Datum, Uhrzeit, Kalender & Co
… und Application Express

APEX CONNECT 2017

vom 9. bis 11. Mai in Berlin

#APEXCONN17

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DATE, TIMESTAMP & Co

Was ist der Unterschied - wann nimmt man was?

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DATE und TIMESTAMP: 4 Datentypen

- **DATE**
  Speichert Datum und Uhrzeit - Sekundengenau
- **TIMESTAMP**
  Bietet zusätzlich Sekundenbruchteile (fractional seconds) und Unterstützung für Zeitzonen an.
- **TIMESTAMP WITH TIME ZONE**
  Erlaubt die Angabe einer expliziten Zeitzone
- **TIMESTAMP WITH LOCAL TIME ZONE**
  Rechnet transparent in die Session-Zeitzone um

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DATE und TIMESTAMP-Datentypen

- Die vier Datentypen am Beispiel
- Achtung: Darstellung hängt von NLS-Session-Einstellungen ab

```
DATE                TIMESTAMP
------------------- ---------------------------
28.04.2017 06:44:49 28.04.17 06:44:49,931315000
```

```
TIMESTAMP_LTZ                TIMESTAMP_TZ
---------------------------- ----------------------------------
28.04.17 15:44:49,931315000 28.04.17 06:44:49,931315000 -07:00
```

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Unter der Motorhaube …

```
DATE                                DUMP
----------------------              ------------------------------------------------------------
28.04.2017 06:52:41                 Typ=13  Len=8:  225,7,4,28,6,52,41,0

TIMESTAMP                           DUMP
--------------------------          ------------------------------------------------------------
28.04.17 06:52:41,977037000         Typ=187 Len=20: 225,7,4,28,6,52,41,0,200,102,60,58,249,0,3,0,0,0,0,0

TIMESTAMP_LTZ                       DUMP
--------------------------          ------------------------------------------------------------
28.04.17 15:52:42,039965000         Typ=232 Len=20: 225,7,4,28,15,52,42,0,72,209,97,2,2,0,7,0,127,1,0,0

TIMESTAMP_TZ                        DUMP
----------------------------------- ------------------------------------------------------------
28.04.17 06:52:42,106995000 -07:00 Typ=188 Len=20: 225,7,4,28,13,52,42,0,56,157,96,6,249,0,5,0,0,0,0,0
```

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DATE und TIMESTAMP erzeugen

- SQL-Funktionen TO_DATE, TO_TIMESTAMP, TO_TIMESTAMP_TZ
  - NLS-Formatmaske am bes
  - Nicht auf Defaults verlass
- Alternativ: DATE oder TIME
  - DATE'YYYY-MM-DD'
  - TIMESTAMP'YYYY-MM-DD H
  - Es gibt auch noch ein TIM

a tiny teaser just before the weekend ... can you replicate this one ...?

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Zeitdifferenzen

- Sind bei DATE-Datentypen stets Dezimalzahlen. Es gilt: 1 = 1 Tag

```
SQL> select sysdate - DATE'2016-01-01' as diff from dual;

      DIFF
----------
483,328935
```

```
SQL> select DATE'2016-01-01' + 1.25 new_date from dual;

NEW_DATE
--------------------
02.01.2016 06:00:00
```

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Spezialfall Monate addieren …

- Mit dem DATE-Datentypen: ADD_MONTHS

```
SQL> select add_months( DATE'2017-01-30', 1 ) from dual;

NEW_DATE
--------------------
28.02.2017 00:00:00
```

```
SQL> select add_months(DATE'2017-02-28', -1) from dual;

NEW_DATE
--------------------
31.01.2017 00:00:00
```

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Zeitdifferenzen

- TIMESTAMP arbeitet mit dem INTERVAL Datentyp

```
SQL> select localtimestamp - TIMESTAMP'2016-01-01 00:00:00' from dual;

DIFF
---------------------
+483 16:59:34.120780
```

```
SQL> select TIMESTAMP'2016-01-01 00:00:00' + interval '2' month from dual;

NEW_TS
---------------------------
01.03.16 00:00:00,000000000
```

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Zeitdifferenzen - in Stunden …?

- Mit EXTRACT Informationen aus INTERVAL auslesen

```
SQL> select localtimestamp - TIMESTAMP'2016-01-01 00:00:00' from dual;

DIFF
---------------------
+487 10:25:55.317850
```

```
select extract(
   HOUR from localtimestamp - TIMESTAMP'2016-01-01 00:00:00') from dual;

DIFF_HOURS
----------------------------------------------------------------
                                                             10
```

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Zeitdifferenzen - in Stunden …?

- Mit EXTRACT Informationen aus INTERVAL auslesen

```
with i as (
    select localtimestamp - TIMESTAMP'2016-01-01 00:00:00' diff from dual
)
select extract( DAY  from diff ) * 24 +
       extract( HOUR from diff ) from i;

DIFF_HOURS
----------
                                                                11698
```

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Zeitdifferenzen

- DATE-Methoden funktionieren auch mit TIMESTAMP
- TIMESTAMP-Methoden funktionieren auch mit DATE
- Aber …

```
SQL> select systimestamp, systimestamp + 1 from dual;

SYSTIMESTAMP                              SYSTIMESTAMP+1
----------------------------------------- --------------------
28.04.17 08:02:47,718026000 -07:00 29.04.2017 08:02:47
```

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Monate addieren mit TIMESTAMP …

- Mit dem DATE-Datentypen: ADD_MONTHS

Nach SQL Standard korrektes Verhalten

```
SQL> select TIMESTAMP'2017-01-31 00:00:00' + interval '1' month from dual;

Fehler beim Start in Zeile: 1
ORA-01839: Datum für angegebenen Monat nicht gültig
```

```
select add_months(TIMESTAMP'2017-01-31 00:00:00', 1) from dual;

NEW_DATE
--------------------
28.02.2017 00:00:00
```

Implizit zu DATE konvertiert

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DATE, TIMESTAMP & Co

DATE & TIMESTAMP in Application Express: Generelles

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DATE und TIMESTAMP in Application Express

- APEX Items …
  - kennen weder DATE noch TIMESTAMP
  - sind immer vom Typ VARCHAR2
  - APEX führt intern stets TO_CHAR und TO_DATE aus

- Formatmasken sind daher wichtig
  - Defaults setzen in
    Shared Components -> Application Attributes -> Globalization

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DATE und TIMESTAMP in Application Express

- NLS-Session-Einstellungen abhängig von der Anwendungssprache

Application Express	Database Session
Application Date Format	NLS_DATE_FORMAT
Application Timestamp Format	NLS_TIMESTAMP_FORMAT
Application Timestamp Time Zone Format	NLS_TIMESTAMP_TZ_FORMAT
Application Date Time Format	

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APEX setzt das NLS-Environment automatisch!

Elapsed	Execution	Message	Level	Graph
0.01807	0.00247	Reset NLS settings	4	
0.01854	0.00194	alter session set NLS_COMP='BINARY' NLS_SORT='BINARY' NLS_CALENDAR='GREGORIAN' NLS_TERRITORY='AMERICA' NLS_LANGUAGE='AMERICAN'	4	
0.02048	0.00003	...NLS: Set Decimal separator="."	4	
0.02051	0.00168	...NLS: Set NLS Group separator=","	4	
0.02219	0.00004	...NLS: Set g_nls_date_format="DD-MON-RR"	4	
0.02222	0.00113	...NLS: Set g_nls_timestamp_format="DD-MON-RR HH.MI.SSXFF AM"	4	
0.02335	0.00163	...NLS: Set g_nls_timestamp_tz_format="DD-MON-RR HH.MI.SSXFF AM TZR"	4	
0.02498	0.00011	NLS of database and client differs, characterset conversion needed	4	
0.02509	0.00007	...Setting session time zone to -07:00	4	
0.02516	0.02646	R E Q U E S T show	4	
0.05162	0.00350	Language derived from: FLOW PRIMARY LANGUAGE, current browser language: de	4	
0.05512	0.00003	alter session set nls_language='GERMAN' nls_territory='GERMANY'	4	
0.05516	0.00011	NLS: CSV charset=WE8MSWIN1252	4	
0.05527	0.00002	...NLS: Set Decimal separator=","	4	
0.05528	0.00010	...NLS: Set NLS Group separator="."	4	
0.05538	0.00002	...NLS: Set g_nls_date_format="DD.MM.RR"	4	
0.05540	0.00002	...NLS: Set g_nls_timestamp_format="DD.MM.RR HH24:MI:SSXFF"	4	
0.05542	0.00004	...NLS: Set g_nls_timestamp_tz_format="DD.MM.RR HH24:MI:SSXFF TZR"	4	
0.05546	0.00002	NLS: Language=de	4	
0.05548	0.00058	Application 100, Page Template: 1437064621951882	4	

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Kalender in Application Express: Was geht, was ist neu?

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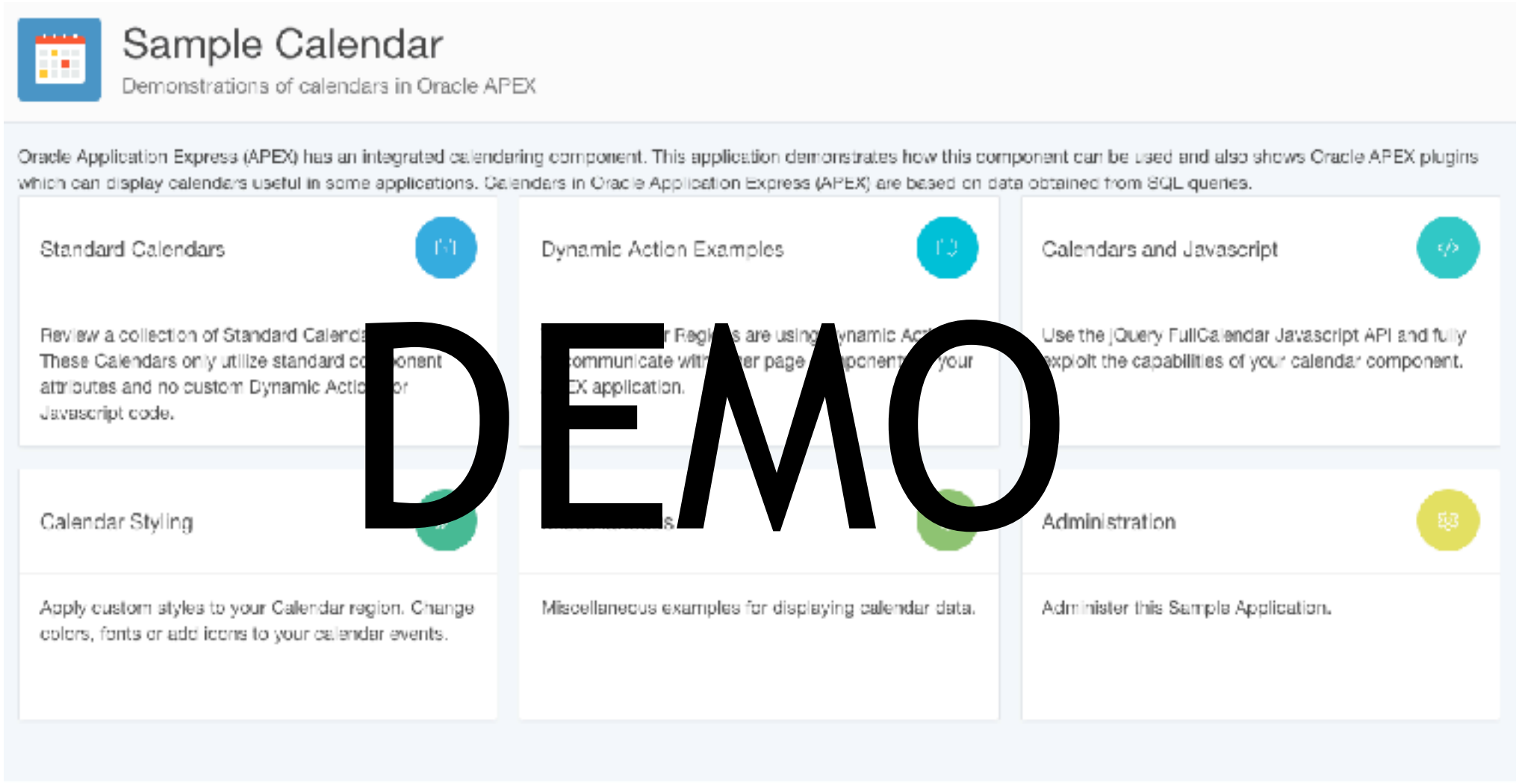

DEMO

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DATE, TIMESTAMP & Co

Ein paar Tipps und Tricks aus der Praxis

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Datumsvergleich …

- Ein DATE enthält Datum und Uhrzeit
- Viele Datumswerte werden mit SYSDATE generiert und gespeichert
- Uhrzeit spielt beim Vergleich eine Rolle!

```
SQL> select * from datum;

SPALTE
---------
02-MAI-17

SQL> select * from datum where spalte = DATE'2017-05-02';

No rows selected.
```

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Datumsvergleich …

- Uhrzeit mit TRUNC({date}) entfernen
- Uhrzeit ins NLS_DATE_FORMAT aufnehmen (login.sql, glogin.sql)

```
SQL> select * from datum;

SPALTE
--------------------
02.05.2017 01:01:06

SQL> select * from datum where trunc( spalte ) = DATE'2017-05-02';

SPALTE
--------------------
02.05.2017 01:01:06
```

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Datumsliste berechnen

- Start- und Enddatum liegen vor - es braucht alle Tage dazwischen
- 1. Schritt: Zeilen generieren
- 2. Schritt: Join mit BETWEEN

```
select DATE'2001-01-01' + level from dual connect by level <= 31;

DATE'2001-01-01'+LE
-------------------
02.01.2001 00:00:00
03.01.2001 00:00:00
04.01.2001 00:00:00
05.01.2001 00:00:00
:
01.02.2001 00:00:00
```

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Datumsliste berechnen

```
with tage as (
  select DATE'2017-01-01' + level tag from dual connect by level <= 365
)
select t.tag, p.name
  from tage t, projects p
 where t.tag between p.start_date and p.end_date;

TAG                  NAME
-------------------- --------------------
04.05.2017 00:00:00 Projekt 1
05.05.2017 00:00:00 Projekt 1
06.05.2017 00:00:00 Projekt 1
07.05.2017 00:00:00 Projekt 1
08.05.2017 00:00:00 Projekt 1
09.05.2017 00:00:00 APEX-Connect
09.05.2017 00:00:00 Projekt 1
10.05.2017 00:00:00 APEX-Connect
10.05.2017 00:00:00 Projekt 1
11.05.2017 00:00:00 APEX-Connect
```

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