Data Services

The Fleet Optimization Experts

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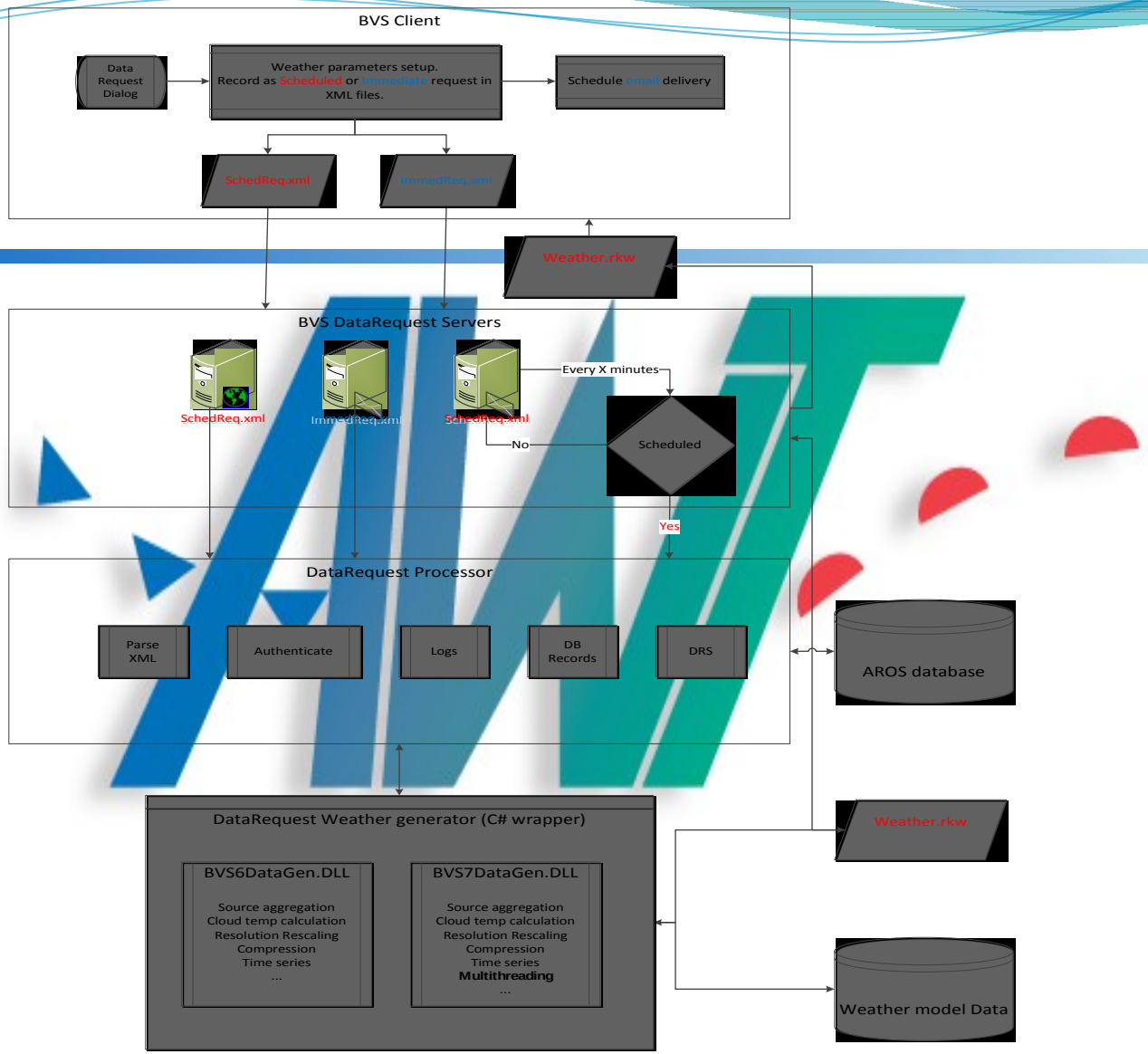
Between rock (software) and hard place (data).

- Data team prepares the weather data.
- Other data feeds (piracy, marine bulletins etc.)
- Software consumes it.
  - Bon Voyage System
  - AROS
  - Third party products (through API).

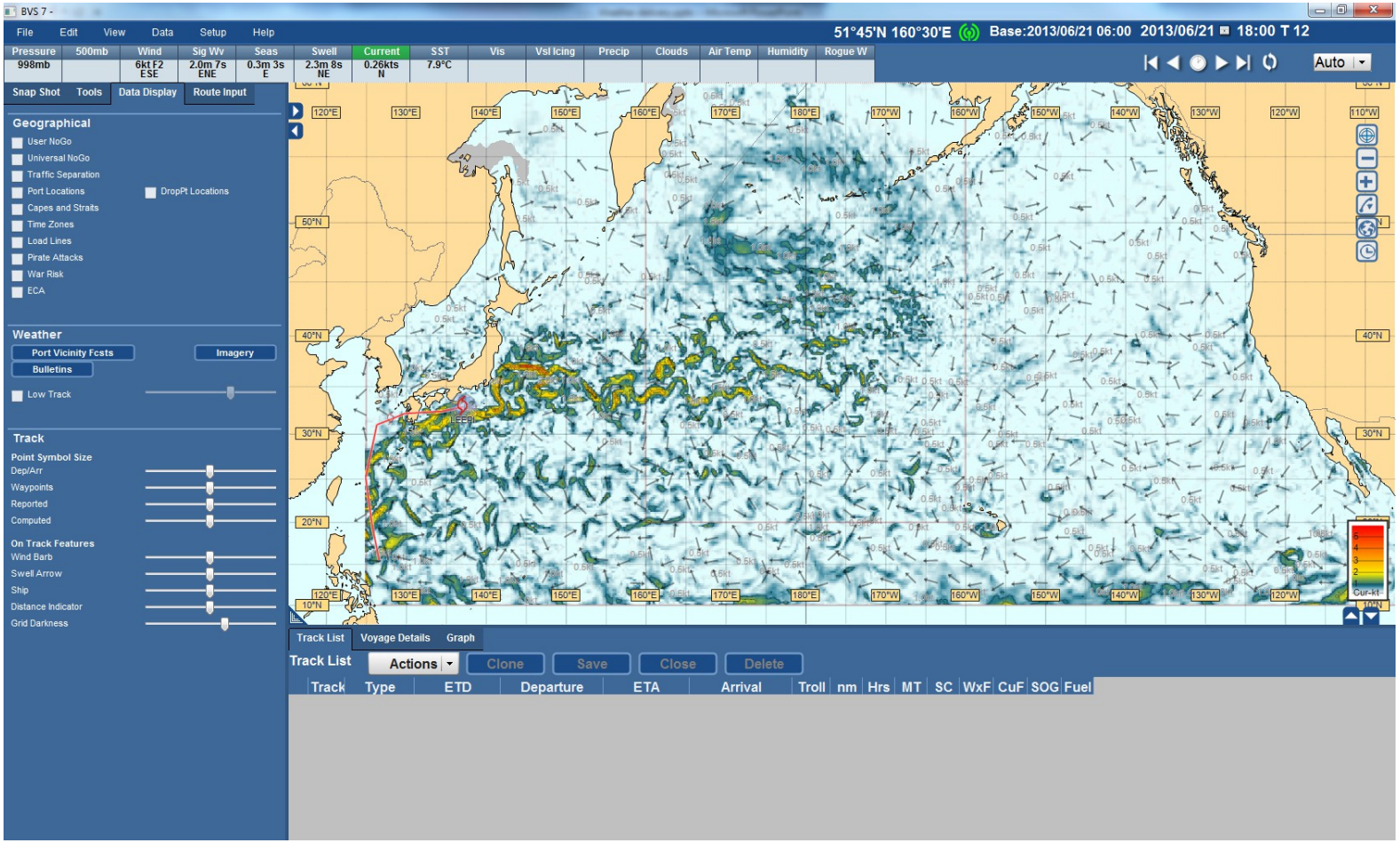
This presentation describes the infrastructure of delivery of this data per software request.


BVS Client
Data Request Dialog
Weather parameters setup.
Record as Scheduled or Immediate request in XML files.
Schedule email delivery
SchedReq.xml
ImmedReq.xml
Weather.rkw
BVS DataRequest Servers
SchedReq.xml
ImmedReq.xml
SchedReq.xml
Every X minutes
No
Scheduled
Yes
DataRequest Processor
Parse XML
Authenticate
Logs
DB Records
DRS
AROS database
DataRequest Weather generator (C# wrapper)
BVS6DataGen.DLL
Source aggregation
Cloud temp calculation
Resolution Rescaling
Compression
Time series
...
BVS7DataGen.DLL
Source aggregation
Cloud temp calculation
Resolution Rescaling
Compression
Time series
Multithreading
...
Weather.rkw
Weather model Data

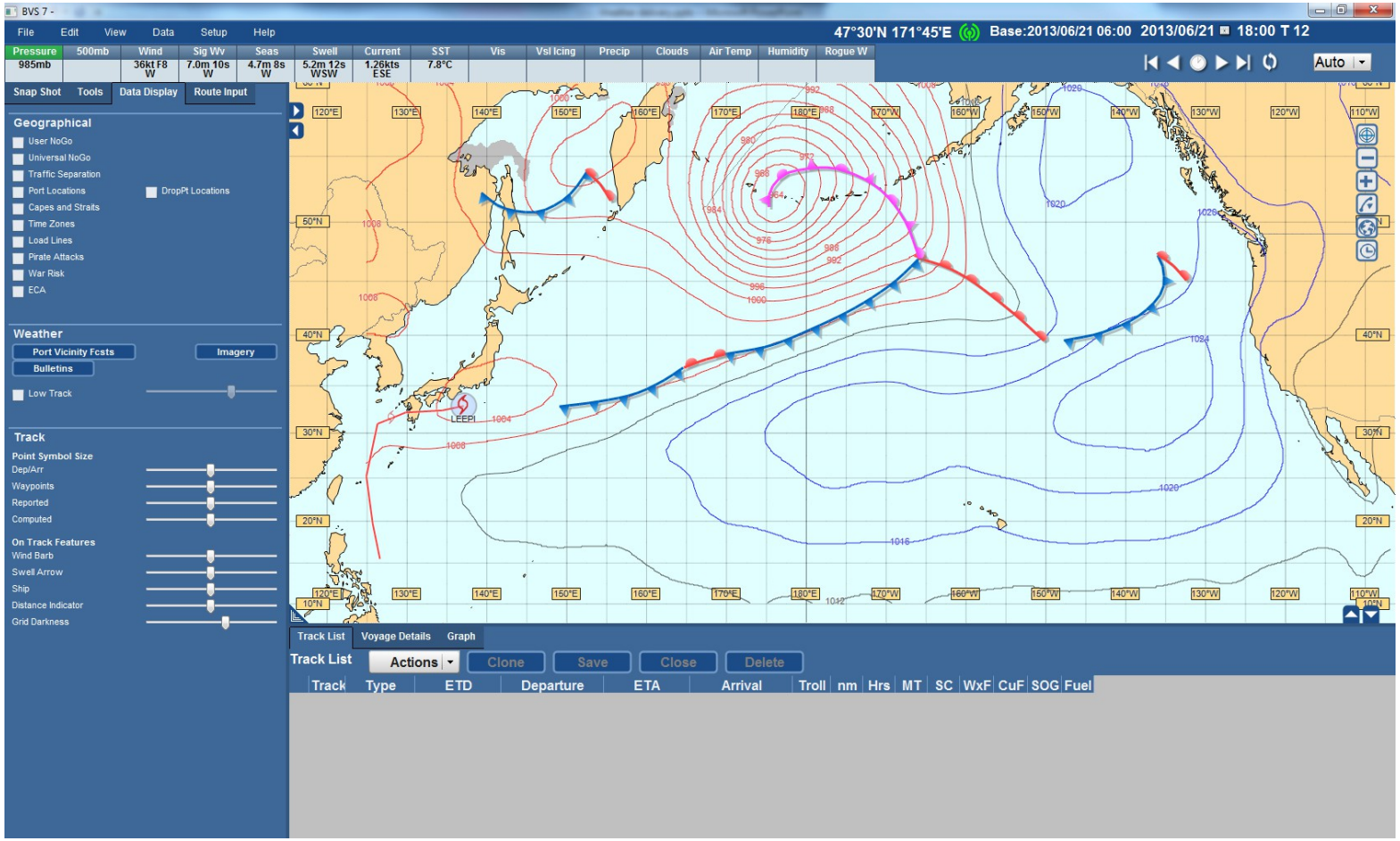
What is in the request XML?


```
nats" imo="0000000" produ    pname=    ship" bvs="7.0.0.41" decoder="1.0
<WEATHER forecast="10" picacyhistory="14" interval="H3" ulat="65" llat="10" llon="125" rlon="-105" updatetropicals="0" updatepiracy="0" updatebulletins="0" piracyhistory="14">
ESSURE>
  <NESTED>
    <WEATHER llon="160" rlon="-160" ulat="60" llat="20" hiresinterval="H3">
      <CURRENT>1</CURRENT>
      <WIND>1</WIND>
      <WAVE>1</WAVE>
      <SWELL>1</SWELL>
      <SEAS>1</SEAS>
    </WEATHER>
    <WEATHER llon="170" rlon="-155" ulat="50" llat="35" hiresinterval="H3">
      <IMAGE>1</IMAGE>
    </WEATHER>
  </NESTED>
</WEATHER>
```

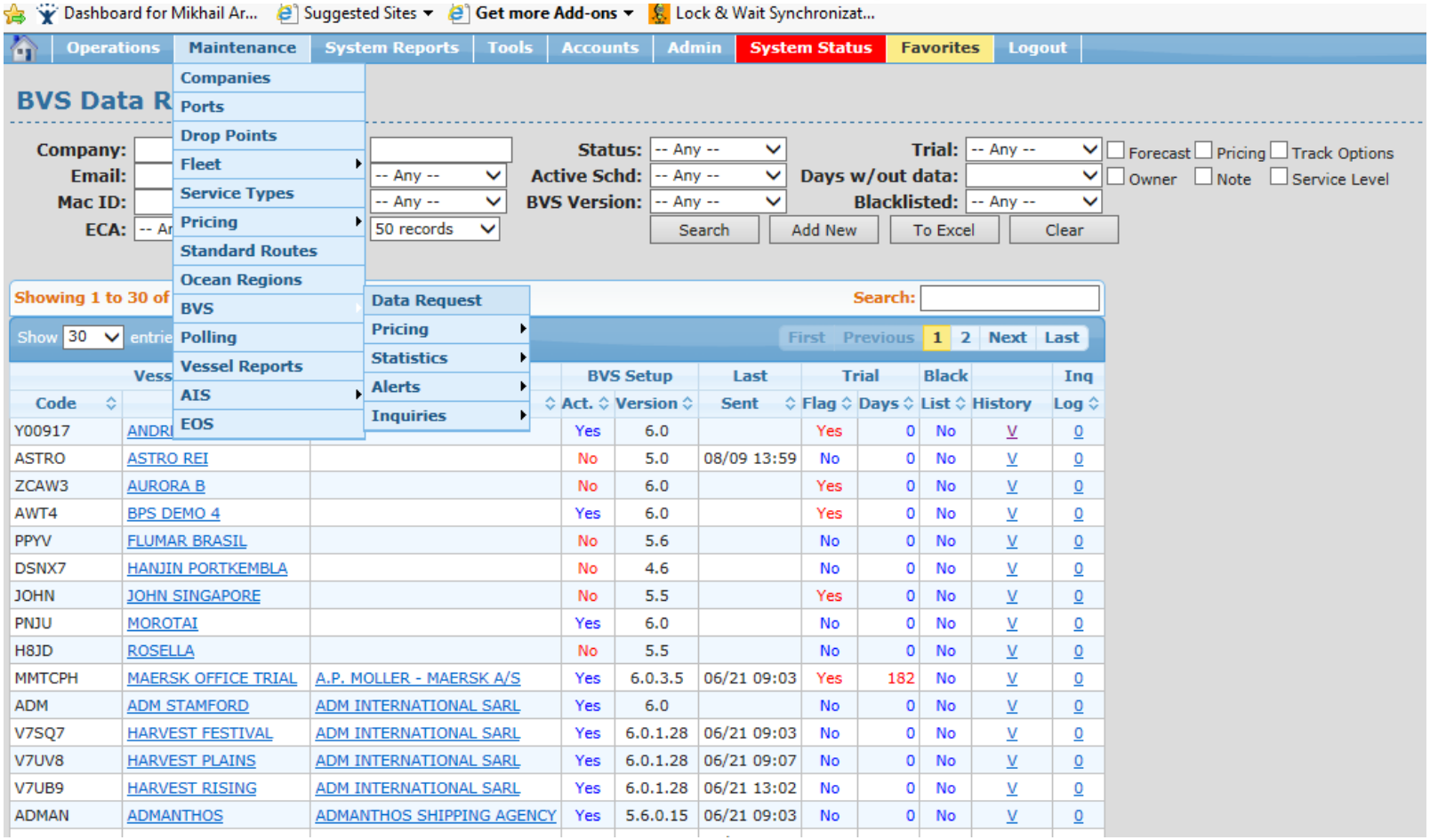
An example of Weather display



Another example



AROS Watches You



AROS Watches You

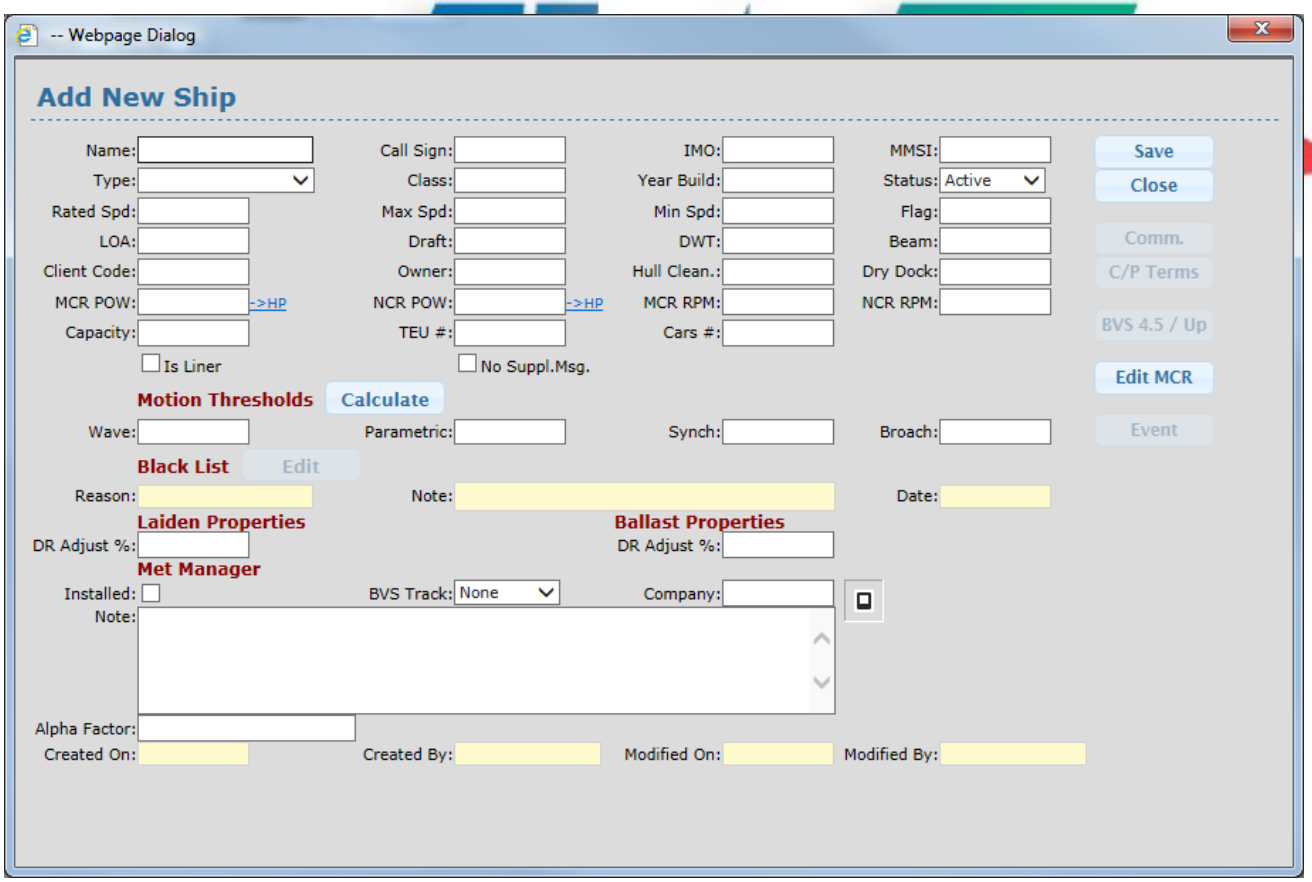
From: 2013/05/22 * To: 2013/06/21 * View Print

History

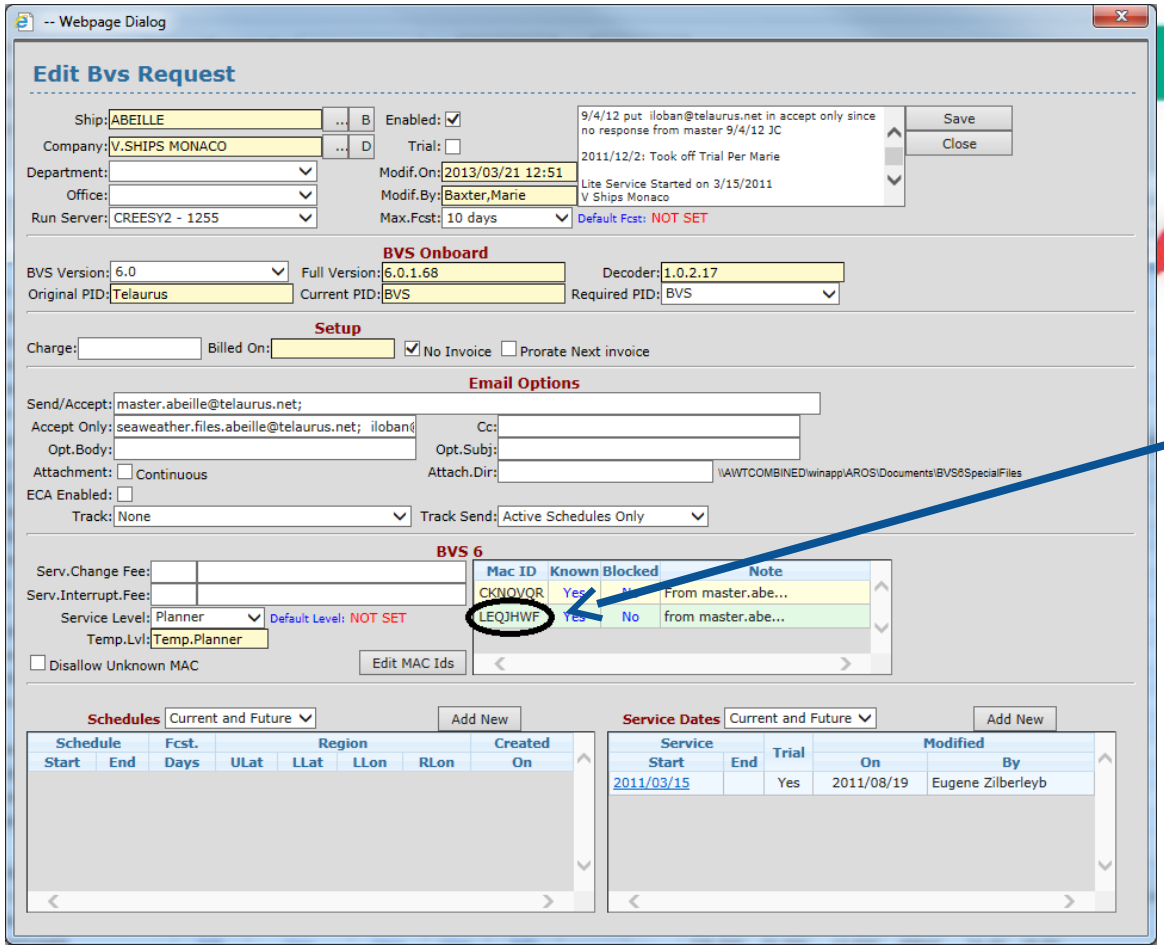
BVS Data Delivery history for AETHOUSTON (2013/05/22 - 2013/06/21)

Date/Time (UTC)	Size (KB)	Trial	Fcst	Interval	Upper Lat	Lower Lat	Left Lon	Right Lon	Trop.	Marine Bull.	Press.	Front	Hght 500mb	Wind	Swell	Wave	Ice	SST	Image	Port	Gulf-Sream	Kuro-shio	Move-ment	NCOM	Visibility	Highs/ Lows	Wx. Type	Vsl. Icing	Ice Density	Clouds	Tem-perature	Nested Grid	Service Level
2013/06/21 09:05	923.5	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/20 09:05	935.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/19 09:05	933.7	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/18 09:05	937.1	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/17 09:05	930.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/16 09:05	929.3	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/15 09:05	931.5	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/14 09:05	927.9	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/13 09:05	918.6	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/12 09:05	907.9	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/11 09:05	910.0	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/10 09:05	904.5	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/09 09:05	902.6	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/08 09:05	911.5	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/07 09:05	913.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/06 09:05	913.7	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/05 09:05	922.5	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/04 09:05	925.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/03 09:05	922.9	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/02 09:05	934.1	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/06/01 09:05	934.3	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/31 09:05	933.0	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/30 09:05	936.3	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/29 09:05	943.8	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/28 09:05	943.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/27 09:05	946.2	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/26 09:05	942.3	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/25 09:05	936.9	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/24 09:05	930.7	No	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/23 09:05	932.8	Yes	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner
2013/05/22 09:05	927.8	Yes	10	H12	60.00	-60.00	50.00	50.00	1	0	1	1	1	1	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	1	1	1	Ultra Planner

Adding new ship to DB



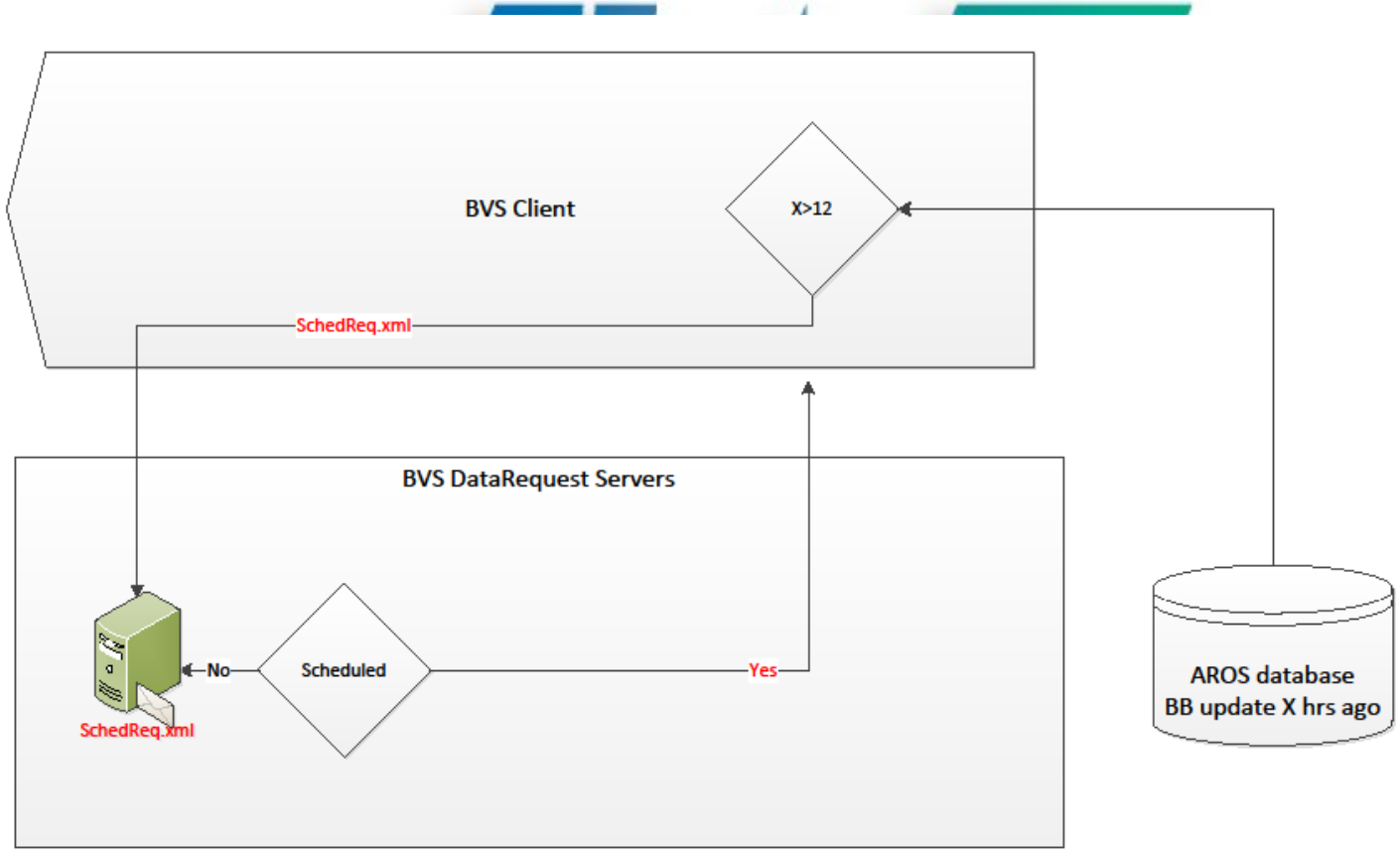
Adding new ship to DB



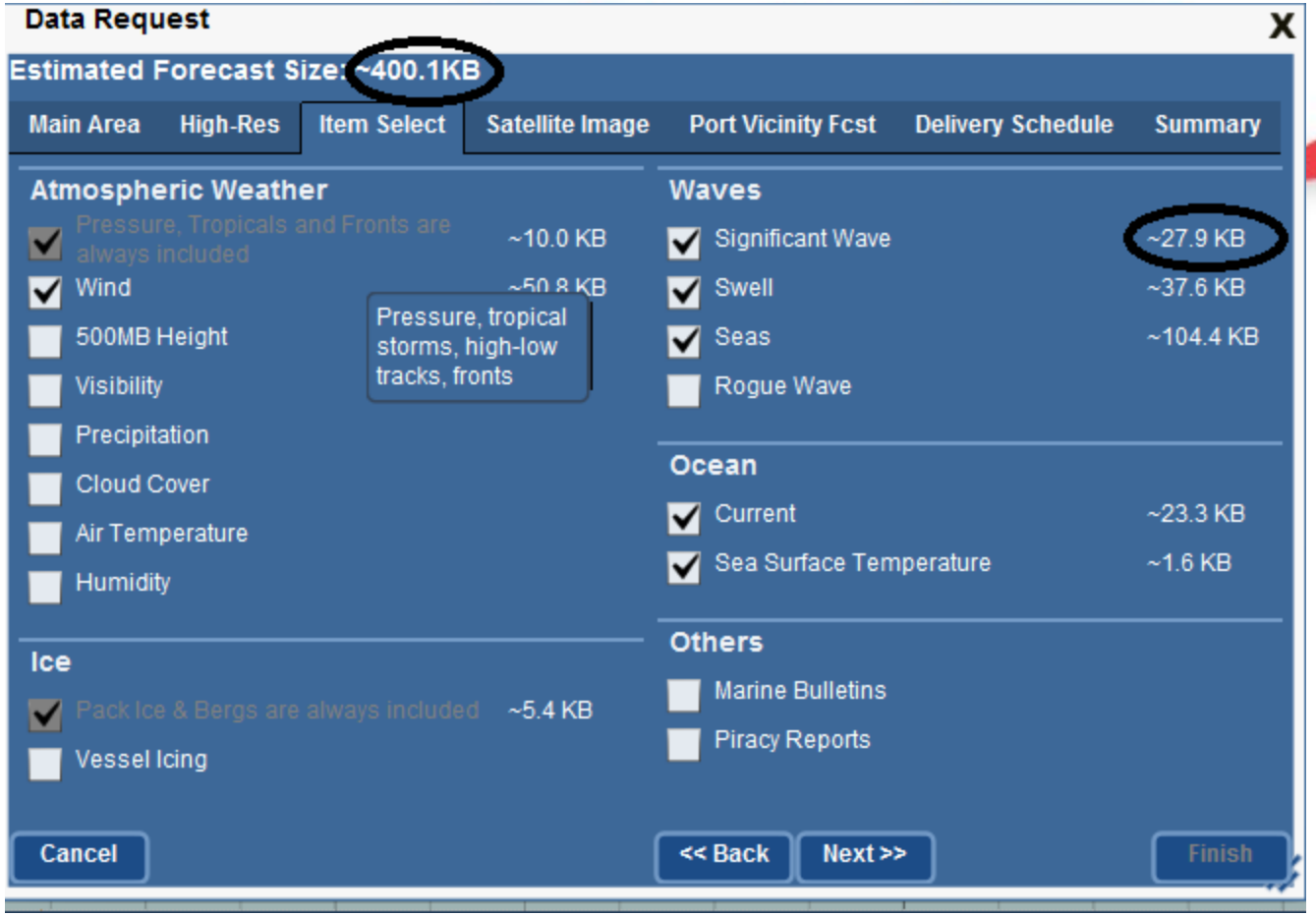
Email Delivery vs. Broadband

- Email Delivery
  - Should open email account
  - Sends an email with new data after, also by email
- Internet
  - No action required to send data request
  - Just need to set Data Request and turn on the system
  - The data is periodically updated over HTTP
- Scheduled Email Delivery
  - Sends data at specified times

Scheduled update as “a broadband plan B” - backup option



Cost of the email data



In order to reduce the file size

Wavelet compression [edit]

Wavelet compression is a form of data compression well suited for image compression (sometimes also video compression and audio compression). Notable implementations are JPEG 2000, DjVu and ECW for still images, REDCODE, CineForm, the BBC's Dirac, and Ogg Tarkin for video. The goal is to store image data in as little space as possible in a file. Wavelet compression can be either lossless or lossy.[1]

Using a wavelet transform, the wavelet compression methods are adequate for representing transients, such as percussion sounds in audio, or high-frequency components in two-dimensional images, for example an image of stars on a night sky. This means that the transient elements of a data signal can be represented by a smaller amount of information than would be the case if some other transform, such as the more widespread discrete cosine transform, had been used.

Wavelet compression is not good for all kinds of data: transient signal characteristics mean good wavelet compression, while smooth, periodic signals are better compressed by other methods, particularly traditional harmonic compression (frequency domain, as by Fourier transforms and related).

See Diary Of An x264 Developer: The problems with wavelets (2010) for discussion of practical issues of current methods using wavelets for video compression.

Method [edit]

First a wavelet transform is applied. This produces as many coefficients as there are pixels in the image (i.e., there is no compression yet since it is only a transform). These coefficients can then be compressed more easily because the information is statistically concentrated in just a few coefficients. This principle is called transform coding. After that, the coefficients are quantized and the quantized values are entropy encoded and/or run length encoded.

A few 1D and 2D applications of wavelet compression use a technique called "wavelet footprints".[2][3]

Comparison with wavelet transformation, Fourier transformation and time-frequency analysis [edit]

Transformation	Representation	Output
Fourier transform	$f(\xi) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \xi}\,dx$	ξ, frequency
Time-frequency analysis	$X(t, f)$	t, time; f, frequency
Wavelet transform	$X(a, b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} \overline{\Psi\left(\frac{t-b}{a}\right)} x(t)\,dt$	a, scaling; b, time

Conclusions and “liⱯe demo”

- Weather data for specified region(s) and date(s) has to be prepared.
- Additional data feeds (such as piracy and marine bulletins) have to be integrated.
- Broadband server has can handle many simultaneous requests.
- Failover, logs and security.