AIS Database

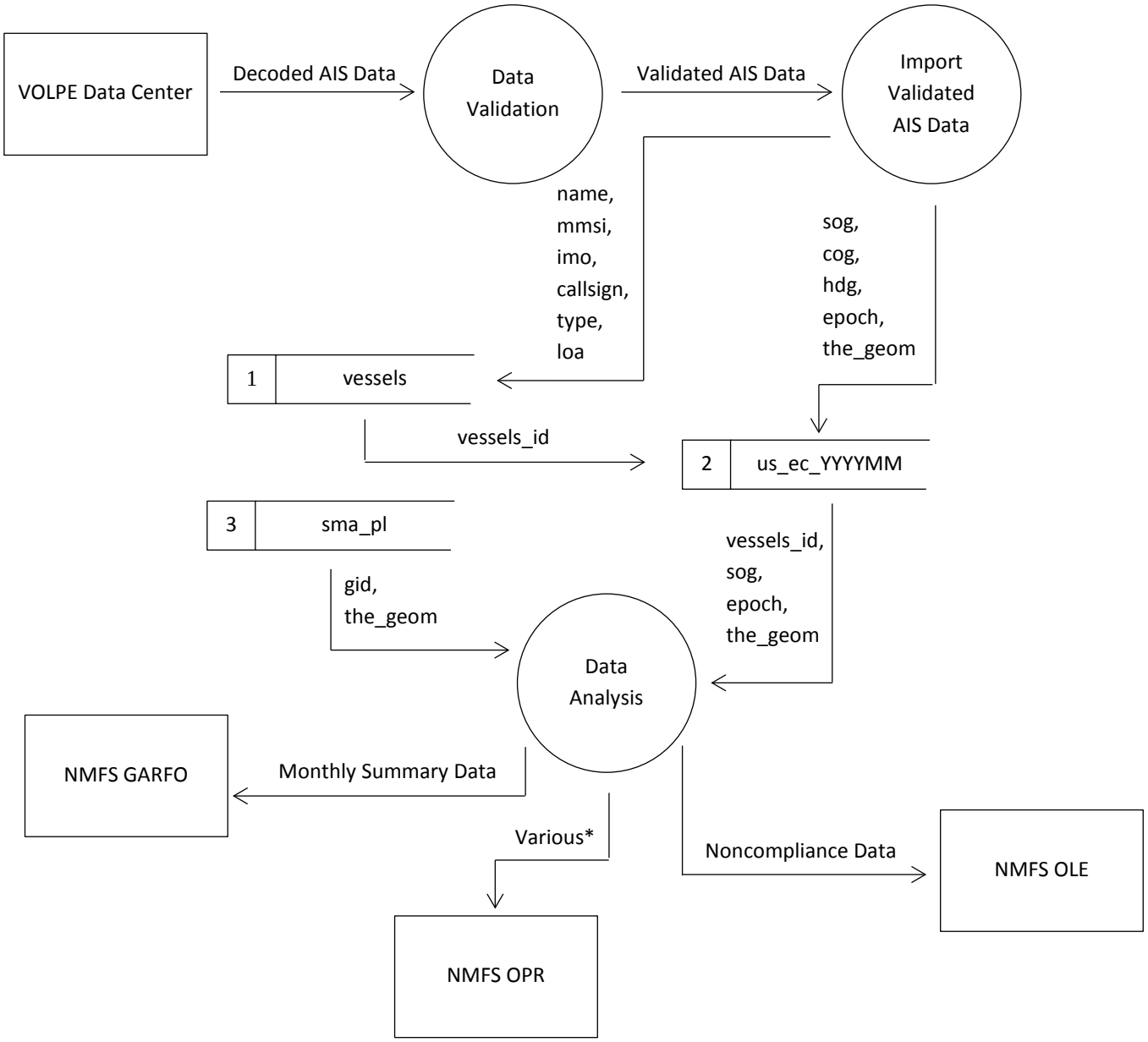
The AIS database is a PostgreSQL/PostGIS database that contains Automatic Identification System (AIS) data from the east coast of the U.S. for November 2008 to the present. The data is acquired by the VOLPE National Transportation Systems Center from the U.S. Coast Guard's Nationwide Automatic Identification System (NAIS) network and is currently being used by NOAA Fisheries' Office of Protected Resources (OPR) to conduct a variety analyses in support of large whale conservation. The database is stored on a server at VOLPE and is administered and managed by OPR. It is not currently accessible to the public.

Raw data from the NAIS feed is decoded into a CSV text file by VOLPE using their TV32 software. A custom PL/SQL import function is then used by OPR to import the data from the CSV text file into the PostgreSQL/PostGIS database. Data is imported into two tables. One table stores vessel information and the other stores the position, speed, and navigational status data. The table that stores vessel information is named *vessels* and contains the following fields: *id* (unique ID), *name* (vessel's name), *mmsi* (vessel's Maritime Mobile Service Identity number), *imo* (vessel's International Maritime Organization number), *callsign* (vessel's call sign), type (vessel's type) and *loa* (vessel's overall length).

The table that stores the position, speed, and navigational status data is named *us_ec* and is partitioned into many child tables by year and month. The partitioned child tables are named using the following convention: *us_ec_YYYYMM* (e.g. *us_ec_200811*, *us_ec_200812*, *us_ec_200901*, etc.). Each partitioned table contains the following fields: *id* (unique ID), *vessels_id* (foreign key to the *vessels* table), *sog* (vessel's speed over ground), *cog* (vessel's course over ground), *hdg* (vessel's heading), epoch (time at which data were generated), *the_geom* (vessel's position).

Efforts are currently underway to import AIS data for the both west coast and gulf coast of the U.S. A similar storage scheme as that described above for east coast data will be employed for this data.

Data Flow Diagram



Decoded AIS Data

name: Name of the vessel (*text*).
mmsi: Maritime Mobile Service Identity number of the vessel (*text*).
imo: International Maritime Organization number of the vessel (*text*).
callsign: Call sign of the vessel (*text*).
type: Vessel type (*text*).
loa: Overall length of the vessel (*text*).
lat: Latitude coordinate (decimal degrees) of the vessel's position (*text*).
lon: Longitude coordinate (decimal degrees) of the vessel's position (*text*).
sog: Vessel's speed over ground (*text*).
cog: Vessel's course over ground (*text*).
hdg: Vessel's heading (*text*).
epoch: The seconds field of the UTC time when the data were generated (*text*).

Data Validation

FOR EACH record in decoded AIS data:

1. Count number of columns (comma separated values) in the record.
2. IF number of columns <> 12, discard record.
   OTHERWISE:
    1. Replace "\" with "\\" and remove double quotes in column 1 (name).
    2. Convert value in column 2 (mmsi) to integer:
       IF conversion fails, replace value with NULL.
    3. Convert value in the column 3 (imo) to integer:
       IF conversion fails, replace value with NULL.
    4. Replace "\" with "\\" and remove double quotes in column 4 (callsign).
    5. Parse out numeric code representing vessel type in column 5 (vessel type):
       IF unable to parse out numeric code, replace value with NULL.
    6. Convert value in column 6 (loa) to decimal(5,1):
       IF conversion fails, replace value with NULL.
    7. Convert value in column 7 (lat) to decimal(8,6):
       IF conversion fails, replace value with NULL.
    8. Convert value in column 8 (lon) to decimal(9,6):
       IF conversion fails, replace value with NULL.
    9. Convert value in column 9 (sog) to decimal(4,1):
       IF conversion fails, replace value with NULL.
    10. Convert value in column 10 (cog) to decimal(4,1):
        IF conversion fails, replace value with NULL.
    11. Convert value in column 11 (hdg) to decimal(4,1):
        IF conversion fails, replace value with NULL.
    12. Convert value in column 12 (epoch) to integer:
        IF conversion fails, replace value with NULL

Validated AIS Data

name: Name of the vessel (*text*).
mmsi: Maritime Mobile Service Identity number of the vessel (*integer*).
imo: International Maritime Organization number of the vessel (*integer*).
callsign: Call sign of the vessel (*text*).
type: Vessel type (*integer*).
loa: Overall length of the vessel (*decimal(5,1)*).
lat: Latitude coordinate (decimal degrees) of the vessel's position (*decimal(8,6)*).
lon: Longitude coordinate (decimal degrees) of the vessel's position (*decimal(9,6)*).
sog: Vessel's speed over ground (*decimal(4,1)*).
cog: Vessel's course over ground (*decimal(4,1)*).
hdg: Vessel's heading (*decimal(4,1)*).
epoch: The seconds field of the UTC time when the data were generated (*integer*).

Import Validated AIS Data

FOR EACH record in validated AIS data:

1. Check vessels table for existing record.
2. IF existing vessel record (name, mmsi, imo, callsign, imo, loa) exists, get id of existing record.
   OTHERWISE:
    1. Append new record into vessels table.
    2. Get id of new record.
3. Create geometry data type field using values in lat and lon fields (the_geom).
4. Append new record into appropriate us_ec partition (us_ec_YYYYMM), including the following fields: vessels_id (*see step 2*), sog, cog, hdg, epoch, the_geom (*see step 3*).

vessels

id: Unique identifier (*integer*).
name: Name of the vessel (*text*).
mmsi: Maritime Mobile Service Identity number of the vessel (*integer*).
imo: International Maritime Organization number of the vessel (*integer*).
callsign: Call sign of the vessel (*text*).
type: Vessel type (*integer*).
loa: Overall length of the vessel (*decimal(5,1)*).

us_ec_YYYYMM

id: Unique identifier (*big integer*).
vessels_id: Foreign key to vessels table (*integer*).
sog: Vessel's speed over ground (*decimal(4,1)*).
cog: Vessel's course over ground (*decimal(4,1)*).
hdg: Vessel's heading (*decimal(4,1)*).
epoch: The seconds field of the UTC time when the data were generated (*integer*).
the_geom: Vessel location (*geometry*).

sma_pl

gid: Unique identifier (*integer*).
alias: Long form name of seasonal management area (*character varying(254)*).
type: Type (Feeding Area, Calving and Nursing Grounds, etc.) of area (*character varying(254)*).
sma: Seasonal management area acronym (*character varying(50)*).
sma_date_ranges_id: Foreign key to table containing effective dates (*integer*).
the_geom: Seasonal management area polygon(s) (*geometry(MultiPolygon)*).

sma_date_ranges

id: Unique identifier (*integer*).
eff_month: Integer representing effective date month (*integer*).
eff_day: Integer representing effective date day (*integer*).
exp_month: Integer representing expiration date month (*integer*).
exp_day: Integer representing expiration date day (*integer*).
yr_add: Factor used to calculate year of expiration date (*integer*).

Data Analysis

Monthly Summary:

<insert Structured English description>

Noncompliance Data:

<insert Structured English description>

Various*:

<insert Structured English description>