



**Cuestión 4 del
Orden del Día:**

Evaluación de los requisitos operacionales para determinar la implantación de mejoras de las capacidades de comunicaciones, navegación y vigilancia (CNS) para operaciones en ruta y área terminal

Desempeño REDDIG II

(Presentada por la Secretaría)

RESUMEN	
<p>Esta nota de estudio presenta el desempeño de la nueva red digital regional REDDIG II desde la fecha de su puesta en operación a finales de enero de 2015 hasta la fecha. También se describe el desempeño de la nueva interconexión MEVAIII/REDDIG II desde su implantación en abril 2015 hasta la fecha, los avances en las actividades para la implantación del nuevo nodo de Brasilia en la REDDIG II y las actividades de entrenamiento previstas.</p>	
<p>Referencias:</p> <ul style="list-style-type: none">• Décimo Quinto Taller/Reunión del Grupo de Implantación SAM (SAM/IG/15) - Proyecto Regional RLA/06/901 (Lima, Perú, 11-15 de mayo de 2015).• Cuarta Reunión Técnica Operacional sobre la REDDIG II (Manaos, Brasil, 20-21 de abril de 2015).• Primera reunión de coordinación MEVAIII REDDIG II Oranjestad, Aruba, del 25-26 de mayo de 2015.	
<p>Objetivos estratégicos de la OACI:</p>	<p><i>A – Seguridad operacional</i> <i>B – Capacidad y eficiencia de la navegación aérea</i></p>

1. Introducción

1.1 La nueva red digital regional REDDIG II entró en operación a finales del mes de enero de 2015. La REDDIG II es una red digital basada en su totalidad en protocolo internet (IP), compuesta por dos sub redes una de tipo satelital integrada por estaciones VSAT y la otra subred es terrestre sobre enlaces de fibras óptica que actúa como respaldo a la sub red satelital.

1.2 La subred satelital de la REDDIG II está conformada por routers CISCO de la serie 2901 y 2911 y de los MODEMs satelitales Skywan 7000 para las estaciones master de Manaus y Ezeiza y el Skywan 1070 para el resto de las estaciones Se continúa utilizando el satélite INTELSAT IS 14 con el mismo ancho de banda de 4.4 Mhz y el acceso al satélite continua siendo de tipo TDMA.

1.3 La subred terrestre, está basada en enlace de fibras óptica utilizando protocolo MPLS basado en IP. El principal equipo de esta red es el router 1921, cada nodo tiene un ancho de banda de

acceso de 256 kbits. La sub red terrestre no es administrada por la Administración REDDIG sino por la empresa LEVEL 3, que es una empresa internacional de servicios de telecomunicaciones por fibra óptica con presencia en 70 países y 600 ciudades alrededor del mundo.

1.4 Las pruebas de aceptación provisional (PSAT) de la REDDIG II se efectuaron del 13 de enero al 3 de febrero de 2015, las mismas fueron aceptadas y firmadas por todos los puntos focales de la REDDIG II con observaciones. De las observaciones resalta el no funcionamiento de algunos circuitos AFTN, AMHS, circuitos orales ATS conmutados, circuitos administrativos, el sistema de gestión de la red y la red de voz IP para el servicio ATFM.

1.5 INEO de acuerdo al contrato establecido entre la OACI y el consorcio INEO & LEVEL 3 tiene un tiempo de 40 días para resolver todas las actividades pendientes detectadas en la PSAT. Para la aceptación final de la REDDIG II faltarían las pruebas de aceptación final FNAT la cual al igual que las pruebas PSAT, será verificada y firmada por los puntos focales de la REDDIG II así como por la gerencia del proyecto (OACI) (Administración REDDIG).

1.6 Los trabajos de interconexión entre la nueva red MEVA III y REDDIG se completaron en el mes de abril de 2015. Para esto se elaboró un nuevo contrato de interconexión MEVA III REDDIG II entre la OACI en nombre de todos los Estados miembros de la REDDIG II, y el proveedor de los servicios de la MEVA III, la empresa COMSOFT.

2 Análisis

Desempeño de la REDDIG II

2.1 La REDDIG II presentó problemas iniciales de funcionamiento en algunos servicios como el AFTN, AMHS, algunos circuitos orales ATS y administrativos, la red de telefonía IP para el servicio ATFM, el servicio de gestión (NMS) y el congelamiento en algunos de los modem satelitales.

2.2 Con el tiempo la mayoría de las fallas se fueron solucionando, alcanzando a la fecha un rendimiento estable con alta disponibilidad. La red presenta todavía algunos problemas que se espera se solucionen a la brevedad como la implantación de algunas funciones en el sistema de gestión de la red, la capacidad del servicio de telefonía IP para el servicio ATFM y el congelamiento intermitente de algunos de los MODEMs satelitales.

2.3 La aceptación final de la REDDIG II se hará una vez que el consorcio INEO & LEVEL 3 complete los aspectos pendientes. Todos los equipos que conforman la REDDIG II tienen una garantía de dos años a partir de la fecha de aceptación final de la red.

Implantación de un nuevo nodo en la REDDIG II

2.4 El nuevo nodo de Brasilia estará compuesto como todos los nodos de la REDDIG II por cuatro partes con dos canales redundantes para garantizar una alta disponibilidad en la red. La primera parte son los equipos *outdoor* compuestos por una antena nueva de 3.8m de diámetros, los elementos del receptor LNB y el SSPA para la transmisión (amplificador de 40Watts). La segunda parte que representa la más importante del nodo está conformada por los routers CISCO 2901 como interfaz a los servicios y los módems satelitales (SKYWAN 1070) para transmitir y recibir la información satelital. Las otras dos partes consisten en el sistema de monitoreo y el router VPN para conexión externa.

2.5 Los equipos para el acceso a la red terrestre de fibra óptica de LEVEL 3 consiste en dos routers 2901 que actúan en caso de falla en la red satelital. El ancho de banda de acceso a la red terrestre como en los otros nodos de la REDDIG es de 256Kbits/seg.

2.6 Los servicios en el nodo de Brasilia serán los siguientes un circuito AFTN con Guyana, 11 circuitos AMHS (todos los Estados adyacentes a Brasil y el circuito con Atlanta a través de la interconexión MEVA III REDDIG II). Con respecto a los circuitos orales se tienen tres circuitos administrativos conmutados y cuatro circuitos orales ATS conmutados. El **Apéndice A** de esta nota de estudio presenta el detalle de la configuración de los servicios en el nodo de Brasilia.

2.7 Los trabajos de instalación del nuevo nodo de la REDDIG en Brasilia iniciaran en el mes de diciembre de 2015 y su operación estaría para enero del 2016. El **Apéndice B** de esta nota de estudio presenta el cronograma de implantación del nodo de Brasilia.

Cursos de capacitación REDDIG II

2.8 Como parte del plan de entrenamiento para el personal a cargo del mantenimiento de la REDDIG II para el año 2015 aprobado por la Décimo Octava Reunión de Coordinación de la REDDIG (RCC/18) realizada en Lima, Perú del 2 al 4 de marzo de 2015 se llevará a cabo en Lima, Perú, del 9 al 13 de noviembre de 2015 un curso básico sobre Switches y Routers IP CISCO.

2.9 El propósito de este curso es proveer capacitación necesaria al personal técnico a cargo del mantenimiento de la REDDIG II que no posea una base sólida sobre redes IP y equipos asociados (routers y switches CISCO). El curso tiene como objetivo proveer habilidades y conocimientos necesarios para instalar, operar y solucionar problemas de conectividad en la REDDIG II, incluyendo la configuración de switches, routers y la implantación de la seguridad respectiva.

2.10 El curso básico completo consta de dos partes independientes y en vista del costo y duración de los mismos, se ha considerado realizarlo en dos partes: El primero llamado “*Interconnecting Cisco Network Devices Part 1 (ICND1)*” a dictarse el año en curso del 9 al 13 de noviembre de 2015 y el segundo “*Interconnecting Cisco Network Devices Part 2 (ICND2)*” programado tentativamente del 4 al 8 de abril de 2016. La descripción del contenido del curso (ICND1 e ICDN2) se presenta (solo en inglés) como **Apéndice C**.

2.11 El costo del curso (ICND1) para un máximo de 16 personas es de aproximadamente USD 8,000.00 (OCHO MIL DÓLARES AMERICANOS) y será cubierto por el Proyecto RLA/03/901. En este sentido, se tiene previsto una Beca por cada nodo instalado de la REDDIG II.

Interconexión MEVA III REDDIG II

2.12 Con el fin de coordinar las actividades finales requeridas para la implantación de los aspectos pendientes en la interconexión de las nuevas redes MEVA III – y REDDIG II, la implantación de nuevos servicios en la interconexión la revisión del Memorando de Entendimiento, que establece las coordinaciones técnicas, operacionales y administrativas entre la red MEVA III y REDDIG II se realizó la primera reunión de coordinación MEVA III REDDIG II en Oranjestad, Aruba, del 25 al 26 de mayo de 2015.

2.13 La Reunión de coordinación contó con la presencia de 29 delegados de 9 Estados/Territorios de las Regiones CAR y SAM, un organismo internacional COCESNA, el proveedor de servicio de la MEVA III y el Administrador de la REDDIG II. De los aspectos más importantes obtenidos de la Reunión se resalta:

- la formulación de acciones para completar la implantación de circuitos de voz conmutados y datos (AFTN) previstos en la interconexión MEVA III REDDIG II.
- Acciones para completar la implantación de las líneas calientes en Bogotá y Caracas y los circuitos AFTN con Atlanta desde Bogotá y Caracas.
- El análisis para implantar nuevos circuitos en la interconexión MEVA III REDDIG II a corto plazo en el periodo 2015 a 2017. Los circuitos considerados fueron los siguientes:

No.	Circuitos requeridos	Fecha de implementación estimada
1	Intercambio datos radar entre Curacao y Venezuela	Antes de 2017
2	Intercambio de datos radar entre Colombia y Panamá	A mediados de 2016
3	Implementación de circuitos SAM AMHS con Atlanta <ul style="list-style-type: none"> • Caracas - Atlanta • Brasilia - Atlanta • Lima - Atlanta 	2016-2017
4	Bogotá Panamá AMHS circuit	2016
4	Implantación circuito AMHS Atlanta- PIARCO- a través del nodo REDDIG II de COCESNA	2016
5	Circuito AFTN PIARCO-Curacao	Después del 15 de junio de 2015

2.14 Al respecto la Reunión formuló la conclusión MIII/RII 1/2 *Confirmación de requerimientos de nuevos circuitos en la interconexión* en la cual se solicita a los Estados involucrados que confirmen la implantación de los circuitos indicados en la tabla indicada en el párrafo 2.3 para así de esta forma iniciar las coordinaciones necesarias para su implantación.


2.15 Finalmente esta Reunión revisó y aprobó el Memorándum de Entendimiento entre los Estados/Territorios/Organización Internacional miembros de las redes MEVAIII y REDDIG II para los procesos de coordinaciones y cooperación de la interconexión MEVA III – REDDIG II a través de la conclusión M III/ RII 1/3. Como **Apéndice D** de esta nota de estudio se presente el MoU enmendado.

3 Acción sugerida

3.1 Se invita a la Reunión a:

- tomar nota de la información presentada;
- dar seguimiento a las actividades correspondientes a la REDDIG II así como la interconexión MEVA III REDDIG II; y
- analizar otras consideraciones al respecto que la reunión considere necesario.

APÉNDICE A

COFELY INEO				Brasilia Services							
TELEPHONY											
Service	PLAR number (autodial)	Destination routing number	Translation rule	Local routing number (station id-number)	#of difgits forwarded	Usual dial number	Router name	Slot/port	Type	Cable number	Plug
							SBBR-CISCO-VSAT-1	0/1/0	FXO		
							SBBR-CISCO-VSAT-1	0/1/1	FXO		
							SBBR-CISCO-VSAT-1	0/1/2	FXO		
							SBBR-CISCO-VSAT-1	0/1/3	FXO		
Mant/Adm						3401	SBBR-CISCO-VSAT-1	0/2/0	FXS		
						Libre	SBBR-CISCO-VSAT-2	0/2/1	FXS		
Mant/Adm						34XXXX	SBBR-CISCO-VSAT-2	0/0/0	E&M type V		
Mant/Adm						34XXXX	SBBR-CISCO-VSAT-2	0/0/1	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-VSAT-2	0/1/0	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-VSAT-2	0/1/1	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-VSAT-2	0/2/0	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-VSAT-2	0/2/1	E&M type V		
Service	PLAR number (autodial)	Destination routing number	Translation rule	Local routing number (station id-number)	#of difgits forwarded	Usual dial number	Router name	Slot/port	Type	Cable number	Plug
ATS/Swtc						34XX	SBBR-CISCO-GBB-1	0/1/0	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-GBB-1	0/1/1	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-GBB-1	0/2/0	E&M type V		
ATS/Swtc						34XX	SBBR-CISCO-GBB-1	0/2/1	E&M type V		
Mant/Adm						3401	SBBR-CISCO-GBB-2	0/0/0	FXS		
							SBBR-CISCO-GBB-2	0/0/1	FXS		
							SBBR-CISCO-GBB-2	0/1/0	FXO		
							SBBR-CISCO-GBB-2	0/1/1	FXO		

IP address Proposal

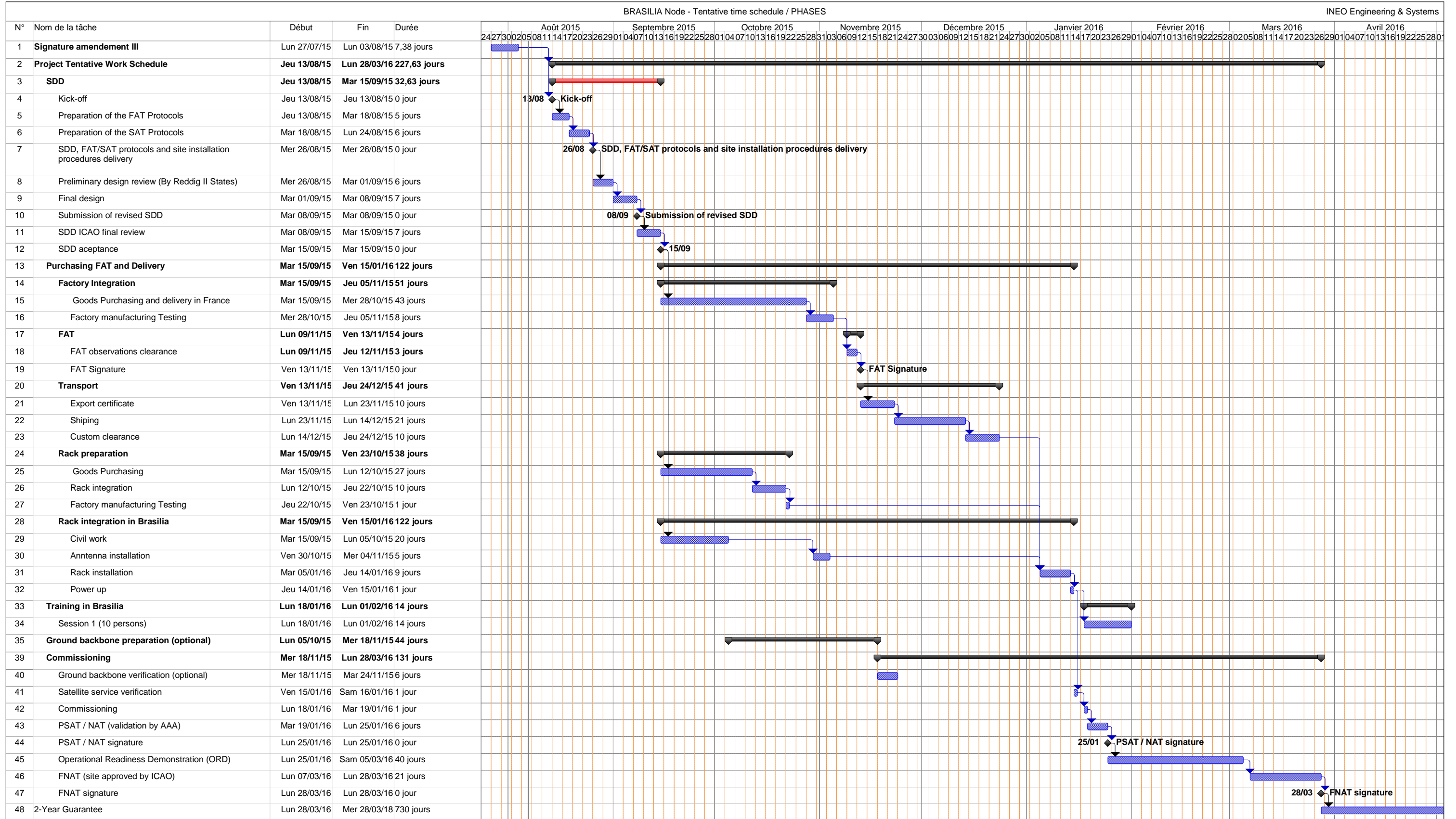
Brasilia Number: 34 (to confirm)

Device	Device number	Device Name	NMS device name	LAN IP address	mask	gateway	VRRP
NMS server	10	SBBR-REDDIG-II	NMS server - local	10.100.34.10	255.255.255.0	10.100.34.254	
NMS printer	20	SBBR-IMP-REDDIG-II	impresora	10.100.34.20	255.255.255.0	10.100.34.254	
Skywan	31	SBBR-SKW-A	Skywan-A	10.100.34.31	255.255.255.0	10.100.34.254	
	32	SBBR-SKW-B	Skywan-B	10.100.34.32	255.255.255.0	10.100.34.254	
IBUC	41	SBBR-IBUC-A	IBUC-A	10.100.34.41	255.255.255.0	10.100.34.254	
	42	SBBR-IBUC-B	IBUC-B	10.100.34.42	255.255.255.0	10.100.34.254	
RX 1+1	43	SBBR-RX-1+1	RX 1+1	10.100.34.43	255.255.255.0	10.100.34.254	
Netgear switch	51	SBBR-SWI-A	Switch-A	10.100.34.51	255.255.255.0	10.100.34.254	
	52	SBBR-SWI-B	Switch-B	10.100.34.52	255.255.255.0	10.100.34.254	
netgear pro safe	60	SBBR-VPN	VPN	10.100.34.60	255.255.255.0	10.100.34.254	
RSS	71	SBBR-RSS-1	RSS-1	10.100.34.71	255.255.255.0	10.100.34.254	
	72	SBBR-RSS-2	RSS-2	10.100.34.72	255.255.255.0	10.100.34.254	
GPS	80	SBBR-GPS	GPS	10.100.34.80	255.255.255.0	10.100.34.254	
MPLS access device	90		GBB-ACCESS	10.100.34.90	255.255.255.0	10.100.34.254	
Cisco VSAT	101	SBBR-CISCO-VSAT-1-A	CISCO-VSAT-1-A	10.100.34.101	255.255.255.0	10.100.34.254	10.100.34.254
	102	SBBR-CISCO-VSAT-1-B	CISCO-VSAT-1-B	10.100.34.102	255.255.255.0	10.100.34.254	10.100.34.254
	103	SBBR-CISCO-VSAT-2-A	CISCO-VSAT-2-A	10.100.34.103	255.255.255.0	10.100.34.254	10.100.34.253
	104	SBBR-CISCO-VSAT-2-B	CISCO-VSAT-2-B	10.100.34.104	255.255.255.0	10.100.34.254	10.100.34.253
cisco GBB	121	SBBR-CISCO-GBB-1	CISCO-GBB-1	10.100.34.121	255.255.255.0	10.100.34.254	
	122	SBBR-CISCO-GBB-2	CISCO-GBB-2	10.100.34.122	255.255.255.0	10.100.34.254	
IP to serial	130	SBBR-Serial	Serial	10.100.34.130	255.255.255.0	10.100.34.254	

Service	IP Address	VLAN
AMHS	10.0.88.0 /24	100
RADAR	10.0.89.0 /24	101
AIDC	10.0.90.0 /24	102

Data

SERIAL - AFTN DESTINATION	Router	Port	BSTUN num	Primary /secondary	Cable number	Plug
SOCA	SBBR-CISCO-VSAT-1	0/0/0				
	SBBR-CISCO-VSAT-1	0/0/1				
	SBBR-CISCO-VSAT-1	0/0/2				
	SBBR-CISCO-VSAT-1	0/0/3				
	SBBR-CISCO-VSAT-GBB-1	0/0/0				
	SBBR-CISCO-VSAT-GBB-1	0/0/1				



Interconnecting Cisco Network Devices Part 1 (ICND1)

Quién debería asistir

Target candidates:

Individuals seeking the Cisco CCENT certification, or Cisco CCNA Routing and Switching certification. The course is also appropriate for support technicians involved in the basic installation, operation, and verification of LAN networks.

Key job tasks:

Configure: Implement the identified solution by applying the planned implementation processes using Cisco IOS commands and applications in the correct order to the selected devices and portions of the network.

Verify: Use the appropriate show commands and applications to ensure that the solution was correctly implemented and is performing as desired.

Job roles: Entry-level network engineer, network administrator, network support technician, and help desk technician

Prerrequisitos

The knowledge and skills that a learner must have before attending this course are as follows:

- Basic computer literacy
- Basic PC operating system navigation skills
- Basic Internet usage skills
- Basic IP address knowledge

Objetivos del curso

Upon completing this course, you will be able to meet these objectives:

- Describe network fundamentals and build simple LANs
- Establish Internet connectivity
- Manage network device security
- Expand small- to medium-sized networks with WAN connectivity
- Describe IPv6 basics

Contenido del curso

Interconnecting Cisco Networking Devices, Part 1 (ICND1) v2.0 is a five-day, instructor-led training course that teaches learners how to install, operate, configure, and verify a basic IPv4 and IPv6 network, including configuring a LAN switch, configuring an IP router, connecting to a WAN, and identifying basic security threats. Optionally, this course can be followed by the [Interconnecting Cisco Network Devices Part 2 \(ICND2\)](#) course, which covers topics in more depth and teaches learners how to perform basic troubleshooting steps in enterprise branch office networks, preparing learners for Cisco CCNA certification.

Esquema Detallado del Curso

Day 1: Course Introduction, Building a Simple Network

- Course Introduction
- Module 1: Building a Simple Network
- Lesson 1-1: Exploring the Functions of Networking
- Lesson 1-2: Understanding the Host-to-Host Communications Model
- Lesson 1-3: Introducing LANs
- Lesson 1-4: Operating Cisco IOS Software
- Lesson 1-5: Starting a Switch
- Lab 1-1: Performing Switch Startup
- Lesson 1-6: Understanding Ethernet and Switch Operation
- Lesson 1-7: Troubleshooting common Switch Media Issues
- Lab 1-2: Troubleshooting Switch Media Issues

Day 2: Establishing Internet Connectivity

- Review of Day 1
 - Module 2: Establishing Internet Connectivity
 - Lesson 2-1: Understanding the TCP/IP Internet Layer
 - Lesson 2-2: IP Addressing and Subnets
 - Lesson 2-3: Understanding the TCP/IP Transport Layer
 - Lesson 2-4: Exploring the Functions of Routing
 - Lesson 2-5: Configuring a Cisco Router
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Interconnecting Cisco Network Devices Part 1 (ICND1)

- Lab 2-1: Performing Initial Router Setup and Configuration
- Lesson 2-6: Exploring the Packet-Delivery Process
- Lesson 2-7: Enabling Static Routing
- Lesson 2-8: Managing Traffic Using ACLs
- Lesson 2-9: Enabling Internet Connectivity

Day 3: Managing Network Device Security

- Review of Day 2
- Lab 2-2: Connecting to the Internet
- Module 3: Managing Network Device Security
- Lesson 3-1: Securing Administrative Access
- Lab 3-1: Enhancing the Security of the Initial Configuration
- Lesson 3-2: Implementing Device Hardening
- Lab 3-2: Device Hardening
- Lesson 3-3: Implementing Traffic Filtering with ACLs

Day 4: Building a Medium-Sized Network

- Review of Day 3
- Lab 3-3: Filtering Traffic with ACLs
- Module 4: Building a Medium-Sized Network
- Lesson 4-1: Implementing VLANs and Trunks
- Lesson 4-2: Routing Between VLANs
- Lab 4-1: Configuring Expanded Switched Networks
- Lesson 4-3: Using a Cisco Network Device as a DHCP Server
- Lab 4-2: Configuring a DHCP Server
- Lesson 4-4: Introducing WAN Technologies
- Lesson 4-5: Introducing Dynamic Routing Protocols
- Lesson 4-6: Implementing OSPF
- Lab 4-3: Implementing OSPF

Day 5: Introducing IPv6

- Review of Day 4
 - Module 5: Introducing IPv6
 - Lesson 5-1: Introducing basic IPv6
 - Lab 5-1: Configure and Verify Basic IPv6
 - Lesson 5-2: Understanding IPv6
 - Lab 5-2: Configure and Verify Stateless Autoconfiguration
 - Lesson 5-3: Configuring IPv6 Routing
 - Lab 5-3: Configure and Verify IPv6 Routing
 - Lab: ICND1 Superlab
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Interconnecting Cisco Network Devices Part 2 (ICND2)

Quién debería asistir

ICND2 is designed for those who have a firm background in data networking, have some hands-on experience with Cisco routers and switches, and are looking to increase their knowledge of installation, maintaining, and troubleshooting medium-sized switched and routed networks or for those who are looking to achieve the first level of Cisco certification, the CCNA.

We strongly recommend that other students start with ICND1.

Prerrequisitos

Before taking [Interconnecting Cisco Network Devices Part 2 \(ICND2\)](#), students should take:

- [Interconnecting Cisco Network Devices Part 1 \(ICND1\)](#)

Objetivos del curso

Upon completing this course, you will be able to meet these objectives:

- Operate a medium-sized LAN with multiple switches, supporting VLANs, trunking, and spanning tree
- Troubleshoot IP connectivity
- Configure and troubleshoot EIGRP in an IPv4 environment, and configure EIGRP for IPv6
- Configure and troubleshoot OSPF in an IPv4 environment, and configure OSPF for IPv6
- Define characteristics, functions, and components of a WAN
- Describe SNMP, syslog, and NetFlow, and manage Cisco device configurations, Cisco IOS images, and licenses

Esquema Detallado del Curso

Module 1: Implementing Scalable Medium-Sized Networks

- Lesson 1: Troubleshooting VLAN Connectivity
- Lab 1-1: Troubleshooting VLANs and Trunks

- Lesson 2: Building Redundant Switched Topologies
- Lab 1-2: Optimizing STP
- Lesson 3: Improving Redundant Switched Topologies with EtherChannel
- Lab 1-3: Configuring EtherChannel
- Lesson 4: Understanding Layer 3 Redundancy
- Module 2: Troubleshooting Basic Connectivity
- Lesson 1: Troubleshooting IPv4 Network Connectivity
- Lab 2-1: Troubleshooting IP Connectivity
- Lesson 2: Troubleshooting IPv6 Network Connectivity

Module 3: Implementing an EIGRP-Based Solution

- Lesson 1: Implementing EIGRP
- Lab 3-1: Implementing EIGRP
- Lesson 2: Troubleshooting EIGRP
- Lab 3-2: Troubleshooting EIGRP
- Lesson 3: Implementing EIGRP for IPv6
- Lab 3-3: Implementing EIGRP for IPv6
- Lesson 4: Module Summary
- Lesson 5: Module Self-Check

Module 4: Implementing a Scalable, Multi-area Network, OSPF Based Solution

- Lesson 1: OSPF Overview
- Lesson 2: Multiarea OSPF IPv4 Implementation
- Lab 4-1: Configuring Multiarea OSPF
- Lesson 3: Troubleshooting Multiarea OSPF
- Lab 4-2: Troubleshooting Multiarea OSPF
- Lesson 4: Examining OSPFv3
- Lab 4-3: Configuring OSPF for IPv6
- Lesson 5: Module Summary
- Lesson 6: Module Self-Check

Module 5: Wide-Area Networks

- Lesson 1: Understanding WAN Technologies
 - Lesson 2: Configuring Serial Encapsulation
 - Lab 5-1: Configuring and Troubleshooting a Serial Connection
 - Lesson 3: Establishing a WAN Connection Using Frame Relay
 - Lab 5-2: Establishing a Frame Relay WAN
 - Lesson 4: Introducing VPN Solutions
 - Lesson 5: Configuring GRE Tunnels
 - Lab 5-3: Establishing a GRE Tunnel
 - Lesson 6: Module Summary
 - Lesson 7: Module Self-Check
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Interconnecting Cisco Network Devices Part 2 (ICND2)

Module 6: Network Device Management

- Lesson 1: Configuring Network Devices to Support Network Management Protocols
- Lab 6-1: SNMP and Syslog Basic Configuration
- Lab 6-2: Analyzing NetFlow Data
- Lesson 2: Managing Cisco Devices
- Lesson 3: Licensing
- Lab 6-3: Managing Cisco Devices and Licensing

Module S: ICND2 Superlab

- Lab S-2: ICND2 Superlab
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APÉNDICE D

MEMORANDUM OF UNDERSTANDING BETWEEN STATES/TERRITORIES/INTERNATIONAL ORGANISATIONS MEMBERS OF MEVA III AND REDDIG II PROJECT ORGANISATION

1. SECTION 1. INTRODUCTION AND PURPOSE OF THIS DOCUMENT

1.1 INTRODUCTION

1.1.1 With the aim of effectively and efficiently fulfilling aeronautical telecommunications requirements in these regions, the members of the MEVA II and REDDIG VSAT networks decided to interconnect the two networks. For this purpose, the Members agreed to establish this Memorandum of Understanding (MoU). This Agreement is being established jointly under coordination of the ICAO North American, Central American, and Caribbean (NACC) Office in Mexico City, Mexico and the ICAO South American (SAM) Office, in Lima, Peru.

1.1.2 The Third MEVA II / REDDIG Coordination Meeting (MR/3) concluded that the interconnection implementation will operate for a five-year period, as an initial basis, after finalising the implementation.

1.1.3 The First MEVA III / REDDIG II Coordination Meeting concluded that the interconnection implementation will be renewed for five initial year period, after finalizing the implementation.

1.1.4 The main body of this document consists of four (4) sections and 2 Appendices. The content of the sections and appendices is summarised below: In accordance with the interconnection development, when considered necessary, and if the interested Parties of both networks agree to do so, other Appendices could be added as necessary.

Section 1.0: Presents a brief overview and statement of purpose.

Section 2.0: Provides an explanation of the Technical Cooperative Agreement process.

Section 3.0: Describes the technical terms of reference.

Section 4.0: Describes the financial responsibilities of the parties to this agreement.

Appendix A: A list of reference documents used in support of this Agreement.

Appendix B: Technical-operational coordination agreement for the establishment of VSAT MEVA III and REDDIG II networks interconnection

1.1.5 This document is based on the former MEVA II - REDDIG Memorandum of Understanding (MoU).

1.2 SECTION 1 – PURPOSE

1.2.1 The goal of this MoU is to foster a coordinated plan for in the development of MEVA III and REDDIG II networks and its interconnection implementation.

1.2.2 This MoU is a living document through which members of the MEVA III and REDDIG II networks shall convene, as necessary and at locations agreed upon, to review or amend the details of the Agreement. Revised versions of this Agreement, or paragraph changes, shall be coordinated and distributed by the ICAO NACC and SAM Regional Offices to the signatory parties of the Agreement as appropriate.

1.2.3 This MoU document establishes the following coordination and cooperation process:

a) The holding of coordination meetings, if required, to analyse and identify the new service requirements for the MEVA III and REDDIG II VSAT networks interconnection.

b) The exchange of technical reports and documentation, program plans and schedules, as may become necessary, to assure the successful and timely completion of these efforts.

c) Operational-technical coordination between the Parties involved in MEVA III and REDDIG II networks, as necessary.

d) Planning, technical coordination, and development participating member States/Territories/International Organisations of the MEVA III and REDDIG II Networks.

2. SECTION 2 – THE TECHNICAL COOPERATIVE AGREEMENT PROCESS

2.1 To reach the goal of this MoU, the MEVA III and REDDIG II members have developed an interconnection solution to operate during a five-year phase after the implementation of the interconnection of the MEVA III and REDDIG II Networks.

2.2 RELATIONSHIPS AND RESPONSIBILITIES OF THE PARTIES

2.2.1 In order to achieve the interconnection of the networks in a timely and mutually beneficial way, the parties to this Agreement recognise the need to coordinate their actions and exchange updated operational-technical information.

2.2.2 The Parties also recognise the need to develop common technical solutions for interconnecting and/or integrating these networks, in a manner that shall not negatively impact the planned operation, performance, or management of the either network.

2.2.3 ICAO NACC and SAM Regional Offices shall convene coordination meetings, as needed.

2.2.4 The Parties of this MoU agree to exchange reports, technical documents, plans and programming that may be necessary in order to guarantee the interconnection and the implementation of the new services.

2.2.5 The Parties of this MoU agree to implement during a 5 year phase the MEVA III / REDDIG II interconnection solution as presented in Appendix B.

3. **SECTION 3 – TECHNICAL TERMS OF REFERENCE**

3.1 The interconnection solution's objectives and their technical operational principles are described under the Appendix B of this document.

4. **SECTION 4 – FINANCIAL RESPONSIBILITIES OF THE NETWORK PARTIES**

4.1 MEVA III / REDDIG II Members shall, as individual administrations, be responsible for their own financial obligations, in accordance with the Agreement contained in Appendix B.

4.2 The Parties to this Agreement understand that they shall not commit to any action that may result in a financial obligation to other Parties, without first obtaining an Agreement, in writing, from all other parties to this Agreement.

NOTES:

MEVA III - The term "MEVA III", as used in this document, refers to the VSAT network currently providing voice and data aeronautical telecommunications services to States/Territories/International Organisations in the Caribbean Region. The network is managed by Caribbean States/Territories/International Organisations members, through the Technical MEVA Group (TMG), and is coordinated by the ICAO NACC Regional Office.

REDDIG II - The term "REDDIG II", as used in this document, refers to the VSAT network presently implemented in the South American region under the technical cooperation project RLA/03/901 coordinated by the ICAO Lima Office.

APPENDIX A

A LIST OF REFERENCE DOCUMENTS USED IN SUPPORT OF THIS AGREEMENT

- Contract N| 2250128 between the International Civil Aviation Organization and COMSOFT GmbH for the provision of the Interconnection of the MEVA III and REDDIG II Satellite Telecommunications Network for MEVAIII and REDDIG II Member States/Territory/International Organization
- Acuerdo de gestión de servicios entre la Cooperación Centroamericana de Servicios de Navegación Aérea (COCESNA) y la OACI Proyecto RLA/09/901 Interconexión del Nodo MEVAII de COCESNA a la REDDIG
- Contract No. 22501200 between the International Civil Aviation Organization and the consortium consisting of INEO Engineering and Systems and LEVEL 3 PERÚ S.A. for the Provision of a New Regional Aeronautical Telecommunication Network (REDDIG II)and associated equipment and services
- Manual de operación de la REDDIG II
- MEVA III Document of Agreement
- MEVA III Service Level Agreement

APPENDIX B

**TECHNICAL-OPERATIONAL COORDINATION AGREEMENT FOR THE ESTABLISHMENT OF VSAT
MEVA III AND REDDIG II NETWORKS INTERCONNECTION**

1. SECTION 1 – PURPOSE OF THIS AGREEMENT

1.1 PURPOSE

1.1.1 To establish technical, operational and administrative aspects necessary for the digital VSAT MEVA III and REDDIG II networks interconnection, to meet aeronautical telecommunications requirements between the CAR/SAM Regions.

2. SECTION 2 – CO-OPERATIONAL TECHNICAL PROCESS OF THE AGREEMENT

2.1 RELATIONSHIP AND RESPONSIBILITIES OF THE PARTIES

2.1.1 During this stage, the management of MEVA III and REDDIG II shall continue with their respective service providers, i.e, REDDIG II shall continue with its REDDIG Administration, and MEVA III, with the MEVA III Service Provider.

2.1.2 States/Territories/International Organisations members of MEVA III and REDDIG II networks shall be responsible for the normal operation of each of their nodes, having to establish mechanisms necessary to ensure the degree of availability required for each of the services under consideration.

3. SECTION 3 – TECHNICAL TERMS OF REFERENCE

3.1 TECHNICAL TERMS OF REFERENCE

3.1.1 Members of MEVA III and REDDIG II networks have mutual interest in establishing the interconnection of their respective communications networks in a manner that they provide the capacity for current and future voice and data aeronautical telecommunications services between the designated nodes within these networks, so as to support aeronautical telecommunications in the CAR/SAM Regions.

3.1.2 The interconnection technical solution shall be carried out under premise that the REDDIG II and MEVA III VSAT network is developed under a full mesh network topology, using TDMA satellite access, as well as a IS-14 satellite transponder with a beam directed over United states / Latin America, C-band operation frequencies and co-linear vertical polarisation.

3.1.3 For the interconnection of the additional equipment to be initially installed at each node involved, MODEM, as well as any other necessary equipment required.

3.1.4 The interconnection implies the following implementations:

a) Additional equipment at Bogota (Colombia) and Caracas (Venezuela), REDDIG II nodes; and

- b) Additional equipment at Tegucigalpa, Honduras, COCESNA MEVA III node.

3.2 MANAGEMENT TERMS OF REFERENCE

3.2.1 Implementation of the interconnection option shall not involve modifications to the technical, operational and control management of MEVA III and REDDIG II networks, with exception of the necessary maintenance coordination procedures detailed in paragraph 3.2.5 of this Attachment.

3.2.2 The configuration, synchronisation, supervision and control of additional MODEMS participating in the interconnection and installed at REDDIG II nodes, shall be carried out by the MEVA III Network Control Centre (NCC). Also, the configuration, synchronisation, supervision and control of additional MODEMS participating in the interconnection and installed at MEVA III nodes, shall be carried out by the REDDIG NCC.

3.2.3 The bandwidth, number and type of circuits installed in the MEVA III node for communications with REDDIG II, shall be managed by REDDIG II.

3.2.4 The bandwidth, number and type of circuits installed in the REDDIG II node for communications with MEVA III, shall be managed by MEVA III.

3.2.5 Maintenance coordination procedures between the NCCs

3.2.5.1 When there is any problem in a REDDIG II node, with the MODEM or other equipment involved in the interconnection with MEVA III, the following shall be applied:

- a) MEVA III Service Provider shall call the REDDIG II Administration informing of the happening;
- b) The REDDIG II Administration shall phone the respective node and shall establish an audio teleconference between MEVA III Service Provider and Caracas or Bogota local technicians, as necessary;
- c) REDDIG II NCC, under control of the REDDIG II Administration, shall supervise communications between MEVA III Service Provider and REDDIG II nodes technicians.
- d) The MEVA III Service Provider is the only one that may call the REDDIG II Administration to start or close the respective trouble ticket.

3.2.5.2 When there is any problem in a MEVA III node, with the MODEM or other equipment affect the interconnection with REDDIG, the following shall be applied:

- a) The REDDIG II Administration shall call the MEVA III Service Provider informing of the happening;
- b) The MEVA III Service Provider shall call the respective node and shall establish an audio conference between REDDIG II Administration and local technicians, as necessary;

- c) MEVA III NCC, under control of the Service Provider, shall supervise communications between REDDIG II Administration and MEVA III nodes technicians.
- d) The REDDIG II Administration is the only one that may call the MEVA III Service Provider to start or close the respective trouble ticket.

3.2.6 Security requirements

3.2.6.1 The minimum security arrangements required by REDDIG II, and that should be followed by the MEVA III, are:

- a) MEVA III network have no direct communications with public networks.
- b) The equipment is not shared with services different to MEVA III.
- c) Access restriction to equipment belonging to the network, through the use of a password.
- d) The network must exclusively support services to which it was originally constituted for.

3.2.6.2 The minimum security arrangements required by MEVA III, and that shall be followed by REDDIG II, are:

- a) REDDIG II network have no direct communications with public networks.
- b) The equipment is not shared with services different to REDDIG II.
- c) Access restriction to equipment belonging to the network, through the use of a password.
- d) The network must exclusively support services to which it was originally constituted for.

4. SECTION 4 – FINANCIAL RESPONSIBILITIES OF THE PARTIES

4.1 EQUIPMENT PURCHASING

4.1.1 Additional equipment to be installed at REDDIG II nodes, with MEVA III MODEMs requirements, can be included in the leased contract established between ICAO, in behalf of the REDDIG II members, and the MEVA III Service Provider in accordance with the requirements established for the interconnection.

4.1.2 Additional equipment to be installed at MEVA III nodes, with REDDIG II MODEMs requirements, can be purchased by MEVA III members (States, Territories, Organisations) in accordance with the requirements established for the interconnection.

4.2 SPARE PARTS LOT PURCHASING

4.2.1 The spare parts for the additional equipment to be installed at the REDDIG II nodes, with MEVA III MODEM and other device requirements, can be included in the leasing contract established between ICAO, on behalf of the REDDIG II States, and the MEVA III Service Provider.

4.2.2 The spare parts for the additional equipment to be installed at the MEVA III nodes, with REDDIG II MODEM and other device requirements, shall be purchased by MEVA III Members.

4.3 MAINTENANCE

4.3.1 The additional equipment that would be installed in the REDDIG II nodes and that would route communications requirements with MEVA III nodes, shall be maintained by the MEVA III Service Provider, under the coordination of the REDDIG II Administration.

4.3.2 The additional equipment that would be installed in the MEVA III node, with communications requirements with REDDIG II nodes, shall be maintained by MEVA III Member, in coordination with the REDDIG II and the MEVA III Service Provider.

4.4 SPACE SEGMENT

4.4.1 The carriers, as well as the band width requirement for communications between REDDIG II nodes shall be the same as those currently rented with INTELSAT. The payment of the space segment to INTELSAT shall continue being carried out through the REDDIG II Administration, who shall be in charge of collecting contributions from each SAM State member of REDDIG II.

4.4.2 The carriers, as well as the band width requirement for communications between MEVA III nodes shall be done through the MEVA III Service Provider. MEVA III members shall pay the bandwidth consumption to the MEVA III Service Provider.

4.4.3 The circuits necessary for communications between a REDDIG II node having MODEMs participating in the interconnection with MEVA III shall be administrated by the MEVA III Service Provider. The amount charged for circuits used by the REDDIG II Member of the aforementioned node mentioned shall be provided by the MEVA III Service Provider, and the respective consumption payment to the provider shall be made through REDDIG II Administration.

4.4.4 The circuits necessary for communications between a MEVA III node having MODEMs participating in the interconnection with REDDIG II shall be administrated by REDDIG II. The amount charged for circuits used by the mentioned node shall be provided by the REDDIG II Administration, and the respective consumption payment shall be made by the MEVA II member of the aforementioned node to the REDDIG II Administration.