International Civil Aviation Organization SAM/IG/8- WP/11
South American Regional Office 06/09/11
Assistance for the Implementation of a Regional ATM System, taking into account the ATM operational concept and the corresponding CNS technological support
Eighth Workshop/Meeting of the SAM Implementation Group (SAM/IG/8) –RLA/06/901 Regional Project
Lima, Peru, 10-14 October 2011

Agenda Item 6: Assessment of operational requirements to determine the implementation of improvements in communication, navigation and surveillance (CNS) capabilities for en-route and terminal area operations

Activities Performed under the SAM ATN Architecture Project

(Presented by the Coordinator of the SAM ATN Architecture Project)

Summary

The purpose of this working paper is to inform participants about the status of the deliverables foreseen for the SAM ATN Architecture Project.

References:

- CAR/SAM ATN Architecture Project (D1);
- Report of the Second Meeting of the CNS/ATM Subgroup (Mexico City, Mexico, 16-19 November 2010);
- Report of the Eighth Meeting of the GREPECAS Administration Coordination Group - ACG/8 (Mexico City, Mexico, 26-27 January 2011);
- Sixteenth Meeting of the CAR/SAM Planning and Implementation Group - GREPECAS/16 (Punta Cana, Dominican Republic, 28 March-1 April 2011;
- Seventh Workshop/Meeting of the SAM Implementation Group (SAM/IG/7) RLA/06/901 Project (Lima, Peru, 10-14 May 2010);
- Study for the Implementation of a New South American Digital Network (REDDIG); and
- Technical Specifications for REDDIG II.

ICAO strategic objectives:	*A – Safety*

1. Background

1.1 The First Meeting of the CNS/ATM Subgroup (CNS/ATM/SG/1), held in Lima – Peru from 15 to 19 March 2010 decided to adopt a project management approach to the work, instead of using working groups, in order to ensure better coordination of ATM and CNS matters and to develop CAR/SAM performance-based planning, with a view to implementing the global ATM system.

1.2 The CNS/ATM Subgroup was organized into a series of four programmes, identified as follows:

a) PBN;
b) ATFM;
c) ATM automation and situational awareness; and
d) Ground-ground and ground-air communications infrastructure

1.3 The Ground-Ground and Air-Ground Communications Infrastructure Programme encompassed two Projects, as follows:

a) CAR/SAM ATN Architecture (D1); and
b) ATN ground-ground and ground-air applications (D2).

1.4 The ACG/8 Meeting decided that the work being done by the GREPECAS AERMET, AGA/AOP, AIM and CNS/ATM Subgroups and their Task Forces should be converted into programmes and projects.

1.5 The GREPECAS/16 Meeting noted that the CNS/ATM Subgroup was already using a programme and project management approach, on which the other Subgroups should base their activities.

1.6 The Programme and Project Review Committee (PPRC) was created to give shape to the new structure of GREPECAS. That Committee will prepare the GREPECAS annual reports for approval by the Group, using this express procedure and these reports will then be submitted by the Secretariat to the ANC, for subsequent presentation to the Council, as appropriate.

1.7 Another decision adopted by the GREPECAS/16 Meeting was to use a regional approach to project management. Everything that was being done by the CNS/ATM Subgroup for the CAR/SAM Regions was broken down by subject, and assigned to one or the other Region.

1.8 In practical terms, insofar as the CAR/SAM Infrastructure Project (D1) is concerned, the SAM/IG/7 meeting created a SAM Infrastructure Project, for which the D1 Project Coordinator was maintained to deal with matters pertaining strictly to the SAM Region.

1.9 This working paper describes all of the documents involved, the changes and adjustments made in the original documents for the CAR/SAM Infrastructure Project (D1) and the activities that were carried out in 2011.

2 Discussion

2.1 As already explained in the introduction, the basic difference between the project management approach being used by the former CNS/ATM Subgroup and the one adopted by the GREPECAS/16 meeting lies in the scope of the projects, which formerly covered tasks for both the CAR and SAM Regions. As a result of this change, Project D1 was subdivided into CAR ATN Architecture and SAM ATN Architecture.

2.2 Figure 1 illustrates the new organizational structure of GREPECAS, emphasizing its programmes and projects. The CAR/SAM Programme and Project Coordination body was created to handle matters that concern both regions.

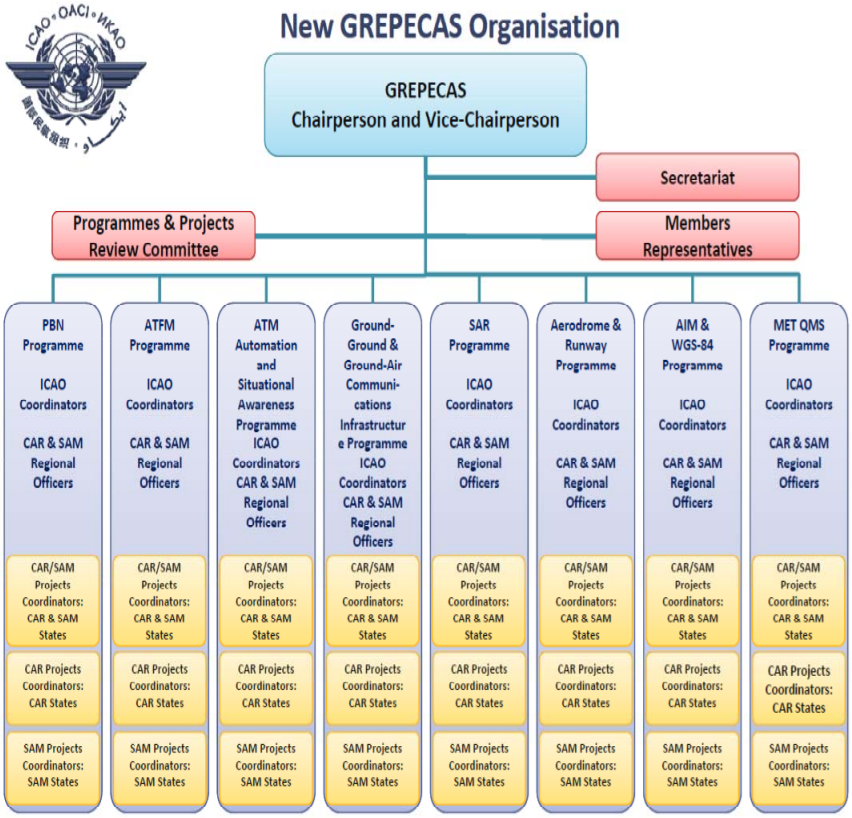

Figure 1: Composition of GREPECAS

2.3 The new Project Coordinators for the SAM Region were appointed at the SAM/IG/7 meeting, with Mr. Athayde Licério Vieira Frauche (Brazil), an expert who was already working on the tasks for the CAR/SAM Region, being retained as Coordinator for the SAM Architecture Project.

2.4 Changes were then made in all of the original documents to provide for the tasks involving only the SAM Region, as described in the body of this working paper.

2.5 Project Documents

2.5.1 The SAM Region Project took advantage of all of the documents that were being handled by the CAR/SAM ATN Architecture Project.

2.5.2 The documents that make up the SAM ATN Architecture Project are:

a) Working Programme;
b) Project Description (DP);
c) Project File; and
d) Analytical Structure of the Project (EAP).

2.5.3 The original deliverables assigned to the CAR/SAM ATN Architecture Project and which were taken into account for the specific SAM Region Project are described in the Table shown in **Appendix A.**

2.5.4 A simple analysis of the table contained in Appendix A leads to the conclusion that deliverable D 1.4 is the main activity to be carried out for the definition of an IP backbone for the SAM Region. This means that task D 1.3 is part of deliverable D 1.4.

2.5.5 Regarding deliverables D 1.1 and D 1.2, the Programme and Project Coordinators concluded that they should be a part of the work to be carried out by ICAO jointly with the REDDIG Administration. In other words, the results will not be the responsibility of the Project Coordinator.

2.5.6 In the case of deliverable D 1.5, it was felt that it would more appropriate for ICAO to carry it out than the Project Coordinator.

2.5.7 The purpose of a well-designed communications network is to transport all of the applications that are transmitted through it. As a result, it can be concluded that deliverables D 1.6 and D 1.7 go beyond mere consideration of the network's bandwidth and will warrant projects separate from the SAM ATN Architecture Project.

2.5.8 As a result of the analysis made, the deliverables of the SAM ATN Architecture Project are enumerated in the Project Description document in **Appendix B**.

2.5.9 The Project Description document contains a summary of the main Project phases, from inception to the completion of its full activities.

2.5.10 The Project file, set forth in **Appendix C,** allows for the management of all project variables, such as: scope, time, resources, quality, human resources and other elements.

2.5.11 The EAP, shown in **Appendix D,** is a hierarchical tree-shaped structure whose terminals (branches) are the deliverables and tasks related to the implementation of the project.

2.5.12 **Appendix E** summarizes the activities performed to determine the SAM ATN architecture.

2.6 Progress of the Activities

2.6.1 The Fifth Workshop/Meeting of the SAM Implementation Group (SAM/IG/5) considered the possibility of conducting studies on the implementation of a new regional satellite, ground or mixed (satellite and ground) digital network to serve as the backbone for the SAM Aeronautical Telecommunications Network (SAM ATN). This new network would have to be designed to support current fixed aeronautical requirements for voice and data transmission and exchange of radar data and flight plans, together with the new ATN ground-ground applications between States/Territories in the SAM Region that are planned for implementation in the short and medium terms.

2.6.2 At the SAM/IG/6 meeting, the studies for the choice of the IP backbone for the SAM Region were completed and submitted for evaluation to States in the Region.

2.6.2 As a result, the deliverables foreseen for the SAM ATN Architecture Project have been almost completed.

2.6.3 One of the original tasks of the CAR/SAM ATN Architecture Project was the preparation of an IPv6 addressing plan for the SAM Region. Considering that the Aeronautical Communications Panel is managing the acquisition of blocks of addresses for all States, a task that can be performed by the ICAO Regional Offices, it was removed from the portfolio of SAM ATN Architecture Project deliverables.

2.6.4 The elaboration, in August 2011, of the technical specifications for modernizing the REDDIG envisaged the natural evolution of all elements presented in the deliverables. This could lead to the creation of a new project to look into the next steps to be taken.

3 **Action suggested**

3.1 The Meeting is invited to:

a) Take note of the information that has been presented;

b) Review the activities of the SAM ATN Infrastructure Project that are described in Section 2 of this working paper, including Appendices A, B, C, D and E, in the light of the adjustments made to the original CAR/SAM D1 Project Documents;

c) Study the feasibility of creating a new Project for the implementation of REDDIG II; and

d) Examine the progress made with the deliverables of Project described in Appendix E.

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APPENDIX A / APÉNDICE A

PROGRAMME/PROGRAMA: GROUND-GROUND AND AIR-GROUND TELECOMMUNICATIONS INFRASTRUCTURE/ INFRAESTUCTURA DE COMUNICACIONES TIERRA-TIERRA Y TIERRA-AIRE

PROJECT/PROYECTO: SAM ATN ARCHITECTURE / ARQUITECTURA DE LA ATN SAM

PROJECT COORDINATOR/ COORDINADOR DEL PROYECTO: Athayde Frauche

No.	Tarea/Task	Inicio Fin / Start End	Responsable / Responsible	Estado/Status	Deliverable/Entregable
1	2	3	4	5	6
D 1.1	Guide the interconnection/integration of Communications digital networks Guiar la interconexión/ integración de redes digitales de comunicaciones	Marzo - Dic 2010/ March - Dec 2010	OACI Administración REDDIG Grupo MEVA TMG/ ICAO REDDIG Administration MEVA TMG Group	Valid/Válida	Evaluación del desempeño de la interconexión MEVA II REDDIG/ Evaluation of the performance of the interconnection of MEVA II/REDDIG
D 1.2	Technical revision of Regional Telecommunication Network for ATN implementation Revisión técnica de redes regionales de telecomunicaciones para la implantación de la ATN	Junio 2009- Julio 2011 June 2009-July 2011	OACI Administracion REDDIG ICAO REDDIG Administration	Valid/Válida	Estudio técnico de las redes MEVA II y REDDIG para la implementación de la ATN Technical study of MEVA II and REDDIG networks for ATN implementation
D 1.3	Trial implementation to determine ATN bandwidth to support ground application Implantación de pruebas para determinar el ancho de banda de la ATN para soportar las aplicaciones terrestre	2009 - Sep 2010/ 2009 - Sep 2010	Proyecto SAM/SAM Project	Valid/Válida	Evaluación de los resultados de las pruebas preliminares para determinar ancho banda requerido para la red ATN en la Región SAM Evaluation of the preliminary trials results on the definition of the SAM ATN bandwidth requirement.

No.	Tarea/Task	Inicio Fin / Start End	Responsable / Responsible	Estado/Status	Deliverable/Entregable
1	2	3	4	5	6
D 1.4	Study for an IP ATN SAM backbone network configuration Estudio para la configuración de una red medular IP para las Región SAM	2009 - Dic 2011/ 2009 - Dec 2011	Proyecto SAM/SAM Project	Valid/Válida	Estudio para la configuración de una red medular IP Study for the configuration of an IP backbone network
D 1.5	Update of SAM Router Plan Actualización del plan regional SAM de encaminadores	Enero 2012 January 2012	OACI /ICAO	Valid/Válida	Actualización al Plan regional SAM de encaminadores del ATN Update to SAM Regional Plan on ATN Routers
D 1.6	Analyze proposals for data Communications infrastructure in support of ATFM implementation This activity supports the activity *Support PBN and ATFM implementation, optimization of ATM routes and guidance for ATM service automation* covered in the communication area. Analizar las propuestas de infraestructura de comunicaciones de datos en apoyo de la implantación de la ATFM Esta actividad apoya la actividad *Soporte a la implantación del PBN el ATFM, optimización de las rutas ATM y guías para el servicio de automatización ATM* cubierta en el área de comunicaciones.	2009 - Dic 2011 2009 - Dec 2011	Proyecto SAM/SAM Project Note: Coordination needed with Program A (PBN), B (ATFM) and C (Situational Awareness)	Valid/Válida	Estudio de requerimientos de ancho de banda para las comunicaciones para soportar la implantación de la ATFM Study of communication bandwidth requirements to support ATFM implantation

No.	Tarea/Task	Inicio Fin / Start End	Responsable / Responsible	Estado/Status	Deliverable/Entregable
1	2	3	4	5	6
D 1.7	Elaborate a SAM plan for the establishment of the communications system needed for the migration towards aeronautical MET messages exchange (METAR/SPECI and TAF) in the new format to be defined Elaborar un plan SAM para establecer el sistema de comunicaciones necesario para la migración hacia el intercambio de mensajes aeronáuticos MET (METAR/SPECI y TAF) en el nuevo formato a definirse	Junio 2011- Junio 2012 June 2011 - June 2012	OACI Note: Coordination needed with MET Subgroup	Valid/Válida	Estudio de requerimientos de comunicaciones para soportar la migración al nuevo formato OPMET Study of communication requirement to support the migration to new OPMET format.

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APPENDIX B

<table>
<tr><td rowspan="2"></td><td rowspan="2">PROJECT DESCRIPTION
(PD)</td><td colspan="2">PD No</td></tr>
<tr><td>Date: 25/06/10</td><td>Page: 1/3</td></tr>
<tr><td colspan="2">Ground-Ground/Air Ground Communications Infrastructure Programme</td><td>Project Title
SAM ATN Architecture</td><td>Starting date: 05/2010
Ending date: 12/2011</td></tr>
</table>

Project Objective

Choose optimum architecture for an IP protocol-based backbone network for the SAM Region.

Project Scope

1. Study for deploying an IP backbone network for the SAM Region that would include an optimum configuration and provide for the following deliverables, among others:

   - Technical review of regional (ground, satellite or mixed) telecommunications networks for purposes of ATN implementation, based on a cost-benefit analysis.

   - Testing to determine the ATN bandwidth needed to support ground applications.

   - IP (IPv4 and IPv6) addressing system and assessment of the data communication infrastructure needed to support short, medium and long-term ATS operational requirements.

Project Strategy

All work will be done by experts appointed by SAM States that are members of the *SAM ATN Architecture* project, under the direction of the Project Coordinator. Communications between project members and between the Project Coordinator and Programme Coordinator will be carried out via teleconferencing and the INTERNET.

Once the study has been completed, the results will be remitted to the ICAO Programme Coordinator in the form of a consolidated final document for analysis, review and approval.

Project Justification

The study of an IP backbone network for the SAM Region will make it possible to define an optimum architectural structure for the communications network in that region, which is currently based mainly on the REDDIG, a satellite-based telecommunications network. That system, which has been providing States in the SAM Region with excellent services since 2003, has reached the end of its life cycle.

In order to be able to obtain the best network infrastructure, it is highly important to determine the bandwidth demanded for current applications. In this connection, States are already conducting tests, particularly of AMHS, to determine the associated spatial segment. This is considered to be the starting point for the cost-benefit analysis of the networks.

In addition, there is a growing bandwidth demand for new services like automation, surveillance, ATFM and meteorology. It is also necessary to work closely with other programmes and their respective projects in order to collect information about operational demands for the cited applications and their tentative implementation dates.

	PROJECT DESCRIPTION (PD)	PD No	
		Date: 25/06/10	Page: 2/3
Ground-Ground/Air Ground Communications Infrastructure Programme	**Project Title** SAM ATN Architecture	**Starting date:** 05/2010 **Ending date:** 12/2011	

Project Coordinator: Athayde Licério Viera Frauche (Brazil).

Related Projects

The following projects are associated with the project described herein:

- Air Navigation Systems in Support of PBN;
- Automation (Systems Interconnection);
- Improvement of ATM Situational Awareness;
- Implementation of ICAO's Model New Flight Plan Format;
- ATN Ground-Ground and Air-Ground Applications.

Although not directly considered in this task, aeronautical telecommunications experts from all SAM States must evaluate their countries' internal networks in the light of the findings of this work.

Project Deliverables	**Foreseen Date**
Project Description Document (DP)	July 2010
Analytical Structure of the Project (EAP)	July 2010
Analysis of the status of the SAM communications network (REDDIG)	August 2010
Analysis of the status of the MEVA II/REDDIG Interconnection	June 2011
Tests for determining the necessary AMHS bandwidth	September 2010
Analysis of the impact of the AMHS bandwidth on the current REDDIG satellite structure	September 2010
Analysis of the impact of the AMHS bandwidth on the current MEVA II/ REDDIG satellite structure	January 2011
Application requirements through time in the SAM Region	September 2010
Comparative study of IP-based satellite, ground and mixed (satellite and ground) network models for the SAM Region	October 2010
Definition of the model ATN IP network infrastructure for the SAM Region	October 2010
Drafting of the REDDIG Safety Manual	October 2011
Drafting of the IP Routing Policy document	October 2011
Completion of the IPv4 addressing plan for the SAM Region	August 2010
Final consolidation document for the CAR/SAM IP-based networks and its delivery to ICAO	December 2011

Necessary resources	**Foreseen date**
Testing equipment for measuring AMHS traffic	
Team of specialists: Argentina, Bolivia, Chile, and Brazil	

	PROJECT DESCRIPTION (PD)	PD No	
		Date: 25/06/10	Page: 3/3
Ground-Ground/Air Ground Communications Infrastructure Programme	**Project Title** SAM ATN Architecture	**Starting date:** 05/2010 **Ending date:** 12/2011	

Main stakeholders

SAM States, Territories and International Organizations

Assumptions

1- Project team dedicated to product delivery;
2- Easy access to the information and documentation requested by ICAO;
3- Easy communication among States; and
4- Availability of technical resources for testing purposes.

Restrictions

1- Delivery of the study document in December 2011;
2- Compliance with ICAO standards; and
3- Development of ATM applications.

Project Risks

1- Unavailability of team of experts to perform the service;
2- Communication problems between team members;
3- Planning of new measures for proposals not accepted by ICAO;
4- Difficulty of States in obtaining testing equipment; and
5- Delay in the delivery of Project outputs.

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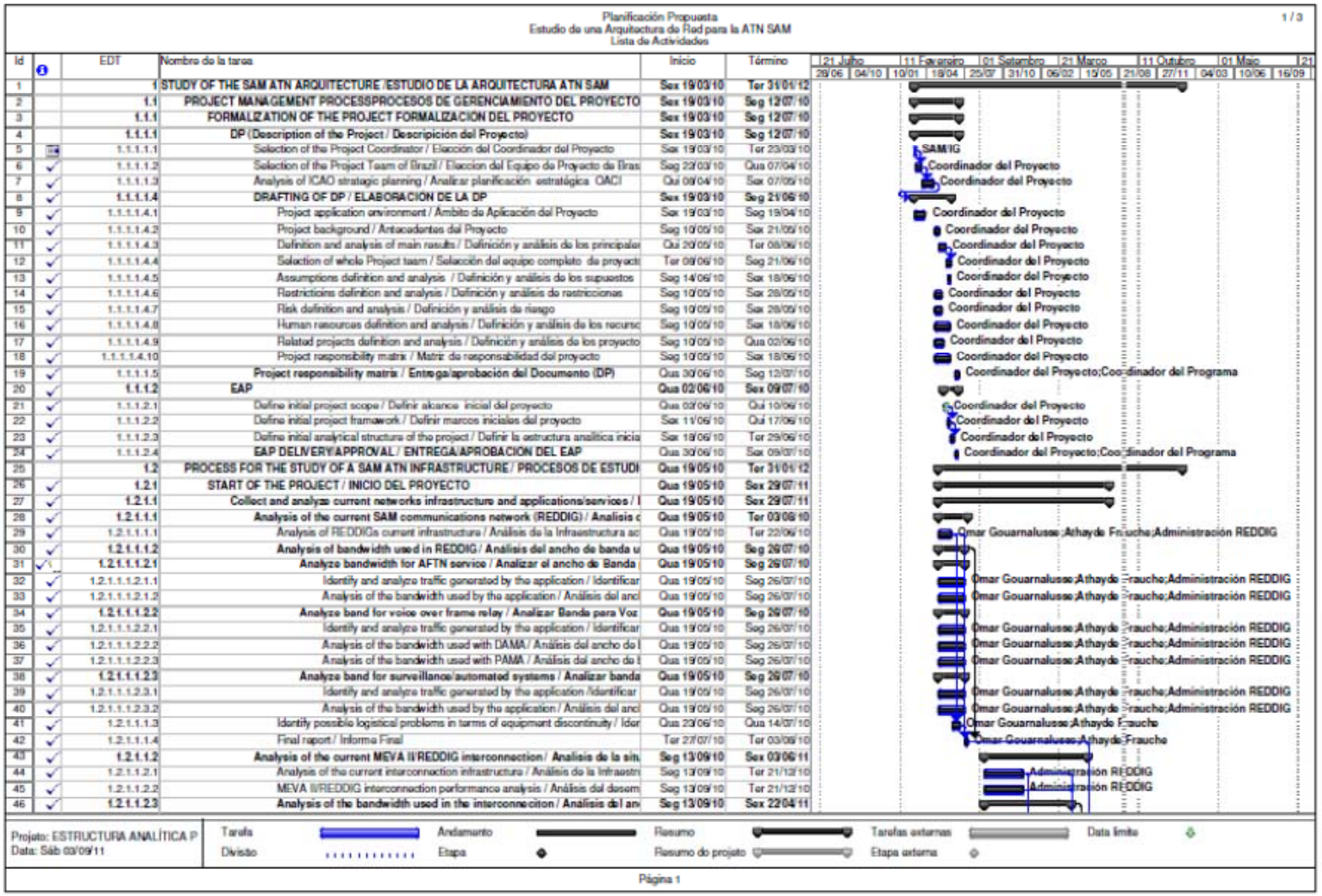
APPENDIX C / APÉNDICE C



Planificación Propuesta
Estudio de una Arquitectura de Red para la ATN SAM
Lista de Actividades

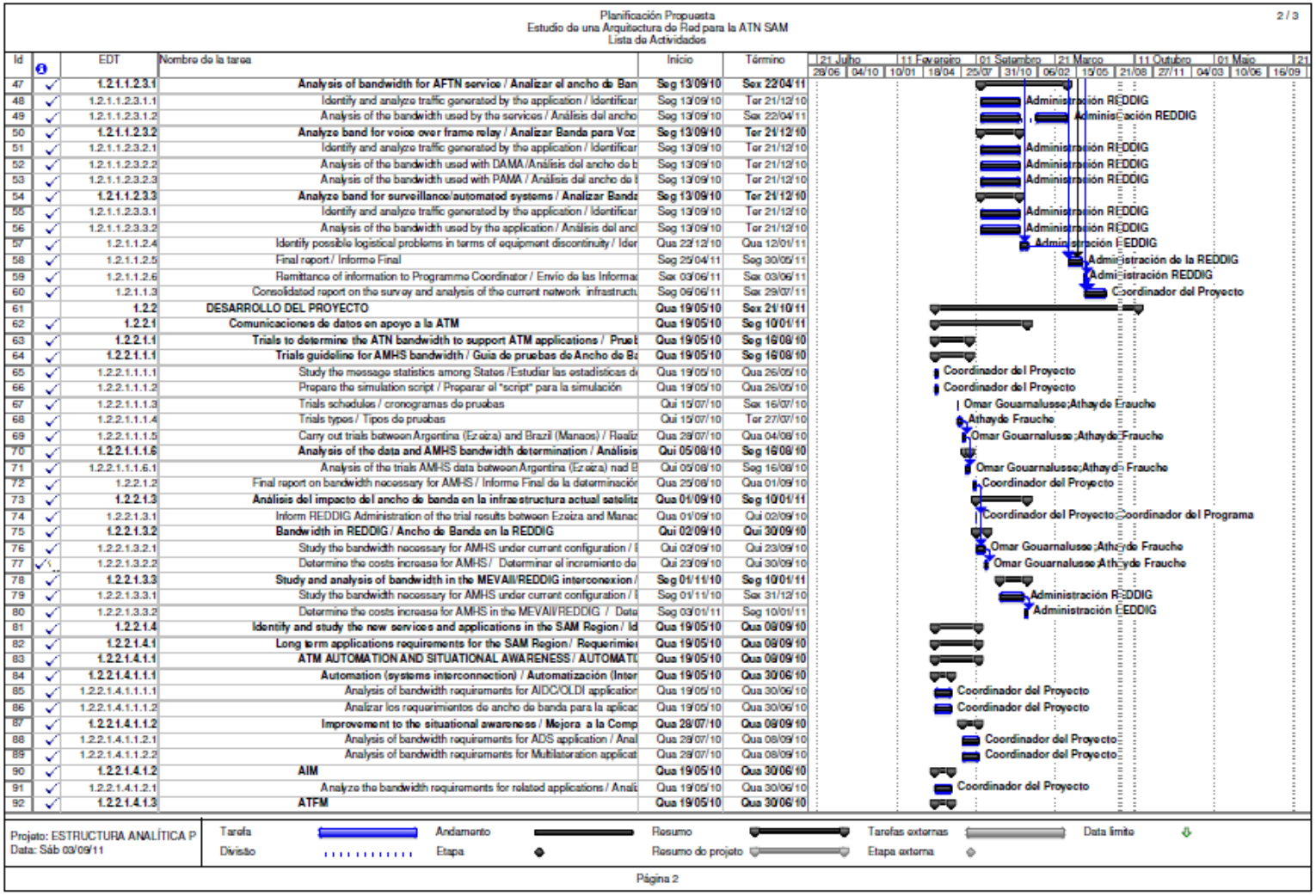
1 / 3

Id	EDT	Nombre de la tarea	Inicio	Término
1	1	STUDY OF THE SAM ATN ARQUITECTURE /ESTUDIO DE LA ARQUITECTURA ATN SAM	Sex 19/03/10	Ter 31/01/12
2	1.1	PROJECT MANAGEMENT PROCESSPROCESOS DE GERENCIAMIENTO DEL PROYECTO	Sex 19/03/10	Seg 12/07/10
3	1.1.1	FORMALIZATION OF THE PROJECT FORMALIZACION DEL PROYECTO	Sex 19/03/10	Seg 12/07/10
4	1.1.1.1	DP (Description of the Project / Descripición del Proyecto)	Sex 19/03/10	Seg 12/07/10
5	1.1.1.1.1	Selection of the Project Coordinator / Elección del Coordinador del Proyecto	Sex 19/03/10	Ter 23/03/10
6	1.1.1.1.2	Selection of the Project Team of Brazil / Elaccion del Equipo de Proyecto de Bras	Sag 22/03/10	Qua 07/04/10
7	1.1.1.1.3	Analysis of ICAO strategic planning / Analizar planificación estratégica OACI	Qui 08/04/10	Sex 07/05/10
8	1.1.1.1.4	DRAFTING OF DP / ELABORACION DE LA DP	Sex 19/03/10	Seg 21/06/10
9	1.1.1.1.4.1	Project application environment / Ambito de Aplicación del Proyecto	Sex 19/03/10	Seg 19/04/10
10	1.1.1.1.4.2	Project background / Antecedentes del Proyecto	Seg 10/05/10	Sex 21/05/10
11	1.1.1.1.4.3	Definition and analysis of main results / Definición y análisis de los principales	Qui 20/05/10	Ter 08/06/10
12	1.1.1.1.4.4	Selection of whole Project team / Selección del equipo completo de proyecto	Ter 08/06/10	Seg 21/06/10
13	1.1.1.1.4.5	Assumptions definition and analysis / Definición y análisis de los supuestos	Seg 14/06/10	Sex 18/06/10
14	1.1.1.1.4.6	Restrictions definition and analysis / Definición y análisis de restricciones	Seg 10/05/10	Sex 28/05/10
15	1.1.1.1.4.7	Risk definition and analysis / Definición y análisis de riesgo	Seg 10/05/10	Sex 28/05/10
16	1.1.1.1.4.8	Human resources definition and analysis / Definición y análisis de los recurso	Seg 10/05/10	Sex 18/06/10
17	1.1.1.1.4.9	Related projects definition and analysis / Definición y análisis de los proyecto	Seg 10/05/10	Qua 02/06/10
18	1.1.1.1.4.10	Project responsibility matrix / Matriz de responsabilidad del proyecto	Seg 10/05/10	Sex 18/06/10
19	1.1.1.1.5	Project responsibility matrix / Entrega/aprobación del Documento (DP)	Qua 30/06/10	Seg 12/07/10
20	1.1.1.2	EAP	Qua 02/06/10	Sex 09/07/10
21	1.1.1.2.1	Define initial project scope / Definir alcance inicial del proyecto	Qua 02/06/10	Qui 10/06/10
22	1.1.1.2.2	Define initial project framework / Definir marcos iniciales del proyecto	Sex 11/06/10	Qui 17/06/10
23	1.1.1.2.3	Define initial analytical structure of the project / Definir la estructura analítica inicia	Sex 18/06/10	Ter 29/06/10
24	1.1.1.2.4	EAP DELIVERY/APPROVAL / ENTREGA/APROBACION DEL EAP	Qua 30/06/10	Sex 09/07/10
25	1.2	PROCESS FOR THE STUDY OF A SAM ATN INFRASTRUCTURE / PROCESOS DE ESTUDI	Qua 19/05/10	Ter 31/01/12
26	1.2.1	START OF THE PROJECT / INICIO DEL PROYECTO	Qua 19/05/10	Sex 29/07/11
27	1.2.1.1	Collect and analyze current networks infrastructure and applications/services / I	Qua 19/05/10	Sex 29/07/11
28	1.2.1.1.1	Analysis of the current SAM communications network (REDDIG) / Analisis c	Qua 19/05/10	Ter 03/08/10
29	1.2.1.1.1.1	Analysis of REDDIGs current infrastructura / Análisis de la Infraestructura ac	Qua 19/05/10	Ter 22/06/10
30	1.2.1.1.1.2	Analysis of bandwidth used in REDDIG / Analisis del ancho de banda u	Qua 19/05/10	Seg 26/07/10
31	1.2.1.1.1.2.1	Analyze bandwidth for AFTN service / Analizar el ancho de Banda	Qua 19/05/10	Seg 26/07/10
32	1.2.1.1.1.2.1.1	Identify and analyze traffic generated by the application / Identificar	Qua 19/05/10	Seg 26/07/10
33	1.2.1.1.1.2.1.2	Analysis of the bandwidth used by the application / Análisis del ancl	Qua 19/05/10	Seg 26/07/10
34	1.2.1.1.1.2.2	Analyze band for voice over frame relay / Analizar Banda para Voz	Qua 19/05/10	Seg 26/07/10
35	1.2.1.1.1.2.2.1	Identify and analyze traffic generated by the application / Identificar	Qua 19/05/10	Seg 26/07/10
36	1.2.1.1.1.2.2.2	Analysis of the bandwidth used with DAMA / Análisis del ancho de l	Qua 19/05/10	Seg 26/07/10
37	1.2.1.1.1.2.2.3	Analysis of the bandwidth used with PAMA / Análisis del ancho de l	Qua 19/05/10	Seg 26/07/10
38	1.2.1.1.1.2.3	Analyze band for surveillance/automated systems / Analizar banda	Qua 19/05/10	Seg 26/07/10
39	1.2.1.1.1.2.3.1	Identify and analyze traffic generated by the application /Identificar	Qua 19/05/10	Seg 26/07/10
40	1.2.1.1.1.2.3.2	Analysis of the bandwidth used by the application / Análisis del ancl	Qua 19/05/10	Seg 26/07/10
41	1.2.1.1.1.3	Identify possible logistical problems in terms of equipment discontinuity / Iden	Qua 23/06/10	Qua 14/07/10
42	1.2.1.1.1.4	Final report / Informe Final	Ter 27/07/10	Ter 03/08/10
43	1.2.1.1.2	Analysis of the current MEVA II/REDDIG interconnection / Analisis de la sit	Seg 13/09/10	Sex 03/06/11
44	1.2.1.1.2.1	Analysis of the current interconnection infrastructura / Análisis de la Infraestr	Seg 13/09/10	Ter 21/12/10
45	1.2.1.1.2.2	MEVA II/REDDIG interconnection performance analysis / Análisis del desem	Seg 13/09/10	Ter 21/12/10
46	1.2.1.1.2.3	Analysis of the bandwidth used in the interconnecition / Analisis del an	Seg 13/09/10	Sex 22/04/11

Projeto: ESTRUTURA ANALÍTICA P
Data: Sáb 03/09/11

Tarefa · Divisão · Andamento · Etapa · Resumo · Resumo do projeto · Tarefas externas · Etapa externa · Data limite

Página 1



Planificación Propuesta
Estudio de una Arquitectura de Red para la ATN SAM
Lista de Actividades

2 / 3

Id	EDT	Nombre de la tarea	Inicio	Término
47	1.2.1.1.2.3.1	Analysis of bandwidth for AFTN service / Analizar el ancho de Ban	Seg 13/09/10	Sex 22/04/11
48	1.2.1.1.2.3.1.1	Identify and analyze traffic generated by the application / Identificar	Seg 13/09/10	Ter 21/12/10
49	1.2.1.1.2.3.1.2	Analysis of the bandwidth used by the services / Análisis del ancho	Seg 13/09/10	Sex 22/04/11
50	1.2.1.1.2.3.2	Analyze band for voice over frame relay / Analizar Banda para Voz	Seg 13/09/10	Ter 21/12/10
51	1.2.1.1.2.3.2.1	Identify and analyze traffic generated by the application / Identificar	Seg 13/09/10	Ter 21/12/10
52	1.2.1.1.2.3.2.2	Analysis of the bandwidth used with DAMA /Análisis del ancho de b	Seg 13/09/10	Ter 21/12/10
53	1.2.1.1.2.3.2.3	Analysis of the bandwidth used with PAMA / Análisis del ancho de b	Seg 13/09/10	Ter 21/12/10
54	1.2.1.1.2.3.3	Analyze band for surveillance/automated systems / Analizar Bandz	Seg 13/09/10	Ter 21/12/10
55	1.2.1.1.2.3.3.1	Identify and analyze traffic generated by the application / Identificar	Seg 13/09/10	Ter 21/12/10
56	1.2.1.1.2.3.3.2	Analysis of the bandwidth used by the application / Análisis del anch	Seg 13/09/10	Ter 21/12/10
57	1.2.1.1.2.4	Identify possible logistical problems in terms of equipment discontinuity / Ider	Qua 22/12/10	Qua 12/01/11
58	1.2.1.1.2.5	Final report / Informe Final	Seg 25/04/11	Seg 30/05/11
59	1.2.1.1.2.6	Remittance of information to Programme Coordinator / Envío de las Informac	Sex 03/06/11	Sex 03/06/11
60	1.2.1.1.3	Consolidated report on the survey and analysis of the current network infrastructu	Seg 06/06/11	Sex 29/07/11
61	1.2.2	DESARROLLO DEL PROYECTO	Qua 19/05/10	Sex 24/10/11
62	1.2.2.1	Comunicaciones de datos en apoyo a la ATM	Qua 19/05/10	Seg 10/01/11
63	1.2.2.1.1	Trials to determine the ATN bandwidth to support ATM applications / Prue	Qua 19/05/10	Seg 16/08/10
64	1.2.2.1.1.1	Trials guideline for AMHS bandwidth / Guía de pruebas de Ancho de Ba	Qua 19/05/10	Seg 16/08/10
65	1.2.2.1.1.1.1	Study the message statistics among States /Estudiar las estadísticas d	Qua 19/05/10	Qua 26/05/10
66	1.2.2.1.1.1.2	Prepare the simulation script / Preparar el "script" para la simulación	Qua 19/05/10	Qua 26/05/10
67	1.2.2.1.1.1.3	Trials schedules / cronogramas de pruebas	Qui 15/07/10	Sex 16/07/10
68	1.2.2.1.1.1.4	Trials types / Tipos de pruebas	Qui 15/07/10	Ter 27/07/10
69	1.2.2.1.1.1.5	Carry out trials between Argentina (Ezeiza) and Brazil (Manaos) / Realiz	Qua 28/07/10	Qua 04/08/10
70	1.2.2.1.1.1.6	Analysis of the data and AMHS bandwidth determination / Análisis	Qui 05/08/10	Seg 16/08/10
71	1.2.2.1.1.1.6.1	Analysis of the trials AMHS data between Argentina (Ezeiza) nad E	Qui 05/08/10	Seg 16/08/10
72	1.2.2.1.2	Final report on bandwidth necessary for AMHS / Informe Final de la determinación	Qua 25/08/10	Qua 01/09/10
73	1.2.2.1.3	Análisis del impacto del ancho de banda en la infraestructura actual satelita	Qua 01/09/10	Seg 10/01/11
74	1.2.2.1.3.1	Inform REDDIG Administration of the trial results between Ezeiza and Manac	Qua 01/09/10	Qui 02/09/10
75	1.2.2.1.3.2	Bandwidth in REDDIG / Ancho de Banda en la REDDIG	Qui 02/09/10	Qui 30/09/10
76	1.2.2.1.3.2.1	Study the bandwidth necessary for AMHS under current configuration / E	Qui 02/09/10	Qui 23/09/10
77	1.2.2.1.3.2.2	Determine the costs increase for AMHS / Determinar el incremiento de	Qui 23/09/10	Qui 30/09/10
78	1.2.2.1.3.3	Study and analysis of bandwidth in the MEVA II/REDDIG interconexion /	Seg 01/11/10	Seg 10/01/11
79	1.2.2.1.3.3.1	Study the bandwidth necessary for AMHS under current configuration / E	Seg 01/11/10	Sex 31/12/10
80	1.2.2.1.3.3.2	Determine the costs increase for AMHS in the MEVA II/REDDIG / Data	Seg 03/01/11	Seg 10/01/11
81	1.2.2.1.4	Identify and study the new services and applications in the SAM Region / Id	Qua 19/05/10	Qua 08/09/10
82	1.2.2.1.4.1	Long term applications requirements for the SAM Region / Requerimier	Qua 19/05/10	Qua 08/09/10
83	1.2.2.1.4.1.1	ATM AUTOMATION AND SITUATIONAL AWARENESS / AUTOMATI	Qua 19/05/10	Qua 08/09/10
84	1.2.2.1.4.1.1.1	Automation (systems interconnection) / Automatización (Inter	Qua 19/05/10	Qua 30/06/10
85	1.2.2.1.4.1.1.1.1	Analysis of bandwidth requirements for AIDC/OLDI application	Qua 19/05/10	Qua 30/06/10
86	1.2.2.1.4.1.1.1.2	Analizar los requerimientos de ancho de banda para la aplicac	Qua 19/05/10	Qua 30/06/10
87	1.2.2.1.4.1.1.2	Improvement to the situational awareness / Mejora a la Comp	Qua 28/07/10	Qua 08/09/10
88	1.2.2.1.4.1.1.2.1	Analysis of bandwidth requirements for ADS application / Anal	Qua 28/07/10	Qua 08/09/10
89	1.2.2.1.4.1.1.2.2	Analysis of bandwidth requirements for Multilateration applicat	Qua 28/07/10	Qua 08/09/10
90	1.2.2.1.4.1.2	AIM	Qua 19/05/10	Qua 30/06/10
91	1.2.2.1.4.1.2.1	Analyze the bandwidth requirements for related applications / Anali	Qua 19/05/10	Qua 30/06/10
92	1.2.2.1.4.1.3	ATFM	Qua 19/05/10	Qua 30/06/10

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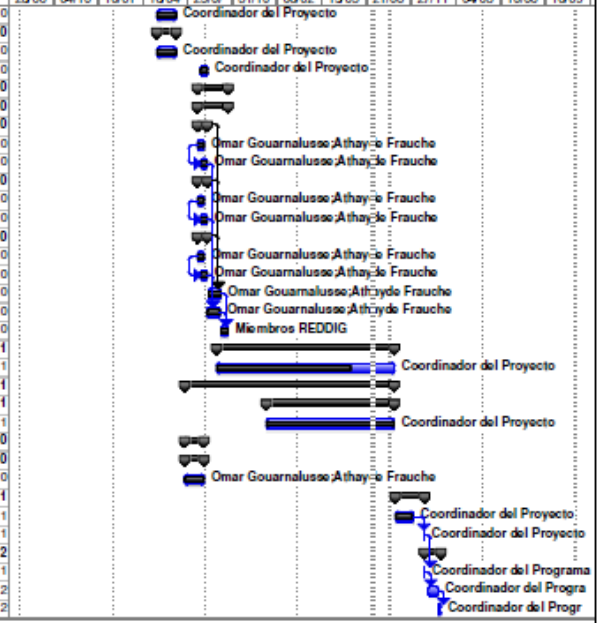
Divisão — Etapa — Resumo do projeto — Etapa externa

Planificación Propuesta
Estudio de una Arquitectura de Red para la ATN SAM
Lista de Actividades

3 / 3

Id	EDT	Nombre de la tarea	Início	Término
93	1.2.2.1.4.1.3.1	Analysis of bandwidth requirements for applications in support of A	Qua 19/05/10	Qua 30/06/10
94	1.2.2.1.4.1.4	**MET**	Qua 19/05/10	Qua 30/06/10
95	1.2.2.1.4.1.4.1	Analizar los requerimientos de ancho de banda para las aplicacion	Qua 19/05/10	Qua 30/06/10
96	1.2.2.1.4.2	Consolidated report on the study for new services and ATM/ATN application	Seg 23/08/10	Seg 06/09/10
97	1.2.2.2	**Study of the desired scenario /Estudio del escenário deseado**	Seg 16/08/10	Sex 22/10/10
98	1.2.2.2.1	**SAM Network / Red SAM**	Seg 16/08/10	Sex 22/10/10
99	1.2.2.2.1.1	**Infrastructure of a satellite network / Infraestructura de una Red Satéli**	Seg 16/08/10	Seg 06/09/10
100	1.2.2.2.1.1.1	Study on a SAM satellite IP network structure / Estudiar una estructura	Seg 16/08/10	Seg 30/08/10
101	1.2.2.2.1.1.2	Determination of SAM satellite network costs / Determinación de los cos	Seg 23/08/10	Seg 06/09/10
102	1.2.2.2.1.2	**Infrastructure of a ground network / Infraestructura de una Red Terre**	Seg 16/08/10	Seg 06/09/10
103	1.2.2.2.1.2.1	Study on a SAM ground IP network structure / Estudiar una estructura d	Seg 16/08/10	Seg 30/08/10
104	1.2.2.2.1.2.2	Determination of SAM ground network costs / Determinación de los cos	Seg 23/08/10	Seg 06/09/10
105	1.2.2.2.1.3	**Infrastructure of a mixed network (satellite + ground) / Infraestructura**	Seg 16/08/10	Seg 06/09/10
106	1.2.2.2.1.3.1	Study on a SAM mixed IP network structure (satellite + ground) / Estud	Seg 16/08/10	Seg 30/08/10
107	1.2.2.2.1.3.2	Determination of SAM mixed network costs / Determinación de los cost	Seg 23/08/10	Seg 06/09/10
108	1.2.2.2.1.4	Comparative analysis between network infrastructures / Análisis comparativo	Qua 08/09/10	Qua 06/10/10
109	1.2.2.2.1.5	Analysis of desired platform implementation costs / Análisis de costos de imp	Seg 06/09/10	Seg 04/10/10
110	1.2.2.2.1.6	Definition of desired platform / Definición de la Plataforma deseada	Qua 06/10/10	Sex 22/10/10
111	1.2.2.3	**Drafting of guide on development of information security / Elaborar Guia de Des**	Seg 27/09/10	Sex 21/10/11
112	1.2.2.3.1	Completion of guide on MEVA II/REDDIG network communications security / Con	Seg 27/09/10	Sex 21/10/11
113	1.2.2.4	**Networks addressing /Direccionamiento de las redes**	Seg 19/07/10	Qui 20/10/11
114	1.2.2.4.1	**Drafting of document on IP routing policy / Elaborar el documento IP Routir**	Sex 14/01/11	Qui 20/10/11
115	1.2.2.4.1.1	Completion of IP routing policy document / Completar el documento IP Routi	Sex 14/01/11	Qui 20/10/11
116	1.2.2.4.2	**IPv4 addressing / Direccionamiento IPv4**	Seg 19/07/10	Seg 30/08/10
117	1.2.2.4.2.1	**SAM NetworkRede SAM**	Seg 19/07/10	Seg 30/08/10
118	1.2.2.4.2.1.1	Completion of IPv4 addressing plan / Completar el plan de direccionami	Seg 19/07/10	Seg 30/08/10
119	1.2.3	**IMPLEMENTATION MONITORING / MONITOREO DE IMPLANTACION**	Seg 24/10/11	Seg 26/12/11
120	1.2.3.1	Consolidation of final project study documentation / Consolidación de la documentación	Seg 24/10/11	Sex 02/12/11
121	1.2.3.2	Delivery of final study documentation to ICAO SAM RO / Entrega de la documentación	Seg 26/12/11	Seg 26/12/11
122	1.2.4	**PROJECT CLOSING / CIERRE DEL PROYECTO**	Ter 27/12/11	Ter 31/01/12
123	1.2.4.1	Reception of project documentation by CNS/ATM/SG / Recibo de documentación del p	Ter 27/12/11	Ter 27/12/11
124	1.2.4.2	ICAO acceptance of studies / Proceso de Aceptación de los Estudios por la OACI	Qua 04/01/12	Ter 24/01/12
125	1.2.4.3	Documentation archiving / Archivo de la Documentación	Qua 25/01/12	Ter 31/01/12



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Página 3

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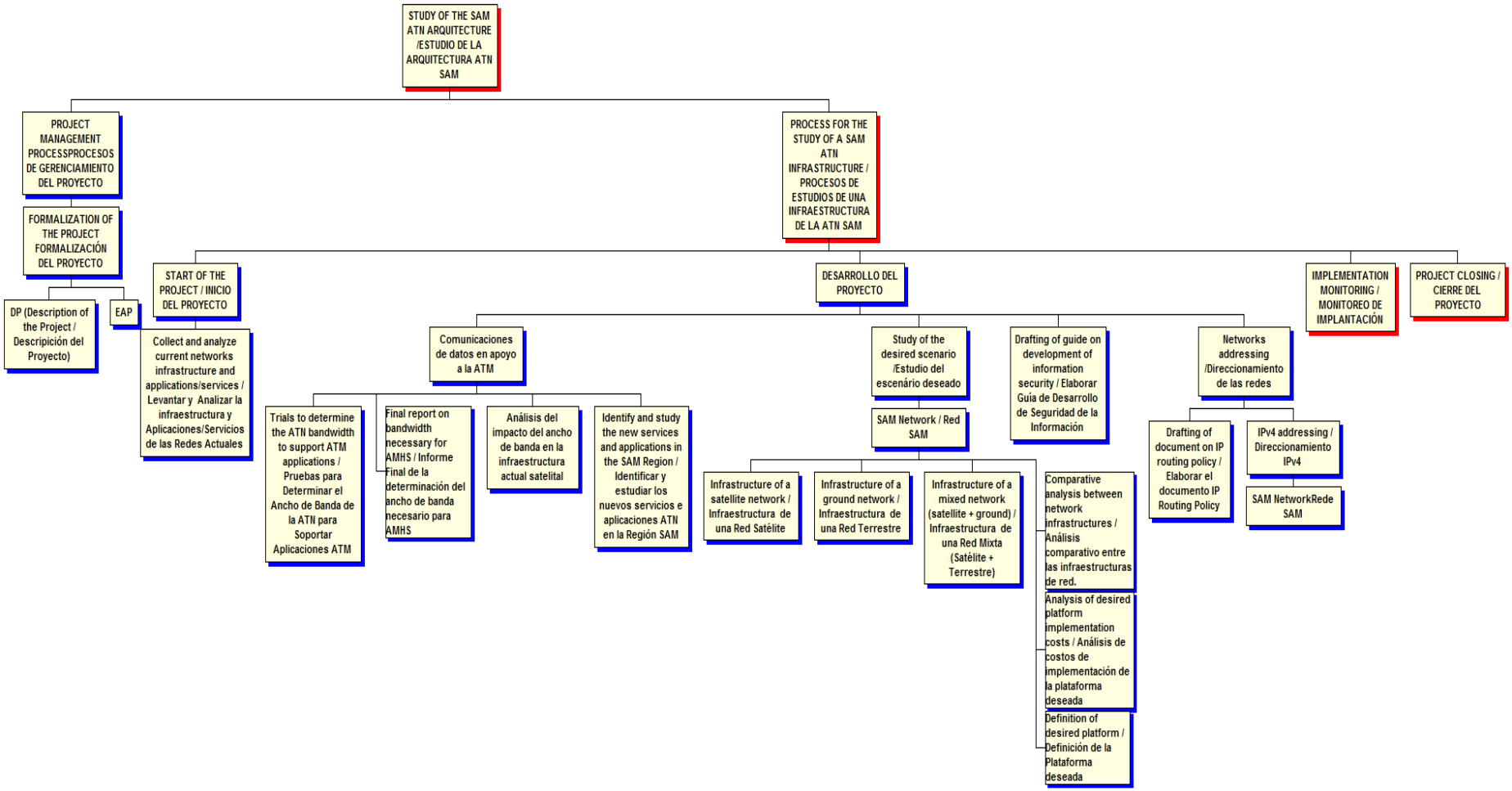
APPENDIX D / APÉNDICE D



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APPENDIX E

ADVANCES IN SAM ATN ARCHITECTURE PROJECT ACTIVITIES

Current status assessment of the SAM – REDDIG (D 1.3) communications network and Long-term applications requirements in the SAM Region (D 1.8).

3.1.2 The CNS1A (AFTN Plan) and CNS1C (ATS direct speech circuits plan) Tables describe the current services offered by REDDIG in response to the requirements set forth in the Air Navigation Plan for the Caribbean and South American Regions, almost all of which are operational today.

3.1.3 A large number of future short, medium and long-term services will need to be added to the REDDIG, as follows:

3.1.3.1 Those deriving from MEVA II – REDDIG interconnection.

3.1.3.2 A Teleconferencing Service for flow management units (FMU) or for flow management posts (FMP) that will operate daily among all units in the Region and will be initially designed for twenty users.

3.1.3.3 The exchange of flight plans and/or radar information by conventional means, in keeping with the respective MoUs (Memoranda of Understanding) that have been or are to be signed.

3.1.3.4 Interconnection requirements for AMHS, which will progressively replace AFTN service, in keeping with the respective MoUs (Memoranda of Understanding) that have been or are to be signed.

3.1.3.5 Interconnection requirements for AIDC, which will progressively replace ATS Speech Service.

3.1.3.6 Exchange of ADS-B data and multilaterization among all ACCs of adjacent FIRs.

3.1.3.7 Interconnection of automated systems using Asterix 62 and 63 and exchange of radar data using Asterix (1,2,34,48) protocols, among all ACCs of adjacent FIRs.

3.1.3.8 AIM requirements: to date, no concrete requirements have been received.

3.1.4 These activities made it possible to determine the necessary interfaces that will enable REDDIG telecommunications equipment to support all current and future requirements:

State	**Site**	**Minimum Interfaces**					
		Serial	**Ethernet**	**Digital**	**E&M**	**FXO**	**FXS**
Argentina	Ezeiza	11	1	0	11	0	1
Bolivia	La Paz	4	1	0	4	0	4
Brazil	Curitiba	4	1	0	6	2	1
	Manaus	6	1	0	7	0	5
	Recife	1	1	0	7	0	1

State	Site	Minimum Interfaces					
		Serial	Ethernet	Digital	E&M	FXO	FXS
Chile	Santiago	2	1	0	8	0	0
Colombia	Bogotá	7	1	1	0	0	0
Ecuador	Guayaquil	3	1	1	0	0	0
French Guiana	Rochambeau	2	1	0	0	0	5
Guyana	Georgetown	4	1	0	0	0	5
Paraguay	Asunción	3	1	0	3	0	3
Peru	Lima	9	1	1	0	0	0
Suriname	Paramaribo	3	1	0	0	0	4
Trinidad and Tobago	Piarco	2	1	0	0	0	6
Uruguay	Montevideo	2	1	0	0	4	5
Venezuela	Maiquetía	10	1	0	7	0	4

Table 1: Interfaces of Future Routers

3.1.5 Regarding the bandwidth for current and future applications, Table 1 shows the needs identified for REDDIG.

State	Site	Service (each in kbps)		
		Radar	AMHS	ADS-B
Argentina	Ezeiza	76.8	28.8	19.2
Bolivia	La Paz	115.2	14.4	19.2
Brazil	Curitiba	76.8	19.2	19.2
	Manaus	134.4	33.6	19.2
	Recife	0	4.8	19.2
Chile	Santiago	57.6	9.6	19.2
Colombia	Bogotá	76.8	38.4	19.2
Ecuador	Guayaquil	38.4	14.4	19.2
French Guiana	Rochambeau	38.4	9.6	19.2
Guyana	Georgetown	57.6	19.2	19.2
Paraguay	Asunción	57.6	9.6	19.2
Peru	Lima	96	43.2	19.2
Suriname	Paramaribo	76.8	14.4	19.2
Trinidad and Tobago	Piarco	19.2	9.6	19.2
Uruguay	Montevideo	19.2	9.6	19.2
Venezuela	Maiquetía	76.8	38.4	19.2

State	Site	Service (each in kbps)		
		Radar	AMHS	ADS-B
Partial total (kbps)		1017.6	316.8	307.2
Partial grand total (kbps)		1641.6		
AFTN difference		-103.2		
Net increase in bandwidth		**1538.4**		

Table 2: Estimated Additional Bandwidth

3.1.6 An analysis of Table 1 2 leads to the following observations:

3.1.6.1 It should be noted that the bandwidth the AFTN will cease to use should be subtracted from the indicated increases, for the service is provided by either AFTN or AMHS, but never in parallel. As a result, that value is inserted on the next-to-the-last line of Table 2, where it is subtracted from the total, leaving the net increase in bandwidth needed for the application.

3.1.6.2 **No increase in bandwidth is required** for ATS speech circuits, inasmuch as no additional direct or switched operational requirements are foreseen in Table CNS1C.

3.1.6.3 The additional bandwidth requirement produced by the exchange of radar data will depend exclusively upon the MoUs (Memoranda of Understanding) States have signed or will sign. In order to make an initial calculation of the amount, it is estimated that each State will transmit and receive at least either data from one radar or synthesized information to/from adjacent States. **For that reason, the total bandwidth needed for radar applications amounts to approximately 1 Mbps.**

3.1.6.4 The remaining REDDIG interfaces and bandwidth capacity are estimated to be sufficient to absorb the demand for ATFM teleconferencing service, even during peak moments of voice and data traffic. **For that reason, no additional bandwidth is needed.**

3.1.6.5 To calculate the additional bandwidth needed for AMHS application, the primary conclusions of the tests made between Manaus and Ezeiza have been applied. **Consequently**, **the additional bandwidth requirement has been estimated at approximately 320 kbps.**

3.1.6.6 It is estimated that, for AIDC implementation, the reduction in ATS voice service will offset the increase in message traffic. Only during the transition period, while AIDC is being implemented, could the bandwidth increase. Once that phase has been completed, with the progressive deactivation of voice communications, bandwidth consumption will begin to decline, until the need to continue using voice circuits completely disappears. **As a result, no additional bandwidth is needed for AIDC.**

3.1.6.7 The increase in the bandwidth for automated radar data exchange systems using Asterix 62 and 63 is a case similar to that of AIDC. The moment of greatest bandwidth need will arise when use of that service has been completely disseminated throughout the Region, while *temporarily* maintaining the obligation to continue transmissions of the “radar toward the automated centre” type. **Therefore, no additional bandwidth is required for this application.**

Tests for determining the necessary bandwidth for AMHS applications (D1.7)

3.1.7 Tests were conducted between the Ezeiza (CIPE) and Manaus MTAs, in order to determine the minimum bandwidth needed for operation among MTAs during AMHS implementation.

3.1.8 Figure 1 illustrates the scenario used, including the IP addressing plan.

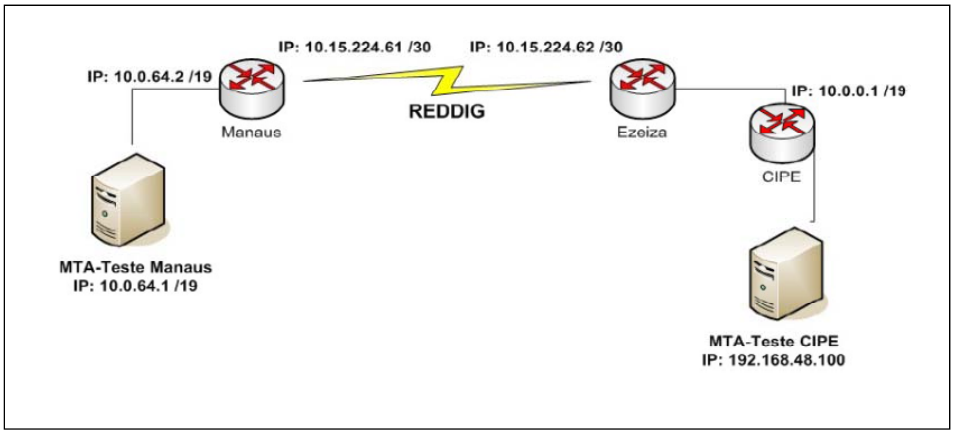


Figure 1: Connectivity scheme

3.1.9 Table 3 covers part of the tests conducted using 1 KB-sized messages and speeds of 64, 32 and 4.8 Kbps that are configured in the REDDIG.

Test No.	Description	Link speed (Kbits/s)	Total time (hh/mm/ss)	Messages exchanged / hour	Messages exchanged / second	Transit time for each message (seconds)
1	Transmission Of 50001KB messages	64	0:59:21	5000	1.39	0.72
2	Transmission of 5000 1KB messages	32	2:18:00	2174	0.6	1.66
3	Transmission Of 25 1KB messages	4.8	11:42:00 (*)	427	0.12	8.43

(*): if the test would had covered 5000 messages

Table 3: Tests and Results obtained

3.1.10 The conclusion reached is that a bandwidth of 4.8 kbps is sufficient to support peak hour message exchanges between Argentina y Brazil, which have the heaviest traffic in South America.

3.1.11 As a result, that speed is taken into account for estimating the bandwidth for all South American MTAs in the future REDDIG.

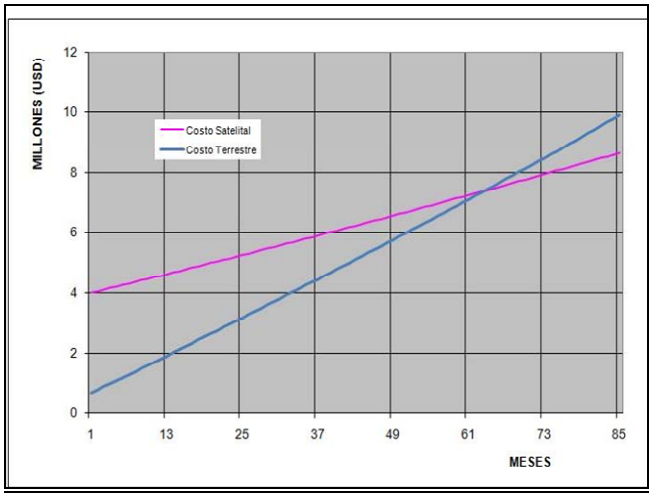
3.1.12 For the case of messages between Brazil and the United States, a speed of 9.6 or 16 kbps can be sufficient for the application.

Comparative study of IP-based satellite, ground and mixed (satellite and ground) network models for the SAM Region (D 1.10)

3.1.13 The studies conducted to choose an IP platform for the SAM Region are summarized as follows:

3.1.14 It was decided, based on the studies conducted in the SAM Region, that the most appropriate structure for the future REDDIG would be a mixed one.

3.1.15 A comparison of the costs of a satellite network with those of a ground network revealed that the former is more advantageous, as can be seen in Figure 2.



Millions of U.S. dollars

Satellite cost
Ground cost

Figure 2: Cost Comparison for a Satellite Network and a Ground Network over time

3.1.16 From an economic and technical-operational viewpoint, a satellite structure is more advantageous for States in the South American Region than one that is purely ground-based. On the other hand, however, hiring a ground network at the same time would mean (in the first place) ensuring availability and allowing for a natural increase in traffic. As a result, a mixed network configuration is presented that could be applied until the South American Air Navigation and Safety Organization is created.

3.1.17 The infrastructure of that network is based on the scheme shown in Figure 3.

STATE A STATE B

SATELLITE NETWORK

GROUND

NETWORK

STATE C

MODEL OF PROPOSED

MIXED INFRASTRUCTURE

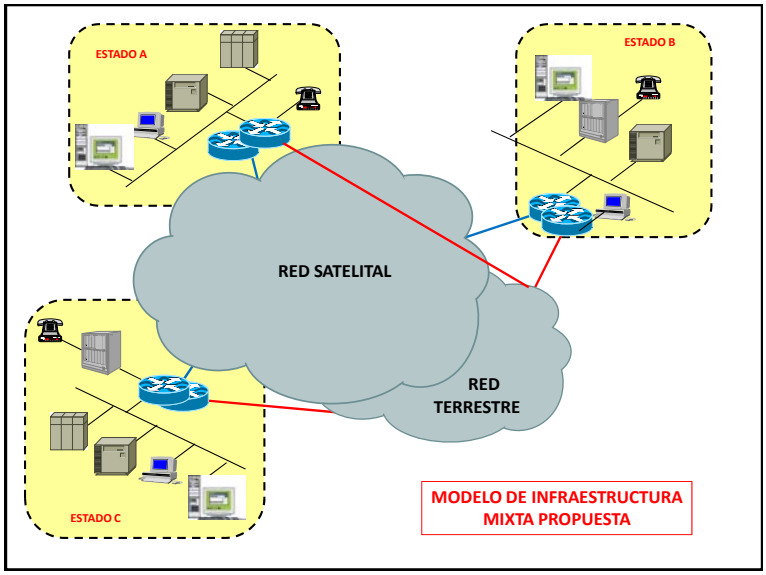


Figure 3: Proposed Infrastructure Scheme

3.1.18 The network would be a mix of *a main satellite network and another ground network* that would increase the capacity of the network to carry new ATN applications and, as already explained at length, also increase availability in the system for their support.

3.1.19 For that purpose, the satellite portion would be endowed with duplicate chains to ensure a high level of availability, while the ground portion would have a chain allowing for the practical availability supplied by most ground networks.

- END -