



- Agenda Item 2:** **Analysis to the proposals for the interconnection/interoperability between nodes in the MEVA II and REDDIG networks requiring it**
- Agenda Item 3:** **Development of a proposal for actions to implement the recommended option for the integration/interconnections of the MEVA II and REDDIG networks**

**FEASIBILITY STUDY ON THE INTERCONNECTION / INTEROPERABILITY BETWEEN
NODES REQUIRING IT IN MEVA II AND REDDIG NETWORKS**

(Paper presented by the Rapporteur of the MEVA II / REDDIG Working Group)

SUMMARY

This working paper presents a feasibility study on partially homogeneous interconnection / interoperability between MEVA II and REDDIG nodes requiring so, carried out during the meeting of the Working Group held in Lima from 24 to 28 April 2006, for its analysis during the meeting of the Task Force with the aim of deciding on the most appropriate configuration.

References:

- Report of MEVA II/REDDIG Coordination Meeting. (Lima, Peru, 20- 22 March 2006);
- Report of the ninth meeting of the REDDIG Coordination Committee (RCC/9); and
- REDDIG Operational and Technical Manual.

1. Background

1.1 The partially homogeneous MEVA II / REDDIG interconnection / interoperation implicates the existence of two independent networks, REDDIG / MEVA II, and each with its own network control centre.

1.2 The use of compatible equipment between MEVA II and REDDIG at FRAD and satellite MODEM level, as well as use of the same PAS1R satellite, hemispheric beam, C band and co-linear polarization permits that interconnection become possible, with the implementation of additional equipment at both REDDIG and MEVA II nodes.

1.3 Taking under consideration AFS operational requirements in FASID ANP, Tables CNS 1A and CNS 1C, shown in the table in **Appendix A**, as well as future ATN applications requirements, radar data exchange, satellite navigation systems augmentation and other additional services, an analysis was made to additional equipment in REDDIG and MEVA II nodes as regards FRAD equipment cards, satellite MODEM and SSPA for the nodes involved in the interconnection.

2. Possible technical configurations

2.1 **Appendix B** presents diagrammes with possible technical configurations for MEVA II /REDDIG partially homogeneous interconnection. Three integration options are presented:

Option A (Addition of MEVA II Linkway MODEMs in REDDIG node involved).

Option B (Addition of REDDIG Linkway MODEMs in MEVA II node involved).

Option C (Addition of mixed Linkway MODEMs).

2.2 Option A consists in the installation of MEVA II Linkway MODEMs at the following REDDIG nodes: Brazil, Colombia, Ecuador, Peru and Venezuela. Also, other equipment will be added, which are described in Section 3 of this working paper.

2.3 This installation will guarantee implementation of all AFTN and ATS speech services between the REDDIG / MEVA II and REDDIG nodes specified in the CAR/SAM Air Navigation Plan.

2.4 Section 4 of this working paper describes the institutional arrangements to carry out supervision and control, the space segment arrangement and the administration of the spare parts for this option.

2.5 Option B consists in the installation of REDDIG Linkway MODEMs at the following MEVA II nodes: Aruba, Curazao, COCESNA (Honduras), Jamaica, Panama and Puerto Rico. Also, other equipment will be added, which are described in Section 3 of this working paper.

2.6 This installation will guarantee implementation of all AFTN and ATS speech services between the REDDIG / MEVA II and REDDIG nodes specified in the CAR/SAM Air Navigation Plan.

2.7 Section 4 of this working paper describes the institutional arrangements to carry out supervision and control, the space segment arrangement and the administration of the spare parts for this option.

2.8 Option C consists in the installation of MEVA II MODEMs at the Colombia and Venezuela REDDIG nodes, and the installation of REDDIG MODEMs at the COCESNA and Puerto Rico MEVA II nodes.

2.9 This installation will guarantee implementation of all AFTN and ATS speech services between the REDDIG / MEVA II and REDDIG nodes specified in the CAR/SAM Air Navigation Plan

2.10 Section 4 of this working paper describes the institutional arrangements to carry out supervision and control, the space segment arrangement and the administration of the spare parts for this option.

2.11 Brazil has extra-officially informed it will propose an amendment to ANP FASID Table CNS 1A for the elimination of the Brasilia-United States AFTN circuit; therefore, the interconnection requirements between MEVA II and REDDIG will not be necessary for this purpose. Nevertheless, the requirements for Brazil have been included in the configurations' analysis.

3. **Additional equipment at REDDIG and MEVA II nodes within possible technical configurations**

Additional FRAD equipment at the various technical configurations

3.1 At FRAD equipment level and for each of the possible technical configurations described in Section 2, the following modules should be implemented at each for the REDDIG and MEVA II nodes:

3.1.1 **REDDIG nodes**

Brazil

No additional equipment would be necessary for the AFTN data channel with United States via Puerto Rico, since the SBMN and SBRF nodes have free gateways for data transmission.

Colombia

Taking into considerations that Colombia would have an interoperability gateway with the CAR Region via the SKED node, speech channels would have to be added at this node with two (2) digital voice modules at each FRAD equipment E1 DIM card. No additional equipment would be required for the AFTN data channel (1) with Panama, since the SKED node has free ports for data transmission. Total additional equipment: Four (4) voice digital modules in E1 DIM card.

Ecuador

The additional channel that Ecuador would have with COCESNA could be tolerated, depending of the traffic with the current speech channels. In the event required, the SEGU node would have to extend the number of speech channels with one (1) digital voice module in each FRAD equipment E1 DIM card Total . Total additional equipment: Two (2) voice digital modules in E1 DIM card.

Peru

No additional equipment would be necessary for the AFTN data channel with United Status, since the SPIM node has free gateways for data transmission.

Venezuela

The SVMII node will require to extend its speech channels with two (2) analogue voice cards in each FRAD equipment. No additional equipment is required for the AFTN data channels, since the SVMII node has free ports for data transmission. Total additional equipment: Four (4) analogue voice cards.

3.1.2 **Nodos MEVA II**

3.1.2.1 The analysis of additional requirements for the MEVA II nodes was made without having knowledge of the number of interface cards in the FRAD (MEMOTEC) equipment at the MEVA II nodes involved in the interconnection; therefore, the Task Force Meeting would have to update this.

COCESNA

The COCESNA MEVA II node would need an analogue voice card in the FRAD equipment, to cover voice requirements with Colombia and Ecuador, plus possibly an I/O universal card for access to the satellite MODEM (REDDIG MODEM Options B and C).

Puerto Rico

The San Juan of Puerto Rico MEVA II node would need an analogue voice card to cover voice requirements with Venezuela. Taking into consideration that there is requirement for three AFTN data channels, a multi I/O card would be necessary. Also, an I/O universal card for access to the satellite MODEM (REDDIG MODEM Options B and C).

Panama

Four voice channels and one AFTN data channel with Colombia would be required; therefore, two analogue voice and one multi I/O cards would be necessary. In addition, a universal I/O for access to the satellite MODEM (MODEM REDDIG Option B).

Aruba

One analogue voice card is necessary to cover voice requirements with Venezuela. If a REDDIG MODEM is installed (Option B), a universal I/O card is necessary.

Curacao

One analogue voice card would be necessary for voice requirements with Venezuela and Colombia, plus one multi I/O card for the AFTN requirement with Venezuela. Also, a universal I/O card that would additionally cover access to the satellite MODEM, in the event a REDDIG MODEM were installed (Option B).

Jamaica

One analogue voice card would be necessary to cover voice requirements with Barranquilla ACC. If a REDDIG MODEM were installed (Option b), a universal I/O card would be required.

Additional MODEM, splitters and SSPA equipment in the various technical configurations***Addition of MEVA II Linkway MODEMs at each REDDIG node involved (Option A)***

3.2 Under this configuration, the following additional equipment would be required at the Brazil, Colombia, Ecuador, Peru and Venezuela nodes (Note: for the SSPA, an initial maximum requirement of 75 Watts has been indicated, but this would have to be further analyzed):

- Two (2) Linkway MODEMs with one (1) FR interface;
- Two (2) L Band splitters/combinators and integration material: and
- Two (2) 75 W SSPA, in the event the link budget for the transmission of two simultaneous carriers confirms it.

Addition of REDDIG Linkway MODEMs at each MEVA II node involved (Option B)

3.3 Under this configuration the following additional equipment would be required at the Aruba, Curacao, COCESNA, Jamaica, Puerto Rico and Panamá MEVA II nodes (Note: for the SSPA, an initial maximum requirement of 75 Watts has been indicated, but this would have to be further analyzed):

Two (2) Linkway MODEMs with one (1) FR interface;
 Two (2) L Band splitters/combinators and integration material: and
 Two (2) 75 W SSPA, in the event the link budget for the transmission of two simultaneous carriers confirms it.

Addition of mixed Linkway MODEMs (Option C)

3.4 Under this configuration, the following additional equipment would be required in Colombia, Puerto Rico, Venezuela and COCESNA (Note: for the SSPA, an initial maximum requirement of 75 Watts has been indicated, but this would have to be further analyzed):

Two (2) Linkway MODEMs with one (1) FR interface;
 Two (2) L Band slitters/combinators and integration material: and
 Two (2) 75 W SSPA, in the event the link budget for the transmission of two simultaneous carriers confirms it.

4. **Administrative arrangements for the implementation of the technical options**

4.1 For each of the partially homogeneous interconnection configurations, aspects related with supervision and control, space segment arrangement, maintenance and spare parts management have been analyzed.

*Addition of MEVA II Linkway MODEMs at each REDDIG node involved (Option A)**Supervision and control*

4.2 For this configuration, supervision and control of REDDIG nodes will be carried out through the REDDIG NCC, while supervision and control of the MEVA II MODEM at the REDDIG nodes will be made by the MEVA II NCC. All REDDIG MODEM will be synchronized from the Manaos NCC with Ezeiza NCC as alternate, while the MEVA II MODEM installed in the REDDIG nodes will by synchronized by the Alexandria (Virginia) NCC with Miami (Florida) as alternate. All communications between REDDIG nodes will be controlled by the REDDIG NCC, while communications between REDDIG and MEVA II nodes will by controlled by the MEVA II NCC.

Space segment arrangements

4.3 The carriers, as well as the communications bandwidth between REDDIG nodes will be the same as the ones currently leased with Panamsat. Payment of space segment to Panamsat will continue to be made through the ICAO Technical Cooperation Bureau, who will be in charge of collecting contributions from each SAM State member of REDDIG.

4.4 Band width requirements for communications between REDDIG and MEVA II nodes will be manager by the MEVA II service provider. REDDIG States with communications requirements with MEVA II node will only pay to the ICAO Technical Cooperation Bureau only for the consumption measured by the MEVA II provider; ICAO will be in charge of paying said amount to the MEVA II service provider.

4.5 The carrier, as well as the band width requirements among MEVA II nodes will be managed by the MEVA II provider, who will be in charge of establishing the amount to be paid by each MEVA I node.

Maintenance

4.6 The additional equipment to be installed in each of the REDDIG nodes with communications requirements with MEVA II nodes will be maintained by the respective REDDIG States.

4.7 Upon failure in a MEVA II MODEM, the person in charge of the REDDIG node maintenance will inform of the event to the REDDIG Administrator, who will coordinate with the MEVA II Administrator to carry out appropriate procedures. Also, if the MEVA II Administrator detects a failure in a REDDIG node where a MEVA II MODEM is installed, he will inform so to the REDDIG Administrator for the carrying out of respective procedures for the repair. As possible, there will be no direct contact between the REDDIG node having a MEVA II MODEM installed there, with the MEVA II Administrator.

Spare parts management

4.8 The spare parts for the additional equipment to be installed at the REDDIG nodes with MEVA II MODEM requirements, will be purchased by REDDIG and will form part of the spare parts lot existing in REDDIG.

Addition of REDDIG Linkway MODEMsat each MEVA II node involved (Option B)

Supervision and control

4.9 For this configuration, MEVA II nodes control and supervision will be carried out through the MEVA II NCC, while REDDIG MODEM supervision and control at MEVA II nodes will be carried out by the REDDIG NCC. All MEVA II MODEMs will be synchronized from the Alexandria NCC with Miami NCC as alternate, while the REDDIG MODEMs installed in the MEVA II nodes will be synchronized by the NCC installed in Manaos, with Ezeiza NCC as alternate.

Space segment arrangements

4.10 The carriers, as well as the communications bandwidth between MEVA II and REDDIG nodes will be administrated by the REDDIG service provider. MEVA II members with communications requirements with REDDIG nodes will pay their respective consumptions, measured by the REDDIG Administrator, to the ICAO Technical Cooperation, who will be in charge of paying said amount to Panamsat.

Maintenance

4.11 The additional equipment to be installed in each MEVA II node withe communications requirements with REDDIG nodes will be maintained by the MEVA II provider.

4.12 Upon failure in a REDDIG MODEM, the person in charge of the MEVA II node maintenance will inform of the event to the MEVA II Administrator, who will coordinate with the REDDIG Administrator to carry out appropriate procedures. Also, if the REDDIG Administrator detects a failure in a MEVA II node where a REDDIG MODEM is installed, he will inform so to the MEVA II Administrator for the carrying out of respective procedures for the repair. As possible, there will be no direct contact between the MEVA II node having a REDDIG MODEM installed there, with the REDDIG Administrator.

Spare parts management

4.13 The spare parts for the additional equipment to be installed at the MEVA II nodes with REDDIG MODEM requirements, will be purchased by MEVA II and will form part of the spare parts lot existing in MEVA II.

Addition of mixed Linkway MODEMs (Option C)

Supervision and control

4.14 For this configuration, REDDIG nodes supervision and control will be carried out through REDDIG NCC; MEVA II MODEM supervision and control at REDDIG nodes will be carried out by the MEVA II NCC; and REDDIG MODEM supervision and control at MEVA II nodes will be carried out by the REDDIG NCC. All REDDIG MODEMs will be synchronized from the Manaos ACC with Ezeiza NCC as alternate, while the MEVA II MODEMs installed in the REDDIG nodes will be synchronized by the Alexandria NCC with Miami NCC as alternate.

Space segment arrangements

4.15 The carriers, as well as the band width requirement for communications among REDDIG nodes will be the same currently leased with Panamsat. Payment of the space segment to Panamsat will continue being carried out through the ICAO Technical Cooperation, who will be in charge of collecting contributions from each SAM State member of REDDIG.

4.16 The carriers, as well as the band width requirement for communications among MEVA II nodes will be carried out through the MEVA II provider. MEVA II States will pay for the band width consumption to the MEVA II provider.

4.17 Band width requirements for communications between REDDIG nodes having MEVA II MODEM (Colombia and Venezuela) would be administrated by the MEVA II service provider. Band width consumption for the mentioned States will be measured by the MEVA II provider, and the respective payment to the provider will be made through the ICAO Technical Cooperation (RLA/03/901 Project).

4.18 Band width requirements for communications between MEVA II nodes having REDDIG MODEM (COCESNA and Puerto Rico) would be administrated by the REDDIG. Band width consumption for the mentioned States will be measured by the REDDIG Administrator, and the respective payment to the provider will be made through the ICAO Technical Cooperation (RLA/03/901 Project).

Maintenance

4.19 The additional equipment to be installed at each of the REDDIG nodes with communications requirements with MEVA II nodes, will be maintained by the respective REDDIG Status, under the coordination of the REDDIG Administrator.

4.20 Upon failure in a MEVA II MODEM, the person in charge of the REDDIG node maintenance will inform of the event to the REDDIG Administrator, who will coordinate with the MEVA II Administrator to carry out appropriate procedures. Also, if the MEVA II Administrator detects a failure in a REDDIG node where a MEVA II MODEM is installed, he will inform so to the REDDIG Administrator for the carrying out of respective procedures for the repair. As possible, there will be no direct contact between the REDDIG node having a MEVA II MODEM installed there, with the MEVA I Administrator.

4.21 Likewise, upon failure in a REDDIG MODEM, the person in charge of the MEVA II node maintenance will inform of the event to the MEVA II Administrator, who will coordinate with the REDDIG Administrator to carry out appropriate procedures. Also, if the REDDIG Administrator detects a failure in a MEVA II node where a REDDIG MODEM is installed, he will inform so to the MEVA II Administrator for the carrying out of respective procedures for the repair. As possible, there will be no direct contact between the MEVA II node having a REDDIG MODEM installed there, with the REDDIG Administrator.

Spare parts management

4.22 The spare parts for the additional equipment to be installed at the REDDIG nodes with MEVA II MODEM requirements, will be purchased by REDDIG and will form part of the spare parts lot existing in REDDIG.

4.23 Spares for the additional equipment to be installed at MEVA II nodes with REDDIG MODEM requirements shall be purchased from the MEVA II communications service provider.

5. Cost/benefit analysis

5.1 **Appendix C** presents a cost/benefit analysis for the various configurations for the implementation of MEVA II / REDDIG partially homogeneous interconnection / interoperability, over a 5-year period.

5.2 Administrative costs, additional equipment necessary, and annual circuit leasing costs have been determined for each of the configurations.

5.3 The analysis of the network's (REDDIG) administration aspects has been restricted to support services costs that, under the principle of technical cooperation, only involve operational costs without taking into account profit in the provision of the service.

5.4 As regards use of the network, it has been calculated on the basis of the costs indicated in each of the networks' (MEVA II and REDDIG) financial reports. In this manner, the use of the network is related with the payment proportional to the use or radioelectrical spectrum of circuit achieved, without including network synchronization.

5.5 With regard to technical aspects, commercial costs of communications solutions between FASID requirements counterparts have been involved. After exploring current circuits implementation costs, most favourable costs to the system have been included. It is to be highlighted that even though currently part of the solutions have been implemented with the Colombian VSAT network, at no cost to States, this has been quantified in order to achieve a better cost approximation.

5.6 The table highlights the annual implementation benefit value in each modality of Option B, as regards obtaining a different solution to the costs that a contract with a communications service provider would imply.

5.7 With respect to the benefit obtained, it can be observed that consistent benefits start to be obtained as of the second year on the various configurations of the partially homogeneous MEVA II / REDDIG interconnection. Of the three options, observation can be made that **Option C** provides the most benefits.

6. **Action suggested**

6.1 The Meeting is invited to:

- a) Take note of the information provided;
- b) Analyze the possible technical configurations indicated in Section 2 and in **Appendix B** to this working paper;
- c) Analyze the additional equipment to implement at the REDDIG and MEVA II nodes under the various technical configurations described in Section 3;
- d) Analyze the administrative arrangements for the implementation of the various technical configurations described in Section 4;
- e) Analyze the results of the cost/Benefit analysis indicated in Section 5, as well as **Appendix C** to this working paper; and
- f) On the basis of the analysis of the afore indicated items, select the technical configuration most convenient to the interest of REDDIG and MEVA II member States.

APPENDIX A

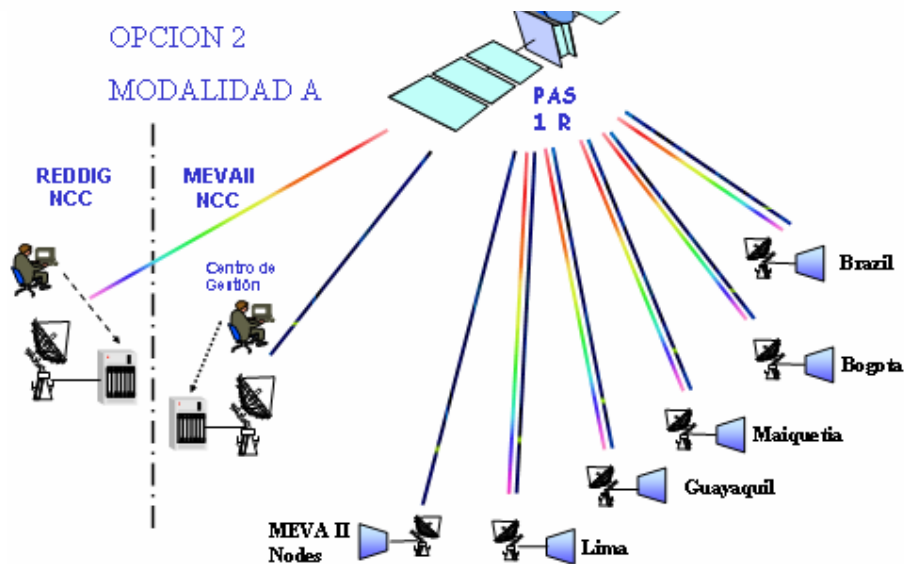
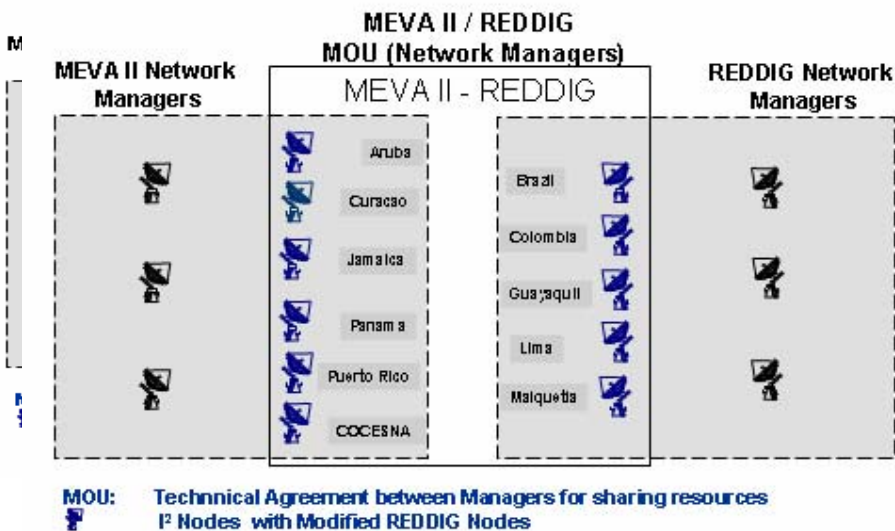
Table No. 1 – Summary CAR/SAM interoperability Requirements																		
No.	State/Station	ARUBA, Aruba	COLOMBIA	Barranquilla	Bogota	Cali	Medellin	San Andres	ECUADOR, Guayaquil	JAMAICA, Kingston	NETHERLANDS A. Curacao	PANAMÁ, Panama	PUERTO RICO, San Juan	VENEZUELA	Caracas	Josefa Camejo	COCESNA, Tegucigalpa	Total per State
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	ARUBA, Aruba															V		1 Voice
2	COLOMBIA																	8 Voice + 1 Data
2.1	Barranquilla									V	V	V						
2.2	Bogota											D,V				V		
2.3	Cali											V						
2.4	Medellin											V						
2.5	San Andres											V						
3	ECUADOR, Guayaquil																V	1 Voice
4	JAMAICA, Kingston			V														1 Voice
5	NETHERLANDS A. Curacao			V											D,V			2 Voice + 1 Data
6	PANAMA, Panama			V	D,V	V	V	V										5 Voice + 1 Data
7	PUERTO RICO, San Juan														D,V			1 Voice + 1 Data
8	VENEZUELA																	3 Voice + 2 Data
8.1	Caracas										D,V		D,V					
8.2	Josefa Camejo	V																
9	COCESNA, Tegucigalpa				V				V									2 Voice
	Total per Station	1 Voice		3 Voice	2 Voice + 1 Data	1 Voice	1 Voice	1 Voice	1 Voice	1 Voice	2 Voice + 1 Data	5 Voice + 1 Data	1 Voice + 1 Data		2 Voice + 2 Data	1 Voice	2 Voice	

Note: Additionally to the requirements expressed in Table No. 1, the ATN router interconnection, new services for the radar data sharing and other communications services should be added, all of which are in its review and definition process.

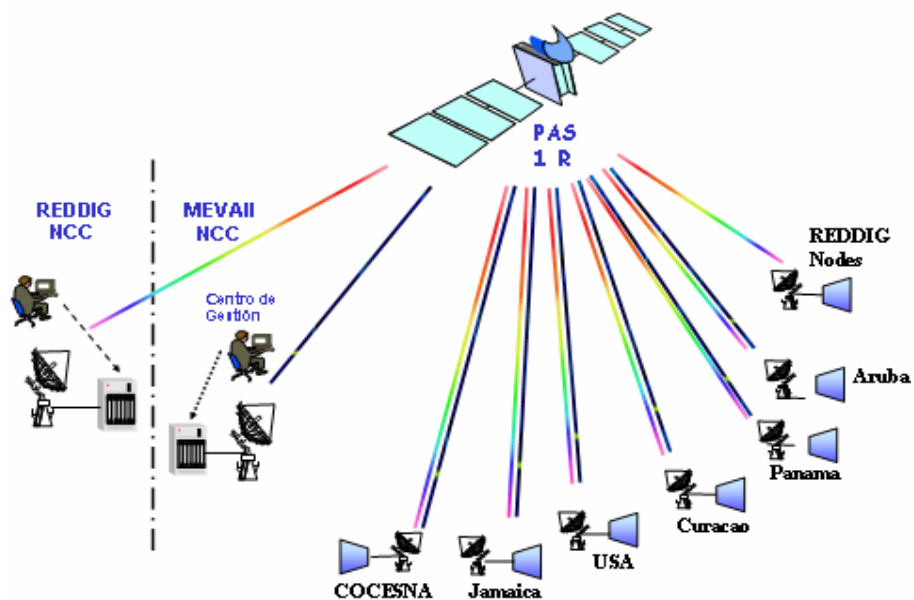
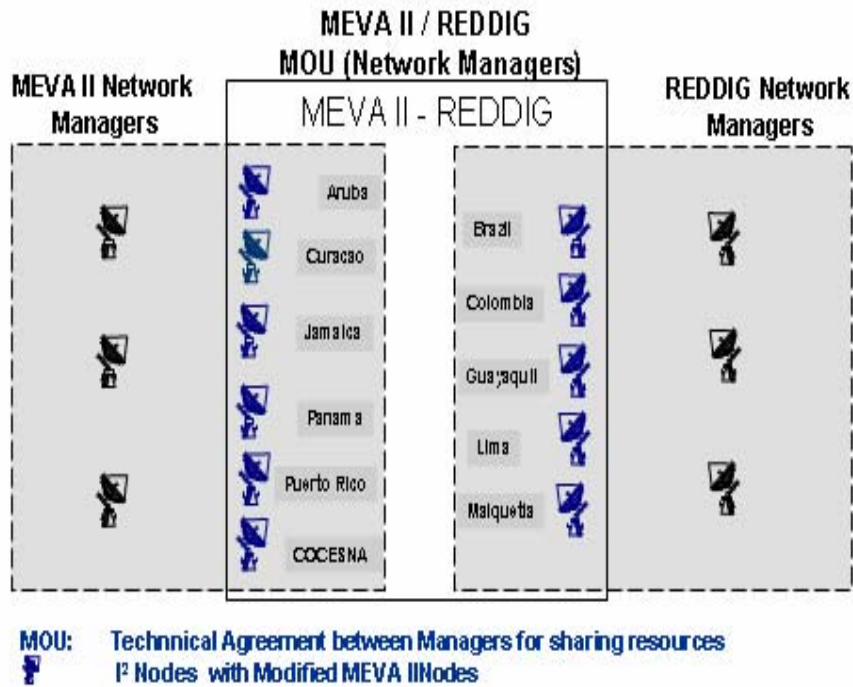
Table No. 2 - NAM/SAM interoperability requirements		
No.	Servicio de comunicación	Tipo
1	2	3
1	BRAZIL , Brasilia – UNITED STATES AFTN trunk circuit	Data
2	PERU , Lima – UNITED STATES AFTN trunk circuit	Data
3	VENEZUELA , Caracas – UNITED STATES AFTN trunk circuit	Data
4	Interconnection No. 1 of ATN routers (Plan in review)	Data
5	Interconnection No. 2 of ATN routers (Plan in review)	Data
6	Other future services	Data

APPENDIX B

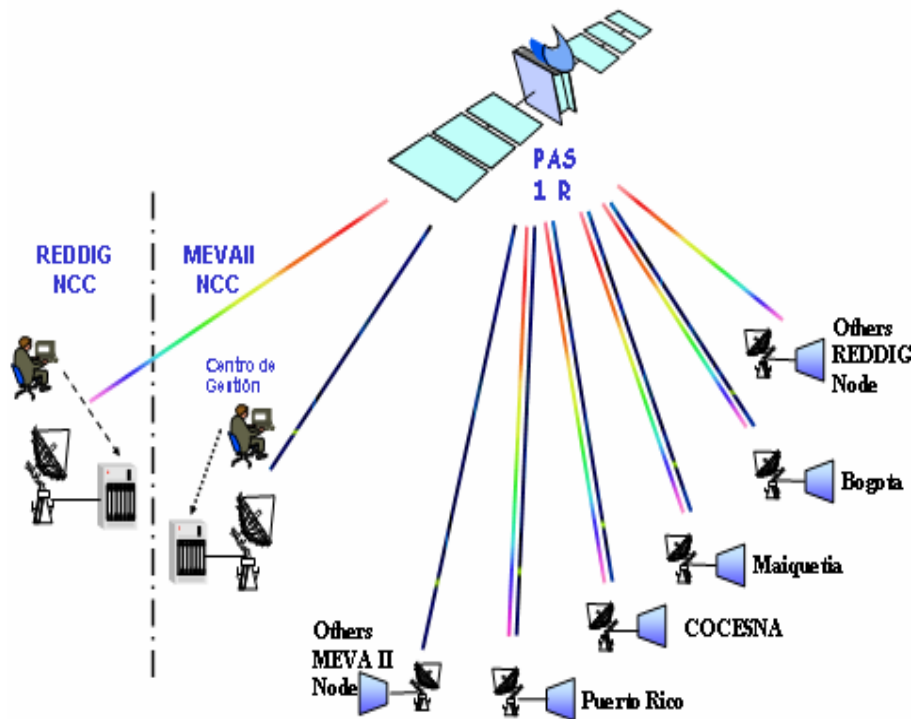
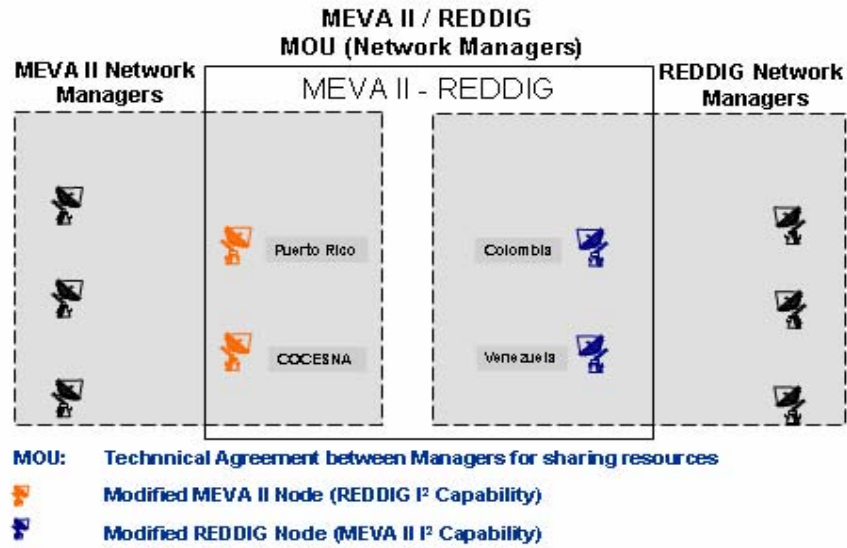
TECHNICAL CONFIGURATION OPTION A



TECHNICAL CONFIGURATION OPTION B



TECHNICAL CONFIGURATION OPTION C



MR/TF-WP/4

						1	2	3	4	5
COSTOS ADMINISTRATIVOS TO REDDIG NODES										
Admin MEVAII in REDDIG station Brasil	1348	16,176	16,176	16,176	16,176	16,176				
Admin MEVAII in REDDIG station Colombia	1348	16,176	16,176	16,176	16,176	16,176				
Admin MEVAII in REDDIG station Ecuador	1348	16,176	16,176	16,176	16,176	16,176				
Admin MEVAII in REDDIG station Peru	1348	16,176	16,176	16,176	16,176	16,176				
Admin MEVAII in REDDIG station Venezuela	1348	16,176	16,176	16,176	16,176	16,176				
Use of segm satelital MEVA II Brasil	245	2,940	2,940	2,940	2,940	2,940				
Use of segm satelital MEVA II Colombia	1085	13,020	13,020	13,020	13,020	13,020				
Use of segm satelital MEVA II Ecuador	105	1,260	1,260	1,260	1,260	1,260				
Use of segm satelital by MEVA II Peru	245	2,940	2,940	2,940	2,940	2,940				
Use of segm satelital MEVA II Venezuela	805	9,660	9,660	9,660	9,660	9,660				
TOTAL COSTOS						110,700	110,700	110,700	110,700	110,700
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS										
Colombia/Panama		70,800	70,800	70,800	70,800	70,800				
Colombia/Jamaica		96,000	96,000	96,000	96,000	96,000				
Colombia/Curacao		48,000	48,000	48,000	48,000	48,000				
Venezuela/Aruba		26,136	26,136	26,136	26,136	26,136				
Venezuela/Curacao		26,136	26,136	26,136	26,136	26,136				
Brasil/USA		24,000	24,000	24,000	24,000	24,000				
Peru/USA		88,000	88,000	88,000	88,000	88,000				
Equator/COCESNA		60,000	60,000	60,000	60,000	60,000				
Colombia/COSESNA		75,600	75,600	75,600	75,600	75,600				
Venezuela/San Juan		43,968	43,968	43,968	43,968	43,968				
TOTAL BENEFICIOS						558,640	558,640	558,640	558,640	558,640
BENEFICIOS NETOS						418,120	418,120	418,120	418,120	418,120
INVERSION										
Equipment MEVA II in Brasil										
Modem+Splitter+SSPA	71,825									
Memotec extra cards	0									
Equipment MEVA II in Colombia										
Modem+Splitter+SSPA	71,825									
Memotec extra cards	2,200									
Equipment MEVA II in Ecuador										
Modem+Splitter+SSPA	71,825									
Memotec extra cards	1,100									
Equipment MEVA II in Peru										
Modem+Splitter+SSPA	71,825									
Memotec extra cards	0									
Equipment MEVA II in Venezuela										
Modem+Splitter+SSPA	71,825									
Memotec extra cards	4,950									
MEVA II Memotec extra cards (budgetary)	6,000									
TOTAL INVERSION	-373,375									
VAN						1,012,370				

APENDICE C ANALISIS COSTO BENEFICIO OPCIONES A,B Y C
OPCION B

		Monthly	1	2	3	4	5			Monthly	1	2	3	4	5
COSTOS ADMINISTRATIVOS TO MEVA NODE								COSTOS ADMINISTRATIVOS TO MEVA NODES							
Admin REDDIG in MEVA II station Aruba		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVAII in Curacao		\$ -	0	0	0	0	0
Admin REDDIG in MEVA II station COCESNA		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVAII in Panama		\$ -	0	0	0	0	0
Admin REDDIG in MEVA II station Curazao		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVAII in COCESNA		\$ -	0	0	0	0	0
Admin REDDIG in MEVA II station Jamaica		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVAII in Aruba		\$ -	0	0	0	0	0
Admin REDDIG in MEVA II station Panama		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVAII in Jamaica		\$ -	0	0	0	0	0
Admin REDDIG in MEVA II station Puerto Rico		\$ 515	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	\$ 6,181.8	Admin MEVA II in USA							
Administrative support in Manaus								Admin MEVA II in PR							
Use segmento satelital REDDIG station Aruba		\$ 289	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	Use of segm satelital by MEVA II Curacao		\$ 455	5,460	5,460	5,460	5,460	5,460
Use segmento satelital REDDIG stationCOCESNA		\$ 1,156	\$ 13,875.8	\$ 13,875.8	\$ 13,875.8	\$ 13,875.8	\$ 13,875.8	Use of segm satelital by MEVA II Panama		\$ 770	9,240	9,240	9,240	9,240	9,240
Use segmento satelital REDDIG station Curacao		\$ 578	\$ 6,937.9	\$ 6,937.9	\$ 6,937.9	\$ 6,937.9	\$ 6,937.9	Use of segm satelital by MEVA II COCESNA		\$ 210	2,520	2,520	2,520	2,520	2,520
Use segmento satelital REDDIG station Jamaica		\$ 289	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	\$ 3,469.0	Use of segm satelital by MEVA II Aruba		\$ 105	1,260	1,260	1,260	1,260	1,260
Use segmento satelital REDDIG station Panama		\$ 1,542	\$ 18,501.1	\$ 18,501.1	\$ 18,501.1	\$ 18,501.1	\$ 18,501.1	Use of segm satelital by MEVA II Jamaica		\$ 105	1,260	1,260	1,260	1,260	1,260
Use segmento satelital REDDIG station Puerto Rico		\$ 1,156	\$ 13,875.8	\$ 13,875.8	\$ 13,876.0	\$ 13,876.0	\$ 13,876.0	Use of segm satelital by MEVA II USA		\$ 490	5,880	5,880	5,880	5,880	5,880
								Use of segm satelital by MEVA II PR		\$ 350	4,200	4,200	4,200	4,200	4,200
TOTAL COSTOS			97,220	97,220	97,220	97,220	97,220	TOTAL COSTOS			29,820	29,820	29,820	29,820	29,820
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS															
Colombia/Panama			70,800	70,800	70,800	70,800	70,800	22 Nodes Monthly \$136,000 \$ 6,182 \$ 515 Does not consider cost of NCC/NMC personnel							
Colombia/Jamaica			96,000	96,000	96,000	96,000	96,000								
Colombia/Curacao			48,000	48,000	48,000	48,000	48,000								
Venezuela/Aruba			26,136	26,136	26,136	26,136	26,136								
Venezuela/Curacao			26,136	26,136	26,136	26,136	26,136								
Brasil/USA			24,000	24,000	24,000	24,000	24,000								
Peru/USA			88,000	88,000	88,000	88,000	88,000								
Equator/COCESNA			60,000	60,000	60,000	60,000	60,000								
Colombia/COSESNA			75,600	75,600	75,600	75,600	75,600								
Venezuela/San Juan			43,968	43,968	43,968	43,968	43,968								
TOTAL BENEFICIOS			558,640	558,640	558,640	558,640	558,640								
BENEFICIOS NETOS			431,600	431,600	431,600	431,600	431,600								
INVERSION															
Equipment REDDIG in Aruba															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		2,035													
Equipment REDDIG in COCESNA															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		2,035													
Equipment REDDIG in Curazao															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		2,585													
Equipment REDDIG in Jamaica															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		2,035													
Equipment REDDIG in Panama															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		3,823													
Equipment REDDIG in Puerto Rico															
Modem+Splitter+SSPA		71,825													
Memotec extra cards		2,585													
TOTAL INVERSION		-446,048													
VAN		990,871													

**APENDICE C ANALISIS COSTO BENEFICIO OPCIONES A,B Y C
OPCION C**

Monthly	1	2	3	4	5
COSTOS ADMINISTRATIVOS					
Administracion REDDIG					
MEVA II Station San Juan (cost to operate on REDDIG) \$ 630	7,556	7,556	7,556	7,556	7,556
MEVA II Station COCESNA (cost to operate on REDDIG) \$ 630	7,556	7,556	7,556	7,556	7,556
Soporte Administrativo en Manaos					
Administracion MEVA II AGS					
Estacion Colombia (cost to operate on MEVA II) \$ 1,380	16,560	16,560	16,560	16,560	16,560
Estacion Venezuela (cost to operate on MEVA II) \$ 1,380	16,560	16,560	16,560	16,560	16,560
COSTOS SEGMENTO SATELITAL					
Uso segmento satelital REDDIG San Juan \$ 1,349	16,189	16,189	16,189	16,189	16,189
Uso segmento satelital REDDIG COCESNA \$ 1,349	16,189	16,189	16,189	16,189	16,189
Uso segmento satelital MEVA Colombia \$ 1,085	13,020	13,020	13,020	13,020	13,020
Uso segmento satelital MEVA Venezuela \$ 805	9,660	9,660	9,660	9,660	9,660
TOTAL COSTOS	103,289.11	103,289.12	103,289.12	103,289.12	103,289.12
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS					
Brasil/USA	24,000	24,000	24,000	24,000	24,000
Peru/USA	88,000	88,000	88,000	88,000	88,000
Ecuador/COCESNA	60,000	60,000	60,000	60,000	60,000
Colombia/COCESNA	75,600	75,600	75,600	75,600	75,600
Venezuela/San Juan	44,000	44,000	44,000	44,000	44,000
Colombia/Panama	70,800	70,800	70,800	70,800	70,800
Colombia/Jamaica	96,000	96,000	96,000	96,000	96,000
Colombia/Curaçao	48,000	48,000	48,000	48,000	48,000
Venezuela/Aruba	26,136	26,136	26,136	26,136	26,136
Venezuela/Curaçao	26,136	26,136	26,136	26,136	26,136
TOTAL BENEFICIOS	558,672	558,672	558,672	558,672	558,672
BENEFICIOS NETOS	455,383	455,383	455,383	455,383	455,383
INVERSION					
Equipos MEVA en Colombia					
Modem+Splitter+SSPA	-71,825				
Memotec extra cards	-2,200				
Equipos MEVA en Venezuela					
Modem+Splitter+SSPA	-71,825				
Memotec extra cards	-4,950				
Equipos REDDID en San Juan					
Modem+Splitter+SSPA	-71,825				
Memotec extra cards	-2,035				
Equipos REDDID en COCESNA					
Modem+Splitter+SSPA	-71,825				
Memotec extra cards	-2,585				
TOTAL INVERSION	-299,070				
VAN	1,198,646				

18 Nodes Monthly
\$136,000 \$ 7,556 \$ 630
Does not consider cost of NCC/NMC personnel

(Admin = Cost of network, NMC/NCC personnel)

What about Brazil, Peru and USA Conenctivity??