ICAO BANGKOK UNITING AVIATION

CRV: ITS POTENTIAL AND OPERATIONAL PLANNING

Present to:

Fourth Meeting of the MID ATS Messaging Management Centre Steering Group (MIDAMC STG/4)

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Federal Aviation Administration (FAA)
International Telecommunication Service

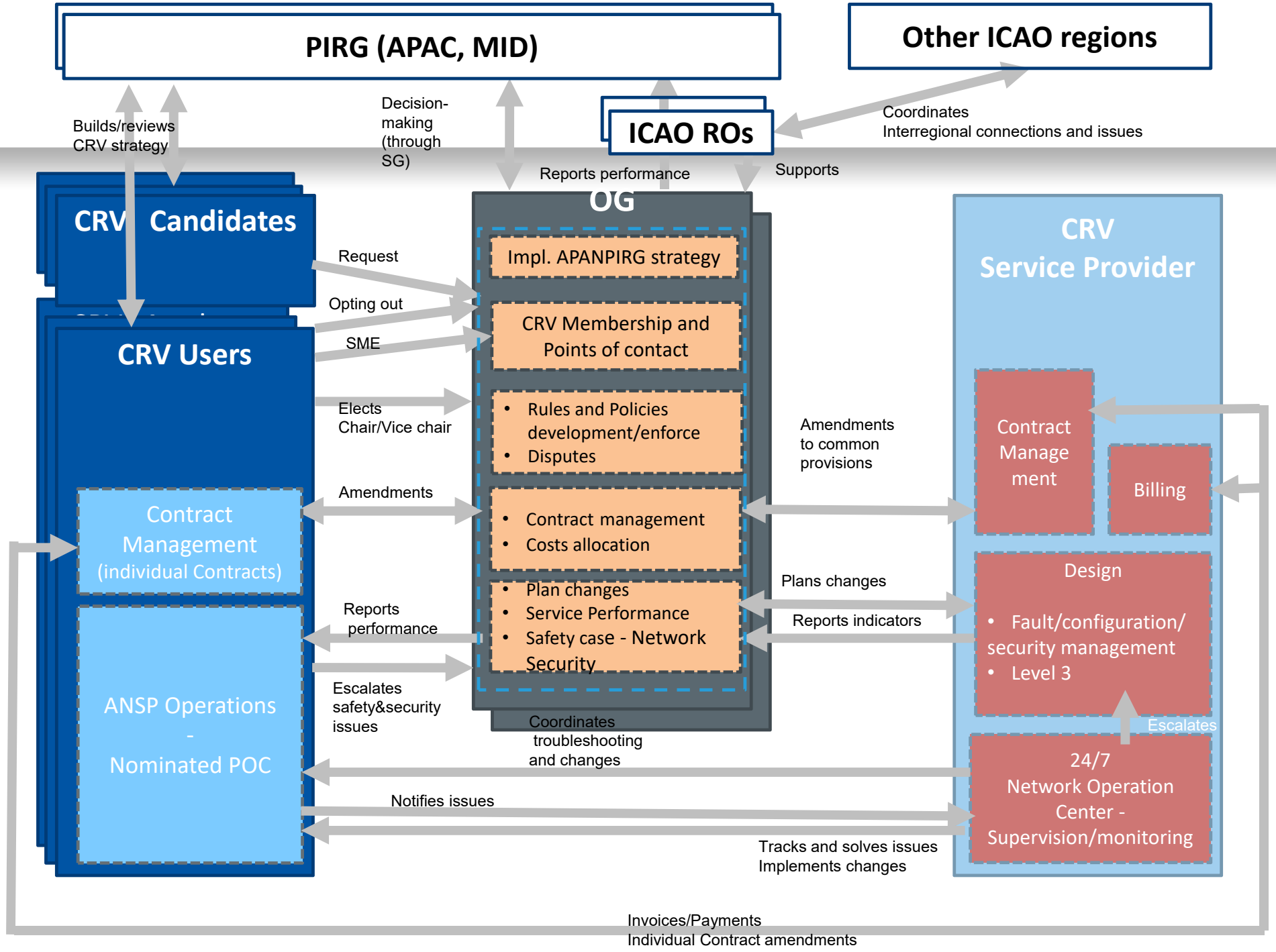
Date: 18-19 March 2019
MID Regional Office
Cairo, Egypt

TOPICS:

1. CRV Description
2. Federal Aviation Administration (FAA) CRV Planning and Operation
3. AMHS Routing over CRV
4. IWXXM/AMHS over CRV
5. SWIM
6. ISSUES SUMMARY
7. RECOMMENDED SOLUTIONS

What is CRV?

- An Asia-Pacific aeronautical network for Asia-Pacific and Middle East ICAO Members: “Common AeRonautical Virtual (CRV) Network ”
- A wholly dependable and reliable communications infrastructure for aeronautical communications, enabling the global roadmap (ASBUs: B0-FICE, B0-NOPS, VoIP and B1-SWIM modules)


PIRG (APAC, MID)
Other ICAO regions
Builds/reviews CRV strategy
Decision-making (through SG)
ICAO ROs
Coordinates Interregional connections and issues
Reports performance
Supports
CRV Candidates
OG
CRV Service Provider
Request
Impl. APANPIRG strategy
Opting out
CRV Membership and Points of contact
SME
CRV Users
Elects Chair/Vice chair
• Rules and Policies development/enforce
• Disputes
Amendments to common provisions
Contract Manage ment
Billing
Amendments
Contract Management (individual Contracts)
• Contract management
• Costs allocation
Plans changes
Reports indicators
Reports performance
• Plan changes
• Service Performance
• Safety case - Network Security
Design
• Fault/configuration/ security management
• Level 3
Escalates
Escalates safety&security issues
Coordinates troubleshooting and changes
ANSP Operations - Nominated POC
24/7 Network Operation Center - Supervision/monitoring
Notifies issues
Tracks and solves issues
Implements changes
Invoices/Payments
Individual Contract amendments

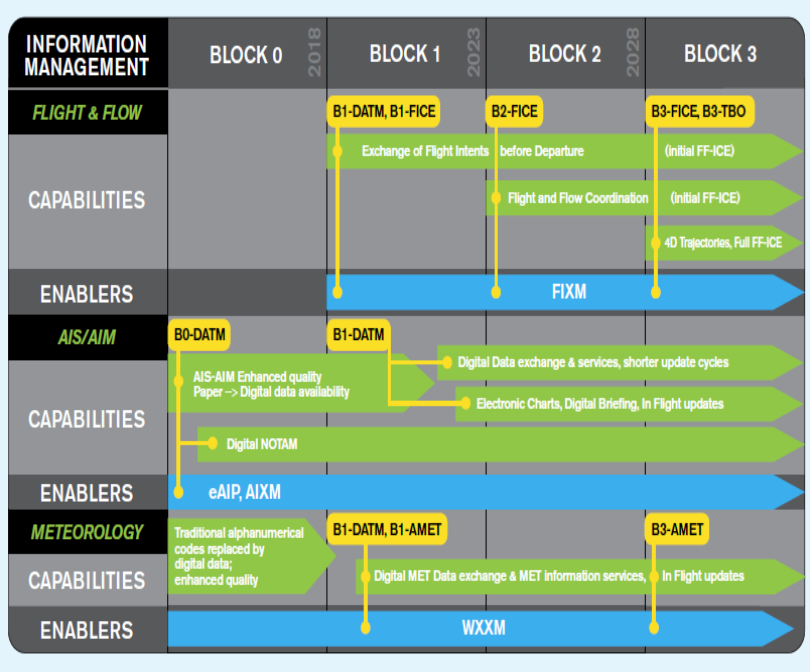
Process

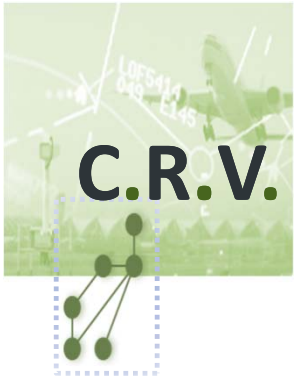
- All States/Administrations (APAC, MID) encouraged to join
- States/Administrations will have to join CRV-OG before signing an Individual Service Contract with the selected supplier
  - A single basis (common provisions) for all ANSP, with selectable services/class of services/options, based on requirements, and associated prices
  - Only existing contracts: signed between each individual State/Administration and supplier
  - No contract between CRV-OG and the supplier
  - No contract between ICAO and the CRV Service Provider (general case)

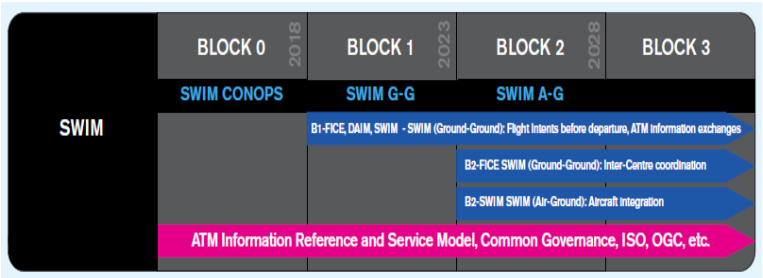
CRV OG: terms of reference

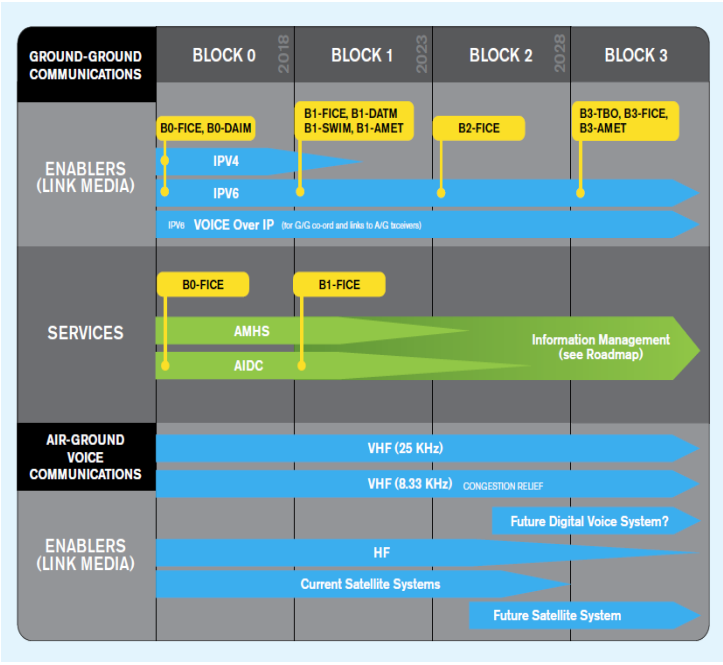
a) Oversee the implementation of the CRV post Contract Award;
b) Manage issues arising from the transition with CRV OG, if any;
c) Co-ordinate and standardize the establishment or upgrade of CRV services as required;
d) Co-ordinate activities with other ICAO CRV OGs, if any, to make sure that decision making and communication with CRV Service Provider is consistent and timely;
e) Oversee the performance of the CRV Service Provider, including customer service;
f) Oversee the performance of the CRV network;
g) Oversee the escalation and solving by the CRV Service Provider of issues associated with the provision of the CRV, including safety and security related issues;
h) Assist with the resolution of issues associated with the provision of the CRV among the CRV Users as required, including safety and security related issues;
i) Assist with the migration of Aeronautical Fixed Services (AFS) onto the CRV, in line with the GANP and seamless ATM plan;
j) Maintain CRV OG documentation associated with the function, performance and management of the CRV, including the CRV OG Operations Manual, a list of CRV users and a record of variations to the common tender package;
k) Accept deliverables from the CRV Service Provider on behalf of the CRV Users as required;
l) Promote the use of CRV; and
m) Perform any other activity as required by CRV operations.

GANP


INFORMATION MANAGEMENT
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
FLIGHT & FLOW
B1-DATM, B1-FICE
B2-FICE
B3-FICE, B3-TBO
CAPABILITIES
Exchange of Flight Intents before Departure
(initial FF-ICE)
Flight and Flow Coordination
(initial FF-ICE)
4D Trajectories, Full FF-ICE
ENABLERS
FIXM
AIS/AIM
B0-DATM
B1-DATM
CAPABILITIES
AIS-AIM Enhanced quality Paper –> Digital data availability
Digital Data exchange & services, shorter update cycles
Electronic Charts, Digital Briefing, In Flight updates
Digital NOTAM
ENABLERS
eAIP, AIXM
METEOROLOGY
Traditional alphanumerical codes replaced by digital data; enhanced quality
B1-DATM, B1-AMET
B3-AMET
CAPABILITIES
Digital MET Data exchange & MET information services
In Flight updates
ENABLERS
WXXM


C.R.V.


SWIM
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
SWIM CONOPS
SWIM G-G
SWIM A-G
B1-FICE, DAIM, SWIM - SWIM (Ground-Ground): Flight Intents before departure, ATM information exchanges
B2-FICE SWIM (Ground-Ground): Inter-Centre coordination
B2-SWIM SWIM (Air-Ground): Aircraft Integration
ATM Information Reference and Service Model, Common Governance, ISO, OGC, etc.


GROUND-GROUND COMMUNICATIONS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
ENABLERS (LINK MEDIA)
B0-FICE, B0-DAIM
B1-FICE, B1-DATM B1-SWIM, B1-AMET
B2-FICE
B3-TBO, B3-FICE, B3-AMET
IPV4
IPV6
IPV6 VOICE Over IP (for G/G co-ord and links to A/G tcvrs)
SERVICES
B0-FICE
B1-FICE
AMHS
AIDC
Information Management (see Roadmap)
AIR-GROUND VOICE COMMUNICATIONS
VHF (25 KHz)
VHF (8.33 KHz) CONGESTION RELIEF
Future Digital Voice System?
ENABLERS (LINK MEDIA)
HF
Current Satellite Systems
Future Satellite System

Issues addressed

- Reduce telecommunication costs in most cases (to be confirmed by local CBA)
- Enable integration in the aeronautical infrastructure and enhanced services (GANP, regional objectives)
- Enhance information security
- Provide a standardized interface for AFS (instead of multiple protocols, some of which are obsolete)
- Rationalize coordination for network management and enhancement
- Respond to Air Traffic requirements in a timely and standardized manner

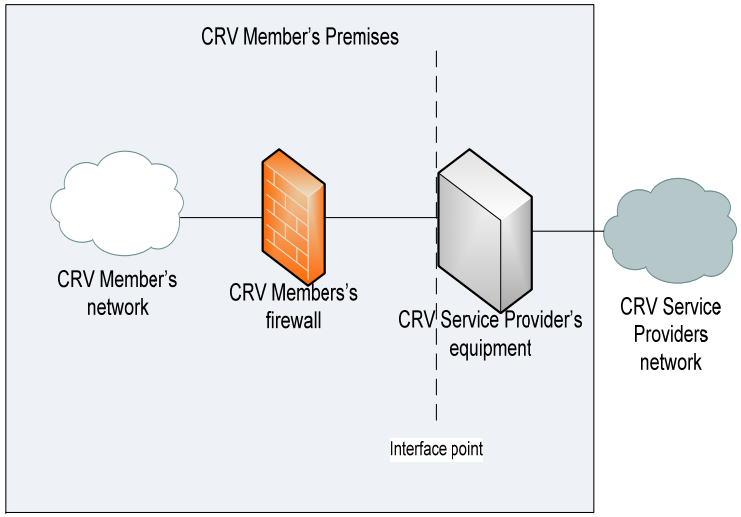
Elsewhere

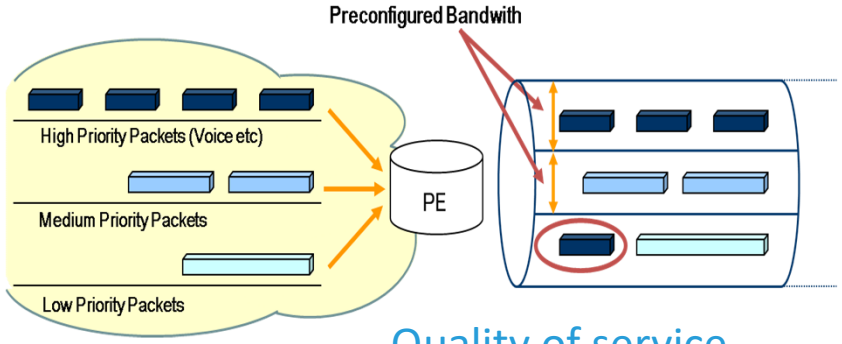
- European region has implemented the Pan-European Network Service (PENS)
- North American region has FAA Telecommunication Infrastructure (FTI) to support Canada and USA to distribute AFS data
- South America has REDDIG
- Caribbean has MEVA
- …

CONOPS

- IP version 4 and version 6 address space will be proposed by the CRV Service Provider and agreed with the CRV Coordinator during the procurement process.
- It is anticipated that Members will need to use Network Address Translation (NAT) due to the various IP addressing schemes used by the Members.
- The OG Coordinator will manage the Regional IP address plan after the contract is awarded.

Security





Quality of service

- each user of the network will take responsibility for their own IT security.
- network will support this security by being a closed private network, without access to the public Internet.
- Each Member can (and should) establish IT security protections so that they comply with their organization's security policies.
- At their discretion, some Members may also establish bi-lateral VPN overlays over the CRV to provide an additional layer of protection

Current CRV Users in Asia/Pacific Region (VoIP and AMHS)

Australia
Fiji
Hong Kong, China
Japan
Philippines
New Zealand
USA

Current CRV Service

1. Voice over Internet Protocol (VoIP):
   a) Conversion VoIP to legacy
   b) Support ED-137 VoIP
2. Air Traffic Service Message Handling System (AMHS)
3. AFTN over IP

Planned CRV Service

1. AMHS with XML attachment (FTBP)
2. System Wide Information Management (SWIM)
3. European Directory Service (EDS)?

CRV ISSUES

1. All States/Administrations (APAC, MID) encouraged to join
2. Formal coordination between Asia/Pac CRV OG and MID CRV operational body
3. Formalization of non-ANSPs (e.g. service providers) approval process
4. Formalization Procedure of new connections between ANSPs

FAA CRV NETWORK

- Voice service: Oakland, CA
- Primary Data: Salt Lake City, UT
- Backup Data: Atlanta, GA

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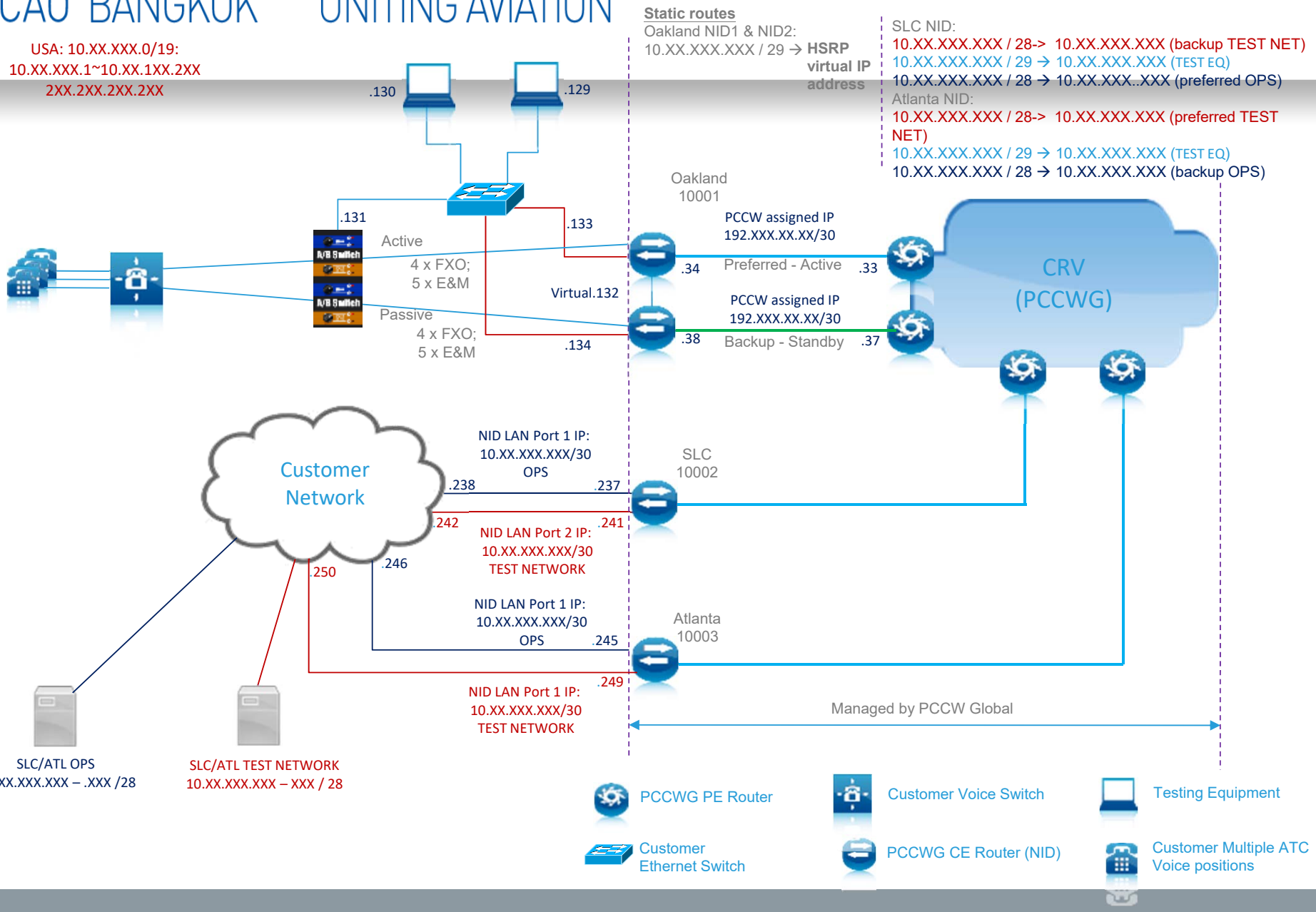
High Level Solution Diagram for the USA (20-Sept-2018)



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High Level Solution Diagram for the USA (20-Sept-2018)

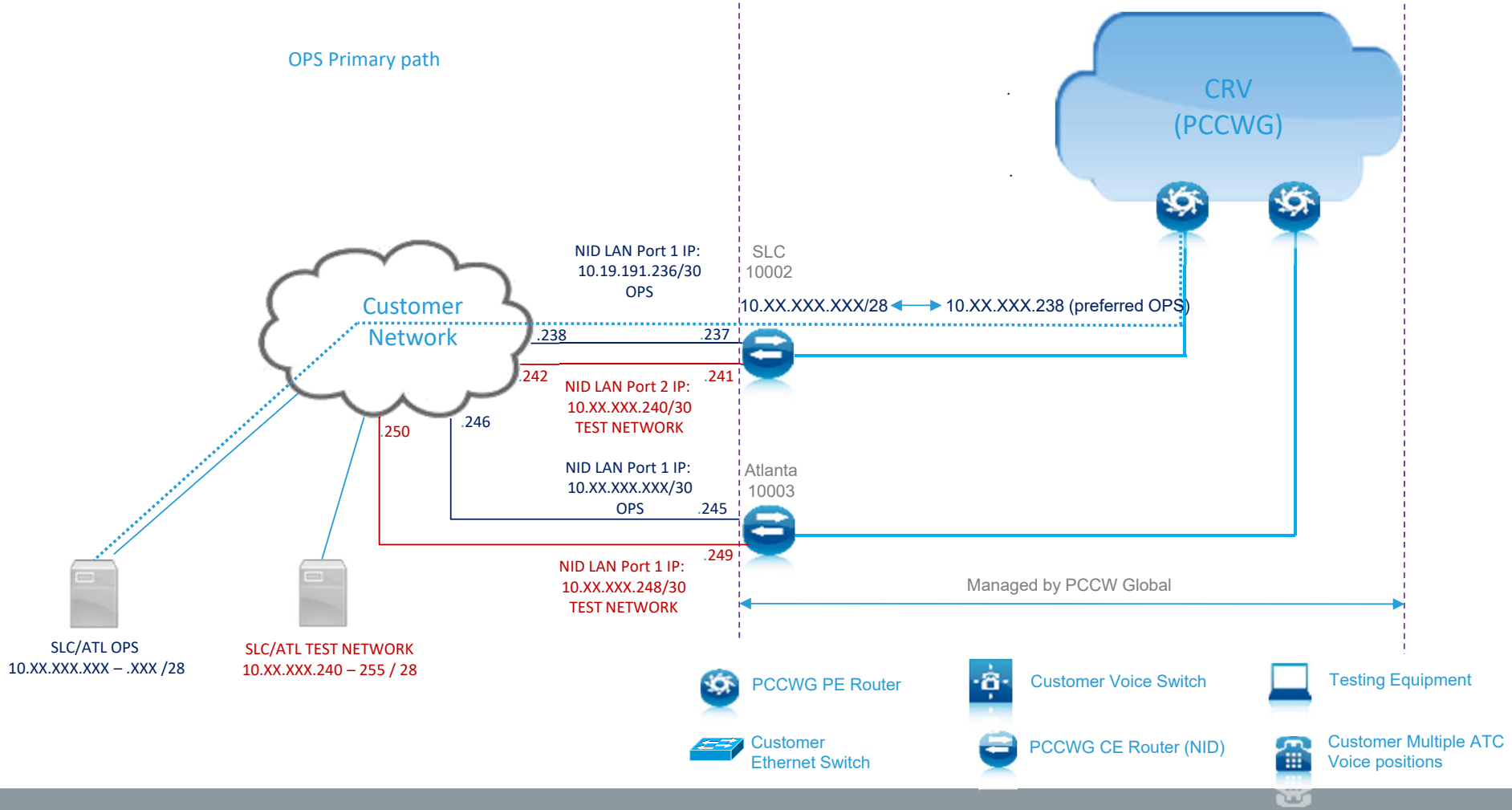
USA: 10.XX.XXX.0/19:
10.XX.XXX.1~10.XX.1XX.2XX
2XX.2XX.2XX.2XX

Static routes
Oakland NID1 & NID2:
10.19.162.128 / 29 →

HSRP virtual IP address

SLC NID:
10.XX.XXX.XXX / 28-> 10.XX.XXX.XXX (backup TEST NET)
10.XX.XXX.XXX / 29 → 10.XX.XXX.XXX (TEST EQ)
10.XX.XXX.XXX / 28 → 10.XX.XXX..XXX (preferred OPS)
Atlanta NID:
10.XX.XXX.XXX / 28-> 10.XX.XXX.XXX (preferred TEST NET)
10.XX.XXX.XXX / 29 → 10.XX.XXX.XXX (TEST EQ)
10.XX.XXX.XXX / 28 → 10.XX.XXX.XXX (backup OPS)

OPS Primary path



PCCWG PE Router
Customer Voice Switch
Testing Equipment
Customer Ethernet Switch
PCCWG CE Router (NID)
Customer Multiple ATC Voice positions

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USA: 10.XX.XXX.0/19:
10.XX.XXX.1~10.XX.1XX.2XX
2XX.2XX.2XX.2XX

High Level Solution Diagram for the USA (20-Sept-2018)

Static routes
Oakland NID1 & NID2:
10.19.162.128 / 29 →

HSRP virtual IP address

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10.XX.XXX.XXX / 29 → 10.XX.XXX.XXX (TEST EQ)
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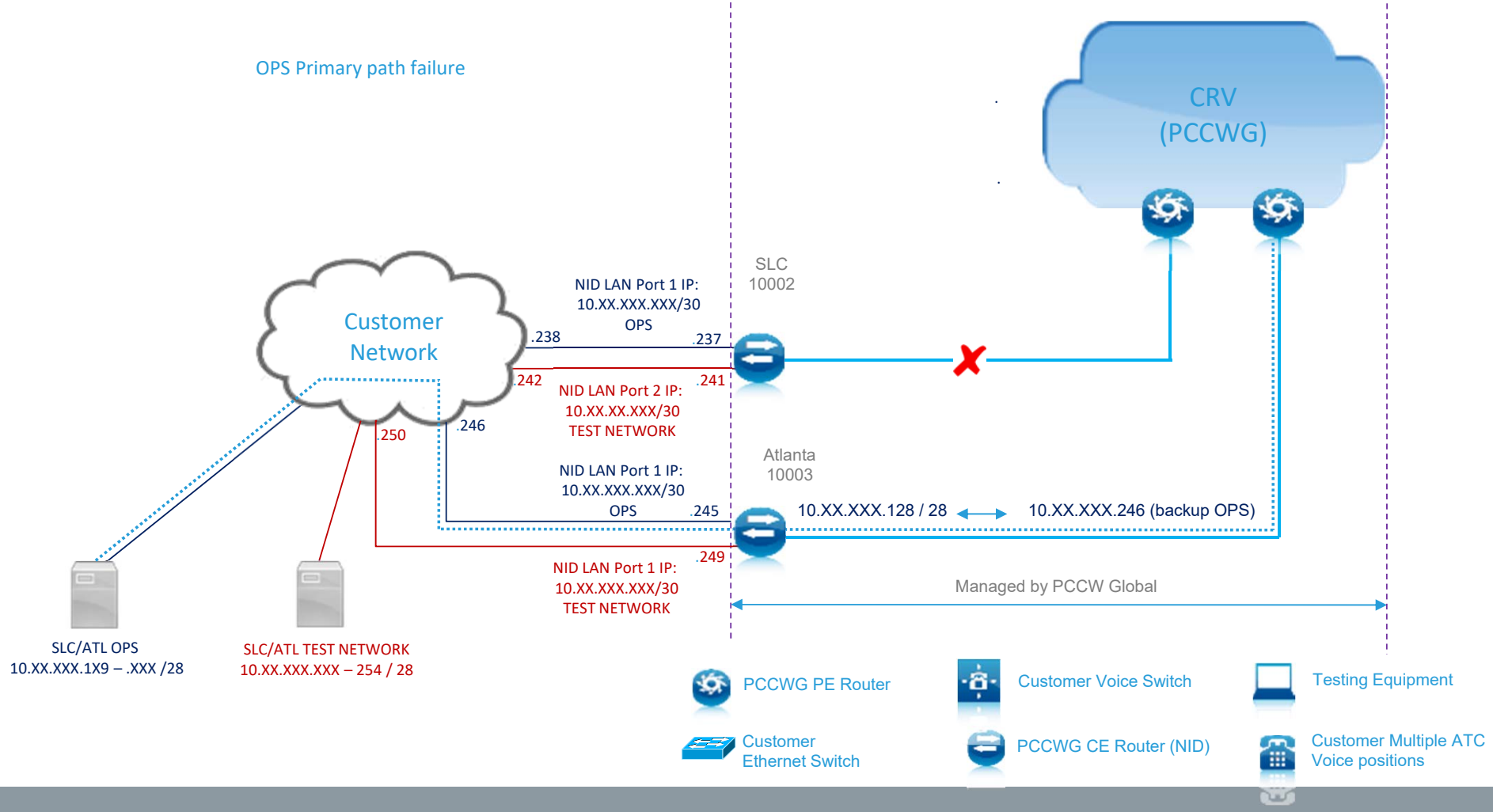
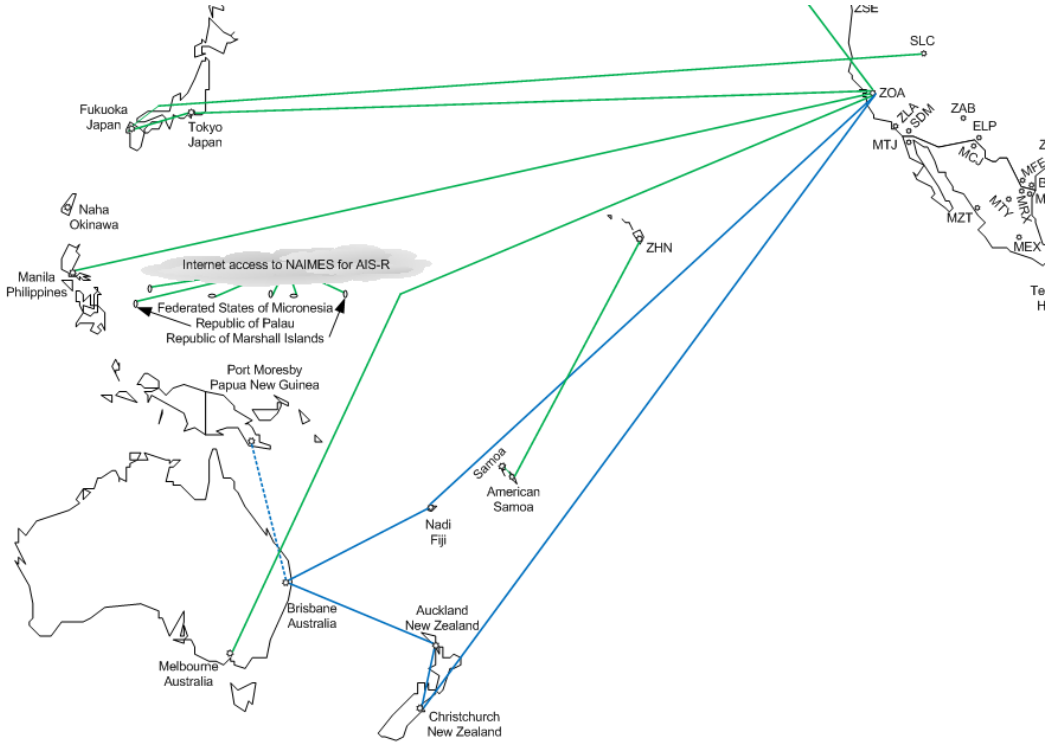
Atlanta NID:
10.XX.XXX.XXX / 28-> 10.XX.XXX.XXX (preferred TEST NET)
10.XX.XXX.XXX / 29 → 10.XX.XXX.XXX (TEST EQ)
10.XX.XXX.XXX / 28 → 10.XX.XXX.XXX (backup OPS

OPS Primary path failure

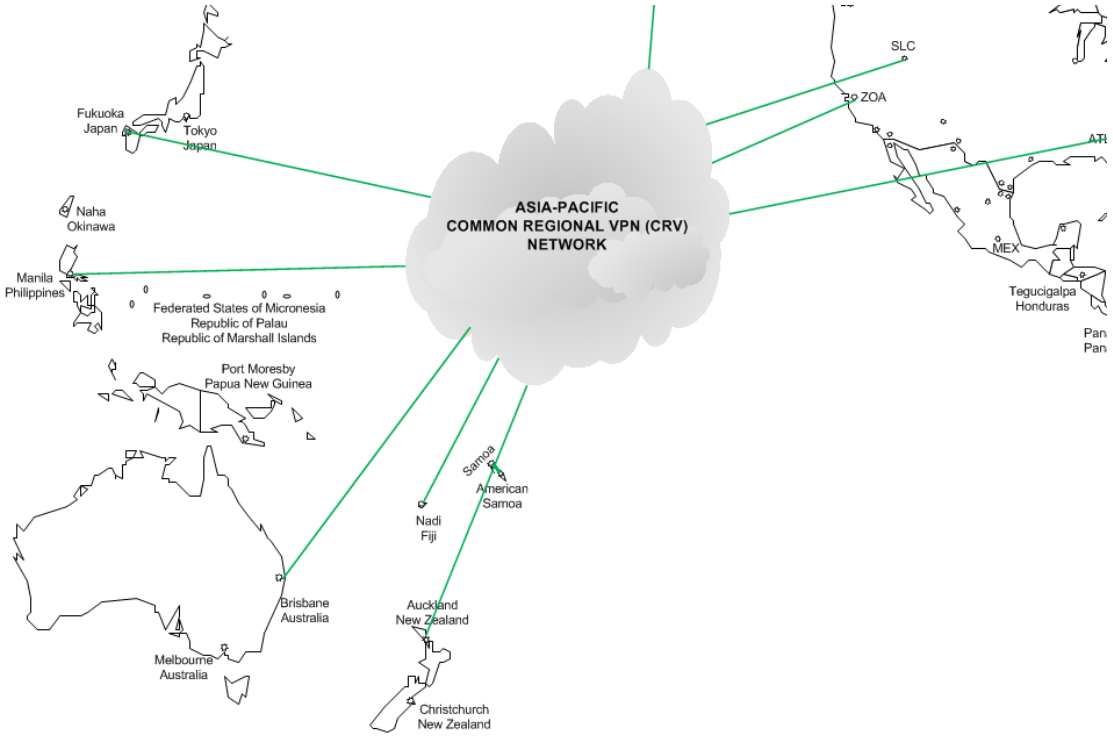


PCCWG PE Router
Customer Voice Switch
Testing Equipment
Customer Ethernet Switch
PCCWG CE Router (NID)
Customer Multiple ATC Voice positions

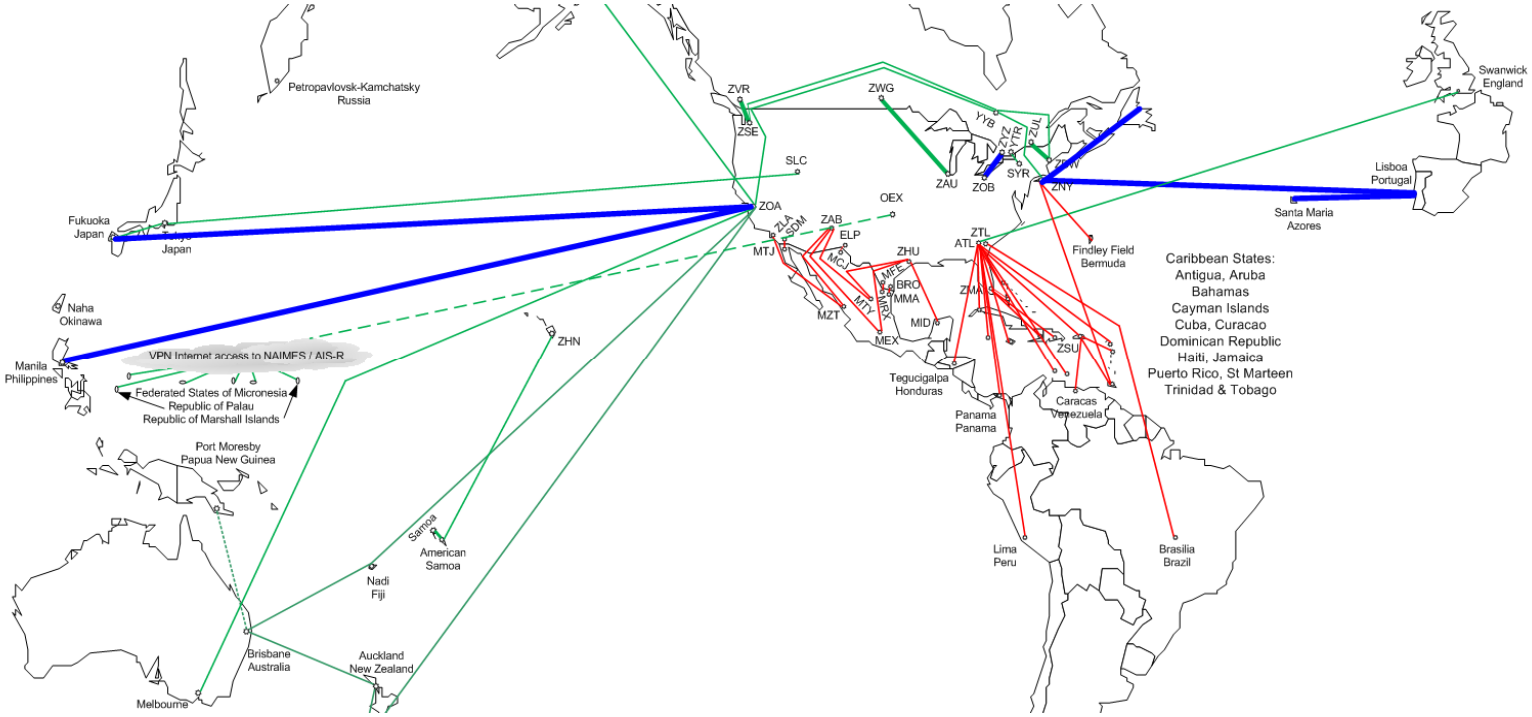
FAA PRE-CRV NETWORK



FAA CRV NETWORK



FAA VOIP IMPLEMENTATION



CRV Safety

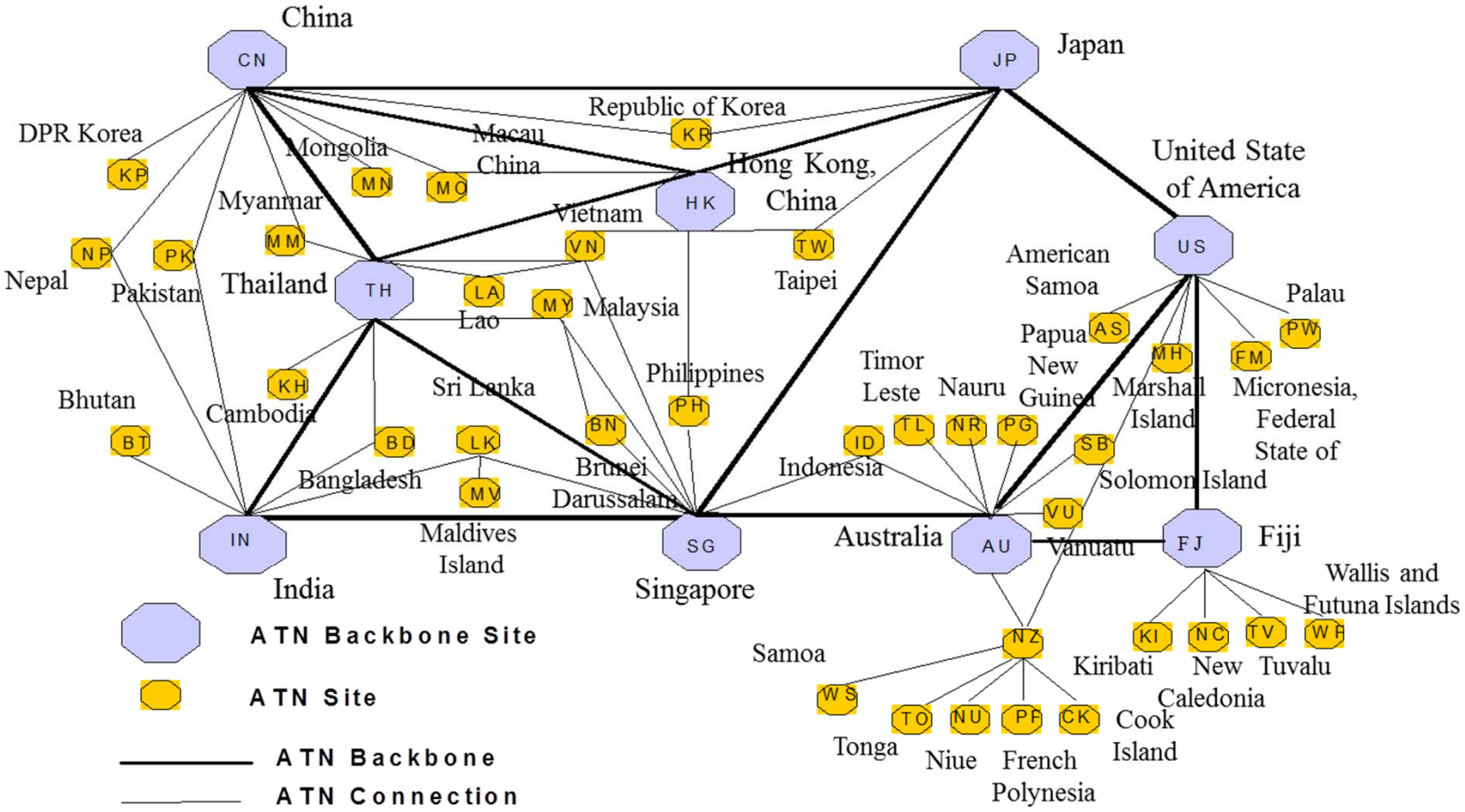
- FAA assesses safety based on service not on project/program
- For voice service over CRV, FAA has Package A (Hot Standby). FAA can revert to International Dial Direct (IDD) as needed.
- For AMHS Network Backup, FAA has two CRV Package C at separated Locations (Atlanta and Salt Lake City) that CRV can re-route traffic using Border Gateway Protocol (BGP).
- For AMHS System Backup, FAA would use its internal International User Portal (IUP) to re-Direct traffic between Atlanta and Salt Lake City using BGP between IUPs.

AMHS ROUTING OVER CRV

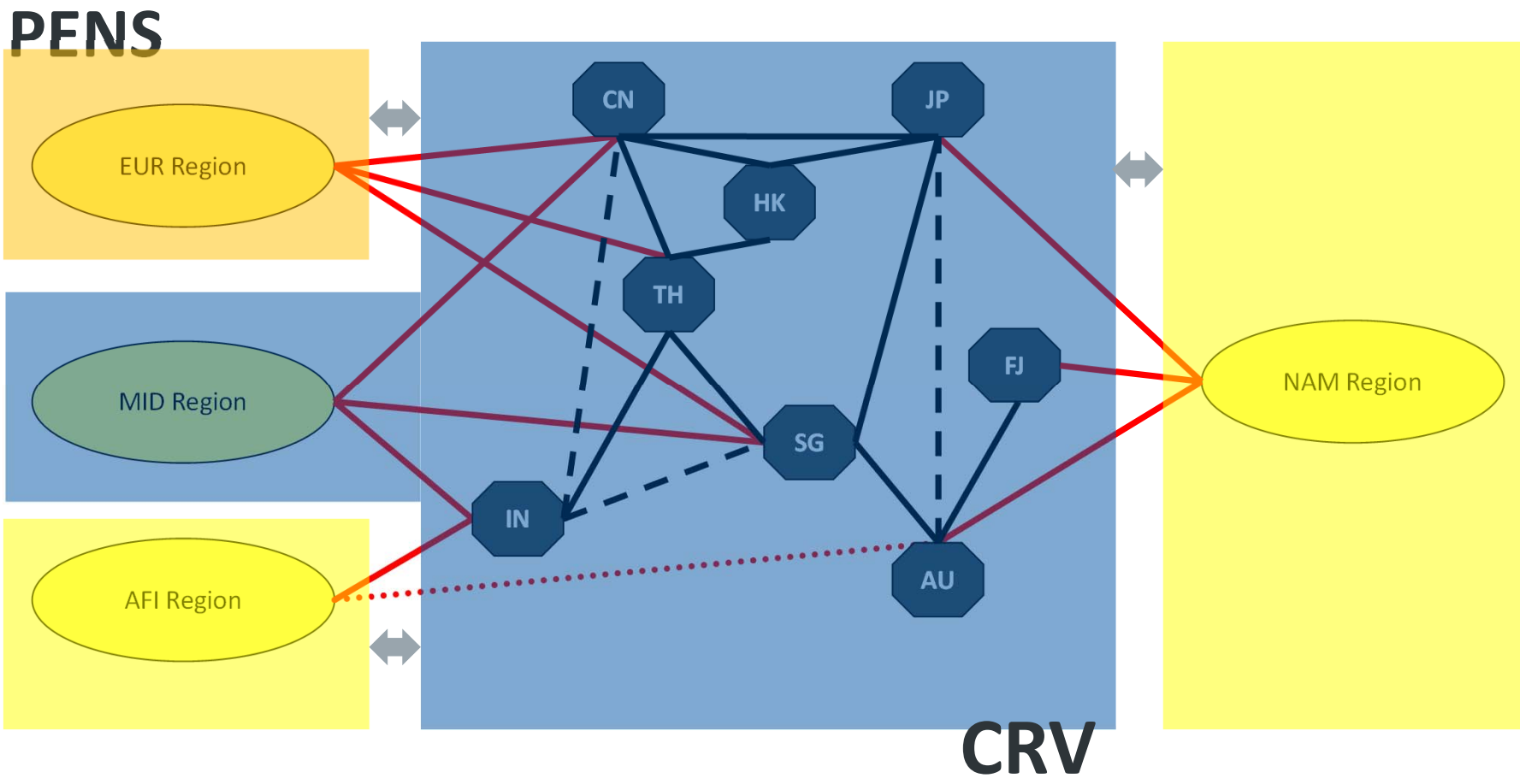
AMHS ROUTING

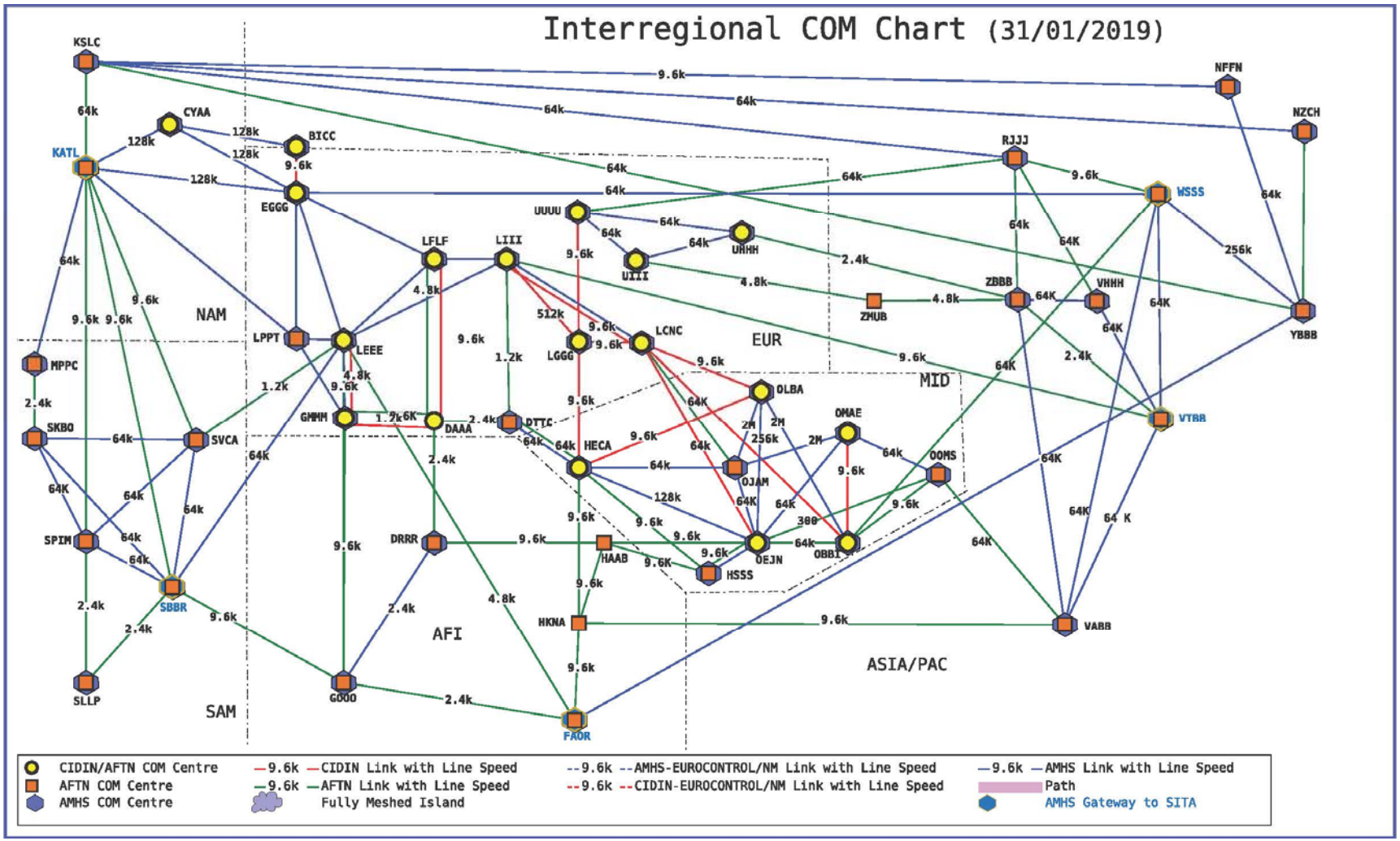
- AMHS is routing by Application not by network
- CRV potentially allows connection between any AMHS MTAs within network

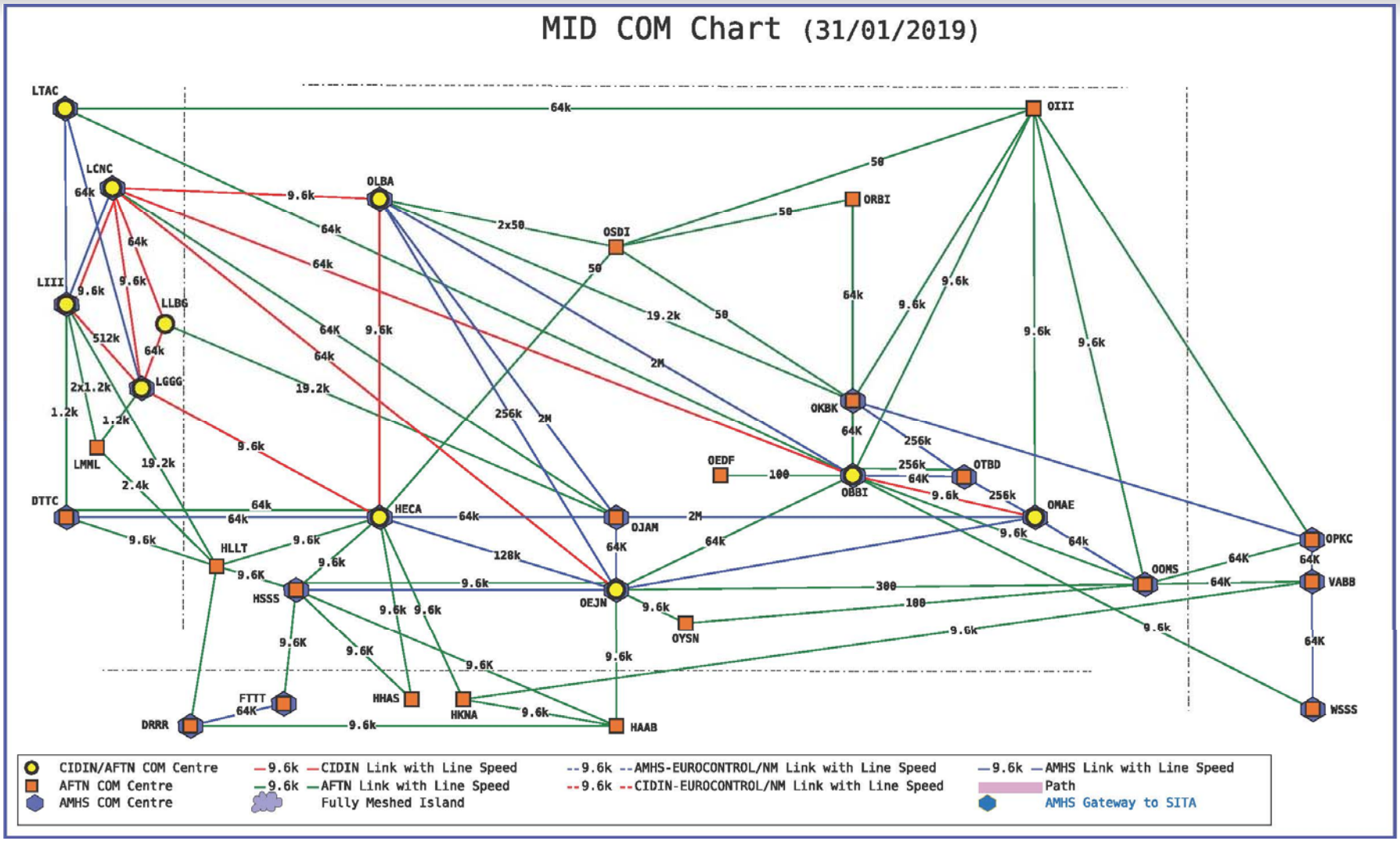
AMHS ROUTING

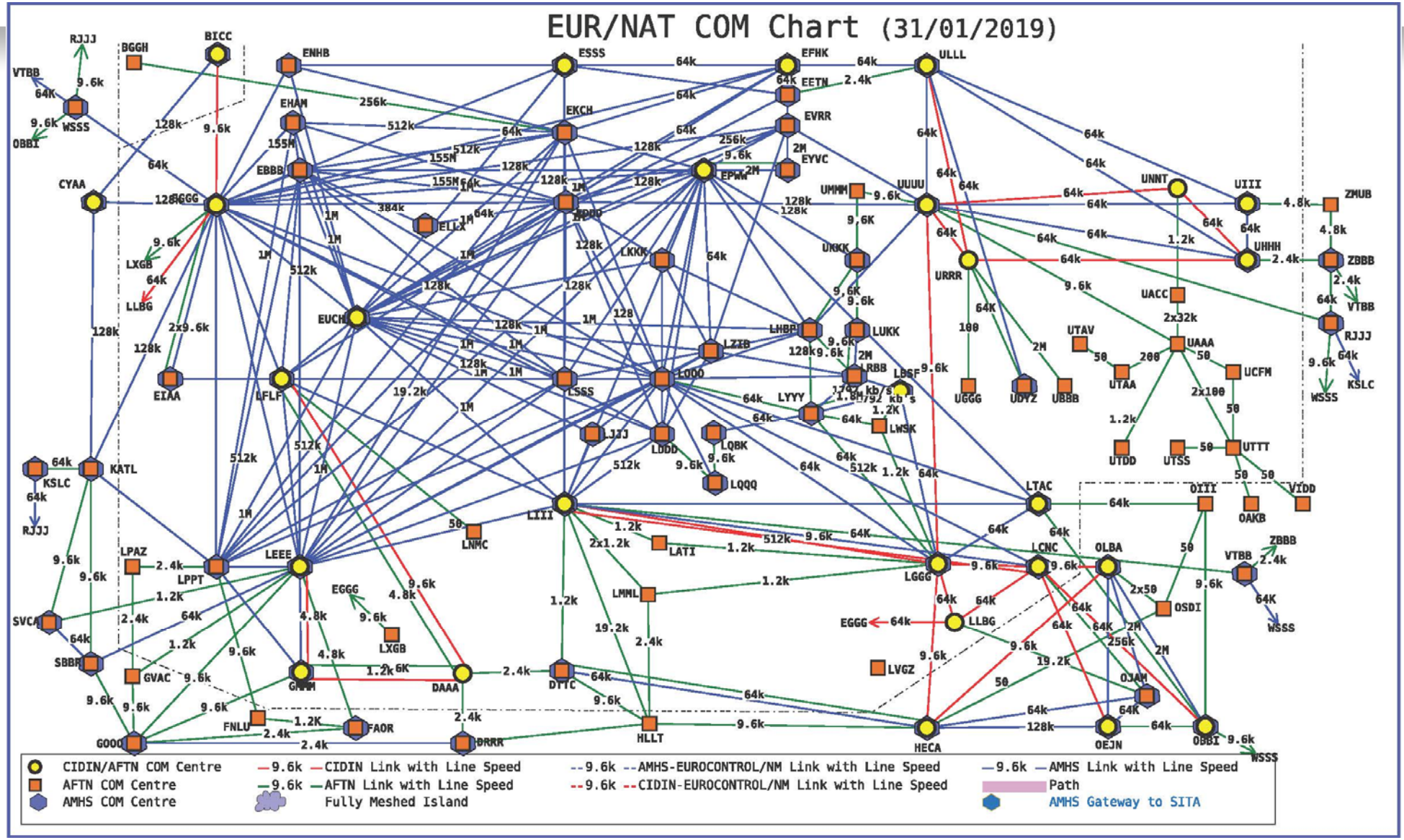


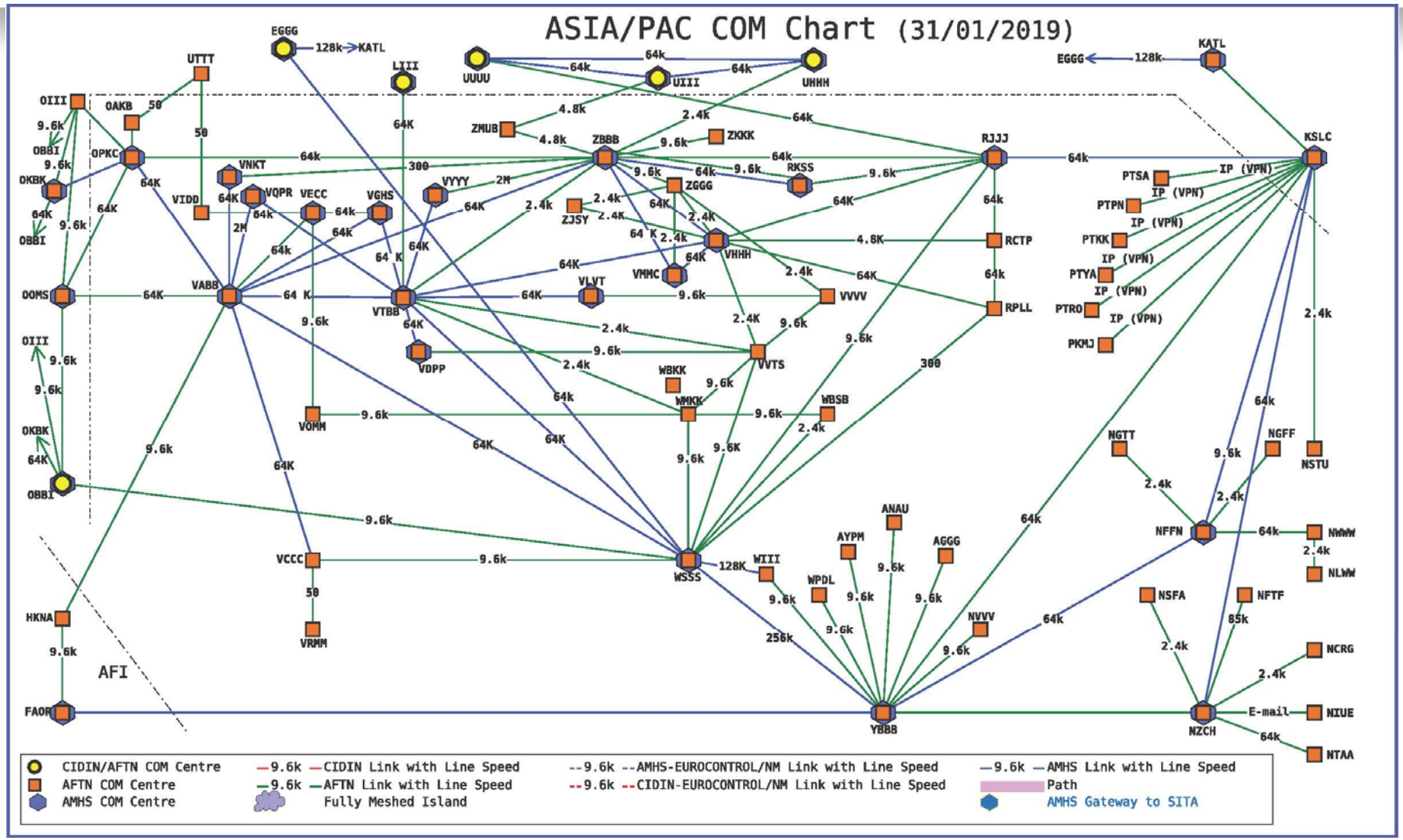
AMHS INTER-REGIONAL ROUTING




Interregional COM Chart (31/01/2019)
KSLC
NFFN
NZCH
CYAA
BICC
KATL
RJJJ
WSSS
EGGG
UUUU
UHHH
UIII
LFLF
LIII
ZBBB
VHHH
ZMUB
YBBB
LPPT
LEEE
LGGG
LCNC
MPPC
OLBA
OMAE
VTBB
SKBO
SVCA
GMMM
DAAA
DTTC
HECA
OJAM
OOMS
SPIM
DRRR
HAAB
OEJN
OBBI
HSSS
SBBR
HKNA
VABB
SLLP
GOOO
FAOR
NAM
EUR
MID
AFI
ASIA/PAC
SAM
CIDIN/AFTN COM Centre
AFTN COM Centre
AMHS COM Centre
9.6k CIDIN Link with Line Speed
9.6k AFTN Link with Line Speed
Fully Meshed Island
9.6k AMHS-EUROCONTROL/NM Link with Line Speed
9.6k CIDIN-EUROCONTROL/NM Link with Line Speed
9.6k AMHS Link with Line Speed
Path
AMHS Gateway to SITA


MID COM Chart (31/01/2019)
LTAC
LCNC
LIII
LLBG
LGGG
LMML
DTTC
HLLT
HSSS
DRRR
FTTT
HECA
OLBA
OSDI
HHAS
HKNA
HAAB
DJAM
OEJN
OEDF
OBBI
OKBK
ORBI
OIII
OTBD
OMAE
OOMS
OYSN
OPKC
VABB
WSSS
CIDIN/AFTN COM Centre
AFTN COM Centre
AMHS COM Centre
9.6k CIDIN Link with Line Speed
9.6k AFTN Link with Line Speed
Fully Meshed Island
9.6k AMHS-EUROCONTROL/NM Link with Line Speed
9.6k CIDIN-EUROCONTROL/NM Link with Line Speed
9.6k AMHS Link with Line Speed
Path
AMHS Gateway to SITA


EUR/NAT COM Chart (31/01/2019)
CIDIN/AFTN COM Centre
AFTN COM Centre
AMHS COM Centre
9.6k CIDIN Link with Line Speed
9.6k AFTN Link with Line Speed
Fully Meshed Island
9.6k AMHS-EUROCONTROL/NM Link with Line Speed
9.6k CIDIN-EUROCONTROL/NM Link with Line Speed
9.6k AMHS Link with Line Speed
Path
AMHS Gateway to SITA


ASIA/PAC COM Chart (31/01/2019)
EGGG
128k
KATL
UTTT
LIII
UUUU
UIII
UHHH
OIII
OAKB
50
ZMUB
ZBBB
ZKKK
RJJJ
KSLC
OBBI
OPKC
VNKT
VYYY
ZGGG
RKSS
PTSA
IP (VPN)
PTPN
OKBK
VIDD
VQPR
VECC
VGHS
ZJSY
RCTP
PTKK
VHHH
PTYA
VMMC
VLVT
VVVV
RPLL
PTRO
OOMS
VABB
VTBB
VDPP
PKMJ
VVTS
WBKK
WMKK
WBSB
VOMM
NGTT
NGFF
NSTU
NFFN
NWWW
NLWW
VCCC
WSSS
WIII
AYPM
ANAU
AGGG
WPDL
NVVV
NSFA
NFTF
HKNA
VRMM
AFI
NCRG
FAOR
YBBB
NZCH
E-mail
NIUE
NTAA
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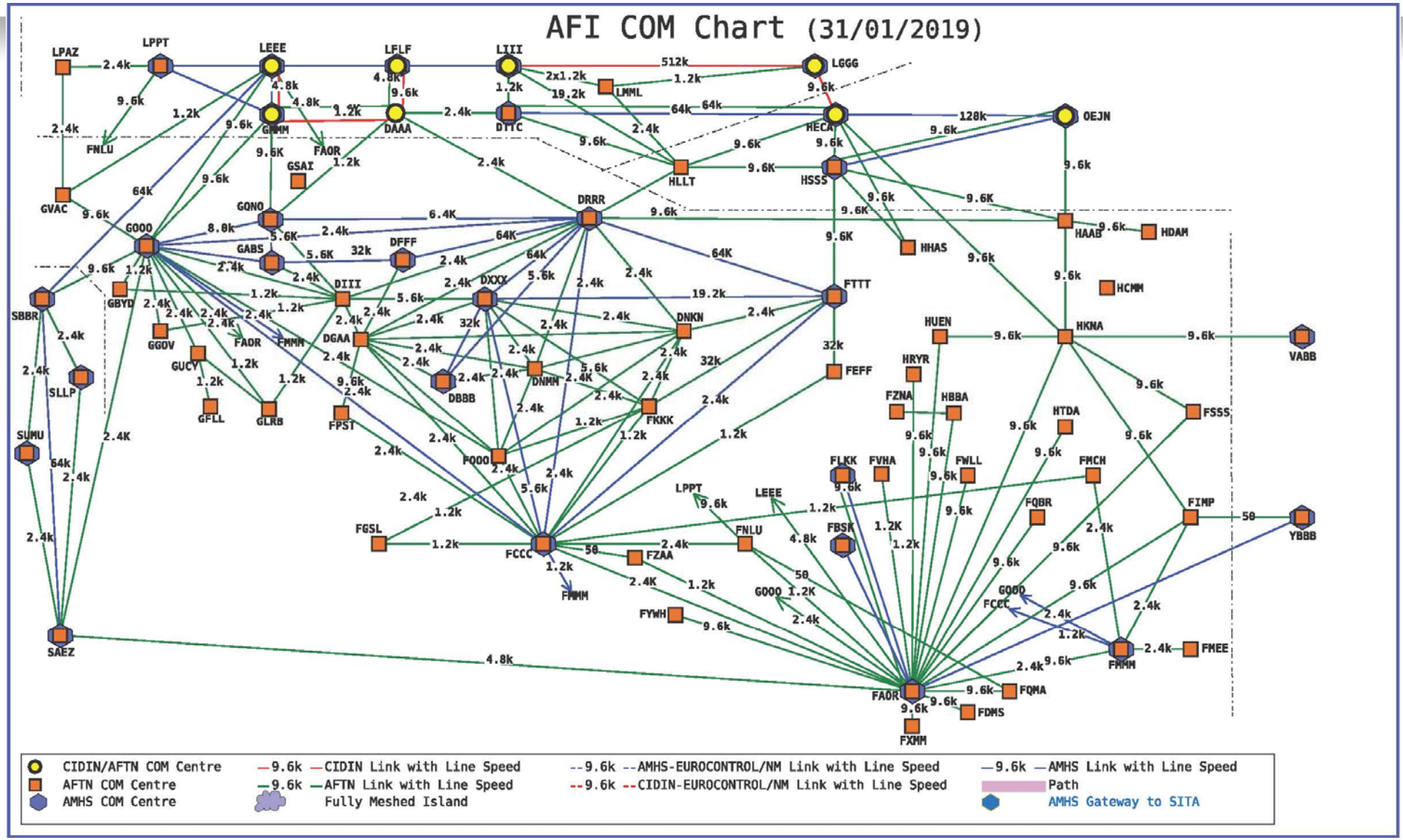
Path
AMHS Gateway to SITA


AFI COM Chart (31/01/2019)
LPAZ
LPPT
LEEE
LFLF
LIII
LGGG
LMML
OEJN
GMMM
DAAA
DTTC
HECA
FNLU
FAOR
GSAI
HLLT
HSSS
GVAC
GOOO
GONO
DRRR
HAAB
HDAM
HHAS
GABS
DFFF
DIII
DXXX
FTTT
HCMM
SBBR
GBYD
DNKN
HUEN
HKNA
VABB
GGOV
GUCY
FMMM
DGAA
HRYR
FEFF
SLLP
GFLL
GLRB
DBBB
DNMM
FZNA
HBBA
FSSS
FPST
FKKK
HTDA
SUMU
FOOO
FLKK
FVHA
FWLL
FMCH
LPPT
LEEE
FQBR
FIMP
FGSL
FNLU
FBSK
FCCC
FZAA
YBBB
FMMM
GOOO
FCCC
FYWH
SAEZ
FMEE
FAOR
FQMA
FDMS
FXMM
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AFTN COM Centre
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9.6k CIDIN Link with Line Speed
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9.6k CIDIN-EUROCONTROL/NM Link with Line Speed
9.6k AMHS Link with Line Speed
Path
AMHS Gateway to SITA

AMHS over CRV Issues

- Under CRV network, any AMHS can potentially connect with any other within the network: This could impact AMHS operation based on existing AMHS routing
- Directory Service: Potential impact to ANSPs' Information security as would allow out of organization Directory Service access to internal application/network

IWXXM

IWXXM

- IWXXM is a variant of WXXM agreed by ICAO and the WMO for the exchange of Aviation-related Weather data using XML. IWXXM = ICAO Meteorological Information Exchange Model IWXXM facilitates the exchange of aviation MET data in a machine-readable form (XML). Real people need an HMI to read IWXXM data. Amendment 78 of ICAO Annex 3 mandates the use of IWXXM as a standard for digital MET data exchange from November 2020 - in addition to TAC (Text–based MET) remaining as a standard. IWXXM, together with the Aeronautical Information Exchange Model (AIXM) and the Flight Information Exchange Model (FIXM), provide standards for the exchange of Aviation-related information using System Wide Information Management (SWIM). Latest version is IWXXM 2.1 (April 2017). Some question the operational benefit of IWXXM and will need to be convinced of the benefits before adopting its use –often a case of WIIFM! An Asia-Pacific aeronautical network for Asia-Pacific and Middle East ICAO Members: CRV, the “Common AeRonautical Virtual (CRV) Network ”
- A wholly dependable and reliable communications infrastructure for aeronautical communications, enabling the global roadmap (ASBU B0-FICE, B0-NOPS, VoIP and B1-SWIM modules)

Exchange of Weather Data Airways provides the infrastructure for the exchange of Weather messages, e.g. METAR/SPECI, TAF, SIGMET, ARFOR and ATIS

- AFTN Supports TAC (Traditional Alphanumeric Codes) MET messages. Text –based reports only, with limited character set (not full ASCII) X.25 Serial connections almost phased out – most AFTN connections are now IP-based.
- AMHS Supports TAC and IWXXM (XML formatted) MET messages. Supports exchange of Textual messages (full ASCII character set) and binary data (via FTBP - File Transfer Body Part). AMHS uses IP-based connections only.
- Web Services MET data are obtained from smartAIM using Web Service requests. AQC (Airways query converter) allows remote clients to request MET and other data from the AIM database - either separately or in a Pre-Flight Briefing, and in different formats (text, HTTP, XML). (Source: New Zealand Airways)

METAR Message Sample

- SADR31 MDSD 140000
- METAR
- METAR MDPP 140000Z 00000KT 9999 TS FEW017CB FEW018 27/25 Q1012
- CB/SW/W=
- METAR MDST 140000Z 11012KT 9999 TS FEW018CB FEW018 26/23 Q1012 CB/W=
- METAR MDPC 140000Z VRB03KT 160V220 9999 FEW016CB FEW016 BKN070
- BKN300 25/23 Q1014 RERA CB/NE/E=
- METAR MDBH 140000Z 13014KT 8000 -RA FEW016CB BKN018 BKN070 26/24
- Q1014 CB/NW/N=
- METAR MDSD 140000Z 17003KT 130V210 9999 SCT018 25/23 Q1013=
- METAR MDLR 140000Z 00000KT 9999 FEW016CB SCT018 SCT070 BKN300 23/22
- Q1015 CB/NE/E/SE/S=
- METAR MDCY 140000Z 00000KT 9999 SCT018 26/24 Q1013=
- AFTNTextSize: 570 chars
- SABZ20 SBPV 140000
- METAR SBPV 140000Z 00000KT 9000 SCT020 BKN070 25/24 Q1008 =

- AFTNTextSize: 78 chars

IWXXM Message Sample

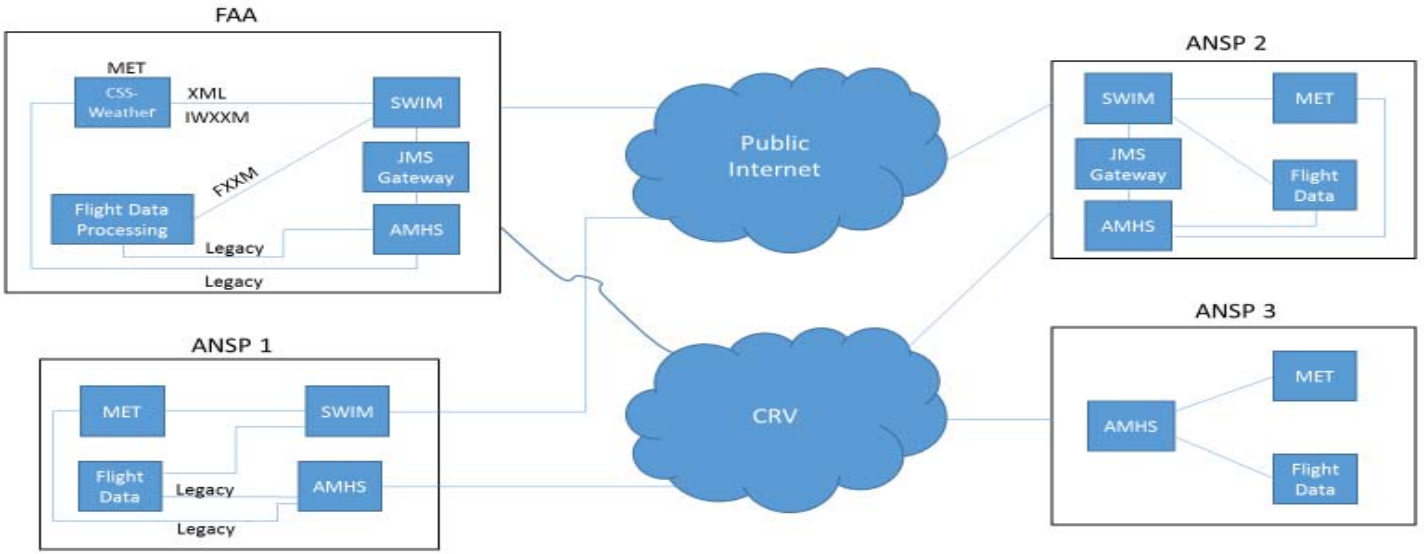
- <?xml version="1.0" encoding="UTF-8"?>
- <collect:MeteorologicalBulletin gml:id="**uuid-c1895be7-4486-4a5a-9d4f-3460968d1aea-LAFR21LFPW-20180116153000**" xmlns:gmd="**http://www.isotc211.org/2005/gmd**" xmlns:xlink="**http://www.w3.org/1999/xlink**" xmlns:om="**http://www.opengis.net/om/2.0**" xmlns:collect="**http://def.wmo.int/collect/2014**" xmlns:sf="**http://www.opengis.net/sampling/2.0**" xmlns:gco="**http://www.isotc211.org/2005/gco**" xmlns:metce="**http://def.wmo.int/metce/2013**" xmlns:aixm="**http://www.aixm.aero/schema/5.1.1**" xmlns:xsi="**http://www.w3.org/2001/XMLSchema-instance**" xmlns:opm="**http://def.wmo.int/opm/2013**" xmlns:gml="**http://www.opengis.net/gml/3.2**" xmlns:gsr="**http://www.isotc211.org/2005/gsr**" xmlns:gts="**http://www.isotc211.org/2005/gts**" xmlns:gss="**http://www.isotc211.org/2005/gss**" xmlns:sams="**http://www.opengis.net/samplingSpatial/2.0**" xmlns:iwxxm="**http://icao.int/iwxxm/2.1**" xsi:schemaLocation="**http://def.wmo.int/collect/2014 http://schemas.wmo.int/collect/1.2/collect.xsd http://icao.int/iwxxm/2.1 http://schemas.wmo.int/iwxxm/2.1/iwxxm.xsd**"><collect:meteorologicalInformation><iwxxm:METAR gml:id="**uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**" permissibleUsageReason="**TEST**" permissibleUsage="**NON-OPERATIONAL**" automatedStation="**true**" status="**NORMAL**"><iwxxm:observation><om:OM_Observation gml:id="**obs-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><om:type xlink:href="**http://codes.wmo.int/49-2/observation-type/IWXXM/2.1/MeteorologicalAerodromeObservation**"/><om:phenomenonTime><gml:TimeInstant gml:id="**ti-20180116T153000Z-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><gml:timePosition>2018-01-16T15:30:00Z</gml:timePosition></gml:TimeInstant></om:phenomenonTime><om:resultTime xlink:href="**#ti-20180116T153000Z-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"/><om:procedure><metce:Process gml:id="**p-49-2-metar-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><gml:description>WMO No. 49 Volume 2 Meteorological Service for International Air Navigation APPENDIX 3 TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS</gml:description></metce:Process></om:procedure><om:observedProperty xlink:href="**http://codes.wmo.int/49-2/observable-property/MeteorologicalAerodromeObservation**"/><om:featureOfInterest><sams:SF_SpatialSamplingFeature gml:id="**sampling-point-03839-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><sf:type xlink:href="**http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF_SamplingPoint**"/><sf:sampledFeature><aixm:AirportHeliport gml:id="**aerodrome-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><aixm:timeSlice><aixm:AirportHeliportTimeSlice gml:id="**aerodrome-ts-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><gml:validTime/><aixm:interpretation>SNAPSHOT</aixm:interpretation><aixm:locationIndicatorICAO>LFOA</aixm:locationIndicatorICAO></aixm:AirportHeliportTimeSlice></aixm:timeSlice></aixm:AirportHeliport></sf:sampledFeature><sams:shape/></sams:SF_SpatialSamplingFeature></om:featureOfInterest><om:result xsi:type="**iwxxm:MeteorologicalAerodromeObservationRecordPropertyType**"><iwxxm:MeteorologicalAerodromeObservationRecord gml:id="**obs-record-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**" cloudAndVisibilityOK="**false**"><iwxxm:airTemperature uom="**Cel**">10.0</iwxxm:airTemperature><iwxxm:dewpointTemperature uom="**Cel**">8.0</iwxxm:dewpointTemperature><iwxxm:qnh uom="**hPa**">1006.0</iwxxm:qnh><iwxxm:surfaceWind><iwxxm:AerodromeSurfaceWind variableWindDirection="**false**"><iwxxm:meanWindDirection uom="**deg**">260.0</iwxxm:meanWindDirection><iwxxm:meanWindSpeed uom="**[kn_i]**">22.0</iwxxm:meanWindSpeed><iwxxm:windGustSpeed uom="**[kn_i]**">33.0</iwxxm:windGustSpeed></iwxxm:AerodromeSurfaceWind></iwxxm:surfaceWind><iwxxm:visibility><iwxxm:AerodromeHorizontalVisibility><iwxxm:prevailingVisibility uom="**m**">10000.0</iwxxm:prevailingVisibility><iwxxm:prevailingVisibilityOperator>ABOVE</iwxxm:prevailingVisibilityOperator></iwxxm:AerodromeHorizontalVisibility></iwxxm:visibility><iwxxm:cloud><iwxxm:AerodromeObservedClouds><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Few**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/1**"/><iwxxm:base uom="**[ft_i]**">2900.0</iwxxm:base></iwxxm:CloudLayer></iwxxm:layer><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Broken**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/3**"/><iwxxm:base uom="**[ft_i]**">6600.0</iwxxm:base></iwxxm:CloudLayer></iwxxm:layer></iwxxm:AerodromeObservedClouds></iwxxm:cloud></iwxxm:MeteorologicalAerodromeObservationRecord></om:result></om:OM_Observation></iwxxm:observation><iwxxm:trendForecast><om:OM_Observation gml:id="**trend-fcst-1-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><om:type xlink:title="**Aerodrome Trend Forecast**" xlink:href="**http://codes.wmo.int/49-2/observation-type/IWXXM/2.1/MeteorologicalAerodromeTrendForecast**"/><om:phenomenonTime><gml:TimePeriod gml:id="**tp-tf-1-20180116T153000Z-20180116T173000Z-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><gml:beginPosition>2018-01-16T15:30:00Z</gml:beginPosition><gml:endPosition>2018-01-16T17:30:00Z</gml:endPosition></gml:TimePeriod></om:phenomenonTime><om:resultTime xlink:href="**#ti-20180116T153000Z-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"/><om:procedure xlink:href="**#p-49-2-metar-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"/><om:observedProperty xlink:title="**METAR trend forecast properties**" xlink:href="**http://codes.wmo.int/49-2/observable-property/MeteorologicalAerodromeTrendForecast**"/><om:featureOfInterest xlink:href="**#sampling-point-03839-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"/><om:result xsi:type="**iwxxm:MeteorologicalAerodromeTrendForecastRecordPropertyType**"><iwxxm:MeteorologicalAerodromeTrendForecastRecord gml:id="**trend-fcst-record-1-20180116T1530Z-201801161730Z-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**" cloudAndVisibilityOK="**false**" changeIndicator="**TEMPORARY_FLUCTUATIONS**"><iwxxm:prevailingVisibility uom="**m**">4000.0</iwxxm:prevailingVisibility><iwxxm:forecastWeather xlink:title="**Showery precipitation of rain**" xlink:href="**http://codes.wmo.int/306/4678/SHRA**"/><iwxxm:cloud><iwxxm:AerodromeCloudForecast gml:id="**acf-1-uuid.e33f415f95a337a0108b556699e50acc-LFOA-20180116T153000Z**"><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Scattered**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/2**"/><iwxxm:base uom="**m**">300.0</iwxxm:base></iwxxm:CloudLayer></iwxxm:layer><iwxxm:layer><iwxxm:CloudLayer><iwxxm:amount xlink:title="**Broken**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-008/3**"/><iwxxm:base uom="**m**">600.0</iwxxm:base><iwxxm:cloudType xlink:title="**Towering cumulus**" xlink:href="**http://codes.wmo.int/bufr4/codeflag/0-20-012/32**"/></iwxxm:CloudLayer></iwxxm:layer></iwxxm:AerodromeCloudForecast></iwxxm:cloud></iwxxm:MeteorologicalAerodromeTrendForecastRecord></om:result></om:OM_Observation></iwxxm:trendForecast></iwxxm:METAR></collect:meteorologicalInformation><collect:bulletinIdentifier> A_LAFR21LFPW161530_C_LFPW_20180116153000.xml.gz </collect:bulletinIdentifier></collect:MeteorologicalBulletin>

IWXXM and Additional Bandwidth Requirements to CRV

- The communication infrastructure (AMHS and CRV) is expected to support both IWXXM traffic and TAC . In this case, AMHS will support XML/GML based IWXXM and legacy TAC messages until TAC format is phased out of operation. This means additional bandwidth is expected.
- There is also a plan for Flight and Flow Information for a Collaborative Environment (FF-ICE) to be introduced in ASBU Block 1. This will further require additional bandwidth to CRV.
- As shown in previous slides, the IWXXM required significant bandwidth compared to legacy message format (at least five times based on European study)
- As projection of increasing bandwidth would result in additional operating cost for CRV, compression of XML based message should be considered to minimize the impact
- In order for AMHS to support XML, File Transfer Body Part (FTBP) function will be required. It is noted that AMHS Extended Service which required X.500 Directory Service is not required to support FTBP.

FAA Plan to Support IWXMM Distribution

1. Implement Java Message Service (JMS) Gateway between FAA SWIM and FAA AMHS
2. Will Distribute IWXXM through AMHS externally



IWXXM Issues

- IWXXM is adopted to be distributed over AMHS beginning 2020. There is no clear plan of support IWXXM over SWIM in Asia/Pacific region
- IWXXM required MET application/system to support XML and develop compatible XML schema
- Need projection of bandwidth required
- Implement FTBP to AMHS
- Ensure no AFTN routing is involved

SWIM Over CRV

- SWIM has been adopted in Asia/Pac region and other ICAO regions to distribute future message format such as FIXM, IWXXM, AIXM
- Current FAA SWIM service has distributed IWXXM and other Non-time sensitive data
- FAA SWIM operated as an Enterprise service where as European is under Federated architecture
- Since SWIM can support many non-time sensitive data, prioritize of data distribution should be considered

SWIM Over CRV Issues

- Regional SWIM Architecture and its planned connections over CRV
- SWIM over CRV will be connected through GRE tunnel
- Dual Operation: AMHS legacy traffic and SWIM
- Projection of bandwidth, type of traffic (time sensitive?), architecture (Centralized or Distributed or Hybrid?), allow interface with Internet?

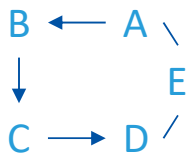
ISSUES AND RECOMMENDATIONS

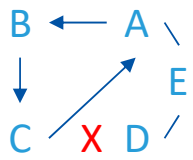
- Issue: CRV Inter-Regional Coordination
- Recommendation:
  - Change States/Administrations to join CRV to “ANSPs”
  - Establish a formal coordination to exchange new CRV connection, especially, non ANSPs
- Justification: ‘States/Administrations’ term is not specific and will delay approval process. The CRV is designed to primarily support time sensitive ATC voice and AFTN/AMHS. For a CRV user that is not an ANSP, a credential evaluation should be considered.

ISSUES AND RECOMMENDATIONS

- Issue: AMHS over CRV
- Recommendation: Maintain the AMHS routing and expand routing with coordination to all impacted ANSPs.
- Justification: AMHS traffic is routed by AMHS header. This was not an issue when AMHS connection is based on point-to-point circuit. However, ANSPs with CRV service, can potentially connect to any ANSPs linked to the CRV. Without careful coordination this can lead to operational problems. An example below depicts AMHS routing scenario

If *A* normally passes traffic for *D* through *B* and *C*





But C reroutes D traffic to A based on a perceived alternate route to D, a loop will form.

ISSUES AND RECOMMENDATIONS

- Issue: IWXXM
- Recommendation: IWXXM traffic will be distributed by AMHS as adopted by ICAO. IWXMM traffic should be evaluated regularly to ensure CRV can provide support
- Justification: IWXXM traffic based on XML is very large when compared to legacy weather data. CRV is expected to carry legacy TAC weather in addition IWXXM as well as SWIM. Either or both compression and/or increase of CRV is required when all are in operation.

ISSUES AND RECOMMENDATIONS

- Issue: SWIM over CRV
- Recommendation: SWIM over CRV should be regularly evaluate of its traffic to ensure CRV bandwidth can be used efficiently
- Justification: Some of SWIM traffic is non-time sensitive and could be supported by internet

ISSUES AND RECOMMENDATIONS

- Issue: Dual Operation: SWIM and AMHS
- Recommendation: Need to have a transition plan if SWIM will replace AMHS or carry AMHS traffic
- Justification: Prevent duplication of messages.

Conclusions

- The target is to have one common IP network for all ANSPs in APAC and MID Regions, connected to other ICAO regions, with applications migrated gradually
- Thus, CRV will be an infrastructure for all ANSPs to communicate to one another. We need to protect our network for safe and efficient air traffic control service.

ICAO

North American Central American and Caribbean (NACC) Office
Mexico City

South American (SAM) Office
Lima

ICAO Headquarters
Montréal

Western and Central African (WACAF) Office
Dakar

European and North Atlantic (EUR/NAT) Office
Paris

Middle East (MID) Office
Cairo

Eastern and Southern African (ESAF) Office
Nairobi

Asia and Pacific (APAC) Sub-office
Beijing

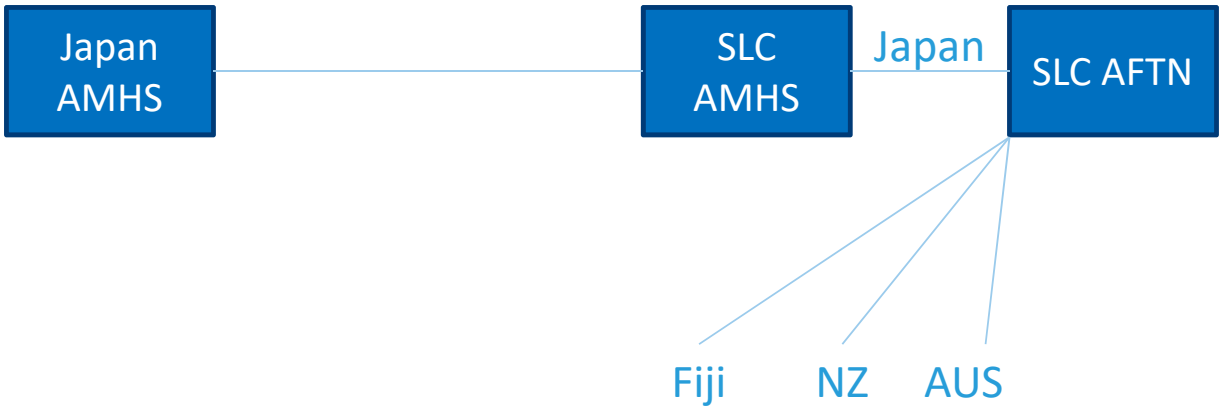
Asia and Pacific (APAC) Office
Bangkok

THANK YOU

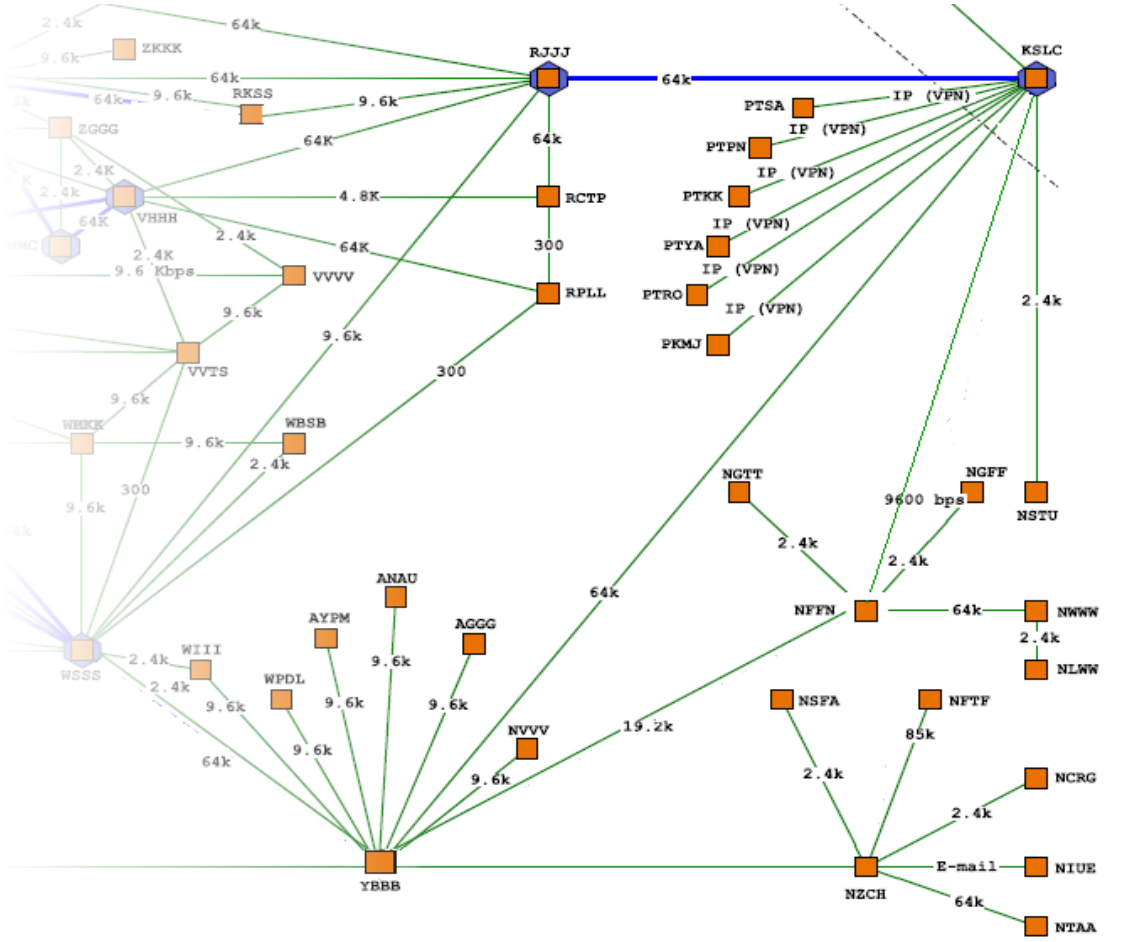
BACKUP

That was Then ….

- Initially, the only SLC AMHS connection was to Japan.
- Japan AMHS was essentially a station on NMR. Changing the routing for Japan traffic was purely an NMR alt route function.
- All other Asia-Pac destinations were AFTN alt routes.

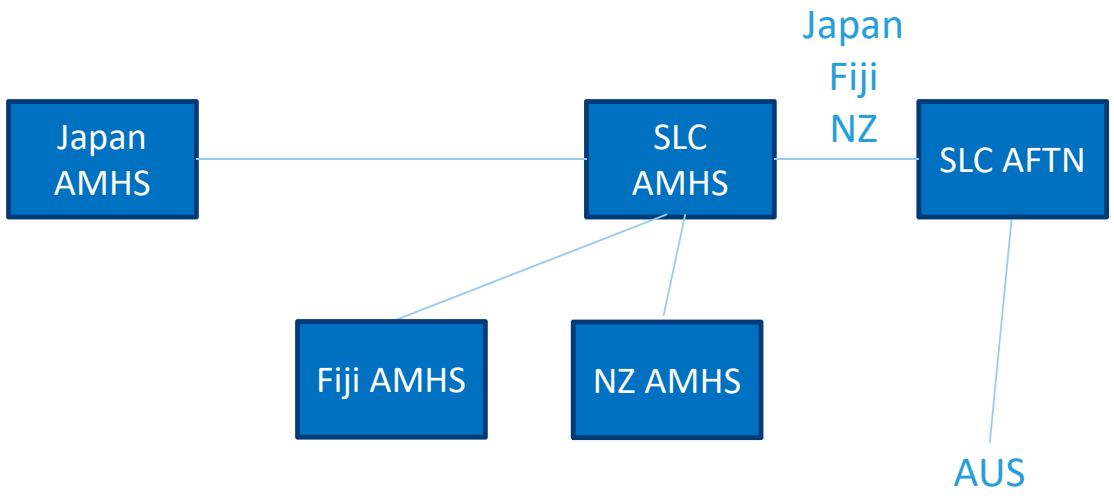


That was Then… (cont'd)

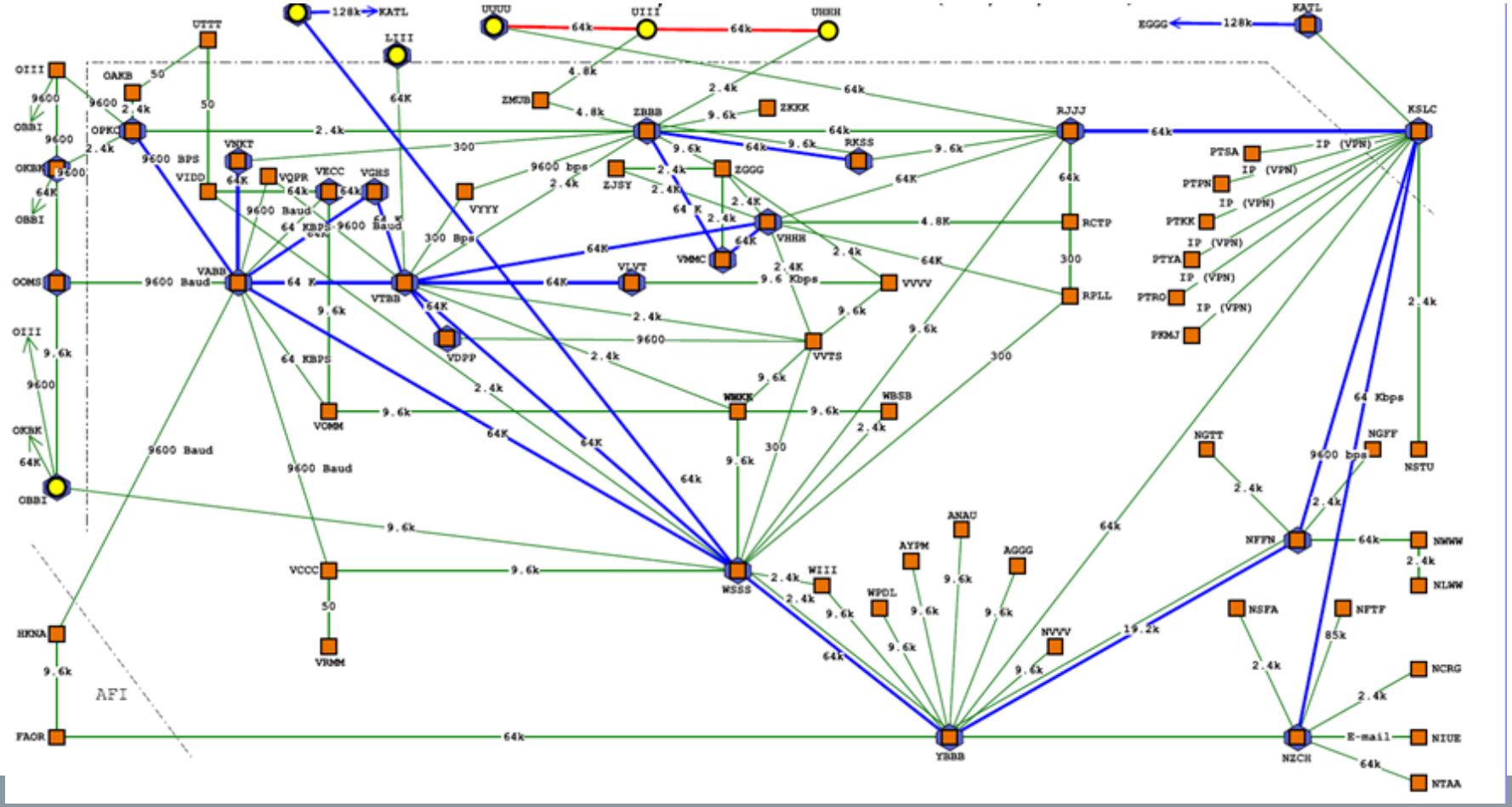


This is Now…

Now, Japan, Fiji and New Zealand all go through AMHS. Re-routing may be accomplished at those sites.
Whether alt routing through AMHS or NMR, must understand the impact downstream.

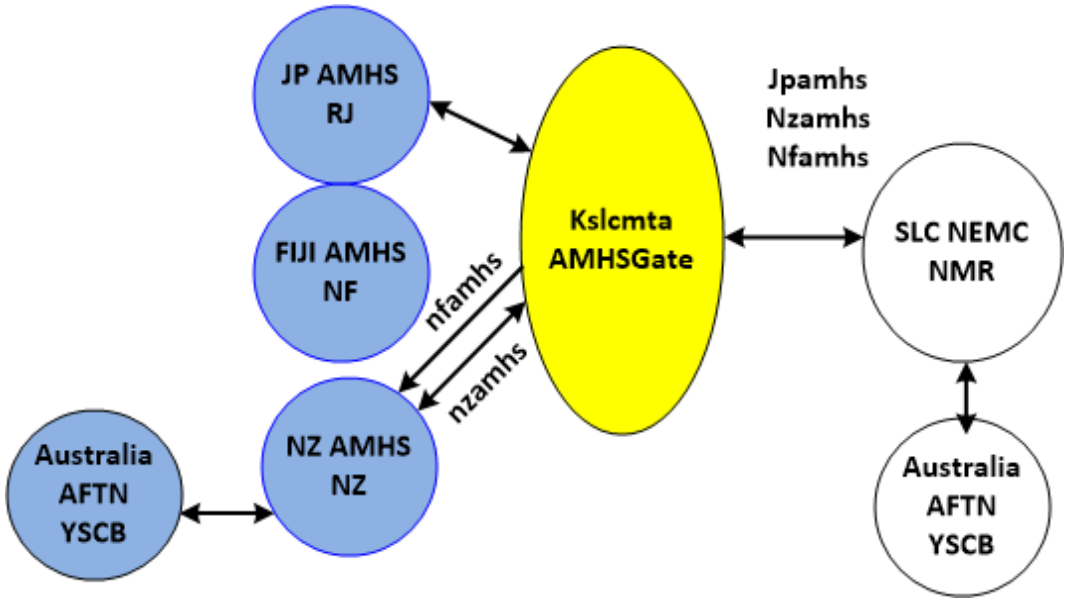


This Is Now… (cont'd)

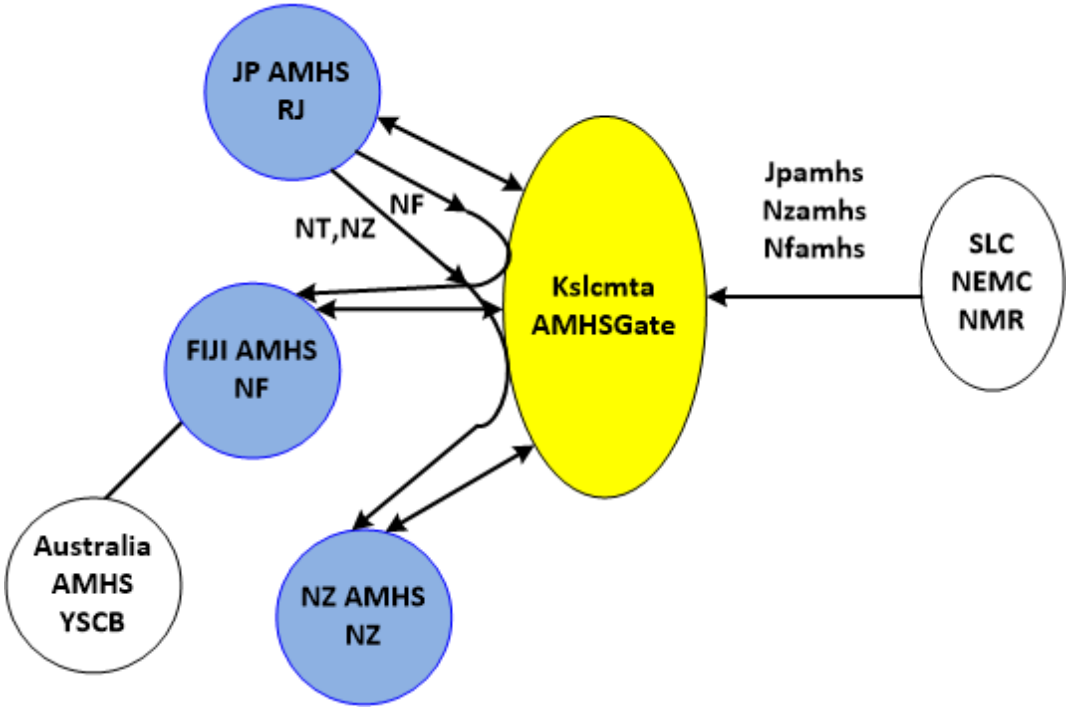


Changing Normal Traffic Flow: Re-Route To AMHS Peer

Example 1: Fiji to New Zealand (OK)



Changing Normal Traffic Flow: Re-Route To AMHS Peer
Example 2: New Zealand to Japan (*Not* OK)



Japan normally sends NF, NT, and NZ traffic to the US kslcmta (above)
Rerouting nzamhs to jpamhs would cause a loop detection by our local MTA, kslcmta (red table entry).

Changing Normal Traffic Flow: Re-Route To AMHS Peer

From Example:
'Re-route through'

'Destination'

nzamhs	nfamhs	jpamhs	auamhs
nfamhs	nzamhs	nzamhs	nzamhs
jpamhs	jpamhs	nfamhs	nfamhs
auamhs	auamhs	auamhs	jpamhs

1. The table above uses MConsole channel names. MConsole is the tool to control AMHS peer re-routing. No AFTN procedures are needed.
2. The top row is the 're-route through' AMHS peer.
3. The rows below are possible 'destination' AMHS peers.
4. The color scheme 'channels' indicate which AMHS channel may be routed to each AMHS channel listed in the top row.
5. Auamhs is not yet available as a 're-route through' AMHS peer (column 4).
6. Traffic for Australia can be re-routed to AMHS with special procedures in SOP- including AFTN procedures (shaded).