

Debugging in APEX and SQL Developer

Dimitri Gielis



About Dimitri Gielis

- Director & Co-Founder of APEX Evangelists
- 12+ years of Oracle Experience
- OBUG APEX SIG Leader
- ‘Dimitri.Gielis@AE’ in the APEX forums
- Presenter at ODTUG, OOW, UKOUG, OBUG, ...
- OCP 8i/9i/10g + APEX Certified
- Oracle ACE Director
- “APEX Developer of the Year 2009”
- Blog @ <http://dgielis.blogspot.com>

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Oracle ACE Director



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Specific Debugging Methods

- Developer Toolbar
- Debug Mode
- Trace files
- Code Instrumentation
- Client-side Tools
- Interactive Debugging
- Database Monitor
- Others (Application Reports, ...)



This Presentation Focusses On

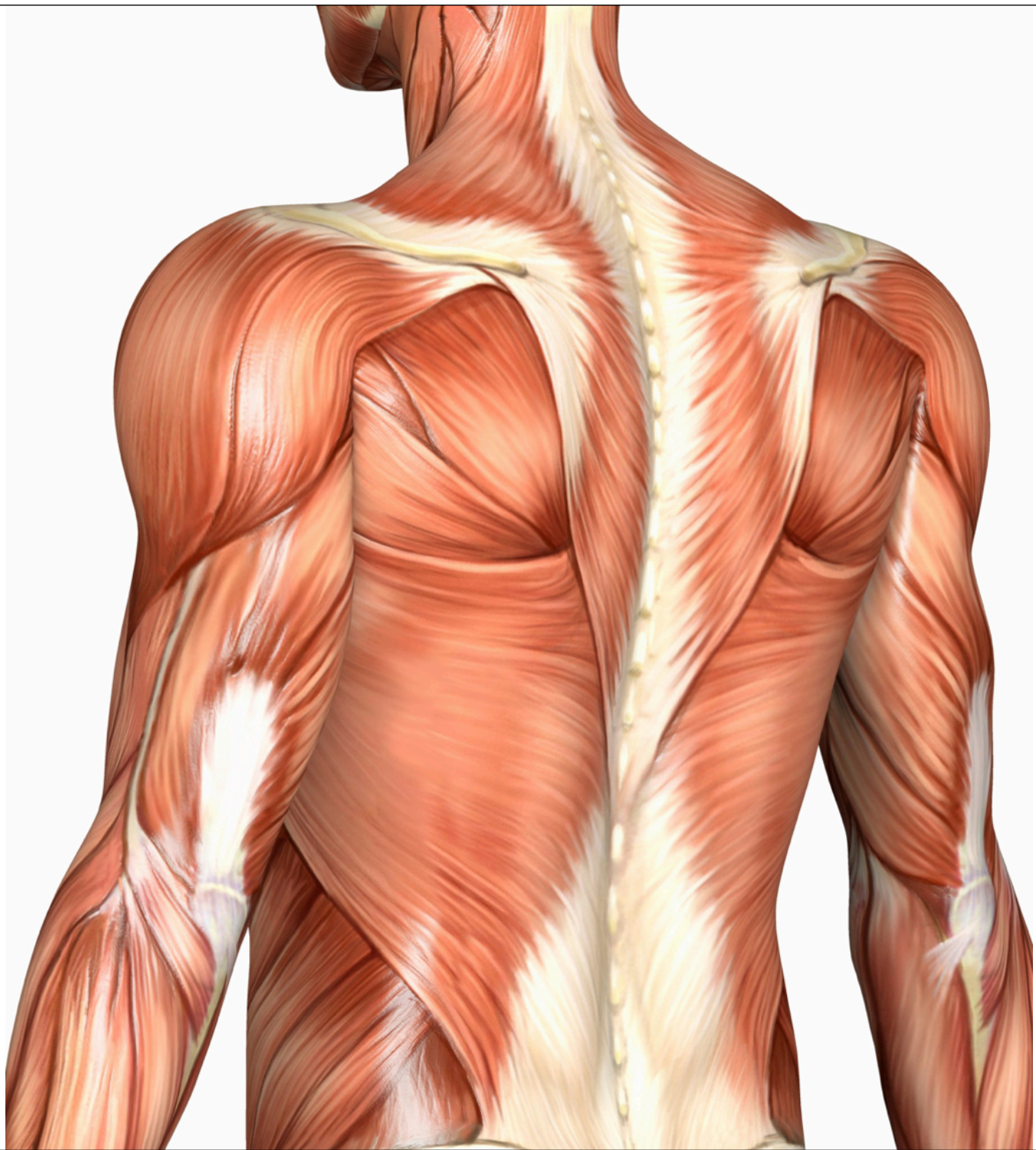
- Code Instrumentation
- Normal Debugging with SQL Developer
- Logging and Debugging in APEX 4.x
- Remote Debugging of APEX with SQL Developer



Code Instrumentation



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Code Instrumentation

- Allows us to see what our code is doing at runtime
- Add instrumentation as you code
- Make it configurable
- Many ways to do that (dbms_application_info, ...)
- Is it necessary, does it make the system slower?

If you don't believe me, see what Tom Kyte says about that :-)
<http://tkyte.blogspot.com/2005/06/instrumentation.html>



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Instrument Your Own Code

- Packages to use
 - Logger of Tyler Muth
 - 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

- <http://tylermuth.wordpress.com/2011/11/09/logger-project-moved-temporarily/>



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Samplecode Username: **dimitrigielis_ext**

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logger

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Summary A PL/SQL logging and debugging utility.

Categories [plsql](#), [application-express](#)

Owner(s) [tmuth](#)

Author: Tyler D. Muth

Contributing Author: Christopher Beck

Last Updated: 4/16/2009

Project Version: 1.3.0

Related Products: APEX, PL/SQL

Supported DB Versions: XE, 10.2, 11.1, 11.2.

Discussions: [General Questions](#) | [Announcements](#) | [Enhancement Requests](#) | [Bug Reports](#)

Important! Before you can post to discussions you must [Request Project Role](#) and select the role of "Observer". I've set you for that role.

Download Now: https://logger.samplecode.oracle.com/source/browse/*checkout*/logger/tags/1.3.0/logger_1.3.0.zip

- [What is Logger?](#)



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About Logger

- Written by Tyler D. Muth (and Christopher Beck)
- Simple to use PL/SQL logging and debugging framework
 - Debugging
 - Error Logging
 - Timing
 - Instrumentation



Installation Of Logger

- grant connect,create view, create job, create table, create sequence, create trigger, create procedure, create any context to <user>
- @logger_install.sql

Using Logger

- in your PL/SQL code:
 - `logger.log('Some Text','schema.package.procedure');`
 - `logger.log_error('Error Text','schema.package.procedure');`
 - `logger.log_apex_items('APEX','schema.package.procedure');`
 - ... (many other possibilities)
- `select * from logger_logs_5_min;`



Logger

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PL/SQL Debugging with SQL Developer





What Is Debugging?

- Ability to step through code
- Watch and Change Variables/Parameters
- Set Breakpoints
- View Call and Exception Stack
- Run/don't run specific code



Normal PL/SQL Debugging

- Set Breakpoints
- Compile your package for Debug



```
Code | Grants | Dependencies | References | Details | Profiles
Find
427
430 PROCEDURE show_thumbnail(
431     p_image_id IN NUMBER)
432 AS
433     l_mime      VARCHAR2 (255);
434     l_length    NUMBER;
435     l_file_name VARCHAR2 (2000);
436     lob_loc     BLOB;
437 BEGIN
438     SELECT mime_type,
439            thumbnail_blob,
440            image_name,
441            DBMS_LOB.getlength (thumbnail_blob)
442     INTO l_mime,
443            lob_loc,
444            l_file_name,
445            l_length
446     FROM tdg_image
447    WHERE image_id = p_image_id;
448     -- Set up HTTP header
449     -- Use an NVL around the mime type and if it is a null, set it to
450     -- application/octet - which may launch a download window from windows
451     OWA_UTIL.mime_header (NVL (l_mime, 'application/octet'), FALSE);
452     -- Set the size so the browser knows how much to download
453     HTP.p ('Content-length: ' || l_length);
454     HTP.p ('Expires: ' || TO_CHAR (SYSDATE + 50, 'Day, DD Month, YYYY HH24:MI:SS'));
455     -- The filename will be used by the browser if the users does a "Save as"
456     HTP.p ('Content-Disposition: attachment; filename="' || l_file_name || '"');
457     -- Close the headers
458     OWA_UTIL.http_header_close;
459     -- Download the BLOB
460     wpg_docload.download_file (lob_loc);
```



Normal PL/SQL Debugging

- Execute in Debug mode
(enables Debugging Log tab)
- Need specific grants!



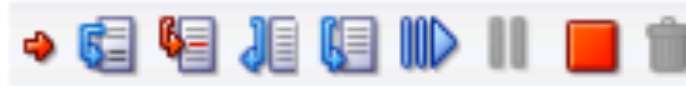
ORA-01031: insufficient privileges
ORA-06512: at "SYS.DBMS_DEBUG_JDWP", line 68
ORA-06512: at line 1

```
grant DEBUG CONNECT SESSION to <user>;  
grant DEBUG ANY PROCEDURE to <user>;
```



Normal PL/SQL Debugging

- Debugging Toolbar



- Find Execution Point
 - Step Over
 - Step Into
 - Step Out
 - Step to End of Method
 - Resume / Pause / Terminate
- Other tabs: Breakpoints, Smart Data, Data, Watches



Debugging in SQL Developer

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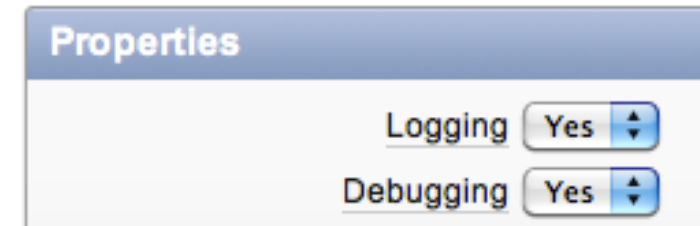
Logging and Debugging in APEX 4.x





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



Debugging

- DEBUG Mode lets us:
 - View page rendering and processing actions
 - View session state information
 - View timing information (CPU, not wall-clock)
- !! Changed in APEX 4.0 and 4.2 !!
- Results in APEX_DEBUG_MESSAGES view



New Debug View In APEX 4.0

Items

Pages

Queries

Tables

PL/SQL

Images

Debug

Session

Errors

Page View Identifier

Application: **367**

Page: **1**

Elapsed Time: **0.12587**

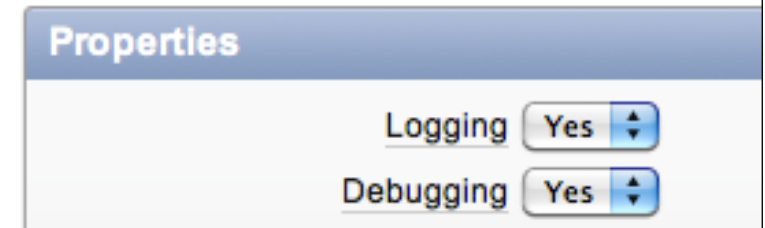
Maximum Execution Time **0.02875**



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 and level of detail
- 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
```



Logging and Debugging in APEX 4.x

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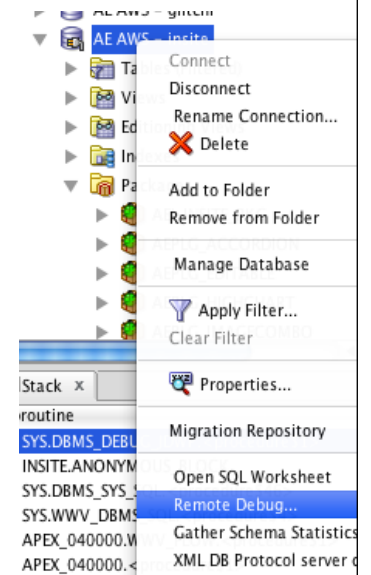
Remote Debugging of APEX with SQL developer



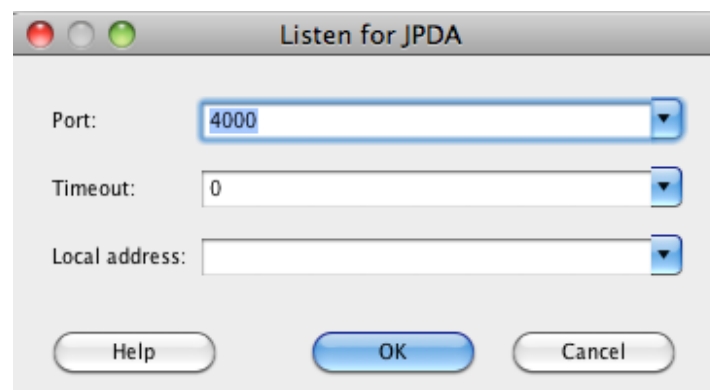


Setup Debugging

- Start the Remote Debug in SQL Developer
(Right click on connection)



- Set the port and your (developer) IP address



Local Debugging

- Set Breakpoint(s)
- Compile code in Debug Mode
- Execute Code
- ... Debug ...



Remote Debugging

- Connect to Remote Debugger
- Set Breakpoint(s)
- Compile code in Debug Mode
- Execute Code
- ... Debug ...
- Disconnect from Remote Debugger



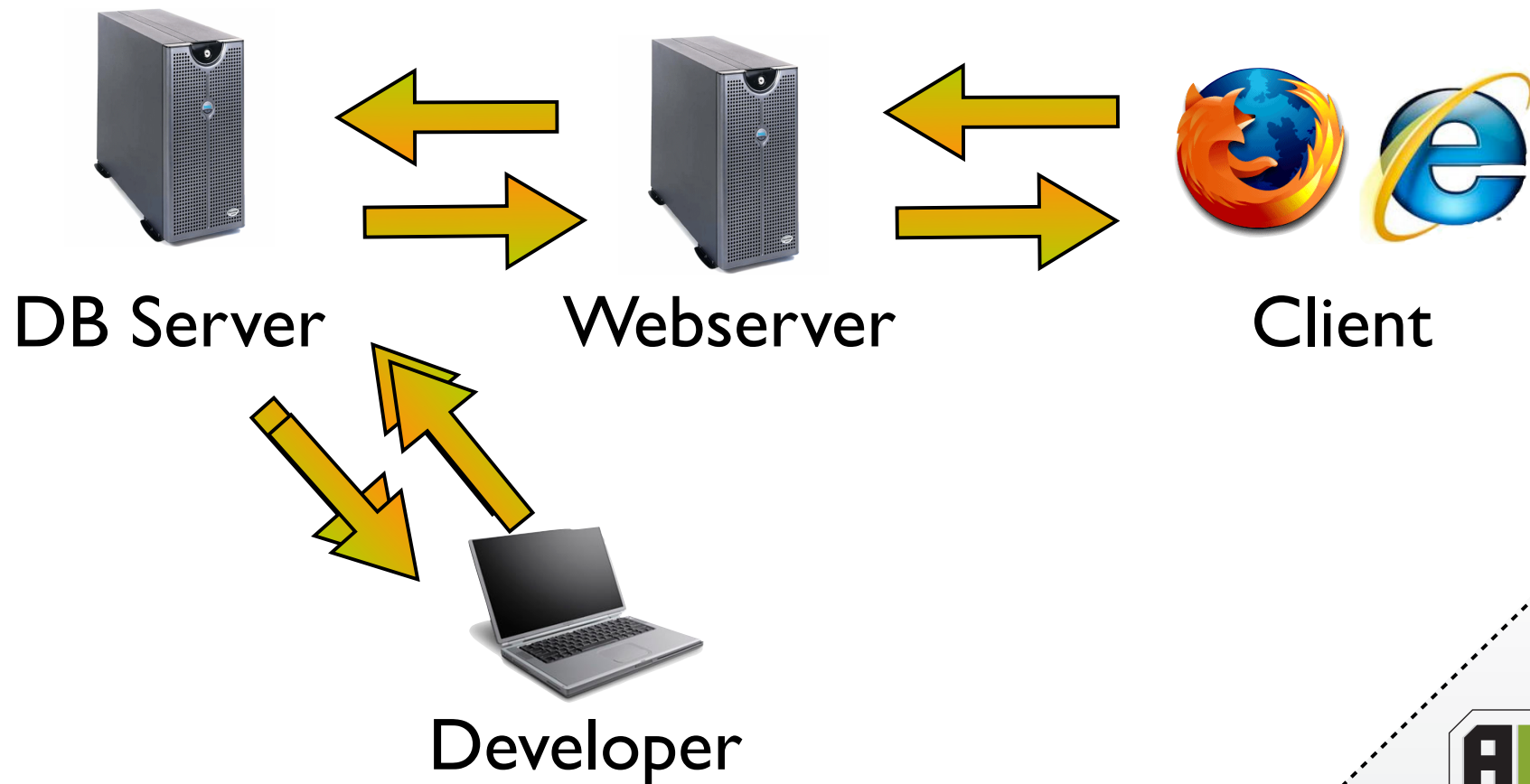
Remote Debugging Requirements

- Remote Debugging Relies on DBMS_DEBUG_JDWP package (introduced in 9iR2)
- Necessary grants **EPG**:
 - grant debug any procedure to ANONYMOUS;
 - grant debug connect session to ANONYMOUS;
- Necessary grants **Other**:
 - grant debug any procedure to APEX_PUBLIC_USER;
 - grant debug connect session to APEX_PUBLIC_USER;



Remote Debugging Requirements

- Machine with SQL Developer running needs access to the server and the other way round!



Remote Debugging

- Example:

```
dbms_debug_jdwp.connect_tcp(host, port);  
... call code ...  
dbms_debug_jdwp.disconnect;
```

- Through the URL (APEX >= 3.1)

```
f?p=APP_ID:PAGE_ID:SESSION_ID::REMOTE
```



Remote Debugging APEX with SQL Dev

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Summary

- Code Instrumentation is important
- Normal Debugging with SQL Developer
- Logging and Debugging in APEX 4.x
- Remote Debugging of APEX with SQL Developer



Q&A

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