

# PRECISE FOR ORACLE DATABASE

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Professional Services Enterprise Improves Oracle Database Performance

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# CHALLENGE

A large enterprise professional services company for computer-assisted legal research in the United States of America uses an application based on Oracle Database for online activity. Their online users complained about the slow performance of this business-critical application.

# INVESTIGATION

The Findings Section of the 'Overview' tab on the right side of the 'Dashboard' workspace for all monitored instances of Oracle Database (Figure 1) displays the top consumers that Precise automatically identifies. In this case, it automatically identified a heavy SQL statement for 'SELECT \*' that consumed 59% of resources for Oracle Database when executed more than 47 thousand times. Selecting the 'Learn more' hyperlink leads to subsequent steps in the context of the heavy SQL statement.

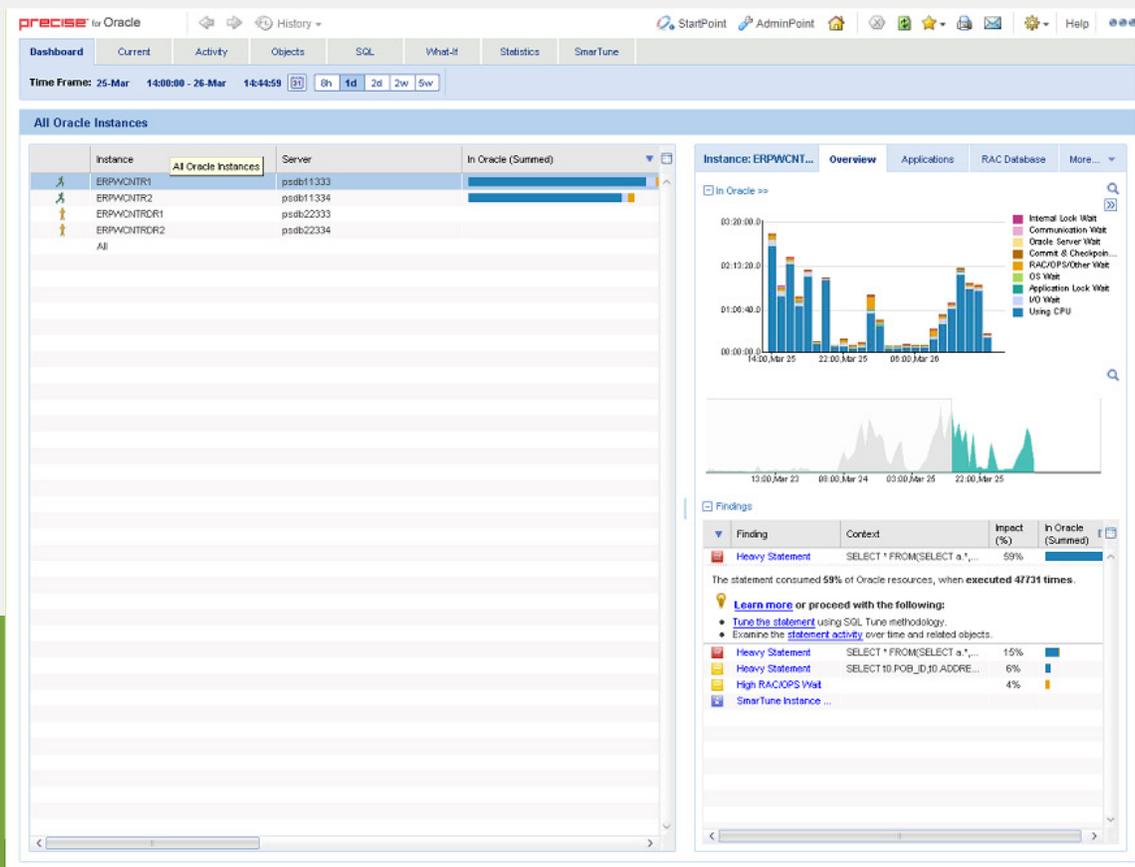


Figure 1 The 'Overview' tab of the 'Dashboard' workspace for all monitored instances of Oracle Database.

The 'Statements' area at the bottom part of the 'Table View' tab of the 'Activity' workspace for the problematic instance of Oracle Database (Figure 2) displays the SQL statements ranked by order of time spent in Oracle Database. The top SQL statement identified by '18533' corresponds to almost 14 hours of CPU time which is a lot for an application with low latency and high throughput where time is money.

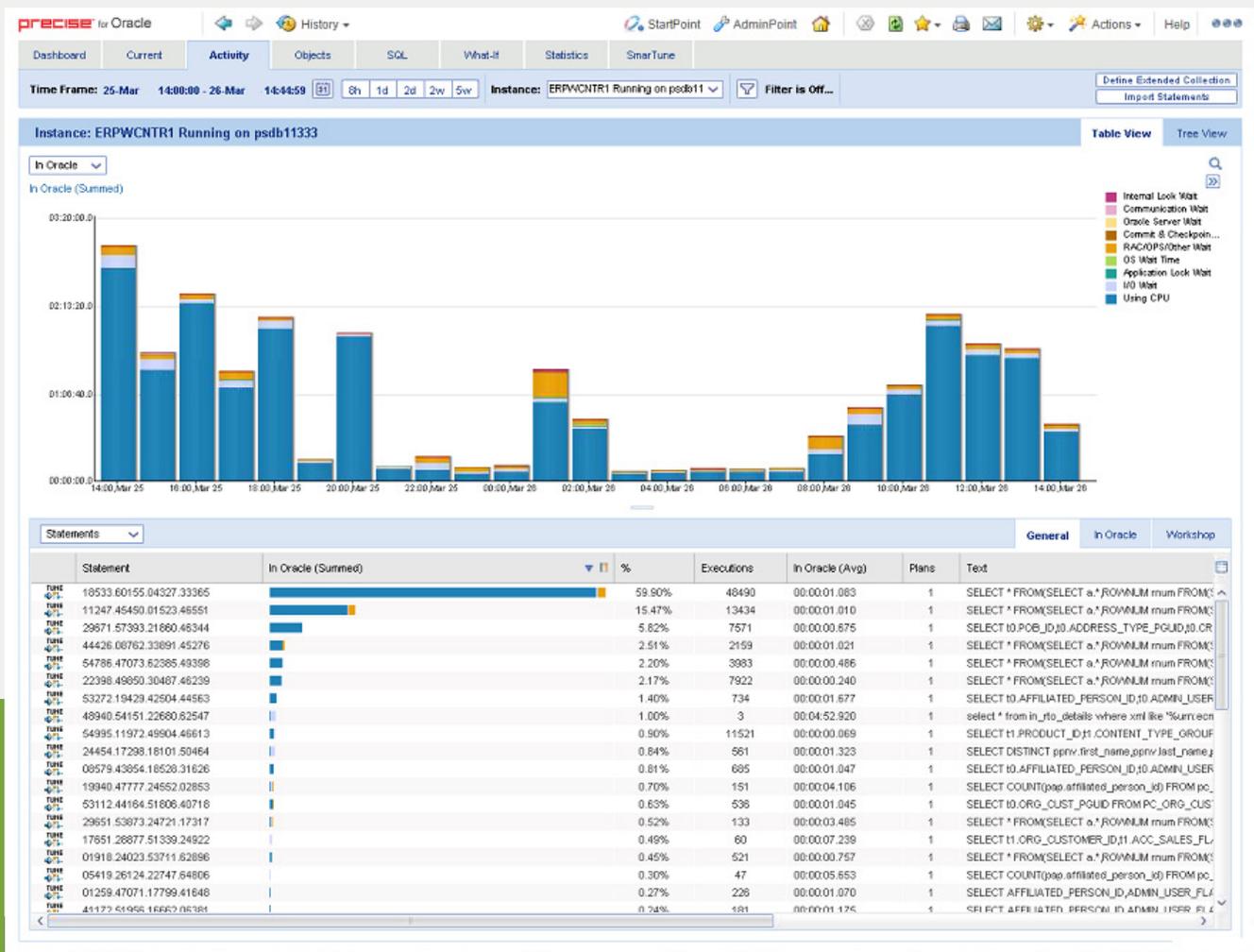


Figure 2 The 'Statements' area at the bottom part of the 'Table View' tab of the 'Activity' workspace for the problematic instance of Oracle Database.

The 'Plan' tab of the 'SQL' workspace for the top SQL statement (Figure 3) displays the execution plan for the heavy SQL statement identified by '18533'. The 'Text' subtab shows that for the table 'PC\_AFFILIATED\_PERSON' the 'WHERE' clause filters on the column 'USER\_PERM\_ID' via the 'UPPER()' function that converts a string to upper-case. The 'Tables in use' area in the 'Objects' subtab confirms that the SQL statement operates on the table 'PC\_AFFILIATED\_PERSON'. The 'Indexed defined on table' area shows that the only index that refers to the column 'USER\_PERM\_ID' is the index 'AFF\_PERSON\_USERPERMID\_IDX' which does not refer to the 'UPPER()' function. The 'Columns in table' area shows that the column 'USER\_PERM\_ID' contains data of type 'Varchar(90)' with more than 1 million distinct values for a total of almost 100 million characters or bytes in memory.

The screenshot displays the Oracle SQL Developer interface. The main window shows the execution plan for a query. The 'Text' tab is active, showing the following SQL query:

```

SELECT * FROM PC_AFFILIATED_PERSON
WHERE UPPER(USER_PERM_ID) = UPPER(1)
WHERE ROWNUM <= 2
WHERE num = 3

```

The 'Objects' subtab shows the table PC\_AFFILIATED\_PERSON and its indexes. The 'Columns in table' subtab shows the columns of PC\_AFFILIATED\_PERSON, including USER\_PERM\_ID.

Locate	Used	Table	IO Val	IT	Rows	Blocks	Non-Empty Blocks	La
		PC_AFFILIATED_PERSON			1088645	37378	37127	Ma

Locate	Used	Index	IO Val	IT	Unique	Type	Partitioned	Leaf Bloc
		AFF_PERSON_OROCUST_IDX			No	Normal	No	
		AFF_PERSON_USERPERMID_IDX			Yes	Normal	No	
		AFF_PERSON_POUID_IDX			Yes	Normal	No	
		AFF_PERSON_PERSON_IDX			No	Normal	No	
		PC_AFFILIATED_PERSON_PK			Yes	Normal	No	
		AFF_PERSON_POB_IDX			No	Normal	No	

Column	Type	Distinct Values	Key Number	In Clause	Indexable
AT USER_PERM_ID	Varchar(90)	1000642	1	Where,Select	
ORO_CUSTOMER_ID	Number	32339		Select	
LAST_LOGIN_DATE	Timestamp(6)	393394		Select	
USER_TYPE_POUID	Varchar(200)	3		Select	
POSITION_POUID	Varchar(200)	262		Select	
CHAMBER_OFFICE_POUID	Varchar(200)	0		Select	
LAST_UPDATE_DATE	Timestamp(6)	1088138		Select	
DS_VERIFIED_DATE	Timestamp(6)	60		Select	
CREATE_DATE	Timestamp(6)	993432		Select	
STATUS_REASON_CODE	Varchar(250)	0		Select	

Figure 3 The 'Plan' tab of the 'SQL' workspace for the top SQL statement before adding the new index.

# FINDINGS

To improve the performance of the heavy SQL statement for the table 'PC\_AFFILIATED\_PERSON', the company created an index with the name of 'USER\_PERM\_ID\_UP' with the content 'UPPER(USER\_PERM\_ID)'.

The 'Plan' tab of the 'SQL' workspace for the top SQL statement (Figure 4) verifies that the SQL statement uses the new execution plan with the new index 'USER\_PERM\_ID\_UP'.

The screenshot displays the Oracle SQL Developer interface. The top navigation bar includes 'precise for Oracle', 'History', 'StartPoint', 'AdminPoint', and 'Help'. The main workspace is titled '18533.60155.04327.33365 (in ERPWCNTR1 Running on psdb11333)'. The 'Plan' tab is active, showing the execution plan for a SQL statement. The plan is a 'Real plan' with a hash value of 1611861180 and an estimated cost of 3. It consists of a select statement with a table access for 'PC\_AFFILIATED\_PERSON' and an index scan for 'USER\_PERM\_ID\_UP'. The SQL text is displayed on the right, showing a select statement with various columns from the 'PC\_AFFILIATED\_PERSON' table. The findings panel at the bottom indicates a 'Frequently Executed Statement' with high CPU usage and provides a link to 'Learn more or proceed with the following'.

```
SELECT *
FROM
(SELECT a.*,
ROWNUM rnum
FROM
(SELECT AFFILIATED_PERSON_ID AS a1,
ADMIN_USER_FLAG AS a2,
AFF_PER_PGID AS a3,
CHAMBER_OFFICE_PGID AS a4,
COURT_AGENCY_PGID AS a5,
COURT_TYPE_PGID AS a6,
COURT_UNIT_PGID AS a7,
CREATE_DATE AS a8,
DEPT_PGID AS a9,
DOMAIN_ID AS a10,
DS_VERIFIED_DATE AS a11,
INTERNAL AS a12,
INVOICE_USER_FLAG AS a13,
JOB_TITLE AS a14,
LANG_CODE_PGID AS a15,
LAST_LC_DATE AS a16,
LAST_LOGIN_DATE AS a17,
LAST_UPDATE_DATE AS a18,
LEGAL_ID AS a19,
LOCALE AS a20,
MY_LEXIS_ROLE AS a21,
ORGANIZATION_PGID AS a22,
PERIOD_END_DATE AS a23,
PERIOD_START_DATE AS a24,
POSITION_PGID AS a25,
POSITION_REASON AS a26,
```

Figure 4 The 'Plan' tab of the 'SQL' workspace for the top SQL statement after adding the new index.

The top part of the 'Table Overview' tab of the 'Activity' workspace for the problematic SQL statement (Figure 5) shows that the average time spent in the Oracle Database was reduced from some 1.2 second to 0.12 millisecond for each execution. That is a performance improvement of almost 10,000 times. Moreover, that reduction corresponds to a savings of some 10 hours of summed time spent in the Oracle Database.

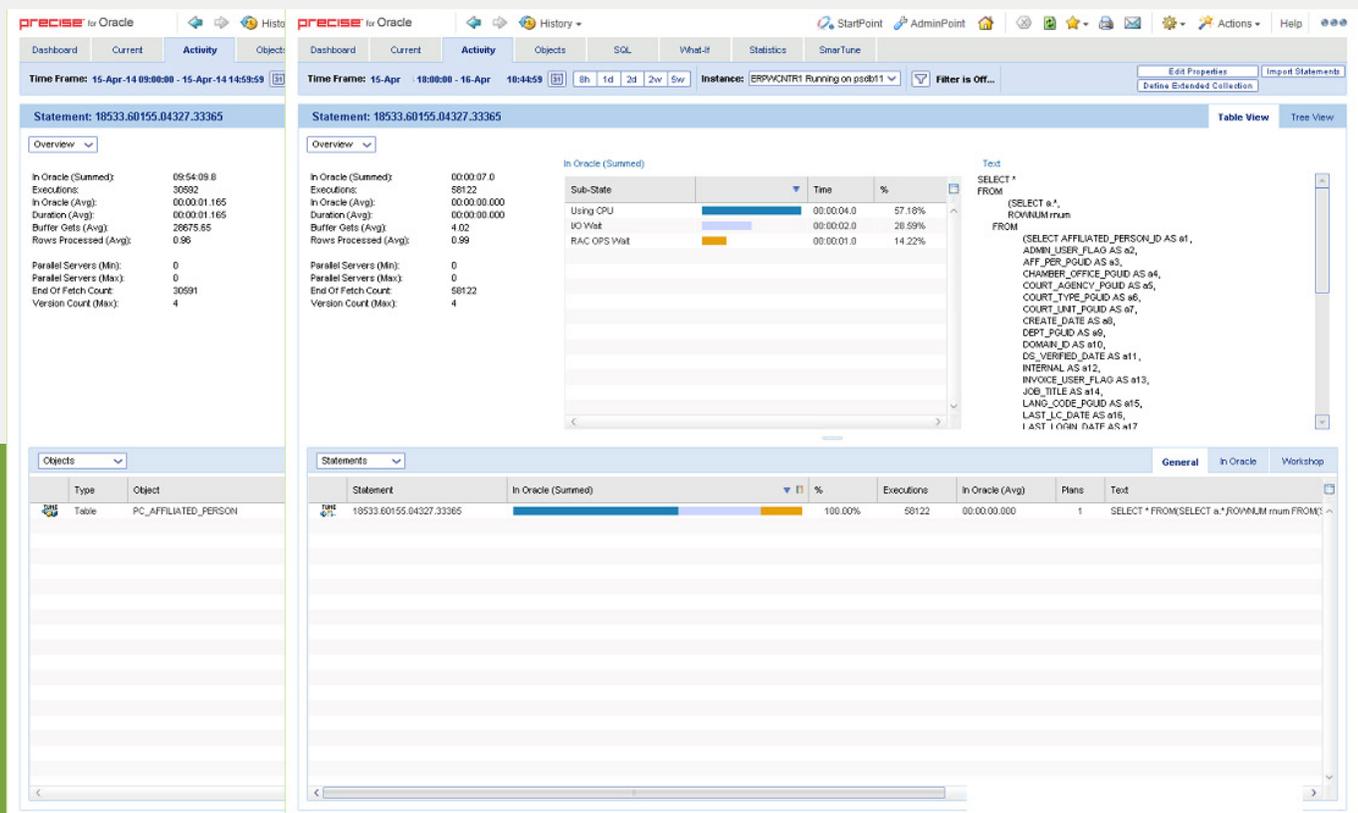


Figure 5 The 'Table View' tab of the 'Activity' workspace for the problematic SQL statement before versus after adding the new index.

The 'In Oracle' area at the top of the 'Table View' tab of the 'Activity' workspace for the problematic instance of Oracle Database (Figure 6) shows the significant reduction of the summed time spent in the Oracle Database after the index change versus before the index change, starting at 6 PM on April 15.

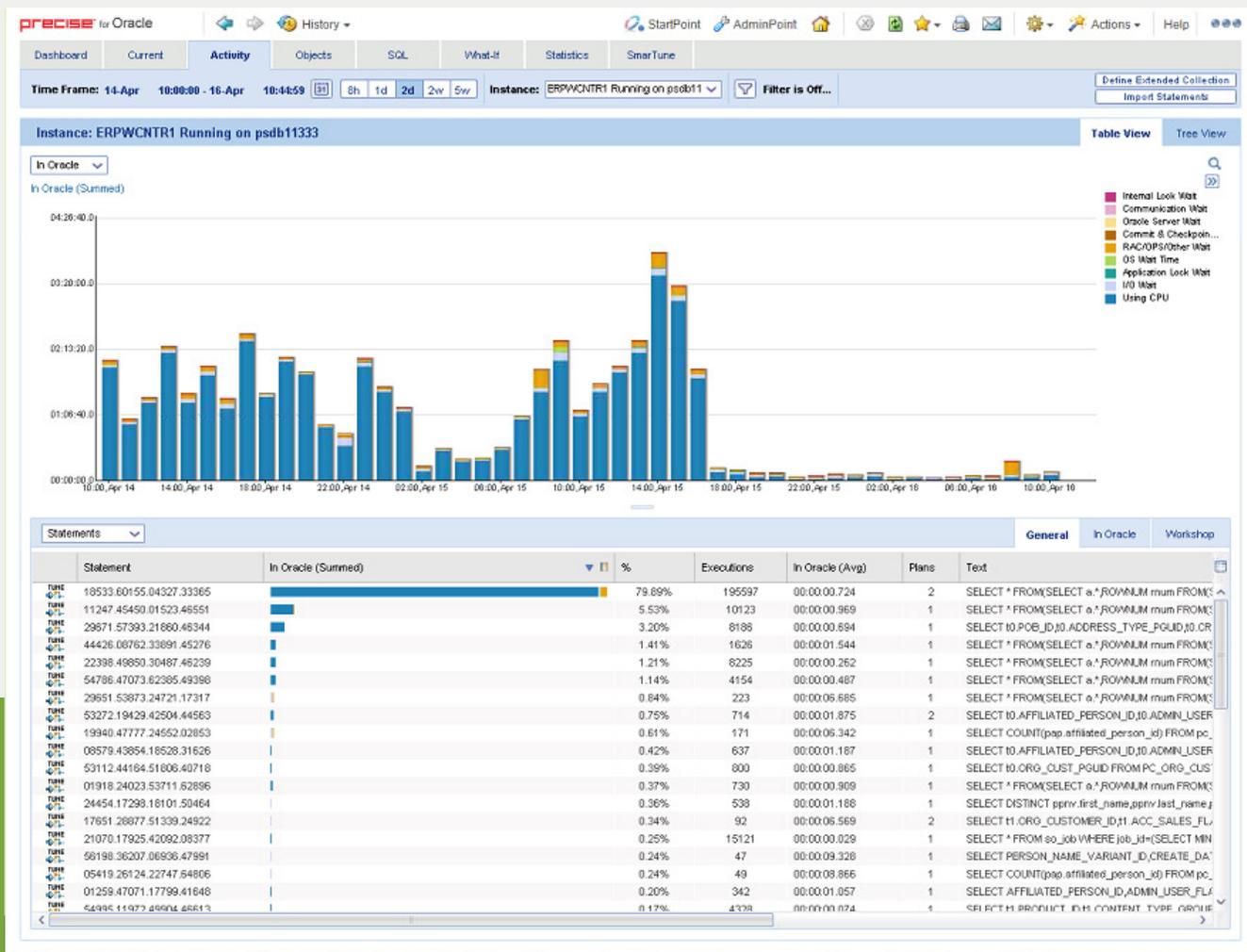
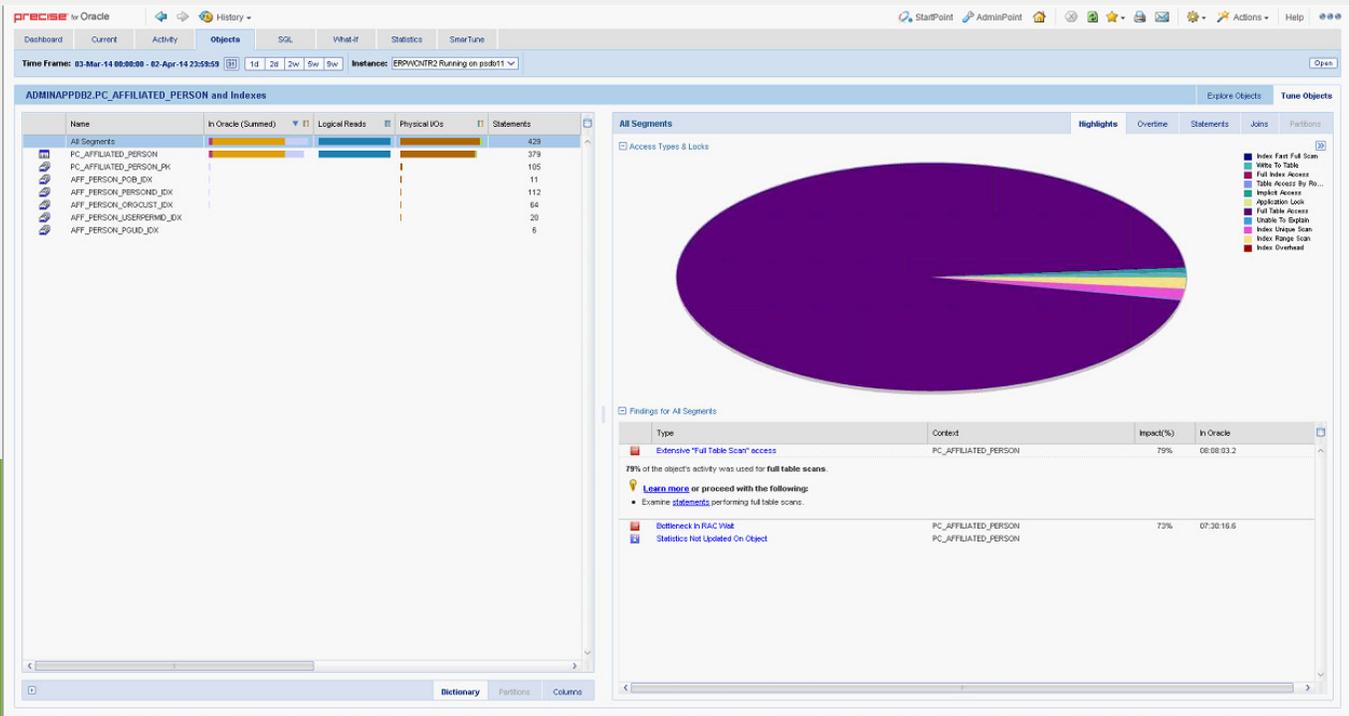


Figure 6 The 'In Oracle' area at the top of the 'Table View' tab of the 'Activity' workspace for the problematic instance of Oracle Database before and after adding the new index.

The left side of the 'Tune Objects' tab of the 'Objects' workspace for the table 'PC\_AFFILIATED\_PERSON' (Figure 7) shows that the bottom six indexes are under-used. The top part of the 'Highlights' subtab shows that these under-used indexes cause significant index overhead. At the same time, the bottom part of the 'Highlights' subtab shows that Precise identified an extensive full table scan access. Consequently, it appears that additional improvements in performance may be possible by further optimizing the use of indexes.



**Figure 7** The left side of the 'Tune Objects' tab of the 'Objects' workspace for the table 'PC\_AFFILIATED\_PERSON' after adding the new index.

# SUMMARY

The company identified the problematic SQL statement and explored options for optimization with Precise. It pinpointed the top SQL statement and focused on the resource (that is, CPU time) that it is consuming. The company then considered ideas for making the SQL statement more efficient by creating an index that used the UPPER function. This avoids the need to convert it for every execution of the SQL statement. Subsequently, it verified the results. Precise facilitated a repeatable process of finding, focusing, improving, and verifying. The SQL statement used the new index which resulted in less resources being consumed. This meant that the Oracle instance now consumes much less CPU time. Consequently, the company avoided a refresh of hardware that the company had scheduled for the next budget cycle. By improving the efficiency of what is running, the company extended the life of the hardware while delivering better performance to the end-users of the applications.

# PRECISE FOR ORACLE DATABASE

## ACCELERATE BUSINESS PERFORMANCE

- Database Performance Fuels Company Performance
- Multiple Platform Database Monitoring and Alerting
- Performance Management Database
- Root Cause Identification
- Tuning Recommendations
- What-if Analysis
- Capacity Planning

SEE IT IN ACTION

