

SITA AIRCOM ATN Services

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ICAO ATN Seminar

- **SITA Services**
 - Datalink today with pre-FANS and FANS
 - ATN CPDLC, ADS-C and AMHS
- **SITA ATN Subnetworks**
 - VDL
 - ATN router (air-ground-air and ground-ground)
 - AMHS
- **SITA and ATN**
 - Security
 - Authentication
- **Summary and Conclusions**



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Why ATN?

- To meet the predicted increase in aircraft movements ATS Providers seek affordable and sustainable growth in airspace capacity to meet (i.e. reduce) delay targets
- Increased air traffic will be supported by migrating from voice to data comms, leading to an increase in ATC data link
- Harmonisation of airline data applications and those of ATC data link applications, including avionics and ground system elements



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- **Airlines Seek:**
 - Increased operational efficiency
 - Increased operational flexibility
 - To take advantage of increased aircraft automation
- **Airlines need a single, global standard to ensure that the same avionics can be used world-wide**
- **New aircraft performance metrics see increased amounts of data transactions and reports of avionics to ground hosts**
- **Focus on data link applications, airspace efficiencies, technology harmonisation, costs and benefits to airlines and ATS providers**



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SITA Services – Datalink Today

SITA Air Traffic Services



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SITA Overview

- Today, Datalink is implemented as ACARS with SITA providing *SATELLITE AIRCOM* and *VHF AIRCOM* Services
 - *SATELLITE AIRCOM* using INMARSAT Aero-H, Aero-H+ and Aero-I Services
 - *VHF AIRCOM* consists of a Network of VHF Ground Stations operated and owned by SITA
- Telephony/fax services are provided using *SATELLITE AIRCOM* and are used by passengers and crew



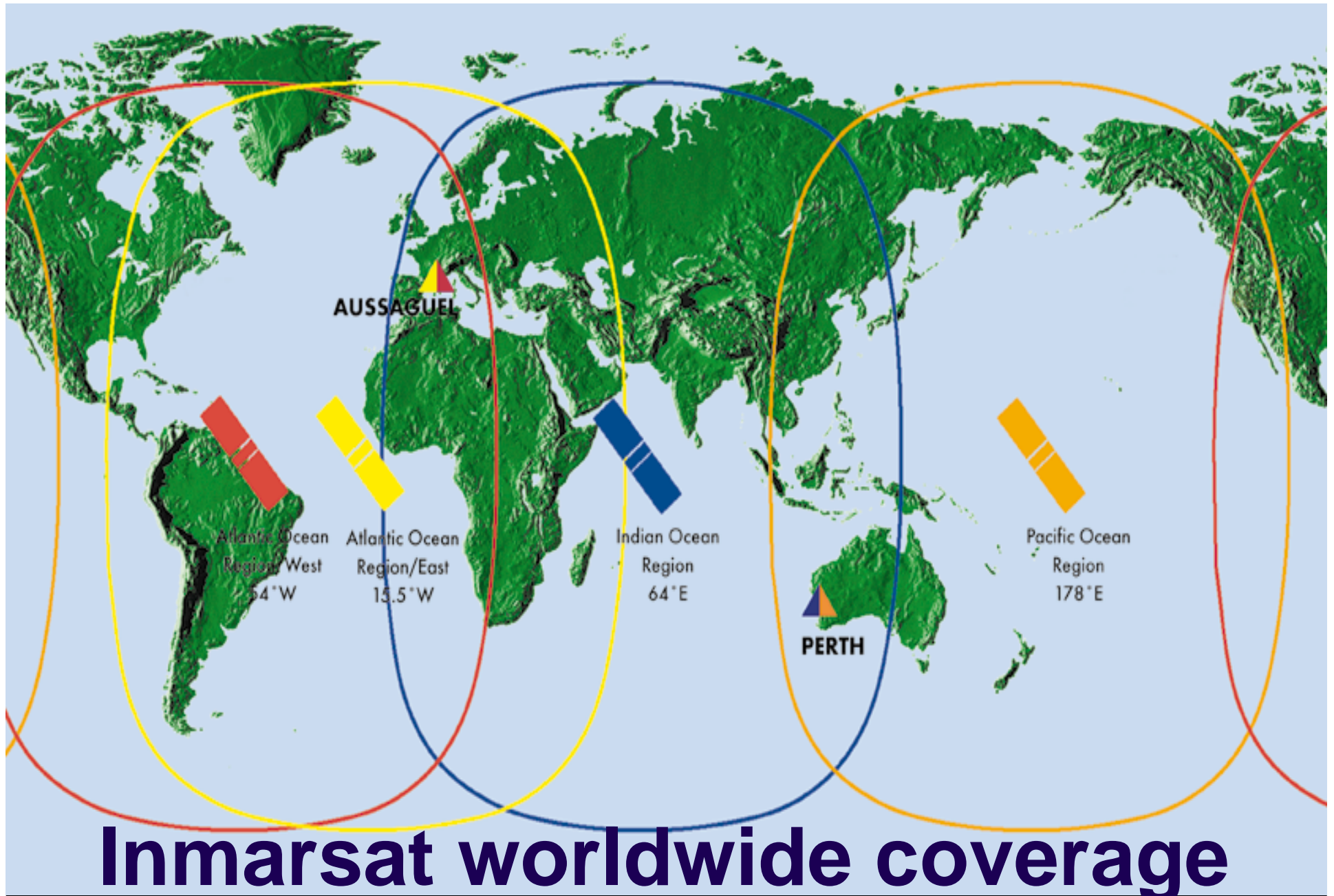
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SITA *AIRCOM* Service

- **SITA *Satellite AIRCOM***
 - 60+ contracted airlines
 - 750+ equipped aircraft
 - Two, dual-Ocean Region Satellite Ground Earth Stations (GES)
 - Perth, Australia and Aussaguel, France
 - ICAO AMSS and ATN SARPs compliant Data-3 Service is available today



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SITA *AIRCOM* Service

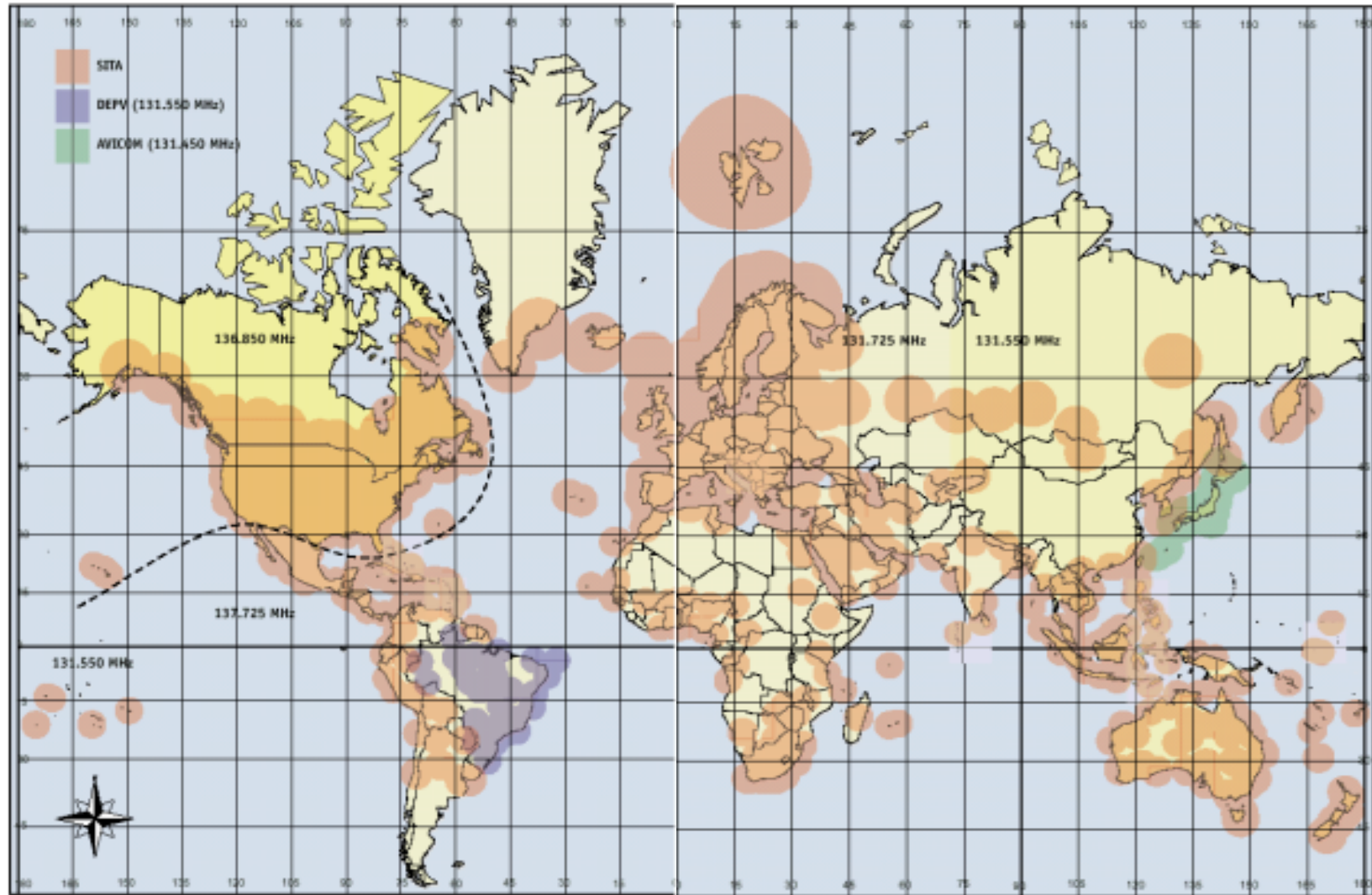
- **SITA *VHF AIRCOM***

- 780+ VHF Remote Ground Stations (RGS) for ACARS
- These RGS are located in some 164 countries
- Some 4,500+ ACARS-equipped aircraft & 100 Airlines enjoy services SITA's ACARS datalink today
- SARPs compliant VDL2 services deployment has begun in 2001



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SITA VHF *AIRCOM* (ACARS) Service



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ATS *AIRCOM* Service

- For ATS Providers the **ATS *AIRCOM*** services enable benefits for their ATS datalink applications to the datalink equipped aircraft.
- SITA currently has two generations of ATS applications that are supported today:
 - Pre-FANS services (text message exchange)
 - FANS services (binary data exchange on ACARS link)



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ATS *AIRCOM* Pre-FANS Services

- These applications send text messages to a cockpit printer or gate printer or airline host
- They remove the need for pilots and controllers to manually transcribe voice messages during periods of high workload, nominally:
 - d-ATIS: Automatic Terminal Information Service
 - PDC/DCL: (Pre-)Departure Clearance
 - (North Atlantic) Oceanic CLearance delivery



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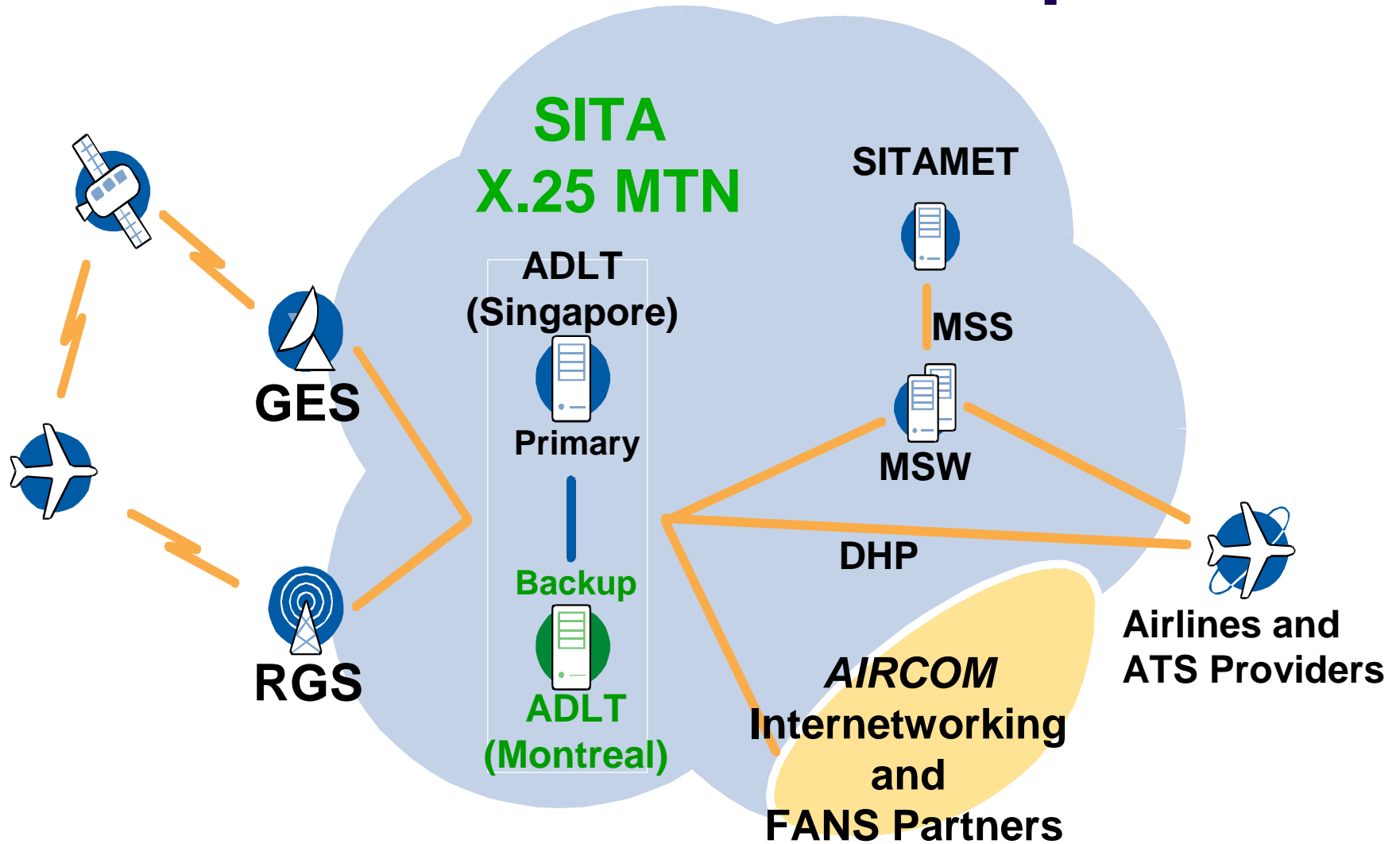
ATS *AIRCOM* FANS Services

- **SITA FANS Services facilitate optimum flight trajectories, FANS routes**
 - flight economies enabled through greater load uplift & reduced fuel burn
- **The FANS applications of ADS, CPDLC and AFN are supported, allowing:**
 - replacement of ATC voice radiotelephony for position reporting and routine communications
 - Reduced pilot and controller workloads



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AIRCOM Service Description



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SITA and CNS/ATM Transition

SITA Air Traffic Services



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Why SITA involved in the ATN?

- SITA is involved in the ATN due to the significant role we play in service delivery of airline and ATS applications today
- This includes:
 - Extensive infrastructure air-ground-air and telecommunications
 - Extensive application delivery that are essential for airline operations
 - Extensive application delivery of ATC data link applications
 - SITA is a World-wide civil aviation service provider

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Why SITA involved in the ATN?

SITA is developing ATN systems to:

- ensure we keep up technologically
- have the opportunity to influence world-wide ATN implementation choices
- minimise future transition costs for airlines and ATC service providers
- be ready when airlines require ATN services
- Maintain airline (AOC) services as customers move from ACARS to ATN
- advance operational benefits and optimise the overall Air Traffic Service efficiency

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SITA ATN Services

Current non-ATN services:

- Pre-FANS – ACARS, PDC, Digital ATIS
- FANS – CPDLC, ADS-C
- Airline applications

ATN services:

- Pre-FANS
- FANS
- VHF Datalink (VDL Mode 2)
- AMHS (includes AIDC)



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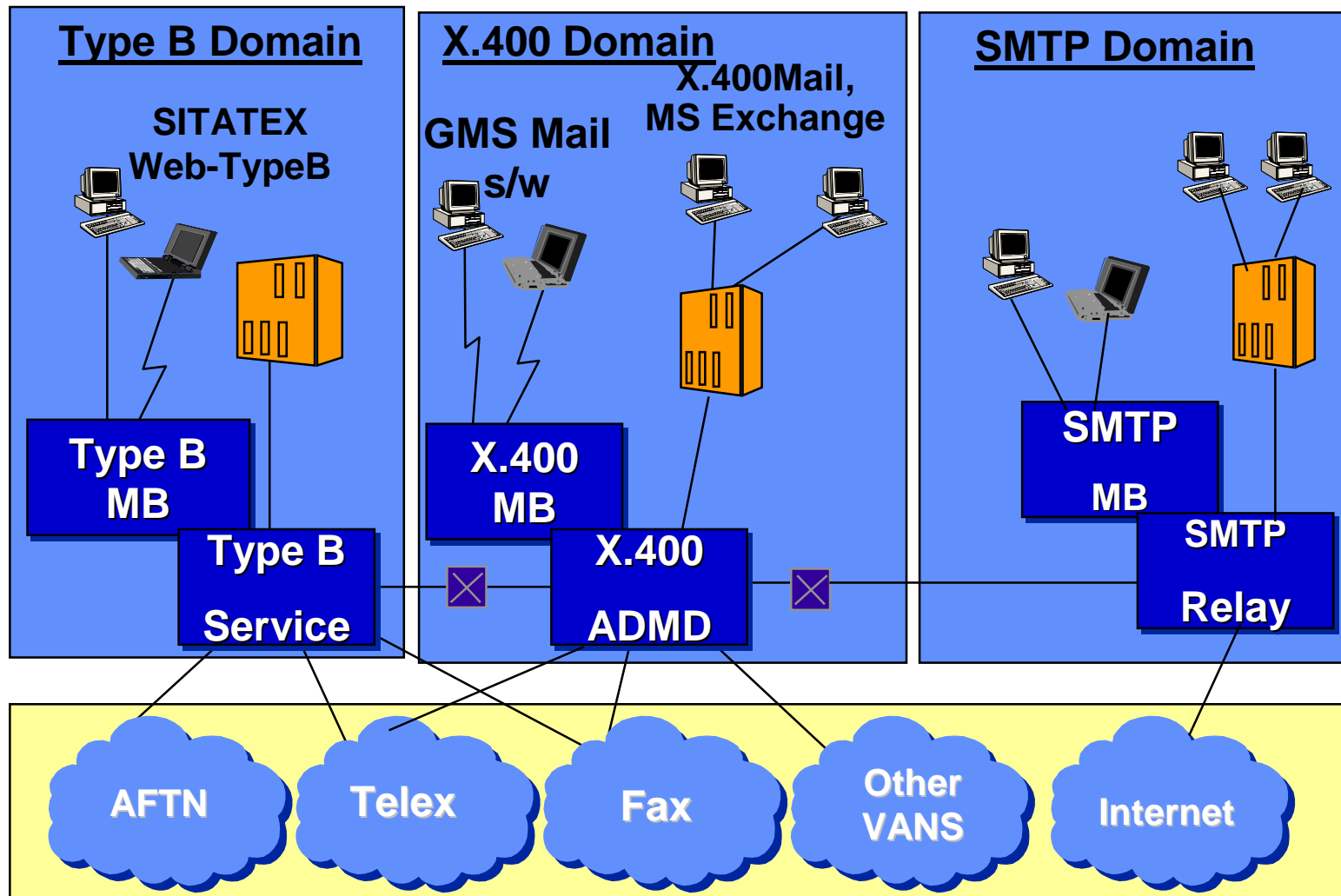
ATS AIRCOM Ground Services

- **ATS Message Handling Service (AMHS)**
 - Replaces AFTN intercentre communications
 - As AMHS has its own addressing scheme, AMHS systems can communicate via generic networks and do not require ATN Internet routers
 - SITA's homogeneous X.400 ground connectivity ensures a robust & reliable service
 - AMHS may be run over X.25 networks
 - SITA X.400 and X.25 networks can be used for AMHS today!



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SITA Messaging Services



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ATS AIRCOM Ground Services

- **ATS Interfacility Data Communications (AIDC) can be supported by Customers on the SITA international network**
 - replaces verbal ATS co-ordination and transfer of control
 - automation saves time for ATC staff
 - SITA's homogeneous X.25 ground connectivity ensures a robust & reliable service



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SITA and CNS/ATM Message Handling Services

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AMHS Background

- ATN-P Subgroup 1 has defined the use of AMHS for ground-ground messaging and transition from AFTN to AMHS
- AMHS fully complies with ITU X.400 standards with a global ADMD name “ICAO” under the country code “XX”
- Several ATNs already have an operational AMHS service in place, or plan to do so within short term, as we have seen also in the Asia Pacific Regional Plans
- However because of limited commercial success several public X.400 services have closed
- SITA continues to provide X.400 and AFTN services, and plans for AMHS services to assist and support the transition from AFTN TO AMHS



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SITA Messaging Services

- **Airline Messaging domain**
 - Type B Services (MQ-Type-B, MATIP-Type-B ..)
 - Web-Type B and SITATEX
- **X.400 Messaging domain**
 - X.400 Relay Service (PRMD to PRMD/ADMD)
 - X.400 Mailbox; GMS Mail
- **AFTN Messaging domain**
 - Direct Connections to AFTN networks for message delivery to airlines
- **SMTP Messaging domain**
 - SMTP Relay Service (private & open Internet)
 - SMTP Mailbox; PoP3, IMAP4, Web
- **Delivery to other domains (Gateways)**
 - Gateways to FAX and TELEX services
 - Inter-domain Messaging gateways, Internet Gateway



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SITA Plans for AMHS

- SITA plans to complement the existing services for a complete Messaging service to ATS Providers including:
 - Fully tested AMHS relay and mailbox services
 - AMHS gateways to AFTN and airline messaging
 - PRMD hosting services
 - Consultancy and partnership for deployment and migration
- Provision of different services will depend on community plans for a regional, global or back up use



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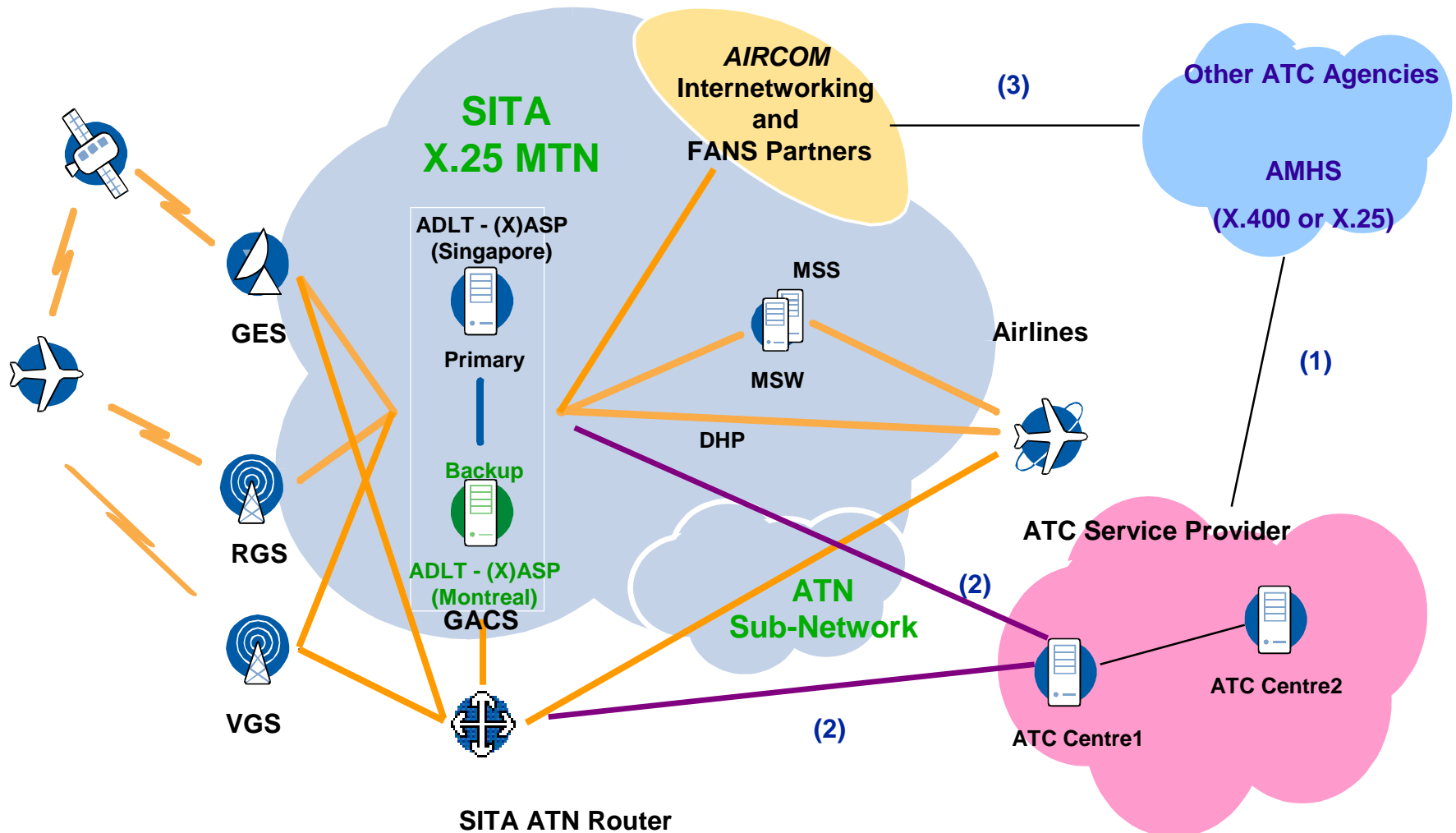
SITA Plans for AMHS

- The AMHS architecture includes the following components:
 - MTA/MS (ATS Message Server)
 - DS (X.500/88 Directory Server)
 - Communication stacks (ATN, LAN, WAN)
 - AFTN/AMHS gateway
 - UA (AMHS terminal)
 - Integration with the existing SITA Messaging services for communications to AFTN, Type B, SMTP, Internet email, fax and telex



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SITA and CNS/ATM AMHS



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SITA Plans for AMHS

For AMHS implementation we have the options of:

(1) Agreement between ATS Providers as done now for AFTN

- May prove expensive and inefficient given AMHS traffic levels
- Requires individual agreements between ATC Service Providers
- Not truly homogeneous AMHS network
- May lead to inefficiencies as different ATC Service Providers implement individual solutions of AFTN/AMHS gateways, circuits and ground-ground routers



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SITA Plans for AMHS

(2) SITA AMHS with ATS Providers using SITA X.25 or X.400 for AMHS delivery

- utilises existing SITA X.400 and/or X.25 network
- utilises existing X.25 FANS network connections that many ATS Providers enjoy with SITA today
- efficiencies in costs without explicit AFTN and AMHS point-to-point circuits, especially in the early transition from AFTN to AMHS
- uniform and homogeneous AMHS network
- uniform and consistent SITA AMHS network access and message transaction charging regime



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SITA Plans for AMHS

(3) ATS Providers use alternative X.25 or X.400 networks for AMHS delivery

- **may use existing X.25 FANS network connections of alternative Data Service Providers**
- **AMHS network harmony heavily reliant of internetworking agreements between Data Service Providers**
- **may prove inefficient with regard to AMHS implementation and network topology**



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SITA Plans for AMHS

ATS Providers have set the schedule for AMHS implementation:

- **Regional ICAO ATN Plan**
 - AFTN loadings and circuit topology
 - AFTN to AMHS transition
 - AMHS deployment from 2002
 - AMHS network topology akin to that for AFTN
 - AMHS implemented with routers
- **While this is a Plan, it does not address:**
 - Economics of implementation of choice
 - Network security or regulatory requirements
 - Application authentication across network elements
 - Certification of network elements
 - Internetworking regulation across the network elements



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SITA and CNS/ATM ATN Routers

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SITA ATN Routers

ICAO CNS/ATM implementation will see different levels of ATN routers functionality:

- 1. Ground - ground router**
- 2. Air - ground - air router**
- 3. Avionics router**

Each router will see differing levels of ATN SARPs compliance and features

- Each router has varying levels of complexity and associated costs**
- Each router has explicit network compliance issues for existing Data Service Providers such as SITA**



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SITA and CNS/ATM Transition

SITA ATN development and achievements:

- **SITA developed an ATN Router as a partner in ProATN from 1995-2000 and in the previous EurATN project from 1990-1995**
- **More recently SITA issued a RFP for production ATN routers to provide operational service**
- **SITA has developed strategies that see existing network support ATN applications and be ATN compliant**
- **SITA ATN service was to be available in early 2002 – in line with the first operational implementation of ATN CPDLC in the FAA CPDLC Build 1, but will now slip as has the FAA project to mid 2003**



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SITA and CNS/ATM Sub-networks

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SITA ATN Sub-networks

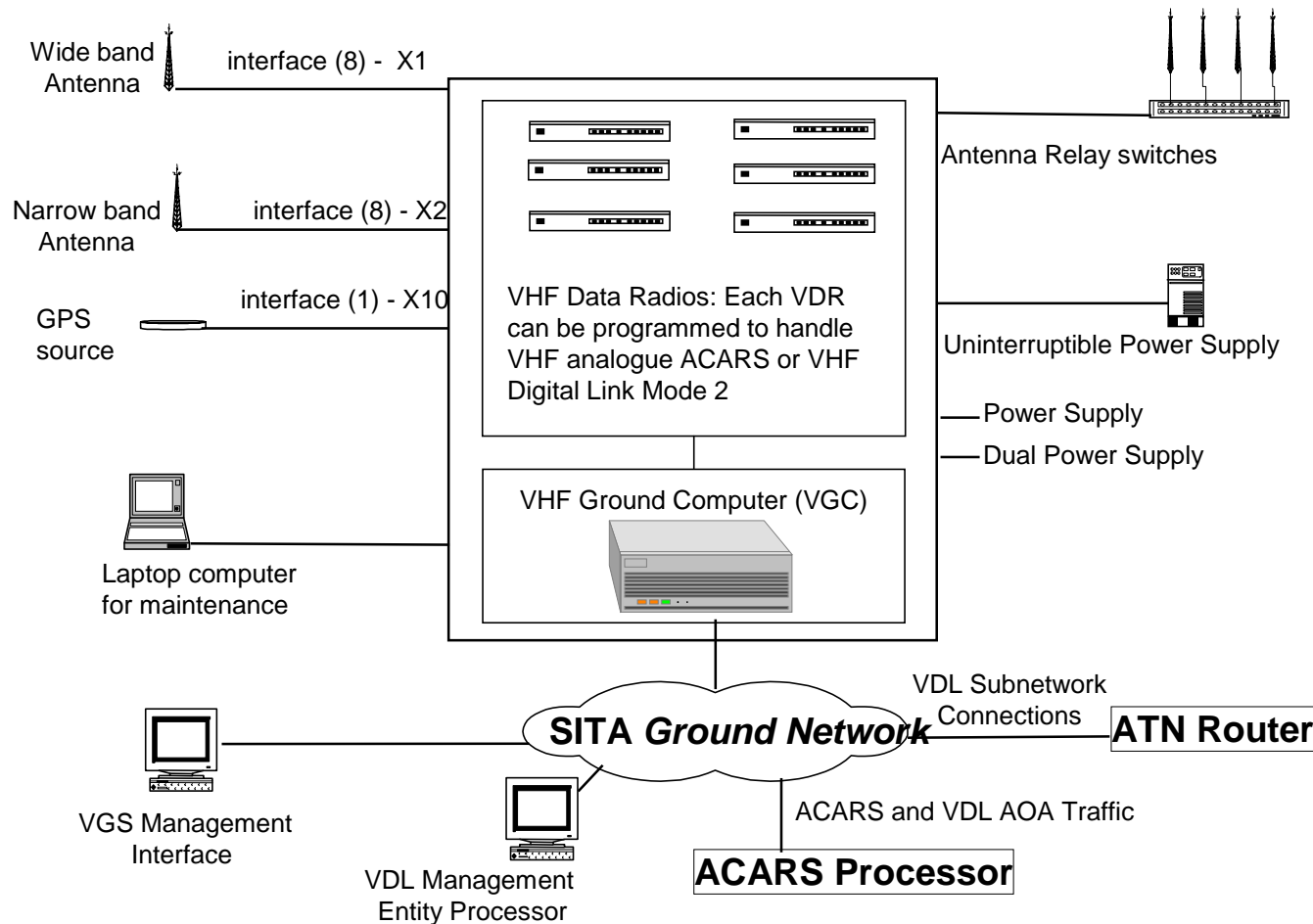
SITA sub-networks for ATN will include:

- The SITA Satellite *AIRCOM* service supports ATN communications and has been demonstrated in the ADS Europe project
- SITA has acquired a new VHF *AIRCOM* ground stations that will support ATN/VDL sub-network service
- The SITA VDL ground station will also support the use of the AVLIC protocol specified in the ICAO VDL standard for the exchange of ACARS messages. The AEEC has specified this ACARS over AVLIC (VDL AOA) service
- SITA will maintain existing VHF analogue service (ACARS)



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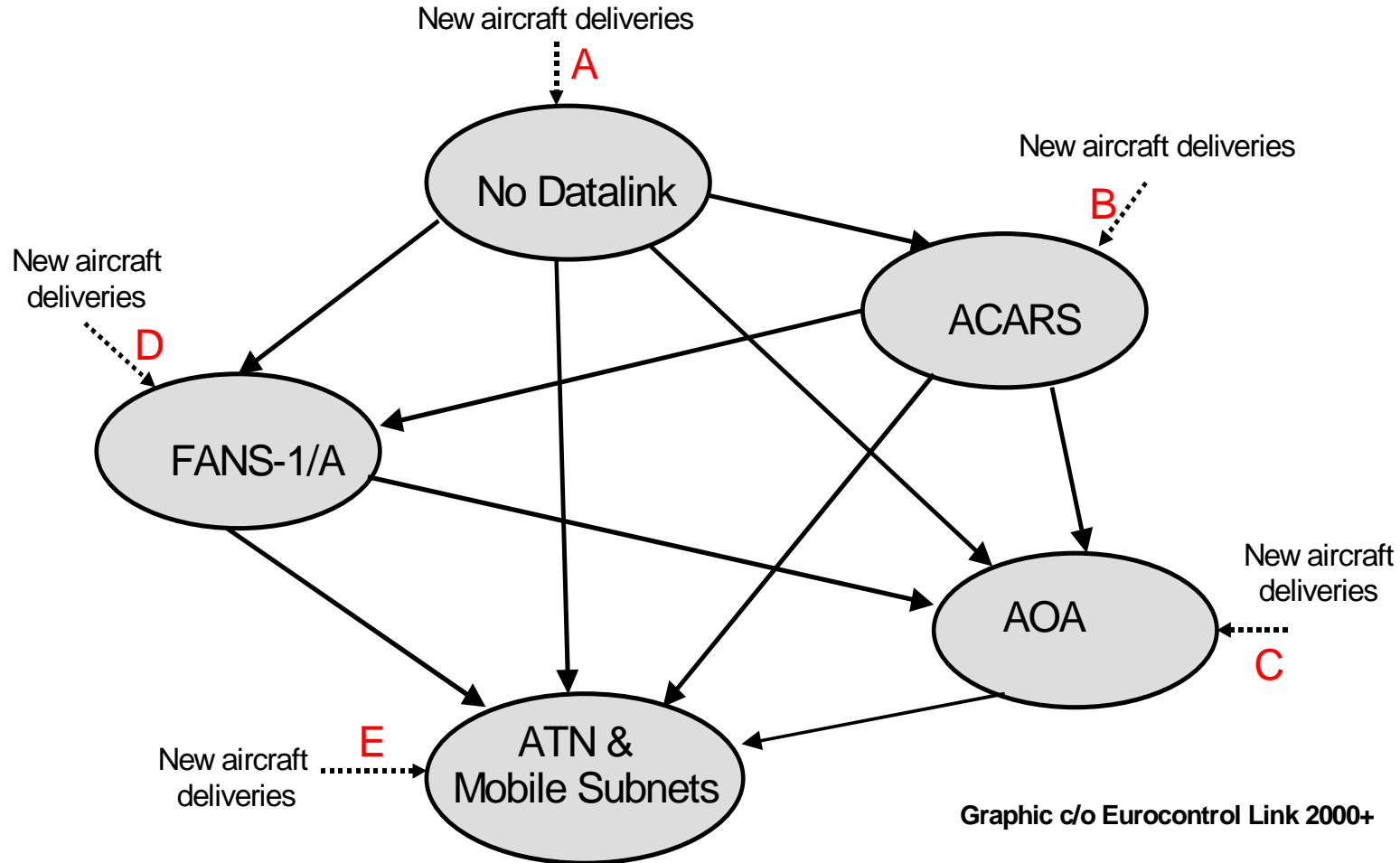
SITA VDL Ground Station Architecture



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Avionics Transition from ACARS to ATN/VDL



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SITA ATN/VDL Sub-network

Given the multifunctional avionics requirement we will see a graceful migration from FANS to ATN:

- **FANS 1/A initial ATN dual stack on ground systems**
- **FANS 1/A over VDL Mode 2, ATN “Convergence Pack”, ATN aircraft – 2002**
- **Full ATN integrated FMC solution by 2006**

Supported by AC, ANZ, DHL, QF and UAL.



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SITA ATN/VDL Sub-network

SITA is implementing VDL to increase data link capacity in the VHF band:

- Aircraft that implement VDL Mode 2 will obtain VHF link performance 10 times better than VHF analogue ACARS**
- A 250 character ACARS block will take about 0.06 seconds to cross the VDL Mode 2 link instead of 0.83 on the VHF analogue link**
- Improvement in the RF robustness of VDL over ACARS**
- For aircraft using VDL AOA, the VHF link transit time be a negligible factor in the end to end performance**



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SITA ATN/VDL Sub-network

- The implementation of ACARS over AVLC (VDL AOA) service has the following components:
 - The VGS is made up of a VHF Data Radio that processes the VDL D8PSK physical layer and a computer that processes the Aviation VHF Link Control (AVLC) protocol specified in the ICAO VDL standard
 - The service requires no major modifications to SITA ACARS processor because aircraft use the same ACARS message formats over VDL AOA links as over VHF analogue links
 - SITA will implement the VHF Management Entity (VME) processor to manage the VDL links



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SITA ATN/VDL Sub-network

SITA ATN development and achievements:

- Dec 2000 => Implement preliminary VDL Avionics Qualification capability
- Nov 2000 => VDL ground system validation
- Dec 2000 => VGS Service Cut-over (analogue)
 - PAR and GVA have been operational since Nov./Dec. 2000
 - ORY and AMS followed in Feb. and Mar. 2001
- Oct 2000 => Interoperability testing between VDL avionics and VGS successfully performed at the SITA Montreal test bed
- Jan 2001 => VGS installed at Rockwell Collins, Cedar Rapids for testing in the lab and with test aircraft



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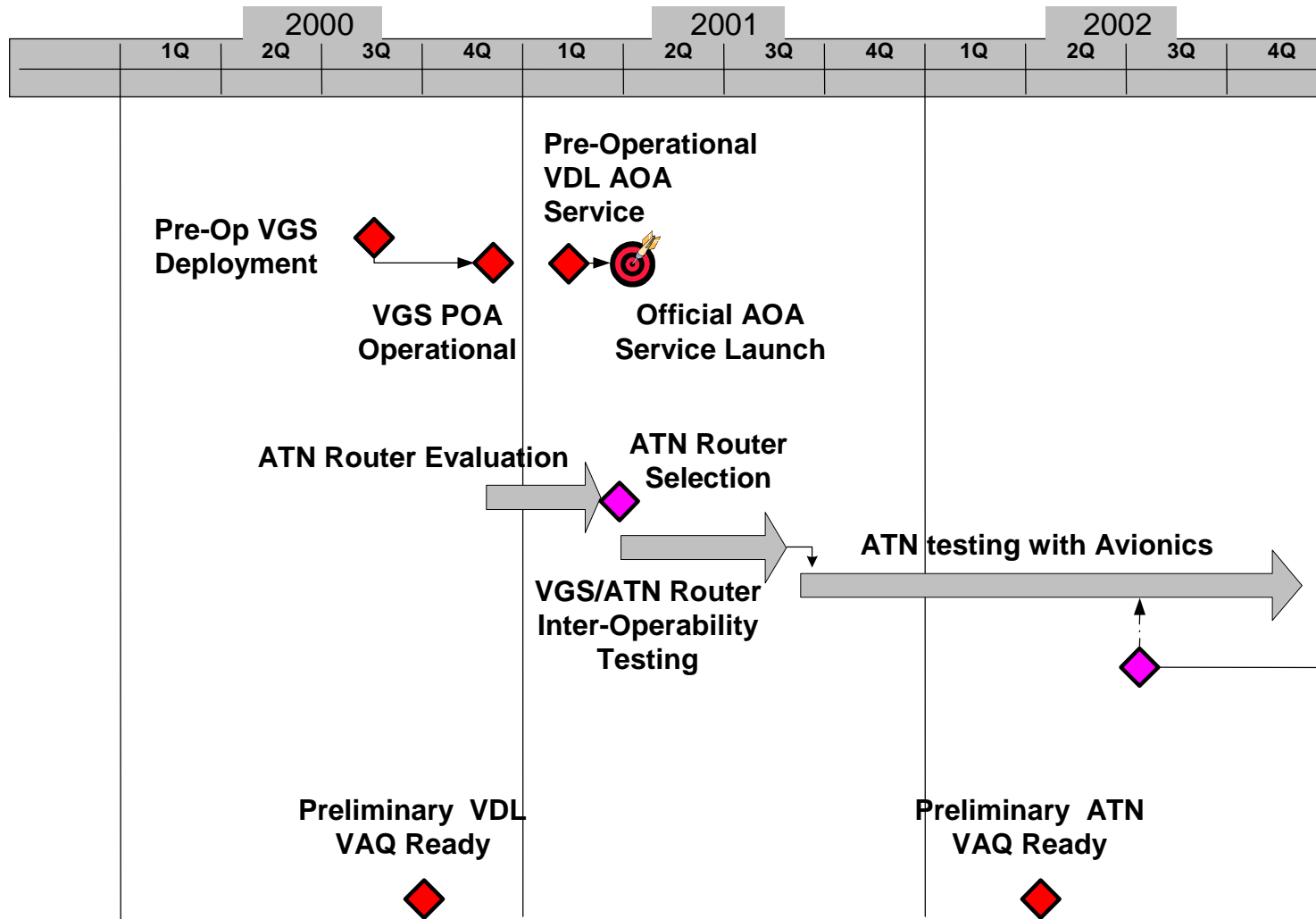
SITA ATN/VDL Sub-network

- The earliest plan to implement operational ATN CPDLC service is the FAA CPDLC Build 1 in July 2006 (was July 2002)
- The FAA will start certifying the ATN CPDLC avionics in 2002, but it will take several years for the avionics to be installed in a significant proportion of the airline fleet.
- In Europe, the Eurocontrol Maastricht ATC centre plans to implement ATN CPDLC in 2002 but no other centre has a firm plan so they could not have CPDLC in service before 2004.



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SITA ATN/VDL Sub-network

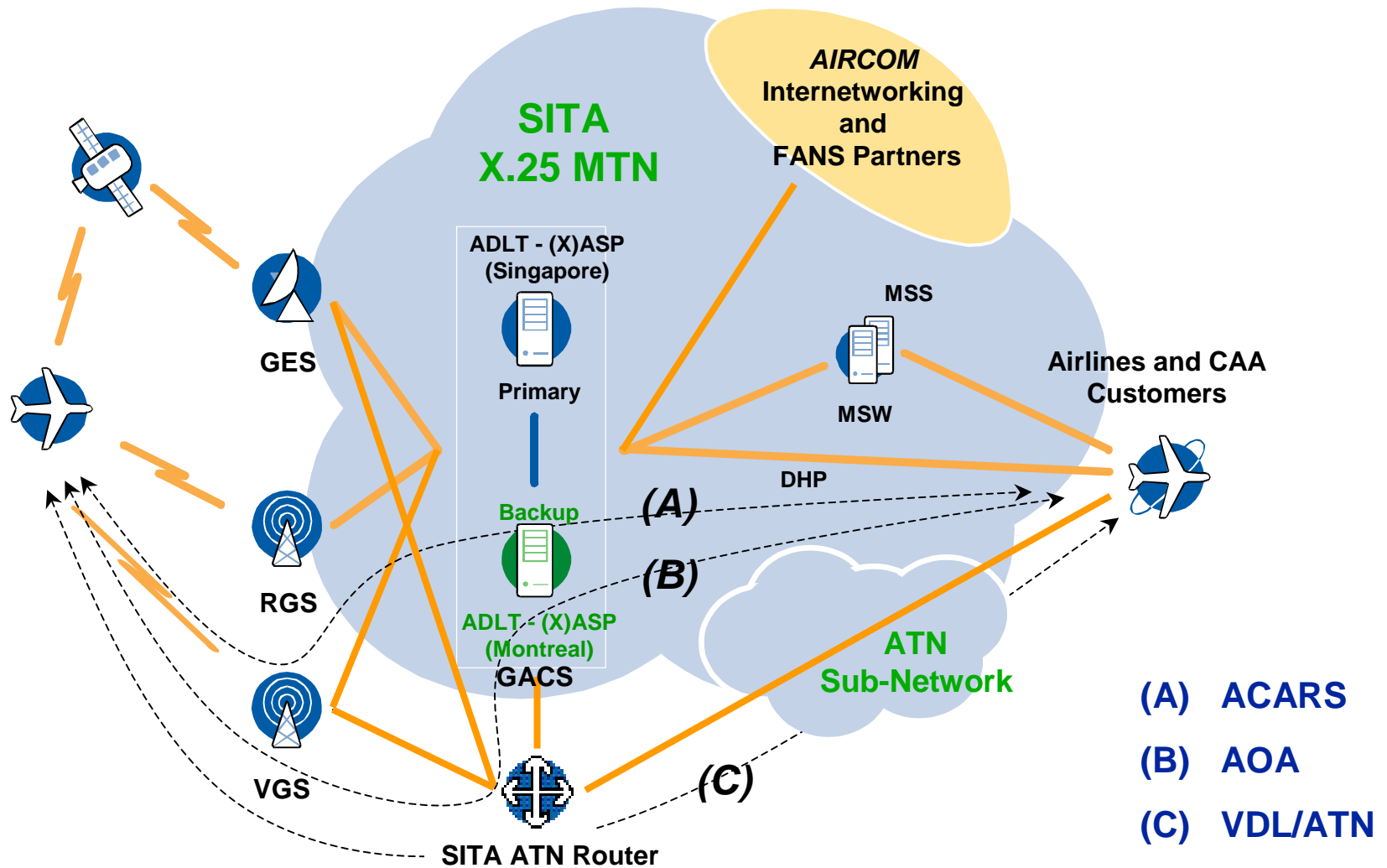


July 2006
FAA CPDLC Build 1

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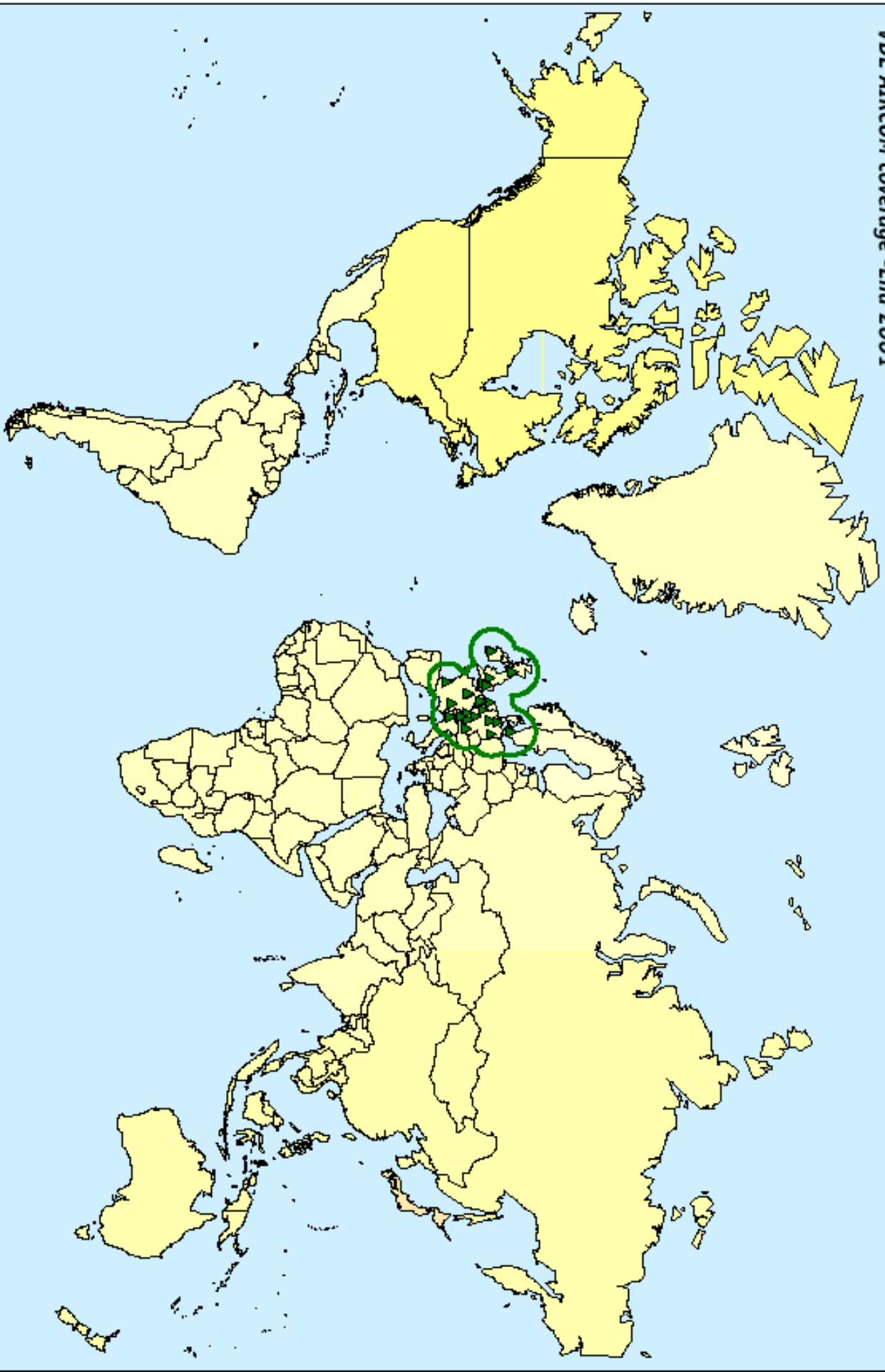
SITA ATN/VDL Sub-network



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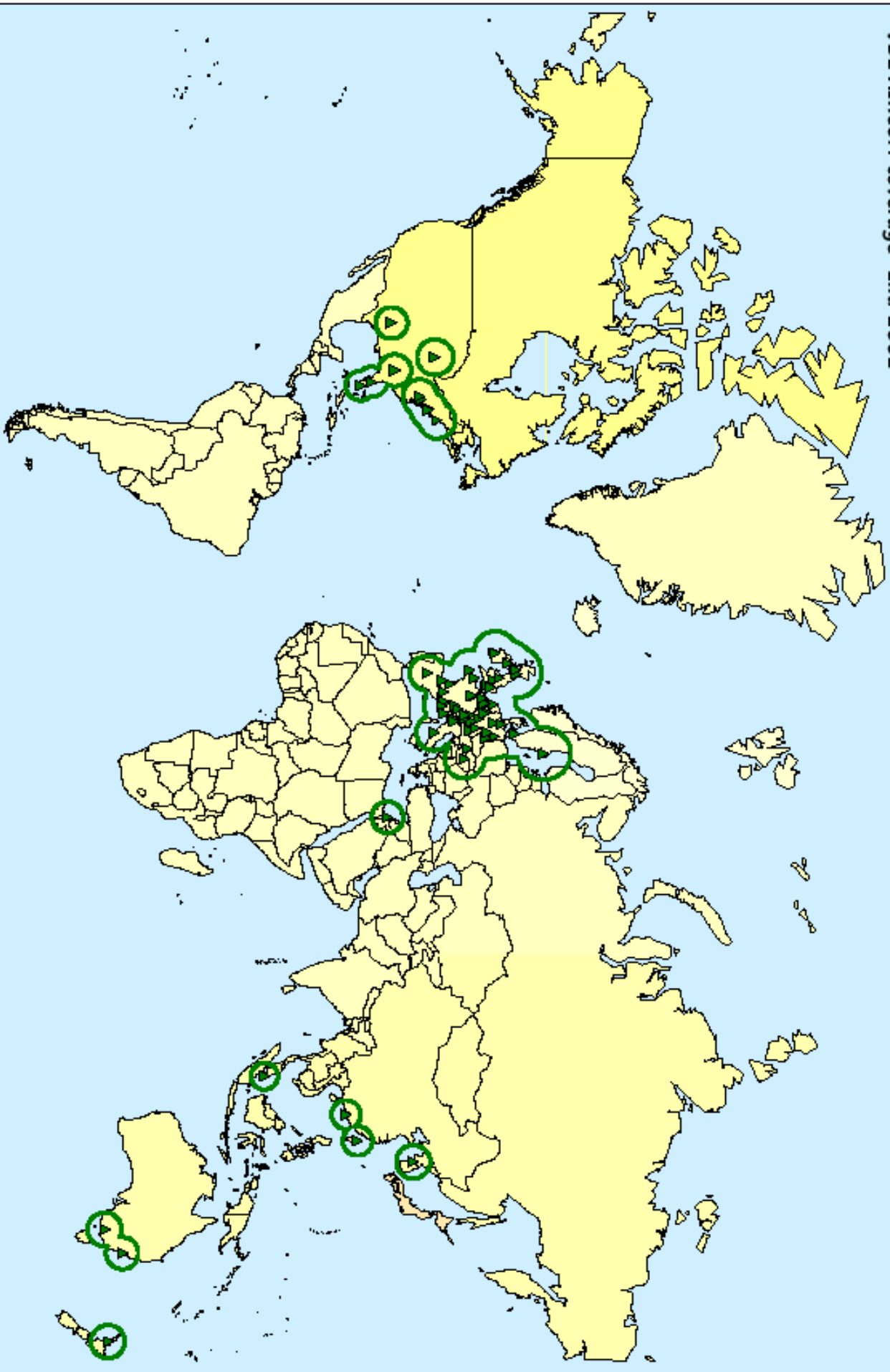
VDL AIRCOM coverage - End 2001



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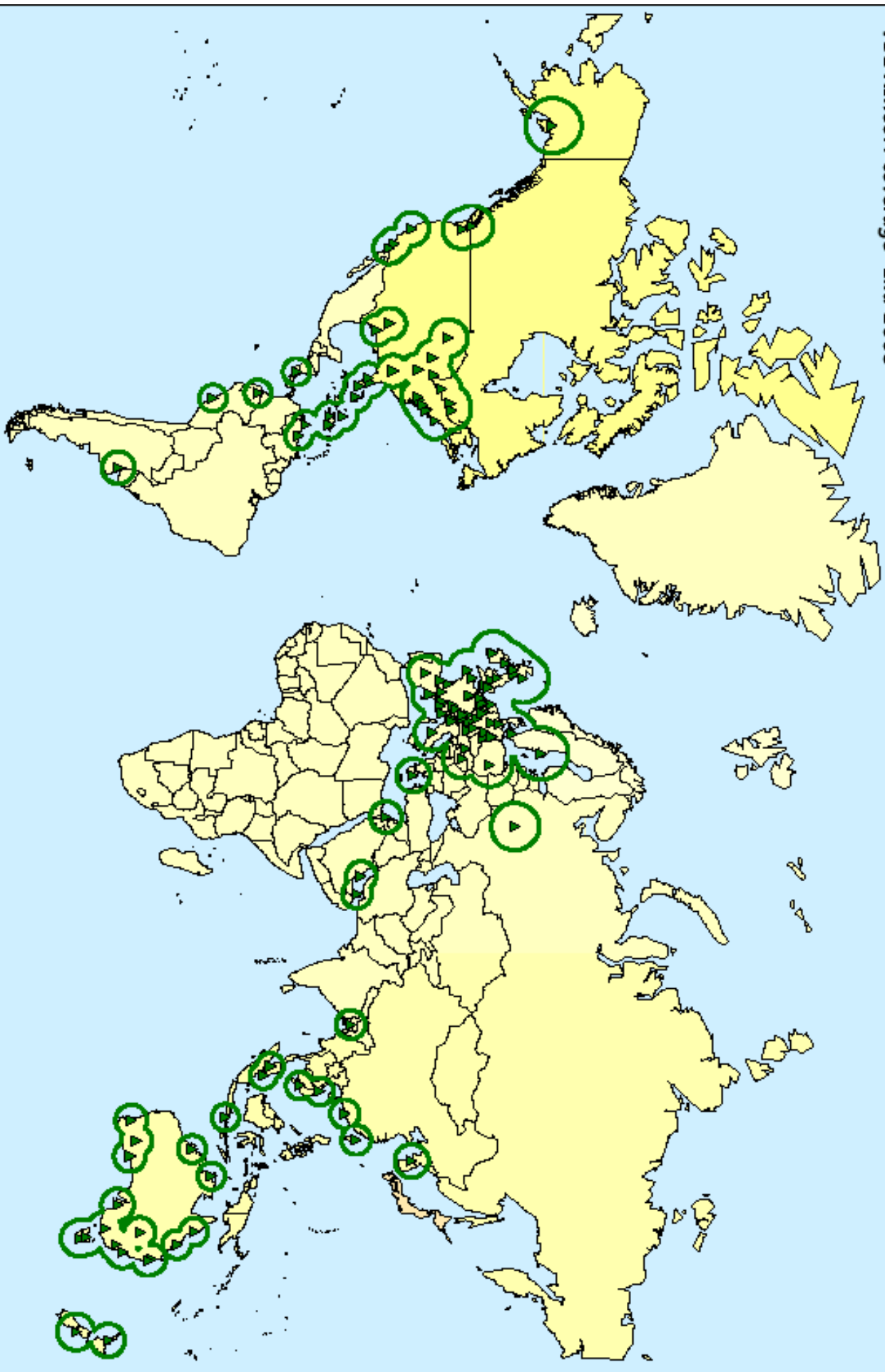
VDL AIRCOM coverage - End 2002



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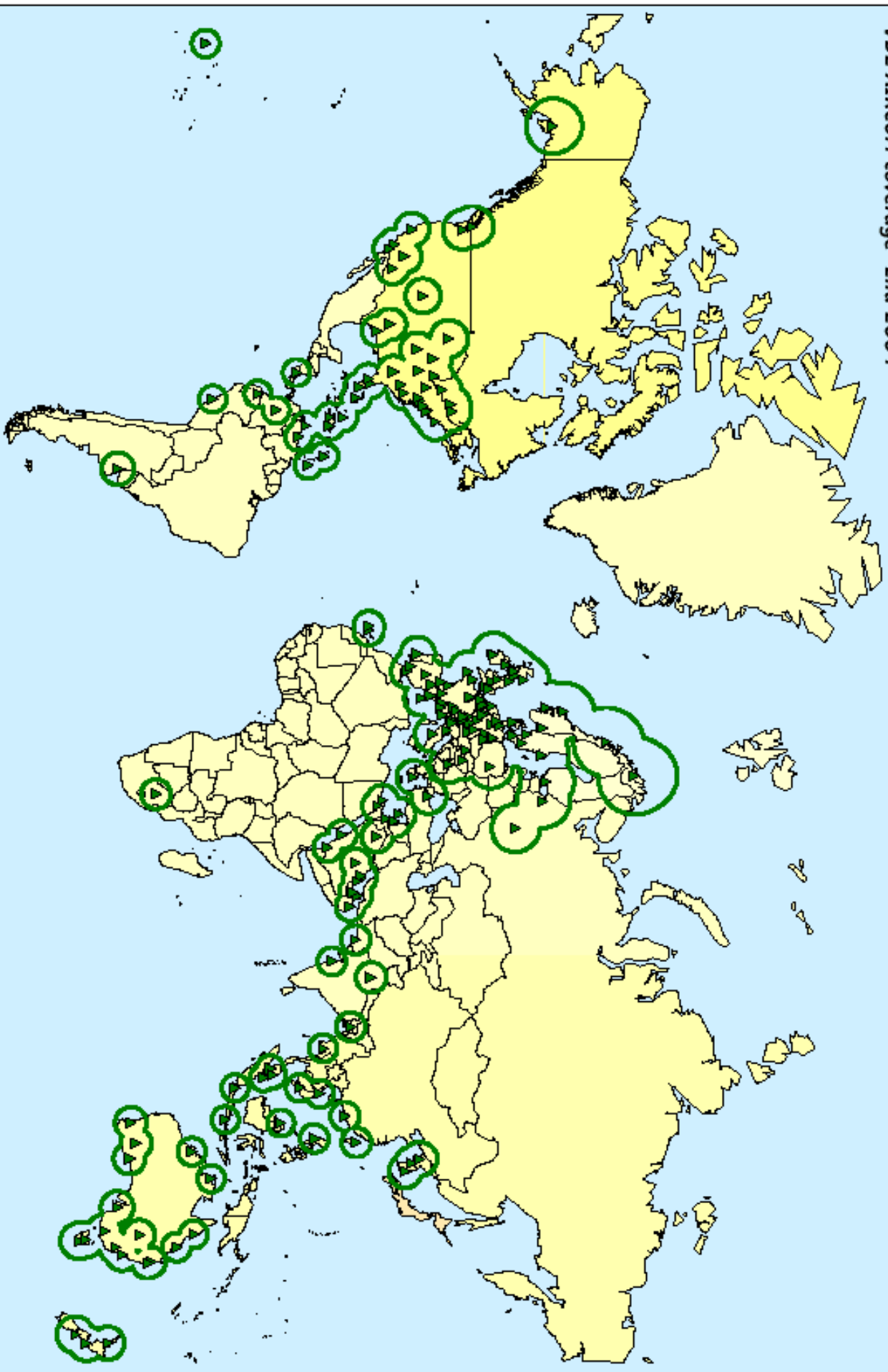
VDL AIRCOM coverage - End 2003



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VDL AIRCOM coverage -End 2004



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SITA and CNS/ATM Internetworking

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Internetworking by Service Providers

Internetworking between data service providers is the means for message assurance, application performance and system monitoring:

- **ATS Providers need to communicate with all aircraft in their airspace**
- **With FANS this data communication to all aircraft in all airspace is heavily reliant on internetworking between Datalink Service Providers such as SITA**
- **ATC communication is independent of which Datalink Service Provider the airline has chosen to contract with**



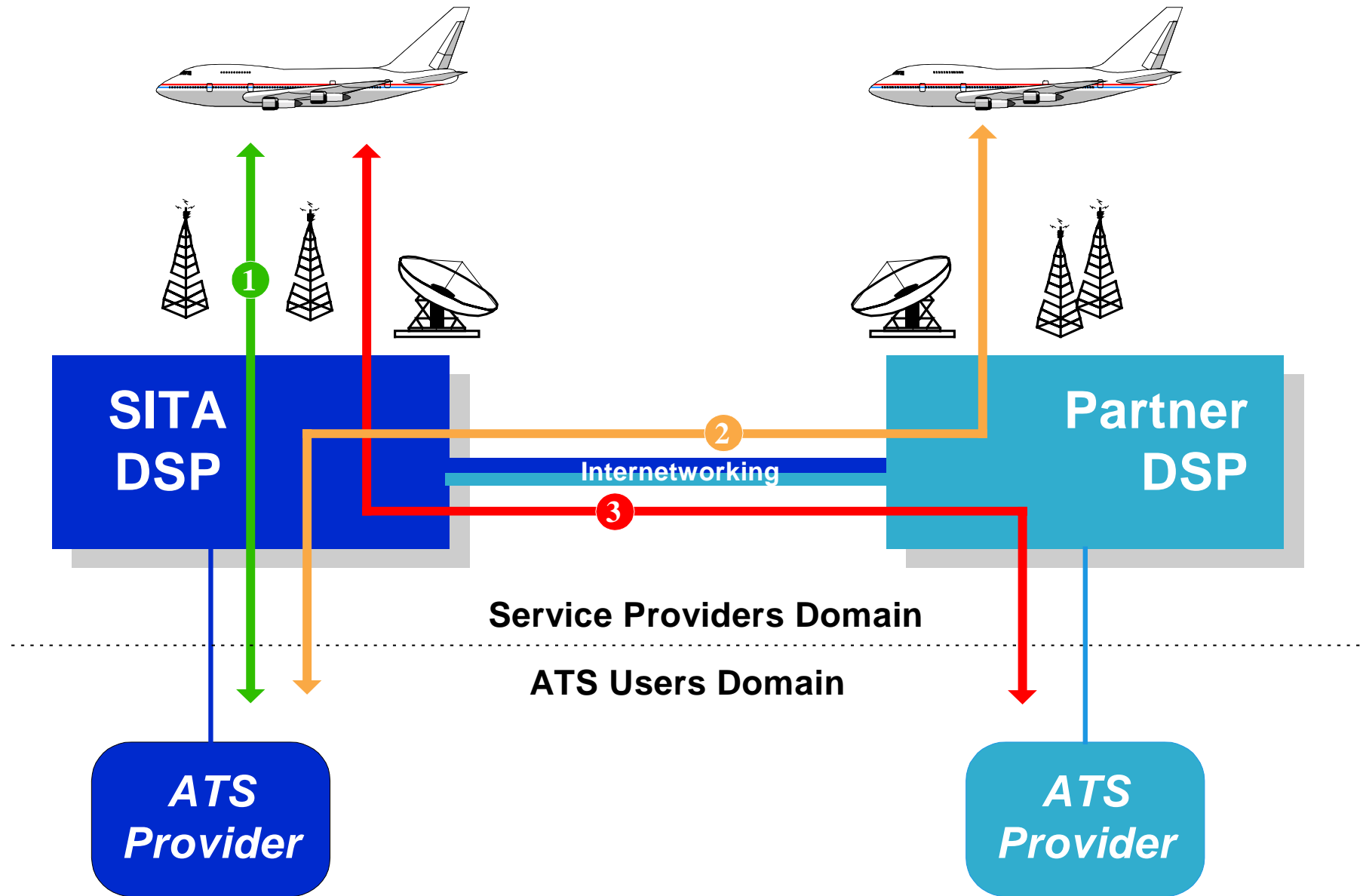
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Internetworking by Service Providers

- To date there is agreement between Data Service Providers for no double billing of airlines and ATIS Providers for ATC data applications
 - FANS CPDLC and ADS-C
- A feature of SITA network connections for ATC ensure that ATC ground systems can communicate with all ACARS aircraft
- SITA views the responsibility of internetworking and the associated obligations are that of Data Service Providers
- for ATN as this responsibility is the same, ensuring network integrity, authentication and security is managed across networks



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Summary and Conclusions

- **SITA is moving towards ATN**
 - Router developments (ground-ground and a-g-a)
 - VDL implementation for mid-2002
 - VDL spectrum planning
 - SITA AMHS deployment and support
 - FANS services continuing
 - pre-FANS services continuing
 - SITA network upgrades for ATN linked to CPDLC Build 1 Project
 - Regulatory framework for network security, authentication and internetworking is required



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Discussion and Questions?

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