AirVia Ltd
5374 Main Street
City, County
WC2N 5DN
020 7946 5374

28 January 2023

IN2018 Team
City, University of London
Northampton Square
London EC1V 0HB

Dear IN2018 Team,

It is my pleasure to confirm that AirVia Ltd wishes to commission you to develop a software prototype to report sales of air tickets sold by our travel agents. This prototype is for a single AirVia Ltd Travel Agent, Terrific Travel, and will be used to evaluate the suitability of the proposed solution for roll-out to all agents. Further, if the evaluation is favorable, we may look to take an Maintenance Contract with your company.

AirVia Ltd is an international airline which sells its tickets through a collection of local Travel Agents. The current software in place is over 20 years old and has reached a point where further maintenance is problematic. AirVia Ltd requires a new software solution that also reflects the recent advances in software and interface development, eliminating the difficulties and limitations identified with the current system.

The enclosed Initial Statement of Requirements (page 2-5) describe AirVia's needs along with a selection of current reports. Enclosed reports:

1. Ticket Stock Turnover Report (page 6)
2. Interline Sales Reports
   a. Individual Sales Report (page 7)
   b. Global Sales Report (page 8)
3. Domestic Sales Report (page 9)
   a. Individual Sales Report
   b. Global Sales Report

I have asked my assistant to setup an interview appointment for your Team to discuss the requirements and you'll receive a separate message to inform the details.

I look forward to meeting with you and reviewing your proposed solution in due course.

Sincerely,

John Lancaster

Mr John Lancaster
IT Manager, AirVia Ltd

AirVia Air Tickets Sales (ATS)
Initial Statement of Requirements

The AirTicket Sales (ATS) system will keep records of tickets sold by a Travel Agent company to customers, and produce the reports required by the Financial Department of AirVia Ltd. It will also allow a Travel Agent company to give discounts to their valued customers.

Ticket Types

The tickets consist of flight coupons (up to 4) and auditor's coupons, which are bundled together. The bundles are called 'blanks' and can be of different types:

- 444 – used for international destinations (automatic ticketing with up to 4 flight coupons; each coupon is used for a particular leg of the journey),

- 440 – the same as 444 but for manual processing (the flying details are filled in manually by a travel advisor, e.g. if computer-based system is unavailable),

- 420 – as 444 but with only 2 flight coupons.

There are also blanks for domestic flights, which are filled in using computer (not manually):

- 201 – a blank with two coupons, and

- 101 – a blank with only 1 coupon.

Finally, there are MCO (Miscellaneous Charges Order) blanks used for excess luggage and for other miscellaneous services provided by the airline to their passengers. The codes used for MCO blanks are, respectively, 451 and 452.

All blanks are provided by the airline to the Travel Agents for producing tickets. Each blank has a number, which starts with the blank type (e.g., 444). This is followed by between 6 to 8 further digits to make a blank number consisting of up to 11 digits (e.g., 444 10023489). A blank becomes a valid ticket if the itinerary of the journey is placed on the flight coupons. Alternatively, a blank can be 'void' if the travel advisor makes a mistake.

The airline demand reports from the Travel Agents on their use of the blanks.

In case of a blank being lost or stolen the airline demand that this be immediately reported so that the blanks can be blacklisted through the global reservation system and cannot be used by malicious people. The reporting of theft/loss, however, is neither part of the existing AirTicket Sales nor required for the new software.

Once new blanks are received from the airline by a representative of the Travel Agent they are added to the existing stock of blanks (it ought to be possible to arrange them by blank type). Then Office Manager allocates blanks to each travel advisor before they can sell them to a customer. Unless a blank is assigned, it cannot be sold. Only the advisor who has been assigned a blank can sell it to a customer. This is required by the airline as a measure of improving accountability of advisors with respect to the blanks. A blank initially assigned to an advisor can be reassigned to a different advisor. In some cases unused blanks may be returned to the airline in which case a record about this can be kept in the Travel Agent's log file (when and what has been returned to the airline), but records about the returned blanks are not kept in the Travel Agent's database.

On a monthly basis, or on demand, reports are produced by the Travel Agent in which the turnover of the blanks is shown (see 9.1 Ticket Stock Turnover Report).

The system administrator is responsible for maintaining the stock of blanks and fixing problems with the database.

Each travel advisor is responsible for the stock of blanks assigned to them.

Sales

Every ticket sold by an advisor must be registered in an Air Ticket Sales Report.

In the new system, recording of the following payment types is required: cash and credit card. The same holds for refunds.

There are two types of sales - domestic and interlines (i.e. international destinations). The payment for interline sales, in turn, can be made in local currency (using the currency codes specified by IATA – the International Air Traffic Association) or in United States Dollars (USD).

For interline sales in local currency the rate of US Dollars (USD) in local currency must be provided. The rate used is the one specified by the National Bank on the day of the sale.

The airline demand sales to be reported twice a month. With the current system up to 14 rates may be used within a report period. In the new system, the number of rates must be no less than in the current system. The rate format must be XXXXX.YYYY (as in the current system), i.e., the precision is 4 digits after the decimal point, and 1 USD may be no more than 99999 units in local currency.

For each sale the Travel Agent company is given a commission as a percentage of the ticket fare (the airport taxes/fees are excluded). The percentage of the commission depends on the type of the ticket and is agreed between the airline and the Travel Agent in a contract between them. The system must allow a commission rate to be added/deleted. When a sale is made, the appropriate commission amount should be recorded.

The sales reports must list all sales transactions together with the corresponding sub-totals and grand totals (see enclosed documents). They are requested with various levels of detail as follows:

- individual reports as prepared by each advisor;
- summaries, i.e. global reports, which are arranged as:
  - reports per advisor. Each report contains one line per advisor;
  - reports per USD rate (tickets sold by all advisors for a given "USD/Local currency" rate). Each report contains one line per rate.

An example of reports for interline sales in local currency is shown in the subsequent pages. Reports for domestic sales are also provided.

Refunds

Once a customer cancels a ticket, a record about this is made detailing the ticket returned and the amount refunded to the customer. It is sufficient that the details about refunds are recorded in a (set of) file(s). No refund reports are necessary.

The number of commission rates used for refunds as a rule is greater than the number of commission rates used for sales reports for the following reason. The Air Via Ltd occasionally changes the

commission rates. Since the tickets may be returned up to 1 year after the sale, the system must, in addition to the rates currently used for sales, allow the use of commission rates, which were used up to 1 year in the past.

Miscellaneous

The system is expected to provide functionality for maintaining the list of travel advisors and general maintenance of the system database by a system administrator: i) maintain contact details of the Travel Agent – name and address – which will be used by the software in all reports, and ii) maintain a list of ticket types which will be used by the Travel Agent. In addition, the new system is expected to provide an adequate level of security. Also, a backup/restore facility for database is required which does not exist in the current system.

Problems with the current system

1. The user interface is old-fashioned. The first release of the existing system took place in the 90's of the last century. The technology at the time did not allow a GUI. This must change in the new system. Of highest priority for the new system is the graphical user interface. It must be clear, consistent and make the system easy to use.

2. The technology used in the existing system does not support different levels of security. Appropriate new technology must be used which provides adequate security mechanisms and allows users different levels of access to the system. For example, the administrator must have full access to the system stock, the advisors will have access to their own stock and respective sales reports only, the office manager will have access to the whole stock and to all individual reports. Office manager is also the only role who can generate all types of reports.

3. The existing system has severe functional limitations which make it difficult to use; new software must rectify these. Some examples are given below to illustrate this:

   a. Assume that a record about a sale is associated with a particular USD rate, which was found to be incorrect. With the current system, the only way to alter the record is to delete it first and then create it again with a correct rate.

   b. Commission rates are hard-coded in the current version of the source code. Every time they change, a minor release of software is required, which creates compatibility problems between the versions. Since the commission rates may vary between Travel Agents (different Agent companies may have different commission rates agreed with the airline), with the current version a multitude of different releases must be maintained – thus, this functionality becomes problematic. The new software must allow the use of an arbitrary number of commission rates. Introducing a new commission rate, however, should not require changes to the software source code.

   c. The current system does provide a rudimentary functionality to handle special kind of customers. The new system must provide an extensive functionality to allow the Travel Agents to improve their relationship with these kinds of customers. The list of features which are required is as follows:

      i. Regular customers may have an account, which allows them to pay later – up to 30 days after the original purchase. Late payments must be discovered by the system and the Travel Agent (automatically) prompted after 30 days, via an alert.

ii. Valued customers, in addition to the "late payment" option as for the Regular customers, can be given a discount as a percentage of the ticket fare. The discount plan is set/maintained by Office Manager and can be either fixed or flexible depending on the sales to the customer within a calendar month. The discount can be paid to the customer at the end of the month or deducted from the amount due for future sales. In either case, a record about this should be maintained in the system.

- fixed discount – the same percentage of discount, e.g. 3%, is given to the customer for each ticket fare, irrespective of type and number of tickets sold.

- flexible discount – the percentage of the discount depends on the value of the sales to the same customer accumulated within a calendar month.

Also, it is important that an appropriate Concurrency Control mechanism is used in the system so that database inconsistencies are avoided. For this, an appropriate isolation level between concurrent database transactions is needed. For example, concurrent interaction between the following: i) reporting of the sales by a single, or several, advisors; ii) use/assignment of the blanks by/to the advisor(s) and iii) stock update by the administrator, should produce consistent results and leave the database in a consistent state.
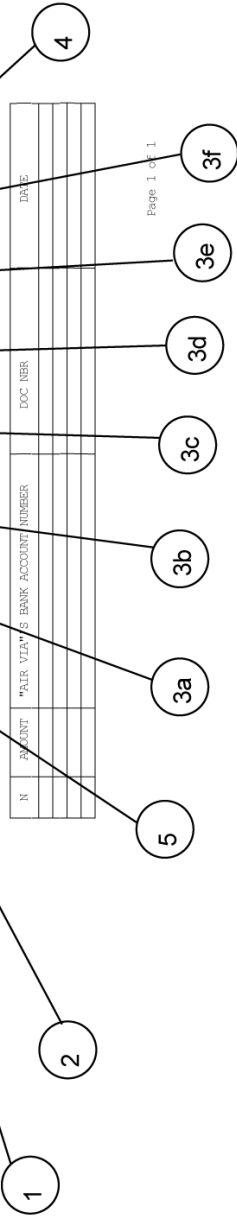
1. Ticket Stock Turnover Report

```
A G E N T        : AIR LINK
N u m b e r      : /
Sales Office Place :
Report Period   : 01/01/19 - 31/01/19
```

Batch NBR	Curr. of SALE
Port of SALE	Curr. conv. RATE
Period	S.AGENT'S Code
Operator's Code	
Report NBR	Supervisor's code

AGENT'S STOCK STATUS REPORT

NN	RECEIVED BLANKS AGENTS' FROM/TO BLANKS NBRS	AMNT	SUB AGENTS' CODE	FROM/TO BLANKS NBRS	AMNT	AGENT'S STOCK AMNT	ASSIGNED/USED BLANKS (SUB AGENTS') CODE	ASSIGNED (FROM/TO)	AMNT	USED (FROM/TO)	AMNT	FINAL AMOUNTS AGENT'S AMOUNT FROM/TO	AMNT	SUB AGENTS' AMOUNTS CODE	FROM/TO	AMNT
1							289	4203948627-4203948700	74	440000034-440000039	6	4203948627-4203948700	74	289	4203948627-4203948700	74
2							250	4203963102-4203963200	99	4402013508-4402013512	5	4203963102-4203963200	99	250	4203963102-4203963200	99
3							250	4400000034-4400000100	67	201047209- 201047211	3	4400000040-4400000100	61	250	4400000040-4400000100	61
4							289	4402013508-4402013600	93	201047214- 201047215	2	4402013513-4402013600	88	289	4402013513-4402013600	88
5							250	4402036588-4402036600	13	201047304- 201047309	6	4402036588-4402036600	13	250	4402036588-4402036600	13
6							250	201047209- 201047299	91			201047212- 201047213	2	250	201047212- 201047213	2
7							289	201047302- 201047302	1			201047216- 201047299	84	250	201047216- 201047299	84
8							289	201047304- 201047399	96			201047302- 201047302	1	289	201047302- 201047302	1
9												201047310- 201047399	90	289	201047310- 201047399	90
TOTALS		0			0	0			534		22		512			512

```
PREPARED BY: _____          APPROVED BY: _____

CHECKED BY: _____               DATE: _____
```

Page 1 of 1

Legend:

i) The columns whose names are encircled with solid lines contain the following data:

RECEIVED: New blanks received within the report period.
  AGENT'S STOCK: New blanks received by the Agent (assigned or non-assigned to advisors)
  SUB-AGENTS: Blanks assigned to an advisor.

ASSIGNED/USED BLANKS: Blanks assigned to advisors/used by the agent within the report period.
  ASSIGNED: Existing (not newly received) blanks assigned to advisors (by advisor's code);
  USED: Blanks used (new or existing) by the agent (no matter the advisor);

FINAL AMOUNTS: Blanks of agent/advisors at the end of report period by blank type.
  AGENT'S AMOUNT: blanks available in Agent's stock at the end of period;
  SUB-AGENT'S AMOUNT: Amount of blanks of a given type assigned to an advisor at the end of period.

ii) The columns whose names are encircled with dashed lines contain the following data:

FROM/TO BLANKS NBRS: A batch of blanks/tickets.
  CODE: Advisor's code as defined in the system (a three digit number, e.g. 250).

Interline Sales Reports

A G E N T   : AIR LINK
N u m b e r   : /
Sales Office Place : 01/01/19 – 31/01/19
Sales Period   : 01/01/19 – 31/01/19

Batch NBR	Curr. of SALE
Port of SALE	Curr. conv. RATE
Period	S.AGENT'S Code
Operator's Code	
Report NBR	Supervisor's code

I N D I V I D U A L   S A L E S   R E P O R T
(I N T E R L I N E   USD Rate = 1500.00)
Emil Dimitrov   250

N	AIR VIA				D O C U M E N T S						IN EXCHANGE FOR DOCS OF:						F O R M S O F P A Y M E N T S					C O M M I S S I O N S						NON
	ORIGINAL ISSUED NUMBER	F A R E A M O U N T			T A X E S		TOTAL DOCUMENT'S AMOUNT			AIRLINES				TOTAL AMOUNTS PAID	CASH	CREDIT CARDS			A S S E S S A B L E A M O U N T S					ASSESS. AMOUNTS
		USD	USD/BGL	BGL	LZ	OTHS			CD	DOC.NBR	FC	PROR.AMNT			LC	FULL CC NUMBER	USD	BGL	15 %	12 %	10 %	9 %	8.5 %	7 %	
1	4400000034	300	1800.41	540123	30000	25000	595123					595123	595123					540123						55000
2	4400000035	250	1800.00	450000	30000	25000	505000					505000	505000					450000						55000
3	4400000036	250	1800.00	450000	30000	25000	505000					505000	505000					450000						55000
4	4400000037	250	1800.00	450000	30000	25000	505000					505000	505000					450000						55000
5	4400000038	250	1800.00	450000	30000	25000	505000					505000	505000					450000						55000
6	4400000039	350	1771.43	620000	30000	25000	675000					675000	675000					620000						55000
NBR of TKTS	6	1650		2960123	180000	150000	3290123					3290123	3290123					2960123						330000

PREPARED BY :

APPROVED BY :

CHECKED BY :   for the AGENT │ for "AIR VIA"

_____   (accountant's signature)
(advisor's signature)

_____
(supervisor's signature)

TOTAL COMMISSION AMOUNTS 444018.45
NET AMOUNTS FOR AGENT'S DEBIT 2517104.55

TOTAL NETT AMOUNT FOR
BANK REMITTENCE TO "AIR VIA"   2846105

INCLUDING TE FOLLOWING PAYMENTS

| N | AMOUNT | "AIR VIA"'S BANK ACCOUNT NUMBER | DOC NBR | DATE |

Legend:

The amount shown as ⑤ (TOTAL NETT AMOUNT FOR BANK REMITTANCE TO 'AIR VIA') is calculated as follows:

5 = 2 – 3a – 3b – 3c – 3d – 3e – 3f,

i.e., the total amount of all sales is decreased by the amount of all commissions

The result is rounded (up or down) to the nearest integer and shown in the report as amount due to the airline.

The amount of all sales paid with credit cards – given in 1, must be included in "Total amounts paid" – given in 2.

The "Non-assess. Amounts" are excluded from calculating commission.

```
A G E N T          : AIR LINK
N u m b e r        : /
Sales Office Place :
Sales Period       : 01/01/19 - 31/01/19
```

Batch NBR	Curr. of SALE
Port of SALE	Curr. conv. RATE
Period	S.AGENT'S Code
Operator's Code	
Report NBR	Supervisor's code

G L O B A L   S A L E S   R E P O R T
(I N T E R L I N E - By Advisors)

NN	ADVISOR NUMBER	DOC NMBRS ACPNS	FARE AMOUNT	TAXES L2	TAXES OTHERS	TOTAL DOCUMENT'S AMOUNT
1	250	6	2960123	180000	150000	3290123
2	289	5	2700000	100000	175000	2975000
TTLS:	2	11	5660123	280000	325000	6265123

ISSUED IN EXCHANGE FOR DOCUMENTS OF:

AIR VIA DOCS.	FCPNS	PRORATE AMNTS	OTHER AIRLINES DOCS.	FCPNS	PRORATE AMNTS

F O R M S   O F   P A Y M E N T

CASH	CREDIT NMBR	USD	BGL	CARDS	TOTAL AMOUNTS PAID
3290123					3290123
2975000					2975000
6265123					6265123

C O M M I S S I O N S

ASSESSABLE AMOUNTS 15 %	12 %	10 %	A M O U N T S 9 %	8.5 %	7 %	NON ASSESS. AMOUNTS
2960123.00						330000
2700000.00						275000
5660123.00						605000
						* * *
						605000

TOTAL COMMISSION AMOUNTS 849018.45

NET AMOUNTS FOR AGENT'S DEBIT 4811104.55

TOTAL NETT AMOUNT FOR
BANK REMITTENCE TO "AIR VIA" ___5416105___

PREPARED BY :

(supervisor's signature)

APPROVED BY :

for the AGENT | for "AIR VIA"

(accountant's signature)

INCLUDING THE FOLLOWING PAYMENTS

N	AMOUNT	"AIR VIA"'S BANK ACCOUNT NUMBER	DOCUMENT NUMBER	DATE

Page 1 of 1

Legend:
The same rules for calculating the amount encircled as in the previous example in this section (see above).

3. Domestic Sales Reports

A G E N T   : AIR LINK
N u m b e r : /
Sales Office Place : 01/01/19 - 31/01/19
Sales Period : 01/01/19 - 31/01/19

Batch NBR		Curr. of SALE	
Port of SALE		Curr. conv. RATE	
Period		S.AGENT's Code	
Operator's Code			
Report NBR		Supervisor's code	

I N D I V I D U A L   S A L E S   R E P O R T
(D O M E S T I C)   250
Emil Dimitrov

NN	Air Via	DOCUMENTS			FORMS OF PAYMENTS							TOTAL AMOUNT PAID	TAXES	COMMISSIONS ASSESSABLE AMOUNTS		OTHER DETAILS CHQ NMBR, INV. NMBR, CC NMBR SPONSOR,REISS. TKT NMBR	NOTES
		ORIGINAL ISSUED NUMBER	FARE BASE (BGL)	FARE BASE (USD)	CASH (BGL)	CHEQUE (BGL)	INVOICE (BGL)	CREDIT CARD USD	CREDIT CARD BGL					9 %	5 %		
1		201047209	30000	20	35000							35000	5000	30000			
2		201047210	40000	30	45000							45000	5000	40000			
3		201047211	50000	35	55000							55000	5000				
4		201047214	50000	35	55000							55000	5000				
5		201047215	50000	35	55000							55000	5000				
NBR of TKTS	5		220000	155	245000							245000	25000	70000			

TOTAL COMMISSION AMOUNTS 6300.00

NET AMOUNTS FOR AGENT DEBIT 63700.00

TOTAL NETT AMOUNT FOR
BANK REMITTENCE TO "AIR VIA" 238700 INCLUDING THE FOLLOWING PAYMENTS

"AIR VIA"'S BANK ACCOUNT NUMBER

N	AMOUNT	DOC NBR	DATE

PREPARED BY:

_____
(agent's signature)

CHECKED BY:

_____
(supervisor's signature)

APPROVED BY:

for the AGENT | for "AIR VIA"

_____
(accountant's signature)

A G E N T   : AIR LINK
N u m b e r : /
Sales Office Place : 01/01/19 - 31/01/19
Sales Period : 01/01/19 - 31/01/19

Batch NBR		Curr. of SALE	
Port of SALE		Curr. conv. RATE	
Period		S.AGENT's Code	
Operator's Code			
Report NBR		Supervisor's code	

G L O B A L   S A L E S   R E P O R T
(D O M E S T I C)

NN	AGNT NMBR	TTL TKT RPRTED NMBR	FARE BASE (BGL)	FARE BASE (USD)	TAXES	FORMS OF PAYMENTS						TOTAL AMOUNT PAID	COMMISSIONS ASSESSABLE AMNTS		NOTES
						CASH (BGL)	CHEQUE (BGL)	INVOICE (BGL)	CREDIT CARD NMBRS	CREDIT CARD USD	CREDIT CARD BGL		9 %	5 %	
1	250	5	220000	155	25000	245000						245000	220000		
2	289	6	280000	168	22000	302000						302000	280000		
TTLS:	2	11	500000	323	47000	547000						547000	500000		

TOTAL COMMISSION AMOUNTS 45000.00

NET AMOUNTS FOR AGENT DEBIT 455000.00

TOTAL NETT AMOUNT FOR
BANK REMITTENCE TO "AIR VIA" 502000

PREPARED BY:

_____
(supervisor's signature)

APPROVED BY :

for the AGENT | for "AIR VIA"

_____
(accountant's signature)