International Civil Aviation Organization
South American Regional Office - Regional Project RLA/03/901
REDDIG Management System and Satellite Segment Administration
Nineteenth Meeting of the Coordination Committee (RCC/19)
Lima, Peru, 7 to 9 March 2016

Agenda Item 3: Report of the activities carried out to date since the last meeting of the Coordination Committee

FOLLOW-UP TO CHILE ANSP TEST IMPLEMENTATION TO ACCESS THE SITA ACARS SERVICE THROUGH THE REDDIG II NETWORK

(Working Paper presented by SITAONAIR)

SUMMARY

This paper presents a follow-up to Chile ANSP test implementation to access the SITA ACARS service through the REDDIG II network which would replace the current SITA provided IP network access through generic telecom providers and would have benefits and a network solution proposal for operational use of ANSP REDDIG access to SITA.

Reference

- ✓ Performance-Based Air Navigation System Implementation Plan for the SAM Region, version 1.4, ICAO
- ✓ Final Report - RLA/03/901 Fourteenth workshop/meeting of the SAM Implementation Group (SAM/IG/14)
- ✓ Final Report – RLA/03/901 Eighteenth meeting of the Coordination Committee (RCC/18)
- ✓ Final Report - RLA/03/901 Fifteenth workshop/meeting of the SAM Implementation Group (SAM/IG/15)
- ✓ Final Report - RLA/03/901 Sixteenth workshop/meeting of the SAM Implementation Group (SAM/IG/16)

ICAO Strategic Objective:	*A – Safety* *B – Air navigation capacity and efficiency*

1. Introduction

1.1 SITA proposes the South American ANSPs and the ICAO SAM office evaluate and agree on the ANSP system use of the REDDIG network to access the SITA Brazil ACARS processor to communicate via the SITA ACARS service with its user aircraft, using connection to ACARS processor in Montreal as backup solution.

1.2 The SITA proposed ANSP use of REDDIG to access the SITA ACARS service would replace the current SITA provided IP network access through generic telecom providers and would have the following benefits:

- ANSPs would benefit from using a highly reliable and secure network designed for ATC purposes to access the data link service which is becoming more critical to ATC operations
- ANSPs would get increased value from the REDDIG network by adding traffic that would fit within existing VSAT capacity while saving the charges from SITA for the current SITA provided ground network access links to SITA ACARS service
- ANSP transition from using the current SITA provided links to using the REDDIG IP links should require no change to the ANSP system interfaces.

1.3 The RCC/18 Meeting approved the implementation of the SITA data link service through the REDDIG II beginning trials with Chile what has been confirmed by the Administration of Chile on 15 April 2015. It wast agreed then to test the access to the SITA data service through the REDDIG node in Santiago (with real datalink traffic, keeping the conventional connection as backup).

1.4 The tests started on 8 October and the results and conclusions obtaneid so far are presented in this working paper.

2. Analysis

2.1 The trial concept consisted on the implementation of an interconnection, through a single IP circuit, between DGAC Chile/FANS Server and SITA data link Processor located in Rio, Brazil using REDDIG IP network, through its node located in Recife-Brazil. The diagrams and detailed description are presented as appendix A to this WP.

2.2 The main requirements taken into consideration was to provide a network design for the connectivity solution that does not impact 1) the operational FANS service being provided to DGAC Chile , 2) SITA, REDDIG and DECEA networks safety and performance and 3) Data link processing service provided by ACARS processor located in Rio, Brazil.

2.3 During the trial period, different issues and events were verified and addressed by SITA, REDDIG, DGAC Chile and DECEA Brazil staff. The detailing description is presented in the item 9 of the **Appendix A**.

2.4 Considering specific events of disconnections, SITA and DGAC Chile are willing to extend the trial exercise until end of March for further investigation purposes.

2.5 Based on lessons learned so far and taking into consideration the main requirement of no impact to ANSP, REDDIG and DECEA networks, SITA has developed a network configuration design for operational use by any ANSP willing to connect to SITA using their REDDIG node access, and therefore ensuring to be using a dedicated ATC network under cost effective manner. The diagram is presented in the item 9 of Appendix A.

2.6 Finally, since the preparation activities for the trial and till now, SITA, REDDIG, DECEA and DGAC Chile have shown commitment and full support in order to perform the necessary configuration for their network and equipment, being a live proof that industry and ANSPs can collaborate on mutual interest projects that can bring positive impact to the air navigation services

3. Suggested action

3.1 The Meeting is invited to:

Review the provided information about the trial and agree on SAM ANSP access using REDDIG to SITA ACARS processor in Brazil as primary or alternative path to SITA AIRCOM Service as a viable option, to focus on the following aspects:

a) Agree on keeping the investigation about the network and servers performance for the trial as DGAC Chile and SITA are willing to extend it until end of March;

b) Review and agree on proposed network solution for operational use of ANSP REDDIG access to SITA; and

c) Based on final report still to be presented by SITA and DGAC Chile, after trial conclusion, discuss and agree on a comprehensive framework, specific terms and conditions between SITA, ANSP and REDDIG committee.

Appendix A

Trial Preliminary Report
DGAC Chile/REDDIG access to SITA

1. Trial objective

The interconnection solution shall enable the flow of data link messages between ground system (DGAC Chile/FANS server) and equipped aircraft during the period of use, by using REDDIG as the IP ground network to connect Chilean server and SITA ACARS processor.

2. Connectivity requirements

The network connectivity solution to support this exercise privileged the following requirements:

- The operational FANS (ADS-C and CPDLC) services provided by DGAC shall not be affected during the trial period;
- SITA, REDDIG and DECEA networks safety and performance are kept without any impact;
- SITA processor located in Rio which supports all data link services provided to DECEA and airlines in Brazil shall not be impacted.

3. Network development plan

This network development plan was separated in 3 parts: the connection of DGAC to REDDIG network in Chile (Chile side), the connection of REDDIG to GIG Processor network in Brazil (Brazil side) and the feasibility of the operation through REDDIG network.

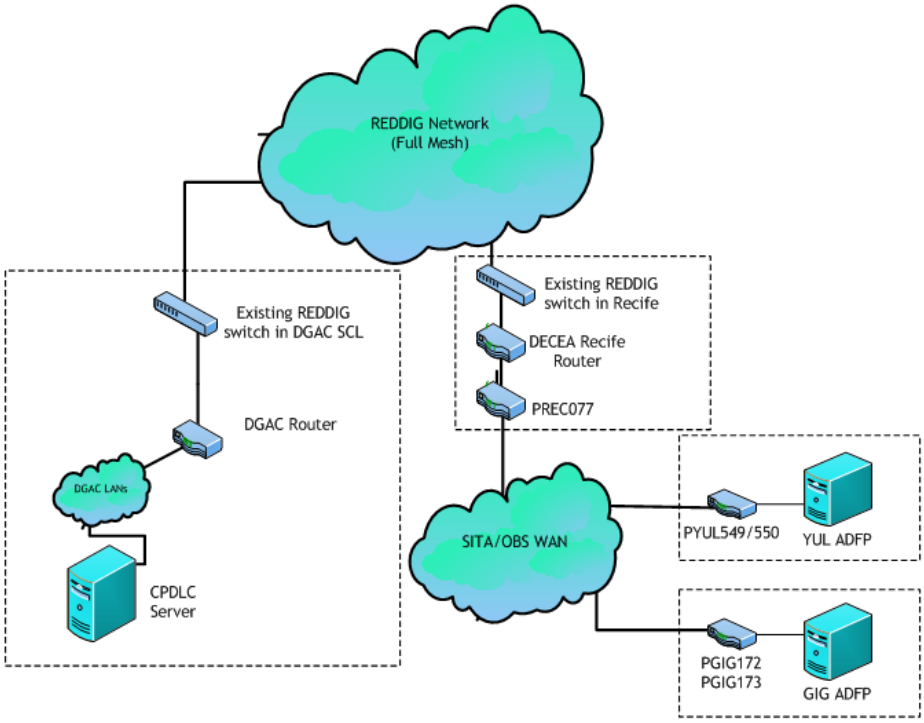

Figure 1: Connection proposal between REDDIG, DGAC and GIG/YUL Processor

4. Connection between DGAC and REDDIG

DGAC and REDDIG's equipment are in the same Equipment Room (Figures 2, 3 and 4) and only for the trial phase, DGAC is responsible for the physical connection between REDDIG switch and DGAC server.

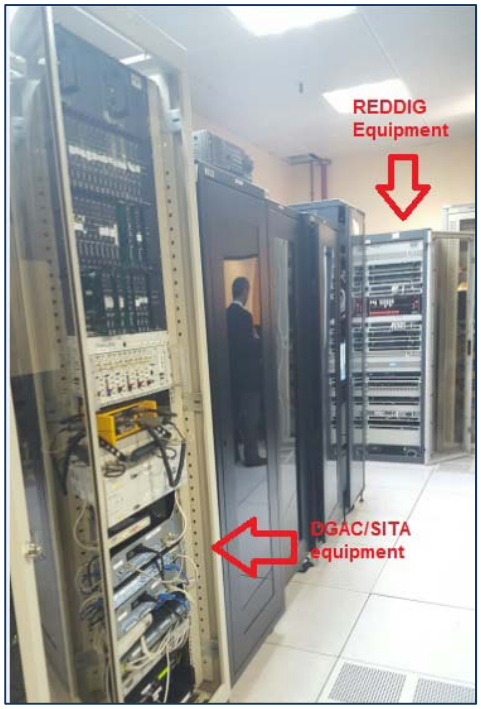

Figure 2: DGAC and REDDIG in ACCO Equipment Room in Santiago.

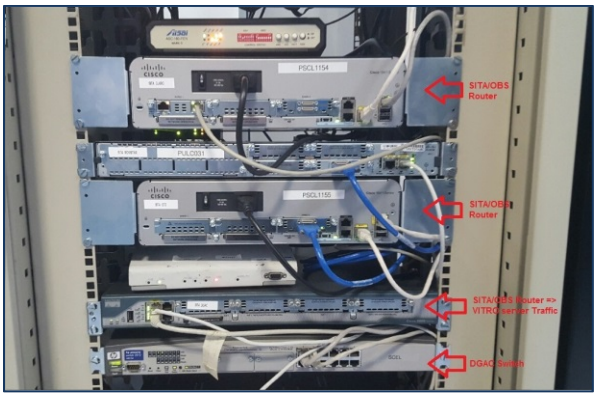

Figure 3: SITA and DGAC Equipment.

Figure 4: Node Santiago REDDIG Equipment.

DGAC made available a new router equipment to connect to VITRO server through DGAC switch to REDDIG switch during the trial period. This configuration allowed the proper configuration and no impact in other services.

5. Connection between REDDIG and SITA

The physical connection between REDDIG network and SITA network was accomplished by the installation of a new DECEA router between REDDIG router and PREC077/SITA router in Recife-Brazil.

6. Network Configuration

A VLAN Test 102 was already configured by REDDIG in Chile and Recife, and no modification was necessary.

DGAC and SITA had to make IP translations to pass the traffic through REDDIG according to Figure 5.

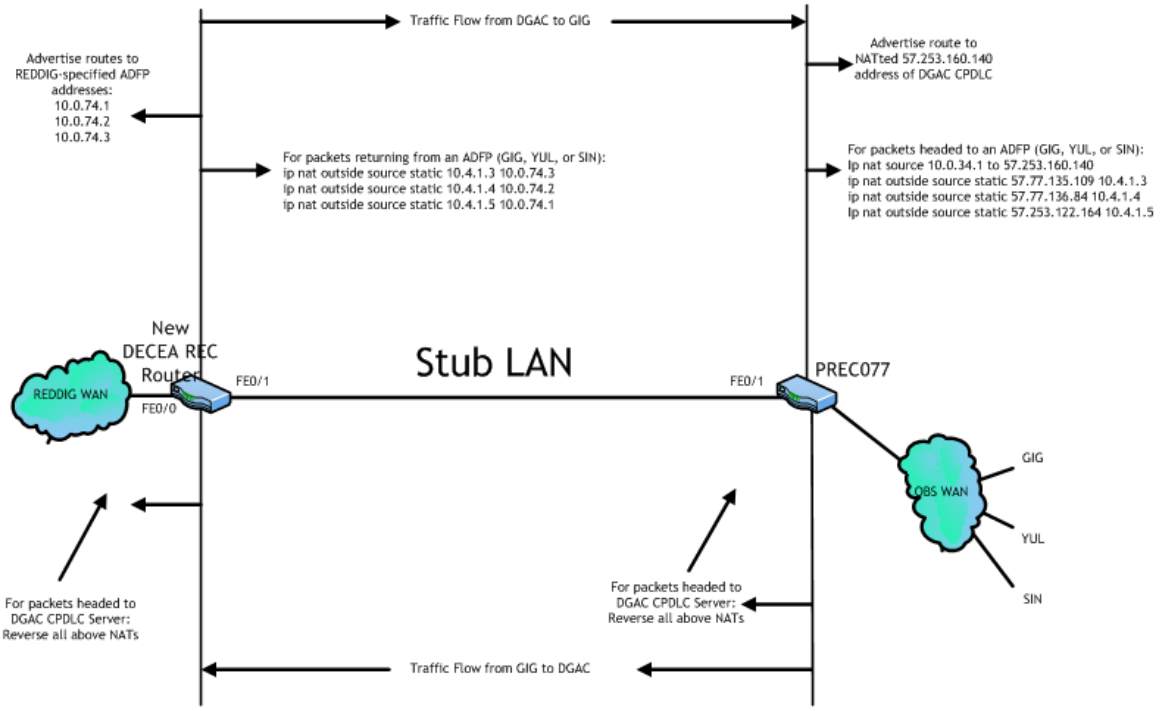

Figure 5: NAT and routings.

DGAC had to configure the IP 10.0.34.200/24 in the router port (Figure 6).

DGAC router needed to accept traffic from primary and secondary links all the time and establish the connection to GIG processor through REDDIG as primary and YUL/SIN processor through OBS as secondary.

This configuration allowed contingence between processors (GIG and YUL) and transmission (REDDIG and OBS), but DGAC had to check the following configuration in VITRO Server:

- Add the REDDIG connections to GIG and YUL on top of the existing connections with SIN & YUL ADFP.
- Use ROUTE commands at the OS level to route the packets on separate gateways depending on the destination address.

In summary, the trial consists on having traffic from VITRO Server to SITA Rio processor through REDDIG (SCLCAYA + REDDIG + GIG) and to YUL processor through OBS transmission (SCLCAYA + OBS + YUL), as exhibited on Figures 6 and 7.

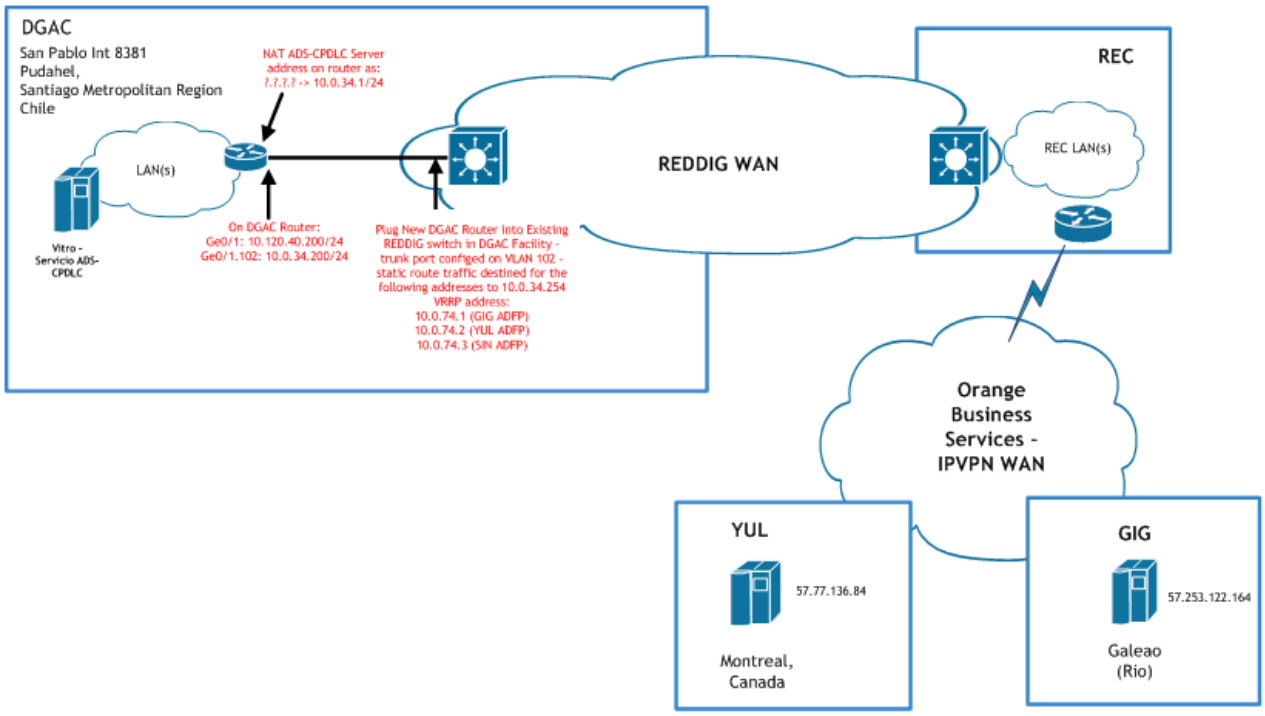

Figure 6: Configuration proposed in ACCO-DGAC.

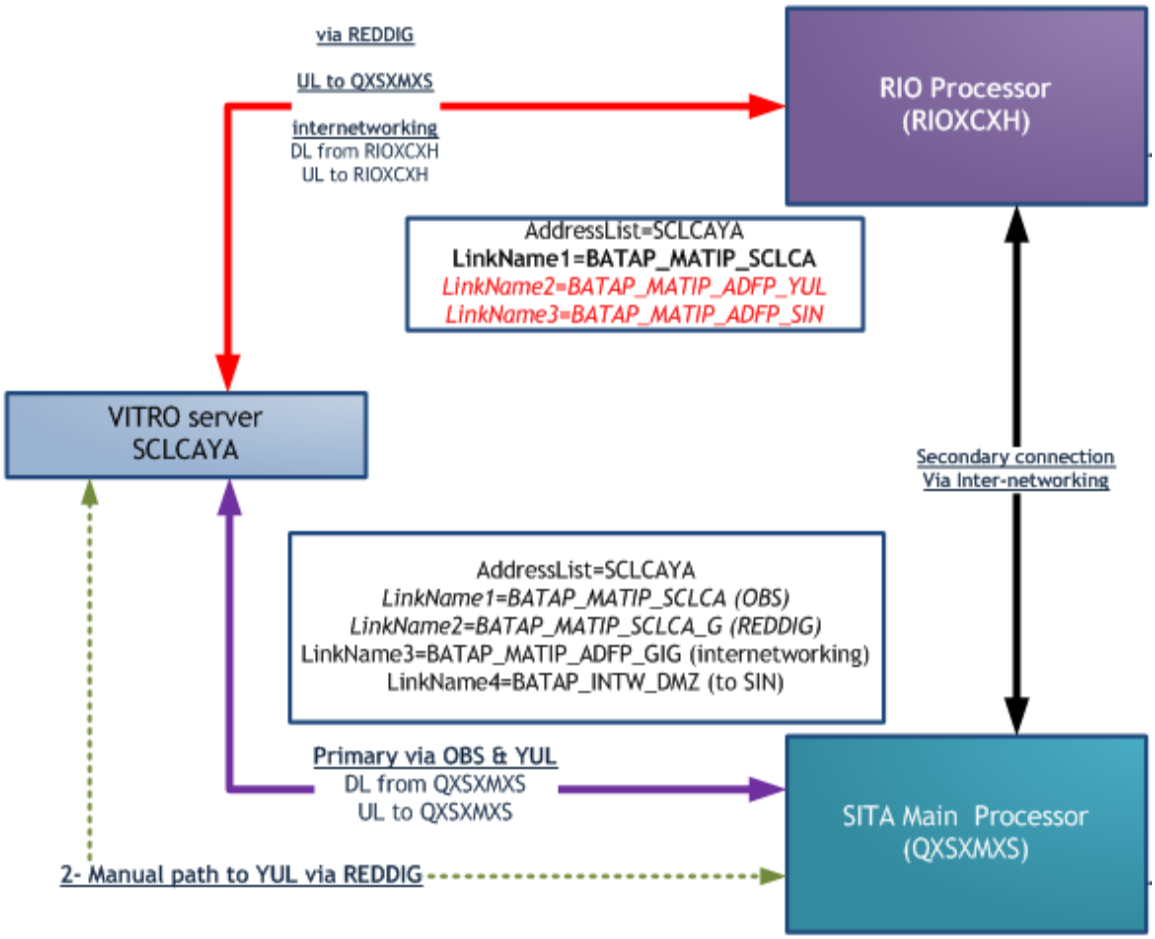

Figure 7: Configuration between VITRO Server, GIG and YUL Processors.

7. DGAC FANS Server

Currently DGAC has two FANS servers: VITRO and TOPSKY. VITRO is used for oceanic traffic and is current connected to SITA YUL/SIN through OBS link. TOPSKY is being used for continental traffic in ACCS, but this system still need software configuration updates in order to be used for data link services.

DGAC had to configure SCLCAYA (VITRO) to accept downlink from RIOXCXH during the test period to establish the communication with GIG ADFP.

8. Trial Setup and schedule

The trial initiated on October 8th 2015 after having all the physical connections in place. The router and server configurations were performed together during the tests according the schedule below:

DAY 1: Thursday, 8th October

12:00 – 15:00 GMT **Installation and configuration of the equipment in Chile**

1.a. Cables and new router installation between REDDIG and DGAC in Chile
1.b. Configuration of the network in DGAC, Recife and SITA.
1.c. Telnet test to check the connections

DAY 2: Tuesday, 20th October

11:00 – 13:00 GMT **Installation and configuration of the equipment in Recife**
2.a. Cables and new router installation between REDDIG and PREC in Recife
2.b. Configuration of the network in DGAC, Recife and SITA.
2.c. Telnet test to check the connections

14.00 – 16.00 GMT **Migration of the traffic**
2.d. Configuration of the CPDLC server to use YUL Processor through REDDIG
2.e. Configuration of the CPDLC server to use GIG Processor through REDDIG
2.f. Observe the traffic through REDDIG to GIG

DAY 3: Wednesday, 21th October

11:00 – 13:00 GMT **Definition of trial duration and back up connection of the network**
3.1 DGAC informed the duration for the trial
3.2 Add the configuration on the CPDLC traffic to YUL processor through OBS
3.3 Observe the traffic

DAY 4: Thursday, 23th October

17:00 – 18:00 GMT **Complete the backup tests between REDDIG and OBS transmissions**
4.1 Configuration at SITA processor to have backup
4.2 Test the backup solution

9. Results and Measures during the trial

9.1 Data link message traffic volume

During the trial, SITA used its network monitoring tools in order to verify the volume of data link traffic going through REDDIG and OBS links.

The summarized table below shows the BATAP message traffic volume (both inbound/outbound directions and data/IMA messages) on links MATIP_SCLCA in YUL ADFP and MATIP_SCLCA in GIG ADFP.

The results are presented for the Nov, Dec, Jan and Feb months:

BATAP Message Traffic Volume		
Month	**YUL Processor**	**GIG Processor**
November-15	*	46024
December-15	*	79352
January-15	9718*	56831
February-15	57690	18738**

*Period from Nov 15, 2015 to Jan 24, 2016
** Data until Nov 23th

9.2 Logs and Network information

During the trial period, the following significant events were reported:

Jan 14th and 15th, 2016: a message codification issue was found by DGAC and it was fixed by SITA

Jan 15th, 2016: SITA could observe some quick disconnections as Figure 8, but they don't affect the message exchange when less than 1 second. REDDIG informed no issues in their Network on Nov 18th

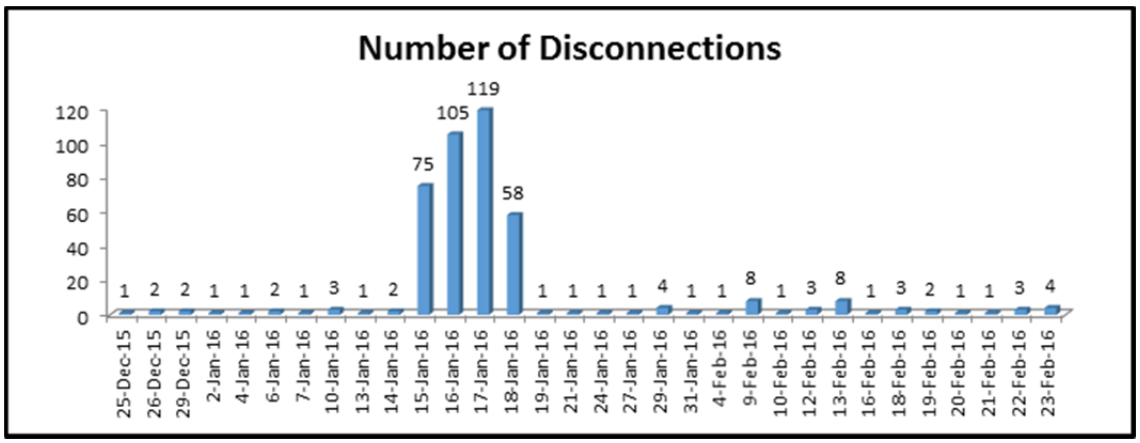

Figure 8: Number of Disconnections

Feb 9th, 2016: upon SITA request, DGAC has fixed the BATAP type of message. This change was necessary to avoid duplicated messages to both SITA processors YUL and GIG.

10. Next steps for the trial

SITA and DGAC agreed on following next steps in order to consolidate the trial results:

- To continue with the tests until end of March in order to further evaluate the disconnections and the change recently made in the type of BATAP messages;
- DGAC will forward to SITA their logs, events and traffic since Nov 2015 (trial start date);
- SITA will advised DGAC the time and configuration needed to have the OBS setup back.

11. Proposed Network Design for operational use of ANSP REDDIG access to SITA

The DGAC/REDDIG/SITA trial is being performed using a network design that considered the aspects described in the items 2 to 6 of this present report.

Based on lessons learned so far and taking into consideration the main requirement of no impact to ANSP, REDDIG and DECEA networks, SITA has developed a proposed network configuration design for operational use by any ANSP willing to connect to SITA using their REDDIG node access, and therefore ensuring to be using a dedicated ATC network under cost effective manner.

Main network requirements for the operational use:

- ANSP ground server should be connected via REDDIG (primary) to GIG (primary) and YUL (secondary) to make ATC message exchange;
- DECEA's nodes with REDDIG in Recife and Brasília (2 switches with cable and VSAT access each) could be used to connect REDDIG to SITA's processors;
- Equipment and site contingence to provide the communication to SITA's processors as figures 9, 10 and 11.

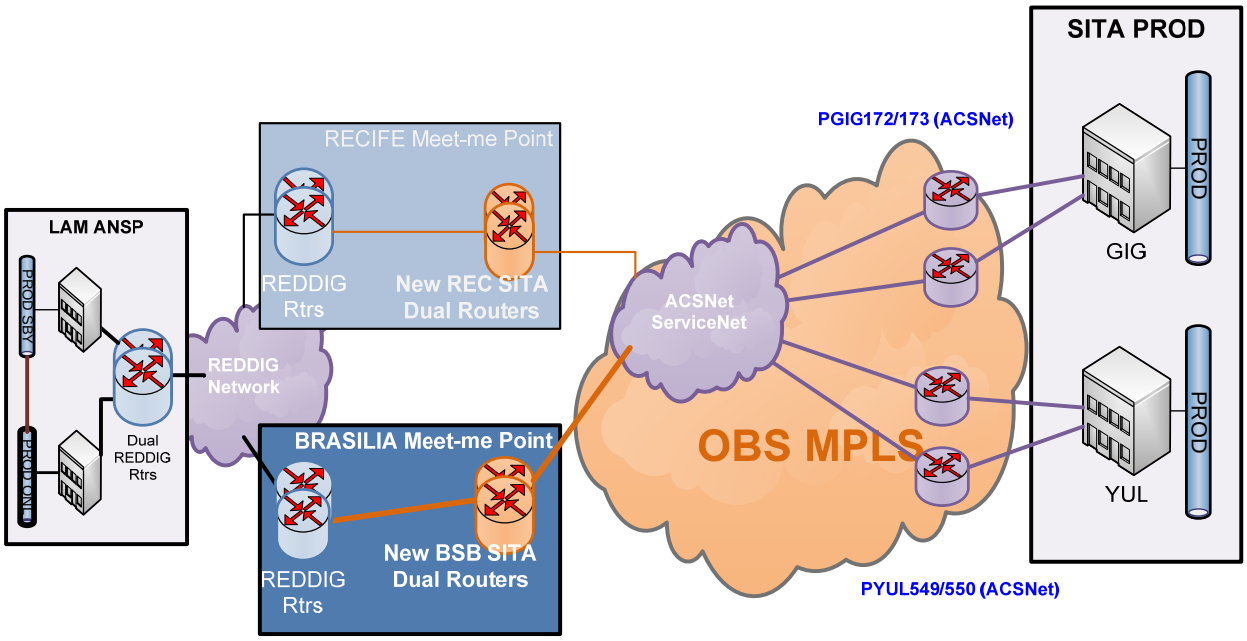

Figure 9: Network diagram for operational use

Proposed Recife Gateway between REDDIG Network and ACSNet Community on OBS Network

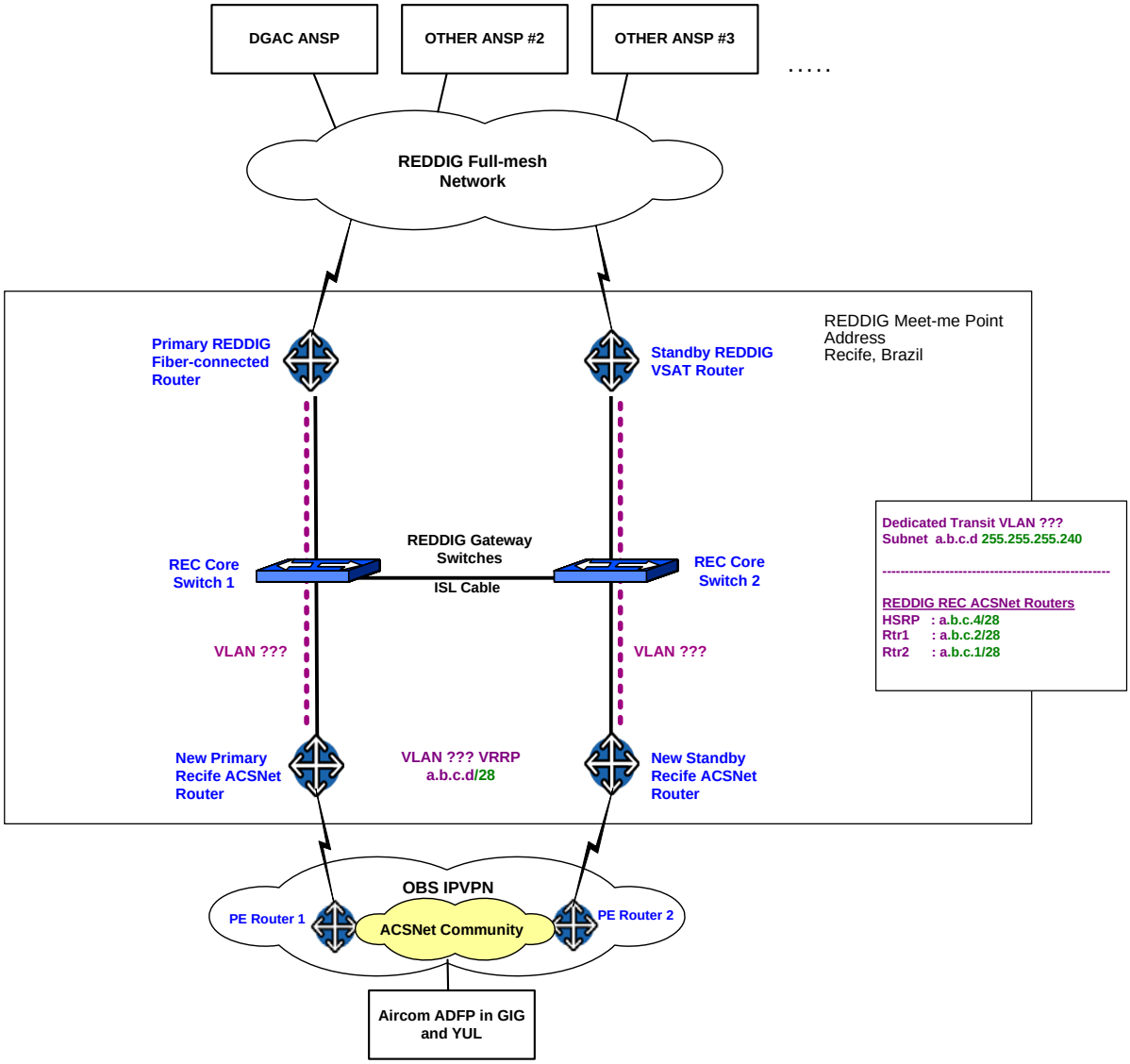

Figure 10: Proposed network solution – Recife site.

Proposed Brasilia Gateway between REDDIG Network and ACSNet Community on OBS Network

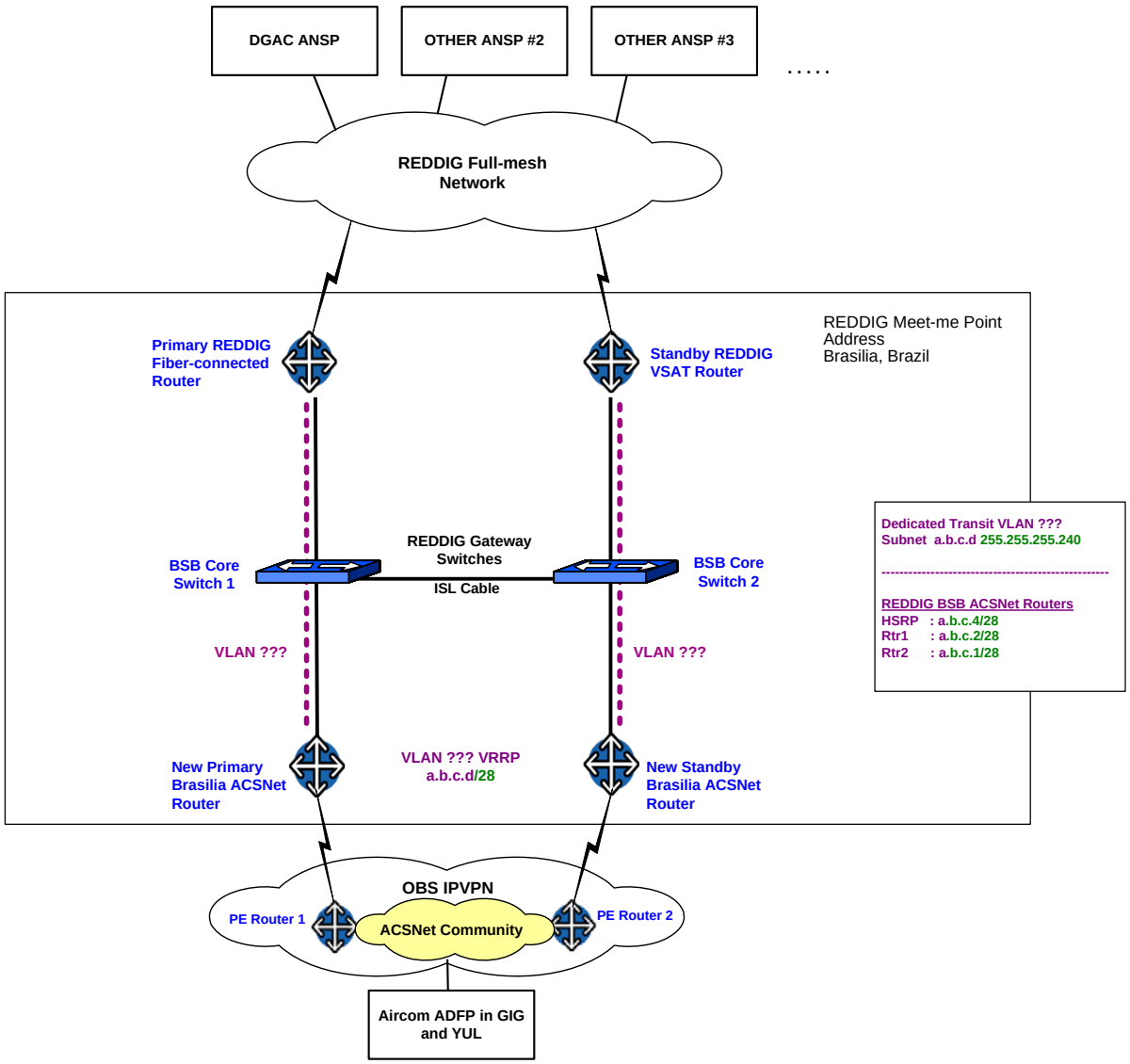

Figure 11: Proposed network solution – Brasília site.