

APEX Application Performance

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What Is This Presentation About

- Answer to two questions:
 - How is my application performing?
 - How can I get to the nitty gritty detail what my APEX app is doing?



What It's nOT

- How to write performant code
- Tell you when your app performance is good





Outline

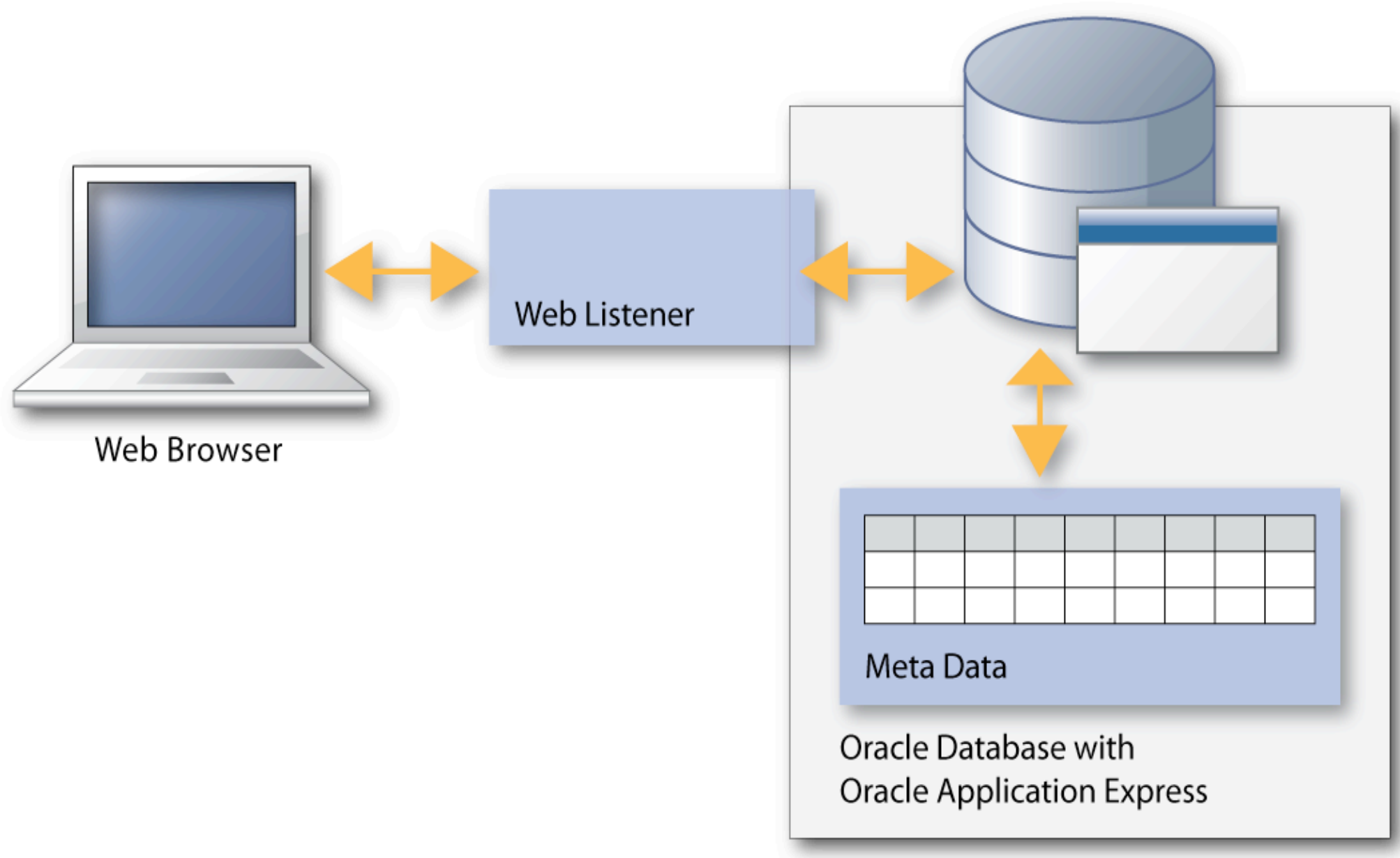
- APEX Architecture
- Querying the APEX Dictionary
- Code Instrumentation in APEX
- APEX Debug Mode
- Tracing in Oracle DB and APEX
- Demo APEX Performance Drill-Down



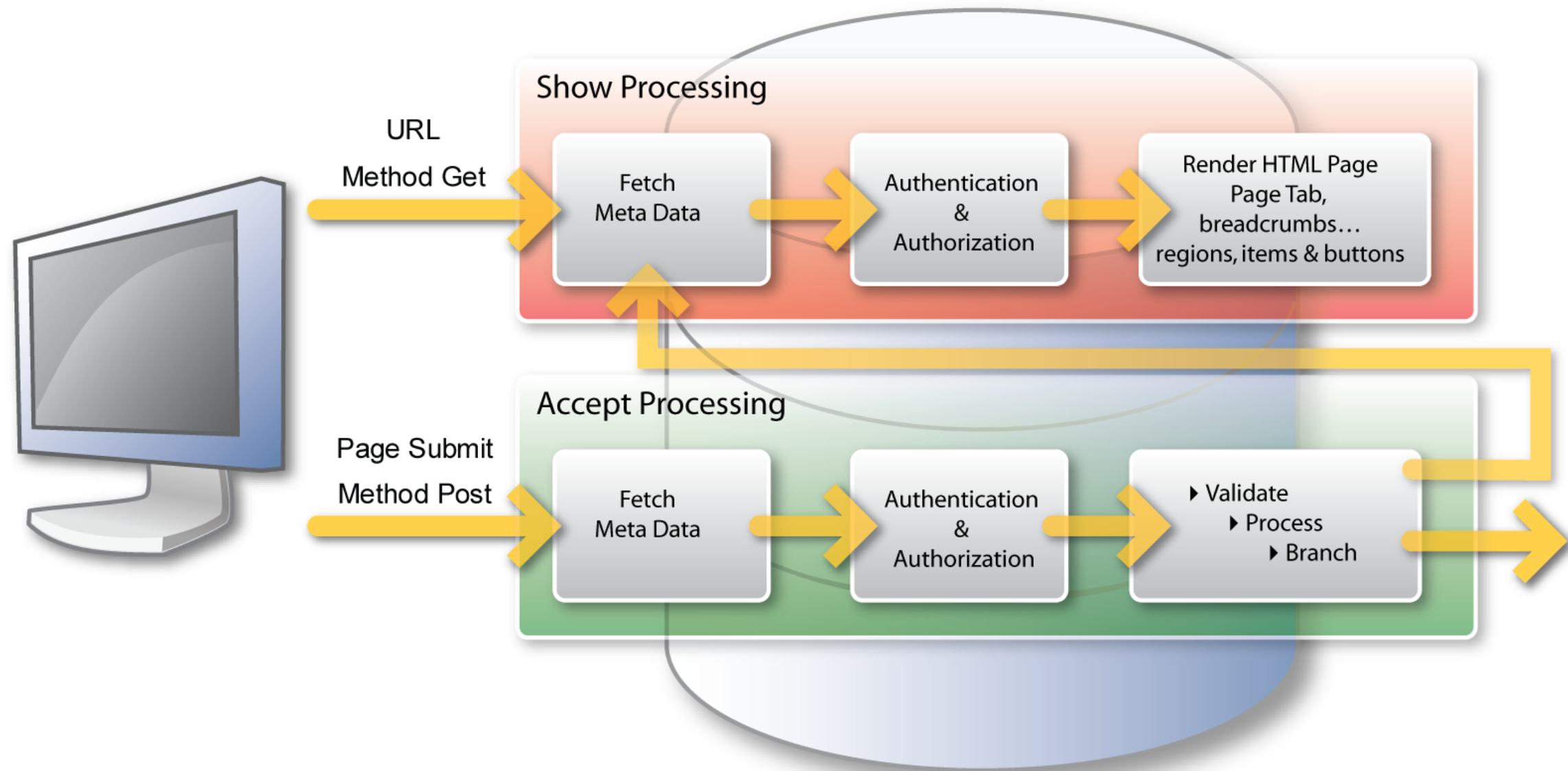
APEX Architecture



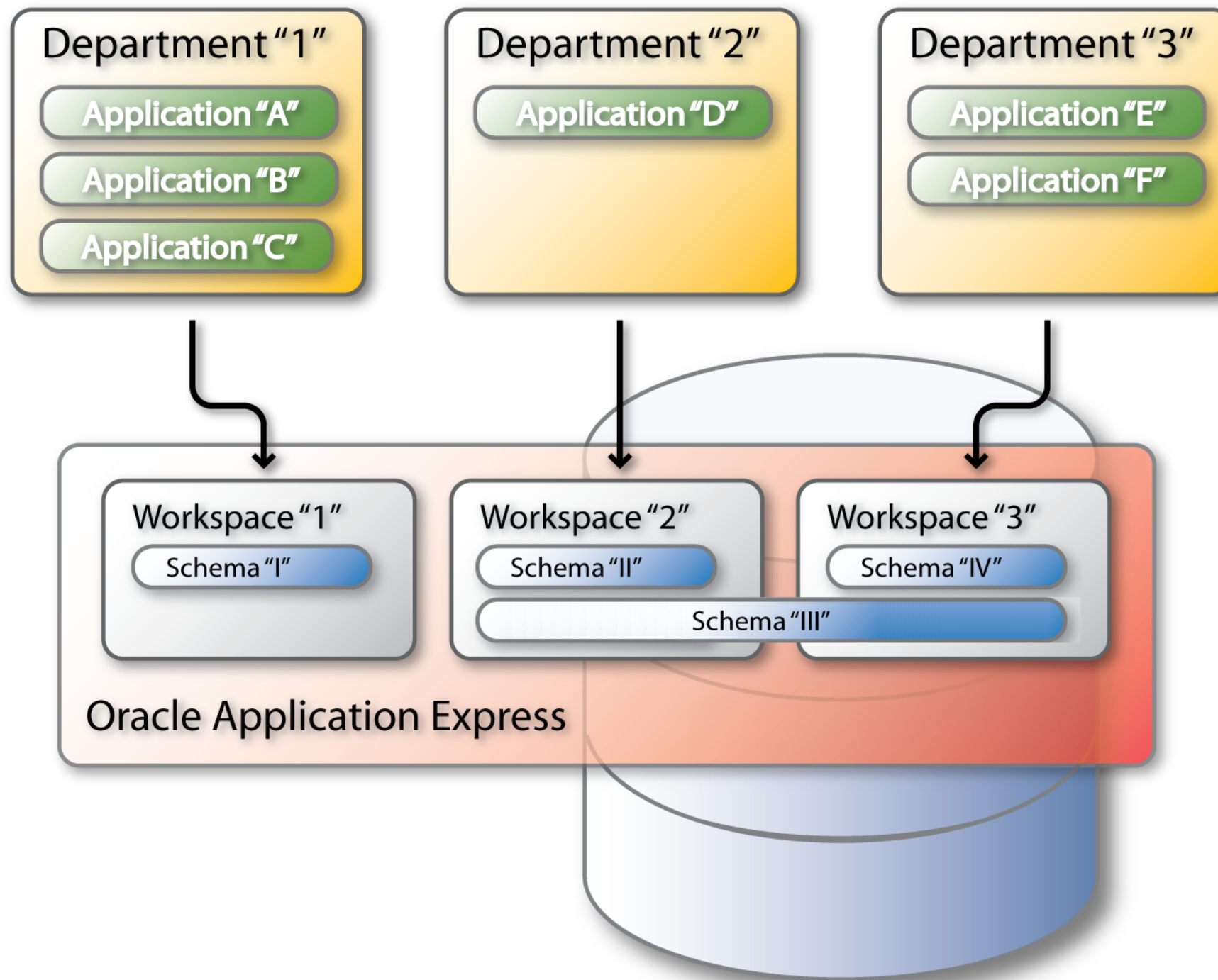
APEX Architecture Overview



Page Processing



Multi-Tenant SaaS



Querying the APEX Dictionary



APEX Dictionary

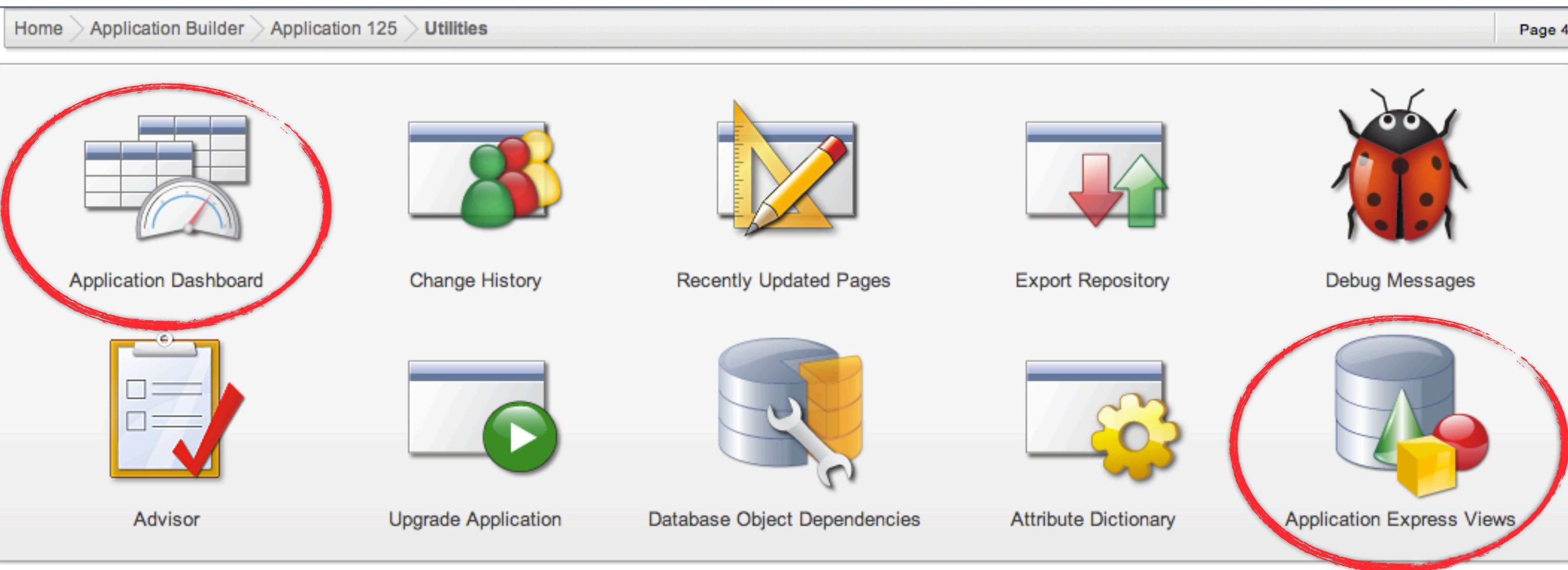
- Query meta-data through:
 - Application Builder interface
 - APEX_DICTIONARY view
 - SQL Developer

Tip: with the APEX_ADMINISTRATOR_ROLE you can view cross workspace



APEX Dictionary: App Builder

- Application Builder > Application xxx > Utilities > Application Dashboard



APEX Dictionary: App Builder

- Administration



Manage Service



Manage Users and Groups



Monitor Activity



Dashboards



Utilization Report

APEX Dictionary: APEX Views

Home

Application Builder ▾

SQL Workshop ▾

Team Development ▾

Administration ▾

Home > SQL Workshop > SQL Commands

Schema

APEXBLOGS ▾

☒ Autocommit

Rows

10 ▾

Save

Run

select * from APEX_WORKSPACE_LOG_SUMMARY

Results

Explain

Describe

Saved SQL

History

WORKSPACE	WORKSPACE_DISPLAY_NAME	APPLICATION_ID	APPLICATION_NAME	PAGE_VIEWS	DISTINCT_PAGES	TOTAL_ELAPSED_TIME	AVERAGE_ELAPSED_TIME
APEXBLOGS	APEXBLOGS	4000	Oracle APEX AppBuilder	14	7	9.529732	.6806951428571428571
APEXBLOGS	APEXBLOGS	4500	Oracle APEX SQL Workshop	10	5	20.055872	2.0055872
APEXBLOGS	APEXBLOGS	107	APEXBlogs v1	4	1	.370292	.092573
APEXBLOGS	APEXBLOGS	118	APEXBlogs v2	39376	19	10687.424608	.2714197635107679804
APEXBLOGS	APEXBLOGS	4350	Oracle APEX Workspace Administration	24	11	77.141554	3.2142314166666666666
APEXBLOGS	APEXBLOGS	4550	Oracle APEX Login	1	1	.056391	.056391

6 rows returned in 6.82 seconds

Download

6 rows returned in 6.82 seconds Download



APEX Dictionary: SQL Developer

The screenshot displays the SQL Developer interface with the APEX Dictionary for Application Performance (125). The left pane shows the database tree with 'Application Express' expanded. The right pane shows the 'Actions...' tab with a table of application properties.

Name	Value
1 APPLICATION_ID	125
2 APPLICATION_NAME	Application Performance
3 ALIAS	F123125
4 OWNER	TRAINING
5 HOME_LINK	f?p=&APP_ID.:1:&SESSION.
6 IMAGE_PREFIX	/i/
7 LOGO	(null)
8 AUTHENTICATION_SCHEME	Application Express Authentication
9 VERSION	release 1.0
10 AVAILABILITY_STATUS	Available with Edit Links
11 BUILD_STATUS	Run and Develop
12 DEBUGGING	Allowed
13 GLOBAL_NOTIFICATION	(null)
14 LAST_UPDATED_BY	ADMIN
15 LAST_UPDATED_ON	27-JUN-12
16 PAGES	7
17 WORKSPACE	TRAINING
18 WORKSPACE_ID	1435515894858890
19 PROXY_SERVER	(null)

APEX Dictionary: SQL Developer

Oracle SQL Developer :

Connections x Reports x

Start Page x AE AWS - apexblogs x Application Statistics x

Refresh: 0

Workspace	APPLICATION_ID	Application Name	Owner	Last Updated By	Last Updated
APEXBLOGS	107	APEXBlogs v1	APEXBLOGS	DIMI	23-FEB-11
APEXBLOGS	118	APEXBlogs v2	APEXBLOGS	DIMI	06-AUG-11

Detailed Page Statistics | Average Response Time by Page | Page Views by Page

Refresh: 0

Page	Visits	Min(e)	Max(e)	Avg(e)	Weighted(e)	Performance Factor	Min(rows)	Max(rows)	Avg(rows)
Home(1)	36893	0.009189	10.116986	0.19	7009.67		0	213	28.76
Register(13)	13190	0.009261	2.483171	0.04	527.6		0	0	0
Login(101)	12680	0.009059	4.904544	0.04	507.2		0	0	0
Blog Posts(3)	7352	0.006279	7.038006	0.05	367.6		0	77	4.28
Reset Password(12)	4027	0.00938	0.639784	0.03	120.81		0	0	0
APEX Usage(23)	181	0.01109	1.754545	0.23	41.63		0	101	30.93
Search(27)	287	0.010191	0.808066	0.11	31.57		0	92	15.44
Plugins(5)	379	0.009462	1.222692	0.08	30.32		0	132	37.43
Tweets(9)	423	0.009168	0.422905	0.06	25.38		0	77	8.66
APEXBlogs - Statistics(8)	121	0.011595	0.916181	0.19	22.99		0	0	0
Knowledge Base(28)	449	0.00939	0.650135	0.05	22.45		0	0	0
Links(20)	374	0.00922	0.607374	0.04	14.96		0	147	18.51
APEX Enhancement Request(17)	130	0.009901	0.561489	0.1	13		0	27	1.98
Feedback(102)	11	0.013558	1.077728	0.36	3.96		0	0	0
About(30)	79	0.010149	0.097909	0.04	3.16		0	0	0
Quick Tips(15)	22	0.02355	0.373702	0.1	2.2		0	1	0.95
APEXBlogs - Statistics (Non-Flash)(35)	15	0.010217	0.781851	0.09	1.35		0	0	0
Forum Mining(10)	3	0.250257	0.254909	0.25	0.75		0	0	0
Rate / Comment(34)	16	0.009832	0.158652	0.04	0.64		0	0	0
Add/Edit APEX Enhancement Request(18)	2	0.178109	0.24368	0.21	0.42		0	0	0
Verification of Email(14)	2	0.020683	0.133197	0.08	0.16		0	0	0

APEX Dictionary

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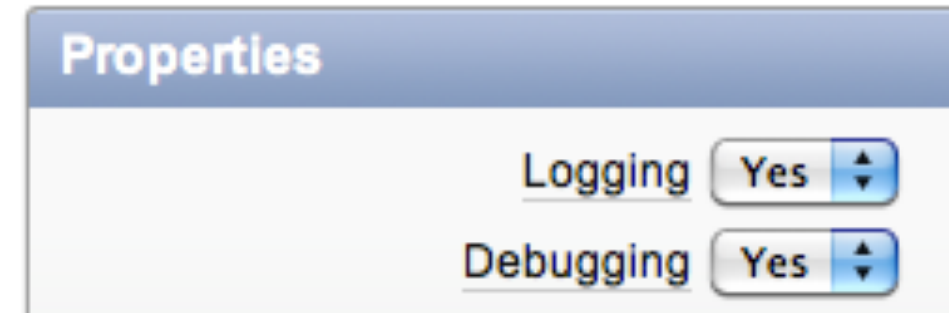


Code Instrumentation in



Logging

- APEX itself is heavily instrument
- Logging can be enabled / disabled
- Results in APEX_WORKSPACE_ACTIVITY_LOG (also in Application Reports)
- dbms_application_info is used a lot behind the scenes
 - look at v\$session, v\$session_longops



Instrument Your Own Code

- Packages to use
 - Logger of Tyler Muth (<https://logger.samplecode.oracle.com/>)
 - ILO (<http://method-r.com/software/ilo>)
 - APEX Debug API (build-in, renewed in APEX 4.2!)
 - needs APEX context in 4.1.1, works outside APEX in 4.2 -
 - ...



Code Instrumentation

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APEX Debug Mode



Debugging

- **DEBUG Mode lets us:**
 - View page rendering and processing actions
 - View session state information
 - View timing information (CPU, not wall-clock)
- Results in **APEX_DEBUG_MESSAGES** view



View Debug Information

Items

Pages

Queries

Tables

PL/SQL

Images

Debug

Session

Errors

Page View Identifier

19696

Set

Select Page View Identifier

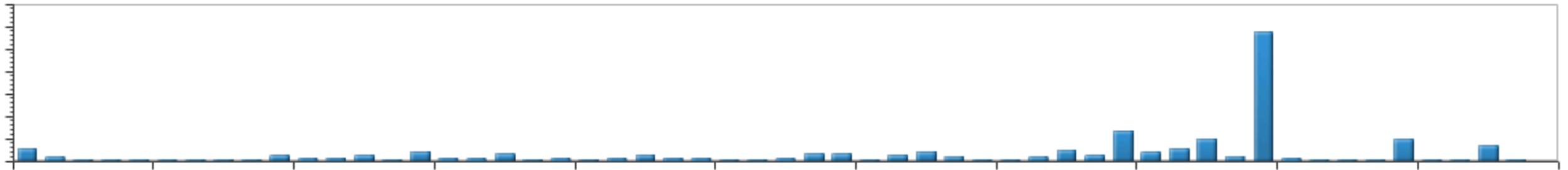
Reset

Application: 367

Page: 1

Elapsed Time: 0.12587

Maximum Execution Time 0.02875



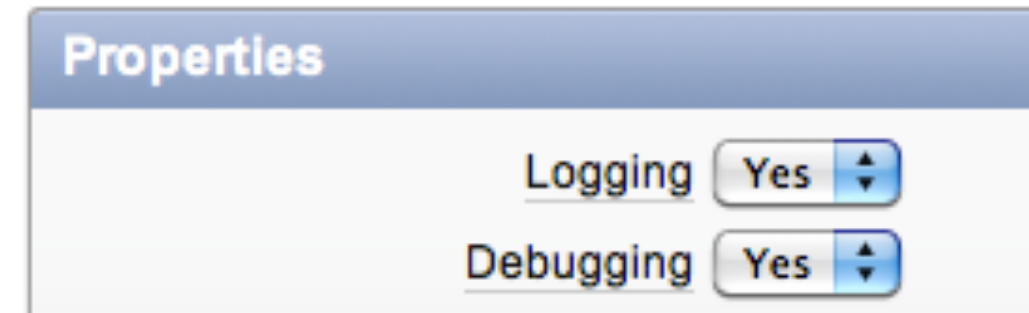
Go

Actions

Elapsed	Execution	Message	Level	Graph
0.03688	0.00276	S H O W: application="367" page="1" workspace="" request="" session="1681521389910867"	3	
0.03956	0.00079	Language derived from: FLOW_PRIMARY_LANGUAGE, current browser language: en	3	
0.04033	0.00036	alter session set nls_language="AMERICAN"	3	
0.04069	0.00021	alter session set nls_territory="AMERICA"	3	
0.04090	0.00032	NLS: CSV charset=WE8MSWIN1252	3	
0.04122	0.00021	...NLS: Set Decimal separator="."	3	
0.04143	0.00034	...NLS: Set NLS Group separator=","	3	
0.04177	0.00032	...NLS: Set g_nls_date_format="DD-MON-RR"	3	
0.04209	0.00038	...NLS: Set g_nls_timestamp_format="DD-MON-RR HH.MI.SSXFF AM"	3	
0.04247	0.00120	...NLS: Set g_nls_timestamp_tz_format="DD-MON-RR HH.MI.SSXFF AM TZR"	3	
0.04368	0.00048	...Setting session time_zone to -04:00	3	
0.04415	0.00074	NLS: Language=en	3	
0.04489	0.00114	Application 367. Authentication: CUSTOM2. Page Template: 10156214620740501	3	

Ways To Turn On/off Debug Mode

- Enable debugging on the Application Level



- **APEX 4.2:**

- Debugging will always work when logged into the App Builder



Ways To Turn On/off Debug Mode

- Application can run in DEBUG Mode
 - Using the Developer Toolbar (toggle)

- Using the URL (YES/NO)
APEX 4.2: also LEVEL[1..9]

f?p=App:Page:Session:Request:Debug:ClearCache:...

- Programmatically via API

APEX 4.1: `apex_debug_message.enable_debug_messages(p_level=>9);`

APEX 4.2: `apex_debug.enable_debug_messages(p_level=>9);`



Debugging Behind the Scenes

- Information is stored in following tables
 - wwv_flow_debug
 - wwv_flow_debug_messages
 - wwv_flow_debug_messages2
- Level = importance
- Two weekly rotating tables (so max 4 weeks of debug information)



Debug Mode

- We can reference the value of DEBUG Mode
 - :DEBUG
 - APEX_APPLICATION.G_DEBUG
 - v('DEBUG')
 - &DEBUG.

```
if APEX_APPLICATION.G_DEBUG  
then  
    ...  
end if;
```



Use APEX Debugger (Code Instr.)

- APEX 3.x

- use of `wwv_flow.debug()`

- APEX 4.0 / 4.1

- Use of `apex_debug_message` API

```
apex_debug_message.enable_debug_messages(p_level=>6);  
apex_debug_message.log_message('I am here',true,1);
```

- APEX 4.2

- Use of `apex_debug` API

```
apex_debug.message  
apex_debug.error  
apex_debug.warn  
apex_trace
```



APEX Debug Mode

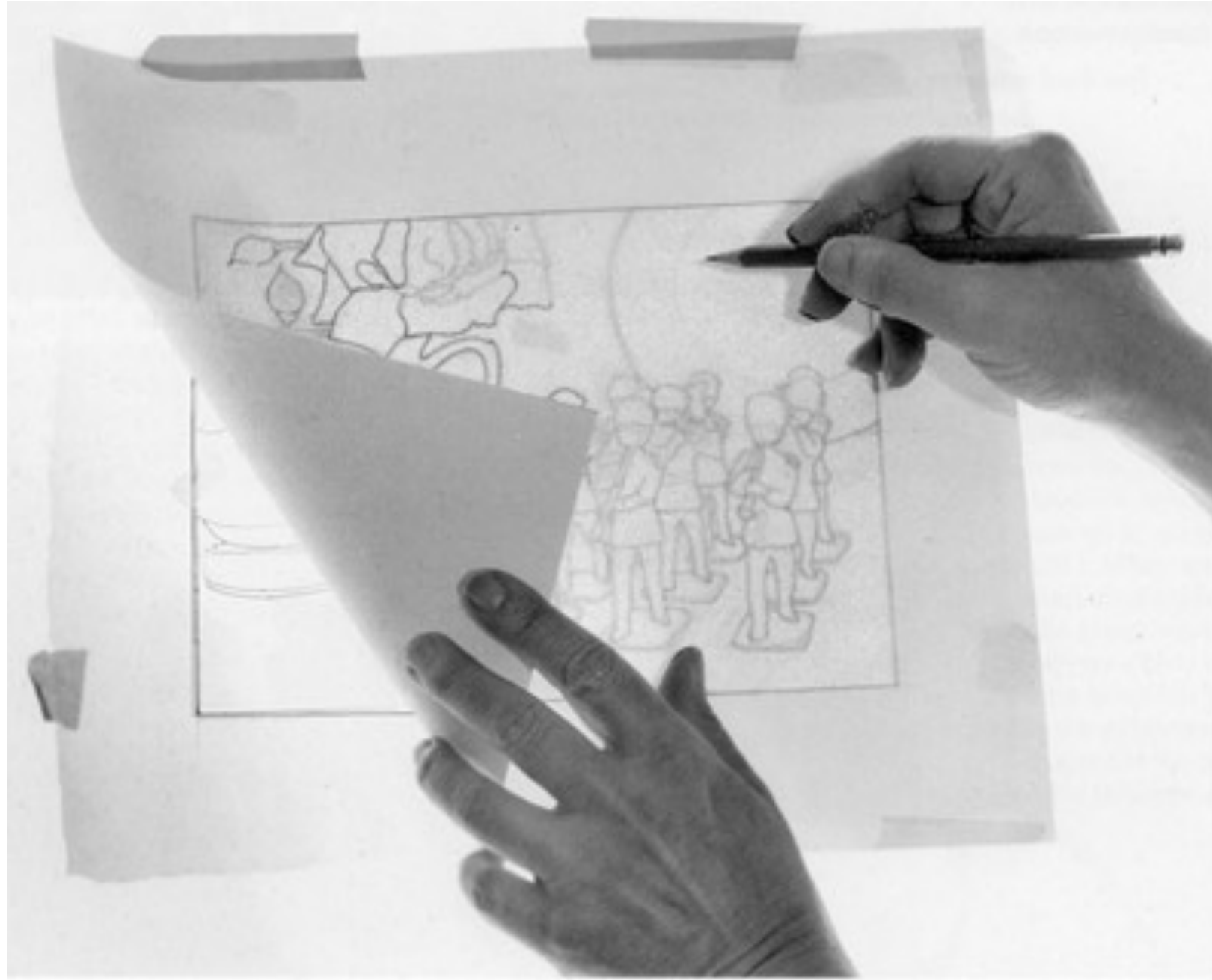
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Tracing



What Is Tracing



What Is Tracing

INSPECTOR
GADGET



INSPECTOR GADGET
CHARACTER LINEUP
ART: José Cobá

Example of Trace File

```
oraaws01_ora_2693_METHODR_20111018132554.trc
1  # version=mrtrace2.0.0.24|cpu_count=2|project=|author=aedimil|platform_name=Linux x86 64-bit|description=|instance_name=oraaws01|node
2  Oracle Database 11g Release 11.2.0.2.0 - 64bit Production-
3  ORACLE_HOME = /u01/app/oracle/product/11.2.0/db_1-
4  System name: Linux-
5  Node name: domU-12-31-39-14-15-51-
6  Release: 2.6.18-164.0.0.0.1.el5xen-
7  Version: #1 SMP Thu Sep 3 00:34:43 EDT 2009-
8  Machine: x86_64-
9  VM name: Xen Version: 3.0 (PVM)-
10 Instance name: oraaws01-
11 Redo thread mounted by this instance: 1-
12 Oracle process number: 48-
13 Unix process pid: 2693, image: oracle@domU-12-31-39-14-15-51-
14 -
15 -
16 *** 2011-10-18 11:25:53.352-
17 *** SESSION ID:(19.36271) 2011-10-18 11:25:53.352-
18 *** CLIENT ID:() 2011-10-18 11:25:53.352-
19 *** SERVICE NAME:(SYS$USERS) 2011-10-18 11:25:53.352-
20 *** MODULE NAME:(SQL Developer) 2011-10-18 11:25:53.352-
21 *** ACTION NAME:() 2011-10-18 11:25:53.352-
22 -
23 CLOSE #47833599256688:c=0,e=7,dep=1,type=0,tim=1318937153333594-
24 -
25 -
26 *** 2011-10-18 11:25:53.352-
27 WAIT #47833597323632: nam='SQL*Net message to client' ela= 6 driver id=1952673792 #bytes=1 p3=0 obj#=77 tim=1318937153352377-
28 =====
29 PARSING IN CURSOR #47833597323632 len=978 dep=0 uid=150 oct=47 lid=150 tim=1318937153352404 hv=2114146534 ad='1004fcda8' sqlid='1d3
30 /*-
31  * This script file contains PL/SQL to enable tracing.-
32  *-
33  * Parameters: -
34  * 1. major_version (NUMBER) - The major version number of the -
35  *   underlying Oracle installation.-
36  *-
37  * 2. trace_file_id (VARCHAR2) - The identifier that will be -
38  *   attached to the generated trace file.-
```

Tracing in the Oracle Database

- How to enable trace (10gR2 and higher)
 - `exec dbms_monitor.session_trace_enable (
 session_id => null,
 serial_num => null,
 waits => true,
 binds => true
);`
 - `dbms_monitor.serv_mod_act_trace_enable`
 - `dbms_monitor.client_id_trace_enable`
 - `alter session set events '10046 trace name context
forever, level 12'`



Tracing in APEX

- Via the url
 - `&p_trace=YES`
- Don't forget to trace your own code!
(by using `dbms_monitor`, `dbms_application_info`,
`ILO` package)



Tracing in the Oracle Database

- Location of the trace files
 - in 10gR2:
select name, value
from v\$parameter
where name like '%dump_dest%';
 - in 11g:
select value
from v\$diag_info
where name = 'Diag Trace';



Tracing in the Oracle Database

- Tagging trace files
 - `alter session set tracefile_identifier = <unique>;`



Understanding Trace Files

Mastering Performance with Oracle Extended SQL Trace

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The most recent update of this paper is available free of obligation at <http://method-r.com/downloads>.

Oracle's extended SQL trace data stream contains a linear sequential record of every database call and every operating system call that the Oracle kernel executes in response to the code that you write. The trace file contains timings that enable you to precisely measure how long your code takes to run and why. The detailed information about individual database calls and operating system calls is vital to building scalable applications (as well as troubleshooting them in production). The information in there is a gold mine, and some of it is available nowhere else.

Recommended Read

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1 PERFORMANCE AND TRACING

You click a button on a web form. It's a button that you click all the time. Normally, the system you're using responds to that click almost instantaneously, but now... Now, it's taking more than 5 seconds every time you do it, and sometimes it takes more than 10. The obvious and very simple question is: *why?*

The vast majority of people who experience a problem like this never find out the answer.

Think for a minute about what the answer ought to look like. If you're a IT professional, then you've probably seen so many reports that the simple answer doesn't even occur to you. Here's what I want: I want a report telling me where *my* time went.

I don't want to see how busy the whole system was when you click that 5-second button. I don't want to see all



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Understanding Trace Files

```
32. =====
33. PARSING IN CURSOR #7285244 len=30 dep=0 uid=5 oct=3
    lid=5 tim=1294688002747560 hv=1604528588 ad='3d526cd8'
    sqlid='guthms1gu6afc'
34. select 'Hello world' from dual
35. END OF STMT
36. PARSE ...,e=70,...
37. EXEC ...,e=112,...
38. WAIT ...'SQL*Net message to client' ela= 2
39. FETCH ...,e=8,...,r=1,...
40. STAT ...op='FAST DUAL (...) '
41. WAIT ...'SQL*Net message from client' ela= 375
42. FETCH ...,e=1,...,r=0,...
43. WAIT ...'SQL*Net message to client' ela= 1
44. WAIT ...'SQL*Net message from client' ela= 1627
45. XCTEND r1bk=0,...
```



Making Trace Files More Readable

- Some tools that can help you
 - SQL Developer
 - TKPROF
 - Orasrp
 - Method-R product (commercial)
 - Profiler
 - MR Trace
 - MR Tools (mrskew, ...)
 - ...



Tracing

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APEX Performance Drill-Down

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Summary





Summary

- APEX Architecture
- Querying the APEX Dictionary
- Code Instrumentation in APEX
- APEX Debug Mode
- Tracing in Oracle DB and APEX
- Demo APEX Performance Drill-Down



Q&A

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