

BUILDING AUTOMATIONS WITH ORACLE APEX 20.2 AND UP

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- Founder & CEO of United Codes
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- Oracle ACE Director
- “APEX Developer of the year 2009” by Oracle Magazine
- “Oracle Developer Choice award (ORDS)” in 2015
- Author Expert Oracle APEX
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APEX Office Print



APEX Media Extension



APEX Project Eye



Plug-ins Pro

HOW CAN WE ... ?



**.. CREATE AND SEND
A MONTHLY INVOICE
(AUTOMATICALLY)?**

—



... CHANGE THE RECOMMENDATION OF A STOCK WHEN ... (AUTOMATICALLY) ?

BUY

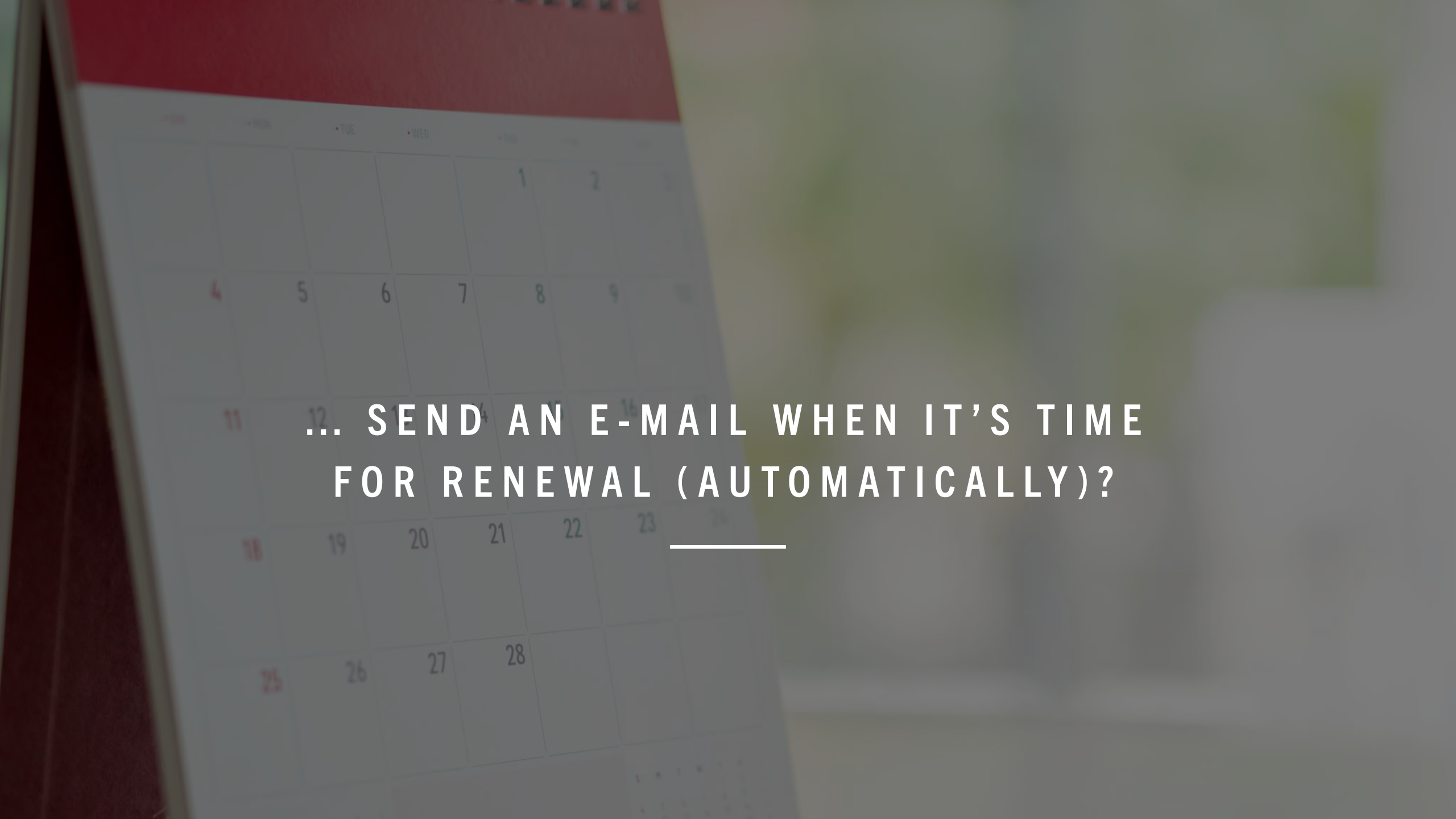
When the stock of Tesla hits 500 USD

HOLD

When the stock of Tesla is between 500 and 700 USD

SELL

When the stock of Tesla hits 700 USD



... SEND AN E-MAIL WHEN IT'S TIME
FOR RENEWAL (AUTOMATICALLY)?

SOLUTION

Time component (monthly, when...)

=> DBMS_SCHEDULER?



AUTOMATIONS



Application 617

Shared Components

Application Logic



Application Definition Attributes

Application Items

Application Processes

Application Computations

Application Settings

Automations

Build Options

DEFINITION

Automations initiate a sequential set of actions based on a schedule.

They are used to monitor data and then perform the appropriate action.

2 TYPES OF AUTOMATION

On Demand

the automation will be executed when called explicitly using the **APEX_AUTOMATION** package

Scheduled

the automation will be executed automatically based on the selected frequency
(uses DBMS_SCHEDULER behind the scenes)

ACTIONS INITIATED ON

Query (= by row)

depending the data source (TABLE / SQL / REST);
row returned or not returned

Function Body Returning Boolean (= 1 time)

not linked to a query

Always (= 1 time)

not linked to a query

Note: Possibility to add Server-side Condition & Build option

DEFINE 1 OR MORE ACTION(S)

Execute Code

Use any PL/SQL (or other DB 21c) against Local DB or REST enabled SQL Service

Data Loading

Based on Data Load Definition

*Note: Possibility to add **Error Handling**, Server-side Condition & Build option*

ADDITIONAL CODE EXECUTION

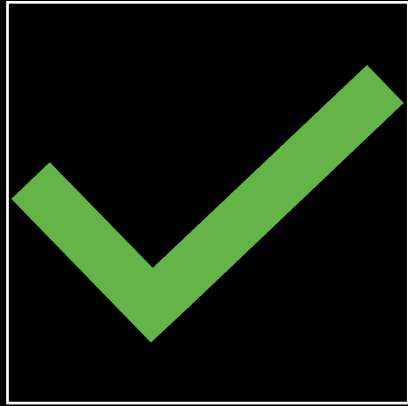
Initialization, Before Row Processing, Clean-up Procedure Name

Use code to prepare and finish the automation

Error Handling (for entire automation)

- **Ignore:** Ignore error and continue processing automation
- **Abort Automation:** Abort automation but leave it enabled
- **Disable Automation:** Abort automation and disable it

TYPICAL USE CASES OF AUTOMATIONS



Auto-approving specific requests



Sending email alerts

APP BUILDER

APP > SHARED COMPONENTS > AUTOMATIONS

 **APEX** **App Builder** ▾ SQL Workshop ▾ Team Development ▾ Gallery

Application 617 ▾ Shared Components ▾ **Automations**  

Automations Execution Log History

 ▾

Go

Actions ▾

Copy

Create

Name	Type	Execute Actions When	Schedule Status	Last Run	Next Run 	Run
My first automation	Scheduled	Rows Returned	 Disabled	06/20/2021 08:18:59 PM		



Application 617 \ Shared Components \ Automations \ My first automation

Automation: My first automation

CancelDeleteSave ChangesSave and Run

Show All

Name

Settings

Source

Actions

Action Execution

Additional Code Execution

Server-Side Condition

Advanced

Name

*

Name

My first automation

?

Static ID

my-first-automation

?

Settings

Type

On Demand

Scheduled?

*

Schedule Expression

FREQ=HOURLY; INTERVAL=1; BYMINUTE=0

?

Schedule Status

Active

Disabled?

Actions Initiated On

Query

Function Body Returning Boolean

Always?

Last Execution

37 minutes ago

?

Source

Data Source

Local Database

REST Enabled SQL Service

REST Data Source?

Source Type

Table

SQL Query

Function Body Returning SQL?

Table / View Owner

Parsing Schema

?

*

Table / View Name

STOCKS (table)

?

Where Clause

?

Order By Clause

?

Include ROWID Column

?

MONITORING AUTOMATIONS > EXECUTION LOG

↑

Application 617 \ Shared Components \ Automations \ Execution Log

+

🔍

⚙

Automations

Execution Log

History

🔍

Go

Actions

Purge Log

Start Timestamp	Automation	Status	Successful Rows	Error Rows	Messages
06/20/2021 08:18:58 PM	My first automation	Success	16	0	0

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AUDIT AUTOMATIONS > HISTORY

↑

Application 617 \ Shared Components \ Automations \ History

+

Automations

Execution Log

History

Q

Go

Actions

Audit Date	Action	Developer	Object Type	Component Name
3 minutes ago	Change	DIMI	Automation	My first automation
3 minutes ago	Create	DIMI	Automation Action	Other action
41 minutes ago	Change	DIMI	Automation	My first automation
102 minutes ago	Change	DIMI	Automation	My first automation
109 minutes ago	Change	DIMI	Automation	My first automation
119 minutes ago	Create	DIMI	Automation	My first automation
119 minutes ago	Change	DIMI	Automation	My first automation
119 minutes ago	Create	DIMI	Automation Action	New Action

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AUTOMATIONS PL/SQL API

Database / Oracle / Application Express / Release 20.2

API Reference

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APEX_APPLICATION_INSTALL

+ 5 APEX_APP_SETTING

+ 6 APEX_AUTHENTICATION

+ 7 APEX_AUTHORIZATION

- 8 APEX_AUTOMATION

8.1 DISABLE Procedure

8.2 ENABLE Procedure

8.3 EXECUTE Procedure

8.4 EXECUTE for Query Context Procedure

8.5 EXIT Procedure

8.6 GET_LAST_RUN Return Function

8.7

GET_LAST_RUN_TIMESTAMP Function

8.8 LOG_ERROR Procedure

8.9 LOG_INFO Procedure

8.10 LOG_WARN Procedure

8.11 RESCHEDULE Procedure

8.12 SKIP_CURRENT_ROW Procedure

8 APEX_AUTOMATION



The `APEX_AUTOMATION` package provides automated functionality to your environment. Automations are a sequential set of actions which are triggered by query results. Use automations to monitor data and then perform the appropriate action, such as auto-approving specific requests and sending email alerts.

[DISABLE Procedure](#)

[ENABLE Procedure](#)

[EXECUTE Procedure](#)

[EXECUTE for Query Context Procedure](#)

[EXIT Procedure](#)

[GET_LAST_RUN Return Function](#)

[GET_LAST_RUN_TIMESTAMP Function](#)

[LOG_ERROR Procedure](#)

[LOG_INFO Procedure](#)

[LOG_WARN Procedure](#)

[RESCHEDULE Procedure](#)

[SKIP_CURRENT_ROW Procedure](#)



AUTOMATIONS BEHIND THE SCENES

- **Meta-data** stored in
APEX_APPL_AUTOMATIONS and
APEX_APPL_AUTOMATION_ACTIONS
- **Logs** stored in
APEX_AUTOMATION_LOG and
APEX_AUTOMATION_MSG_LOG
- **DBMS_SCHEDULER JOB:**
called ORACLE_APEX_AUTOMATIONS
runs every 2 minutes

Name	Value
OWNER	APEX_210100
JOB_NAME	ORACLE_APEX_AUTOMATIONS
JOB_CLASS	DEFAULT_JOB_CLASS
COMMENTS	(null)
ENABLED	TRUE
CREDENTIAL_NAME	(null)
DESTINATION	(null)
PROGRAM_NAME	(null)
JOB_TYPE	STORED_PROCEDURE
JOB_ACTION	WWV_FLOW_AUTOMATION.EXECUTE_DUE_AUTOMATIONS
NUMBER_OF_ARGUMENTS	0
SCHEDULE_OWNER	(null)
SCHEDULE_NAME	(null)
SCHEDULE_TYPE	CALENDAR
START_DATE	04/06/21 23:03:52,000000000 GMT
REPEAT_INTERVAL	FREQ=MINUTELY;INTERVAL=2;BYSECOND=5
END_DATE	(null)
EVENT_QUEUE_OWNER	(null)
EVENT_QUEUE_NAME	(null)
EVENT_QUEUE_AGENT	(null)
EVENT_CONDITION	(null)
FILE_WATCHER_OWNER	(null)
FILE_WATCHER_NAME	(null)
CONNECT_CREDENTIAL_OWNER	(null)
CONNECT_CREDENTIAL_NAME	(null)
STORE_OUTPUT	TRUE

LOG_ID	LOG_DATE	OWNER	JOB_NAME	JOB_SUBNAME	STATUS	ERROR#	REQ_START_DATE	ACTUAL_START_DATE	RUN_DURATION	INSTANCE_ID	SESSION_ID	SLAVE_PID	
6748414	20/06/21 20:05:05,193007000 GMT	APEX_210100	ORACLE_APEX_AUTOMATIONS	(null)	SUCCEEDED	0	20/06/21 20:05:05,000000000 GMT	20/06/21 20:05:05,185462000 GMT	+00 00:00:00.000000	1 2,34763	5773		+00
6748404	20/06/21 20:03:05,144370000 GMT	APEX_210100	ORACLE_APEX_AUTOMATIONS	(null)	SUCCEEDED	0	20/06/21 20:03:05,000000000 GMT	20/06/21 20:03:05,132670000 GMT	+00 00:00:00.000000	1 88,57661	5674		+00
6748402	20/06/21 20:01:05,016247000 GMT	APEX_210100	ORACLE_APEX_AUTOMATIONS	(null)	SUCCEEDED	0	20/06/21 20:01:05,000000000 GMT	20/06/21 20:01:05,013379000 GMT	+00 00:00:00.000000	1 2,3980	5421		+00

3 DEMOS



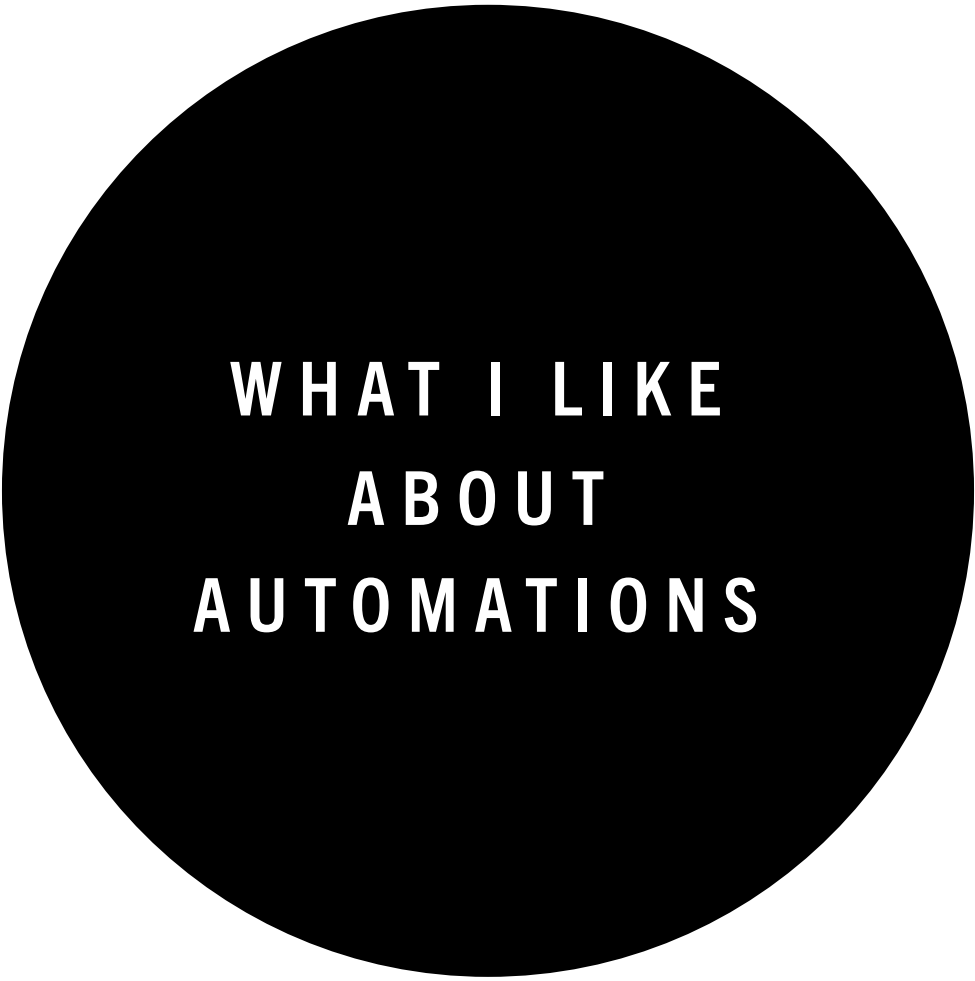
Automatically create an invoice every month and send by email
(used in apexofficeprint.com)



Check the Stock Exchange of Tesla and take action
(used by [app of my father](#))



Send an email when it's time for renewal
(used in plug-ins-pro.com)



WHAT I LIKE ABOUT AUTOMATIONS

- Is part of the APEX application
- Has an APEX session and context of app automatically (so easy to use APEX_MAIL)
- Ability to use bind variables (context of row)
- When exporting the app, automations are exported too (turned off by default on import?)
- Low Code version of DBMS_SCHEDULER with Extras (!)
- No need for DBMS_SCHEDULER privilege (need create job privilege?)
- Execution Log build-in with details of run (careful with logging; success/failure?)
- Auditing on automation (see history)

POWERFULL COMBINATIONS WITH



REST Data Sources
Synchronization



Email Templates



WHEN TO USE DBMS_SCHEDULER?

- When you don't have APEX
- Or when your schema is not associated with an APEX workspace
- When Automations doesn't provide you the specific DBMS_SCHEDULER feature

Note: you need a privilege to use DBMS_SCHEDULER (SCHEDULER_ADMIN, CREATE JOB or MANAGE SCHEDULER)



Q & A

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