International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

MIII-RII/INTERCON/01 — WP/03
20/05/15

**First MEVA III/REDDIG II Interconnection Coordination Meeting (MIII-RII/INTERCON/01)**
**Oranjestad, Aruba, 25 to 26 May 2015**

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**Agenda Item 2: MEVA III and REDDIG II Network Overview**

# REDDIG II NETWORK OVERVIEW

(Presented by the Secretariat)


| **EXECUTIVE SUMMARY** | |
|---|---|
| This Working Paper presents general information about REDDIG II architecture and the current operation status | |
| **Action:** | Suggested Action is presented in Section 3. |
| *Strategic Objectives:* | • Safety<br>• Air Navigation Capacity and Efficiency |
| *References:* | • REDDIG II user manual<br>• Contract No. 22501200 between ICAO and INEO & LEVEL 3 consortium<br>• Final report of the Fourth meeting on the Technical-Operational Implementation of the new REDDIG II digital network (RTO/4) (Manaos Brazil 20 to 21 April 2015) |


## 1. Introduction

1.1 The SAM Digital Network – REDDIG – is the result of the cooperation spirit existing between the member States which under the Regional Project RLA/03/901 have the objective of sharing an own network that provides them with the current and future aeronautical telecommunications services.

1.2 The REDDIG I, supporting both Frame Relay and IP protocols, began to operate in 2003 and ended in January 2015. During all this period the REDDIG I provided the aeronautical services with the highest standards of quality and availability. The main reason to replace the REDDIG I platform, except the antenna, was the obsolescence of network components.

1.3 After a process of study of requirement for a new digital network in the SAM Region, the elaboration of technical specification and the establishment of a bid process, a Contract No. 22501200, between ICAO, on behalf of all REDDIG II member States, and the INEO & LEVEL 3 consortium for the implementation of REDDIG II was signed the 9$^{th}$ of May 2013. .

1.4 The contract includes, in addition to the installation and operation of satellite network equipment, the leasing of the MPLS service on the Level 3 fibre optics ground network for a period of 6 months, starting on final acceptance of REDDIG II.

1.5 Following the initial six months, depending on the quality of the service during this initial period, the REDDIG II member States will decide whether or not to renew the service for an additional period of 4 years and six months, renewable every year, maintaining the monthly costs established for the first 6 months of the service.

## 2 Analysis

2.1 The REDDIG II, was launched in February 2015 by the consortium INEO & Level (3), is a digital network totally based on IP protocol on a mixed satellite-ground network .The main satellite equipment of the REDDIG II are the CISCO 2900 routers, the SKYWAN IDU 7000 satellite modems that will act as masters (Manaus and Ezeiza), and the SKYWAN IDU 1070 modems in the other REDDIG II nodes, which will act as slaves. The block structure of a satellite network node is shown in *Figure 1* of **Appendix A** to this working paper.

2.2 The ground network is a fibre optics network based on the MPLS protocol. Access to ground network services is through the CISCO 1921 router. Each node has an access capacity of 256k bits/sec. The configuration for accessing the MPLS network is shown in *Figure 2* of Appendix A. The ground network provider is LEVEL 3

2.3 At present, the REDDIG network comprises 17 nodes belonging to 12 countries and 1 territory of the SAM Region, 1 country of the Caribbean Region and the COCESNA organization. **Appendix B** to this working paper contains a map with the location of the REDDIG II nodes (Figure 3) and the Level 3 ground network (Figure 4) A new REDDIG II node will be installed in Brasilia at the beginning of the last quarter of 2015

2.4 The REDDIG II continues operating in the same transponder of IS-14 satellite, the same satellite segment with three carriers but employing new modulation scheme 8PSK and FEC 2/3. Likewise, the hardware platform continues to be fully redundant. General overview of the REDDIG II architecture and components are presented in the **Appendix C**.

2.5 The Provisional Site Acceptance Test was completed on February 6$^{th}$; all the REDDIG members States signed the PSAT with commentaries. The commentaries are pending issues that the consortium INEO LEVEL 3 has to complete before the REDDIG II Final Acceptance Test.

2.6 From the pending issues, common aspects to all nodes are highlighted as the lack of IP telephone service operation designed to support the control centers in managing the flow of Air Traffic Management (ATFM), false alarms and quality in the presentation of the Management System (NMS) of the REDDIG II, the quality of the AFTN messages, and the update of the documents containing the circuit diagrams, result of the changes made during the node´s installation of the REDDIG II.

2.7 The consortium INEO LEVEL 3, according to the contract, has a time of 40 days (ORD Operational Readiness Demonstration period) to solve all the pending activities identified in the PSAT.

2.8 At the date REDDIG II is within the ORD period and a the Final Network Acceptance Test will be made once all the pending issues will be completed

## 3. Action required

3.1 The meeting is invited to take note of the information supplied and consider it for the analysis of the coordination and implementation of new services in the MEVA III REDDIG interconnection.

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**APPENDIX A**
**SATELLITE AND GROUND NODE REDDIG II CONFIGURATION**

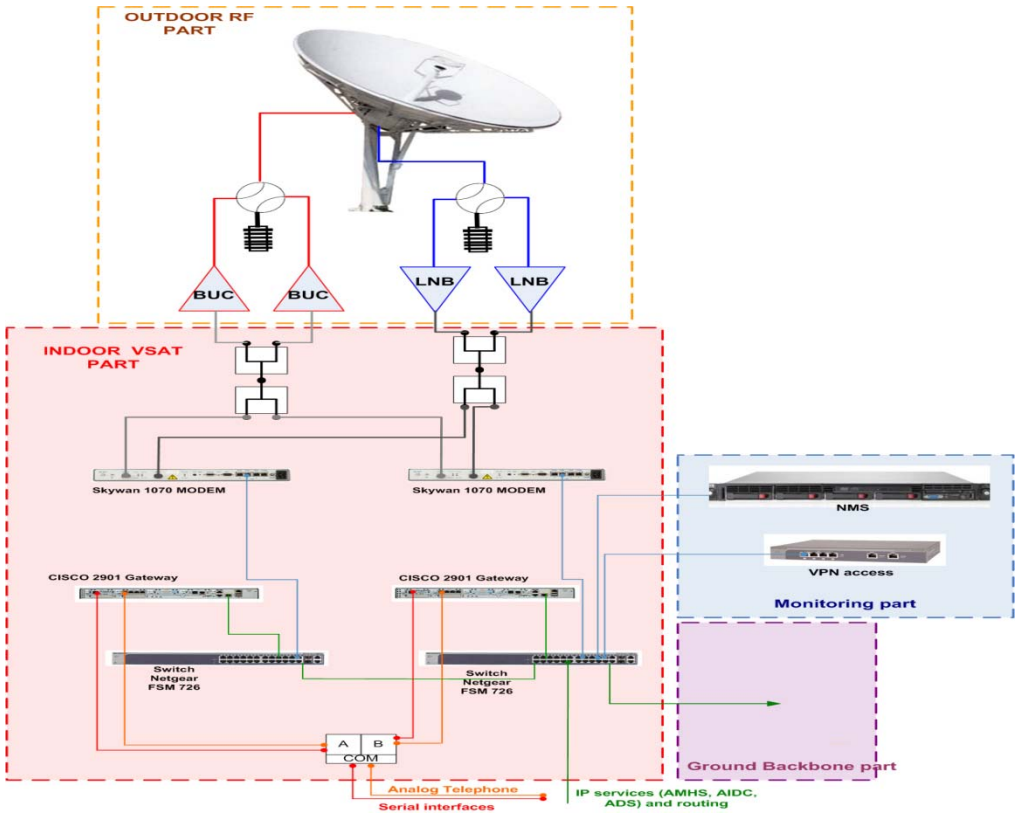


Figure 1: Configuration of REDDIG II satellite node

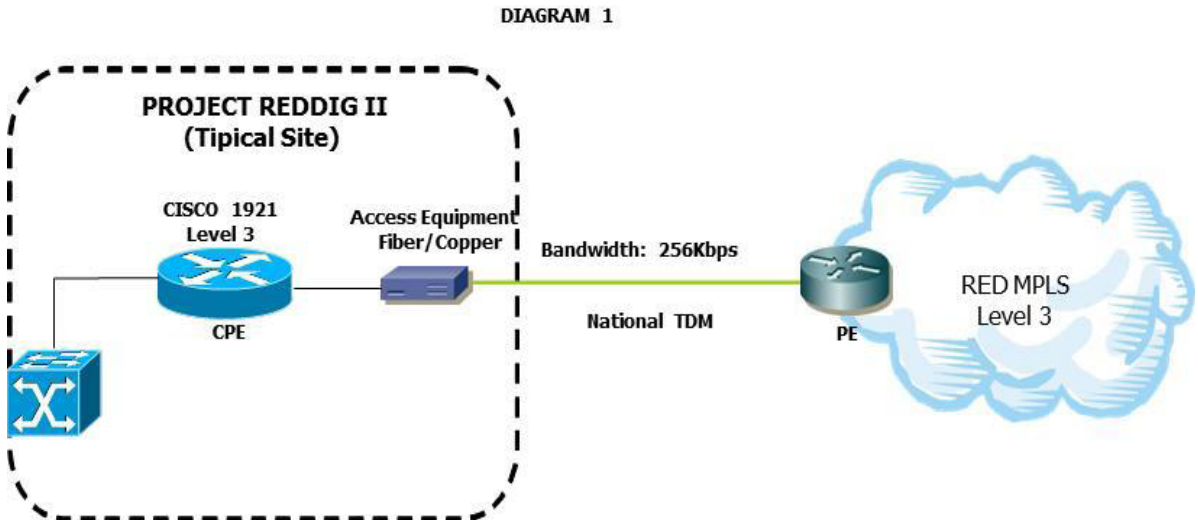


Figure 2: Configuration of MPLS ground network connection in a REDDIG II node

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**APPENDIX B**
**LOCATION OF REDDIG II NODES AND LEVEL 3 GROUND NETWORK**

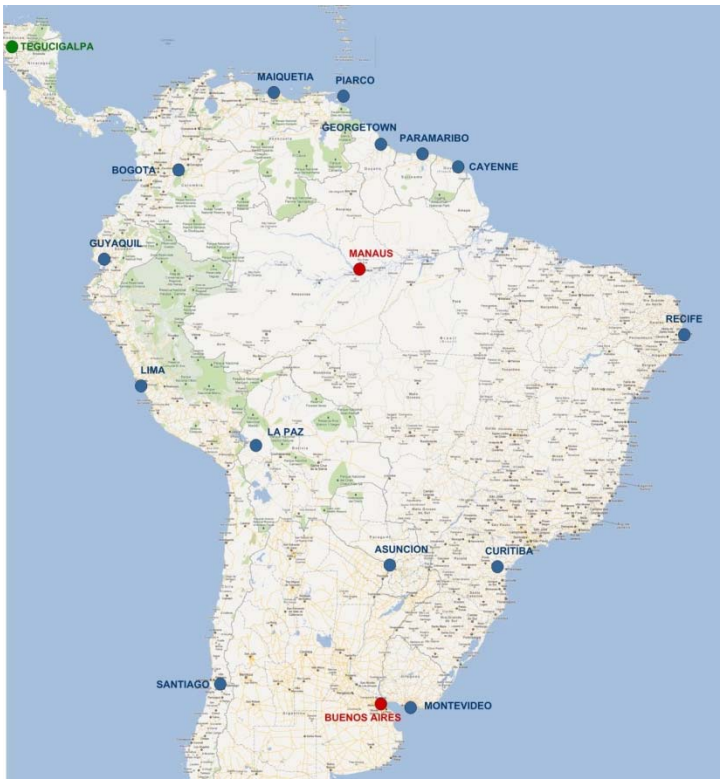



Figure 3: Location of REDDIG II nodes

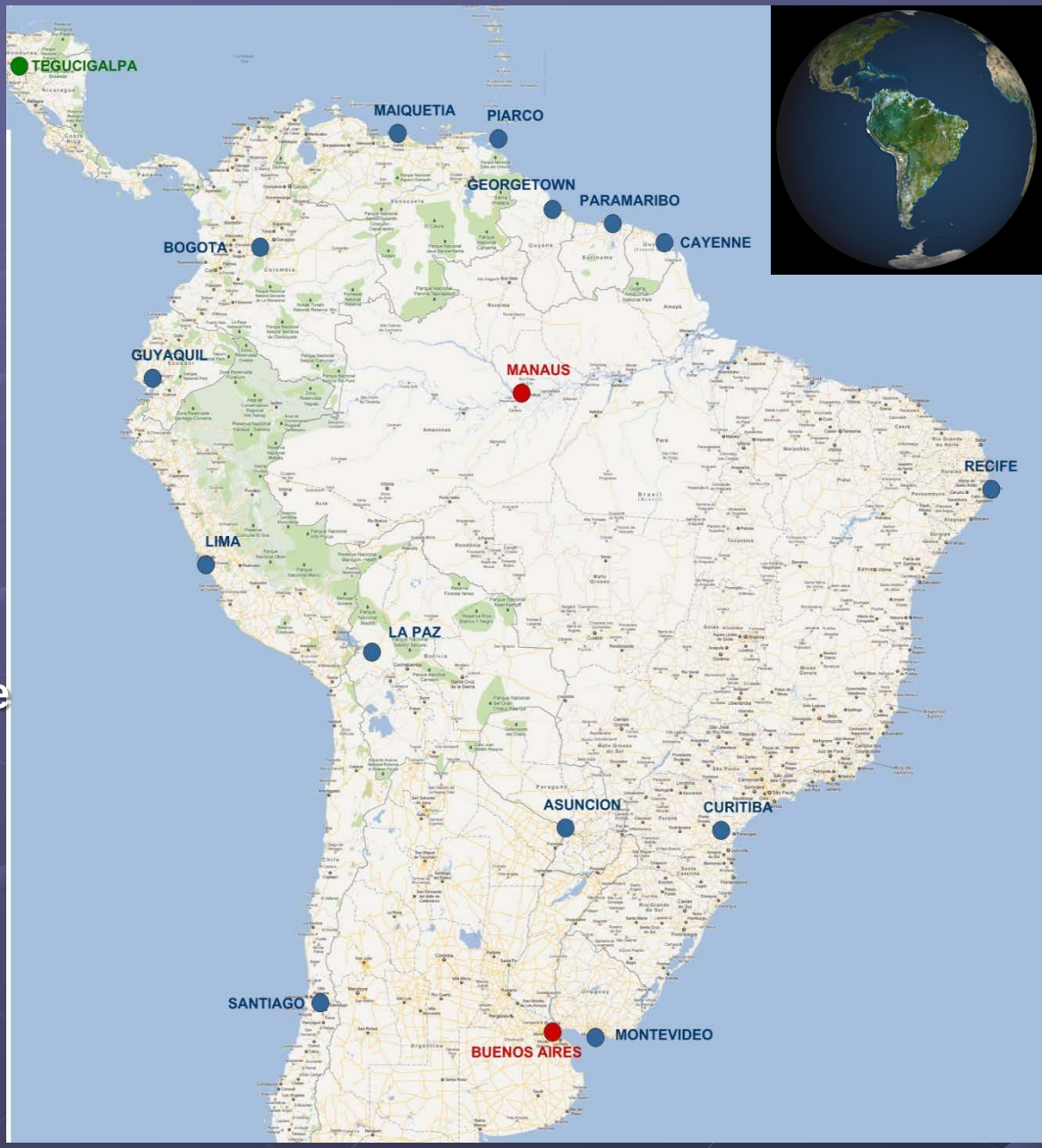

Figure 4: Optic fiber ground network of LEVEL 3

Appendix C


# REDDIG II Overview

# REDDIG Nodes:

- 16 nodes
- 14 countries
- 1 MEVA interconnection node (Tegucigalpa-COCESNA)
- 2 Master stations (Manaus & Ezeiza)

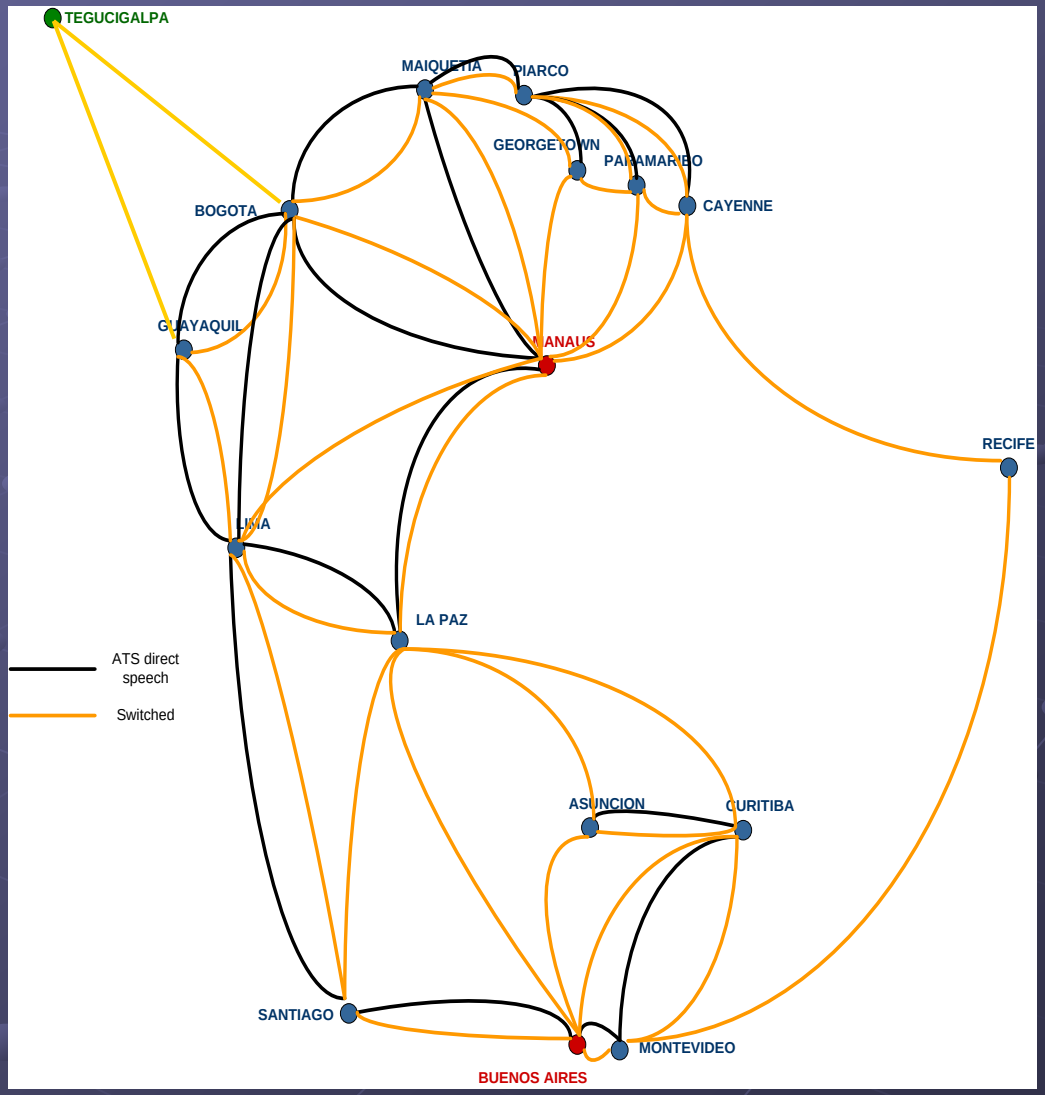


# Nodes connections

The network is meshed in terms of communications.

Masters (Manaus and Ezeiza)

Nodes (Maiquetia, Lima, Bogota, La Paz, Piarco, Asuncion, Curitiba, Guayaquil, Santiago, Montevideo, Recife, Cayenne, Paramaribo, Georgetown, COCESNA)



## Master station features

Master stations, Manaus and Ezeiza will have two special features:

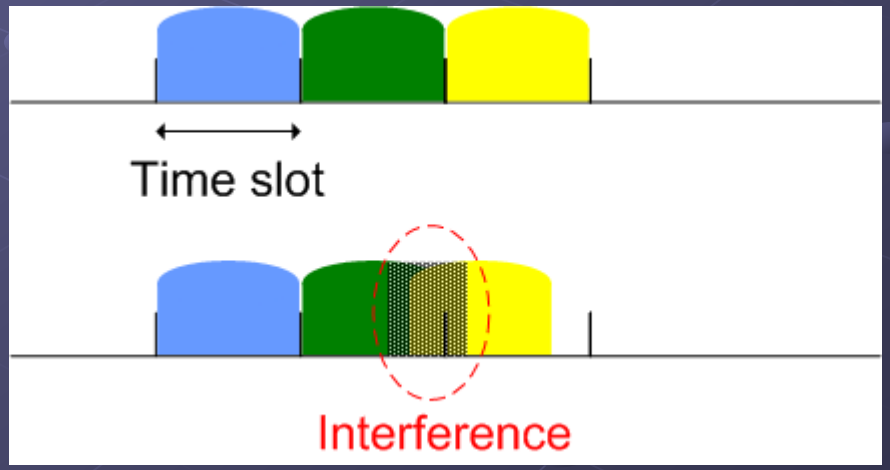
- NMS (Network Management System)
- Satellite network synchronization

NMS role means those stations will gather information from all the sites in order to have a global view and administration of the network.

# Master station features

Satellite network synchronization is related to TDMA. The modems need to be synchronized in order to avoid that two time slots overlap which would produce interference

Thus, every station calculates the round trip time to satellite and this value is controlled and corrected by the master stations.



# Services on the REDDIG II

The following services are transported on REDDIG II network

- AFTN and AMHS → Async. for AFTN, Eth/IP for AMHS
- RADAR and ADS → Serial and Eth/IP
- ATS – telephony → FXS, FXO, E&M, E1
- NMS system →Eth/IP
- Future services over IP → Eth/IP

The network must transport legacy data (serial and analog lines) as well as new IP-based services.

# REDDIG II Node Identification

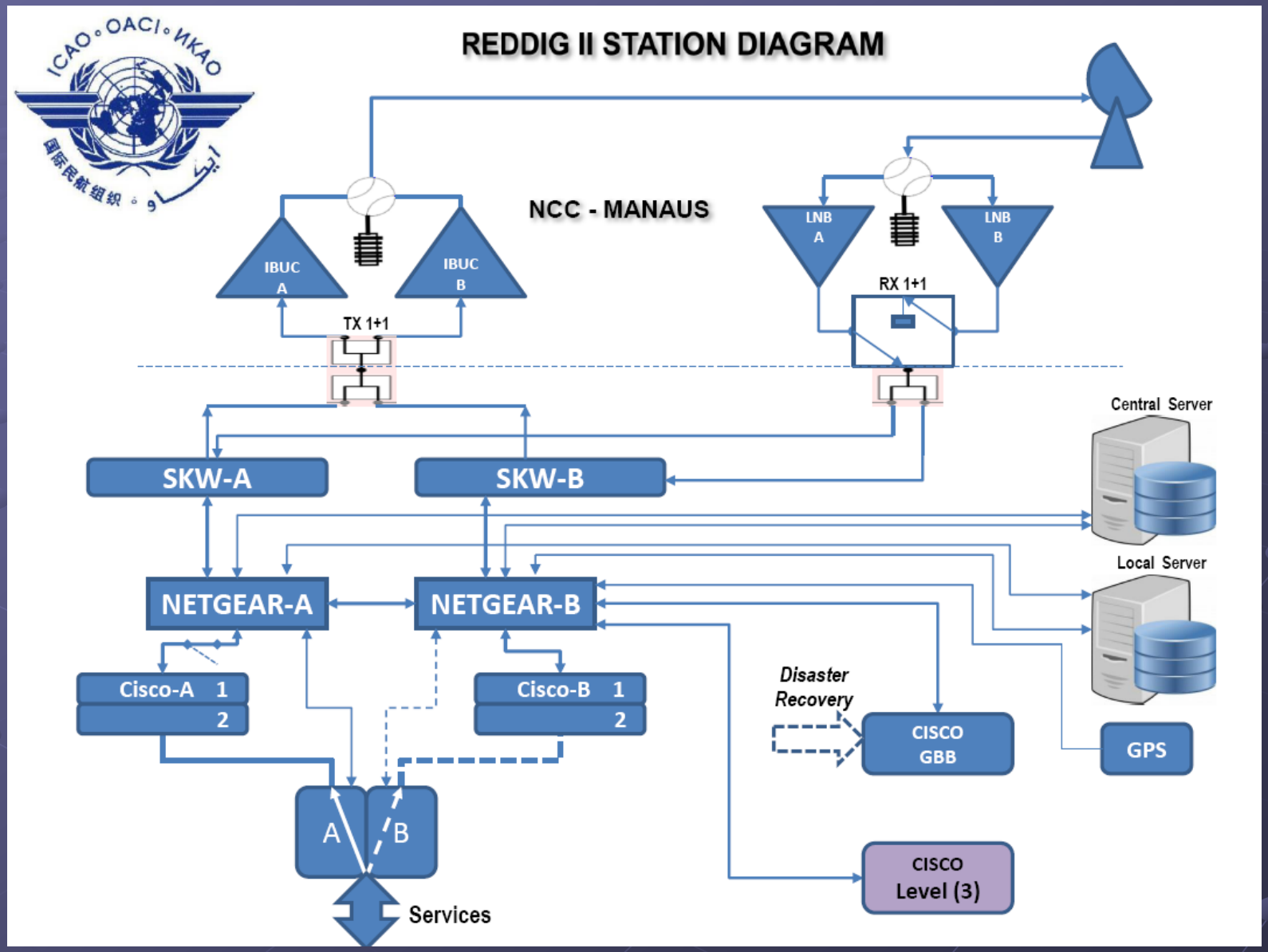
| Country | Code | ID |
|---|---|---|
| Argentina | SAEZ | 20 |
| Bolivia | SLLP | 25 |
| Brazil (Curitiba) | SBCT | 30 |
| Brazil (Manaus) | SBMN | 36 |
| Brazil (Recife) | SBRF | 38 |
| Chile | SCEL | 40 |
| Colombia | SKED | 45 |
| Ecuador | SEGU | 50 |
| French Guyana | SOCA | 92 |
| Guyana | SYGC | 90 |
| Paraguay | SGAS | 55 |
| Peru | SPIM | 60 |
| Suriname | SMPM | 94 |
| Trinidad and Tobago | TTZP | 91 |
| Uruguay | SUMU | 65 |
| Venezuela | SVMI | 80 |
| Honduras | MHTG | 21 |

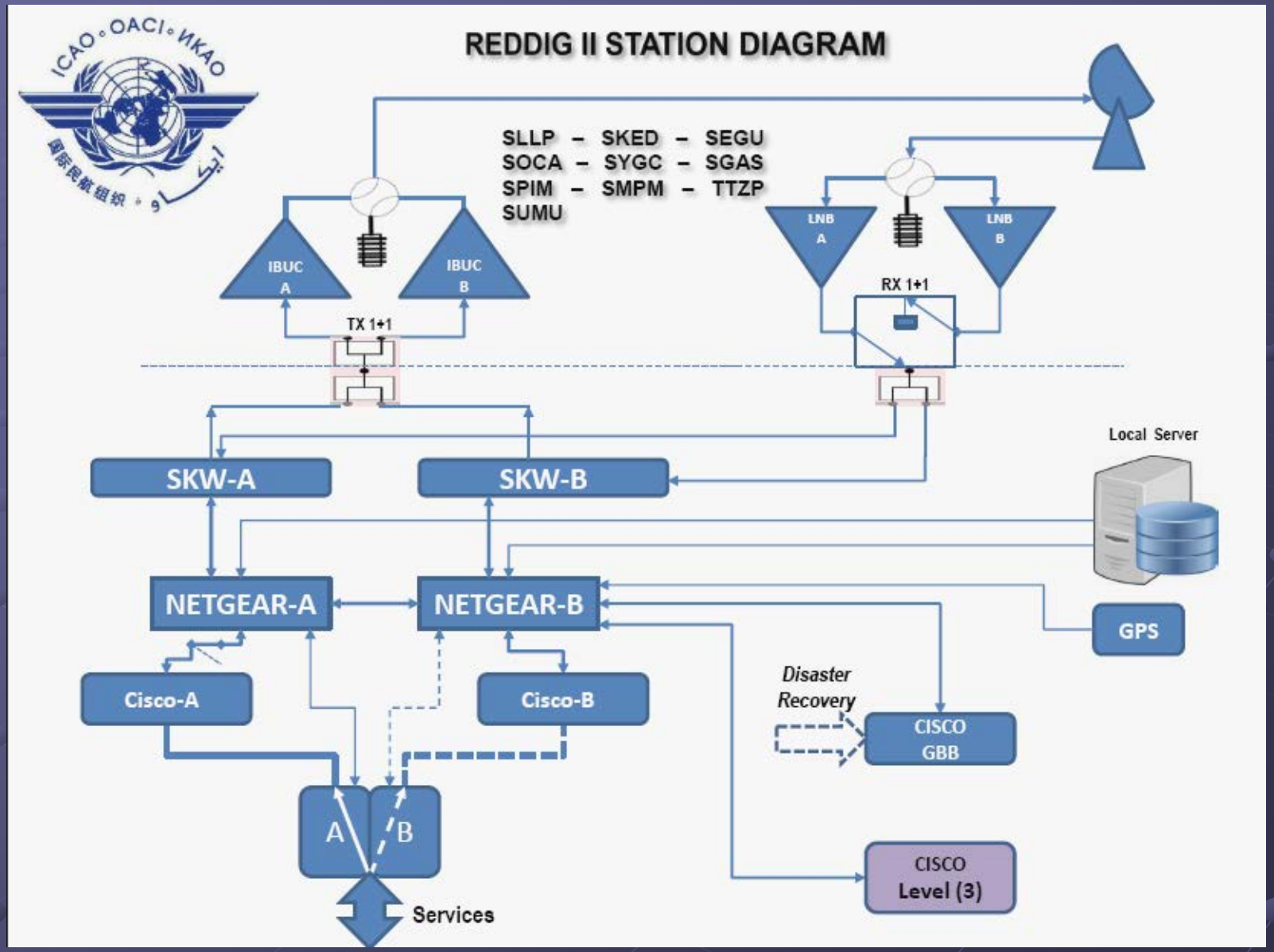
# REDDIG II Node Architecture

- Fully redundant
- Two chains
- Baseband switch for analog, serial and Eth interfaces

Divided in 4 sections:

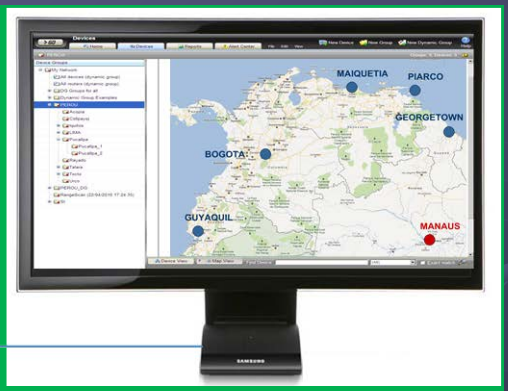
- Outdoor Unit (Antenna, RF, IFL)
- Indoor Unit (BB SW, Routers, Eth SW, SatModems)
- NMS (Network Management System & WUG)
- Back-up Ground Network (Level 3 router)


REDDIG II STATION DIAGRAM
NCC - MANAUS
IBUC A
IBUC B
TX 1+1
LNB A
LNB B
RX 1+1
Central Server
SKW-A
SKW-B
Local Server
NETGEAR-A
NETGEAR-B
Cisco-A 1
2
Cisco-B 1
2
Disaster Recovery
CISCO GBB
GPS
A
B
CISCO Level (3)
Services


REDDIG II STATION DIAGRAM
SLLP – SKED – SEGU
SOCA – SYGC – SGAS
SPIM – SMPM – TTZP
SUMU
IBUC A
IBUC B
TX 1+1
LNB A
LNB B
RX 1+1
Local Server
SKW-A
SKW-B
NETGEAR-A
NETGEAR-B
GPS
Cisco-A
Cisco-B
Disaster Recovery
CISCO GBB
A
B
CISCO Level (3)
Services

# REDDIG II NMS

The NMS system is composed of a workstation equipped with “WhatsUp Gold” (monitoring software), a VPN router for remote access and control, a GPS time reference and an UPS



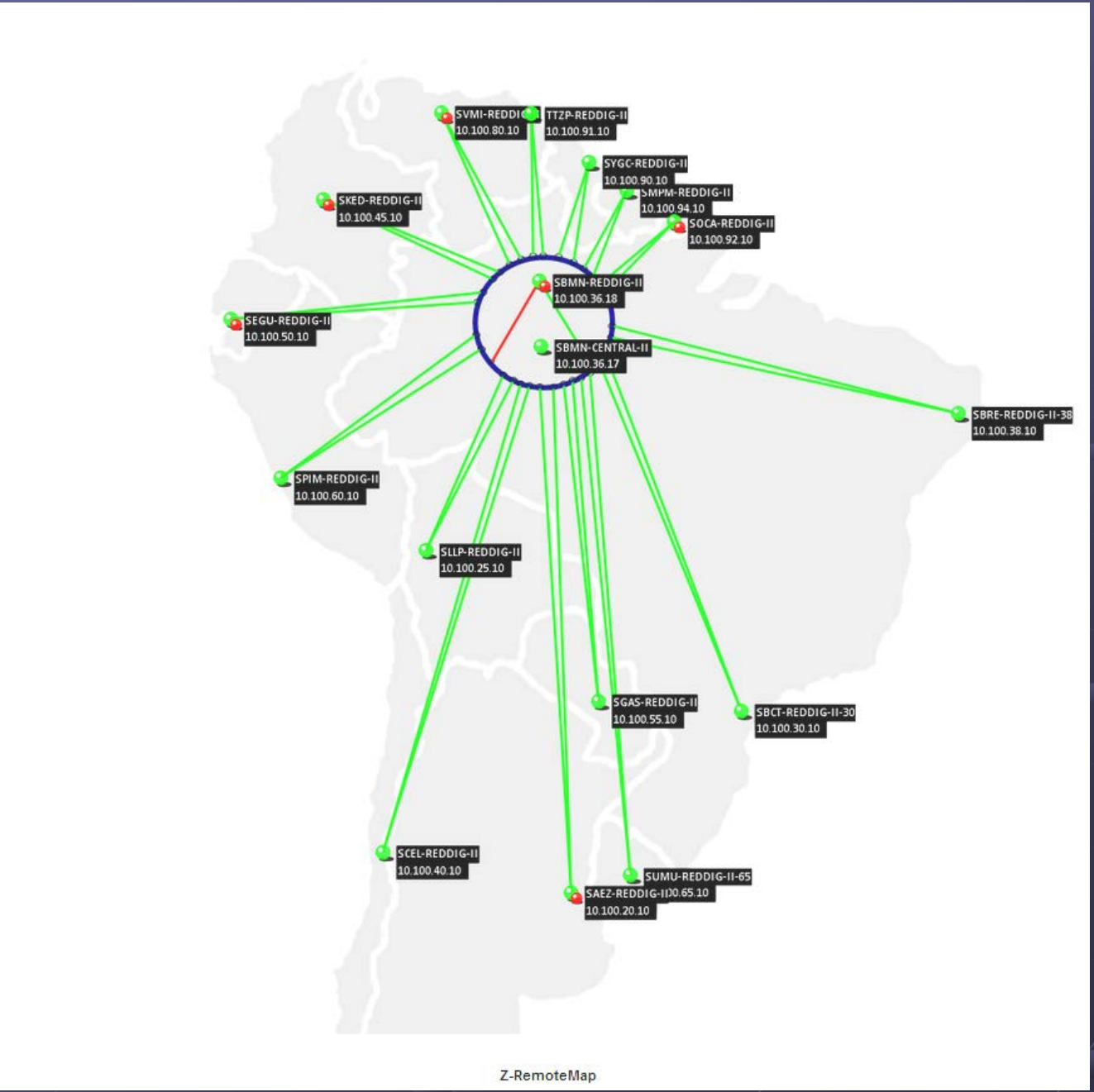

Working station

VPN access

# NMS

# ‘WhatsUp Gold’

# Global Monitoring



# NMS 'WhatsUp Gold' Local Monitoring

**RX SW POSITION: [A=0] or [B=1]** Menu

RX-1+1 (SNMP) LNB1+1 - Current Switch Position

0.0

**IBUC SW POSITION: [A=0] or [B=1]** Menu

IBUC-A (SNMP) IBUC - Switch Position

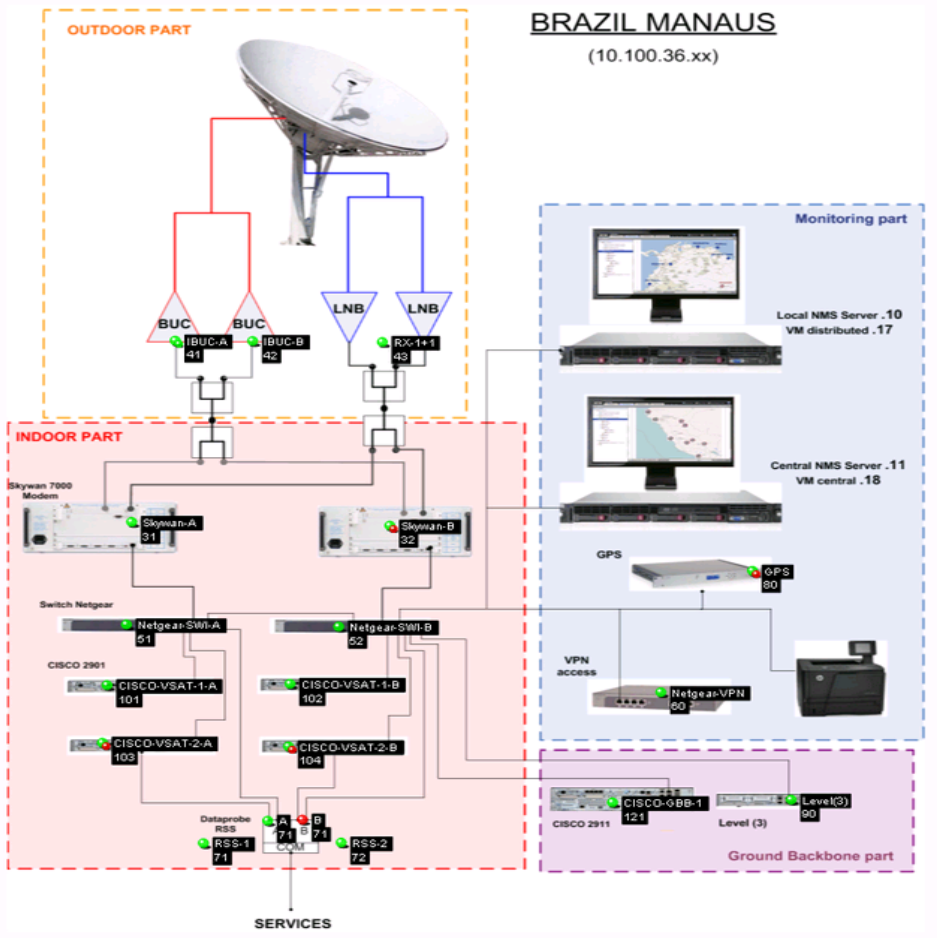
0.0

**MASTER REFERENCE: [MANAUS=1] or [EZEIZA=3]** Menu

Skywan-B (SNMP) Skywan Active Master

0.0

**Map View** Menu



# Backup Ground Network

In each node, the backup ground network is composed of a REDDIG gateway router (A or B or GBB) and a Level 3 MPLS access router.

The gateway router is used to gather all the aeronautical services converted to IP protocol and bring them automatically to the MPLS access router in case there is no satellite access at the node.

This backup ground service is provided by Level 3 through its ground backbone network.