactional Analytics for DB2 under MOI

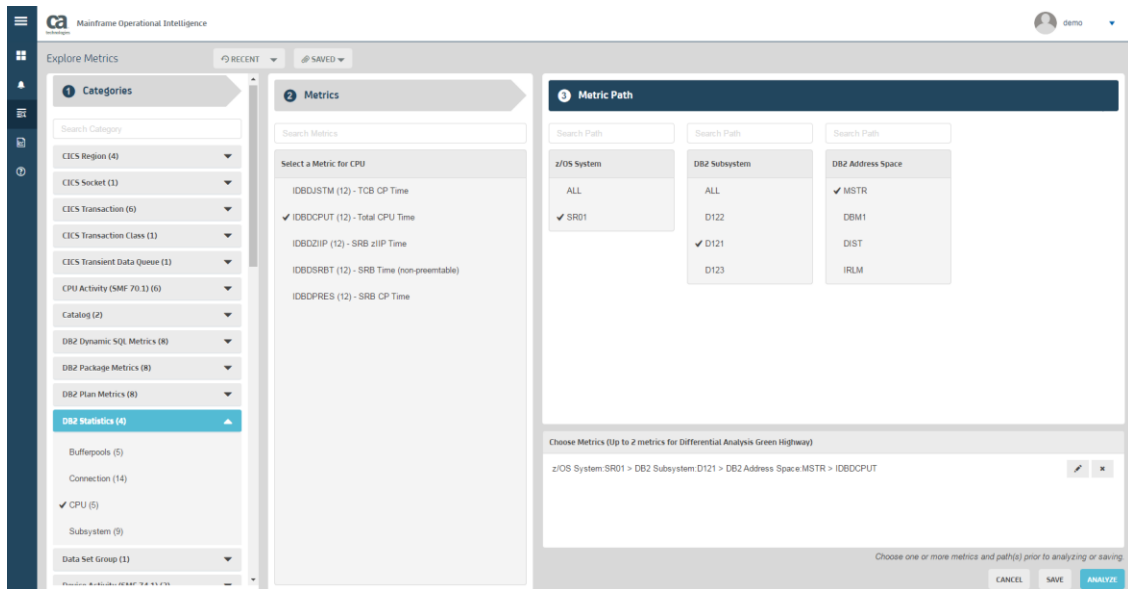
So where are we?

- Received Datastore data from several customers for validation
 - Used these to validate the accuracy of our predictive models
- As is usual for a ML system updating algorithms is an iterative process
- Existing ML Algorithms were for System data which always exists
 - DB2 data is transactional in nature and sparse
 - Some metrics, such as Lock Waits, are highly dynamic
- We have developed a set of ML algorithms to handle this type of data
- Detector at 20.0 iR4 now sends data to MOI
 - Just waiting for the changes within MOI to be implemented

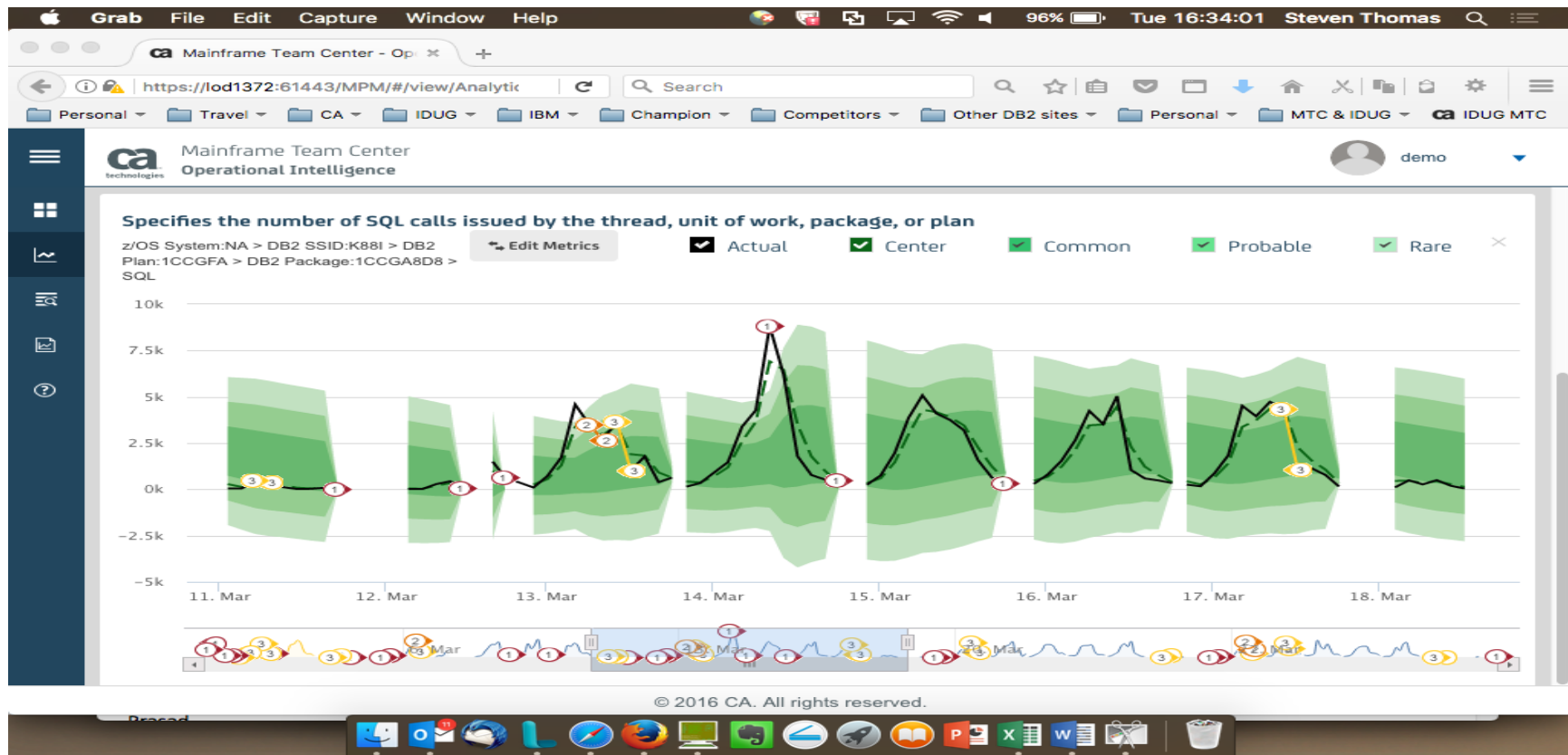
20 CA Mainframe Operational Intelligence for Db2 Management for z/OS



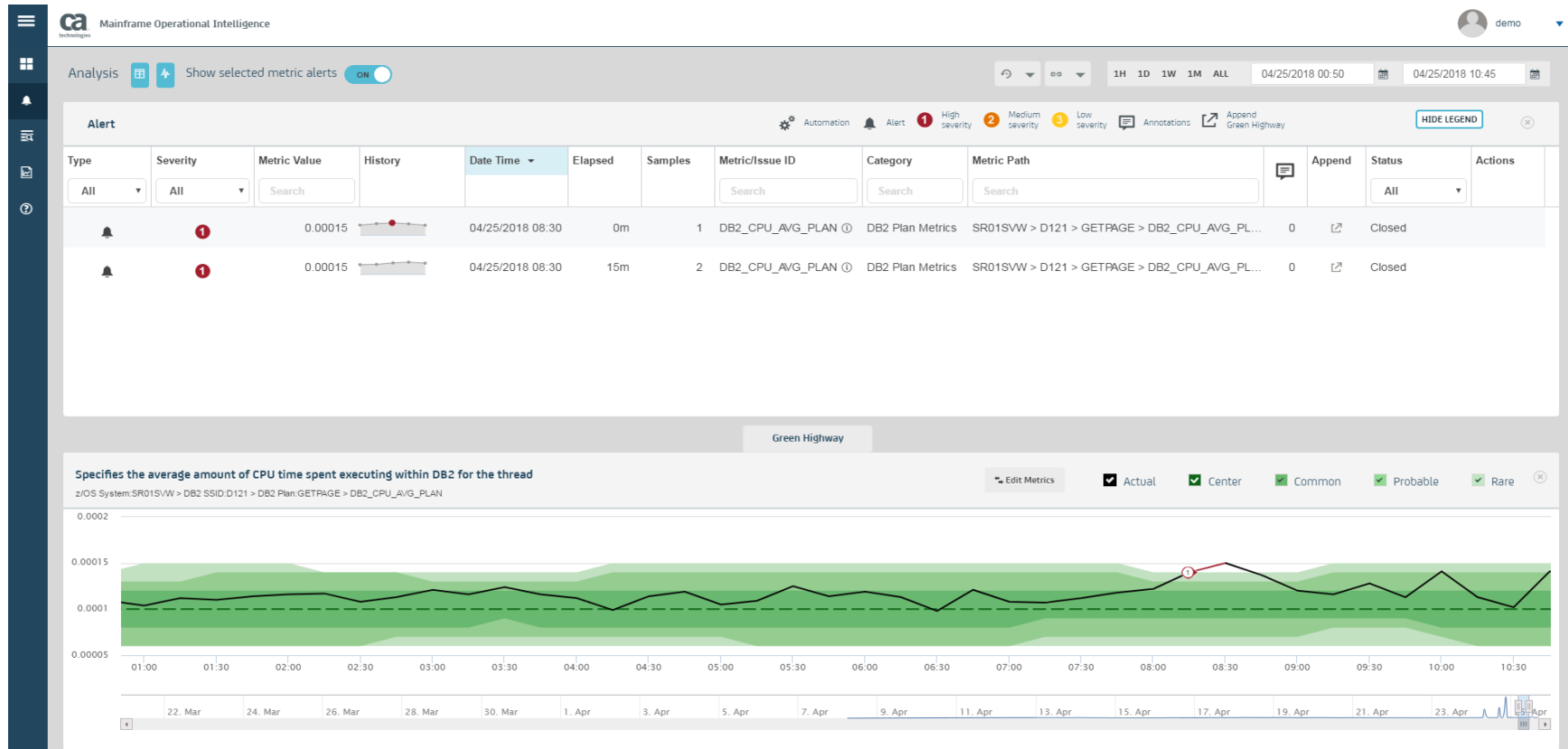
- Two data feeds
 - Db2 SQL
 - Db2 Systems
- Metrics collected
 - 9 SQL Total
 - 8 SQL Averages
 - Plan/Package for SQL
 - 33 System



Early Screenshot from 2017 (using an older UI)



Sample Screen from IDUG NA



Other changes added in 20.0

- Auto-Delete Threshold for Collection Intervals
 - Can now delete older Interval data if Datastore becomes full
 - Prevents collection stopping if datastore was too small
 - User defined threshold for how much data can be removed
- Automatic Collection restart after an internalabend
 - Restarts automatically without any manual intervention
 - No parameter needed to control this – it's automatic
- DB2 12 DDL & DML Support in Plan Analyzer
 - E.g. Obfuscated CREATE TRIGGER, LISTAGG, Offset in SELECT statements



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