



Agenda Item 2: Report of the activities carried out to date since the last REDDIG Coordination Committee meeting

ATN IMPLEMENTATION AND APPLICATIONS SET UP IN ARGENTINA

(Presented by Argentina)

SUMMARY	
This working paper presents information on the implementation of ATN and its applications in Argentina.	
References: <ul style="list-style-type: none">• Report of GREPECAS ATM/CNS/SG ATN/TF/4 meeting;• Report of CNS/ATM/SG/1 meeting;• Report of GREPECAS/15 meeting;• Report of SAM/IG/2 meeting;• Guidance for the implementation of national IP ATN networks;• Report of REDDIG RCC/12 meeting; and• Report of SAM/IG/3 meeting.	
ICAO strategic objectives:	<i>A – Safety; and C – Environmental protection and sustainable development of air transport.</i>

NOTE: Sections 1 to 3 summarizes the first part of “GUIDANCE FOR THE IMPLEMENTATION OF NATIONAL DIGITAL NETWORKS THAT USE THE IP PROTOCOL, TO SUPPORT CURRENT AND FUTURE AERONAUTICAL APPLICATIONS”, document presented by RLA/06/901 project (Implementation Group of the SAM Region (SAM/IG)) and circulated to the States of the Region.

1. Considerations to start the ATN over the IP

1.1 The decision to implement the IPS is both a cost-effective and a technical decision. There are many vendors and service providers for the equipment and the establishment of an IPS network. This has created a competitive environment that should offer ICAO Contracting States favourable prices when buying equipment and network services.

1.2 There are many companies that provide network equipment and IPS-based services, while the establishment of an OSI network gradually reduces their capacity to provide support. Since IPS is the global *de facto* standard for the establishment of a network, supported by many years of implementation, there are many engineers with experience in the establishment of networks who are available to support implementation. This knowledge base can support the deployment of an IPS-based ATN.

1.3 It is absolutely necessary to quickly start a training and/or certification program in IPS networks that will provide the State with a minimum number of individuals for the satisfactory installation, implementation, management, and maintenance of the IPS network.

2. **Planning elements of the domestic ATN**

2.1 The basic recommendation that should be followed by each State is that the IPS network *must be exclusively private*.

2.2 Each State may select the *provider* of the *IPS elements* that it deems advisable; however, this selection must be practically definitive, since it is not advisable to have equipment of various brands being used for the same purpose, since that would represent an unnecessary *multiplication* of training, spare parts, human resources and remote management.

2.3 Likewise, each State (based on its technical and economic policies) shall decide if the IPS network will be:

2.3.1 Supported by *ground or satellite networks* (or a combination of both).

2.3.2 Based on a network of *self-owned or leased* links to the PTTs.

2.3.3 Carried on dedicated lines or switched connections. Switched connections, in turn, may consist of switched circuits or switched packages/cells.

2.4 If use is made of point-to-point and of simple or duplicated accesses to the WAN (wide area network) at each end point.

2.5 The networking elements can be simple or duplicated.

2.6 Remote Network Management: The network shall be installed in such a way to permit the display and remote management of *all and each one of its components*.

2.7 *Addressing plan*

2.7.1 Each State may internally use the addressing scheme approved by GREPECAS/15 (Rio de Janeiro, 13-17 October 2008) or any other it prefers, but it is recommended that:

2.7.1.1 Network addresses be assigned in continuous blocks.

2.7.1.2 Address blocks be distributed in hierarchical order to allow for routing scalability.

2.7.1.3 Subnetwork configuration be allowed in order to maximise the use of each assigned network.

2.7.2 Each State, for the inter and intra-regional communications links for ATN ground applications, must implement the addressing scheme approved by the CNS/ATM/SG/1 meeting (Lima, 15 to 19 March 2010).

2.7.3 The only addresses assigned and known to the other States will be those of communication equipment interfaces used in the interconnection boundaries between internal and external networks in each State.

2.7.4 State must guarantee the routing through its network to the internal address(es) of the application servers used in other States.

3. **Implementation of CNS/ATM applications over the ATN**

3.1 So as not to disturb the normal development of air operations, it is recommended that services be transferred to the IPS network gradually, one at a time.

3.2 As already established, *AMHS* **must** be the first service to be mounted on the IPS-based ATN.

3.3 Once the deployment of this particular service has been completed, each State may choose:

3.3.1 To continue with other data services (radar signals, AIS and/or MET applications, AIDC, OLDI, etc.); or

3.3.2 To begin the transfer of operational voice services (direct or switched ATS communications); or

3.3.3 A combination of both.

3.4 *Radar signals*: If these are generated in a native IP form, they will be mounted directly according to the corresponding addressing. If they are generated in a synchronous serial form, be it V.35 or V.24, they must be entered in the network in a “multicast” so that they can be received at their destination.

3.5 *AIDC*: This application shall be “mounted” over the *AMHS* application; thus, its transport over the IP network is immediate.

3.6 *ATS speech communications (ACC – TWR or between ACCs of the same State)*: Pre-operational tests should be started by duplicating conventional circuits with high traffic density airports in order to detect/correct problems that might emerge. Once this stage has been completed, use shall be extended to the rest of the network.

3.7 *ATS speech communications (between ACCs of different States)*: via REDDIG, once the necessary bilateral or multilateral arrangements have been made.

4. **Decisions in Argentina with respect to ATN and implementations over it**

4.1 *¿When and why?*: Even though the Administration felt that IP would convert itself on the basis of the ATN, it waited until one of the great actors in the aeronautical scenery adopted a definition. This occurred during the last meeting of the ATNP (Toulouse, 2002), when Euroncontrol informed it would start the deployment of *AMHS* over IP, in 2005. As of that date, Argentina started preparations for the installment of *AMHS* over IP in the whole country, during 2004/2005.

4.2 *Implementation of the national ATN*: basic regulations adopted

4.2.1 Totally private.

4.2.2 Cisco is the almost exclusive provider of the network elements, only 3Com switches for small sites / aerodromes.

4.2.3 Supported by ground links, satellite or both, owned in the Buenos Aires metropolitana area, and rented in the rest of the country.

4.2.4 Transported over:

- a) dedicated lines with single or double access to large and medium airports;
- b) switched package for small airports.

4.2.5 Network elements duplicated in the most important sites.

4.2.6 IP Addressing:

An addressing scheme for private networks Class "C" was nationally applied. Each IP address has an implicit meaning that relates to its location as well as to the type of hardware and identification (there are no ambiguities with respect to each device.) In this regard the global structure is:

192.168.XXX.YYY where

XXX: Identifies each enabled sites.

YYY: Identifies the device according to:

IP Assignment at each site		
Addresses 1 – 63	Networking equipment	63 IP
Addresses 64 -126	Servers	63 IP
Addresses 127 – 254	Terminals	128 IP

Por example, in Ezeiza:

192.168.192.1 to 192.168.192.63 corresponds to the routes of routers, switches, gateways, etc.

192.168.192.64 to 192.168.192.126 corresponds to the routes of servers

192.168.192.127 to 192.168.192.254 corresponds to the routes of UA (User Agents)

4.2.7 *Remote management:* centralized in Comodoro Rivadavia (FIR Comodoro Rivadavia), Córdoba (FIR Córdoba and FIR Mendoza) and Ezeiza (all the FIRs), using Cisco Works SNMS, according to:

Functionality	Application of SNMS
Construction of the network topology	What's Up Gold
Device configuration	Cisco View
Management	RME (Resource Manager Essentials)

Attachment A shows some print screen displays that are available in the Ezeiza management position.

4.3 *Current and future operative implementations on ATN IP Argentina.*

4.3.1 *AMHS:* full national operation of the MTA / MS of Ezeiza since 20 January 2006. Since then only remain in AFTN international connections (Uruguay, Paraguay, Bolivia, Peru, Chile, Brazil and South Africa) and a few users of national terminals.

During 2008, proceedings took place on:

- a) Updating of hardware and software of Ezeiza's MTA.
- b) Enabling operational MTA / MS of Cordoba.
- c) Enabling operational MTA / MS of Comodoro Rivadavia.
- d) Enabling MTA / MS for training in the Training, Improvement and Testing Center (CIPE).

4.3.2 *AIDC on AMHS:* in preoperational use among Ezeiza's and Córdoba's ACCs.

4.3.3 *Transport of radar signals:* signals of seven (7) secondary radars natively generated in Asterix and IP (Bariloche, Neuquén, Santa Rosa, Quilmes, Córdoba, San Luis, Bahía Blanca) were implemented on ATN. During the current and next year other 11 radar signals (5 of them generates the signal in serial form) will be added.

4.3.4 Through REDDIG (international) and the ATN network, the data exchange between Argentina and Uruguay has been achieved. At present radar data of Durazno is being received as test and radar data of Córdoba is being sent. In the short term radar data of Paraná and Quilmes will be sent to Carrasco.

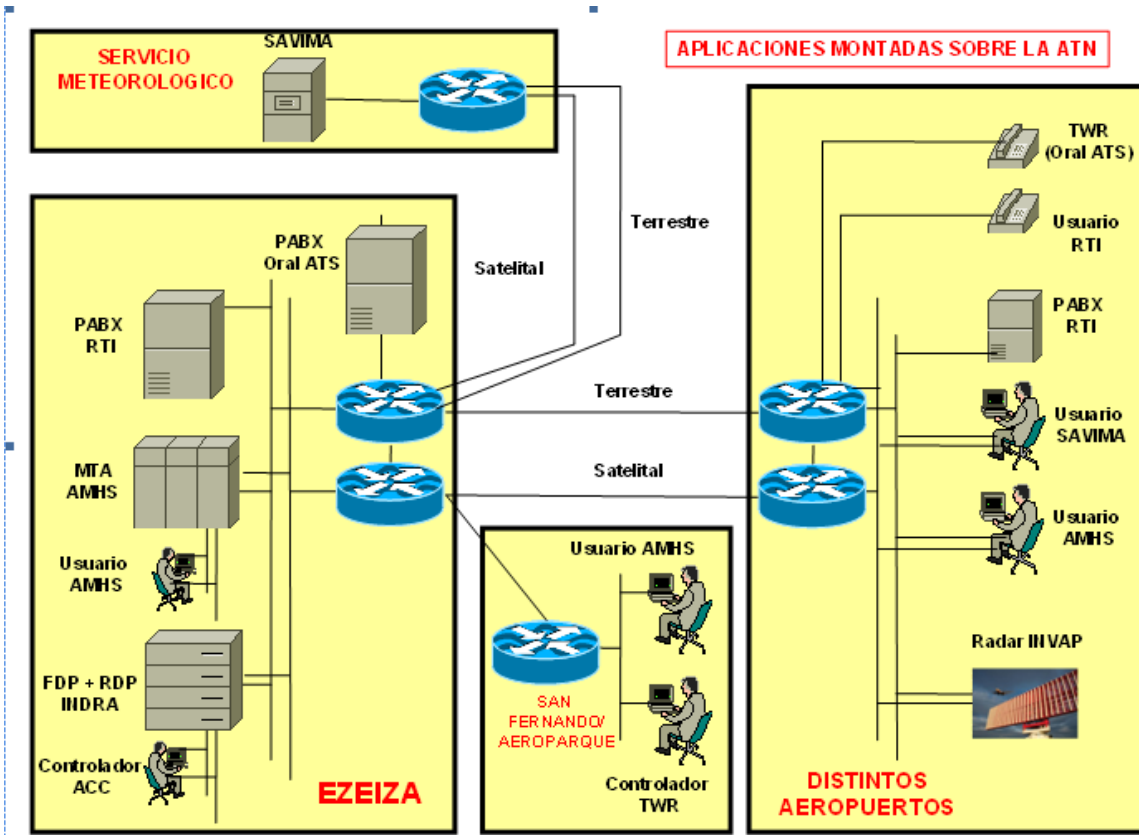
4.3.5 A weather application (Automatic Meteorological Aeronautical Display) in 16 airports.

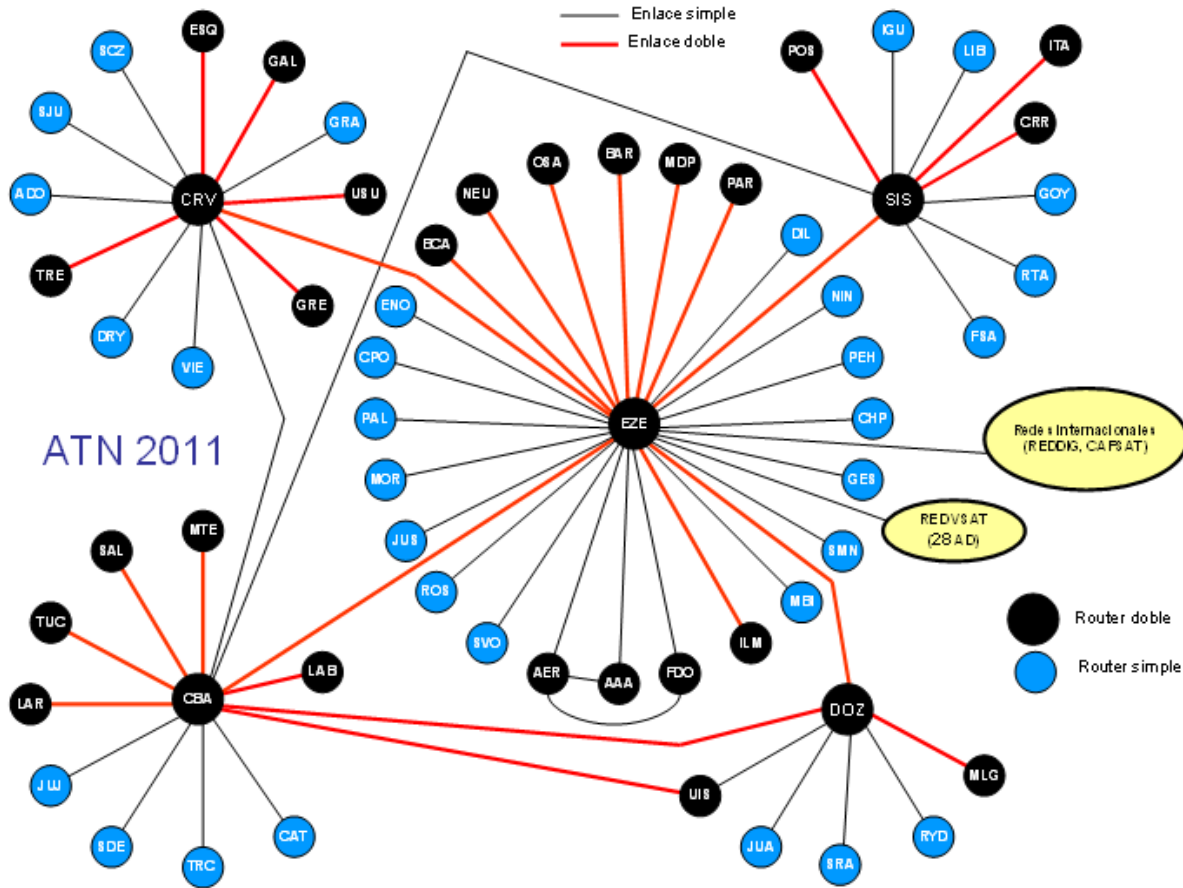
4.3.6 Remote Control Post of ACC Ezeiza (FDP / RDP Aircom 2100 Indra) in Aeroparque Jorge Newbery, located inside the city of Buenos Aires) and in San Fernando. An additional post was installed in the ACC Resistance before Apri.

4.3.7 *ATS Speech Service:* running between the Ezeiza ACC and towers of thirteen (13) airports, between the Comodoro Rivadavia ACC and 10 airports, between Córdoba ACC and seven (7) Airports. It is estimated that by mid-2011 this service will be completely carried by the national ATN.

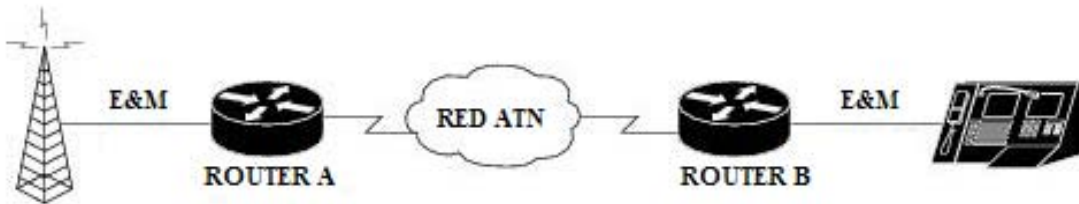
4.3.8 *Integrated Telephone Network Service:* for administrative coordinations it has been implemented in the PABX interfaces ip so-called IPTrunk for the case of the trunks links (eg Ezeiza-Commodore Rivdavia Ezeiza) and IPGateway for the case of branches of key nodes (eg Neuquén enters to Ezeiza via ATN).

4.3.9 *Aeronautical Mobile Service:* this will be the last service to be admitted into the network, once the others are completed (trials are being made in the TMA BAIREs so-called "Testing Air Traffic Control remote station through voice link by IP ". It is estimated to begin the trails at the end of 2011).





Aeronautical Mobile Service: “Testing of Air Traffic Control remote station through voice link by IP”



5. Trials of intra and extra regional implementation in which Argentina participates.

5.1 Executed

5.1.1 Establishment of the IP addresses of frontier devices and MTAs of Argentina, Paraguay, Brazil and Peru, and interconnection trials between routers, as follows, using the established Regional Addressing Plan:

Link Gateways Addresses				
	Argentina	Perú	Paraguay	Brasil
Argentina		10.15.224.13/30	10.15.224.9/30	10.15.224.62/30
Perú	10.15.224.14/30		10.15.224.157/30	
Paraguay	10.15.224.10/30	10.15.224.158/30		10.15.224.70/30
Brazil	10.15.224.61/30		10.15.224.69/30	

MTAs Addresses			
Argentina	Perú	Paraguay	Brasilia
10.0.0.1			10.0.64.2

5.1.2 *Trials between Argentina and Paraguay MTAs*

5.1.3 *Trials between non-operational MTAs of Ezeiza and Madrid:*

Spain has equipped the Canary Station of CAFSAT with the elements to meet Argentina; a speech channel between Madrid (AENA) and Ezeiza has been enabled for a better coordination.

The IPv6 addresses used for the trials between Argentina and Spain are: Interconnection Subnetwork: 2001:4 B50: 150:: 14:4 / 126 (Spain: 2001:4 B50: 150:: 14:5 and Argentina: 2001:4 B50: 150 :: 14:6).

The virtual IPv6 pre-operational network assigned to AMHS Argentine servers could be: 2001:4 B50: 170:: / 96.

The actual IPv4 addresses of the servers from both administrations will be translated into the corresponding IPv6 address

Both ranges of addresses will be defined unilaterally by Argentina and publication is not necessary.

The virtual IPv6 address with which Argentina will see the Spanish MTA is 2001:4 B50: 0AB0:: A45: 46E.

Initially, connectivity among inter-network interfaces.

5.1.4 *Voice trails among Brasilia, Manaus and Ezeiza, using simple and double satellite hop.*

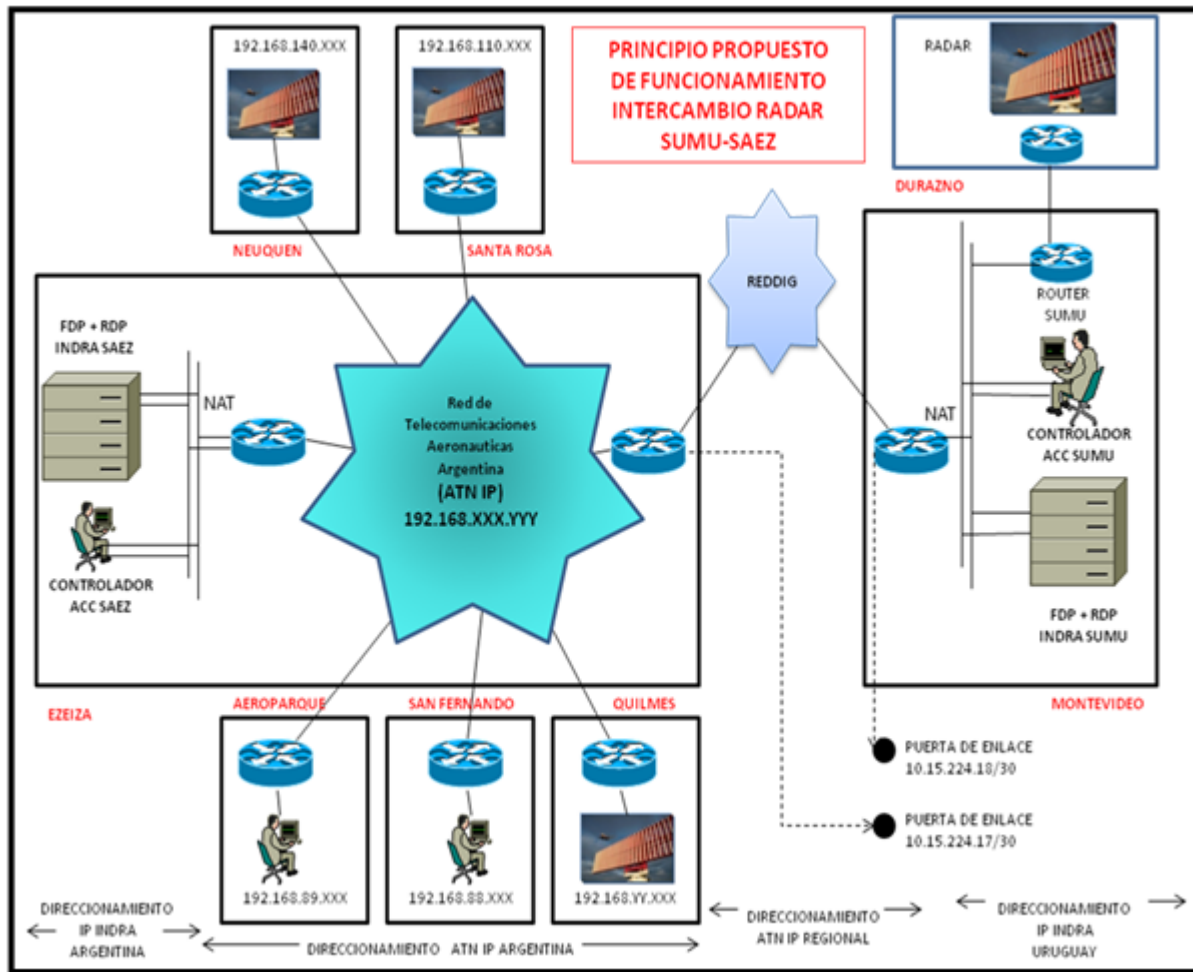
5.1.5 *Implementation of link between Argentina and Uruguay.*

During the ATM/CNS Multilateral Meeting (SAM ATM-CNS MULTI) carried on in Lima, Perú, from 14 to 18 September 2009, a Memorandum of Understanding was signed for the interconnection of the automated systems of Argentina and Uruguay, which included a technical-operative agreement for the:

- a) Current Scenario Analysis
 - ✓ Transfer of Surveillance Data (since 1999 Ezeiza and Carrasco radar data are exchanged – proprietary transmission protocols)
 - ✓ Transfer of flight plans (voice)
- b) Election of Exchange Scenario
 - ✓ Transfer of Surveillance Data (Quilmes – El Durazno – Asterix transmission protocols under TCP/IP).

- ✓ Transfer of flight plans (data – AIDC service will be enabled once Uruguay disposes of same).
- c) Implementation Strategy
 - ✓ Data transport network: Intrarregional ATN IP.
 - ✓ Means of communications: REDDIG.
 - ✓ Channel: DLCI to be implemented by a REDDIG expert.
 - ✓ Frontier ATN elements: Routers.
 - ✓ IP addressing of the routers link gateways: according to the Regional Addressing Plan
 - ✓ Serials interfaces: V.35.

Functional Schematic Diagram



Appendix B shows a basic scheme of connectivity for the development of the executed AMHS trials and to be executed among Argentina, Paraguay and Spain.

An AMHS Simulator installed in CIPE will be used for the corresponding trials.

Identical pattern scheme will be used when performing the future trials with the Lima and Manaus MTAs.

5.2 Planned for the current year.

5.2.1 Trials among Ezeiza's - Manaus' – Asunción's – Lima's MTAs.

5.2.2 In December 2010 MoU between Argentina and Chile was signed for the interconnection of automated systems and for the interconnection of AMHS systems.

- a) Interconnection of automated systems (radar data exchange)
11 Argentine radars and 10 Chilean radars.
Installation of border elements: September 2011.
Trials: October 2011.
Operational Status planned for October 2011.
- b) Interconnection of AMHS systems
Preparatory Phase: May 2011-02-16 Operational Phase: June 2011.

6. Data of ATN and Argentina's AMHS

6.1 ATN

6.1.1 IP Access Sites: 93, double at 16 sites and simple at 77.

6.1.2 Ground Access: 21 sites, satellite: 56 sites and both simultaneously in 16.

6.1.3 Dedicated lines: 37 sites and access by packet-switched in 56.

6.1.4 Installed network elements: 81 routers, 86 switches, 29 LAN extension, 12 1 converters E1 G.703/V.35.

6.1.5 Duplicate elements: Routers, in 18 sites (quadrupled in Ezeiza), and switches in 15.

6.2 AMHS

6.2.1 MTA: 5, of which 3 are operative (Ezeiza, Córdoba, Comodoro Rivadavia), 1 belongs to the Simulator System and 1 is the reserve.

6.2.2 MS: 5, same as previous.

6.2.3 DS (X.500): 1 operative (Ezeiza) and 1 of the Simulator.

6.2.4 Gateway: 2, one operative (Ezeiza), with 12 AFTN channels (7 international + 5 national) and 1 in the Simulator.

6.2.5 Addressing: CAAS.

6.2.6 Exchange of messages protocols: MTA-MTA: P1 / UA-MS: P7.

6.2.7 Sites that have at least one terminal: 94.

6.2.8 Users – computer (Flight Data Processor – AU): 2 (Ezeiza y Córdoba).

6.2.9 Users – persons (Terminals - UA): 194.

6.2.10 Mailbox: 2100.

7. **Suggested action**

7.1 The meeting is invited to:

- a) Take note of the information submitted.
- b) Present their points of view.
- c) Recommend any action accordingly.

ATTACHMENT A

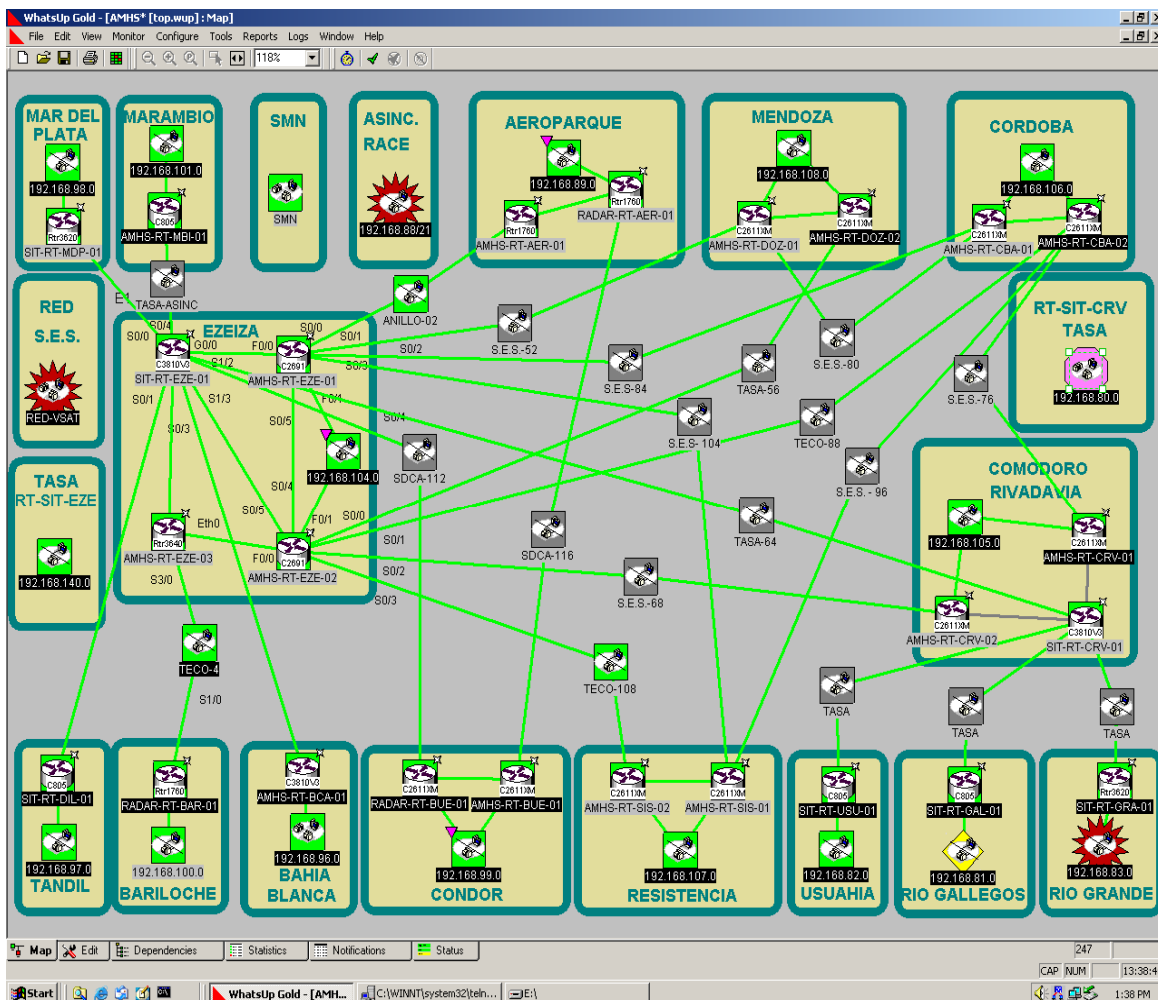
ATN MANAGEMENT

1. Image of the management main screen, which displays the main part of the Argentina's ATN (ACCs and airports), as well as the general condition of each site involved and of the links (green = normal, varying shades of red = problems.)

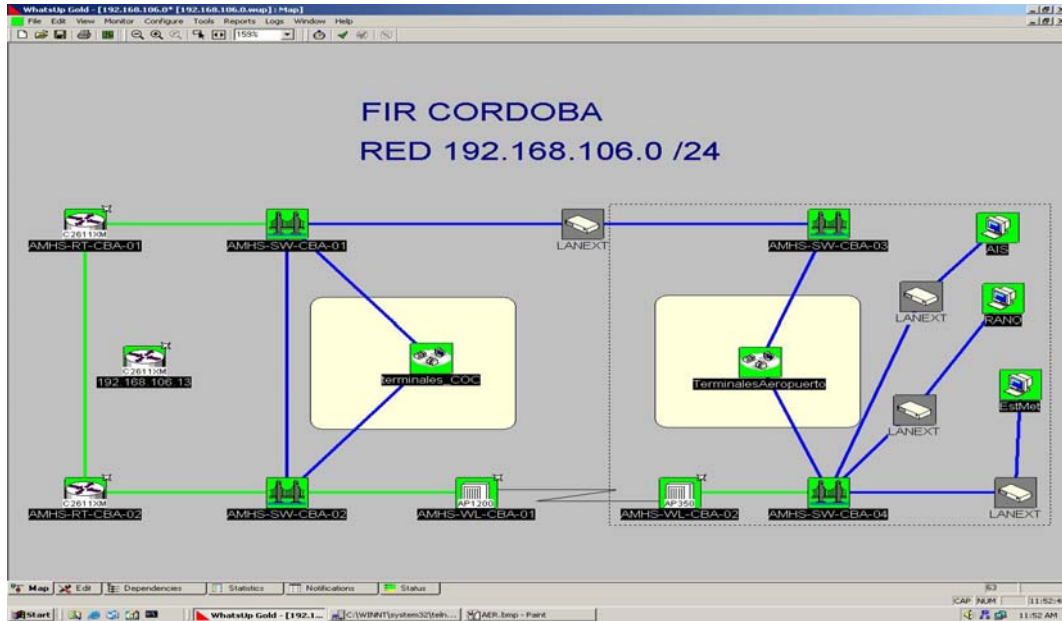
The figures inserted in the links indicate whether the provider is terrestrial (TECO means Telecom, TASA means Telefónica, ANILLO indicates that it is by radio link, SDCA indicates that is by phone board) or if it is via satellite (indicated as SES, borrower). In the case of Ezeiza, the occupied serials are also shown for each link occupied.

Regarding the nomenclature, it is of type XXX – RT – YYY – ZZ, where:

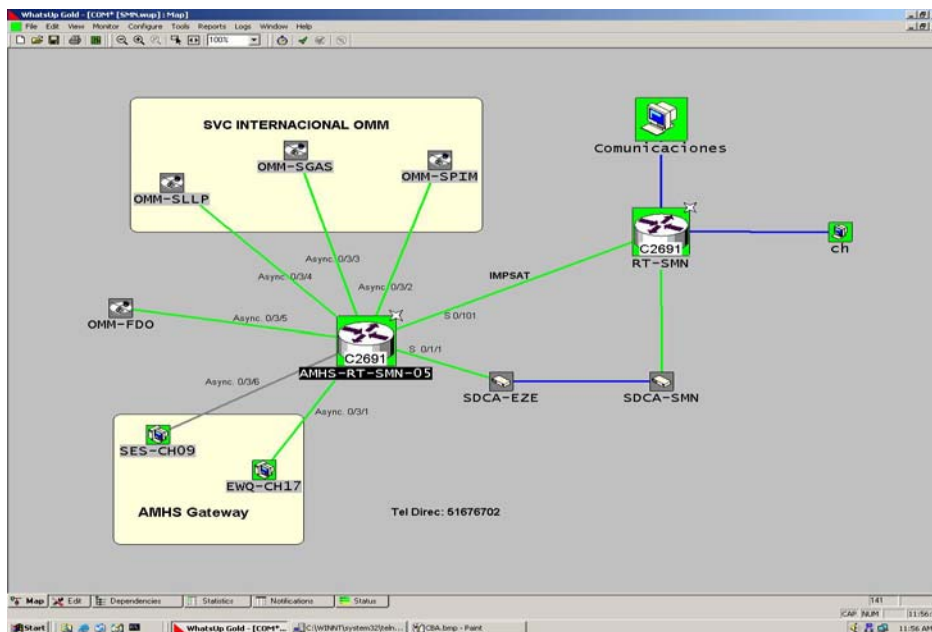
- 1 °) XXX: identifies the source of entrance of the router.
- 2 °) RT: Router (SW indicated switch).
- 3 °) YYY: Site where you installed the router.
- 4 °) ZZ: serial position occupied.



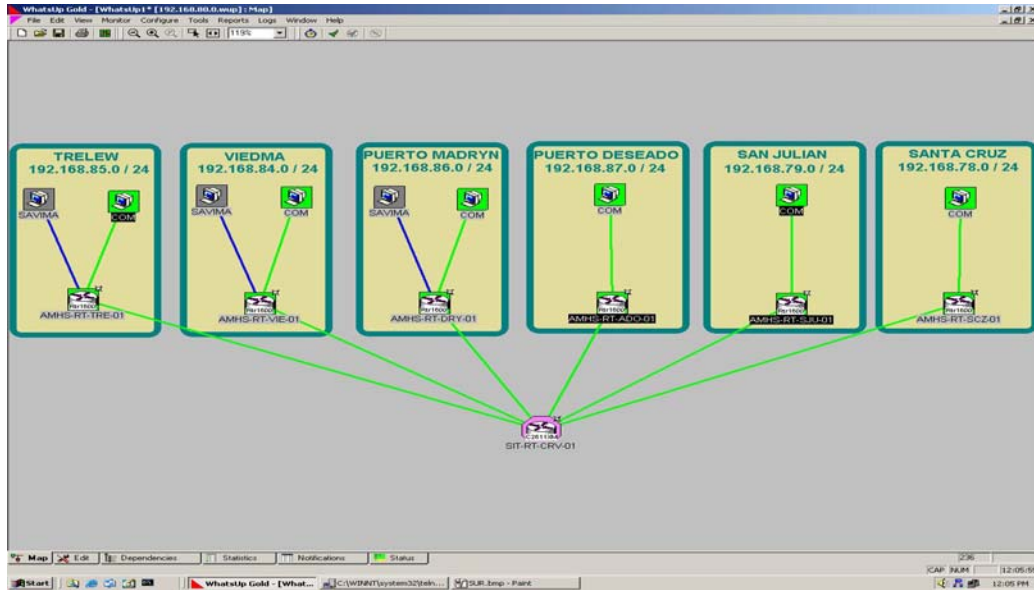
2. Image of an ACC (Córdoba), showing a scenario that is repeated in the rest of the ACCs, that is dual router for the WAN, double-switch and dual LAN for the terminals corresponding to same and duplicate connection (via wireless and LAN extension) with the switches of the airport area, which also has its dual LAN. “COC Terminals” clicking on allows the accessing to terminals’ image of ACC field only, while the same procedure is performed to visualize and manage the “Airport Terminals”.



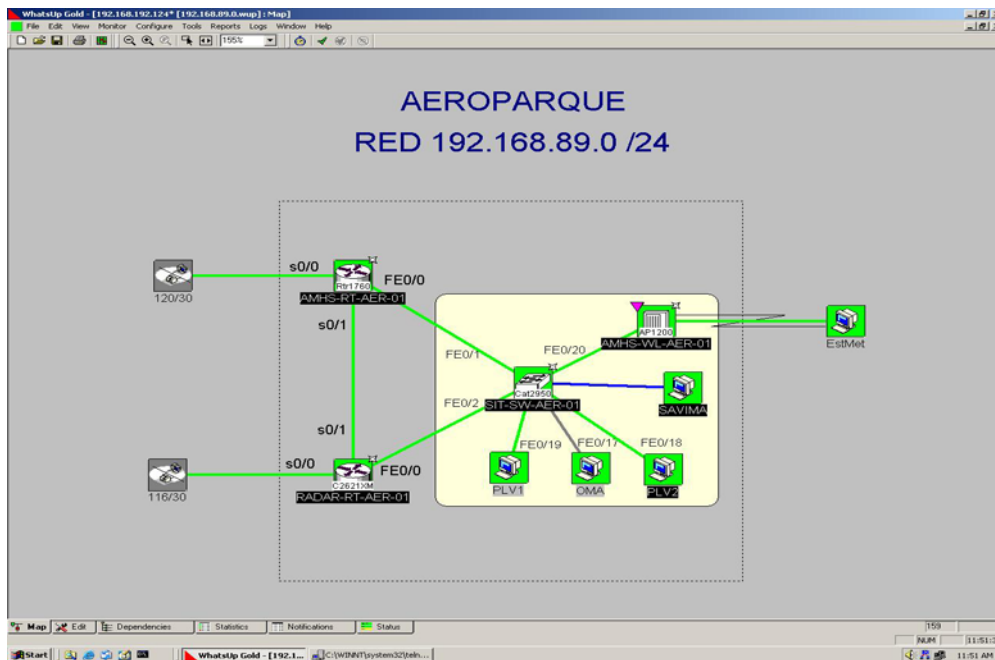
3. Image of the integrated operation with the National Weather Service, showing the use of AFTN gateway, a router at each end, double bond (one terrestrial through an asynchronous channel at 19200 bds by telephone and one satellite using a PTT), a Terminal AMHS, the device that processes the weather information (“Ch”) and the interconnections with other meteorological centers of the region (OMM-SLLP, OMM-SGAS, OMM – SPIM), by REDDIG.



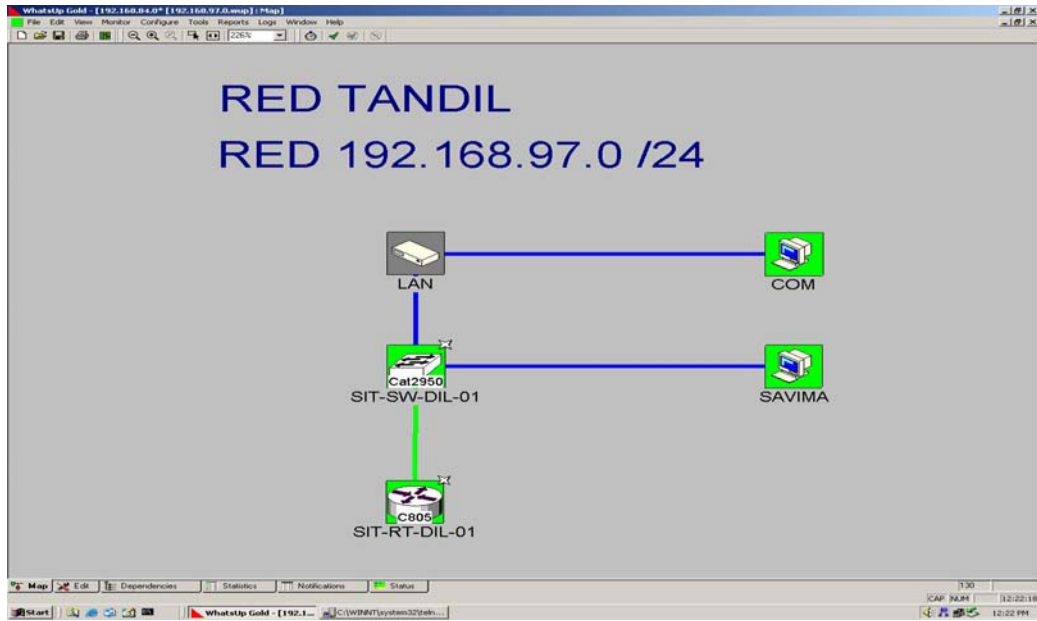
4. Image of a section of the FIR Comodoro Rivadavia, where there are 6 small airports (all linked to the ACC in earthy form), which shows its IP address range, each one with an AMHS Terminal, while 3 of them have a SAVIM service terminal (Aviation Weather Display System), whose central server is located at the National Weather Service, located in Buenos Aires City.



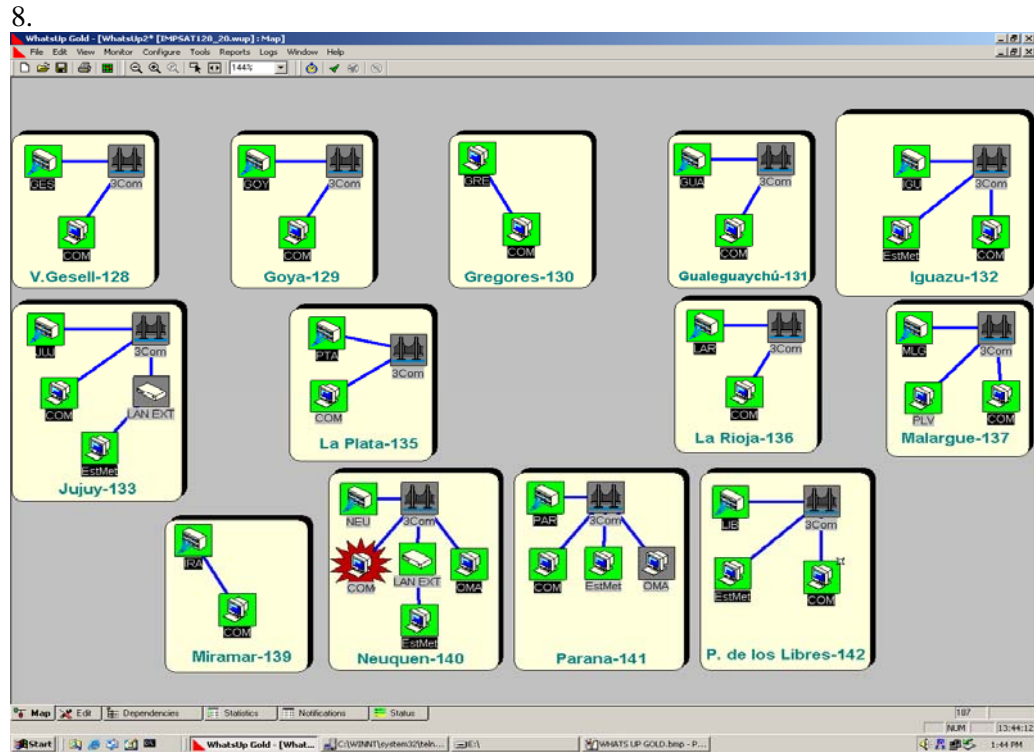
5. Image of an important airport (Aeroparque Jorge Newbery - Buenos Aires), from where most domestic flights departs, where you can observe the dual access to the WAN (both terrestrial, one by radio link at 2Mbits and other by telephone at 64Kbits), 3 AMHS terminals nearby (Flight Plan 1 and 2, Aviation Meteorological Office) and one remote via wireless (Meteorological Station), as well as a terminal of the SAVIMA service.



6. Image of a small airport (Tandil) showing the simple access to the WAN (terrestrial, 64KBits), 1 AMHS terminal (Communications) and one terminal of the SAVIMA service.



7. Image of a secondary screen showing the network status and of each of the AMHS terminals, part of the small airports that access in its entirety through VSAT. The number indicated on the right of the name of each site, identifies the third octet of the IP address (192.168.xxx.yyy).



ATTACHMENT B

