International Civil Aviation Organization
North American, Central American and Caribbean Office (NACC)
Eighth MEVA REDDIG Coordination Meeting (MR/8)
Lima, Peru, 17 to 18 May 2010

Agenda Item 4: Follow up to the integration of MEVA II and REDDIG networks

ANALYSIS AND PROPOSED ACTION PLAN FOR THE INTEGRATION OF THE MEVA II/REDDIG NETWORKS

(Presented by the MEVA TMG)

SUMMARY

This paper presents the analysis carried out by the MEVA TMG about the integration activities for the MEVA II and REDDIG Networks and proposes an action plan to be carried out during the 5-years term agreed for preparing for this integration.

References:

MEVA TMG/21 Meeting Report
MR/7 Meeting Report

Strategic Objective(s)	*This working paper is related to Strategic Objectives:* *A – Safety* *D – Efficiency*

1. Introduction

1.1 Management group members of the MEVA and REDDIG networks, in order to improve the efficiency of air traffic communications in and between the CAR and SAM regions, have implemented under the coordination of the ICAO NACC and SAM offices, the interconnection of these networks which consists in the adjustment of the REDDIG nodes located in Colombia and Venezuela and the MEVA II node of COCESNA.

1.2 At the time, both members REDDIG and MEVA expressed mutual interest in establishing as a first step the interconnection of the networks. They also agreed that at the conclusion of the five year contract, integration of the networks could be possible, for which a study and planning should be made.

1.3 In this respect, the objective of this paper is to continue the initial study and planning in the areas of communications, planning and coordination between the management groups of the REDDIG and MEVA networks, leading to the future integration of both networks, with the purpose of implementing a uniform communication platform based on the existing MEVA II and REDDIG networks and in a timely and mutually beneficial matter, resulting in a network of equal or greater reliability and efficient operating costs to the Member States.

1.4 In this regard, and following the MEVA II REDDIG Conclusion MR 7/3, that the REDDIG and MEVA II administrations will present the results of the initial study made for the integration of the MEVA II/REDDIG networks, as well as an action plan proposal to achieve this integration, taking into account the exchange of information related with the studies made and other considerations pertinent to possible changes to the MEVA II and REDDIG networks current platform, as agreed through Conclusion MR 7/4; the MEVA TMG carried out the following analysis and proposed action plan.

2. Discussion

Analysis

2.1 The MEVA TMG considers that the initial document presented in the 7th MEVA II REDDIG Coordination Meeting was a good initial draft document that shall be reviewed according to the dates established in the proposed action plan. Under **Appendix A** is the initial document.

2.2 The purpose of this document is to establish a general set of objectives and goals that members of the MEVA II and REDDIG networks pursue in order achieve the integration of both networks. This shall be considered a living document subject to updates and modifications by either party as the integration activities advances, based on the knowledge and lessons learned from the interconnection activities of both networks and considering the on-going technical/operational changes in the networks.

2.3 Based on the MR Conclusion 7/3, the update to this document shall be carried out through the exchange of information as the following:

a) Exchange of information, and when necessary the holding of meetings for discussions to identify needs and most suitable technical solutions within the alternatives and options to achieve the integration of the MEVA II and REDDIG networks.
b) Exchange of memos, technical reports and documentation between the Administrative Groups of MEVA and REDDIG, shall be necessary to ensure successful and timely completion of the agreed tasks.
c) Communication and technical coordination with service providers, equipment manufacturers and others involved in the MEVA II and REDDIG project, as needed.

Proposed action Plan:

2.4 Considering the agreed 5 –years term, beginning with the operation of the MEVA II/REDDIG interconnection, the integration activities shall include:

a) cost analysis, coordination procedures, administrative and operational arrangements. (Study for the unification of technical control and the administration of both networks by one single network);
b) suitability study in the use of current equipment of both the REDDIG and MEVA networks and updates that would be necessary for the integration or the complete renovation of the equipment;

c) preparation of the memorandum of understanding for the integration phase, in order to achieve uniform interoperability between the networks;
d) on-going improvements and expansion works on both network, including the operational agreements supporting these works;
e) identification of operation requirements involving the integration;
f) evaluation of new technologies or options that may facilitate and optimize the integration;
g) evaluate service provider-user contract impacts from the integration: bandwidth costs, operational considerations; and
h) evaluate and agreement on administrative procedures for a common network integration implementation.

2.5 Under **Appendix B**, is the MEVA TMG Proposed Action Plan to carry out the MEVA II REDDIG Integration activities.

3. Suggested Actions:

3.1 The Meeting is invited to:

a) review and approve the proposed action Plan for the MEVA II REDDIG Integration activities; and

b) agree any action that the meeting considers necessary for the integration activities.

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APPENDIX A

PRELIMINARY STUDY ON INITIAL TECHNICAL CONSIDERATIONS FOR THE IMPLEMENTATION OF THE MEVA II / REDDIG NETWORKS INTEGRATION

Background and References for Digital Networks Integration

The Third Regional Air Navigation Caribbean and South America Meeting (RAN CAR/SAM/3) (Buenos Aires from October 5th to 15 of 1999) alert GREPECAS the need to develop criterions and pertinent orientation in order to obtain the interconnection among several available and emerging digital networks. Recommendation 9/1 – *Implementation of digital networks to improve the current AFS and to facilitate the introduction of the ATN*.

In order to set up criteria for digital networks interconnection in a regional an interregional level, two informal meetings: CAR/SAM Informal Meeting 01/00 (Mexico, from June 26 to 29, 2000) and CNS-CAR/SAM Informal Meeting 01/01 (Bogota, Colombia, from October 9 to 11, 2001) were held, as well as MEVA and REDDIG networks Interconnection Coordination Meeting (Lima, from November 11 to 12, 2002). In these meetings several proposals of interconnection alternatives were displayed, including the adoption of an memorandum of understanding for the establishment of an homogeneous digital platform based in MEVA II and REDDIG networks interconnection, as well as the transitory implementation of Colombian network nodes in Jamaica, Panama and COCESNA; it was agreed that these measures be applied until the MEVA II / REDDIG interconnection is achieved.

The GREPECAS/10 Meeting (Las Palmas, Spain, October 23 to 27, 2001) adopted a preliminary orientation material referred to digital networks interconnection for aeronautic communications (Conclusion 10/27). Also, the Conclusion 10/28 indicates the need of capacity provision of massive information exchange through aeronautic communications digital networks.

The GREPECAS/12 Meeting (La Habana, Cuba, June 7 to 11, 2004) highlighted the importance to continue efforts in order to achieve interconnection and homogeneous interoperability among CAR/SAM regional digital networks, considering present and future communication requirements of voice and data and, in this sense, formulated Conclusion 12/39 – *Additional inter-connection points for regional and inter-regional digital networks*.

The GREPECAS/13 Meeting, based in the recommendation of CNS/COMM/4 Meeting, considered:

- the need to continue interconnection/interoperability efforts between two networks, using, in this respect, the coordination meetings of ICAO Technical Cooperation Projects, related with MEVA II y la REDDIG.
- research alternatives, such as implementation of an homogeneous type interconnection or the establishment of interconnection points for a non-homogeneous solution.
- it is important to achieve the purpose of interconnection/inter-performance between MEVA II and REDDIG and consequently, Conclusion 13/70 (*Establishment of Agreements to achieve the MEVA II – REDDIG interconnection/interoperation*) was formulated.

The Fifth Meeting of the ALLPIRG/Advisory Group (ALLPIRG/5), held in ICAO Headquarters, Montreal, Canada, 23 to 24 March 2006, among issues related to VSAT networks implementation, formulated Conclusion 5/16 – Implementation of very small aperture terminals (VSATs), which discourage proliferation of VSAT networks where one/some of the existing ones can be expanded to serve new areas of interest.

Considerations and Initial Operational Technical Aspects for the Integration

Under this networks integration concept, VSAT MEVA II and REDDIG networks interoperability will be allowed in a homogeneous way, as if only one VSAT network exist without the need to implement other communication means for interconnection.

Interoperability is possible since the technical characteristic of both (MEVA II and REDDIG) are similar: network topology type Full Mesh, using TDMA/Frame Relay typical satellite access modality, IS 1R satellite with beam addressed over the United States / Latin America, band C and vertical lineal polarization operation frequency. In the same way, both network use similar and compatible equipment, such as those corresponding to FRAD and satellite MODEM.

One of the fundamental parameters for establishing a homogeneous MEVA II – REDDIG network is synchronization of MEVA II and REDDIG carriers. This synchronization could be carried out with the MRT (Master Reference Terminal, located in the Viasat Linkway MODEM) of the REDDIG NCC or the MEVA II NCC.

Due to the MRT importance and in order to avoid collapsing the network when this fails, it is necessary to have an alternate MRT, as presently in the REDDIG. When a MRT fails, the NCC will use the alternate to maintain the network synchronism. This change will be automatic and transparent for the network users. The principal and alternate MRT should be geographically separated and joined in a direct way through a communications mean. For the MEVA II – REDDIG integration, the REDDIG MRT (operating in Manaus) and the MEVA II MRT could be considered.

The MEVA II and REDDIG networks, being integrated in the same transponder, could operate with different groups of nodes or users according to the traffic between them and to respective frequencies being used. In this way, a group with all the REDDIG nodes and other with all the MEVA II nodes could be established, as well as a last group including REDDIG and MEVA II nodes requiring voice and data service between them. This third users group would be conformed by the nodes of Colombia, Ecuador and Venezuela (REDDIG), and Aruba, Curacao, Panamá, Jamaica, Puerto Rico and COCESNA (MEVA II). Only one reference carrier (MRT) would be used for the synchronization of the homogeneous network.

In the same way, the following particular premises could be identified:

a) Network Management Centre
   - Equipment redundancy with hemispherical geographical diversity.
   - Use of the MRT and AMRT with geographical diversity to avoid solar interference
   - Dedicate circuit between MRT and AMRT.
   - Operation of the Network Management Centre during 24x7x365 in English, Spanish and Portuguese languages.
   - Use of carriers up to 1.25 Msps with QPSK and FEC ½. modulation.
   - Conformation of three groups of users NAM-CAR, SAM and NAM-CAR /SAM.
   - Minimum availability: 99.95%.
   - The network is exclusive and closed for member States and should not be interconnected to any Public Network.

b) Remote Nodes
   - Redundant equipment desirable.
   - Minimum availability: 99.95%.
   - BER equal or above 10^{-6}.

Present communications requirements identified for integration between the SAM Region and CAR Region and the SAM Region and NAM Region.

Within the networks integration, initially the voice and data communications requirements between the SAM and CAR Regions (presented in table 1) have been considered, as well as data requirements between the SAM and NAM regions (presented in table 2).

Table No. 1 – Summary of CAR/SAM interoperability requirements

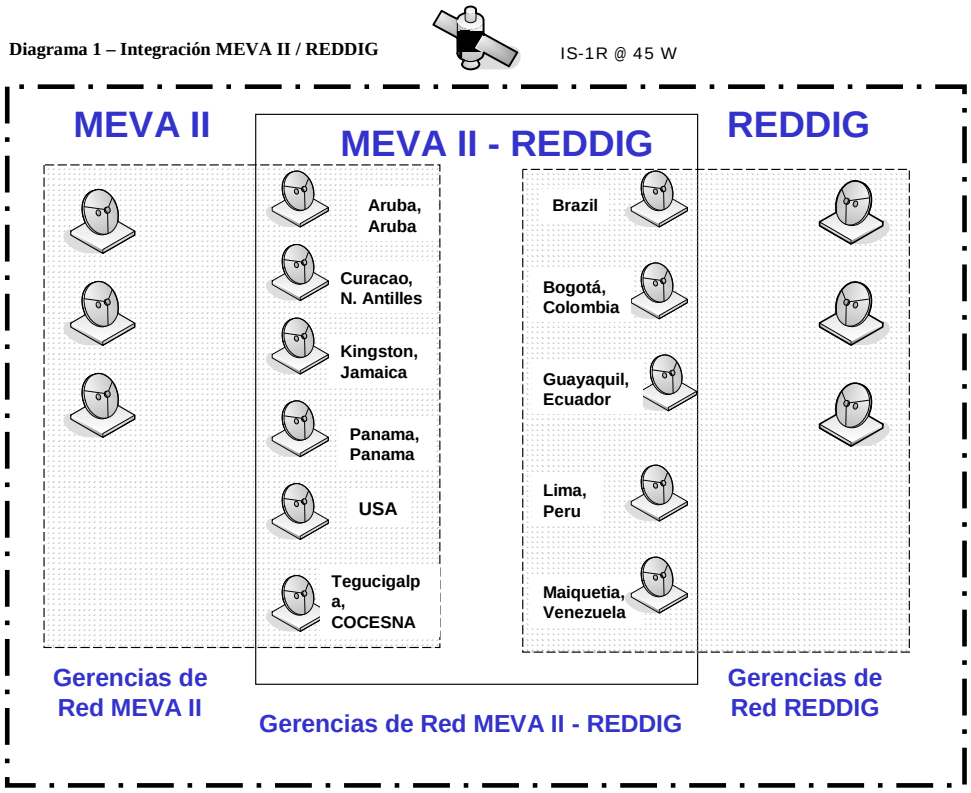
No.	State/Station	**ARUBA,** Aruba	**COLOMBIA**	Barranquilla	Bogota	Cali	Medellín	San Andrés	**ECUADOR**, Guayaquil	**JAMAICA**, Kingston	**NETHERLANDS A.** Curacao	**PANAMÁ**, Panamá	**PUERTO RICO**, San Juan	**VENEZUELA**	Caracas	Josefa Camejo	**COCESNA**, Tegucigalpa	**Total per State**
1	2	3	4	5	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	Bogotá											D,V					V	
2.3	Cali											V						
2.4	Medellín											V						
2.5	San Andrés											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	**PANAMÁ**, Panamá			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 requirements expressed in Table No. 1, ATN routers interconnection should be added, as well as new services for the radar data Exchange and other communications services, all of which is in process of revision an definition. .*

Table No. 2 – Summary of NAM/SAM interoperability requirements		
No.	**Communications services**	**Type**
1	2	3
1	Mian AFTN circuit **BRASIL**, Brasilia – **UNITED STATES**	Data
2	Main AFTN circuit **PERU**, Lima – **UNITED STATES**	Data
3	Main AFTN circuit **VENEZUELA**, Caracas – **UNITED STATES**	Data
4	ATN routers interconnection No. 1 (Plan under review)	Data
5	ATN routers interconnection No. 2 (Plan under review)	Data
6	Other future services	Data

Initial architecture proposed by the MEVA II / REDDIG Coordination meetings for integration of both networks and their suggested operation:

Diagrama 1 – Integración MEVA II / REDDIG



Note: The interrupted dark line represents a total network operator

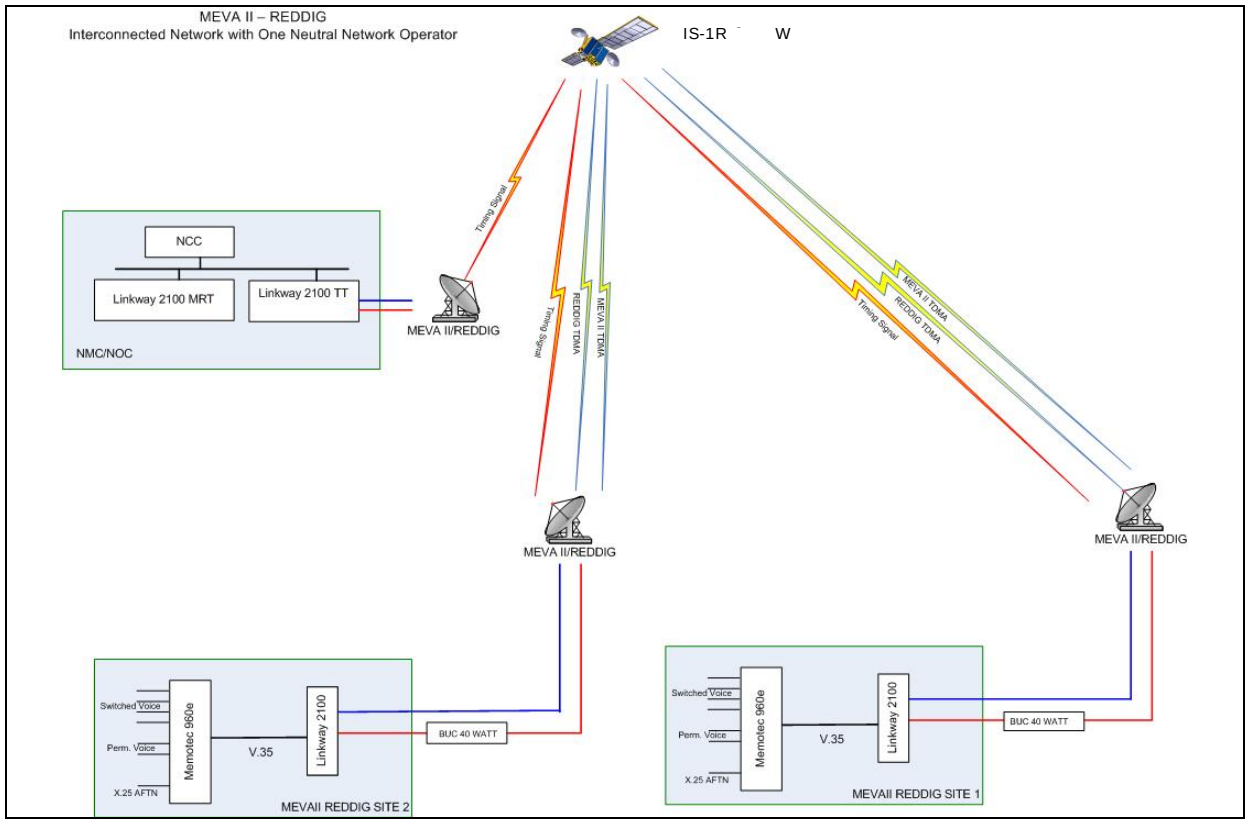


Diagram 2 – MEVA II – REDDIG Networks Interconnected with only one Network Operator

CONCLUSION:

Taking into account these initial considerations on operational technical aspects for the MEVA II and REDDIG networks integration, failing to study in-depth operational, administrative and institutional aspects, as well as review other considerations from the experience in operating both networks interconnection, it could be concluded that both networks integration is technically feasible and among the principal advantages that could be achieved are:

- For any communication between any of the MEVA II and REDDIG nodes only one satellite hop will be used keeping at minimum the delay in voice and data communications.
- Independent and transparent operation for users of groups without interconnection, there should not be interference on those groups traffic.
- Being a homogeneous network in technology and equipments, interconnection and interoperability among MEVA II and REDDIG would be carried out without mayor additional investments in principal equipments or stations.
- Flexibility to increase new interconnection users in any of the networks
- Fulfills interoperability principles of regional digital networks
- Facilitates implementation of ATN applications.

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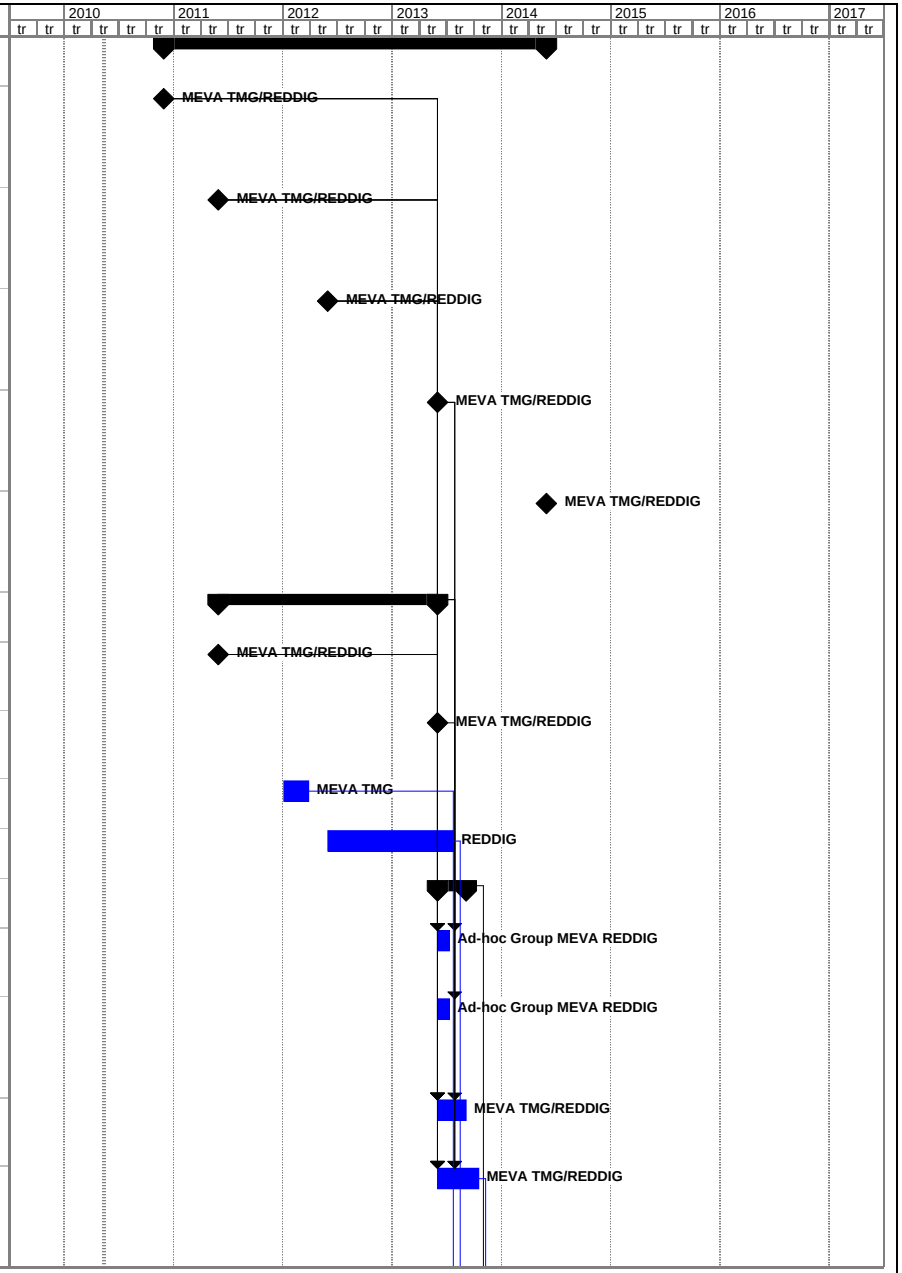
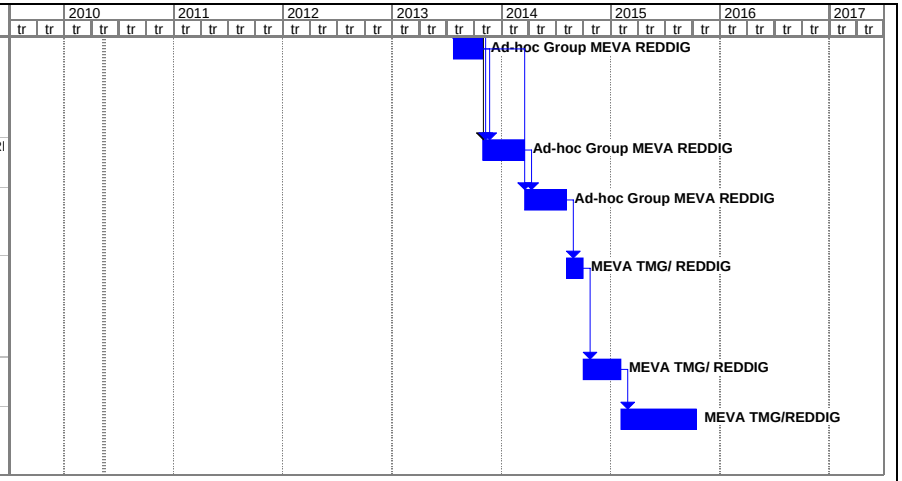
ID	Task Name	Start	Finish	Deliverables/ Entregables	Resource Names
1	**Periodic evaluation of interconnection performance**	**Wed 12/1/10**	**Mon 6/2/14**		
2	Evaluation 1 of interconnection performance	Wed 12/1/10	Wed 12/1/10	Evaluation of performance and identification of relevant results	MEVA TMG/REDDIG
3	Evaluation 2 of interconnection performance	Wed 6/1/11	Wed 6/1/11	Evaluation of performance and identification of relevant results	MEVA TMG/REDDIG
4	Evaluation 3 of interconnection performance	Fri 6/1/12	Fri 6/1/12	Evaluation of performance and identification of relevant results	MEVA TMG/REDDIG
5	Evaluation 4 of interconnection performance	Mon 6/3/13	Mon 6/3/13	Evaluation of performance and identification of relevant results	MEVA TMG/REDDIG
6	Evaluation 5 of interconnection performance	Mon 6/2/14	Mon 6/2/14	Evaluation of performance and identification of relevant results	MEVA TMG/REDDIG
7	**Analisis of network improvements and expansion**	**Wed 6/1/11**	**Mon 6/3/13**		
8	Analisis 1 on network improvements and expansion	Wed 6/1/11	Wed 6/1/11	Exchange of relevant information	MEVA TMG/REDDIG
9	Analisis 2 on network improvements and expansion	Mon 6/3/13	Mon 6/3/13	Exchange of relevant information	MEVA TMG/REDDIG
10	Review of administrative Network issues	Fri 1/6/12	Thu 3/29/12	Updates to service contract	MEVA TMG
11	Administrative network arrangement for RMO	Fri 6/1/12	Thu 7/25/13	RMO	REDDIG
12	**Discussion on technical issues for integration**	**Mon 6/3/13**	**Fri 9/6/13**		
13	Evaluation of technical improvements issues relevant for integration	Mon 6/3/13	Fri 7/12/13	Identification of technical issues for integration	Ad-hoc Group MEVA REDDIG
14	Evaluation of technical expansion issues relevant for integration	Mon 6/3/13	Fri 7/12/13	identification of future technical expansion topics for integration	Ad-hoc Group MEVA REDDIG
15	evaluation of new technologies or options that may facilitate and optimize the integration	Mon 6/3/13	Fri 9/6/13	Recommendations	MEVA TMG/REDDIG
16	Identify integration operational requirements	Mon 6/3/13	Fri 10/18/13	Operational requirements involving integration	MEVA TMG/REDDIG



Project: MEVA TMG PROPOSED ACT
Date: Tue 5/11/10

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

ID	Task Name	Start	Finish	Deliverables/ Entregables	Resource Names
17	Discusion of administrative coordination issues of each network affecting the integration	Fri 7/26/13	Thu 10/31/13	Identification of administrative issues concerning integration	Ad-hoc Group MEVA REDDIG
18	Cost-benefit analysis for integration	Fri 11/1/13	Thu 3/20/14	analysis results	Ad-hoc Group MEVA RI
19	Formulation of Draft MoU for integration	Fri 3/21/14	Thu 8/7/14	Draft MoUs and proposed Action Plan	Ad-hoc Group MEVA REDDIG
20	Discussion of results and decision making	Fri 8/8/14	Thu 10/2/14	1. Evaluation of results 2. proposed actions for Directors	MEVA TMG/ REDDIG
21	Presentation to Directors: benefits and costs involved	Fri 10/3/14	Thu 2/5/15	Approval by Directors	MEVA TMG/ REDDIG
22	Implementation of INTEGRATION of Networks (RFI, RFP, etc..)	Fri 2/6/15	Thu 10/15/15	Integration completed	MEVA TMG/REDDIG



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