

Teaching implementation of sustainable and innovative reporting approaches by means of embedded SAP GUI technologies

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Abstract— Various methods and techniques are available in SAP reporting. New approaches, however, rarely replace old and robust techniques immediately. Depending on the environment, business requirements, organizational and personal best practices, multiple solutions might be adequate. This paper presents an embedded SAP List Viewer technique by means of using shortened expression, the ALV Object Model. This case study demonstrates how to use old and new approaches in parallel, enabling both sustainability and innovation.

Keywords— SAP List Viewer, Sustainability, Innovation

INTRODUCTION

Enterprise Resource Planning, *ERP*, Systems [1-2] play an important role at company level worldwide. A huge number of employees carry out their daily work applying business functions. One can find numerous techniques and methodologies for executing business processes. It is important, therefore, to differentiate between, reliable and novice solutions. Development of reports is one of the most common requests when easy-to-use, enhanced and complex programs are being created.

SAP, a famous, popular and widely used ERP System [3], offers different ways for reporting. SAP ALV List is a tool, which enables business users applying smart features, e.g. sorting, downloading, reacting on users' activities, etc. Developers have various options for creating ALV Lists. SAP applies its own programming, the Advanced Business Application, ABAP language. Modularity is a clear development approach that makes possible the reuse of building blocks, such as subroutines, functions, methods and so on.

A business environment requires reliable solutions for sustainability. It means that the chosen development technique should be valid for long term, applied in different business areas and supported easily. This paper compares three different ALV developments, applying SAP REUSE functions, CONTROL framework and the class based SALV model.

ALV SOLUTIONS

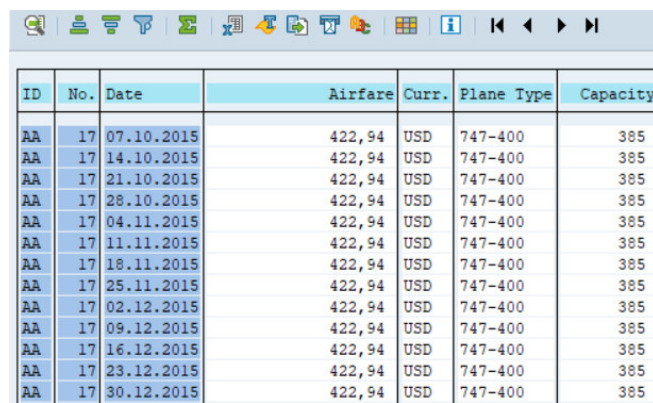
Reusability is available by using the REUSE_ALV_LIST_DISPLAY function module. There are a couple of standard demo programs in the System, introducing the functionalities of ALV lists. One of the

simplest one, the BALVSD02 report consists of a simple array of Flight data displayed by the DISPLAY function.

The code extract and the resulting list is displayed on Figure 1.a and 1.b.

```
DATA: GT_SFLIGHT TYPE TABLE OF SFLIGHT.
* -----
* Selection
SELECT * FROM SFLIGHT INTO TABLE GT_SFLIGHT.
* Call ABAP List Viewer (ALV)
CALL FUNCTION 'REUSE_ALV_LIST_DISPLAY'
  EXPORTING
    I_STRUCTURE_NAME = 'SFLIGHT'
  TABLES
    T_OUTTAB         = GT_SFLIGHT.
```

Fig. 1.a. Output flights program, ©SAP



ID	No.	Date	Airfare	Curr.	Plane Type	Capacity
AA	17	07.10.2015	422,94	USD	747-400	385
AA	17	14.10.2015	422,94	USD	747-400	385
AA	17	21.10.2015	422,94	USD	747-400	385
AA	17	28.10.2015	422,94	USD	747-400	385
AA	17	04.11.2015	422,94	USD	747-400	385
AA	17	11.11.2015	422,94	USD	747-400	385
AA	17	18.11.2015	422,94	USD	747-400	385
AA	17	25.11.2015	422,94	USD	747-400	385
AA	17	02.12.2015	422,94	USD	747-400	385
AA	17	09.12.2015	422,94	USD	747-400	385
AA	17	16.12.2015	422,94	USD	747-400	385
AA	17	23.12.2015	422,94	USD	747-400	385
AA	17	30.12.2015	422,94	USD	747-400	385

Fig. 1.b. Simple ALV functions, ©SAP

Even though only a few functions are handled by clicking on the application toolbar icons displayed above the list, general reporting requirements are covered:

- A line can be selected to display details.
- Records can be sorted ascending or descending.
- Contents can be filtered.
- Totals and subtotals can be added.
- The list can be printed and transferred to different document formats.
- The layout can be changed.

List output can be chosen as List, Fullscreen Grid or Grid. A fullscreen grid list is displayed in Figure 2, where enhanced features, like colors, symbols and icons are added.

Exception	Color	SAP Icons	SAP Symbol
0000	2	⊗	⊗
0000	3	✓	⊗
0000	4	✗	⊗
0000	5	⚡	⊗
0000	6	+	⊗
0000	7	⊖	⊗
0000	1	⊗	⊗
0000	2	⊗	⊗
0000	3	⊗	⊗
0000	4	⊗	⊗
0000	5	⊗	⊗
0000	6	⊗	⊗
0000	7	⊗	⊗

Fig. 2. Fullscreen Grid List, © SAP

SAP introduced then the Control techniques, supporting Custom Container, Dialog Box Container, Docking Box Container, Splitter Container and Easy Splitter Container Controls, respectively.

Displaying list data as a table on the screen, SAP Grid Control Tool enables print and display non-hierarchical list.

The calling program transports data in a table format. A special class, an instance of the standard `cl_gui_alv_grid` includes necessary communication details.

A filed catalog is the formatting description of displaying data.

Two methods of the instance class inherited from `cl_gui_alv_display`, the `set_table_for_first_display` and the `refresh_table_display` ones.

Figure 3.a and 3.b. display a simple SAP Grid list with extended toolbar.

ID	No.	Flight Date	Airfare	Curr.	Plane Type	Capacity	Occupied
AA	17	01.05.2013	422,94	USD	747-400	385	262
AA	17	29.05.2013	422,94	USD	747-400	385	264
AA	17	26.06.2013	422,94	USD	747-400	385	266
AA	17	24.07.2013	422,94	USD	747-400	385	256
AA	17	21.08.2013	422,94	USD	747-400	385	265
AA	17	18.09.2013	422,94	USD	747-400	385	265
AA	17	16.10.2013	422,94	USD	747-400	385	264
AA	17	13.11.2013	422,94	USD	747-400	385	259
AA	17	11.12.2013	422,94	USD	747-400	385	263
AA	17	08.01.2014	422,94	USD	747-400	385	60-
AA	17	05.02.2014	422,94	USD	747-400	385	5
AA	17	05.03.2014	422,94	USD	737-200	130	83-
AA	17	02.04.2014	422,94	USD	747-400	385	103-
AA	17	30.04.2014	422,94	USD	747-400	385	54-
AA	17	28.05.2014	422,94	USD	747-400	385	96-
AA	64	03.05.2013	422,94	USD	A310-300	280	158
AA	64	31.05.2013	422,94	USD	A310-300	280	158
AA	64	28.06.2013	422,94	USD	A310-300	280	158
AA	64	26.07.2013	422,94	USD	A310-300	280	162
AA	64	23.08.2013	422,94	USD	A310-300	280	163

Fig. 3 SAP Grid, © SAP

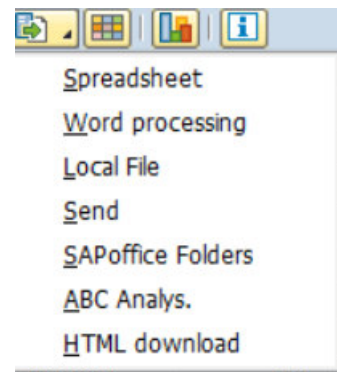


Fig. 3.b. Export, © SAP

Transporting data in different format lets the business users to process information easily.

The ALV Graphic button displays more information, as shown in Figure 4.

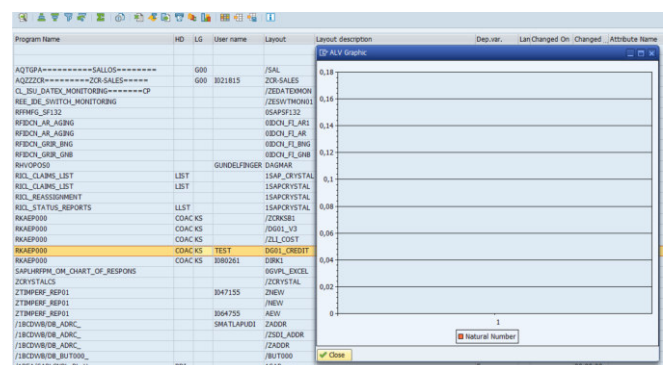


Fig. 4. ALV Graphic, © SAP

Drag&Drop is a comfortable tool in GRID list. Figure 5 a and b demonstrates if one selects a column, and then moves that one to a new position.

ID	No.	Flight Date	Book. no.	Cust. No.	B/ Sr	Lug.weight	Unit	In Ck	Amount (for.currency)	Curr.
AA	17	01.05.2013	1	1552	P	17,4000	KG	C	875,90	EUR
AA	17	01.05.2013	2	560	P	13,4000	KG	C	803,58	USD
AA	17	01.05.2013	3	3080	P	9,8000	KG	C	845,88	USD
AA	17	01.05.2013	4	710	P	23,9000	KG	C	829,82	EUR
AA	17	01.05.2013	5	583	P	25	KG	X C	922,01	EUR
AA	17	01.05.2013	6	669	P	19,8000	KG	C	543,36	GBP
AA	17	01.05.2013	7	180	B	18,9000	KG	C	845,88	USD
AA	17	01.05.2013	8	3871	P	10,9000	KG	C	922,01	EUR
AA	17	01.05.2013	9	4482	P	15,3000	KG	X C	543,36	GBP

Figure 5.a. Select two column in the GRID List

ID	No.	Flight Date	Book. no.	Cust. No.	B/ Sr	Amount (for.currency)	Curr.	Lug.weight	Unit	In Ck
AA	17	01.05.2013	1	1552	P	875,90	EUR	17,4000	KG	C
AA	17	01.05.2013	2	560	P	803,58	USD	13,4000	KG	C
AA	17	01.05.2013	3	3080	P	845,88	USD	9,8000	KG	C
AA	17	01.05.2013	4	710	P	829,82	EUR	23,9000	KG	C
AA	17	01.05.2013	5	583	P	922,01	EUR	25	KG	X C
AA	17	01.05.2013	6	669	P	543,36	GBP	19,8000	KG	C
AA	17	01.05.2013	7	180	B	845,88	USD	18,9000	KG	C
AA	17	01.05.2013	8	3871	P	922,01	EUR	10,9000	KG	C
AA	17	01.05.2013	9	4482	P	543,36	GBP	15,3000	KG	X C

Fig. 5.b. New Column positions after Drag&Drop

A further interactive option is also possible when using ALV GRID. Double-clicking on a row of the basic list, a dialog box appear that includes a detailed list, shown is Figure 6-. The content of the secondary screen is retrieved according to the program code being developed in the corresponding screen (so-called module pool) program.

The screenshot displays two SAP screens. The top screen, 'Flights', shows a list of flight bookings with columns for ID, No., Flight Date, Airfare, Curr., Plane Type, Capacity, Occupied, Booking total, and Capac. The bottom screen, 'Flight Bookings', provides a detailed view of a specific booking (ID 433) with columns for ID, No., Flight Date, Book. no., Curr., No. B/S, Lsg-weight, Unit, In Cl, Amount (for currency), Curr., and Amount. The data in the bottom screen is as follows:

ID	No.	Flight Date	Book. no.	Curr.	No. B/S	Lsg-weight	Unit	In Cl	Amount (for currency)	Curr.	Amount
AA	17	05.05.2013	422	94	USD	747-400	385	262	192,378.66	USD	192,378.66
AA	17	26.06.2013	422	94	USD	747-400	385	264	192,566.92	USD	192,566.92
AA	17	26.06.2013	433	94	USD	747-400	385	262	192,566.92	USD	192,566.92
AA	17	24.07.2013									
AA	17	21.08.2013									
AA	17	18.09.2013									
AA	17	16.10.2013									
AA	17	13.11.2013									
AA	17	29.05.2013	434	94	USD	24 x B	22	KG	X	C	1,302.46 CHF
AA	17	29.05.2013	435	94	USD	1819 x C	11,000		X	C	719.00 USD
AA	17	08.01.2014	436	988	P				X	C	719.00 USD
AA	17	05.02.2014	437	3343	P		19,900	KG	C		514.78 GBP
AA	17	05.03.2014	438	3197	P		24,100	KG	C		845.88 USD
AA	17	02.04.2014	439	2008	P		0	KG	C		845.88 USD
AA	17	30.04.2014	440	3160	P		0	KG	C		719.00 USD
AA	17	28.05.2014	441	1658	P		0	KG	C		783.71 EUR
AA	64	03.05.2013	442	3400	P		24,800	KG	X	C	1,373.71 SGD
AA	64	31.05.2013	443	416	P				X	C	875.90 EUR
AA	64	28.06.2013	444	2139	P		18	KG	C		1,373.19 SGD
AA	64	26.07.2013	445	630	P		23	KG	X	C	829.82 EUR

Fig.6. Detail List in SAP Grid Popup Window, © SAP

A user-specific function can be added to the Toolbar with a simple pushbutton or icon. A program code is executed when the user selects a custom function. If the user selects one or more lines, an addition detailed list can be displayed, as shown in Figure 7 after pressing the 'Detail' pushbutton.

Flights									
ID	No.	Flight Date	Airfare	Curr.	Plane Type	Capacity	Occupied	Booking total	Capacity
AA	17	01.05.2013	422,94	USD	747-400	385	262	192,378,66	31
AA	17	29.05.2013	422,94	USD	747-400	385	264	192,860,92	31
AA	17	26.06.2013	422,94	USD	747-400	385	266	195,174,31	31
AA	17	24.07.2013	422,94	USD	747-400	385	256	189,143,24	31
AA	17	21.08.2013	422,94	USD	747-400	385	265	196,218,95	31
AA	17	18.09.2013							
AA	17	16.10.2013							
AA	17	13.11.2013							
AA	17	11.12.2013							
AA	17	08.01.2014							
AA	17	05.02.2014							
AA	17	03.03.2014							
AA	17	02.04.2014							
AA	17	30.04.2014							
AA	17	28.05.2014							
AA	64	03.05.2013							
AA	64	31.05.2013							
AA	64	28.06.2013							
AA	64	26.07.2013							
AA	64	23.08.2013							
AA	64	20.09.2013							
AA	64	18.10.2013							
AA	64	15.11.2013							
AA	64	13.12.2013							
AA	64	10.01.2014							
AA	64	07.02.2014							
AA	64	07.03.2014							

Fig. 7. Additional Pushbutton on the Toolbar, (SAP)

The User can return to the basic list by pressing the 'Back to Overview' button.

Editing a list is a common requirement. Screen characteristics can be easily changed dynamically in SAP GRID List as shown in Figure 8.a. and 8.b., choosing the Change/Display icon.

ID	Airline	No. Flight Date	Plane Type	Capacity	Occupied	Booking total	Airfare	Curr.
AA	American Airl.	17 01.05.2013	747-400	385	262	192,378.66	Airfare 422.94	USD
	American Airl.	17 29.05.2013	747-400	385	264	192,860.92	422.94	USD
	American Airl.	17 26.06.2013	747-400	385	266	195,174.31	422.94	USD
	American Airl.	17 24.07.2013	747-400	385	256	189,143.24	422.94	USD
	American Airl.	17 21.08.2013	747-400	385	265	196,218.95	422.94	USD
	American Airl.	17 18.09.2013	747-400	385	265	192,230.65	422.94	USD
	American Airl.	17 16.10.2013	747-400	385	264	194,950.26	422.94	USD
	American Airl.	17 13.11.2013	747-400	385	259	188,711.76	422.94	USD
	American Airl.	17 11.12.2013	747-400	385	263	192,649.40	422.94	USD
	American Airl.	17 08.01.2014	747-400	385	60-	25,604.82	422.94	USD
	American Airl.	17 05.02.2014	747-400	385	5	58,255.81	422.94	USD

Fig. 8.a. Display cell data in SAP GRID List, © SAP

ID	* Airline	No. Flight Date	Plane Type	Capacity	Occupied	Booking total	Airfare Curr.
AA	American Airln.	17 01.05.2013	747-400	385	262	192,378.66	422.94 USD
AA	American Airln.	17 29.05.2013	747-400	385	264	192,860.92	422.94 USD
AA	American Airln.	17 26.06.2013	747-400	385	256	195,174.31	422.94 USD
AA	American Airln.	17 24.07.2013	747-400	385	256	189,143.24	422.94 USD
AA	American Airln.	17 21.08.2013	747-400	385	265	196,218.95	422.94 USD
AA	American Airln.	17 18.09.2013	747-400	385	265	192,230.65	422.94 USD
AA	American Airln.	17 16.10.2013	747-400	385	264	194,950.26	422.94 USD
AA	American Airln.	17 13.11.2013	747-400	385	259	188,711.76	422.94 USD
AA	American Airln.	17 11.12.2013	747-400	385	263	192,649.40	422.94 USD
AA	American Airln.	17 08.01.2014	747-400	385	60-	25,604.82	422.94 USD
AA	American Airln.	17 05.02.2014	747-400	385	5	58,255.81	422.94 USD
AA	American Airln.	17 05.03.2014	737-280	130	83-	11,969.21	422.94 USD
AA	American Airln.	17 02.04.2014	747-400	385	103-	1,587.81	422.94 USD
AA	American Airln.	17 30.04.2014	747-400	385	54-	26,442.24	422.94 USD
AA	American Airln.	17 28.05.2014	747-400	385	96-	6,822.02	422.94 USD
AA	American Airln.	64 03.05.2013	A310-300	280	158	132,350.68	422.94 USD
AA	American Airln.	64 31.05.2013	A310-300	280	158	132,680.64	422.94 USD
AA	American Airln.	64 28.06.2013	A310-300	280	158	131,466.81	422.94 USD
AA	American Airln.	64 26.07.2013	A310-300	280	162	135,061.72	422.94 USD
AA	American Airln.	64 23.08.2013	A310-300	280	163	136,038.73	422.94 USD
AA	American Airln.	64 20.09.2013	A310-300	280	154	128,142.52	422.94 USD
AA	American Airln.	64 18.10.2013	A310-300	280	163	132,997.83	422.94 USD
AA	American Airln.	64 15.11.2013	A310-300	280	162	133,179.80	422.94 USD

Fig. 8.b. Display&Edit cell data in SAP GRID List, © SAP

The examples shown above, demonstrate various concepts and solutions. They reflect numerous list functions, which can be implemented separately, according to business needs.

New trends of SAP developments follow simplification, shortened expressions instead of applying long, complex statements followed each the other.

An easy deployment of SAP ALV LIST with shortened expression is the application of the `cl_salv_table` standard class.

A simplified development way of SAP ALV List is shown in Figure 9a and Figure 9b. Program `demo_alv_reporting` calls the factory and the display methods, and displays the list in a straightforward way.

```
cl_salv_table=>factory(
    IMPORTING r_salv_table = DATA(alv)
    CHANGING t_table = scarr_tab ).
alv->display( ).
```

Fig. 9.a. ALV List with SALV TABLE, ©SAP

Airline	Airline URL
American Airlines	http://www.aa.com
Air Berlin	http://www.airberlin.de
Air Canada	http://www.aircanada.ca
Air France	http://www.airfrance.fr
Indian Airlines	http://www.aa.com
Alitalia	http://www.alitalia.it
British Airways	http://www.british-airways.com
Continental Airlines	http://www.continental.com
Delta Airlines	http://www.delta-air.com
Air Pacific	http://www.airpacific.com
Japan Airlines	http://www.jal.co.jp
Lufthansa	http://www.lufthansa.com
Lauda Air	http://www.laudaair.com
Northwest Airlines	http://www.nwa.com
Qantas Airways	http://www.qantas.com.au
South African Air.	http://www.saa.co.za
Singapore Airlines	http://www.singaporeair.com
Swiss	http://www.swiss.com
United Airlines	http://www.ual.com
Indian Airlines	http://www.aa.com

Fig. 9.b. Reporting with SALV TABLE ALV List, ©SAP

Shortened expressions effectively improves the readability and the performance of SAP applications. Simplified solutions definitely makes harder debugging and analyzing the development. It might be advantageous to be familiar with

older, but reliable and sustainable solutions on one hand, and novice, innovative approaches on the other hand.

CONCLUSION

Appropriate solutions required for business needs. However, application of right choices usually depends on the actual environment, long-term strategies, organizational knowledge, resources and so on at Company level.

SAP Reporting by means of ALV List exemplifies different approaches that might be adequate for a particular purpose.

The aim of this paper is to demonstrate that knowing different development ways and techniques is advantageous.

Similar comparisons can be made in different topics, like in Informatics, Robotics, Electronics, Higher Education Studies, etc. as follows.

- Robust techniques can be applied in an interdisciplinary, popular research area, like Cybernetics. [4] New trends are popular in robotics. [5]
- Reliable research methods enable resulting in new research results. [6-11]
- Various educational studies and methodologies should be applied at the universities and at workplaces. [12-15]

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