

A Framework for Resource and Execution Management

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Decision Support Systems for C2
Collaborative Planning and Logistics

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JCDS 21 TD Structure

1: Project Management

2: Front-End Analysis & Experimentation

Identify Requirements Analysis Approach

Conduct Requirements Analysis

Develop MOEs/MOPs

Experiment Design

Management of Experiment Execution

3: Organisational and Individual Factors

Investigate JIMP Paradigm Information Exchange Challenges

Collaborative Working

Decision-Making Factors

Using Advice and Integrating Information in Human Decision-Making

Commanders Decision Making Styles

4: Situation Awareness

Knowledge Mapper

Knowledge Environment for Advanced Command Portal

LiveSpaces (Buy and Try)

5: Decision Support System (Actionable Knowledge)

Actionable Knowledge Framework

Total Resources Visibility

Distributed Decision Analyses and Action Selection

Execution Management in a Distributed Environment

6: Systems Integration and Interoperability

JCDS 21 Test-Bed Human Factors Integration Requirements

Deployment of JCDS 21 Test-bed

Design JCDS 21 Test-Bed System of System Architecture

Manage JCDS 21 Implementation

Asset Visibility (AV) Concept

- ``..Asset Visibility Capability combines the elements of **data synchronization** of ERPs, enhanced information capability to support logistics decision-making and support to planning through process and technology solution...``
- AV is the ability to know the identity, location, status, and condition of assets in the logistics chain at the operational level.
- ``.., the AV capability within DND/CF still remains a deficiency because of the **lack of interoperability** across the various systems that that provide the asset information.``
- NATO: An asset can be described as:
 - Unit (example, HMCS Toronto, 427 Sqn,..etc), Personnel; and Materiel/Equipment

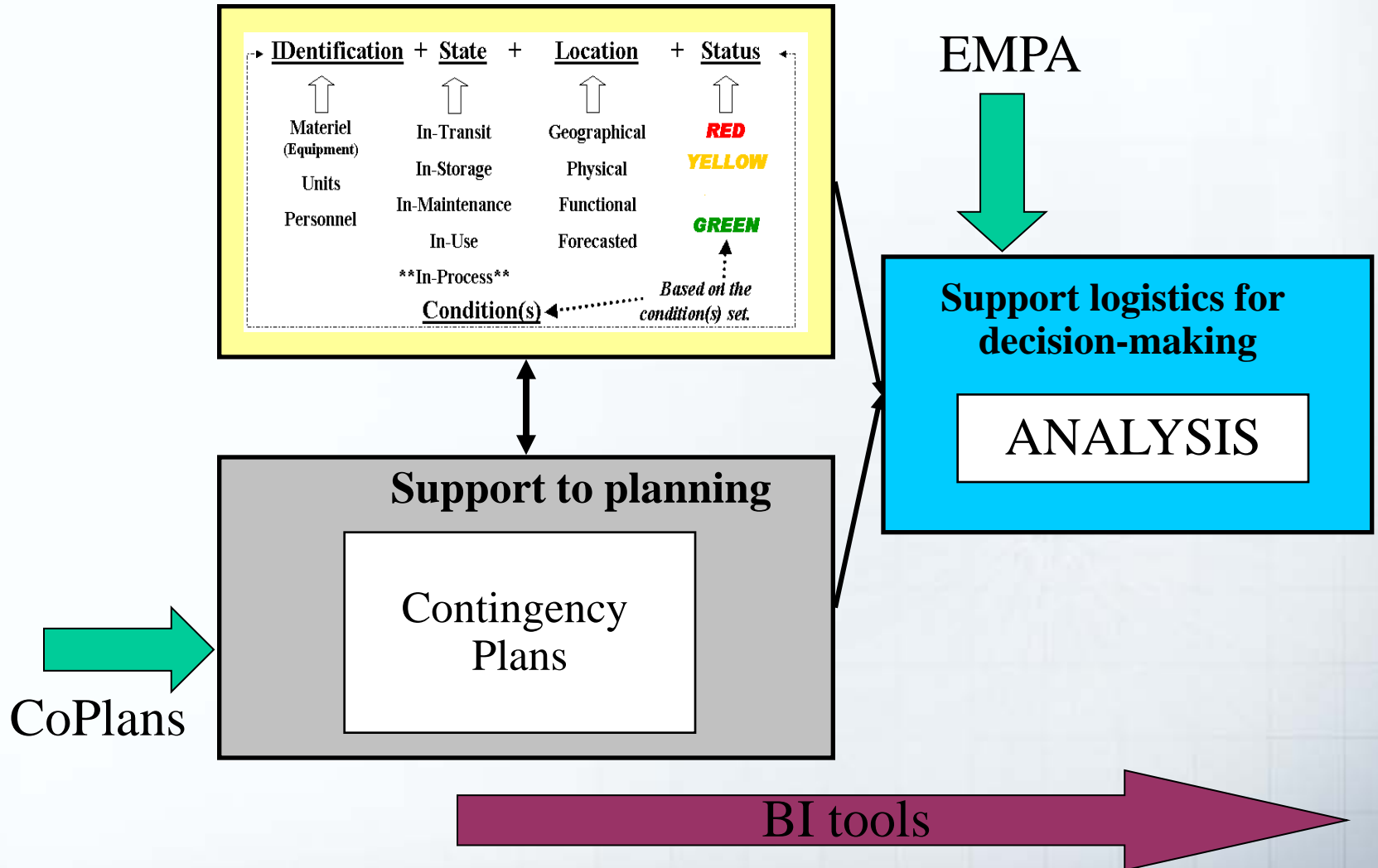
TRV-Purpose

- Resource visibility during planning and operations execution at operational HQs (e.g., CANADA COM, CANOSCOM,..) and
- Analyse and perform measurement of resources employment and usage including operational readiness estimation, forecasting,..

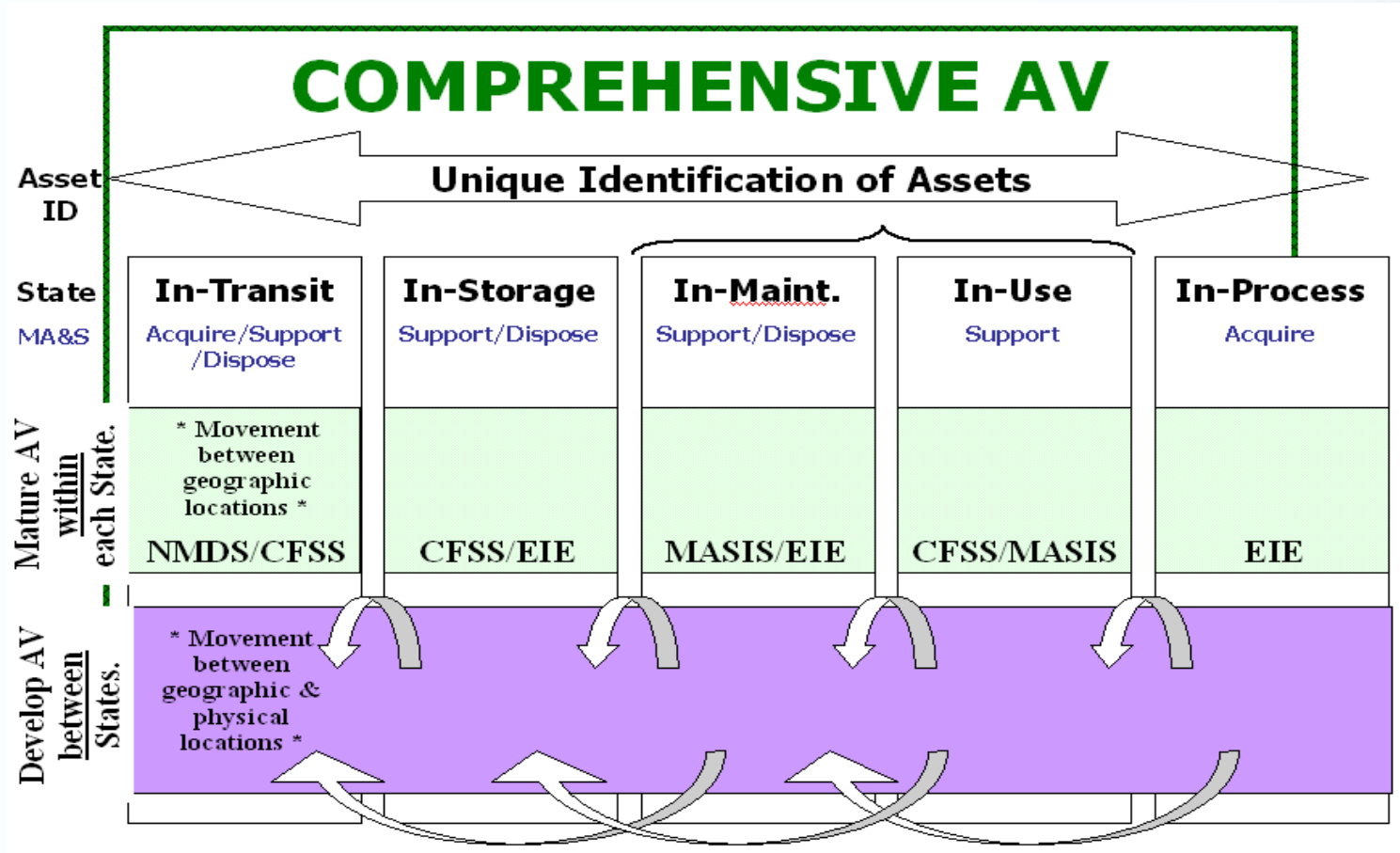
EMPA-Purpose

- Collaborative monitoring and reporting on plan execution at different levels of command;
- Plan adaptation and planning support.
- Enable distributed collaborative monitoring and management of current operations at different levels of command.

TRV – EMPA modules

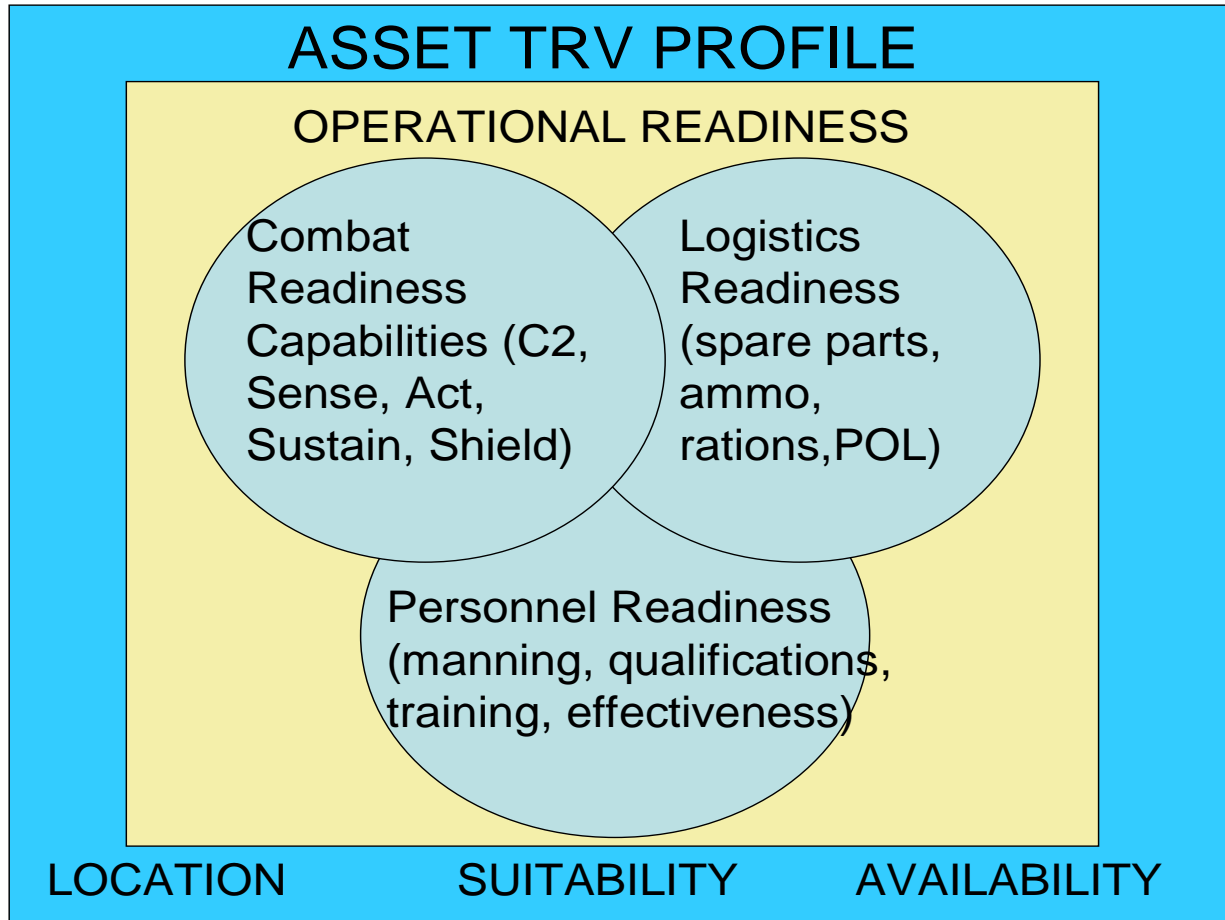


Comprehensive AV, Asset State



From document Statement of Capability Deficiency, ASSET VISIBILITY INTERIM CAPABILITY, 28 January 2008

Operational Readiness (1)

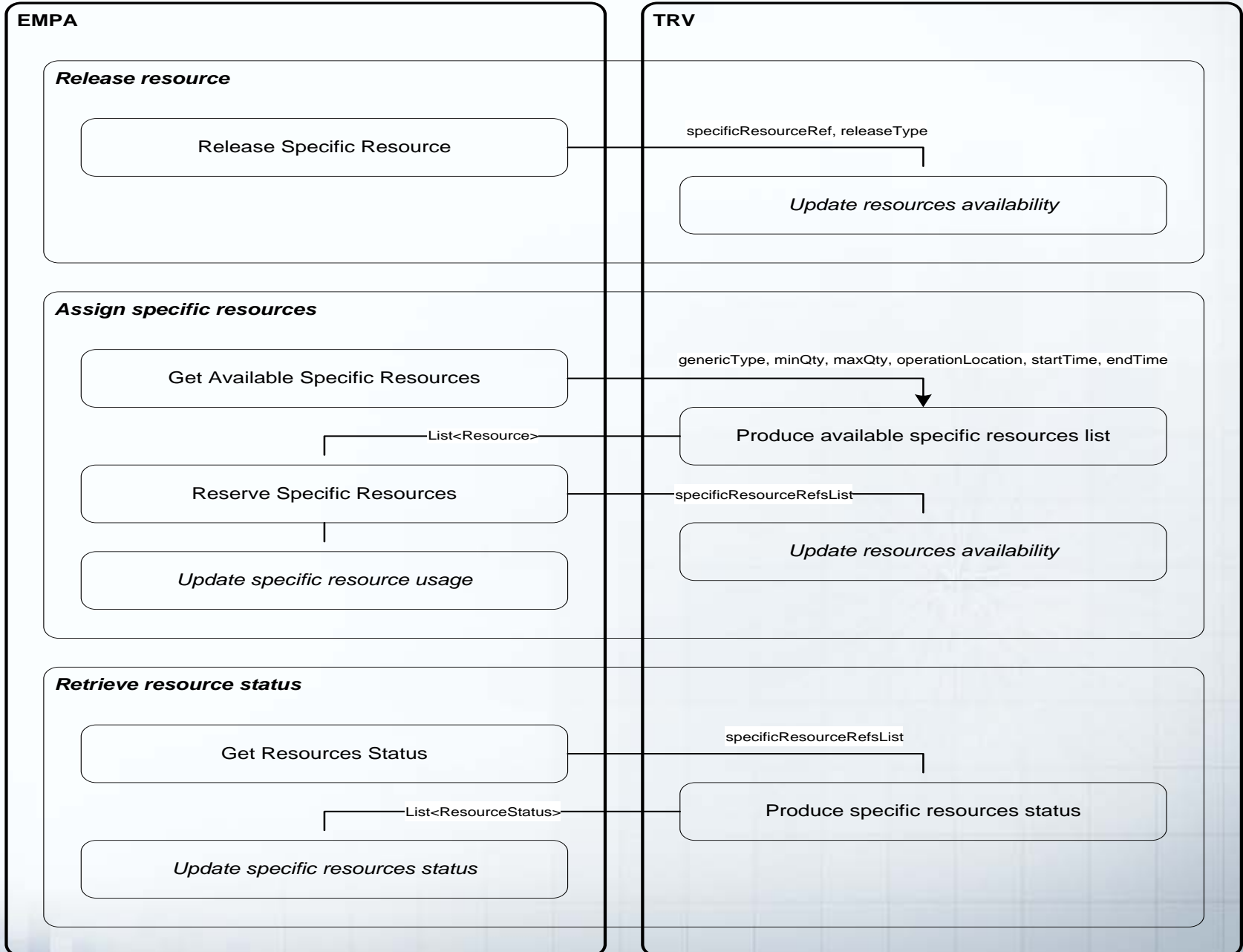


Operational Readiness (2)

Operational Readiness is an overall status assessment of a unit or asset's capability to be used for a military operation taking into account its combat readiness or war-fighting capabilities, its logistics readiness and its personnel readiness.

Asset's combat readiness: ability to exercise command and control (ie to communicate, to issue and receive orders), to sense (ie to use its sensors) to act (ie to move and to use its weapons systems or other non-kinetic capabilities) to shield (ie to defend itself, its operators and its allies or other friendly forces), and to sustain (ie to maintain its other capabilities with POL, spare parts, rations, etc).

Interaction Between TRV-EMPA



Assets Visualization Features (1)

Visualization of assets from several DND sources and applications.

Monitoring of military assets and retrieval of detailed information of specified assets (by location, status, etc.).

Analysis of the aggregated/extracted information to:

- Conduct measurements such as: cost estimation, impact analysis, combat readiness, logistic readiness, personnel readiness, etc.

- Elaborate capabilities that support operational planning.

Assets Visualization Features (2)

- Drill down through mission details

Scenario: Availability of Plan >> Assets support >> Particular Asset details

- Navigating through mission commands

Scenario: JTFs >> ORBATs >> Assets on ORBATs >>Asset Details

- Navigating through bases

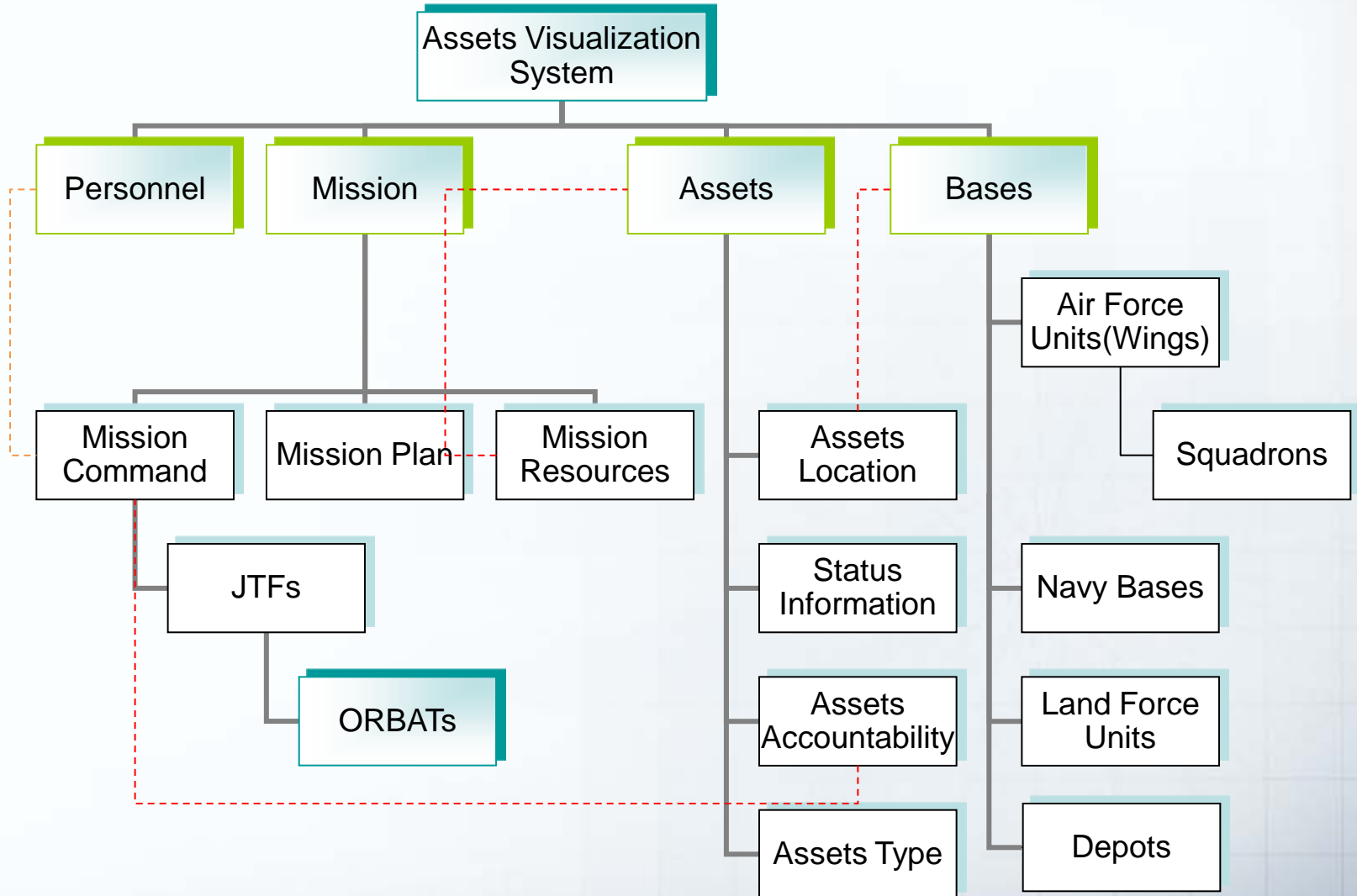
Scenario: Wing >> Squadron >> Assets on Squadron >>Accountable JTF

- Monitoring of assets

Renewable Assets Monitoring

- Information sharing and integration capabilities

Visualization hierarchy model of “Total Assets Visibility” solution



Drill Down through Missions (Slide 1)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

Standard | Advanced | Search

CANADA COMMAND Visualization Window

All Joint Task Forces

All Military Assets

All Military Bases

All Operational Plans

Plan Status | Plan View

Plan Information

Name	Readiness	Status
-Operational Pl	Maintainable	AUTHORIZED
-JTF-Pacific	Available	AUTHORIZED
-COPA	Maintainable	AUTHORIZED
-COPB	Maintainable	DELAYED
-COPC	Available	PLANNED
-JTF North	Available	AUTHORIZED
-JTF West	Available	AUTHORIZED
-JTF-Centr.	Available	AUTHORIZED
-JTF East	Available	AUTHORIZED
-JTF Atlant	Available	AUTHORIZED
-COPAI	Available	AUTHORIZED
-COPB	Maintainable	DELAYED
-COPC	Available	PLANNED
-Proposed Plan:	Maintainable	AUTHORIZED

Monitoring Strategic Assets, such as: Polaris

Selected JTF Area

Click for Contingent Operational Plan (COP) A6 details.

Table Explorer: OPERATIONAL PLANS

View Assets | Navigation Mode | Column Names: Name | Filter String:

Name	Support	Support	Support	Readiness	Status
JTF West	AirForce	Navy	Coast Guard	Available	AUTHORIZED
JTF-Central	AirForce	Navy	Coast Guard	Available	AUTHORIZED
JTF East	AirForce	Navy	Coast Guard	Available	AUTHORIZED
JTF Atlantic	AirForce	Navy	Coast Guard	Available	AUTHORIZED

Drill Down through Missions (Slide 2)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

49.923151604479095, -127.73962750000001

Attributes Panel

HMC5-IROQUOIS-280 :

- Asset Name : HMC5-IROQUOIS-280
- Plan Name : COPA6
- Department : Canadian Naval Base 2
- Accountability : JTF-Atlantic>>ORBAT
- Visibility : 13,14,15
- Readiness : 0.6733333333333333
- Image : images//navy//IROQUOIS.gif
- Location : 49.8,-129.8
- Path : 49.8,-129.8,49.8,-130.8,49.8,-132.8

Plotting Info.

Name	Latitude	Longitude
Point 1	49.8	-129.8
Point 2	49.8	-130.8
Point 3	49.8	-131.8
Point 4	49.8	-132.8

Selected IROQUOIS-Class Destroyer.

Click for all specific assets of this class.

Viewing Asset classes engaged in COPA6 plan.

Plan Status | Plan View

Plan Information

Name	Readiness	Status
Operational Plans	Maintainable	AUTHORIZED
JTF-Pacific	Available	AUTHORIZED
COPA	Maintainable	AUTHORIZED
COPB	Maintainable	DELAYED
COPC	Available	PLANNED
JTF North	Available	AUTHORIZED
JTF West	Available	AUTHORIZED
JTF-Centr	Available	AUTHORIZED
JTF East	Available	AUTHORIZED
JTF Atlant	Available	AUTHORIZED
Proposed Plans	Available	AUTHORIZED
COPA	Maintainable	DELAYED
COPB	Maintainable	DELAYED
COPC	Available	PLANNED
COPD	Available	PLANNED

Table Explorer: ASSETS

View Assets | Navigation Mode | Column Names: Plan Name | Filter String: COPA6




Asset Class	Plan Name	Department	Accountability	Readiness	Image	Command	Sense	Act	Shield	Sustain	Other
IROQUOIS	COPA6	Canadian N...	JTF-Atlantic...	0.50		CCS Comms	0.45	0.36		0.58	0.58
Offshore and Inshore Fisher	COPA6	Canadian C...	JTF-Atlantic...	0.47		CCS Comms	0.53	0.50		0.70	0.00
Aircraft - Rotary Wing	COPA6	Canadian C...	JTF-Atlantic...	0.30		CCS Comms	0.62	0.25		0.62	0.00

Table | Graph

Drill Down through Missions (Slide 3)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

48.82878654504578 , -126.24548687500001

Selected HMCS-ALGONQUINN-283

Attributes Panel

- HMCS-ALGONQUIN-283 :
- Asset Name : HMCS-ALGONQUIN-283
- Plan Name : COPA6
- Department : Canadian Naval Base 2
- Accountability : JTF-Atlantic>>ORBAT
- Visibility : 33,34,35
- Readiness : 0.39666666666666667
- Image : images/navy/IROQUOIS.gif
- Location : 48.7,-128.7
- Path : 48.7,-128.7,48.7,-129.7,48.7,-130.7,48.7,-131.7

Plotting Info.

Name	Latitude	Longitude
Point 1	48.7	-128.7
Point 2	48.7	-129.7
Point 3	48.7	-130.7
		-131.7

Click to view senses of HMCS ALGONQUIN-283

Viewing particular IROQUOIS-Class Destroyer for COPA6

Plan Status | Plan View




Plan Information

Name	Readiness	Status
-Operational Plans	Maintainable	AUTHORIZED
- JTF-Pacific	Available	AUTHORIZED
+ COPA	Maintainable	AUTHORIZED
+ COPB	Maintainable	DELAYED
+ COPC	Available	PLANNED
+ JTF North	Available	AUTHORIZED
+ JTF West	Available	AUTHORIZED
+ JTF-Centr	Available	AUTHORIZED
+ JTF East	Available	AUTHORIZED
+ JTF Atlant	Available	AUTHORIZED
+ COPA	Available	AUTHORIZED
+ COPB	Maintainable	DELAYED
+ COPC	Available	PLANNED
-Proposed Plans	Maintainable	AUTHORIZED

Table Explorer: IROQUOIS

View Assets | Navigation Mode | Column Names: Asset Name | Filter String: No Filter

All Plans | Assets | Operational Plans | Strategic Assets | IROQUOIS

Asset Name	Plan Name	Department	Accountability	Readiness	Image	Command	Senses	Acts	Shields	Sustains	Others	
HMCS-ALGONQUIN-283	COPA6	Canadian N...	JTF-Atlantic...	0.39		CCS Comms	0.40	+	0.50	+	0.62	+
HMCS-ATHABASKAN-282	COPA6	Canadian N...	JTF-Atlantic...	0.61		CCS Comms	0.40	+	0.62	+	0.62	+
HMCS-IROQUOIS-280	COPA6	Canadian N...	JTF-Atlantic...	0.67		CCS Comms	0.55	+	0.62	+	0.50	+

Drill Down through Missions (Slide 4)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

48.82878654504578, -126.24548687500001

Attributes Panel

HMCS-ALGONQUIN-283 :

- Asset Name : HMCS-ALGONQUIN-283
- Plan Name : COPA6
- Department : Canadian Naval Base 2
- Accountability : JTF-Atlantic>>ORBAT
- Visibility : J3,J4,J5
- Readiness : 0.39666666666666667
- Image : images/navy/IROQUOIS.gif
- Location : 48.7,-128.7
- Path : 48.7,-128.7,48.7,-129.7,48.7,-130.7,48.7,-131.7

Plotting Info.

Name	Latitude	Longitude
Point 1	48.7	-128.7
Point 2	48.7	-129.7
Point 3	48.7	-130.7
Point 4	48.7	-131.7

Plan Status | Plan View

Plan Information

Name	Readiness	Status
Operational Plan	Maintainable	AUTHORIZED
-JTF-Pacific	Available	AUTHORIZED
-COPA	Maintainable	AUTHORIZED
-COPB	Maintainable	DELAYED
-COPC	Available	PLANNED
-JTF North	Available	AUTHORIZED
-JTF West	Available	AUTHORIZED
-JTF-Centr.	Available	AUTHORIZED
-JTF East	Available	AUTHORIZED
-JTF Atlant.	Available	AUTHORIZED
-COPA	Available	AUTHORIZED
-COPB	Maintainable	DELAYED
-COPC	Available	PLANNED
Proposed Plan:	Maintainable	AUTHORIZED

Tabular Analysis | Stock Analysis | Impact Analysis

Table Explorer: SENSES

View Assets | Navigation Mode | Column Names: Name | Filter String: No Filter

All Plans | Assets | Operational Plans | Strategic Assets | IROQUOIS | Senses

Name	Count	Condition
Air Radar	1	Red
Surf Radar	1	Red
Nav Radar	1	Green
Sonar	1	Green

Table | Graph

Viewing senses of HMCS ALGONQUIN-283

Navigating through Mission Command (Slide 1)

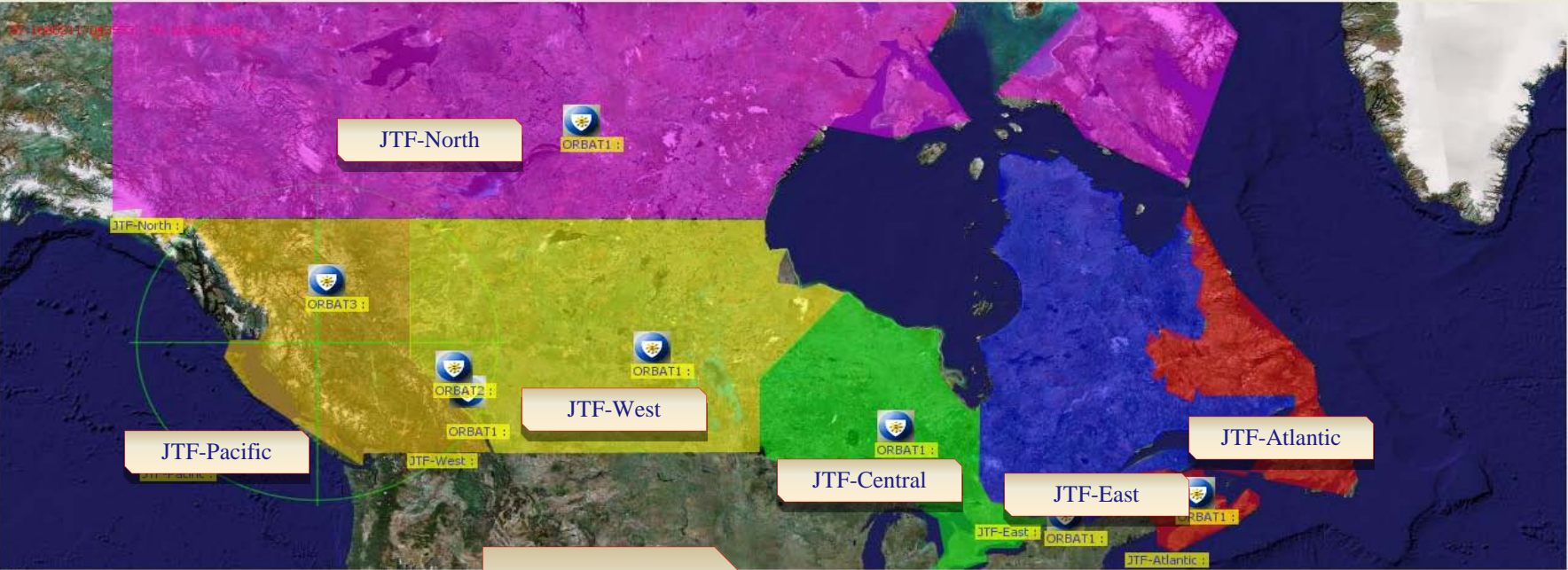
Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting



Viewing all ORBATs for JTF-Pacific

Table Explorer: ALL JTFs

View Assets | Navigation Mode | Column Names | Filter String: No Filter

Task Force Name	Operational Plans	ORBATS	Mission_Board	Agencies
JTF-Pacific	COPA1, COPB1, COPC1	ORBATS in JTF-Pacific	Missions in JTF-Pacific	Agencies in JTF-Pacific
JTF-North	COPA2, COPB2, COPC2	ORBATS in JTF-North	Missions in JTF-North	Agencies in JTF-North
JTF-West	COPA3, COPB3, COPC3	ORBATS in JTF-West	Missions in JTF-West	Agencies in JTF-West
JTF-Central	COPA4, COPB4, COPC4	ORBATS in JTF-Central	Missions in JTF-Central	Agencies in JTF-Central

Navigating through Mission Command (Slide 2)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite Hybrid | Attributes | Plotting

64.145277405140035, -120.146484374999991

ORBAT3

ORBAT2

ORBAT1

Attributes Panel

- ORBAT1 :
- ORBAT Name : ORBAT1
- All Assets : Available
- Department : Canada Command
- Accountability : JTF-Pacific
- Visibility : J3,J4
- Condition : Repairable
- Image : images/orbat_icon.png
- Details : ORBAT1 is operational under JTF
- Location : 51.36882467157702,-122.8731
- Path : 51.36882467157702,-115.873046





ORBATs under JTF-Pacific

Available filtering capabilities on information.

Selecting assets under ORBAT1 of JTF-Pacific

Table Explorer: ORBATs IN JTF-PACIFIC

View Assets | Navigation Mode | Column Names: ORBAT Name | Filter String: No Filter

ORBAT Name	All Assets	Department	Accountability	Condition	Image	Details
ORBAT1		Canada Command	JTF-Pacific	Yellow		ORBAT1 is operational under J...
ORBAT2		Canada Command	JTF-Pacific	Green		ORBAT2 is operational under J...
ORBAT3		Canada Command	JTF-Pacific	Yellow		ORBAT3 is operational under J...

Navigating through Mission Command (Slide 3)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting





Attributes Panel

- ORBAT1 :
- ORBAT Name : ORBAT1
- All Assets : Available
- Department : Canada Command
- Accountability : JTF-Pacific
- Visibility : J3,J4
- Condition : Repairable
- Image : images/orbat_icon.png
- Details : ORBAT1 is operational under JTF
- Location : 51.36882467157702,-112.873046875
- Path : 51.36882467157702,-115.873046875

All assets under ORBAT1 of JTF-Pacific

Table Explorer: ASSETS

View Assets | Navigation Mode | Column Names: Accountability | Filter String: JTF-Pacific>>ORBAT1

Asset_Class	Plan Name	Department	Accountability	Readiness	Image	Command	Sense	Act	Shield	Sustain	Other
CP-140AARCTURUS	COPA1,COPB1	Canadian AirForce(14Wing)	JTF-Pacific>>ORBAT1	0.70		CCS Comms	0.80	1.00	1.00	1.00	0.00
CP-140AURRORA	COPA1,COPB1	Canadian AirForce(14Wing,19Wi...	JTF-Pacific>>ORBAT1,JTF-North>>ORBAT2	0.69		CCS Comms	0.80	1.00	1.00	1.00	0.00
CC-115BUFFALO	COPA1,COPB1	Canadian AirForce(19Wing)	JTF-Pacific>>ORBAT1,JTF-North>>ORBAT2	0.60		CCS Comms	1.00	0.00	0.00	1.00	1.00
CC-177GlohemasterIII	COPA1	Canadian Air Force (8Wing)	JTF-Pacific>>ORBAT1	0.23		CCS Comms	0.00	0.00	0.00	0.00	0.00

Navigating through Military Bases (Slide 1)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

53.0727726452634H - 79.24655537489999L

Air Force Wings

Military Depots

Navy Bases

Attributes Panel

- Wing
 - Wing19 Squadrons :
 - 410 Squadron :
 - 416 Squadron :
 - 441 Squadron :
 - 417 Squadron :
 - 440 Squadron :
 - Missions

Drill-down to the squadrons of 19Wing

Tabular Analysis | Stock Analysis | Impact Analysis

Table Explorer: AIRFORCE WINGS

View Assets | Navigation Mode | Column Names: WING_NAME | Filter String: No Filter

All Plans | Canada Bases | AirForce Wings

WING_NAME	OWNER	DESC_E	UIC_CODE	Squadrons
17WING	Canadian AirForce	17 WING WINNIPEG	0117	Wing17 Squadrons
19WING	Canadian AirForce	19 WING COMOX	0133	Wing19 Squadrons
22WING	Canadian AirForce	22 WING NORTH BAY	0133	Wing22 Squadrons

Table | Graph

Navigating through Military Bases (Slide 2)

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

48 20942388171405 -122 86173887578125

Viewing squadrons of 19Wing, See the runway!!!


Selected 410 Squadron of 19Wing.

Tabular Analysis | Stock Analysis | Impact Analysis

Table Explorer: WING19 SQUADRONS

View Assets | Navigation Mode | Column Names: Squadron Name | Filter String: No Filter

All Plans Canada Bases AirForce Wings Wing19 Squadrons

Squadron Name	All Assets	Wing Name	Department	Condition	Image	Details
410 Squadron	All Assets 	19Wing	Canadian AirForce, 19Wing	 	★	Tactical Fighter Operational Tr...
416 Squadron	All Assets	19Wing	Canadian AirForce, 19Wing	 	★	Tactical Fighter Squadron
441 Squadron	All Assets	19Wing	Canadian AirForce, 19Wing	 	★	Tactical Fighter Squadron

Table

Navigating through Military Bases (Slide 3)

Military Total Assets Visibility Application


Application Display Settings Help

Assets Map Track Satellite Military Plans Assets Editor

Geographic Information System

Start Reset Routes Info Map Satellite Hybrid Attributes Plotting

48 500 000 386 271 465 ... (24 86 27 50 2 978 2 25)



All assets of
Canadian Air Force
under Wing19

Tabular Analysis Stock Analysis Impact Analysis

Table Explorer: ASSETS

View Assets Navigation Mode Column Names: Department Filter String: 19Wing

All Plans Canada Bases AirForce Wings Wing19 Squadrons Assets




Asset_Class	Plan Name	Department	Accountability	Readiness	Image	Command	Sense	Act	Shield	Sustain	Other
CP-140AURRORA	COPA1,COPB1	Canadian AirForce(14Wing,19Wing)	JTF-Pacific>>ORBAT...	0.69		CCS Comms	0.80	1.00	1.00	1.00	0.00
CC-115BUFFALO	COPA1,COPB1	Canadian AirForce(19Wing)	JTF-Pacific>>ORBAT...	0.60		CCS Comms	1.00	0.00	0.00	1.00	1.00
CH-149CORMORANT	COPA4	Canadian Air Force (19Wing, 8Wing, 9Wing, 14Wing)	JTF-Central>>ORBAT2	0.25		CCS Comms	0.00	0.00		0.00	0.00

Table Graph

Assets Monitoring

Military Total Assets Visibility Application

Application | Display | Settings | Help

Assets Map | Track Satellite | Military Plans | Assets Editor

Geographic Information System

Start | Reset | Routes | Info | Map | Satellite | Hybrid | Attributes | Plotting

61.952599562642575, -95.61054687500003

Projected paths of operations

Monitoring of some of the military assets, such as: Hornets, Buffalo aircrafts, IROQUOIS class destroyer.

Assets :

- CP-140AARCTURUS :
- CP-140AURRORA :
- CC-115BUFFALO :
- CC144-CHALLENGER :
- CH-149CORMORANT :
- CT-142DASH-8 :
- CC-177GlobeMasterIII :
- CH-146Griffon :
- CC-130Hercules :
- CF-18Hornet :
- CC-150Polaris :
- CH-124Seaking :
- IROQUOIS :
- HALIFAX :
- PROTECTOR :
- KINGSTON :
- VICTORIA :
- SEAKING :

Plan Information

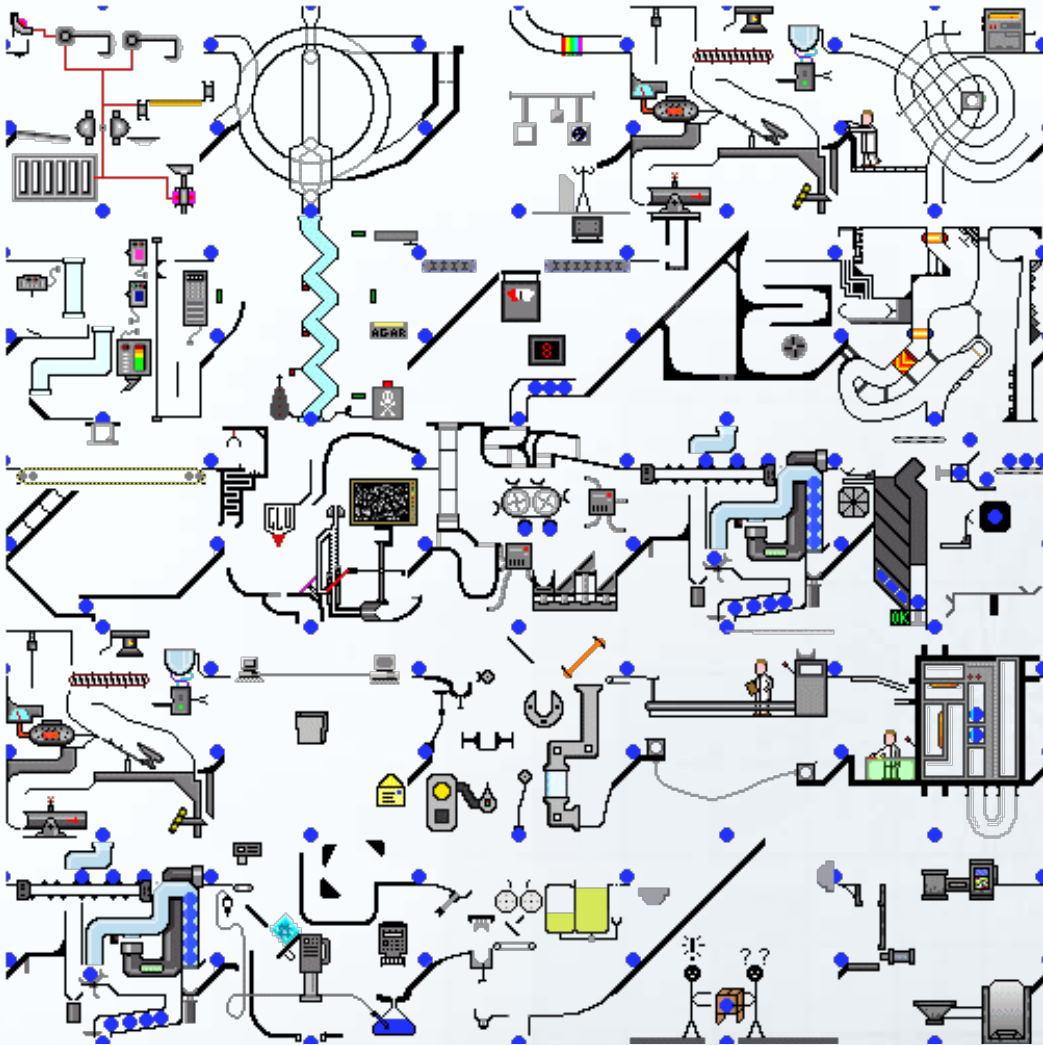
Name	Readiness	Status
Operational Plan	Maintainable	AUTHORIZED
Available	Available	AUTHORIZED
+ COPA	Maintainable	AUTHORIZED
+ COPB	Maintainable	DELAYED
+ COPC	Available	PLANNED
+ JTF North	Available	AUTHORIZED
+ JTF West	Available	AUTHORIZED
+ JTF-Centr.	Available	AUTHORIZED
+ JTF East	Available	AUTHORIZED
+ JTF Atlant.	Available	AUTHORIZED
+ COPA	Available	AUTHORIZED
+ COPB	Maintainable	DELAYED
+ COPC	Available	PLANNED
Proposed Plan	Maintainable	AUTHORIZED

start | DRDCPresentationFe... | TRV-question-sujoy.p... | images | Java - MilAnalysis/File... | Military Total Assets ... | Desktop | Address | 11:07

Conclusion- AV benefits

- Decrease in the number of systems that may have to extract information from or send information to;
- Automated data capture : efficient recording of asset information, increase the efficiencies within DND SC, improve business functions, ...
- Efficient management of logistics chain & Re-direction of assets to meet urgent/critical needs..
- Task-tailored support elements: flexible and adaptive C2 systems.
- Improved information survivability: integrated repositories.
- ``Ability to fuse up-to-date and accurate operational and support/logistics information in order to enable operators to achieve COP of the sustain situation``.
- An ability for multinational (and other Gov. insti.) interoperability : combined operations with US, NATO and Allies.

Questions ?



Most important assets (1)

- Major assets: assets in which military operational planners, ops centre watch keepers and commanders have the most interest with respect to their **location, availability** and **suitability**.
- “any vehicle or appliance that can be used to provide C2, communications, intelligence, surveillance or reconnaissance support or transport, shelter or logistics support in the conduct of military operations”.
- Assets that are of importance to operations planners and monitoring staffs

DEFENCE



DÉFENSE