the VOLPE center

Maritime Safety & Security Information System

U.S. Department of Transportation
Research and Innovative Technology Administration

Enabling Global Maritime Situational Awareness

Report Documentation Page

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a. REPORT	b. ABSTRACT	c. THIS PAGE			
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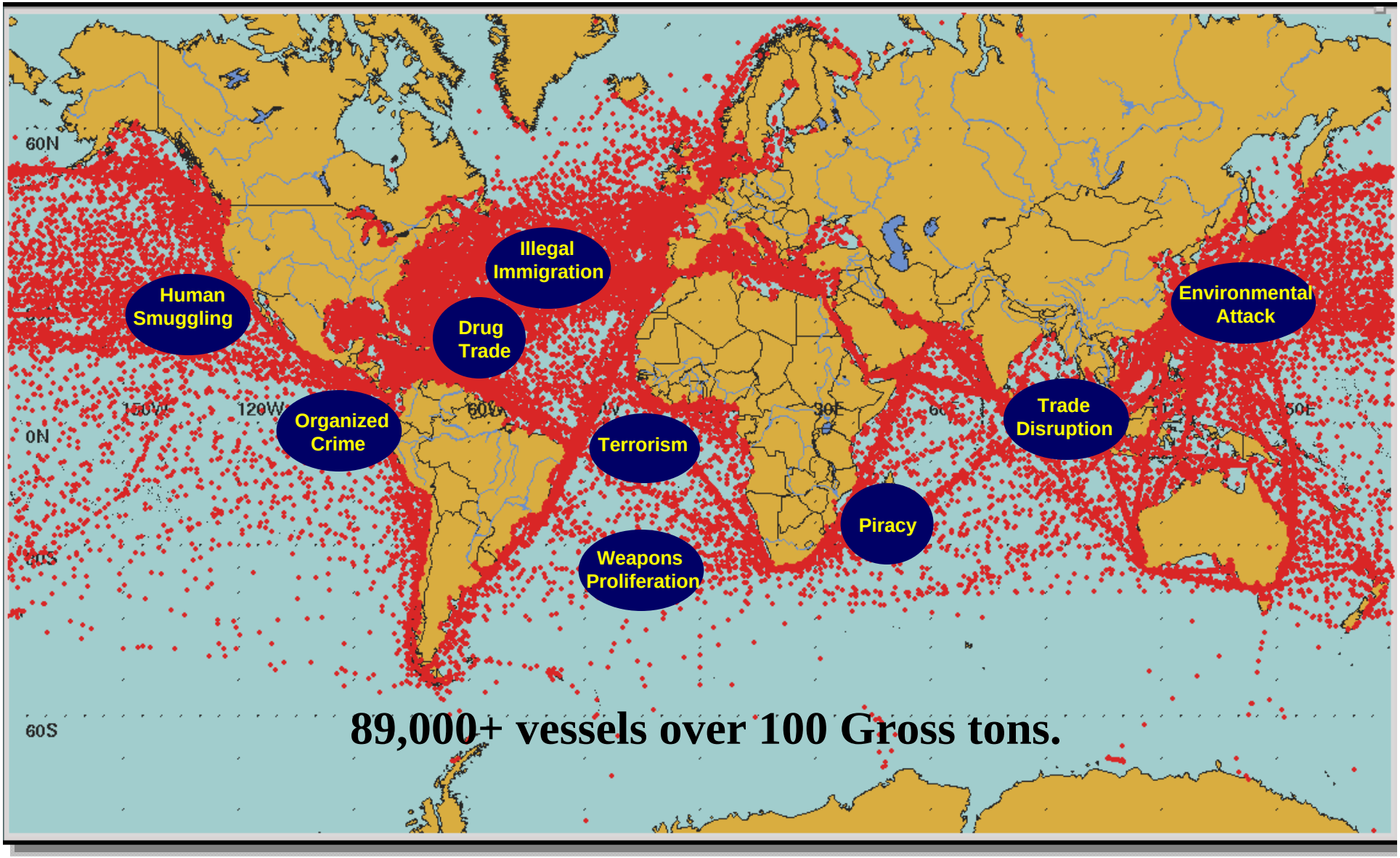
Maritime Situational Awareness



Common Maritime Challenges

Organized crime

Piracy

Drug smuggling

Human smuggling and slavery

Illegal weapons movement/proliferation

Terrorism

Exclusive Economic Zone (resource) exploitation

Illegal fishing

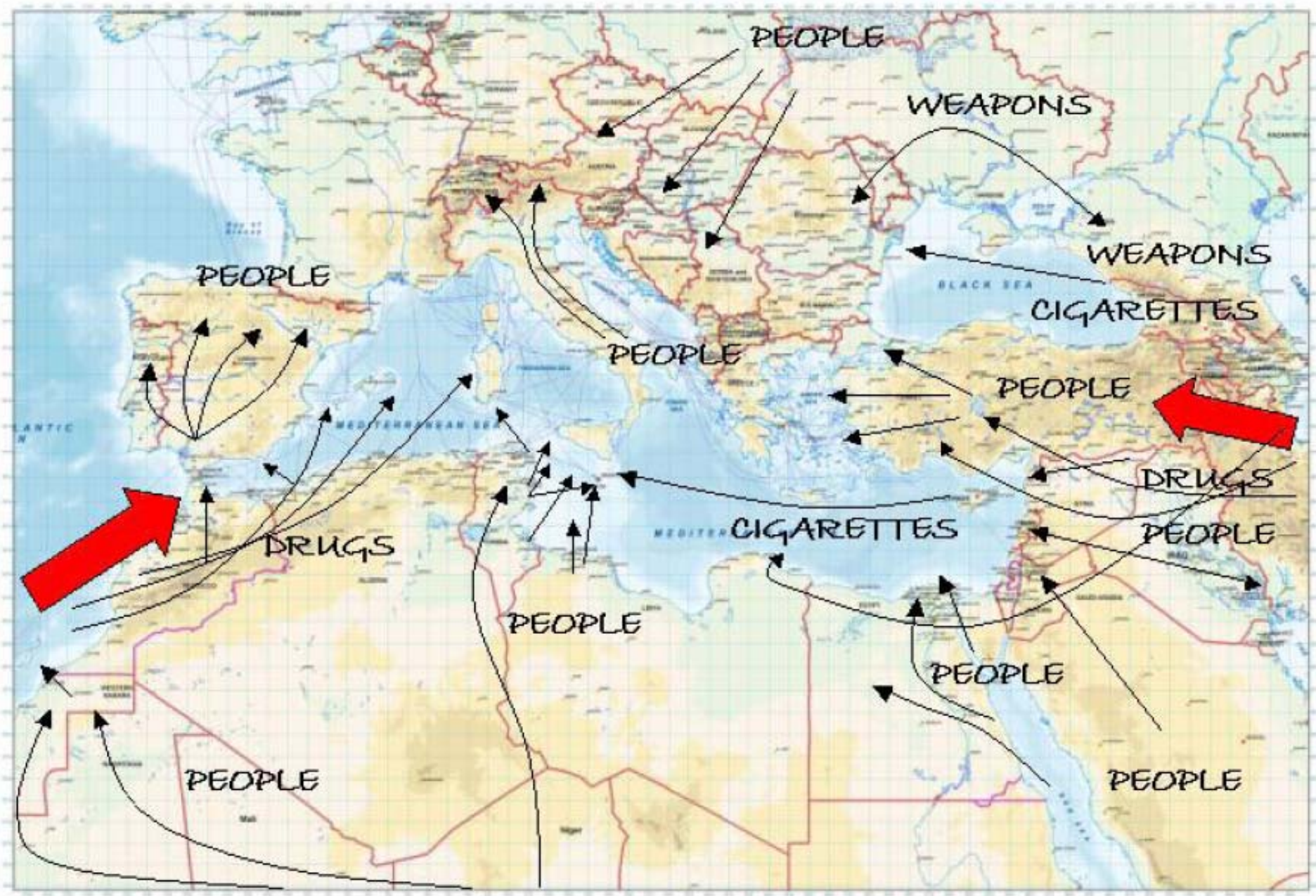
Trade disruption

Illegal migration

Search and Rescue

Environmental issues

Nations find their well-being challenged by these common maritime issues.


PEOPLE
WEAPONS
WEAPONS
CIGARETTES
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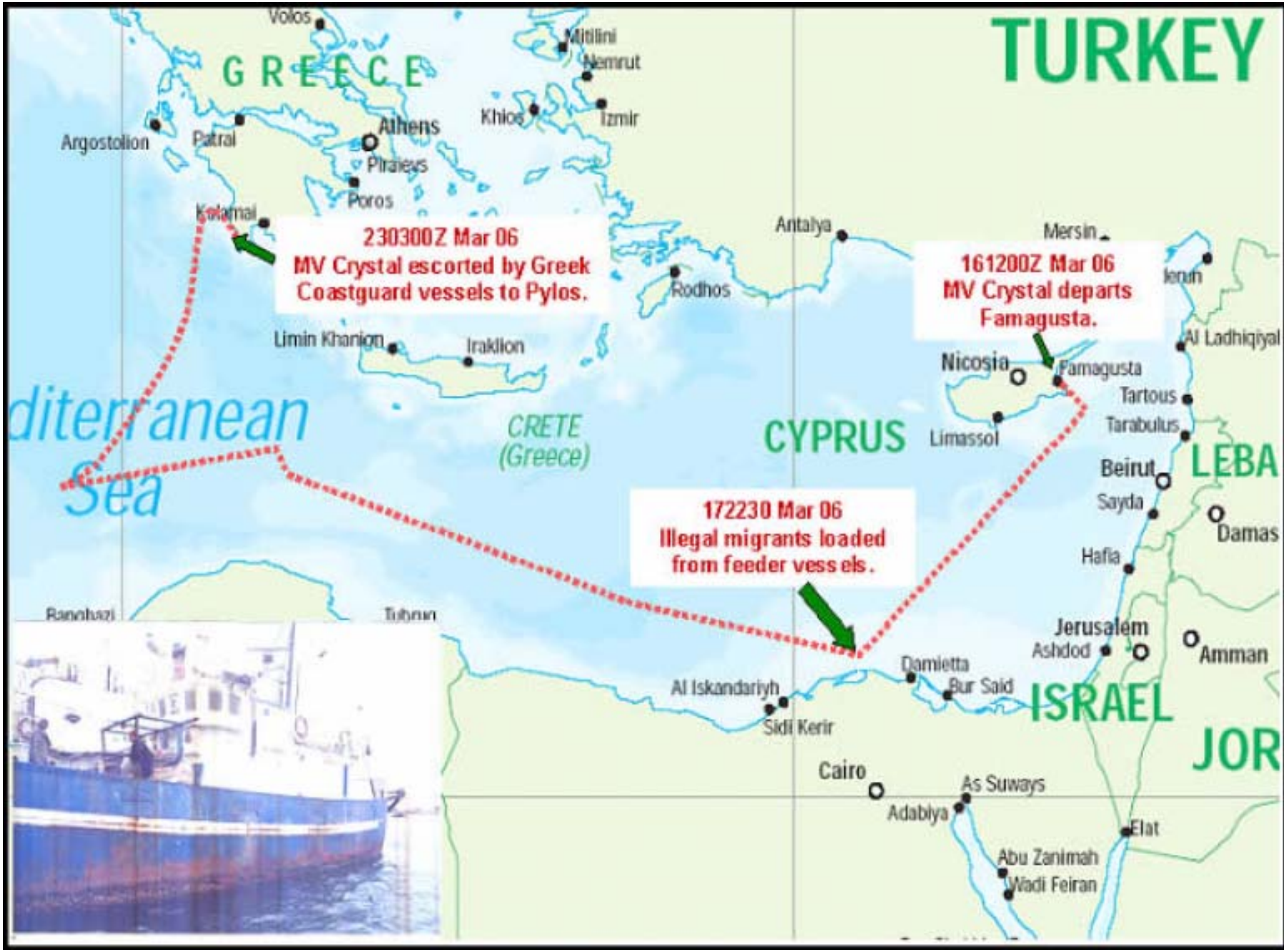
BLACK SEA


TURKEY
GREECE
Volos
Mitilini
Nemrut
Izmir
Khios
Athens
Argostolion
Patrai
Piraievs
Poros
Kalamai
230300Z Mar 06
MV Crystal escorted by Greek
Coastguard vessels to Pylos.
Antalya
Mersin
Rodhos
161200Z Mar 06
MV Crystal departs
Famagusta.
Limin Khanion
Iraklion
Nicosia
Famagusta
Al Ladhiqiyal
Tartous
Tarabulus
diterranean
Sea
CRETE
(Greece)
CYPRUS
Limassol
Beirut
LEBA
Sayda
Damas
172230 Mar 06
Illegal migrants loaded
from feeder vessels.
Hafia
Jerusalem
Ashdod
Amman
Damietta
Bur Said
Al Iskandariyh
Sidi Kerir
ISRAEL
JOR
Cairo
As Suways
Adablya
Elat
Abu Zanimah
Wadi Feiran

MDA Guiding Principles

- MDA is fundamental to maritime security – a common interest.
- Proliferate AIS. Apply the air safety/policing model. AIS = IFF at sea.
- It's ALL about the network – leverage the internet.
- Be transparent - share information widely.
- Work interagency.
- Be inclusive - invite new partners, and not just navies – coast guards, shipping and insurance companies, and international organizations all have a role.
- Provide an incentive to join – safety, economic, and security benefits.
- Keep it UNCLASSIFIED – needless classification only weakens network.

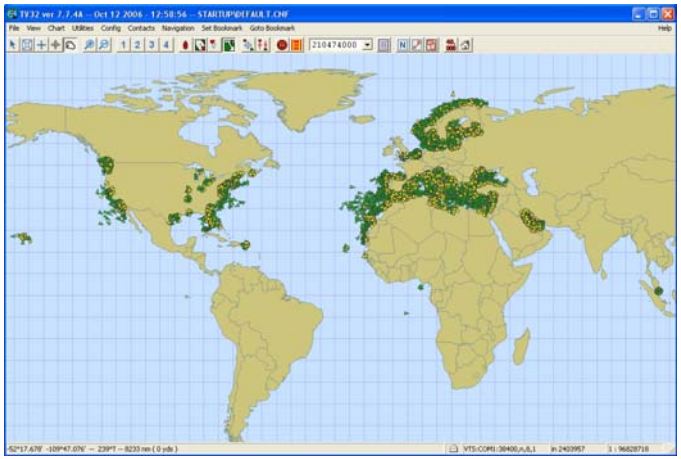
MSSIS

Maritime Safety & Security Information System

Conceived by the U.S. Department of Transportation, NATO, and US Navy as an:

Unclassified, multinational, freely shared, Automatic Identification System (AIS) network

The MSSIS provides clients with real-time AIS data derived from shore side, waterborne, and airborne platforms.



The MSSIS Encourages Participation by all countries through data sharing in order to achieve the universal goal of a safer, more secure, global marine environment.

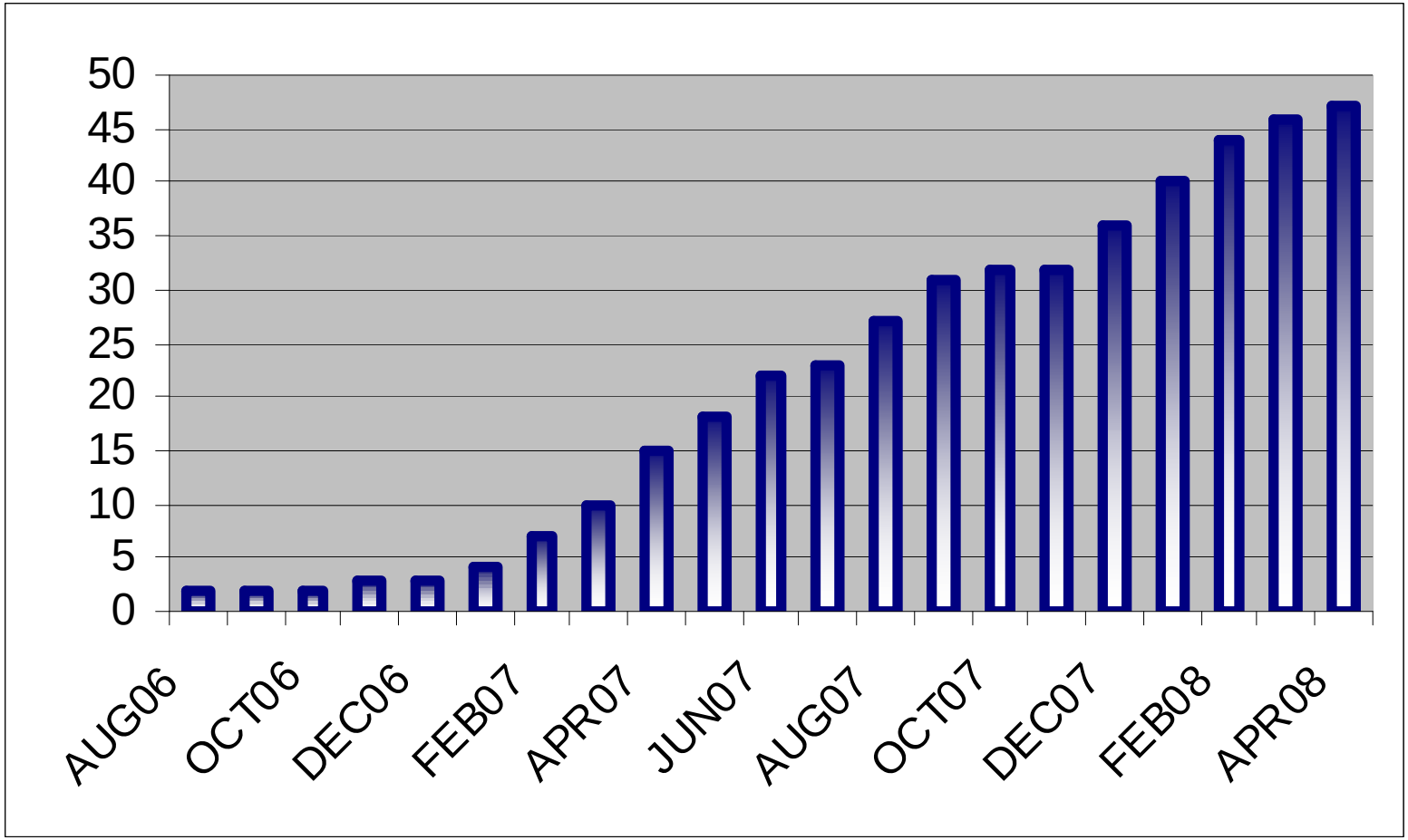
MSSIS: Timeline

- **September 2005** – Demonstration of proposed AIS network, links the ports of Rota, Spain and Souda Bay, Greece. Concept presented to U.S. Navy Sixth Fleet Commander (C6F) and NATO representatives.
- **November 2005** – The Volpe Center continues demonstration for C6F and NATO aggregating feeds from NATO AIS systems in the Mediterranean (coastal systems in Spain, Italy, Greece, Turkey, and shipboard systems). A single desktop computer in Cambridge, MA acts as the network backbone.
- **March 2006** – Kick off meeting and start of the Maritime Safety and Security Information System. Design of the eventual network commences while the demonstration network continues to operate
- **August 2006** – Transition from the demonstration system to the operational MSSIS design laid out over the course of the summer. MSSIS servers at Cambridge, MA operational

MSSIS: Timeline

- **September 2006** – Turkey, Greece, Spain officially join MSSIS
- **October 2006** – USA officially joins MSSIS
- **December 2006** – MSSIS servers installed at Norfolk, VA
- **March 2007** – MSSIS servers installed at US Sixth Fleet HQ, Naples, Italy
- **December 2007** – MSSIS servers installed at NATO Command Component Maritime HQ, Naples Italy. At a Maritime Domain Awareness conference in Santiago Chile, a panel of South American navy admirals recommend joining MSSIS.
- **February 2008** – Middle East and Arabian Gulf nations are introduced to MSSIS at the Maritime Infrastructure Protection Symposium in Bahrain.
- **April 2008** - MSSIS has over 50 member nations.

MSSIS: Country Participation



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U.S. Department of Transportation
Research and Innovative Technology Administration

MSSIS Participating Countries

Albania
Australia
Bahrain
Belgium
Bulgaria
Cameroon
Canada
Cape Verde
Chile
Croatia
Denmark
Estonia
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Iceland
Iraq
Ireland
Israel
Italy
Jordan
Liberia
Lithuania
Malta
Mauritania
Montenegro
Morocco
Mozambique
Netherlands
New Zealand
Nigeria
Norway
Poland
Portugal
Romania
Sao Tome & Principe
Senegal
Serbia
Singapore
Slovenia
Spain
Togo
Tunisia
Turkey
Ukraine
United Kingdom
United States
Yemen

Automatic Identification System (AIS)

Mandated by IMO

"to improve the maritime safety and efficiency of navigation, safety of life at sea and the protection of the marine environment"

IMO *International Convention for the Safety of Life at Sea (SOLAS)* Chapter V, Safety of Navigation, Regulation 19, 1974/1980

Who is required to have AIS?

Per the IMO SOLAS Convention

- All passenger ships.
- All cargo ships ≥ 500 GT.
- Ships ≥ 300 GT on international voyages.

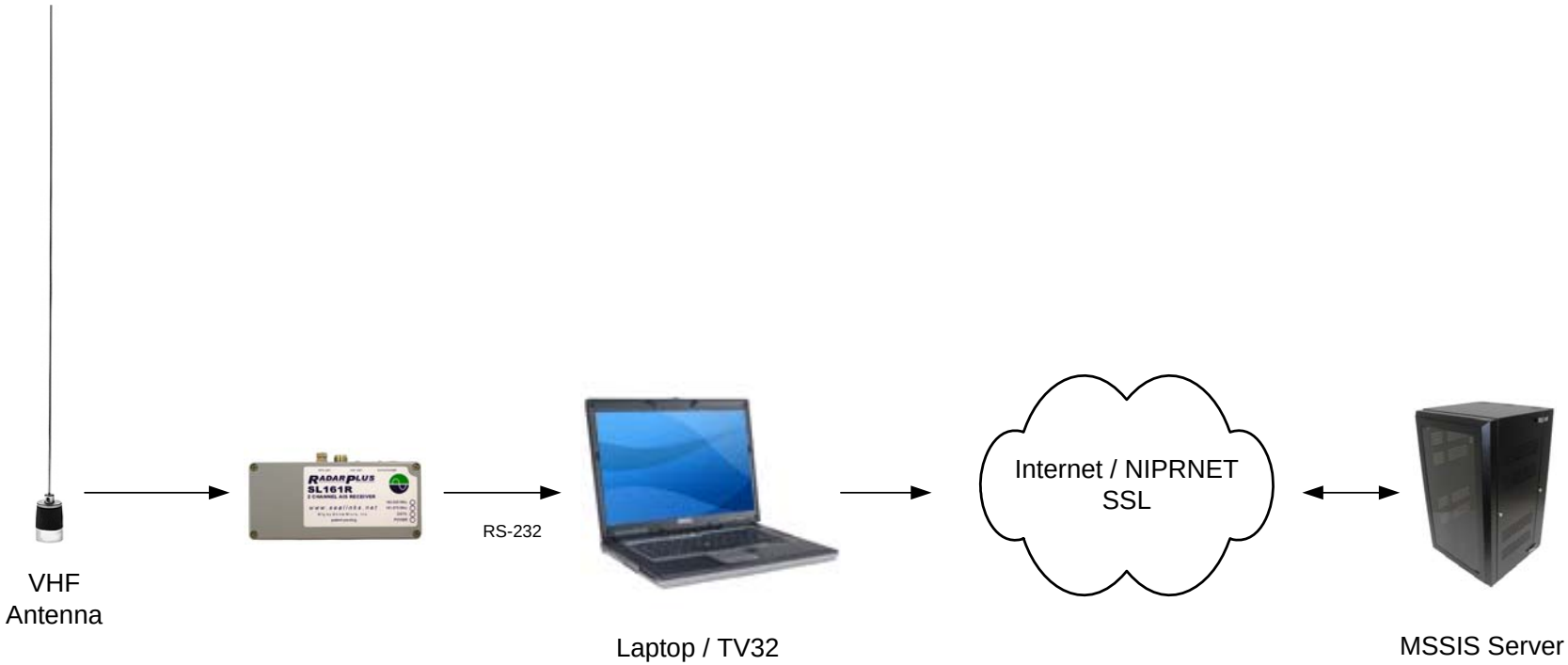
Does not apply to:

- Warships / Naval auxiliary.
- Vessels owned/operated by government and used on government non-commercial service.

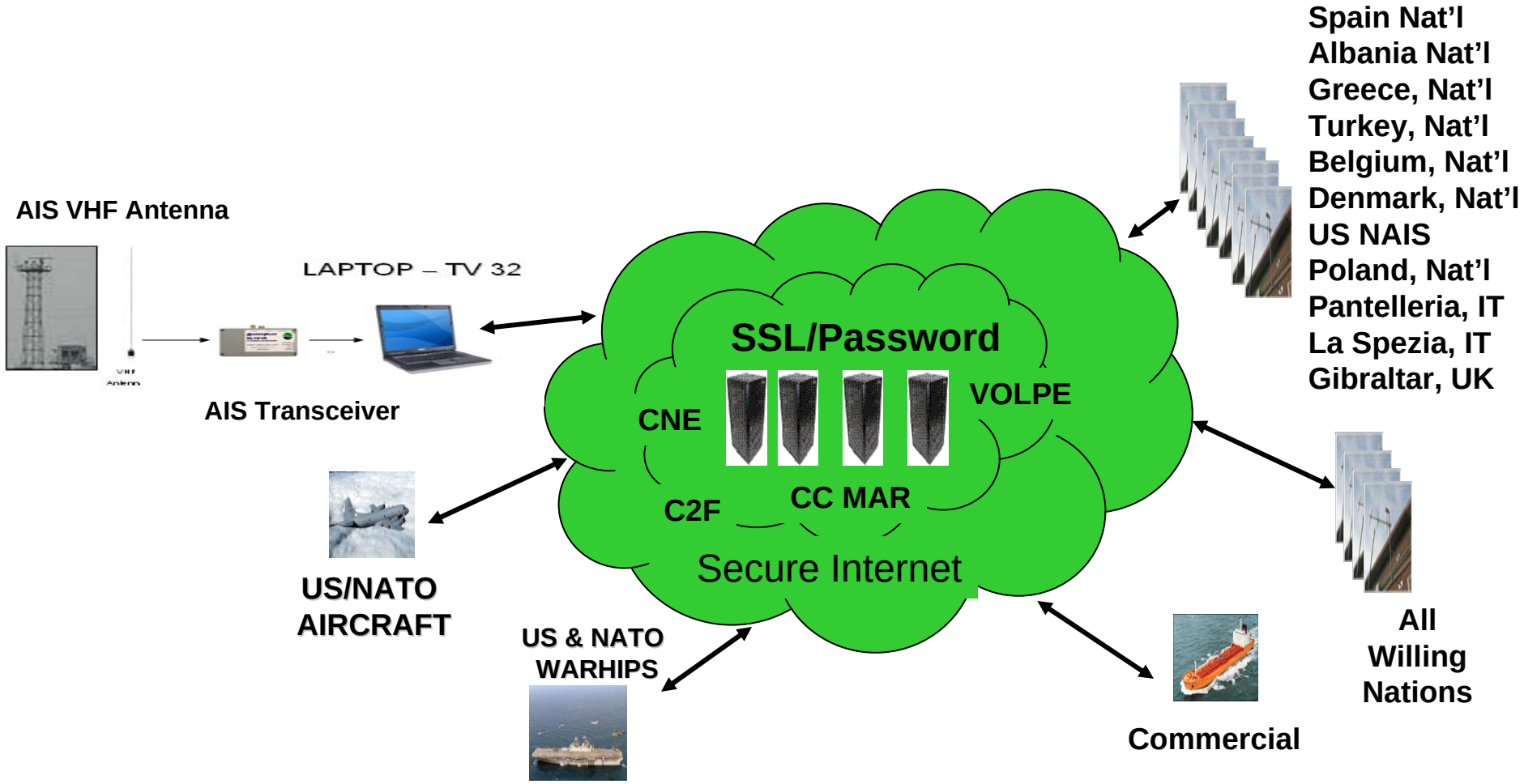
In U.S. Waters, a USCG amendment for Commercial vessels ≥ 65 feet.

Augmented in some cases by local regulations (as example, Singapore requires a transponder on any and all water craft).

Simple MSSIS - AIS Provider



MSSIS Architecture



MSSIS Server – Volpe Center

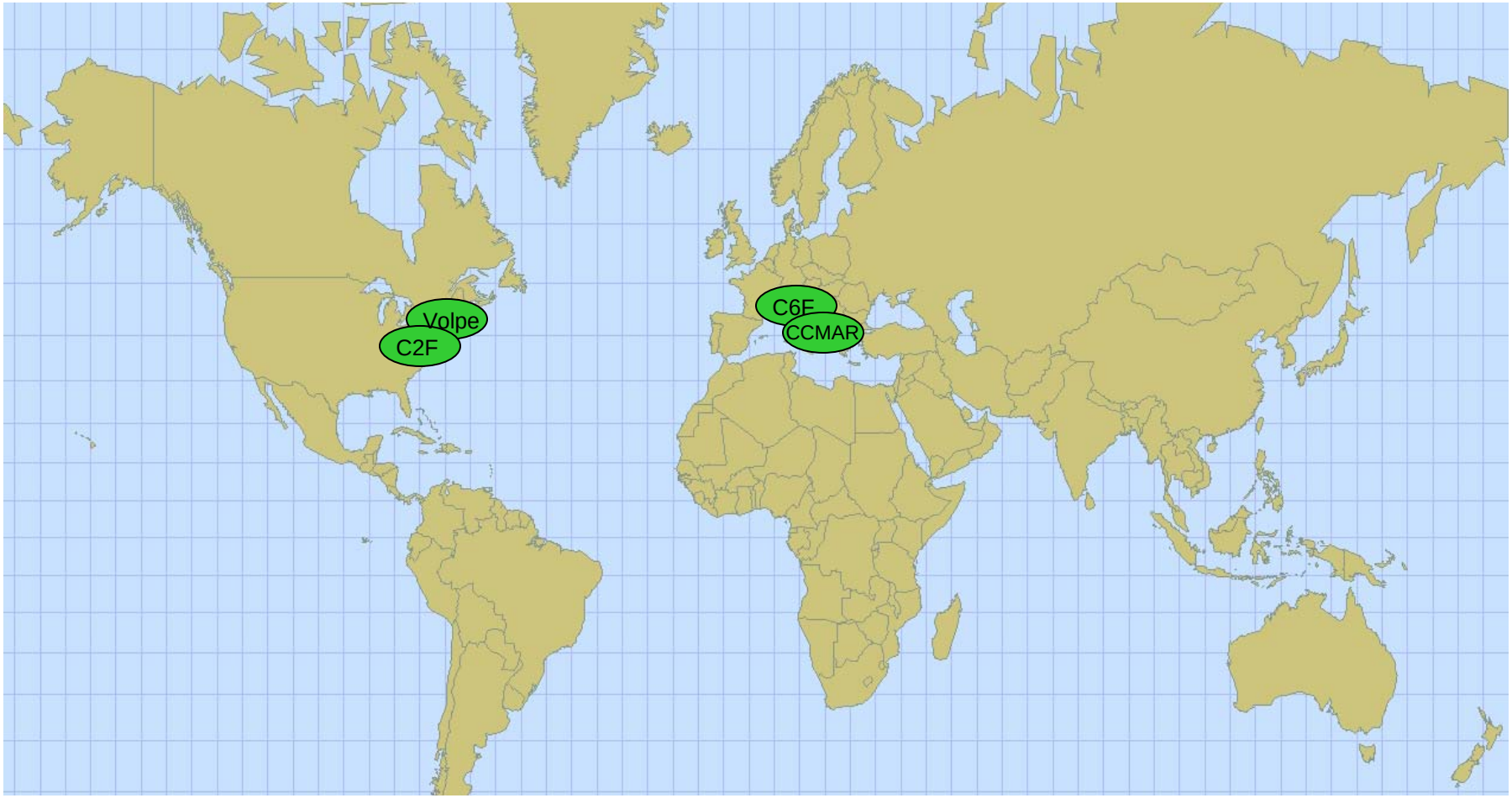
MSSIS Firewall/Router

AIS Collector (sources)

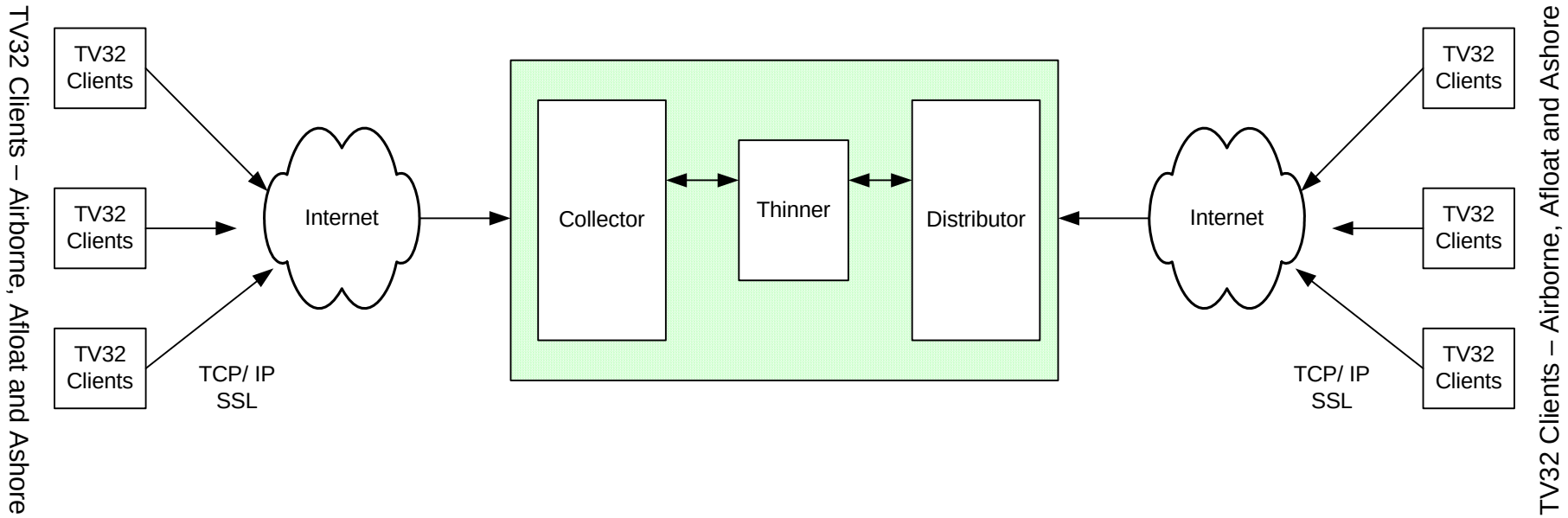
Data Thinner

AIS Distributor (clients)

MSSIS Server Locations



MSSIS Server Suite



Note: Some clients might be both sources and listeners

MSSIS Administration

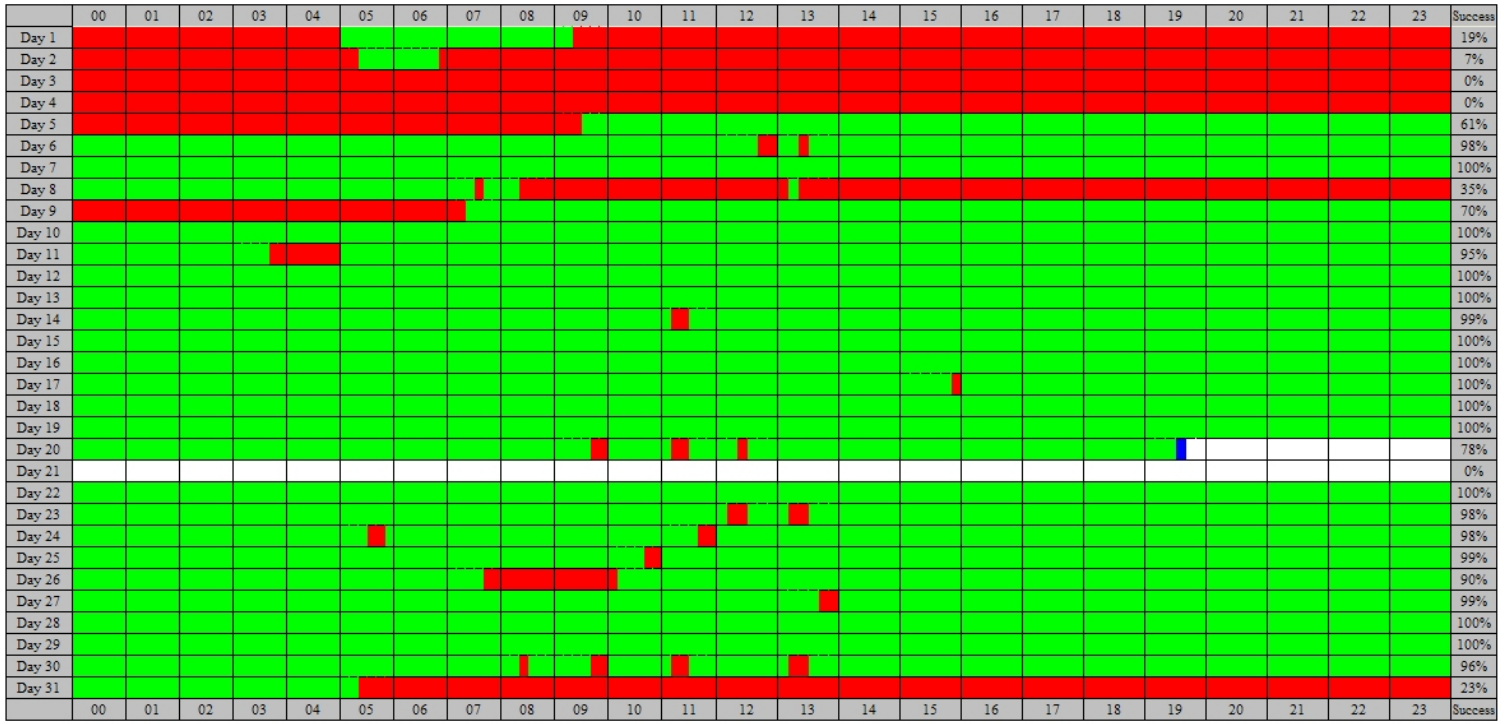
Email notification of Receiver outage

root	Mon, 20 Aug 07 10:17:35 +0000-- Belgium (192050001) Status: RESET	Mon 8/20/2007 6:19 AM	11 KB
root	Mon, 20 Aug 07 10:07:35 +0000-- Belgium (192050001) Status: DOWN	Mon 8/20/2007 6:09 AM	11 KB

Receiver 31 day status page

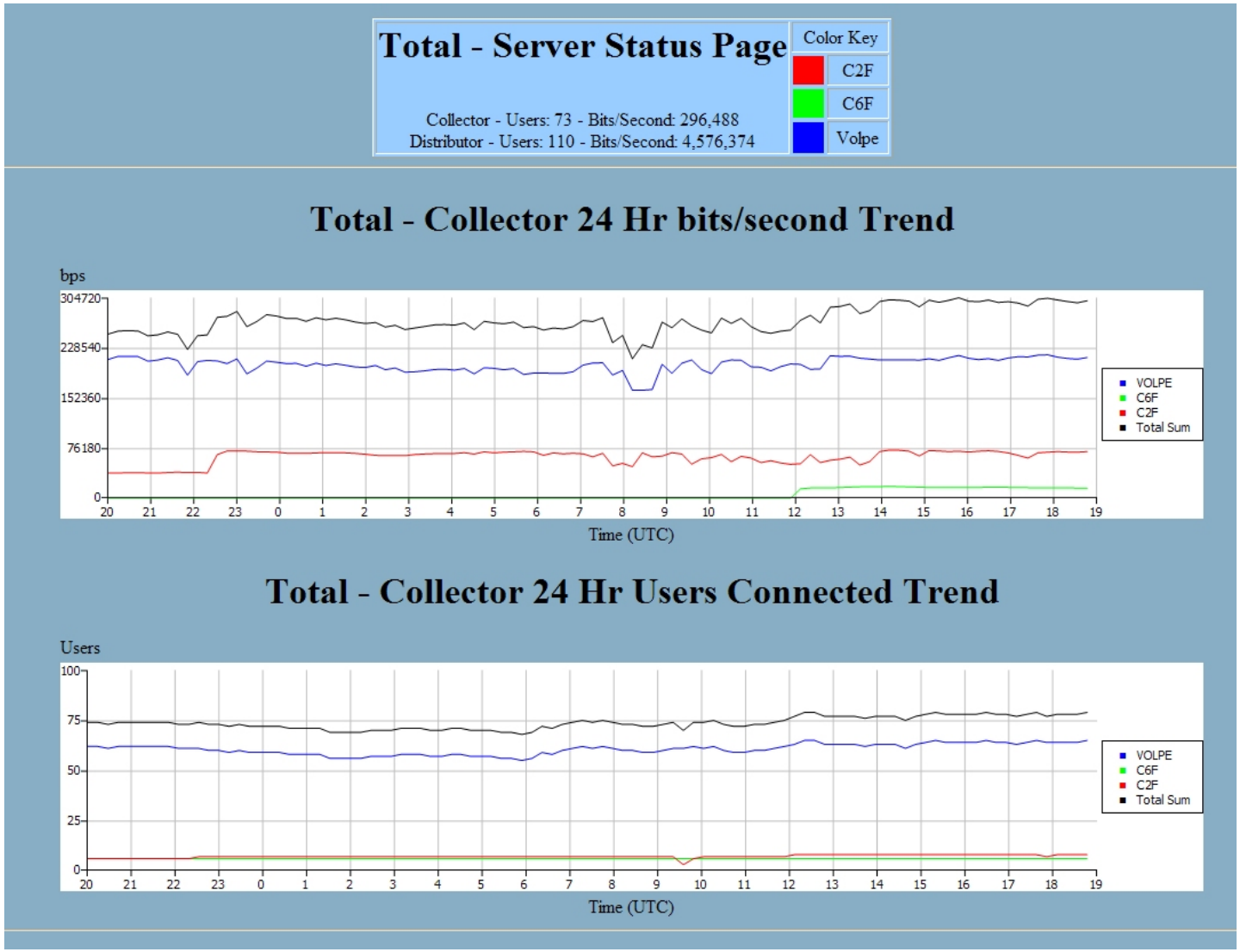
192050001

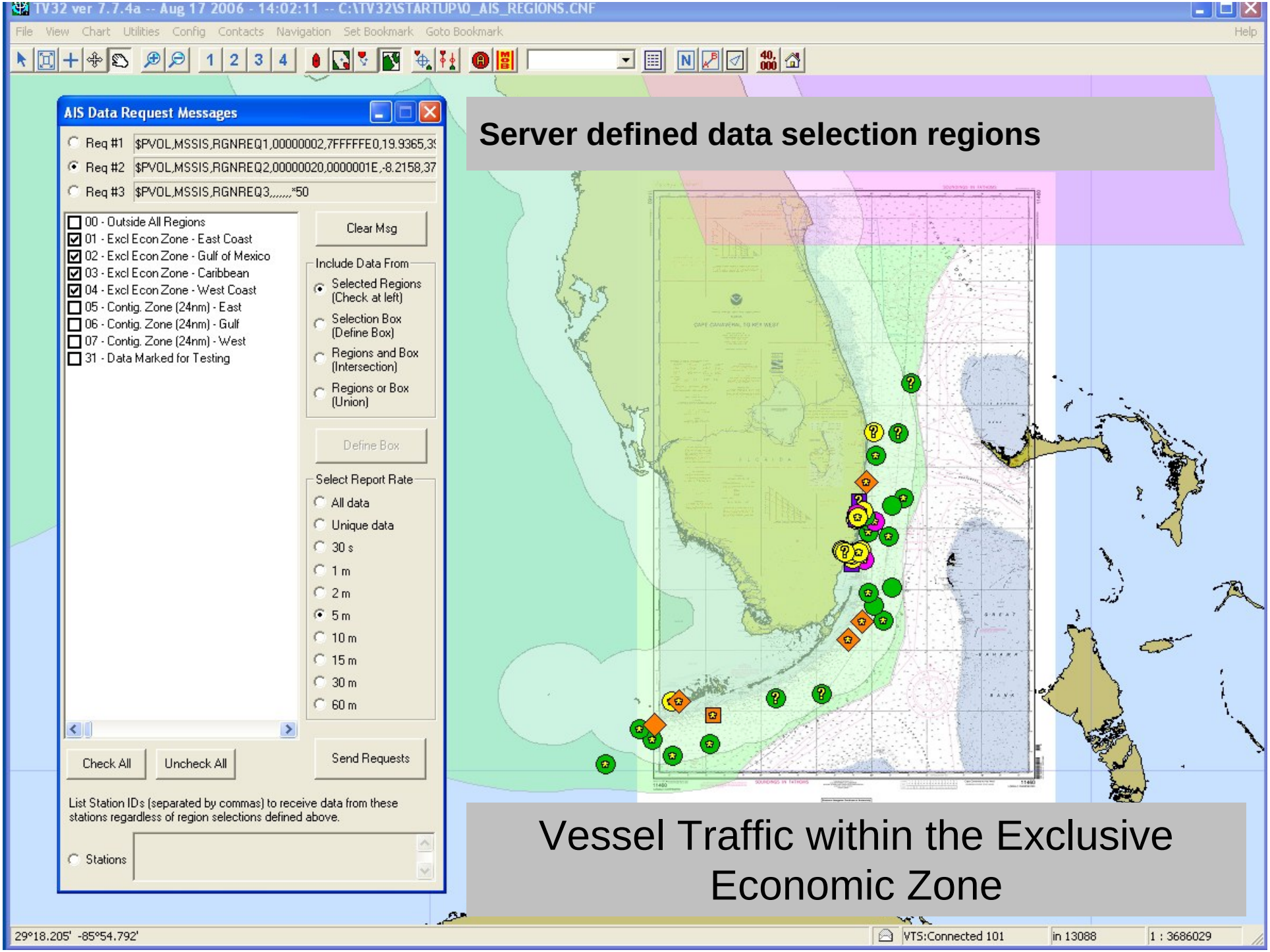
Last Updated (UTC): Mon August 20 19:39:38 2007



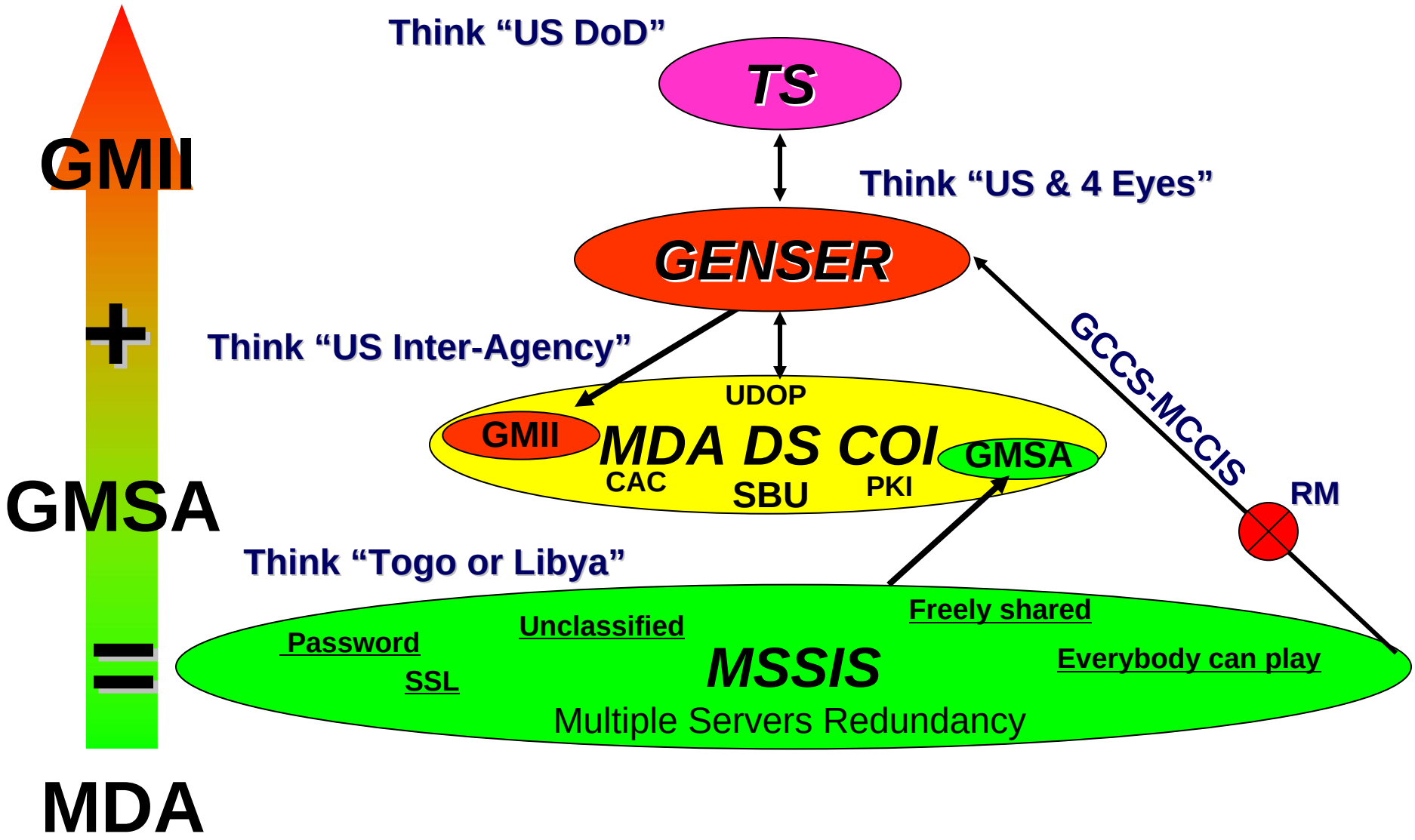
MSSIS Administration

Monitoring System data rates across multiple servers

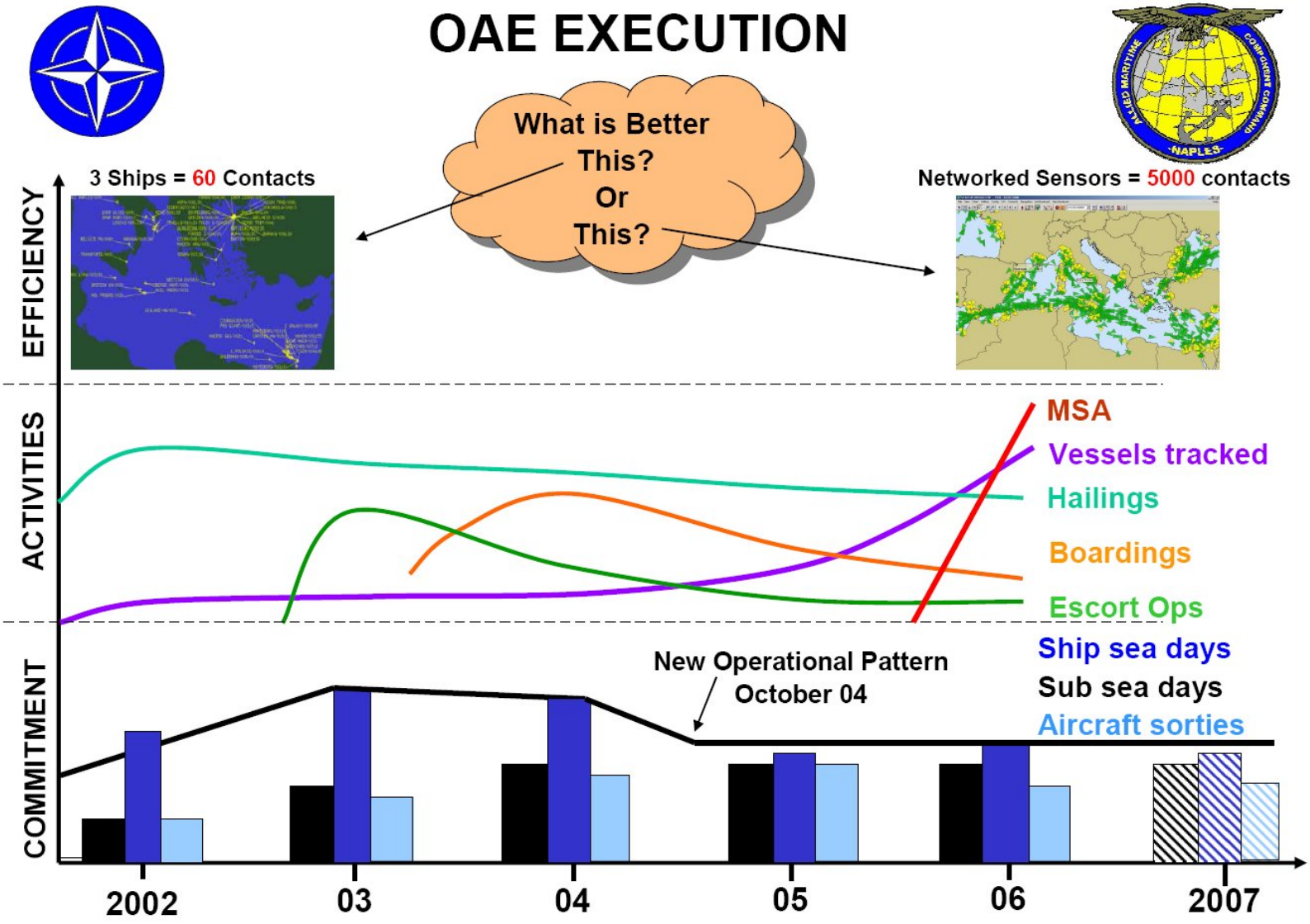


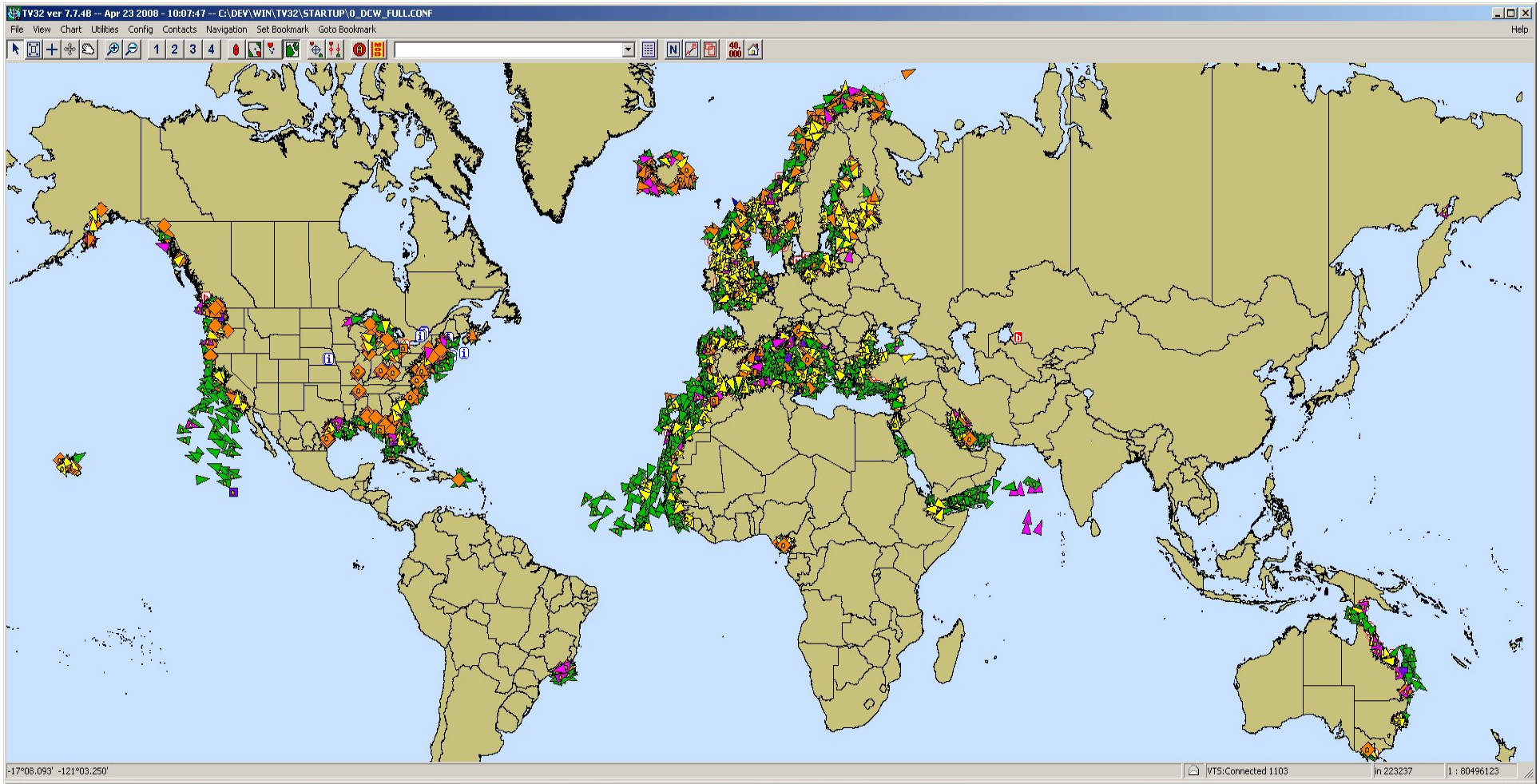

TV32 ver 7.7.4a -- Aug 17 2006 - 14:02:11 -- C:\TV32\STARTUP\0_AIS_REGIONS.CNF
File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
AIS Data Request Messages
Req #1 $PVOL,MSSIS,RGNREQ1,00000002,7FFFFFE0,19.9365,3
Req #2 $PVOL,MSSIS,RGNREQ2,00000020,0000001E,-8.2158,37
Req #3 $PVOL,MSSIS,RGNREQ3,,,,,,*50
00 - Outside All Regions
01 - Excl Econ Zone - East Coast
02 - Excl Econ Zone - Gulf of Mexico
03 - Excl Econ Zone - Caribbean
04 - Excl Econ Zone - West Coast
05 - Contig. Zone (24nm) - East
06 - Contig. Zone (24nm) - Gulf
07 - Contig. Zone (24nm) - West
31 - Data Marked for Testing
Clear Msg
Include Data From
Selected Regions (Check at left)
Selection Box (Define Box)
Regions and Box (Intersection)
Regions or Box (Union)
Define Box
Select Report Rate
All data
Unique data
30 s
1 m
2 m
5 m
10 m
15 m
30 m
60 m
Check All
Uncheck All
Send Requests
List Station IDs (separated by commas) to receive data from these stations regardless of region selections defined above.
Stations
Server defined data selection regions
Vessel Traffic within the Exclusive Economic Zone
29°18.205' -85°54.792'
VTS:Connected 101
in 13088
1 : 3686029

How MSSIS Fits



MSSIS role in NATO Operations

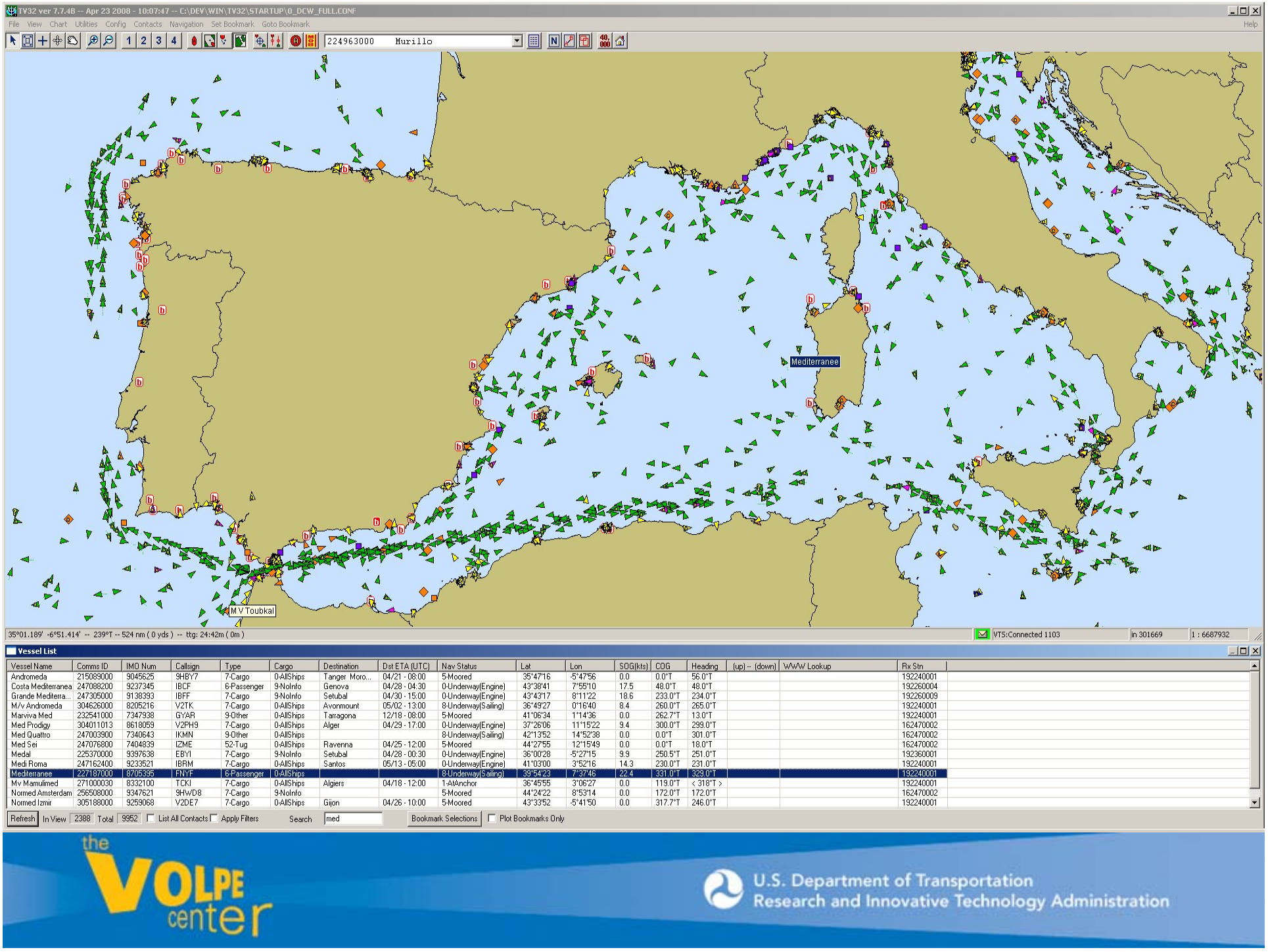




Vessel List

Vessel Name	Comms ID	IMO Num	Callsign	Type	Cargo	Destination	Dst ETA (UTC)	Nav Status	Lat	Lon	SOG(kts)	COG	Heading	(up) -- (down)	WWW Lookup	Rx Stn
Usns Mount Ba...	368781000	8937053	NZHN	35-MilOps	0-AllShips			5-Moored	40°27'20	-74°03'16	0.0	0.1°T	27.0°T			323380001
Usns Antares	367185000	7226897	NPEJ	7-Cargo	0-AllShips		00/00 - 24:60	5-Moored	30°24'00	-81°31'21	0.0	0.0°T	< 0°T >			123380002
Usns Apache Tat...	367848000	8832693	NIGP	52-Tug	0-AllShips	Charleston,det...	03/02 - 13:00	5-Moored	32°51'51	-79°57'52	0.0	0.1°T	< 0°T >			323380001
Usns Big Horn	367864000	8812162	NBIG	9-Other	0-AllShips	Norfolk	00/00 - 24:60	0-Underway(Engine)	58°58'39	-5°15'29	9.6	349.3°T	353.0°T			192320004
Usns Bridge	338956000	0	NGMV	9-Other	9-NoInfo	Local_ops	00/00 - 00:00	5-Moored	47°58'56	-122°13'41	0.0	20.7°T	34.0°T			323380001
Usns Comfort	368817000	7390478	NCOM	58-Medical	0-AllShips		00/00 - 00:00	15-NotDefined	39°15'32	-76°33'32	0.0	0.1°T	< 0°T >			323380001
Usns Kaiser	303849000	8302416	NHJK	8-Tanker	0-AllShips		00/00 - 24:60	5-Moored	32°42'22	-117°11'20	0.0	12.2°T	110.0°T			323380001
Usns Laramie	367861000	8906626	NLAR	35-MilOps	0-AllShips	There	00/00 - 00:00	5-Moored	36°52'57	-76°20'22	0.0	0.1°T	325.0°T			323380001
Usns Mercy	367816000	739045400	NMER	58-Medical	0-AllShips	Sea Trial	04/25 - 00:00	5-Moored	32°41'05	-117°08'06	0.1	319.3°T	< 319°T >			323380001
Usns Paul Buck	366705630	8220773	NBBO	8-Tanker	9-NoInfo		10/27 - 00:00	0-Underway(Engine)	40°51'31	2°12'20	13.5	282.0°T	285.0°T			192240001
Usns Pollux	368989000	7319632	NMVG	9-Other	0-AllShips		00/00 - 24:60	5-Moored	42°20'43	-71°01'48	0.1	194.8°T	< 190°T >			000006099
Usns Sisler	368734000	9117038	NZIX	7-Cargo	0-AllShips	Na	06/18 - 07:00	5-Moored	32°51'14	-79°57'07	0.0	0.0°T	53.0°T			323380001
Usns Soderman	367819000	9232254	NANL	7-Cargo	9-NoInfo	Norfolk	12/21 - 10:00	5-Moored	36°51'54	-76°18'51	0.0	0.0°T	227.0°T			323380001
Usns Waters	367851000	9301988	NWAA	0-Unknown	Unknown	Port Hueneme	00/00 - 24:60	5-Moored	34°08'57	-119°12'23	0.0	0.0°T	139.0°T			323380001

Refresh | In View 9380 | Total 9382 | List All Contacts | Apply Filters | Search usn | Bookmark Selections | Plot Bookmarks Only



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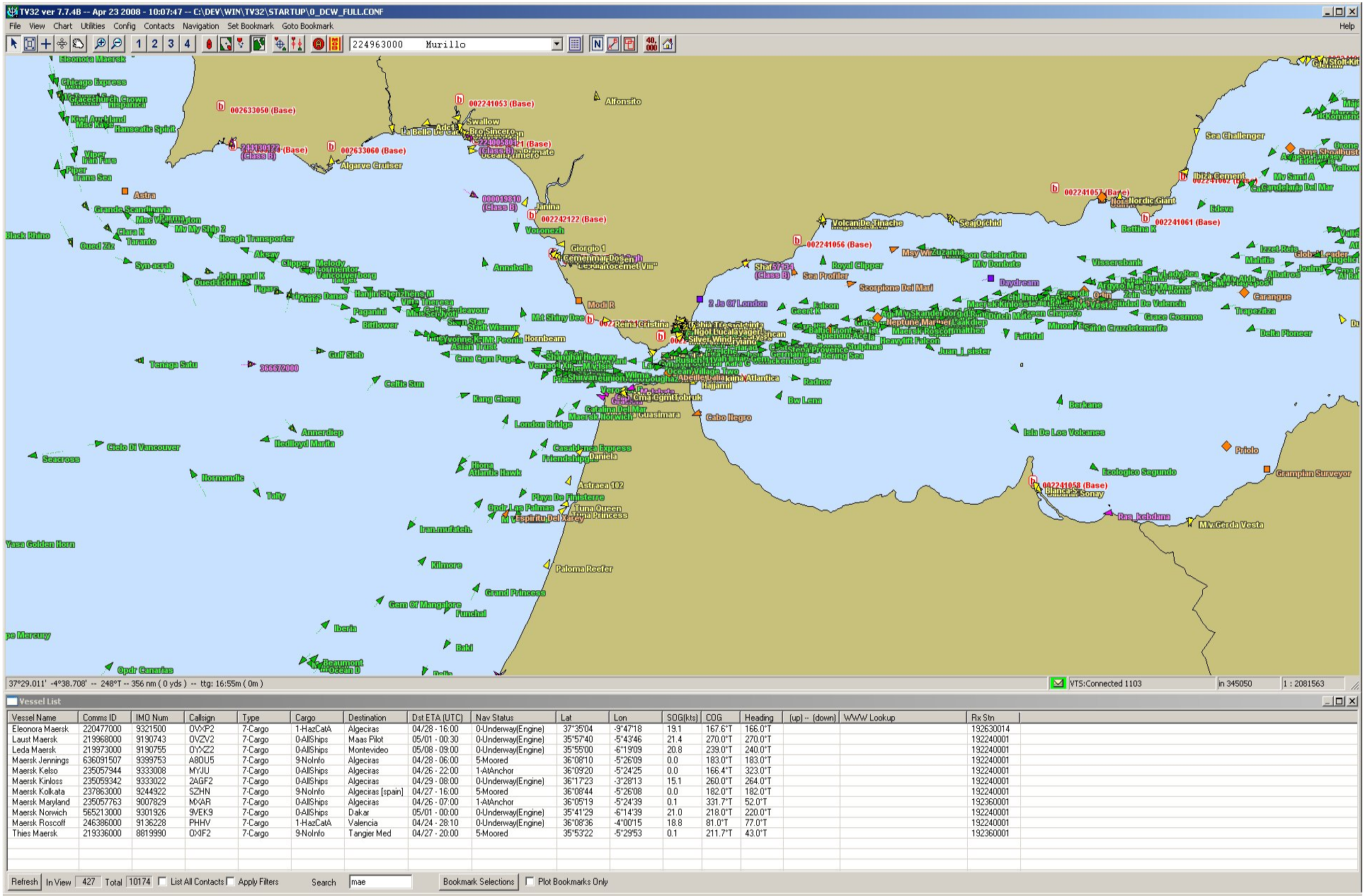
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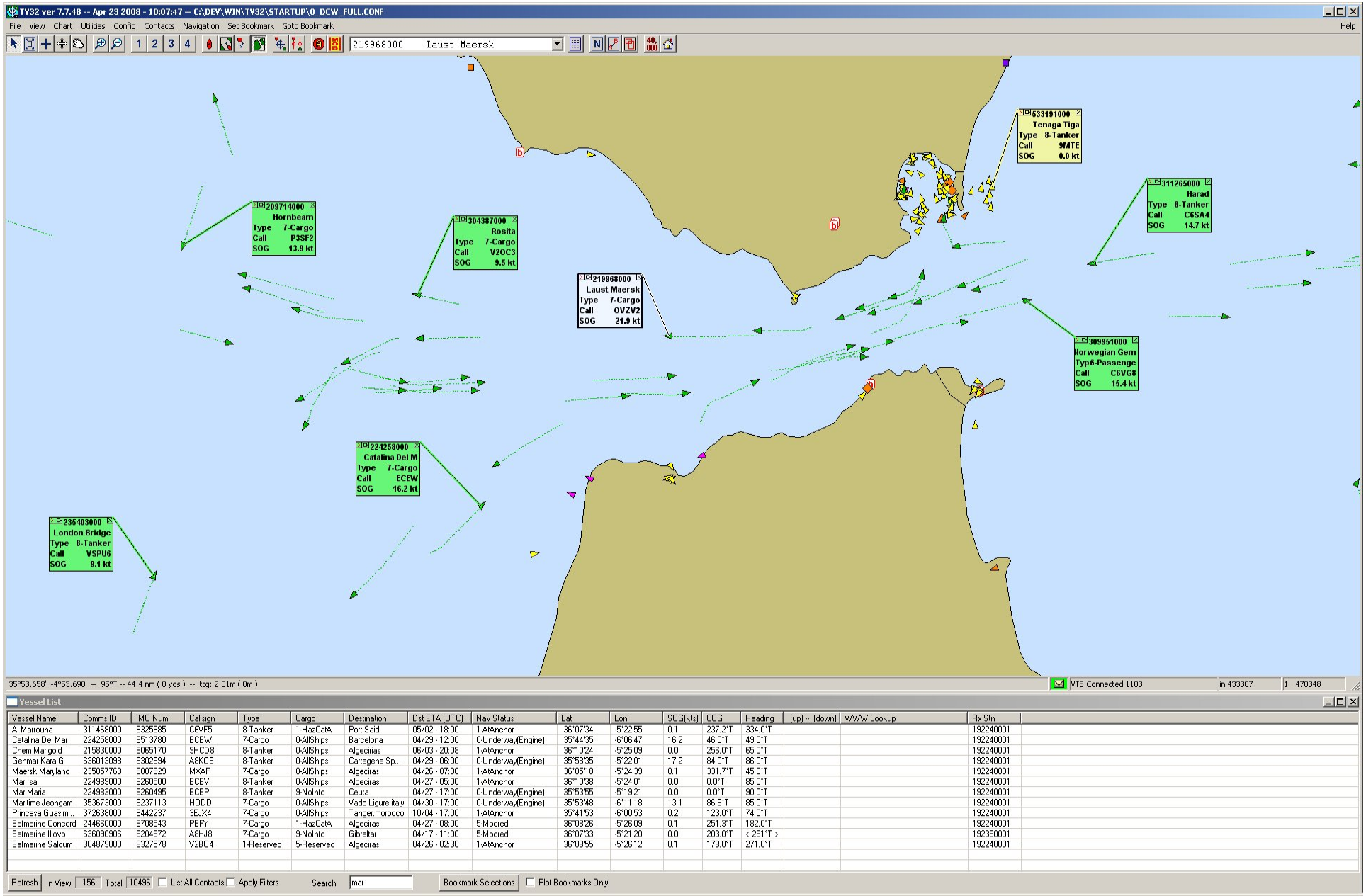
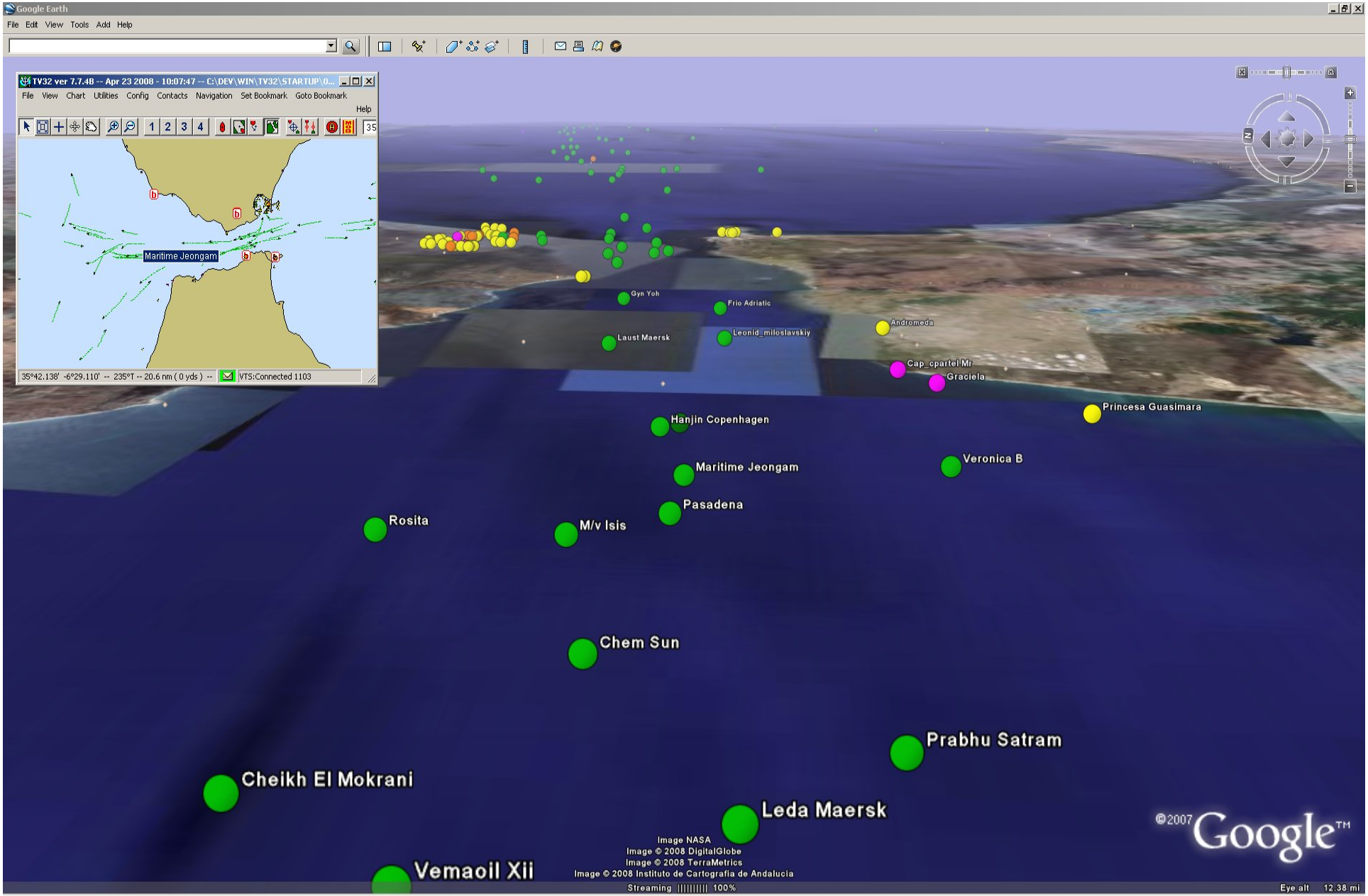
File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
224963000 Murillo
Eleonora Maersk
Chicago Express
Hanseatic Spirit
Viper
Piper
Astra
Grande Scandinavia
Clara K
Toronto
Oued Ziz
Sun-acrab
Aksay
Figaro
Pagnanini
Bbflower
Gulf Sieb
Tenaga Saku
366672000
Celtic Sun
Kang Cheng
Amnerdiep
Hedlloyd Marfin
Cielo Di Vancouver
Seacross
Normandie
Tally
Iran.mufateh.
Yasa Golden Horn
Kilmore
Gem Of Mangalore
Funchal
Iberia
Baki
Opdr Canarias
002633050 (Base)
002241053 (Base)
002633060 (Base)
Algarve Cruiser
Alfonsito
Swallow
Janina
002242122 (Base)
Veronezh
Giorgio 1
Annabella
Modi R
Mt Shiny Dee
Asian Trust
Hornbeam
Cma Cgm Puget
Vemaco
Hanjin Hudway
Hanjin Shenzhen
Hanjin Thames
Hanjin Leavouer
Hanjin Yvon
Hanjin Peonin
Hanjin Star
Hanjin Wiemar
Hanjin Yvonne
Hanjin Theresa
Reina Cristina
Silver Wind
Geert K
Falcon
Mt.Mercia
Mt.Atlantica
Radnor
Rw Lena
Gabo Negro
London Bridge
Casablanca Express
Friendship
Daniela
Hiorn
Atlantic Hawk
Astraea 102
Playa De Fuenterre
Opdr Las Palmas
Tuna Queen
Tuna Princess
M V Espiritu Del Surey
Paloma Reefer
Grand Princess
Beaumont
Ocean D
Volcan De Lanche
Sea Orchid
002241056 (Base)
Royal Clipper
Sea Profiler
Scorpione Dei Mari
Daydream
2 Js 07 London
Neptune Mariner
Leakdep
Faithful
Juan_j_sister
Bering Sea
Kapitan Sulpinas
Kapitan Kudinov
Kapitan Kudinov
Kapitan Kudinov



Vessel List

Vessel Name	Comms ID	IMO Num	Callsign	Type	Cargo	Destination	Dst ETA (UTC)	Nav Status	Lat	Lon	SOG(kts)	COG	Heading	(up) -- (down)	WWW Lookup	Rx Stn
Al Marrouna	311468000	9325685	C6VF5	8-Tanker	1-HazCatA	Port Said	05/02 - 18:00	1-AtAnchor	36°07'34	-5°22'55	0.1	237.2°T	334.0°T			192240001
Catalina Del Mar	224258000	8513780	ECEW	7-Cargo	0-AllShips	Barcelona	04/29 - 12:00	0-Underway(Engine)	35°44'35	-6°06'47	16.2	46.0°T	49.0°T			192240001
Chem Marigold	215830000	9065170	9HCD8	8-Tanker	0-AllShips	Algeciras	06/03 - 20:08	1-AtAnchor	36°10'24	-5°25'09	0.0	256.0°T	65.0°T			192240001
Genmar Kara G	636013098	9302994	A8KO8	8-Tanker	0-AllShips	Cartagena Sp...	04/29 - 06:00	0-Underway(Engine)	35°58'35	-5°22'01	17.2	84.0°T	86.0°T			192240001
Maersk Maryland	235057763	9007829	MXAR	7-Cargo	0-AllShips	Algeciras	04/26 - 07:00	1-AtAnchor	36°05'18	-5°24'39	0.1	331.7°T	45.0°T			192240001
Mar Isa	224989000	9260500	ECBV	8-Tanker	0-AllShips	Algeciras	04/27 - 05:00	1-AtAnchor	36°10'38	-5°24'01	0.0	0.0°T	85.0°T			192240001
Mar Maria	224983000	9260495	ECBP	8-Tanker	9-NoInfo	Ceuta	04/27 - 17:00	0-Underway(Engine)	35°53'55	-5°19'21	0.0	0.0°T	90.0°T			192240001
Maritime Jeongam	353673000	9237113	HODD	7-Cargo	0-AllShips	Vado Ligure,Italy	04/30 - 17:00	0-Underway(Engine)	35°53'48	-6°11'18	13.1	86.6°T	85.0°T			192240001
Princesa Guasim...	372638000	9442237	3EJX4	7-Cargo	0-AllShips	Tanger,morocco	10/04 - 17:00	1-AtAnchor	35°41'53	-6°00'53	0.2	123.0°T	74.0°T			192240001
Safmarine Concord	244660000	8708543	PBFY	7-Cargo	1-HazCatA	Algeciras	04/27 - 08:00	5-Moored	36°08'26	-5°26'09	0.1	251.3°T	182.0°T			192240001
Safmarine Illovo	636090906	9204972	A8HJ8	7-Cargo	9-NoInfo	Gibraltar	04/17 - 11:00	5-Moored	36°07'33	-5°21'20	0.0	203.0°T	< 291°T >			192360001
Safmarine Saloum	304879000	9327578	V2BO4	1-Reserved	5-Reserved	Algeciras	04/26 - 02:30	1-AtAnchor	36°08'55	-5°26'12	0.1	178.0°T	271.0°T			192240001

Refresh | In View 156 | Total 10496 | List All Contacts | Apply Filters | Search mar | Bookmark Selections | Plot Bookmarks Only



the VOLPE center

U.S. Department of Transportation
Research and Innovative Technology Administration

TV32 ver 7.7.4B -- Nov 26 2007 - 11:33:14 -- STARTUP\DEFAULT.CONF
File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
Safety Text Messages
Message
Source
Dest
Time (UTC)
ship entered to restricted area
002470038
247055600 - Dellino Gri...
01/16 - 06:2
be advise that mv ice prince is sinking in position 5009.9n 00202.1w large bert...
002275200
273119500 - Ivan Ryabov
01/16 - 06:3
be advise that mv ice prince is sinking in position 5009.9n 00202.1w large bert...
002275200
211230400 - Rebecca ...
01/16 - 06:5
be advise that mv ice prince is sinking in position 5009.9n 00202.1w large bert...
002275200
234460000 - Isarstern
01/16 - 06:5
Send
Broadcast to All
Repeat (3 min)
To: 232647000
[232647000] : Patricia
Show All Messages
Video - Breaking News Videos from CNN.com - Microsoft Internet Explorer
File Edit View Favorites Tools Help
CNN Video
Live Video
Podcas
COURTESY ITN
CNN
Ship faces turbulent seas 2:03
High winds, crashing seas and a storm threaten to capsize
Source: ITN
Added On January 15, 2008
Internet
Base
002275200
13:36:04
Lat 49°41'02
Lon -1°54'27
Pos Surveyed
Accur. High
SCS 0/4/176
RxTm 08:36:14
49°18.160' -2°07.665' -- 184°T -- 52.0 nm (0 yds) -- ttg: 18:34m (0m)
VTS:Connected 2103
in 13724399
1 : 720895

Google Earth
File Edit View Tools Add Help
warren st, georgetown, ma
Cosco Busan
MMSI 477968900
IMO Num 9231743
Callsign VRDI6
Type 7-Cargo
Destination Pusan S Korea
ETA 11/15 - 22:00
Status 0-Underway(Engine)
SOG / COG 9.2 kts / 304
Report Time 16:29:58 (UTC)
Size 275m x 40m x 12.3m
TV32 Supplied Webpage
USCG Maritime Information Exchange
Shipspotting (photos)
© 2007 Sanborn
Image © 2007 TerraMetrics
© 2007 Tele Atlas
Image © 2007 DigitalGlobe
©2007 Google™
Start
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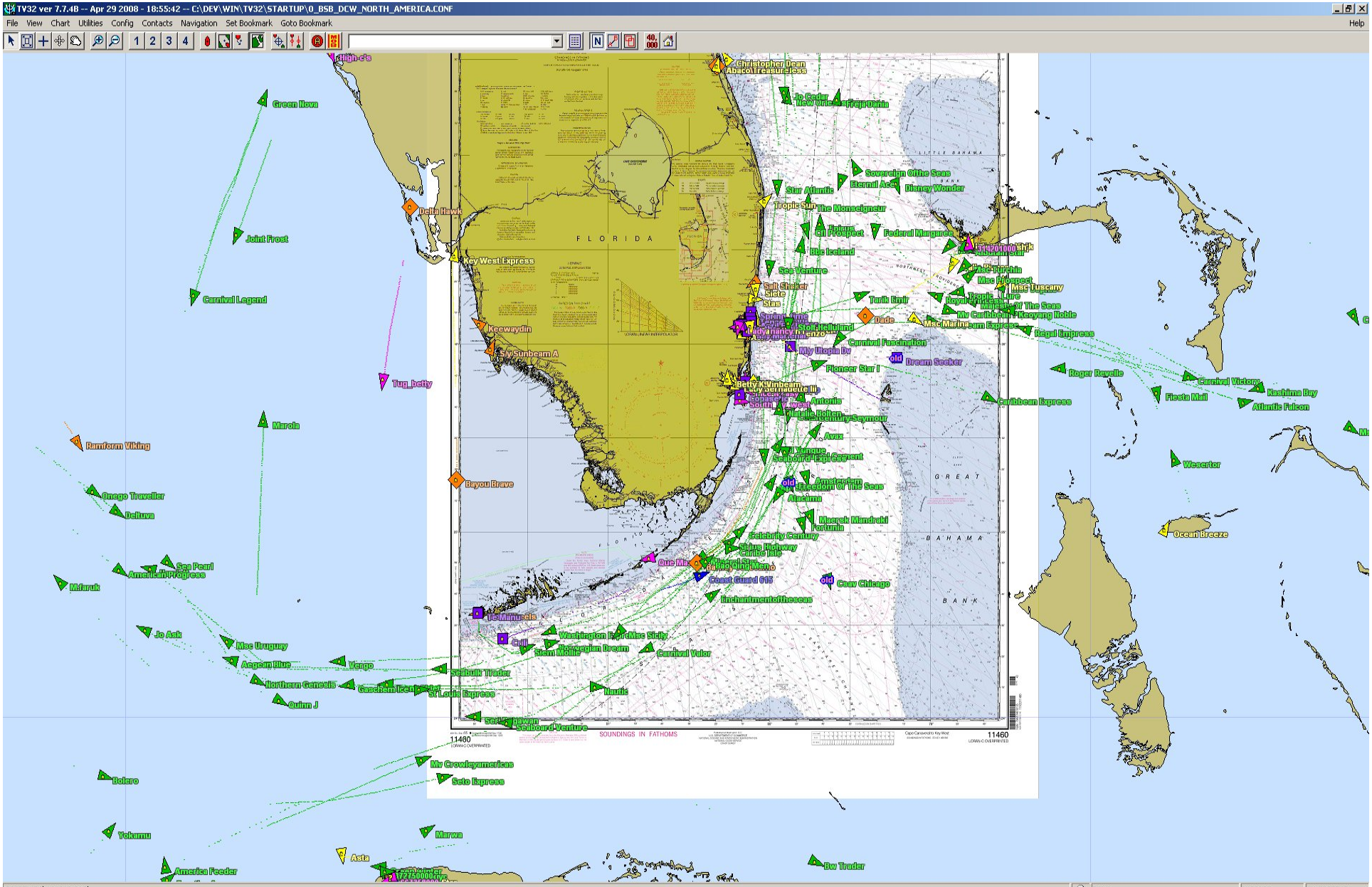
Google Earth
Kurt's Weblog - Windows...
Oakland-San Francisco B...
Jasc Paint Shop Pro - Co...
10:11 AM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File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
FLORIDA
GREAT BAHAMA BANK
LITTLE BAHAMA BANK
Green Nova
Joint Frost
Carnival Legend
Delta Hawk
Key West Express
Keewaydin
Sy Sunbeam A
Tug_betty
Marcia
Rainform Viking
Omega Traveller
Deltuva
Sea Pearl
American Progress
M.faruk
Jo Ask
Msc Uruguay
Aegean Blue
Yongo
Northern Genesis
Quinn J
Seibulk Trader
St Louis Express
Nauric
Bolero
Yokamu
America Feeder
Asia
Marwa
Mv Crowleyamericas
Seto Express
Bayou Brave
Christopher Deem
Abico Treasureless
Jo Cedar
Sovereign Ofthe Seas
Eternal Ace
Disney Wonder
Star Atlantis
Tropic Sun
The Monseigneur
Federal Mangonui
Oil Prospect
Rio Iachimd
Sea Venture
Salt Chalice
Siete
Stas
Tanik Emir
Dodo
Msc Marinesam Expresso
Carnival Fascination
My Utopia Dv
Pioneer Star I
Dream Seeker
Betty K Vinheam
Antonia
Avas
Amsterdam
Direction Of The Seas
Alaskma
Maersk Mandraki
Portumin
Celebrity Century
Shins Highway
Caribe Isle
Ous Max
Coast Guard 615
Coav Chicago
Enchantmentoftheseas
Ile Manuelia
Cnl
Washington Exp
Msc Sicily
Stem Mollis
Norwegian Dream
Carnival Valor
Seibulk Venture
Mv Crowleyamericas
Seto Express
Roger Revelle
Caribbean Express
Carnival Victory
Fiesta Maii
Kashima Bay
Atlantis Falcon
Wesertor
Ocean Breeze
Bw Trader
SOUNDINGS IN FATHOMS
11460
11460
26°25.436' -84°19.319'
Done
in 32182
1 : 2085545

the VOLPE center

U.S. Department of Transportation
Research and Innovative Technology Administration

The value of MSSIS has been demonstrated both in terms of CNE-C6F operations and NATO's Operation Active Endeavour. In several cases, high interest vessels were located and tracked using the network. The ability to share this information enabled us to work the end game with national authorities where we otherwise would have been unable to investigate a suspicious vessel. MSSIS has enabled seizures of contraband and illegal immigrants, as well as rescues at sea.

MSSIS represents a repository of trust, and this trust is what keeps nations in the network. And while we seek to share the burden of running it, all of the participants look to us for the leadership and ideas to develop it further. We must be careful not to shortchange this role, allow MSSIS to degrade, or give the impression that we value classified and bilateral arrangements over unclassified multilateral exchange, as it would be perceived as a betrayal of trust and set back our efforts to build maritime partnerships.

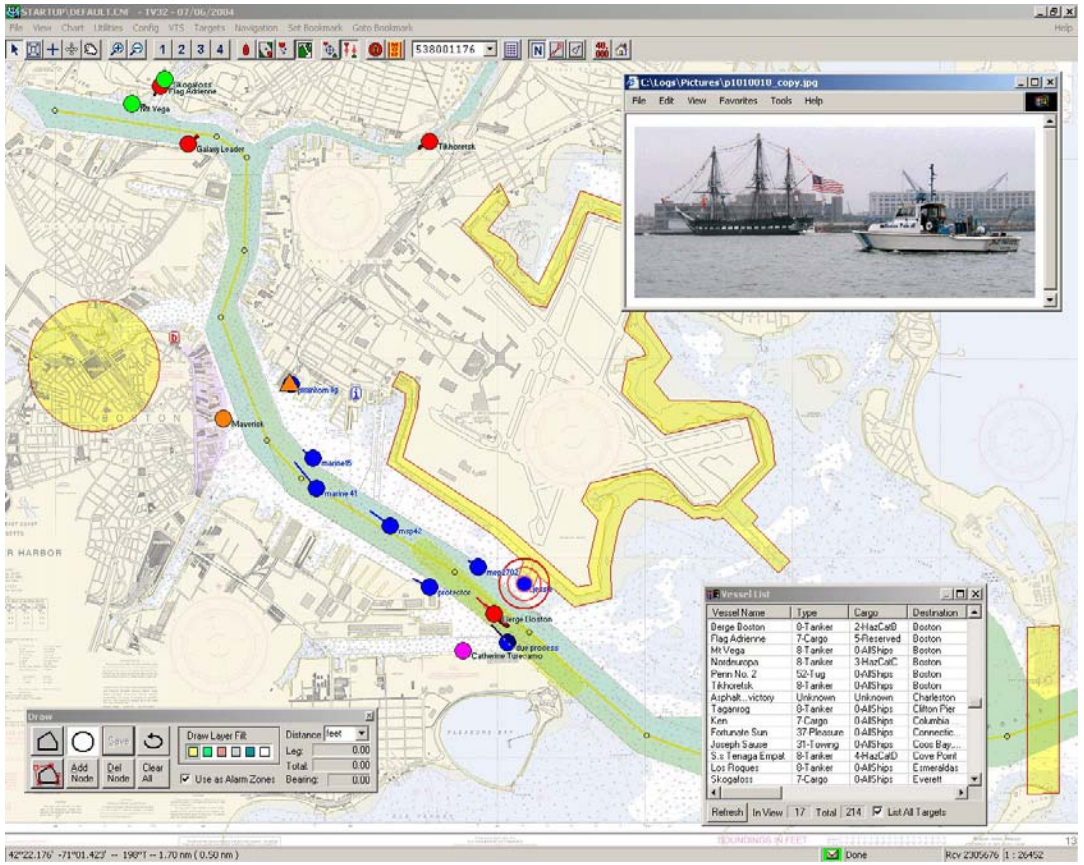
Excerpt from Admiral Ulrich, Commander U.S. Naval Forces Europe, letter to Admiral Roughead, Chief of Naval Operations

October 2007

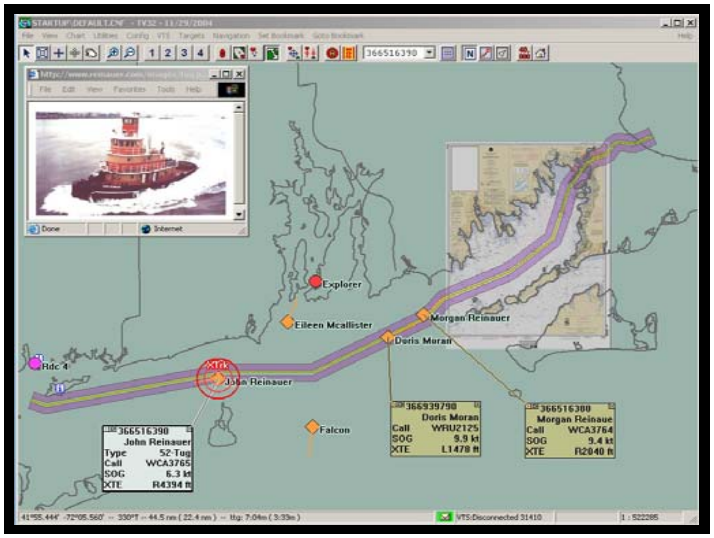
Transview (a.k.a TV32)

TV32 is a windows application developed by the Volpe Center for use in a number of vessel tracking and navigation related projects. Currently, it is used as the primary communications and chart display client for the MSSIS network and is generally provided for free as Government-off-the-shelf (GOTS) software. It has been used for:

- Pilot Navigation
- Vessel Traffic Management
- Oil Spill Modeling
- Accident Investigation
- Buoy Positioning
- Network Monitoring
- Analysis Tool
- Data Logging
- Data Translation/Exchange
- Port/Harbor Security
- Force Protection Display



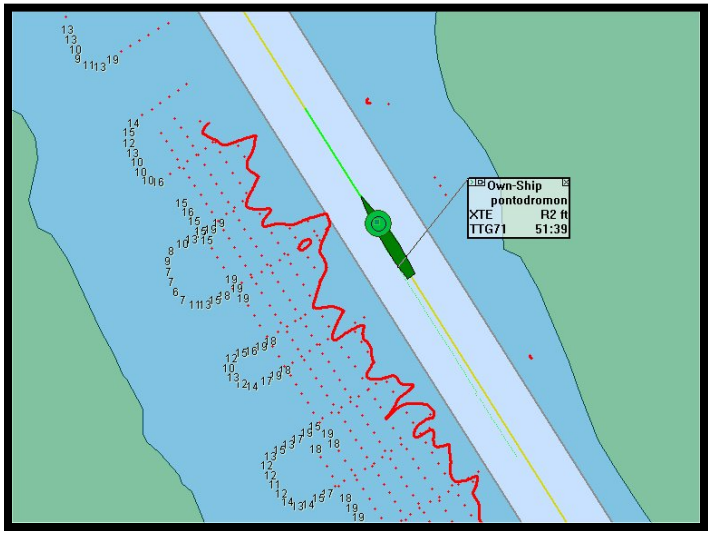
Transview Other Applications:



Cape Cod Canal

-Army Corp of Engineers

-Oil Spill Prevention



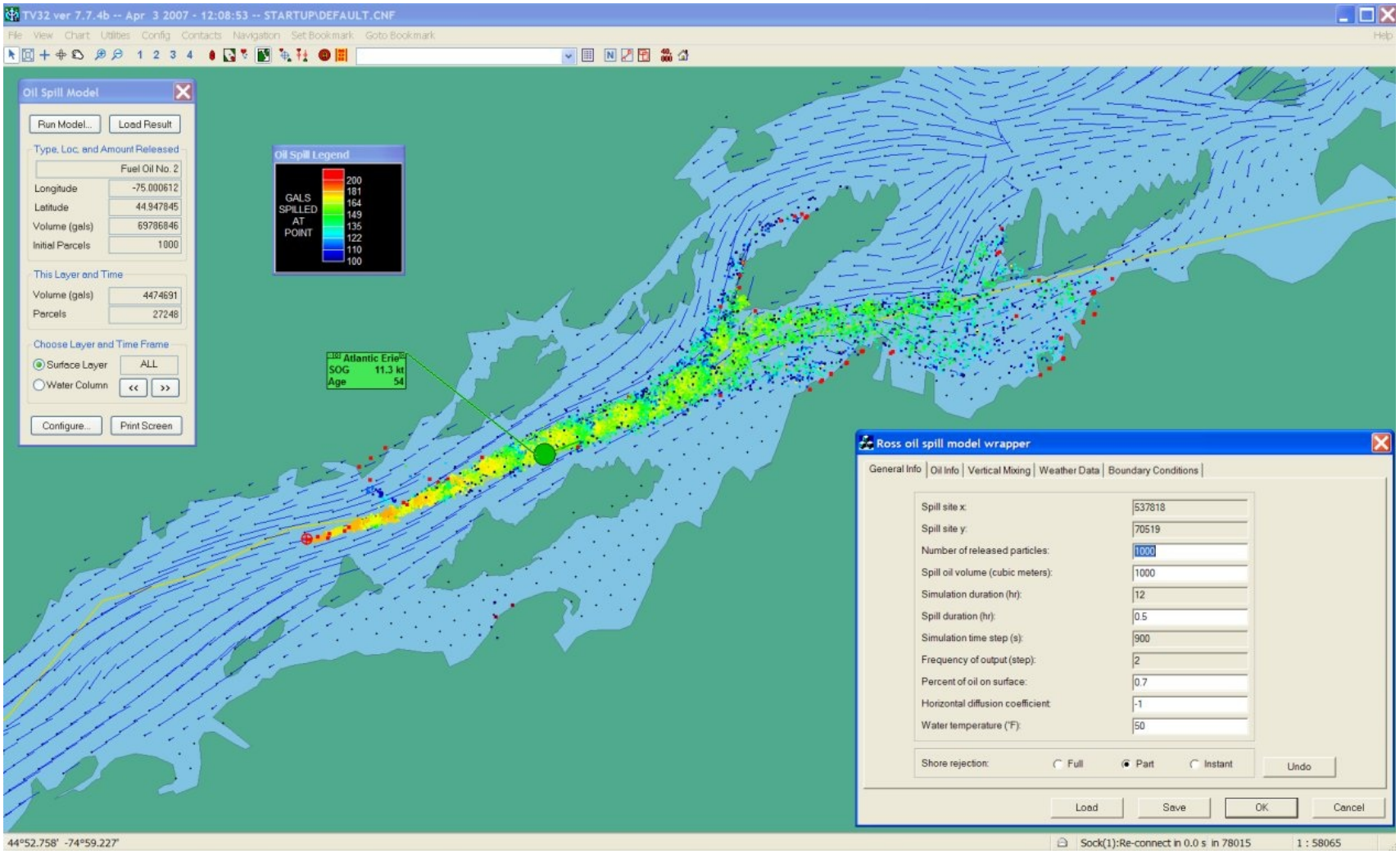
Columbia River Pilots

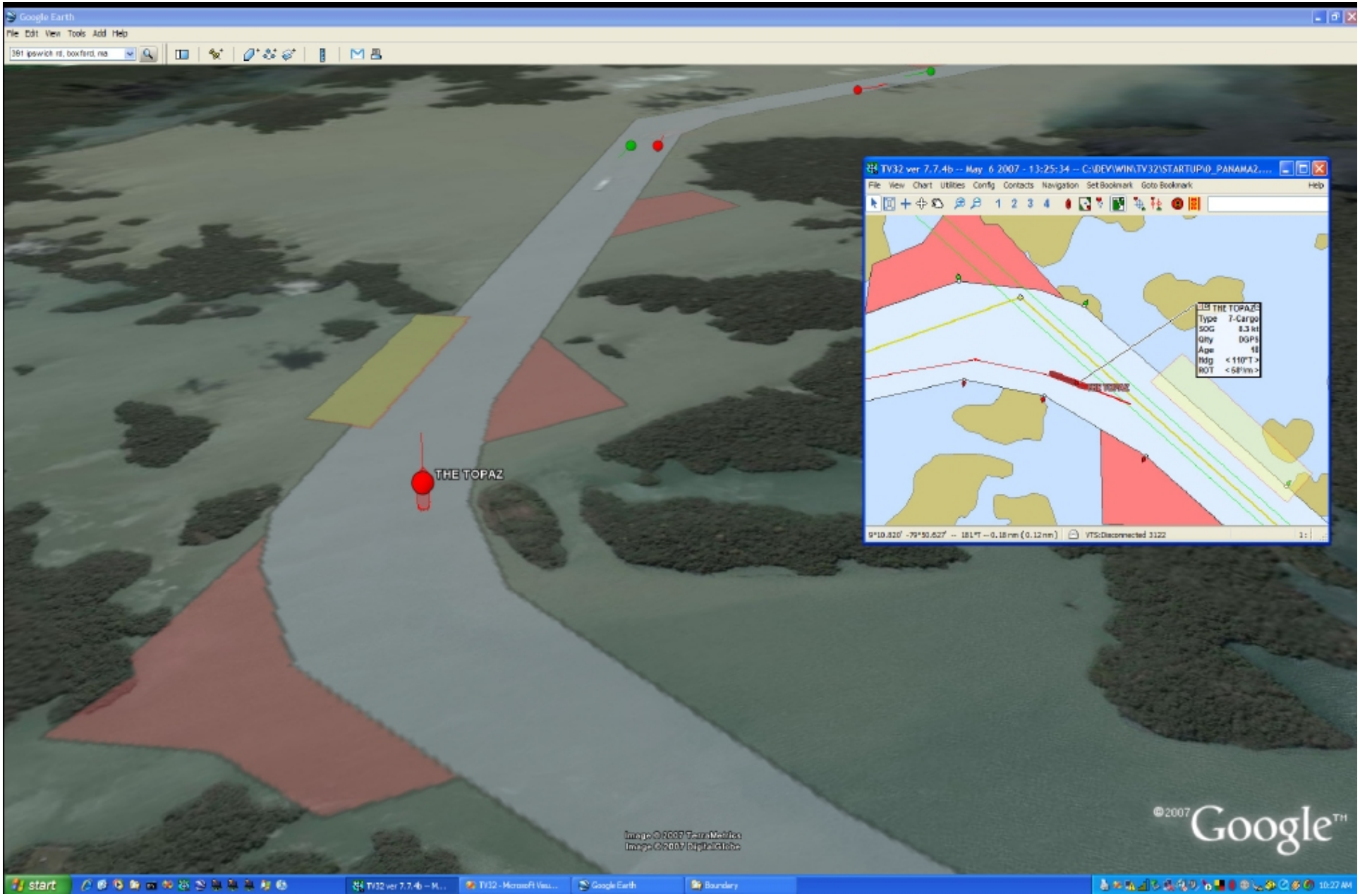
-Pilot Display

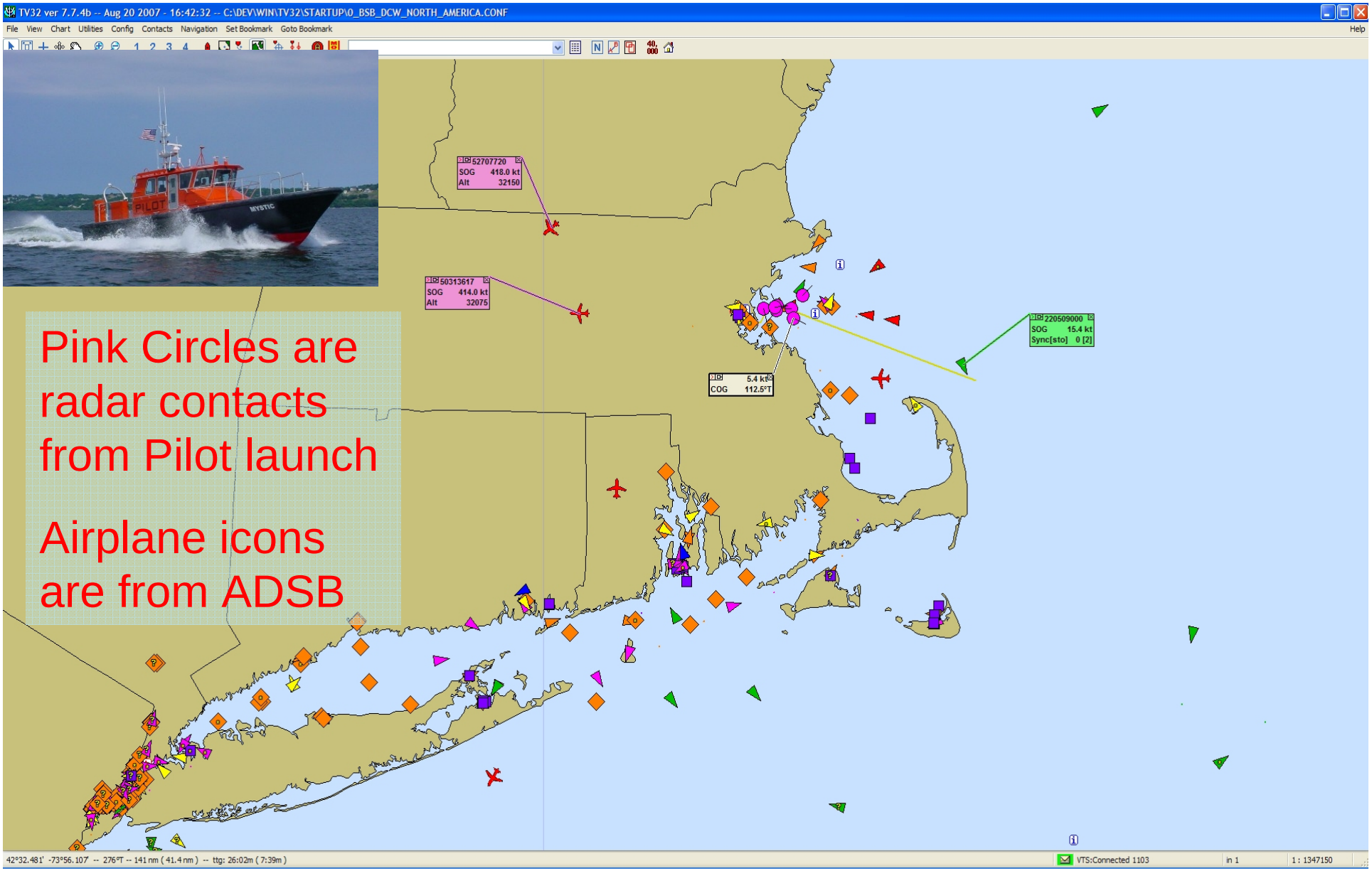
-Hydro Graphic Survey

Transview Other Applications:

Oil Spill Model Display




Google Earth
File Edit View Tools Add Help
TV32 ver 7.7.4b -- May 6 2007 - 13:25:34 -- C:\DEV\WIN\TV32\STARTUP\0_PANAMA2....
File View Chart Utilities Config Contacts Navigation Set Bookmark Goto Bookmark Help
THE TOPAZ
Type 7-Cargo
SOG 8.3 kt
Qlty DGPS
Age 1s
Hdg < 110°T >
ROT < 58°/m >
THE TOPAZ
©2007 Google™
start

MSSIS Future Vision

MSSIS+, AIS, Radar, ADSB, …