



International Civil Aviation Organization
South American Regional Office - Regional Project RLA/03/901
REDDIG Management System and Satellite Segment Administration
Twentieth Meeting of the Coordination Committee (RCC/20)
Lima, Peru, 21 to 23 March 2017

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

(Working paper presented by the Secretariat)

SUMMARY	
This paper presents information on the progress made in the implementation of the activities agreed upon at the last meeting of the Coordination Committee (RCC/19) and to be included in the 2017 work plan.	
Reference	
<ul style="list-style-type: none">• REDDIG Contract 22501200;• Report of the Nineteenth Meeting of the REDDIG Coordination Committee (RCC/19) (Lima, Peru, 7-9 March 2016);• Seventeenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/17) (Lima, Peru, 9 – 13 May 2016);• Fifth Technical/Operational Meeting of the REDDIG II (26 and 27 July 2016); and• Eighteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/18) (Lima, Peru, 17 – 21 October 2016)	
ICAO Strategic Objectives:	<i>A - Safety</i> <i>B – Air navigation capacity and efficiency</i>

1. **Background**

1.1 The main activities agreed upon at the last meeting of the Coordination Committee (RCC/19) to be included in the 2017 work plan and additional to those pertaining the operation, support and maintenance of the network, were the following:

- a) REDDIG II training programme;
- b) REDDIG II operation and analysis to the implementation of new services.

1.2 Likewise, this working paper presents REDDIG logistics aspects since RCC/19, to date.

2. **Analysis**

REDDIG II TRAINING PROGRAMME

- 2.1 With regard to training activities, the following courses were carried out:
- a) Second course “Interconnecting Cisco Network Devices Part 2 (ICND2)”
 - b) Basic course on REDDIG II operations and maintenance.

Second course “Interconnecting Cisco Network Devices Part 2 (ICND2)”

2.2 As part of the training plan for the personnel in charge of the REDDIG II maintenance, in the 2015-2016 period approved by the Eighteenth Coordination Committee Meeting of the REDDIG (RCC/18) held in Lima, Peru, from 2 to 4 March 2015 and the Nineteenth Coordination Committee Meeting of the REDDIG (RCC/19) held in Lima, Peru, from 1 to 3 March 2016, two Basic Courses on IP CISCO Switches and Routers were held in Lima, Peru, from 9 to 13 November 2015 and from 4 to 8 April 2016.

2.3 During the first course called “*Interconnecting Cisco Network Devices Part 1 (ICND1)*” participants received information related to INTERNET connectivity, network security devices management, implementation of medium-capacity network and introduction to the IPv6. In the second course “*Interconnecting Cisco Network Devices Part 2 (ICND2)*” the main content was implementation of medium-capacity scalable networks, EIGRP solution implementation, multi-area scalable networks implementation, solution based on OSPF and management of network devices.

2.4 To the ICND2 Course, 10 member States participated (Argentina, Brazil, Chile, Ecuador, Colombia, Paraguay, Peru, Suriname, Trinidad & Tobago and Uruguay) with a total of 16 participants. The list of participants is attached as **Appendix A** and the content of the course as **Appendix B**.

Basic course on REDDIG II operations and maintenance

2.5 The basic course was delivered, one for the Spanish-speaking REDDIG member States including Brazil which was carried out in the premises of the *Centro de Instrucción, Perfeccionamiento y Experimentación (CIPE)* of the ANAC, in the “*Ministro Pistarini*” International Airport in Ezeiza, Buenos Aires, Argentina, from 5 to 9 September 2016 and the other course delivered for the non-Spanish-speaking States delivered in the “*Cheddi Jagan*” International Airport of Timehri, Guyana, from 26 to 30 September 2016. In both courses, technical personal from all the REDDIG nodes participated, except from Colombia.

2.6 In the basic course provided in Argentina, 23 participants assisted from the States of Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, Uruguay and Venezuela (see **Appendix C**). In the basic course provided in Georgetown, Guyana 18 participants assisted from the States of Guyana, French Guyana, Suriname, and Trinidad&Tobago (see **Appendix D**).

2.7 The content of the course on REDDIG II operations and maintenance includes a general description of the REDDIG II, the REDDIG II node, the RF equipment; MODEM Skywan, Switch Ethernet, CISCO Router, baseband switchboard and the NMS (see **Appendix E**).

2.8 The RCC/19 Meeting assign the Secretariat to investigate about operational courses, maintenance and SKYWAN modem satellites programme, as well as the costs for a group of 20 persons or for a smaller group of two or three persons that in the future could be as an extension of training for a larger number of persons in charge for the REDDIG II maintenance. The initial information received is presented as **Appendix F** to this working paper.

REDDIG II OPERATION AND ANALYSIS TO THE IMPLEMENTATION OF NEW SERVICES

REDDIG II pending activities

2.9 In order to solve the problem of the random freezing of some REDDIG II nodes, INEO has been performing the following actions:

- Changes on the LNBS and installation of the redundancy in the signal of 10MHz that Skywan equipment’s provides (one at a time) to the IBUC equipment’s and new LNBS. This was

donde in thirteen (13) stations: Brasilia, Cayenne, Curitiba, Ezeiza, Georgetown, Guayaquil, Lima, Maiquetia, Manaus, Paramaribo, Piarco and Recife.

- Reconfiguration of the Skywan profile that was completed on 20 July 2016 leaving the satellite network on evaluation.
- Configuration fo the administrative channel of 6 digits in the node of La Paz, Bolivia.

REDDIG II Brasilia Node

2.10 The node of Brasilia started operation on April 2016. To date, the services still operating are the AMHS Brasilia-Lima circuit and the AFTN circuits between Brasilia-Cayenne, Brasilia-Georgetown and Brasilia-Paramaribo (these las two circuits were interconnected in AMHS) and the three oral administrative circuits.

2.11 Regarding the Brasilia-Lima AMHS circuit, it is configured in the REDDIG II Brasilia node since mid-September 2016. In the past, this circuit was going through the REDDIG II node of Curitiba arriving in Brasilia through a Brazilian national communication network.

2.12 The AMHS circuits of Brasilia-Georgetown and Brasilia-Paramaribo started their operation in mid-December of 2016. During mid-February 2017 the AMHS circuits of Brasilia-Georgetown and Brasilia-Paramaribo migrated again to AFTN due to a problem of compatibility with the other AMHS connections in view that in the AMHS connections with Georgetown and Paramaribo was the need to use the “*authorization time*” parameter that was not being used in other AMHS connections. In this sense, Brazil is waiting to reactivate the AMHS connections with Guyana and Suriname by the end of March 2017.

2.13 Regarding the rest of the AMHS connections from Brasilia, to date it is also found the P1 connection with Ezeiza, Bogota and Montevideo.

2.14 On 29 September 2016, the coordination’s for the implementation of the AFTN between Brasilia and Cayenne started, through the REDDIG II nodes of Cayenne and Brasilia. The configuration was analysed by the Brazil and French Guyana focal points and delivered to INEO for its configuration and activation in the REDDIG II. Its operations started on 3 October 2016. With this implementation the AFTN between Cayenne and Manaus was deactivated through the REDDIG II nodes of Cayenne and Manaus. The configuration of the Cayenne-Brasilia AFTN circuit in the REDDIG II is presented as **Appendix G** to this working paper.

Level 3 terrestrial network

2.15 The administration of the REDDDIG has scheduled and added “Active Monitors” in the monitoring applicative and in the control of the Manaus, Ezeiza and Lima stations in order to monitor the availability of all the Level 3 circuits. Having 3 stations allows having a better precision in the calculation of the circuit’s availability.

2.16 By using this tool, is being calculated sin January 2016, the monthly availability (numeric and graphic) of each of the Level 3 terrestrial networks which is used to analyse the compliance of the respective SLA (Service Level Agreement).

2.17 The performance of the LEVEL 3 terrestrial network during 2016 and during January – February 2017 is presented as **Appendix H**.

Analysis on the security in REDDIG II

2.18 The RCC/19 considered important that an analysis on the security in REDDIG has done in order to protect the possible external interferences and to define a common solution applicable

to all the REDDIG nodes. In this sense, an ad hoc group was formed comprising Argentina, Brazil, Colombia, French Guyana, Paraguay, Peru and the REDDIG Administration.

2.19 The ad hoc group held a teleconference on 26 April 2016 as considered by the RCC/19 in order to start with the analysis on the security in REDDIG II. The results of the analysis were presented during the SAM/IG/17 Meeting.

2.20 The SAM/IG/17 considered that the information analysed, should be included as Appendixes in the Safety Guide of IP networks (April 2013) in the SAM Region (see <http://www.icao.int/SAM/eDocuments/GuiaOrientacionSeguridadImplantacionRedesIP.pdf>). In this regard, was formulated the *Conclusion 17/1 – Implementation of actions to maintain the security in REDDIG II* so that REDDIG II member States and the REDDIG II Administration analyses the implementation of the initial actions described in Appendix A of the agenda item 4 in order to maintain the required security in REDDIG II and submit the results of this analysis at the Twentieth meeting of the Coordination Committee of Project RLA/03/01 (RCC/20 March 2017) for approval.

2.21 Pursuant to Conclusion SAM/IG/17/01: Implementation of actions to maintain the security in REDDIG II, the RTO/5 meeting analysed general aspects related to REDDIG security, such as the updating of antivirus software in the servers, the classification and analysis of ‘threats’, and the respective recommendations.

2.22 Regarding the antivirus software in REDDIG II NMS servers, INEO performed the update in July 2016. Some stations have not yet installed the antivirus software in their servers. Consequently, the REDDIG Administration requested at the RTO/5 meeting that they coordinate such installation as soon as possible.

2.23 The RTO/5 meeting considered that ‘threats’ or risks should be classified into two groups, internal and external to REDDIG, as follows:

- *Internal level*
Potential risk factors to be taken into account and the respective recommendations to eliminate or minimise such factors.

Level 3 network

That the ICAO Office request Level 3 to confirm compliance with standard RFC 5920 concerning the security of its service, using MPLS technology. Regarding RFC 5920, Level 3 informed that more than defining technical aspects, it defined the best security practices. In this sense, Level 3 noted that all its procedures were based on best practices.

VPN access *via* Internet

Currently, INEO is using VPN access in a recurrent manner in Manaus, Ezeiza, and Brasilia to correct network issues or to update equipment configuration, and will continue using this access until final acceptance of the network. After that, all Internet connection cables will be withdrawn from all VPN routers in the network, and the operating modality will change to on-demand access (the Internet cable will be connected when needed). This modality will apply to all VPN routers of the network.

Human factors

The RTO/5 meeting recommended not to copy any file from/to the NMS server using a USB port without first verifying (antivirus scanning) that the portable device (‘pen drive’) is free of virus.

Regarding the password to access NMS servers after network reception, the REDDIG Administration will change the access passwords of all network servers. Thus, personnel responsible for station maintenance will only have access to the equipment of their own station.

- *External level*

This level refers mainly to users and their equipment connected to the REDDIG. In this regard, the RTO/5 highlighted the importance of standardising the connection to REDDIG, which will also permit standardisation of security policies in the router/border switch equipment of the States. By way of example, mention was made of the implementation at the SCEL station-Chile, explaining the general connection diagram for IP native services, as shown in **Appendix I**.

The RTO/5 also considered as a 'threat' to network operation and security the radiofrequency interference that could occur in REDDIG stations, causing degradation or even interruption of aeronautical communication services. In this sense, it was recommended to pay attention to any installation by public telecommunication operators in the surroundings of the REDDIG station, and to keep in close communication and coordination with local authorities in charge of managing the radio electric spectrum.

Migration of the REDDIG II node in Bogotá

2.24 The activities for the transfer of the REDDIG II node of Bogota have been postponed to another date, according to information provided by Colombia during the teleconference held on 30 September 2016 among representatives of LEVEL 3, Colombia, and the REDDIG Administration. Operations in the new Bogota ACC began on 2 February 2017. The technical personnel of Colombia has conducted activities to provide ATS speech and data communication services from REDDIG II and the interconnection to adjacent States in the SAM Region without changing the node position.

2.25 From 20 to 21 February 2017, INEO made a site survey in order to send a new proposal for the transfer of the current REDDIG II node of Bogota to the new premises of the ACC Bogota. Colombia considered that the relocation of the node should be carried out by INEO to not affect the REDDIG II warranty.

MEVA II REDDIG II service implementation

2.26 Regarding scheduled activities related to the MEVA III/REDDIG II interconnection, in late August 2016, an ATS speech circuit (hot line) was implemented and commissioned between the Maiquetía ACC and the San Juan ACC. Prior to that, three teleconferences were held on 2, 19, and 24 of August among representatives of Venezuela (REDDIG II focal points), the FAA, the MEVA III provider (Frequentis), and the REDDIG II Administration.

2.27 In the same order, coordination was made for the AMHS tests between Bogota and Panama MTAs through MEVA III/REDDIG II interconnection. **Appendix J** to this working paper presents a circuit configuration scheme. The MEVA III service provider configured nodes of Panama and Bogota for the testing period with no cost for the REDDIG (64Kbits/seg maximum circuit). For further tests, the MEVA III provider will present a quotation.

2.28 Brazil started coordination with the FAA for the migration of the Brasilia-Atlanta AFTN circuit to AMHS through the MEVA III/REDDIG II interconnection. The FAA is evaluating the proposed solution. In the same way Peru will begin coordination with the FAA to migrate the Lima-Atlanta AFTN circuit to an AMHS circuit through the MEVA III/REDDIG II interconnection.

Implementation of REDDIG II new services

2.29 From the RCC/19 new services were implemented and are currently in operation in the REDDIG II such as the AMHS circuits Brasilia-Lima, Santiago-Lima, Brasilia-Georgetown and Brasilia-Paramaribo. Likewise, P1 connectivity tests have been conducted between Brasilia-Ezeiza, Brasilia-Montevideo, Brasilia-Bogotá, Ezeiza-Lima, Ezeiza-Santiago and Ezeiza-Montevideo.

2.30 Tests for the transport of the SITA “datalink ground air” service for the Oceanic ACC of Santiago from REDDIG II node of Santiago to Recife REDDIG II node.

REDDIG logistic aspects

2.31 The logistical operations, mainly originated by failures in the node, include the remittance of equipment or spare parts from the REDDIG storage site, located in the ICAO SAM Regional Office in Lima, or from any other node, to the node requiring them, including coordination with the factories for the repair of the equipment, payment for any transportation and costs involved, as well as coordination and support to States for any import and export involved.

2.32 Since RCC/19, three (3) logistical operations were carried out. The summary of equipment failures and spare parts is shown in **Appendix K** to this working paper.

2.33 **Appendix L** shows the statistics pertaining to the amount of attentions provided to the network node, as well as their distribution as regards the type of equipment originating the attention since RCC/19 meeting.

2.34 **Appendix M** presents the network availability chart since 2004, up to the end of 2016.

3. **Suggested action**

3.1 The Coordination Committee is invited to:

- a) Take note of the information provided;
- b) Review the activities undertaken since RCC/19 described in Section 2, and Appendices A to M of this working paper; and
- c) Analyse any other aspect deemed necessary regarding this Agenda Item.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION****Proyecto Regional RLA/03/901 - Sistema de Gestión de la REDDIG y Administración del Segmento Satelital
Regional Project RLA/03/901 - REDDIG Management System and Administration of the Satellite Segment****Curso sobre la Interconexión de Recursos de la Red CISCO Parte 2 (ICND2)
Course on Interconnecting Cisco Network Devices Part 2 (ICND2)
Lima, Perú, 4 al 8 de abril de 2016 / Lima, Peru, 4 to 8 April 2016****LISTA DE PARTICIPANTES/LIST OF PARTICIPANTS****ARGENTINA**

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APÉNDICE B / APPENDIX B**INTERCONNECTING CISCO NETWORKING DEVICES,
PART 2 (ICND2 VERSION 2)****Course Description**

The Interconnecting Cisco Networking Devices, Part 2 (ICND2) v2.0 course provides entry-level network administrators, network support, and help desk technicians with the knowledge and skills needed to install, configure, operate, and troubleshoot a small enterprise network. ICND2 v2.0 is augmented by a virtual classroom presentation, which has additional slides and interactions for instructor use. In addition to the classic hardware-based lab, Cisco will offer a new set of Cisco Learning Lab Classroom Labs. ICND2 v2.0 focuses on understanding redundant topologies, troubleshooting common network issues, configuring EIGRP and multi-area OSPF in both IPv4 and IPv6, understanding Wide Area Network technologies, and becoming familiar with device management and Cisco licensing. The learner will encounter more troubleshooting and more lab time than with the previous version of ICND.

Course Content**Lesson 1: Intro**

- Course Intro
- Review LAB

Lesson 2: Implementing Scalable Medium-Sized Networks

- Troubleshooting VLAN Connectivity
- Building Redundant Switched Topologies
- Improving Redundant Switched Topologies with EtherChannel
- Understanding Layer 3 Redundancy

Lesson 3: Troubleshooting Basic Connectivity

- Troubleshooting IPv4 Network Connectivity
- Troubleshooting IPv6 Network Connectivity

Lesson 4: Implementing an EIGRP-Based Solution

- Implementing EIGRP
- Troubleshooting EIGRP
- Implementing EIGRP for IPv6

Lesson 5: Implementing a Scalable, Multiarea Network, OSPF Based Solution

- OSPF Overview
- Multiarea OSPF IPv4 Implementation
- Troubleshooting Multiarea OSPF
- Examining OSPFv3

Lesson 6: Wide-Area Networks

- Understanding WAN Technologies
- Configuring Serial Encapsulation
- Establishing a WAN Connection Using Frame Relay
- Introducing VPN Solutions
- Configuring GRE Tunnels

Lesson 7: Network Device Management

- Configuring Network Devices to Support Network Management Protocols
- Managing Cisco Devices
- Licensing

Lesson 8: ICND2 SUPERLAB

APÉNDICE C / APPENDIX C



ANAC
Administración Nacional
de Aviación Civil

Curso de operación y mantenimiento de la REDDIG II

Buenos Aires, Argentina, del 05 al 09 de setiembre de 2016

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APPENDIX E**REDDIG II Operation and management Course****Contents**

- 1. Architecture of the REDDIG II**
 - Satellite network
 - Support ground network
 - Global Plan for Addressing IP
- 2. REDDIG II Nodes**
 - Types and Components
 - Local IP Addressing Plan
- 3. RF Equipment**
 - IBUC + Redundancy
 - LNB + Redundancy
 - HHT and TCP/IP (Web) Access
- 4. Modem Skywan**
 - Model 7000
 - Model 1070
 - Redundancy
 - ‘Telnet’ and ‘Line-up Manager’ Access
 - Performance
- 5. Ethernet Switch Netgear**
- 6. Router Cisco**
 - Interfaces
 - VRRP redundancy protocol
 - OSPF routing protocol
 - VLANs
 - Commands on line
 - Interfaces monitoring
 - Settings
- 7. Baseband Commuter (RSS) and ‘Patch Panel’**
- 8. NMS – WhatsUp Gold**
 - NMS Central Server
 - NMS Remote Server (Local)
 - Web access
 - Modules and displays
 - Monitors
 - Active Monitor
 - Performance Monitor
 - Alarms

IND SATCOM

SKYWAN IDU 7000/1070 COURSE OVERVIEW



Premium Satellite Communications
Systems & Solutions

Version: August 2015

ND SATCOM

TABLE OF CONTENTS:

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ND SATCOM

1 COURSE OVERVIEW: SKYWAN 7000/1070 SATELLITE NETWORKS (VSAT)

ND SatCom offers training in various areas such as installations, operations, maintenance and management of our products and solutions. Convenient **classroom & hands-on training** is available all year-round at our training center in Friedrichshafen. We also offer trainings on request at our regional branches or at customer premises.

ND SatCom training is the most efficient way to get a full comprehension of ND SatCom products and solutions.



The following training course catalogue is based on the current SKYWAN generation with IDU 7000 series and IDU 1070 series. Detailed descriptions of well-proven predefined courses about SKYWAN are available for review.



Beside the SKYWAN predefined courses various customized training packages are possible. Such courses will be defined according to customer specific needs and requirements. The flexible content can be a selection of existing course modules enriched by additional customer topics. For the arrangement of a customized package please contact our training experts. The professional training courses covering all relevant topics for SKYWAN satellite networks.

August 2015

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Our hands-on training enables you to quickly install your VSAT stations, discover how to commissioning and operate your network and learn through ongoing monitoring and maintenance how network downtime can be minimized.

The following figure illustrates the standard course overview for SKYWAN satellite networks:

Tasks	Network Designer	Network Operator	Station Commissioner
Entry	Satellite communication fundamentals (VSAT) Course 8000 / 2 days		
			Installation basics (VSAT station) Entry level Course 8010 / 1 day
Basic / Specialist	Network design & engineering Basic level Course 8340 / 3 days	Network commissioning & operation Basic level Course 8240 / 5 days	Station commissioning Basic level Course 8140 / 1 day
Advanced / Expert	Network design & engineering Advanced level Course 8350 / 2 days	Network commissioning & operation Advanced level Course 8250 / 4 days	Station commissioning, installation & maintenance Advanced level Course 8150 / 2 days
Optional		Configuration of SKYWAN FAD Basic level Course 8243 / 2 days	
	Expert Certification Network Designer 1 day	Expert Certification Network Operator 1 day	Expert Certification Station Commissioner 1 day

The following course descriptions will provide the necessary detailed information about available course modules.

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1.1 Station Commissioning (8140)

Title	8140 - SKYWAN IDU 7000/1070 Station Commissioning
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Prepare & commission a SKYWAN station to become a member of a SKYWAN network and perform tests at station level, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN indoor unit, • Setup a SKYWAN IDU with a predefined parameter set, • Run station specific functional tests, • Control relevant parameters for proper station operation.
Contents	<p>Description of SKYWAN solution:</p> <ul style="list-style-type: none"> • SKYWAN features, hardware & interfaces, • Configuration file & software images, • Interfacing of outdoor unit (RFT, LNB, cabling), • SKYWAN station setup wizard. <p>Installation check of outdoor equipment (ODU):</p> <ul style="list-style-type: none"> • Visual checks, • Check of antenna pointing. <p>Installation steps & Line-up procedure:</p> <ul style="list-style-type: none"> • Loading a predefined configuration, • Change essential configuration parameters, • Required information for proper Line-up, • Procedures (perform tests, final adjustments, cross-pol & power settings). <p>Initial station operation:</p> <ul style="list-style-type: none"> • Basic monitoring (i.e. via LuM and LED indications), • Essential adjustments, • General pitfalls, • Troubleshooting procedure (Identify & localize general failures).
Target Group	Station commissioner (installation staff)
Duration	1 day
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Good knowledge in 'satellite communication fundamentals (VSAT)', • Good knowledge in 'installation basics (VSAT)' (e.g. like course 8010) • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN Line-up Manager software (LuM), antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

ND SATCOM

1.2 Advanced Station Commissioning, Installation & Maintenance (8150)

Title	8150 – SKYWAN IDU 7000/1070 Station Commissioning, Installation & Maintenance
Level	Advanced / Expert
Objectives	<p>The participant will be able to: Commission a SKYWAN station to become a member of a SKYWAN network and perform tests at station level, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN indoor unit, • Setup a SKYWAN IDU with a predefined parameter set, • Run station specific functional tests, • Control relevant parameters for proper station operation, • Perform basic maintenance tasks. <p>This course is the mandatory prerequisite for the participation in the additional certification course ‘Expert SKYWAN IDU 7000/1070 Station Commissioner’.</p>
Contents	<p>Work on various installation example cases:</p> <ul style="list-style-type: none"> • Focus on frequent pitfalls and most critical installation steps. <p>Station commissioning and operation:</p> <ul style="list-style-type: none"> • Run standard site acceptance test (SAT) procedure, • Run advanced trouble shooting procedures, • Interaction with the SKYWAN Network Operator. • Advanced monitoring. <p>Station maintenance:</p> <ul style="list-style-type: none"> • Perform basic / preventive maintenance tasks, • Failure localization, • Exchange of station components (IDU, IDU-boards, LNB, RFT).
Target Group	Station commissioner (installation staff)
Duration	2 days(if certification is required 1 additional day for certification)
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • ND SatCom course 8140, • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook, antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

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1.3 Network Commissioning & Operation (8240)

Title	8240 - SKYWAN IDU 7000/1070 Network Commissioning & Operation
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Plan and configure an entire SKYWAN network ready for network operation based on a predefined design, i.e.:</p> <ul style="list-style-type: none"> • Set initial network & station parameter configuration, • Configure network management relevant parameters, • Monitor & control relevant parameters for proper network operation, • Maintain the required grade of service within the network.
Contents	<p>Description of SKYWAN solution:</p> <ul style="list-style-type: none"> • SKYWAN IDU features, • SKYWAN NMS features. <p>SKYWAN NMS installation: Initial parameter configuration:</p> <ul style="list-style-type: none"> • Network Configurator (Configuration groups & profiles concept; network planning, profile activation & configuration upload), • Satellite link (Configuration of station; network & master/ backup-master), • Network management parameter (Access control for node- & network management). <p>Monitor & control relevant parameters:</p> <ul style="list-style-type: none"> • Monitoring TDMA parameters (LED indications; essential parameters; monitoring screens), • Reconfiguration cases (Fully meshed to star; new frequencies; add 2nd demodulator), • Basic Pitfalls & Troubleshooting. <p>Configure user traffic:</p> <ul style="list-style-type: none"> • IP-feature overview (OSPF, RoHC, load-balancing, IP multicast, TCP-A) and IP-router configuration, • FR-feature overview and basic port configuration. <p>SKYWAN NMS network tasks:</p> <ul style="list-style-type: none"> • Network adjustments, • MIB statistics, • Useful graphs, • Network trouble-shooting procedures.
Target Group	Network Operator
Duration	5 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Good knowledge in TCP/IP basics, • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations for a small network.
Methods	Lecture, hands-on with NMS tools, demonstrations, practical exercises.

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1.4 Advanced Network Commissioning & Operation (8250)

Title	8250 - SKYWAN IDU 7000/1070 Network Commissioning & Operation
Level	Advanced / Expert
Objectives	<p>The participant will be able to: Plan and configure an entire SKYWAN network ready for network operation based on a predefined design, i.e.:</p> <ul style="list-style-type: none"> • Set initial network & station parameter configuration, • Configure network management relevant parameters, • Monitor & control relevant parameters for proper network operation, • Maintain the required grade of service within the network, • Perform necessary FAT- and NAT-procedures. <p>This course is the mandatory prerequisite for the participation in the additional certification course 'Expert SKYWAN IDU 7000/1070 Network Operator'.</p>
Contents	<p>Parameter configuration for certain use cases:</p> <ul style="list-style-type: none"> • Network Configurator (Configuration groups & profiles concept; network planning, profile activation & configuration upload), • Satellite link (Configuration of station; network & master/ backup-master), • Network management parameter (Access control for node- & network management). <p>Acceptance tests:</p> <ul style="list-style-type: none"> • Run FAT procedure, • Run NAT procedure, • Troubleshooting approach. <p>Special configurations:</p> <ul style="list-style-type: none"> • Station & network redundancy, • Basic configuration of serial interfaces (i.e. for standard user FR-traffic). <p>Configure & optimize user IP-traffic:</p> <ul style="list-style-type: none"> • Quality-of-Service features for IP-traffic, • Advanced router configuration. <p>SKYWAN NMS advanced network tasks:</p> <ul style="list-style-type: none"> • Advanced network adjustments, • Additional useful graphs.
Target Group	Network Operator
Duration	4 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • ND SatCom course 8240, • Good knowledge in TCP/IP basics, • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations for a small network.
Methods	Lecture, hands-on with NMS tools, demonstrations, practical exercises.

August 2015

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1.5 Network Design & Engineering (8340)

Title	8340 - SKYWAN IDU 7000/1070 Network Design & Engineering
Level	Basic / Specialist
Objectives	The participant will have general knowledge about: <ul style="list-style-type: none"> • Designing & engineering SKYWAN satellite networks, • Usage of the SKYWAN IDU 7000/1070 TDMA calculation tool.
Contents	<p>Description of SKYWAN solution & features:</p> <p>General carrier design:</p> <ul style="list-style-type: none"> • Traffic calculation (Networking features overview; calculation tool & procedure), • Carrier design (Essential satellite link layer features: Master/ Slave concept, channel coding & modulation, topologies and populations, reference burst modes, data transport; TDMA parameter optimization tool & procedure). <p>Outdoor unit design (incl. satellite selection):</p> <ul style="list-style-type: none"> • Essential satellite link features, • Choice of satellite / transponder, • Outdoor unit design process, • SKYWAN link budget tool & procedure. <p>Detailed indoor unit design:</p> <ul style="list-style-type: none"> • Detailed SKYWAN IDU data, • IP features: IP router, static routing, dynamic routing (OSPF), differentiated services, robust header compression (ROHC), TCP-Acceleration, IP multicast, load balancing, • FR features: port types, basic FR service, traffic shaping, congestion management, communication services, FR multicast), <p>Design finalization & cost optimization:</p> <ul style="list-style-type: none"> • Optimization of network design, • Operational costs versus hardware costs.
Target Group	Network Designer
Duration	3 days
Prerequisites	The following prerequisites are mandatory for the participant: <ul style="list-style-type: none"> • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	PC or notebook with SKYWAN IDU 7000/1070 TDMA calculation tool and MS Excel and SKYWAN link budget tool.
Methods	Lecture, demonstrations & exercises, hands-on tool training.

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1.6 Advanced Network Design & Engineering (8350)

Title	8350 - SKYWAN IDU 7000/1070 Network Design & Engineering
Level	Advanced / Expert
Objectives	<p>The participant will have good knowledge about:</p> <ul style="list-style-type: none"> • Designing & engineering SKYWAN satellite networks, • Usage of the SKYWAN IDU 7000/1070 TDMA calculation tool. <p>This course is the mandatory prerequisite for the participation in the additional certification course 'Expert SKYWAN IDU 7000/1070 Network Designer'.</p>
Contents	<p>Work on various engineering example cases:</p> <p>Carrier & outdoor unit design:</p> <ul style="list-style-type: none"> • Focus on frequent pitfalls and most critical design steps. • Approaches for design optimization, • Usage of DDD template & result documentation, • Interfacing with 'Network Commissioning'. <p>Advanced traffic analysis and QoS-requirements.</p>
Target Group	Network Designer
Duration	3 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Participation in ND SatCom course 8340, • General good English language skills.
Environment	PC or notebook with SKYWAN IDU 7000/1070 TDMA calculation tool and MS Excel and SKYWAN link budget tool.
Methods	Lecture, advanced exercises, hands-on tool training.

ND SATCOM

2 OPTIONAL COURSE MODULES

For certain solutions e.g. with FAD voice multiplexers or flyaway antennas, dedicated / optional courses are available. Some examples you will find on the pages below:

2.1 Configuration of SKYWAN FAD (8243)

8243 – Configuration of SKYWAN FAD	
Title	8243 – Configuration of SKYWAN FAD
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Configure a SKYWAN FAD for basic operation within the SKYWAN network, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN FAD unit, • Setup a SKYWAN FAD with a predefined parameter set, • Run specific functional tests of the unit and within a SKYWAN network.
Contents	<p>Description of SKYWAN FAD solution:</p> <ul style="list-style-type: none"> • Overview about FAD Series 9220 / 9230, • SKYWAN FAD features, • Hardware (interfaces, boards, functionalities, DSP SIMM), • WAN connection & PVC/R protocol, • Supported data protocols & voice codecs, • Configuration file & software images, • Interfacing with SKYWAN IDU. <p>Operator access & command line interface.</p> <p>Configuration section & relevant parameters.</p> <p>Basic pitfalls, test procedures and troubleshooting.</p>
Target Group	Network Operator or Application Configurator FAD
Duration	2 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Participation in ND SatCom course 8240, • Good knowledge in TCP/IP basics, • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	SKYWAN IDU 7000 series hardware, SKYWAN FAD hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations (with FAD) for a small network.
Methods	Lecture, demonstrations, practical hand-on exercises.

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2.2 Installation basics (8010)

Title	8010 – Installation Basics (VSAT Station)
Level	Entry / Beginners
Objectives	The participant will be able to: <ul style="list-style-type: none"> • perform the proper installation of a VSAT station, • do the antenna pointing, • use the necessary equipment & tools.
Contents	The following topics are included: <ul style="list-style-type: none"> • Antenna assembling & mounting, • Grounding & lightning protection, • Cabling & soldering (optional), • Mounting of ODU equipment, • Antenna pointing.
Target Group	Especially for persons new with installation tasks, who want to participate in the product specific courses (i.e. ND SatCom course for “station commissioning”).
Duration	1 day
Prerequisites	The following prerequisites are mandatory for the participant: <ul style="list-style-type: none"> • Basic knowledge in ‘satellite communication fundamentals (VSAT)’, • General good English language skills.
Environment	Spectrum analyzer, antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

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2.3 Satellite communication fundamentals (8000)

Title	8000 Satellite Communication Fundamentals (VSAT)
Level	Entry / Beginners
Objectives	The participant will get good knowledge about satellite communication fundamentals and will get the prerequisite knowledge to continue with our product specific courses.
Contents	<p>The following topics are included:</p> <ul style="list-style-type: none"> • History & benefits of satellite communication, • The satellite & the satellite link, • Units & definitions, • Multiplexing methods, • From voice to bits – digitization basics, • From bits to waves – modulation basics, • Basic VSAT ground station overview, • Antenna basics, • Transmit & receive components (demonstration waveguide), • Safety at work, • Spectrum analyzer basics, • Optional: Hands-on antenna pointing exercise.
Target Group	Anyone interested in satellite communication or persons new in satellite communication technology.
Duration	2 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • General good English language skills.
Environment	Classroom
Methods	Lecture, discussion, demonstrations.

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3 COURSE CERTIFICATE

The ND SatCom courses will provide a solid knowledge about the selected topic for the participant. The following knowledge levels within the available course sequence are introduced:

- Entry level (Beginners)
- Basic level (Silver - Specialist)
- Advanced level (Gold - Expert)

Customer will be able to go for:

- Participation in entry / basic / advanced level courses (without test),
- Participation in additional dedicated Expert certification courses.

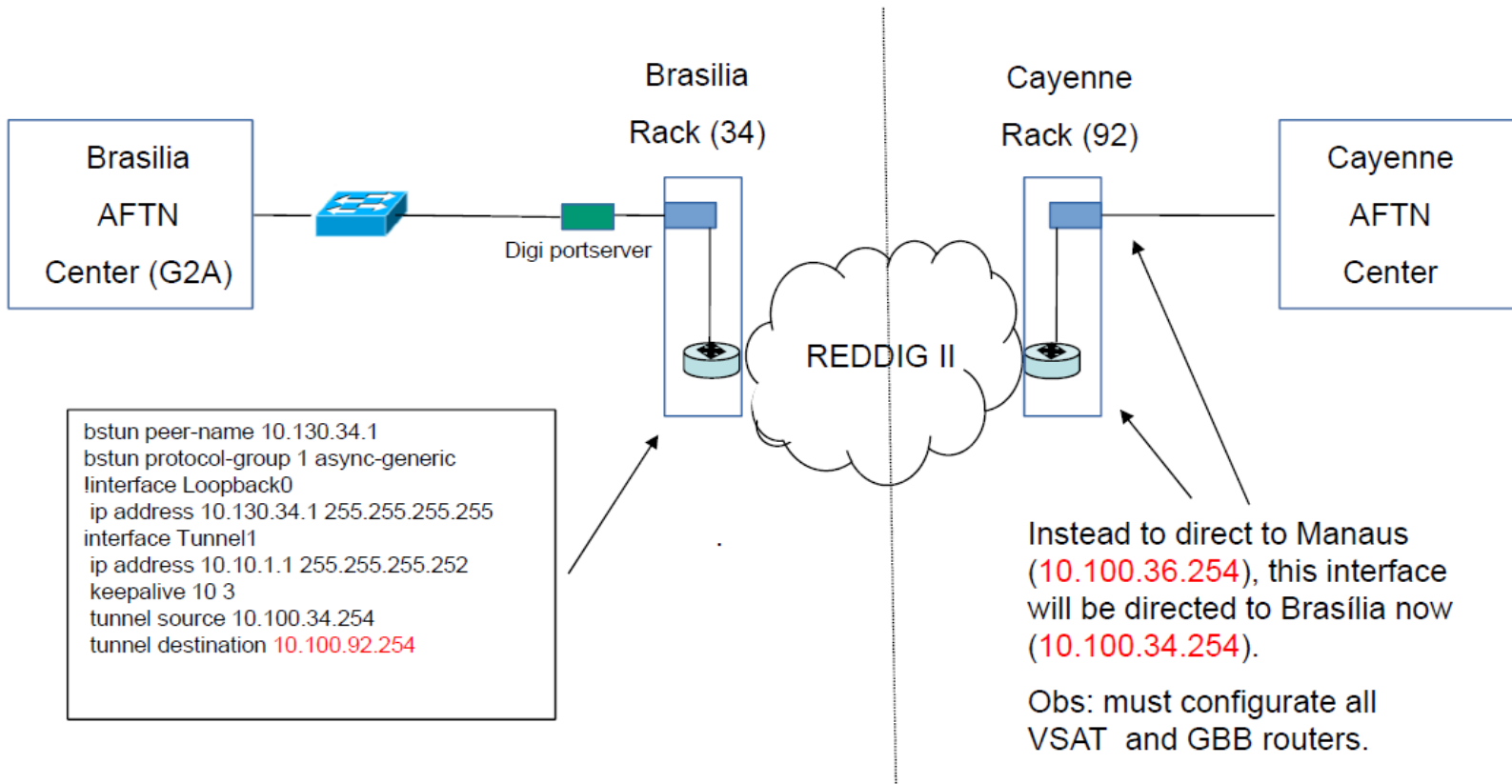
ND SatCom provides currently the following standardized certification courses:

- Expert SKYWAN 7000 Network Designer,
- Expert SKYWAN 7000 Network Operator,
- Expert SKYWAN 7000 Station Commissioner.

By passing our certification courses a common and exchangeable base of proven knowledge and skills will be guaranteed.

All Expert certificates are valid for **2 years**. Prolongation requires a dedicated and timely re-certification.

AFTN Circuit Brasilia/Cayenne



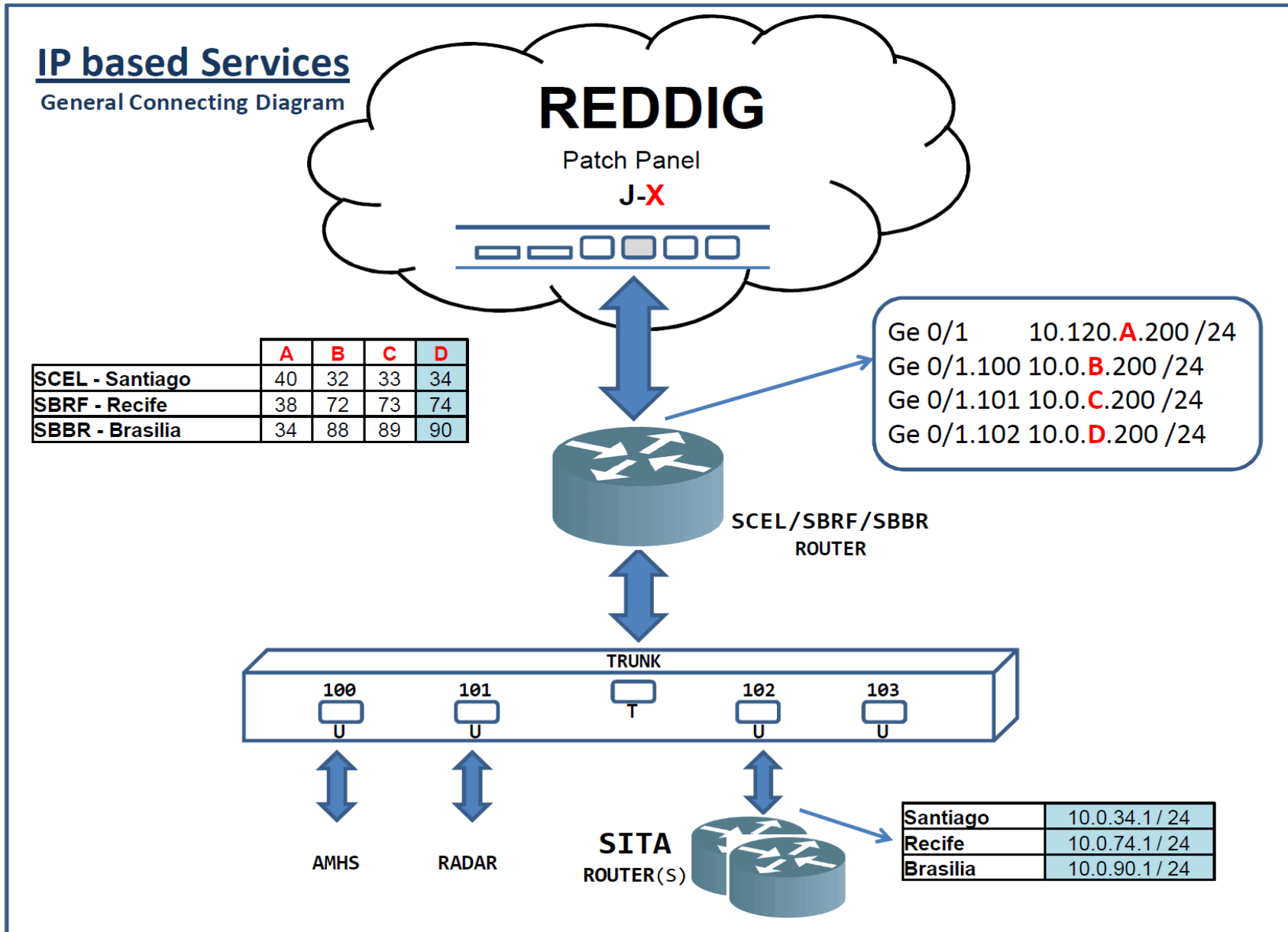
APÉNDICE H / APPENDIX H

Level3_Unavailability Credits_2016

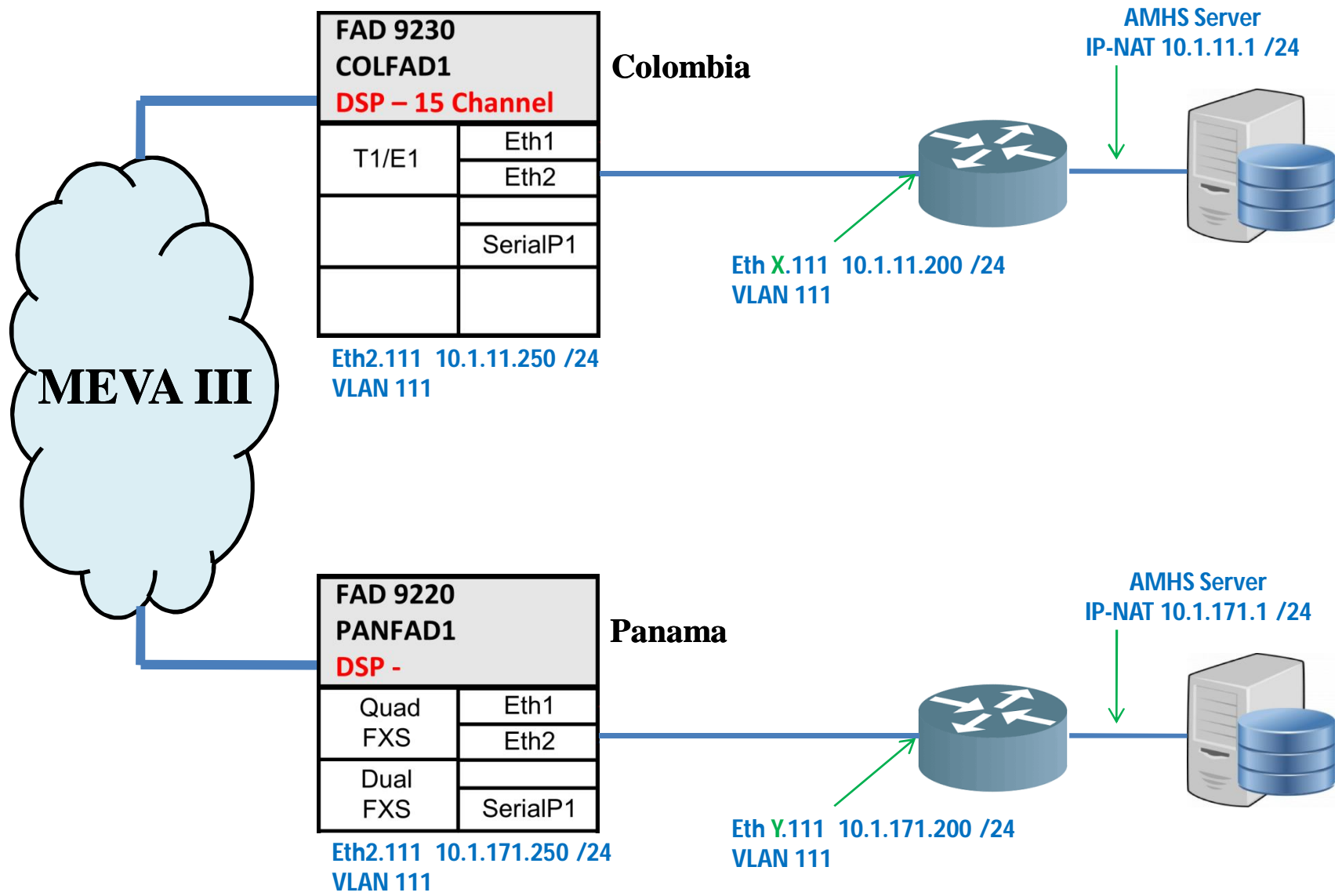
	January 2016		February 2016		March 2016		April 2016		May 2016		June 2016		July 2016		August 2016		September 2016		October 2016		November 2016		December 2016		TOTAL	
	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	Availability	USD Credit	USD Credit	
SAEZ																										-
SBBR																					98,99%	8,52				8,52
SBCT											99,20%	4,13	99,60%	0,87										99,01%	5,74	10,74
SBMN	96,48%	45,36	96,05%	51,83	94,55%	74,31	97,20%	34,52	90,97%	127,98	97,85%	24,78	98,82%	10,26	86,87%	189,45	92,01%	112,43	93,77%	85,93	96,84%	39,94	98,17%	19,89	816,67	
SBRF			99,59%	1,15					92,31%	77,62					96,58%	32,76					99,06%	6,68			118,21	
SCEL							99,44%	2,20																	2,20	
SEGU	93,57%	50,87																							50,87	
SGAS	97,78%	34,56	99,60%	1,75			97,00%	48,64			99,40%	5,45													90,40	
SKED																					95,69%	42,13			42,13	
SLLP																	97,98%	46,39					98,52%	31,78	78,17	
SMPM							99,41%	16,76																	16,76	
SOCA	16,68%	1.620,00					99,62%	4,59																	1.624,59	
SPIM							99,48%	1,85																	1,85	
SUMU			98,75%	17,08			95,41%	77,31							99,20%	9,00			93,22%	116,73					220,12	
SVMI							97,13%	56,33			89,77%	217,55	92,82%	150,69										99,53%	3,74	428,32
SYGC							99,52%	7,05																	7,05	
TTZP			99,39%	1,91			99,46%	0,79							99,37%	2,34	94,97%	81,47			97,84%	29,92			116,42	

Note: SLA-Availability for all nodes: 99.70%
Except for SBMN and TTZP : 99.50%

TOTAL USD 3.633,02



AMHS Interconnection: Colombia-Panama



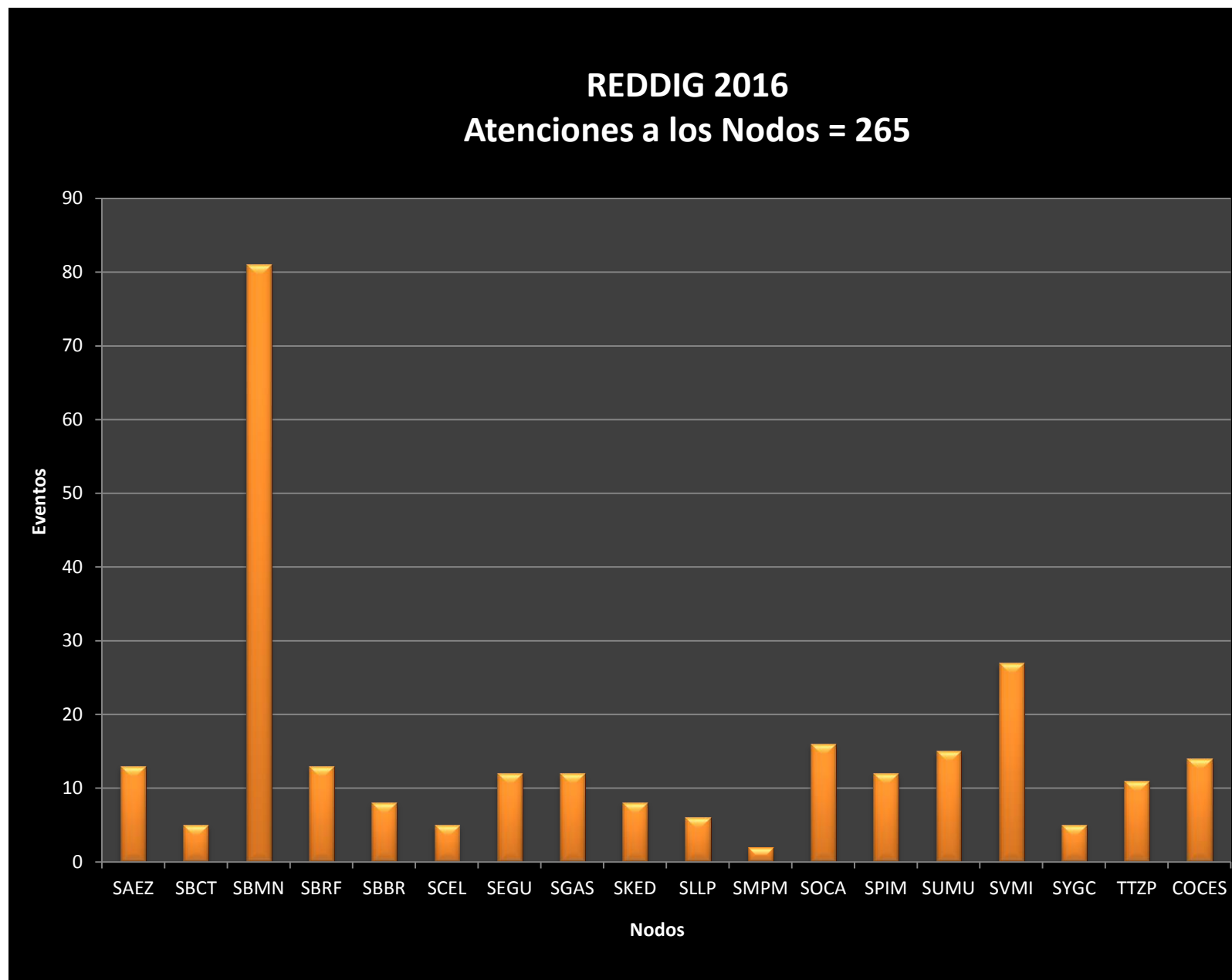
APÉNDICE K / APPENDIX K

RESUMEN DE AVERÍAS Y PARTES – 2016
LIST OF TROUBLESHOOTING AND SPARE PARTS - 2016

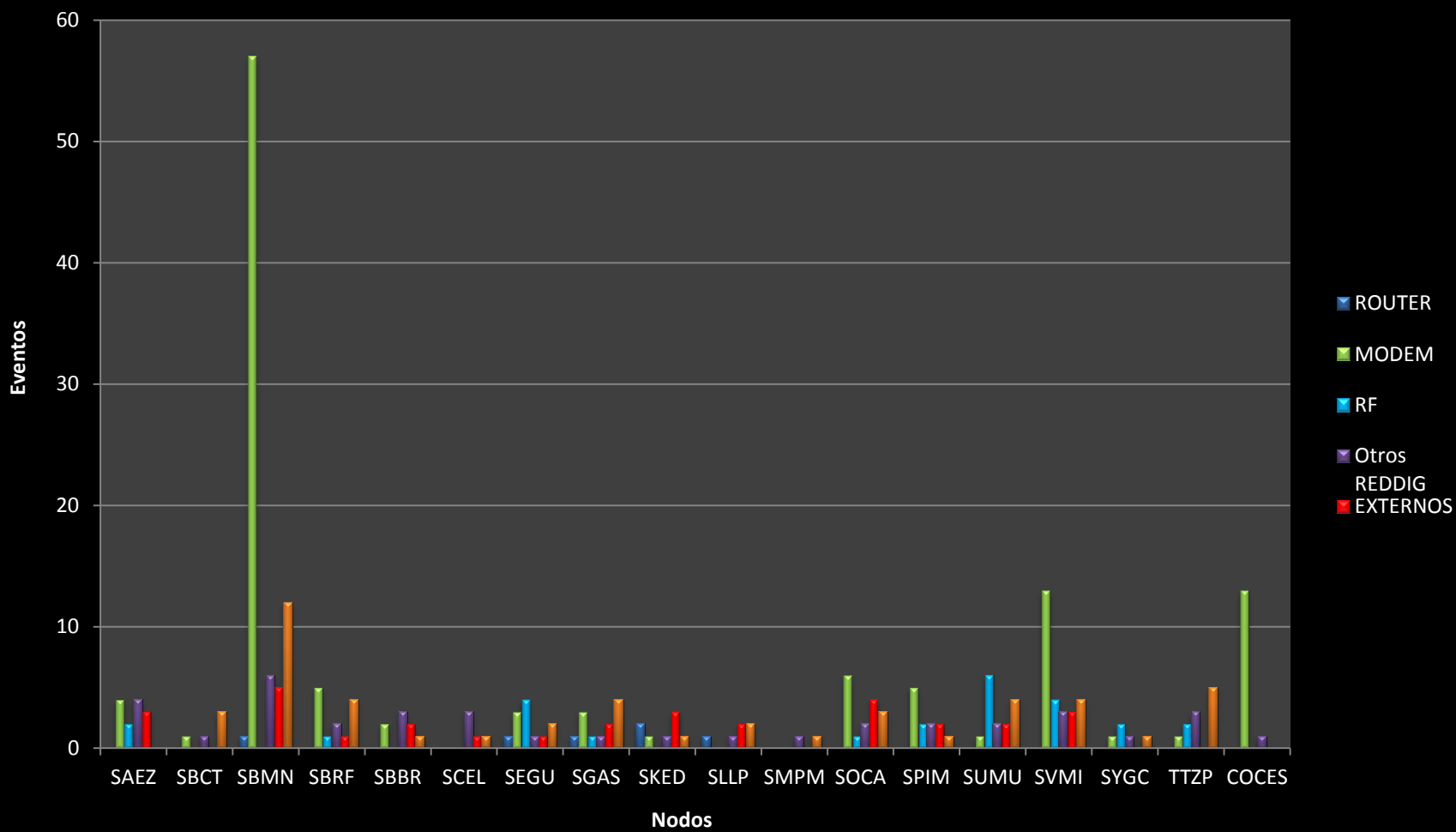
RF	Qty	Fábrica/manufacturer:	TERRASAT Communications, Inc.
	(1)	IBUC 80W	: (1) SVM1

Nota: El equipo fue reemplazado bajo garantía.
Note: Equipment replaced under warranty

APÉNDICE L / APPENDIX L

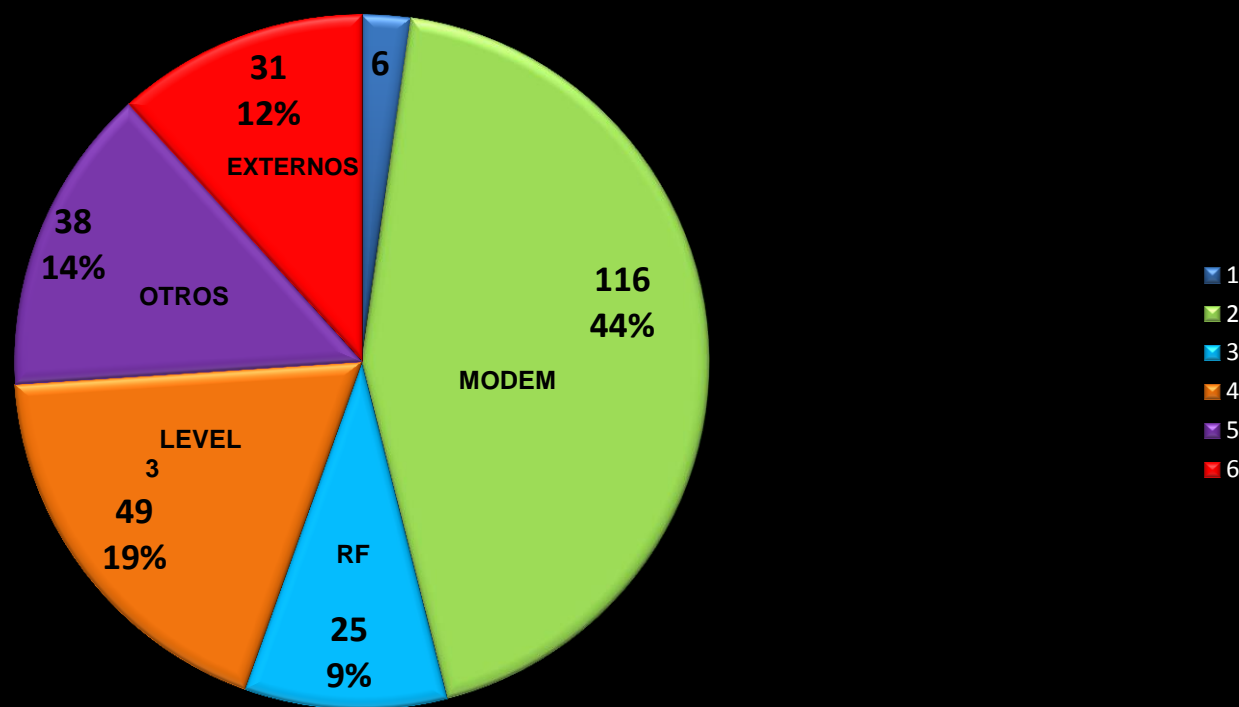


REDDIG 2016 Distribución de atenciones



REDDIG 2016

Distribución de atención por categoría de equipo



APÉNDICE M / APPENDIX M

REDDIG Network Availability

