

Debugging APEX Applications

BGOUG - 2010

sumnēva

Application Success

About Dimitri Gielis



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About this presentation

- What it is:
 - Introduction to tools and features to aid debugging your application
- What it is not:
 - An exhaustive or definitive list
 - Not how to write bug-free code
 - “My way is best”

What is Debugging

“Debugging is a methodical process of finding and reducing the number of bugs, or defects, in a computer program or a piece of electronic hardware thus making it behave as expected.”

Source - Wikipedia

*“Debugging can be
a cumbersome and tiring
task.”*

Source - a Developer

What we get

“It runs slow”

“It does not work anymore”

“I get an error”



What we want

“When I run the Month-end report on a Tuesday, whilst using Firefox logged in as Bob, it runs slower than when logged in as Mary using Internet Explorer”





Educate Developers

Educate Developers

- You shall drink a lot of water
- You shall stay positive at all times
- You shall think before you do
- You shall document your code
- You shall use our team guidelines (BP, naming conv, ...)

Specific Methods

Specific Methods

- Developer Toolbar
- Debug Mode
- Trace files
- Code Instrumentation
- Client-side Tools
- Interactive Debugging
- Other quick tips



Developer Toolbar

Developer Toolbar

ADMIN Logout

Home

Debug Mode

Home

Department

Search

AJAX Report

Employee Search

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT	-	17-NOV-81	5000	-	10
7698	BLAKE	MANAGER	7839	01-MAY-81	2850	-	30
7782	CLARK	MANAGER	7839	09-JUN-81	2450	-	10
7566	JONES	MANAGER	7839	02-APR-81	2975	-	20
7788	SCOTT	ANALYST	7566	09-DEC-82	3000	-	20
7902	FORD	ANALYST	7566	03-DEC-81	3000	-	20
7369	SMITH	CLERK	7902	17-DEC-80	800	-	20
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7876	ADAMS	CLERK	7788	12-JAN-83	1100	-	20
7900	JAMES	CLERK	7698	03-DEC-81	950	-	30
7934	MILLER	CLERK	7782	23-JAN-82	1300	-	10

1 - 14

Home Application 107 Edit Page 1 Create Session Activity Debug Show Edit Links

Developer Toolbar

Home	Application 107	Edit Page 1	Create	Session	Activity	Debug	Show Edit Links
------	-----------------	-------------	--------	---------	----------	-------	-----------------

Developer Toolbar

Home	Application 107	Edit Page 1	Create	Session	Activity	Debug	Show Edit Links
------	-----------------	-------------	--------	---------	----------	-------	-----------------

Allows us to examine:

- Page Items
- Application Items
- Session State
- Collections

Developer Toolbar

D E M O N S T R A T I O N



Debug Mode

Debug Mode

- 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 !!

Debug Mode

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

Home	Application 107	Edit Page 1	Create	Session	Activity	Debug	Show Edit Links
------	-----------------	-------------	--------	---------	----------	-------	-----------------

- Using the URL (YES/NO)

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

- Disabled in production
(Run Application Only or Debugging: No)

Debug Mode

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

Debug Mode

D E M O N S T R A T I O N



Trace Files

Trace Files

- Each Page Request is a separate database session
- We can enable tracing for each page request
- Enable by adding &p_trace=YES to the URL
e.g. f?p=100:1:.....&p_trace=YES

Trace Files

- Created on the DB Server
 - specified by USER_DUMP_DEST
 - show parameter user_dump_dest
- Use TKPROF command to summarize the detail
 - tkprof filename1 filename2 [waits=yes|no] [sort=option] [print=n]

Trace Files

```
system@DBTEST> show parameter user_dump_dest;
```

VALUE

/oracle/admin/dbtest/udump

Trace Files

Find most recently created file:

```
[oracle@dbvm udump]$ ls -alt
total 3192
drwxr-x--- 2 oracle oinstall 12288 Oct  5 14:39 .
-rw-r----- 1 oracle oinstall  3082 Oct  5 10:43 dbtest_ora_2218.trc
-rw-r----- 1 oracle oinstall  2376 Oct  5 10:43 dbtest_ora_2191.trc
-rw-r----- 1 oracle oinstall   781 Oct  4 12:31 dbtest_ora_3742.trc
-rw-r----- 1 oracle oinstall  1302 Oct  4 08:34 dbtest_ora_2225.trc
-rw-r----- 1 oracle oinstall  1216 Oct  4 08:34 dbtest_ora_2198.trc
-rw-r----- 1 oracle oinstall   780 Oct  3 17:39 dbtest_ora_2489.trc
-rw-r----- 1 oracle oinstall  4557 Oct  3 17:08 dbtest_ora_2221.trc
```

(obviously not a great solution if a
lot of trace files are created)

Trace Files

Finding the Tracefile:

Use the session id:

f?p=107:3:3470940048815058::&p_Trace=YES

Trace Files

Finding the Tracefile:

Use the session id:

f?p=107:3:3470940048815058::&p_Trace=YES

```
[oracle@dbtest udump]$ grep -l 3470940048815058 *.trc  
dbtest_ora_4079.trc
```

Trace Files

Finding the Tracefile:

*** 2008-08-05 14:07:08.976
*** ACTION NAME:(PAGE 3) 2008-08-05 14:07:08.975
*** MODULE NAME:(APEX:APPLICATION 108) 2008-08-05
14:07:08.975
*** SERVICE NAME:(dbtest) 2008-08-05 14:07:08.975
*** CLIENT ID:(JES:3747395937286933) 2008-08-05 14:07:08.975
*** SESSION ID:(138.1104) 2008-08-05 14:07:08.975

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*** MODULE NAME:(APEX:APPLICATION 108) 2008-08-05
14:07:08.975

*** SERVICE NAME:(dbtest) 2008-08-10 14:07:08.975

*** CLIENT ID:(JES:3747395937286933) 2008-08-05 14:07:08.975

*** SESSION ID:(138.1104) 2008-08-05 14:07:08.975

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Trace Files

D E M O N S T R A T I O N



Code Instrumentation

Instrumentation

- Allows us to see what the code is doing at runtime
- Can help debug retrospectively
- Add instrumentation as you code
Don't leave it until you really need it
- Make it configurable
- Consider the 'overhead' argument

Instrumentation

PL/SQL

```
if v('DEBUG') = 'YES' then  
    http.p('Foo');  
end if;
```

Instrumentation

APEX Debug Mode

```
if v('DEBUG') = 'YES' then  
    ...  
    wwv_flow.debug('Foo');  
    ...  
end if;
```

Instrumentation

Simple Table Method

```
if v('DEBUG') = 'YES' then
    insert
        into tbl_debug (...)
        values (...);
end if;
```

Instrumentation

DBMS_APPLICATION_INFO

```
PROCEDURE SET_ACTION  
PROCEDURE SET_CLIENT_INFO  
PROCEDURE SET_MODULE  
PROCEDURE SET_SESSION_LONGOPS
```

Allows custom information in:

- V\$SESSION
- V\$SESSION_LONGOPS

Instrumentation

- <http://log4plsql.sourceforge.net/>

Log 4 pl/sql

Oracle Database Logging tools



General information

LOG4PLSQL is a PLSQL framework for logging in all PLSQL code

- Package,
- Procedure,
- Function,
- Trigger,
- PL/SQL Web application,
- Oracle Tools (Form, report,...).

Instrumentation

- <https://logger.samplecode.oracle.com/>

Welcome Dimitri ([Account](#) | [Account Help](#) | [Sign Out](#))



Samplecode Username: **dimitrigielis_ext**

Projects | **logger**

PROJECT TOOLS

[Project home](#)

[Membership](#)

[Announcements](#)

[Discussions](#)

[Documents & files](#)

[Wiki](#)

[Subversion](#)

[Project Tracker](#)

[Project metrics](#)

[Build & Test](#)

QUICK SUBMIT

[Submit Code Sample](#)

[Submit Project](#)

ORACLE TECHNET

[OTN Home](#)

logger

PROJECT HOME

[Request project membership/role](#) | [Watch project](#)

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?](#)

Instrumentation

JAVASCRIPT

`console.log()`

- Outputs a message to the console
- Object ref can be passed in, provides navigation link

`this.debug()`

- Print a string in the console
- Objects are converted to string format

`this.printStackTrace()`

- Logs the current stack trace
- See which method called the current function etc

Instrumentation

D E M O N S T R A T I O N



Client-side Tools

Client side tools

Browser Plugins

Firefox

- Firebug (www.getfirebug.com)

Internet Explorer

- IE Developer Toolbar
- IE Watch
- Firebug Lite

Safari

- Stand
- Safari Enhancer
- Develop (build-in)

Client side tools

Browser Plugins Features -

- DOM inspection
- JavaScript Profiling
- Examine CSS
- Watch variables
- Breakpoints

Client side tools

What is Firebug?

Introduction and Features

Resources

Documentation wiki, FAQ, and other Firebug lore

Community

Discussion forums and lists

Get Involved

Hack the code, create plugins



Firebug

Web Development Evolved.

Install Firebug For Firefox
100% free and open source

[Other Versions](#)

[Firebug Lite](#)

[Extensions](#)

The most popular and powerful web development tool

- ✓ Inspect HTML and modify style and layout in real-time
- ✓ Use the most advanced JavaScript debugger available for any browser
- ✓ Accurately analyze network usage and performance
- ✓ Extend Firebug and add features to make Firebug even more powerful
- ✓ Get the information you need to get it done with Firebug.

[More Features »](#)



Introduction to Firebug

Chief Firebug pyroentomologist Rob Campbell gives a quick introduction to Firebug.

[Watch now »](#)

Other Firebug screencasts

- Check back for more Firebug screencasts, coming soon.



Inspect

Pinpoint an element in a webpage with ease and precision.



Log

Send messages to the console direct from your webpage through Javascript.



Profile

Measure your Javascript performance in the Console's Profiler.



Debug

Step-by-step interactive debugging in a visual environment.



Analyze

Look at detailed measurements of your site's network activity.

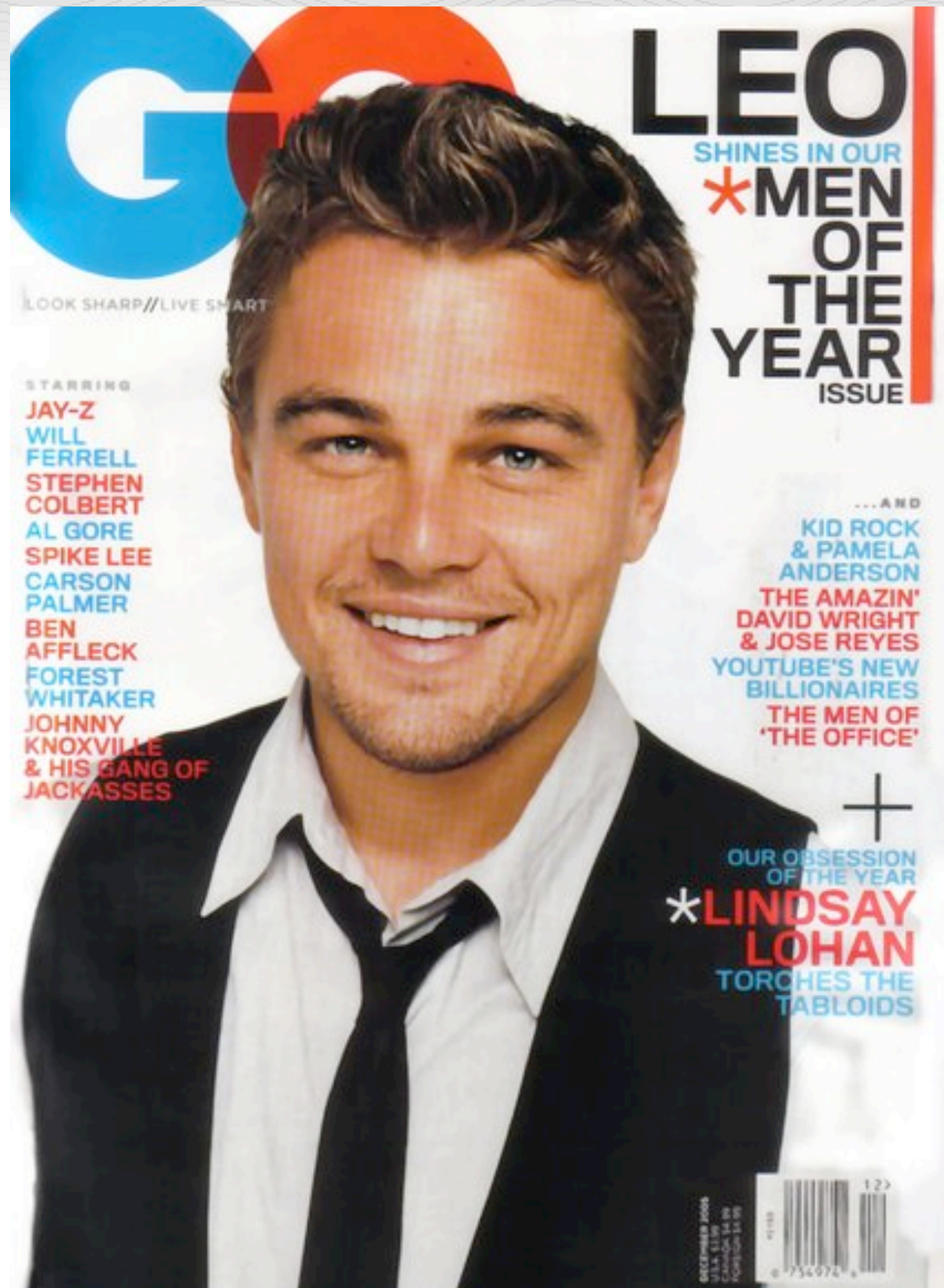


Layout

Tweak and position HTML elements with CSS and the Layout panels.

Client Side Tools

D E M O N S T R A T I O N



Interactive Debugging

Interactive Debugging

- Ability to step through code
- Watch Variables/Parameters
- Set Breakpoints
- View Call and Exception Stack

Interactive Debugging

Common tools:

- SQL Developer (Free!)
- TOAD
- JDeveloper
- SQL Navigator
- PL/SQL Developer

Interactive Debugging

Local Debugging Basic Steps:

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

Interactive Debugging

Remote Debugging Basic Steps:

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

Interactive Debugging

Remote Debugging Basic Steps:

- Connect to Remote Debugger
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- Compile code in Debug Mode
- Execute Code
- ...Debug...
- Disconnect from Remote Debugger

Interactive Debugging

Remote Debugging Requirements:

Relies on DBMS_DEBUG_JDWP package

```
dbms_debug_jdwp.connect_tcp(host, port)
```

```
...call code...
```

```
dbms_debug_jdwp.disconnect
```

(Introduced in 9iR2)

Interactive Debugging

Remote Debugging Requirements:

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```
dbms_debug_jdwp.connect_tcp(host, port)
```

```
...call code..
```

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dbms_debug_jdwp.disconnect
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Interactive Debugging

Remote Debugging Requirements:

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...call code...

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Interactive Debugging

Remote Debugging Requirements:

Relies on DBMS_DEBUG_JDWP package

```
dbms_debug_jdwp.connect_tcp(host, port)
```

```
...call code..
```

```
dbms_debug_jdwp.disconnect
```

Interactive Debugging

Remote Debugging Requirements (≥ 9.2):

- DEBUG CONNECT SESSION (10gRI)
- DEBUG ANY PROCEDURE (9iR2)
- (or DEBUG and EXECUTE) (10gRI)

```
grant debug connect session to <user>
grant debug any procedure to <user>
grant execute on foo to <user>
grant debug on schema.procedure to
<user>
```

(Not a good idea in production!)

Interactive Debugging

D E M O N S T R A T I O N



Other quick tips

Different view in App Builder

- APEX 3.2 - Events view

Page Processing



No computations



No validations



Process: After Submit Run MySleep (declare v_re..)



Go To Page: f?p=&APP_ID.:5:&SESSION.::&DEB (After Processing) sequence: 10Unconditional



Go To Page: f?p=&FLOW_ID.:5:&SESSION.::&DE (After Processing) sequence: 10
button=MYSLEEP

- APEX 4.0 - Use the Tree View

APEX 4.0 Advisor

- Performs checks on your application
 - Programming Errors
 - Security Issues
 - QA and BP

ORACLE® Application Express

Welcome DIMITRI.GIELIS@APEX-EV

Home	Application Builder ▼	SQL Workshop ▼	Team Development ▼	Administration ▼
------	-----------------------	----------------	--------------------	------------------

Home > Application Builder > Application 12807 > Utilities > Advisor

Perform Check

Checks to Perform

☒ References with Substitution Syntax	☒ References with Column Syntax	☒ References with Bind Variable Syntax
☒ Referenced item is on current page	☒ Referenced item is page item of target page	☒ Declarative references of Application/Page Items/IR Filter
☒ References of Page Item in a String	☒ Referenced Page Number Exists	☒ Clear Cache Page Number equals Target- or Current Page
☒ Is Valid SQL/PLSQL Code	☒ Target Page Authorization equals current Component authorization	☒ Target Page Authorization is also set for current Component
☒ Fetch/DML/MR* Processes are valid	☒ Inappropriate use of Substitution Syntax	☒ V Function used in SQL Statement
☒ Hardcoded Application Id	☒ Unconditional Branch before other branches	☒ Associated Item of Validations
☒ Length of item name	☒ Referenced Button in When Button Pressed exists	☒ Report has default order
☒ Page Item has Help Text		

Find what you need

- APEX 3.2 - Use Application Reports > Active Sessions

ORACLE® Application Express

Logout Help

Home Application Builder SQL Workshop Utilities

Home > Application Builder > Application 108 > Application Reports > Activity > Active Sessions

Page 5

User Since 1 Day Display 15 Go

Application	Session	Owner ▲	IP Address	Created	Session State Items
108	1104991462154999	ADMIN	192.168.1.200	24 hours ago	3
108	286266638530877	ADMIN	192.168.1.200	8 hours ago	3
108	936628185246772	ADMIN	192.168.1.200	26 minutes ago	3
108	706550880550535	JES	192.168.1.200	7 hours ago	4
108	2456150899005103	JES	-	8 hours ago	6
108	3747395937286933	JES	-	23 hours ago	5

1 - 6

[Download](#) | [Print](#)

- and many others ...

Be Proactive

- Use the APEX Dictionary
- Use Monitoring tools
- Use other tools depending the technology
e.g. Flash Tracer
- Look at Webserver Logs

Search for help

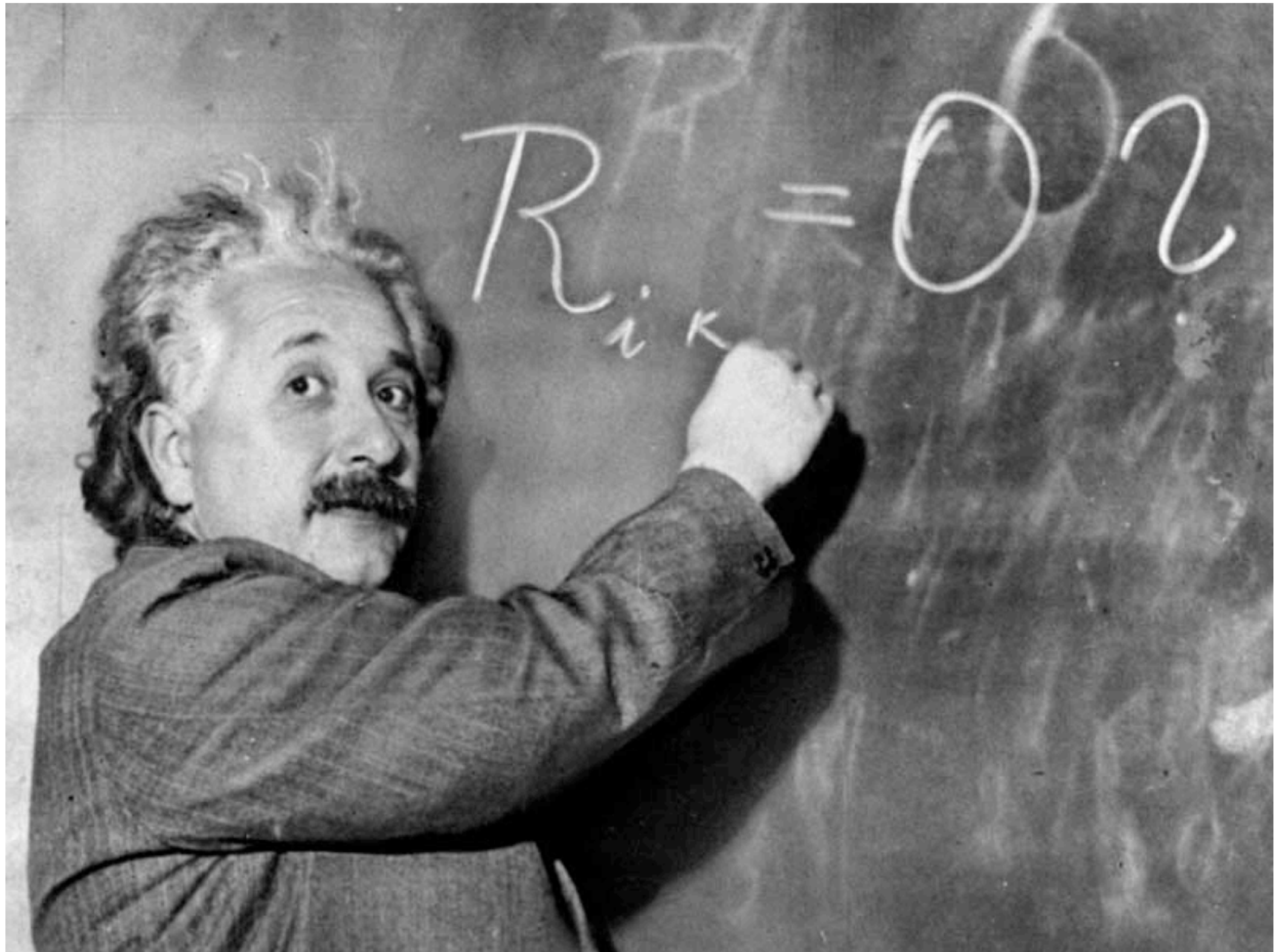
- Use the OTN forums -
 - Very likely someone else has had the problem
 - If you solve a problem, don't keep it to yourself
- Don't be afraid to ask for help (change your approach)
 - 'Fresh pair of eyes'
 - Go for a walk
 - Sleep on it

XDB tracing

- ALTER system SET event = '31098 trace name context forever, level x' scope=spfile;

hint from Marco Gralike

Summary



Summary

- Make use of tools and features to debug your applications and understand what is going on

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Application Success

<http://sumneva.com>