



Advances in Hydrographic Data Processing



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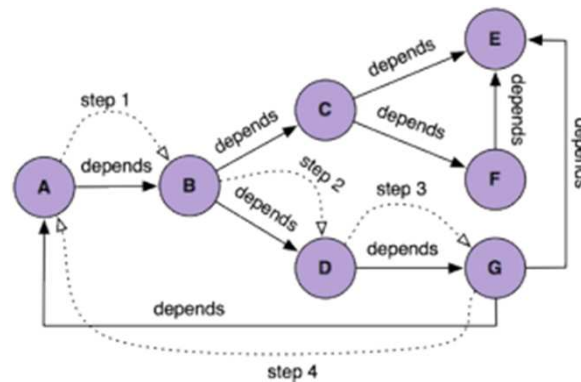
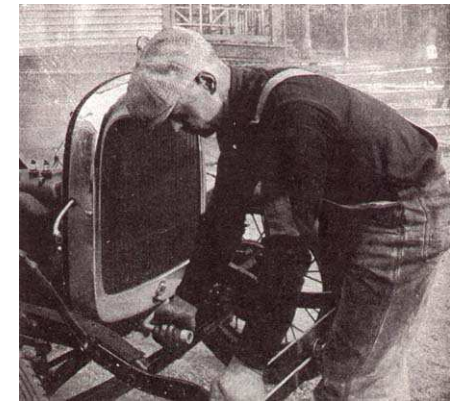
2016-06-22

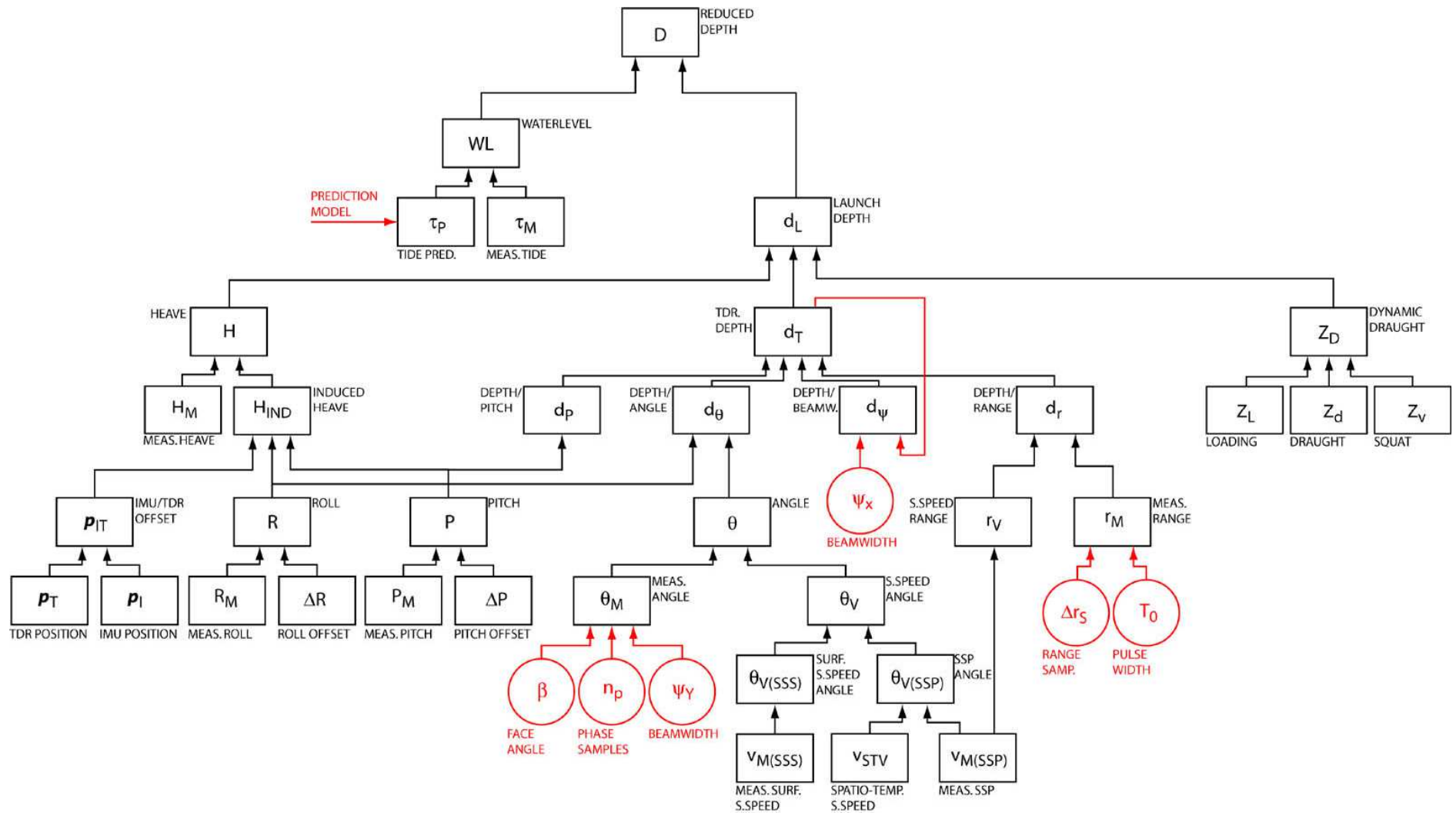


Hydrographic Processing Can Be Hard

- It's true. Even for experienced users.
- Mistakes happen. Safeguards catch them. Mistakes are fixed, sometimes at great cost.
- But it happens again, project after project

Many of the frustrations are due to the fact that the human operator must connect all the pieces together to come up with the final processing solution



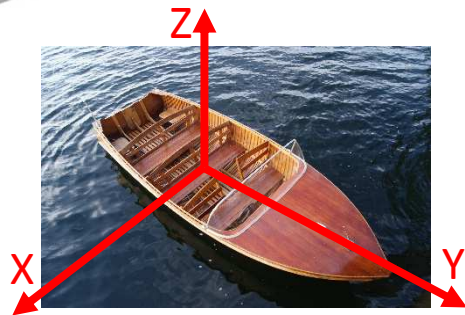


Slide courtesy of Dr. Brian Calder (UNH)

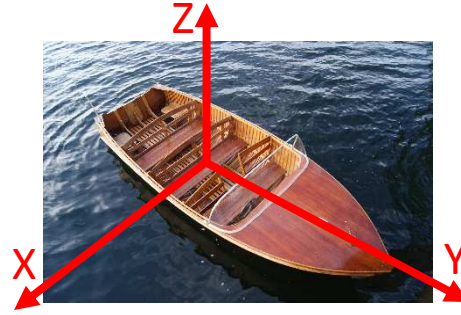


Sources of Human Error

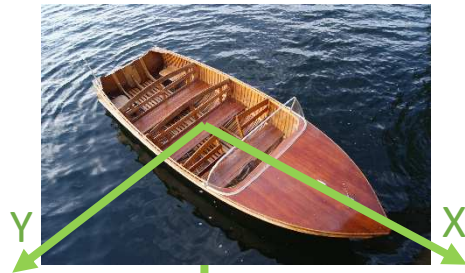
Typos when transcribing vessel configurations from one software application to another or from one coordinate frame convention to another



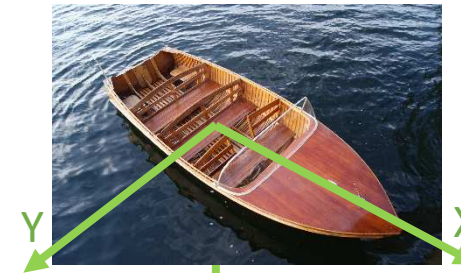
QINSy & Qimera



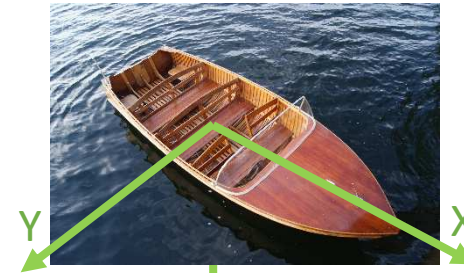
Reson (.s7k, PDS2000)



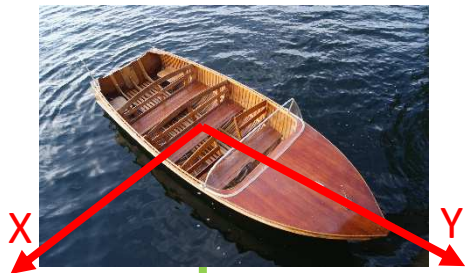
GSF (.gsf) ↓Z



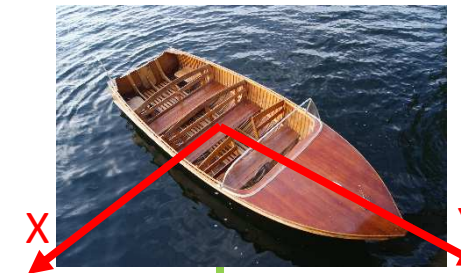
Kongsberg ↓Z (.all)



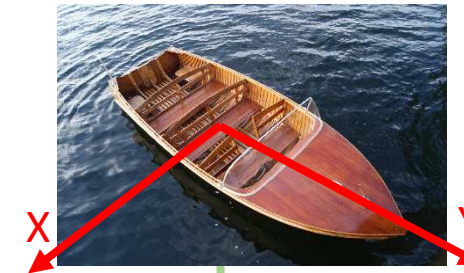
Applanix ↓Z (.000 and SBET)



Hypack ↓Z (.hsx)



XTF (.xtf) ↓Z



Caris (HIPS) ↓Z



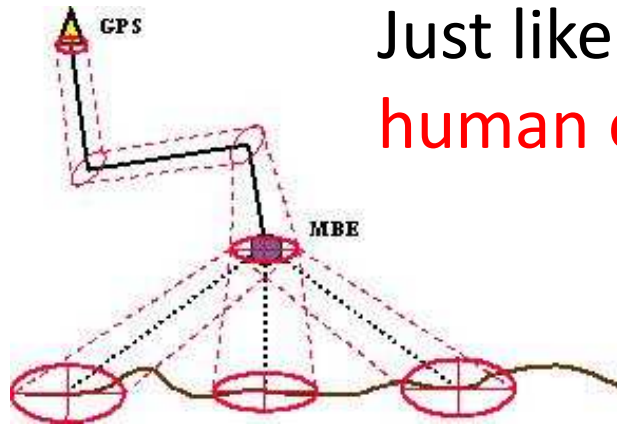
Sources of Human Error

- Importing ancillary data and then failing to apply it to the correct data files
- Changing processing configurations and not then triggering the appropriate reprocessing
- Not triggering the appropriate reprocessing for files that need it

Cruise #	Area:	Line #	Moved to USB Drive	Conv't'd to HDCS	Tide Applied (zero tide)	SVC	Compute TPE	Merge	Added to Surface	WCD Transfer	Remarks & Additional Notes
		2420	X	X	X	X	X	X	X	X	
		2421	X	X	X	X	X	X	X	X	
		2422	X	X	X	X	X	X	X	X	
		2423	X	X	X	X	X	X	X	X	
		2424	X	X	X	X	X	X	X	X	
		2425	X	X	X	X	X	X	X	X	
		2426	X	X	X	X	X	X	X	X	
		2428	X	X	X	X	X	X	X	X	
		2429	X	X	X	X	X	X	X	X	



What's the Cost?



Just like total propagated uncertainty (TPU), **human error** can compound with each mistake

Potential Outcome #1

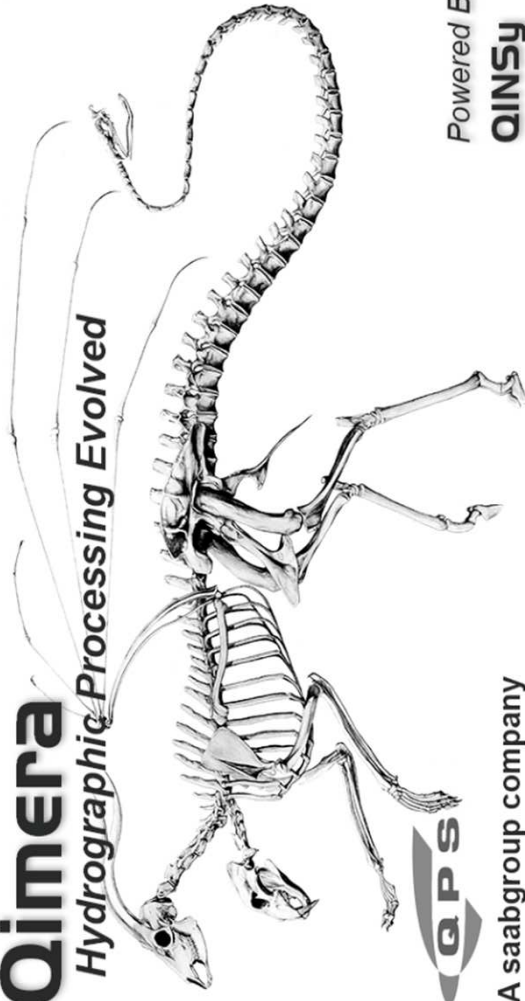
You may have great measurements but your output deliverables may not reflect that.

Potential Outcome #2

You may have a great result, but it took a long time, a lot of people or a lot of \$\$\$ to get to it



Qimera
Hydrographic Processing Evolved



GPS
A saabgroup company

Powered By
QINSy



SAAB
Defence and Security



Qimera?

The Chimera was, according to Greek mythology, a monstrous fire-breathing hybrid creature of Lycia in Asia Minor, composed of the parts of more than one animal.

It is usually depicted as a lion, with the head of a goat arising from its back, and a tail that might end with a snake's head.

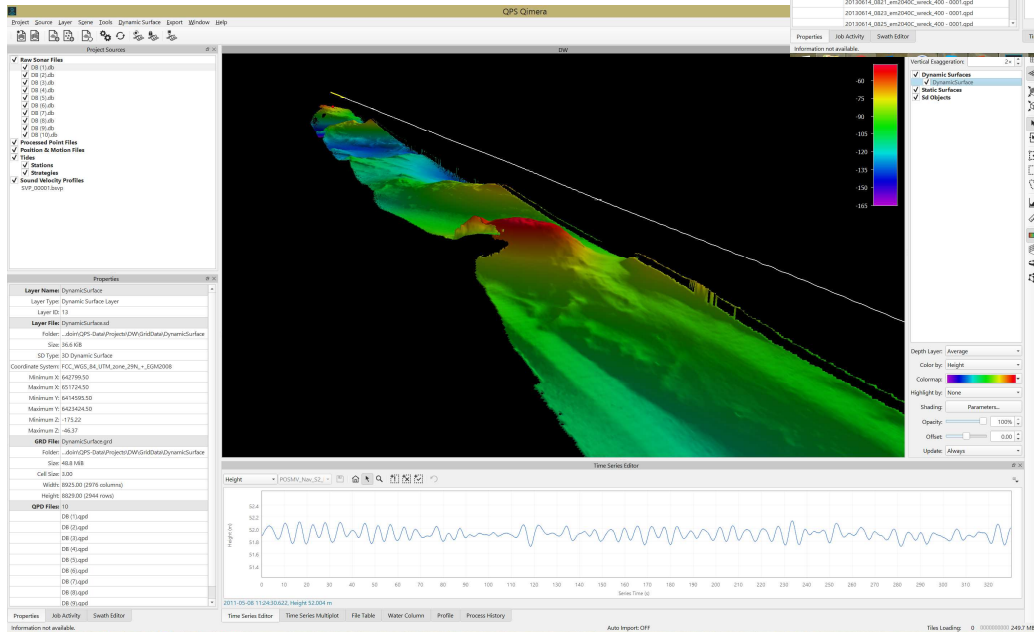
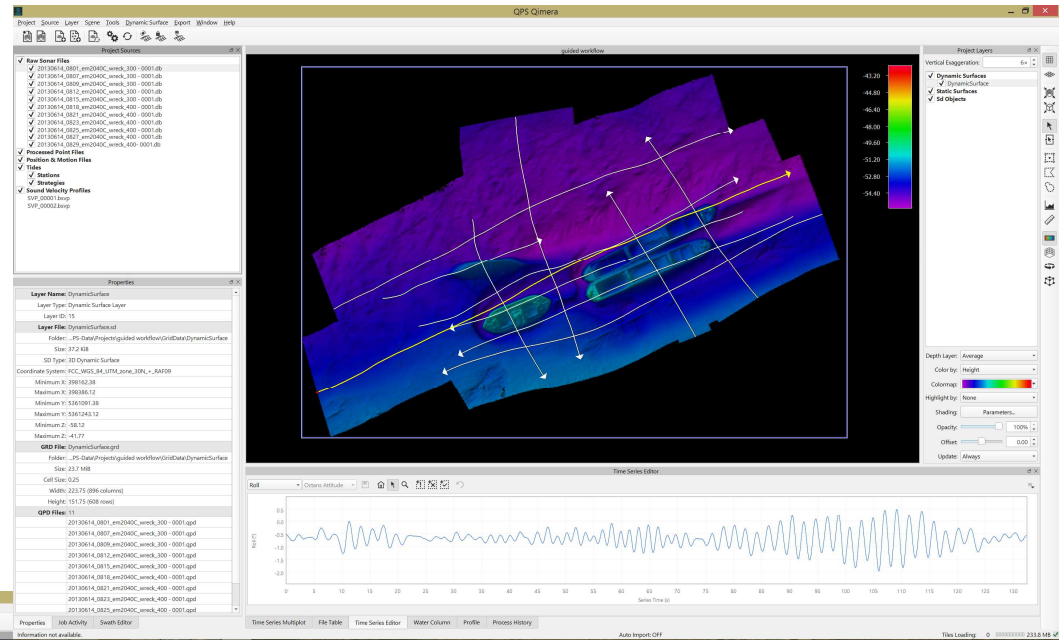
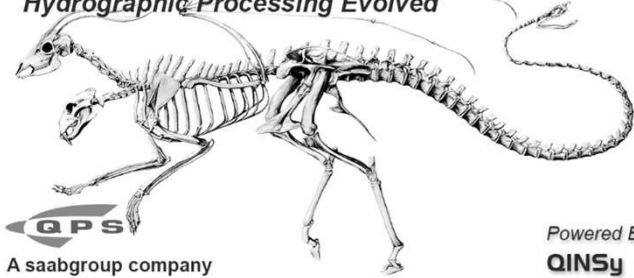
(Wikipedia)



- The Lion: QINSy Hydrographic Engine
- The Goat: Fledermaus 4D Visualization Engine
- The Snake: FMGT and FM Midwater Multi-Core Engine



Qimera
Hydrographic Processing Evolved



Performs complete hydrographic processing for most modern sonar formats: .db, .all, .s7k, .hsx, .jsf, .gsf

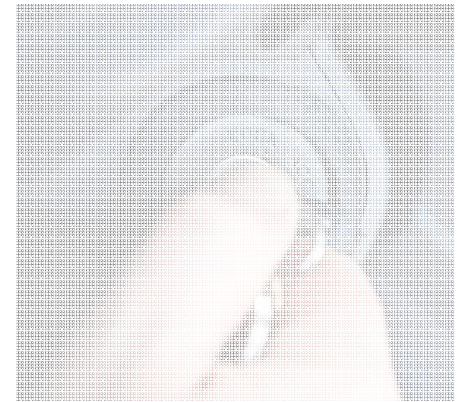
Many ancillary formats are supported: SBET, PosPac, most tide and SVP

Exports include GSF, FAU, BAG, Arc and other image formats



Qimera Innovations

- Automate the mundane and error prone tasks for which computers are well suited but humans are not, for example:
 - Transcription automation
 - Processing state management
- Isolates the stages for which a human brings value to the process, for example:
 - Data validation: knowing good data from bad
 - Processing configuration management: managing the “recipe”, not the process, to get the results you want
 - Troubleshooting: identifying causes of errors





Qimera Innovations

- Guided Workflow
 - Let non-expert users arrive at typical bathymetric deliverables with little training or expert knowledge
- Dynamic Workflow
 - Processing State Management: Codify and manage the relationships between observations and results
 - You don't need to remember **what** processing needs to be done, just that **some** processing must be done





Guided Workflow?





Demo #1: Guided Workflow

The screenshot displays the QPS Qimera software interface. A central dialog box titled "Welcome to Qimera" is open, offering the following options:

- New Project**: Represented by a grid icon.
- Recent Projects**:
 - SDB**: Modified: 2016-06-22 14:05
 - EM710**: Modified: 2016-06-22 14:02

Buttons at the bottom of the dialog include "Open Other...", "Open", and "Close".

The background interface includes a menu bar (Project, Source, Layer, Scene, Tools, Dynamic Surface, Export, Window, Help), a toolbar with various icons, and several panels: "Project Sources", "Surface Edit Overview", "Project Layers" (showing "Vertical Exaggeration: 5x"), and a "Slice Editor" at the bottom. A graph in the lower-left shows "Depth (m)" on the y-axis (0.0 to 1.0) and "Slice Across Track (m)" on the x-axis (0 to 1000).

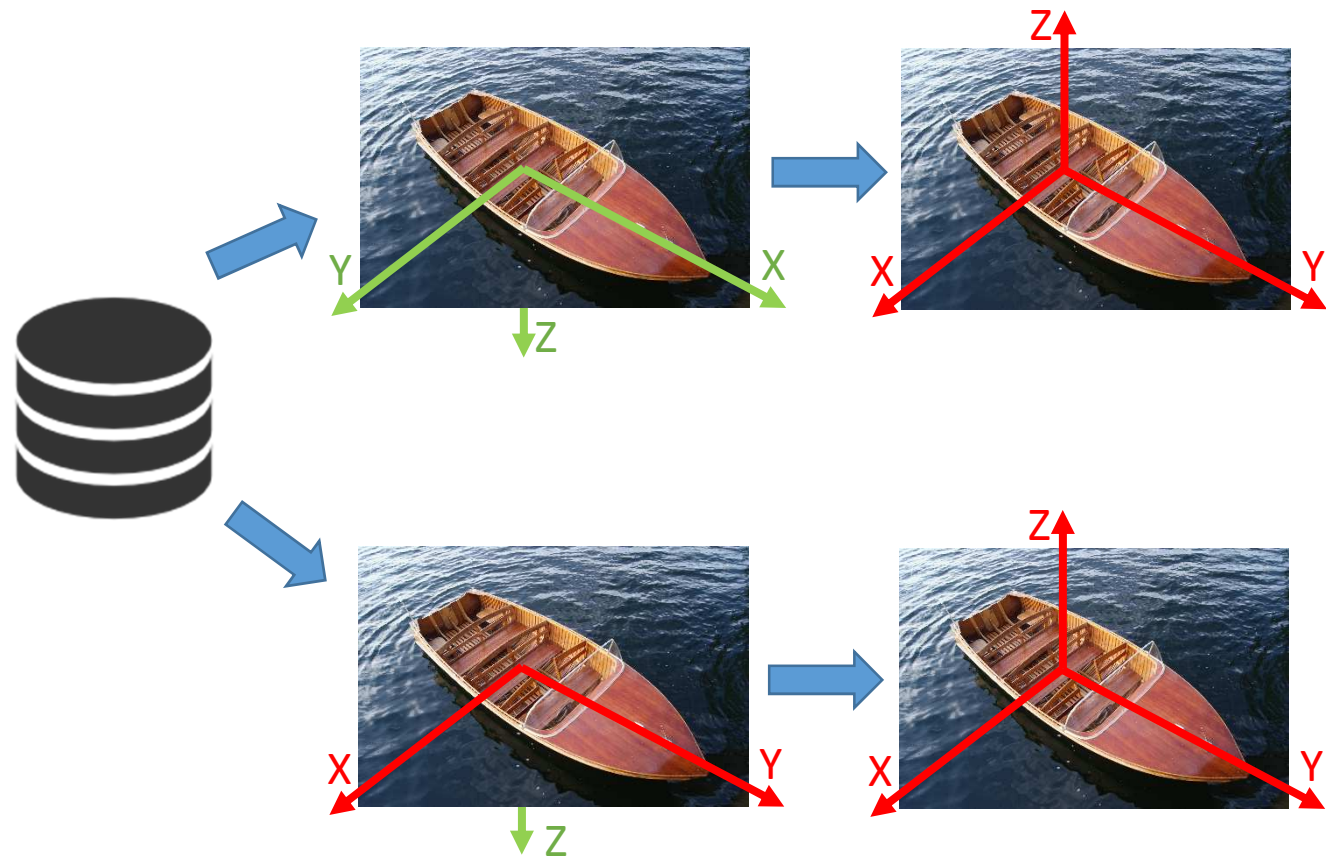


Transcription Automation

Most modern formats can contain:

- Vessel configuration
- SVP
- Tide
- Processing configuration (e.g. tide vs GPS height)

Qimera extracts all of this information and configures the appropriate processing configuration for you.



With well a correctly configured acquisition system, post-processing is very simple. You can get straight to work doing validation.



Demo #2: Automating Transcription

QPS Qimera

Project Source Layer Scene Tools Dynamic Surface Export Window Help

IHO Order 1 Surface's Files Inside Selection 2.50s

Project Sources

- Raw Sonar Files
 - 0000_20100421_090233_ShipName.all
 - 0001_20100421_120248_ShipName.all
 - 0002_20100421_123754_ShipName.all
- Processed Point Files
- Position & Motion Files
- Tides
 - Stations
 - Strategies

Job Activity

ID	Name	Progress	Core Progress

Info: Coordinate system has changed to: FP_WGS_84_UT
Warning: SVP position of observation unknown: 0001_20100421_120248_ShipName.qpd
Warning: SVP position of observation unknown: 0002_20100421_123754_ShipName.qpd

Time	Event	Progress
14:11:41	End	Extract Information 00:0
14:11:41	Start	Convert To QPD3 lines
14:11:43	Success	0000_20100421_090233_ShipName.qpd
14:11:43	Success	0001_20100421_120248_ShipName.qpd
14:11:43	Success	0002_20100421_123754_ShipName.qpd
14:11:43	End	Convert To QPD00:00:01.704
14:11:43	Start	Index Watercolumn 3 lir
14:11:43	End	Index Watercolumn 00:0
14:11:55	Start	Create Dynamic Surface 3 lir
14:11:56	Info:	Updating Surface Values
14:11:56	Info:	Illuminating Surface
14:11:56	Success	DynamicSurface.sd
14:11:56	End	Create Dynamic Surface 00:0

00:00:00 00:00:03

Surface Edit Overvi... Job Activ... Propert... Swath Edi...

Qimera

Project Layers

Vertical Exaggeration: 5x

- Dynamic Surfaces
 - DynamicSurface
- Static Surfaces
- Sd Objects

Slice Editor

Depth (m)

Slice Across Track (m)

Auto Edit

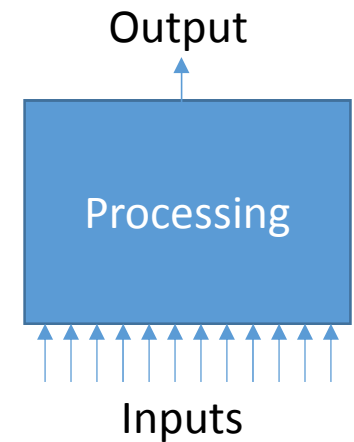
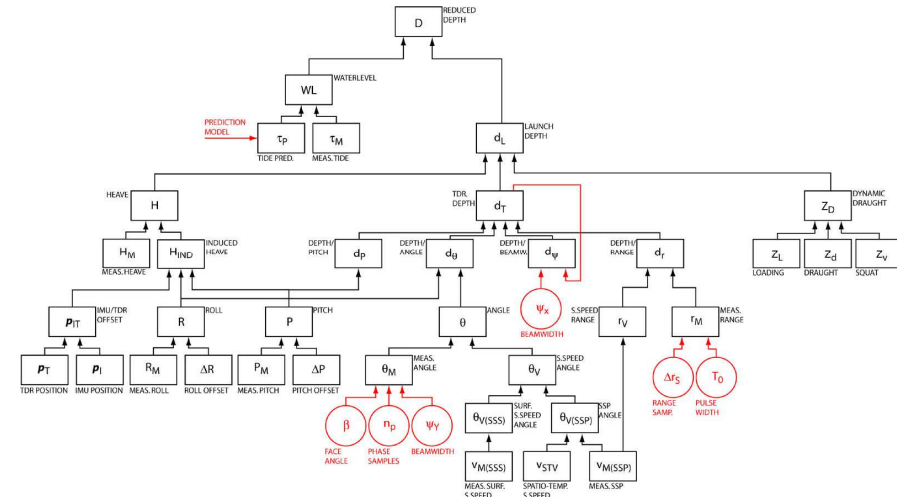
Slice Editor Time Series Editor Time Series Multiplot Water Column Process History

Information not available. Auto Import: OFF Tiles Loading: 0 0000000000 617.4 MB



Processing State Management

- Coupling of Action and Effect: This should be an atomic and indivisible task
- You cannot make changes without updating output (you can delay the update, but we make sure you don't forget)





Demo #3: Processing State Management

QPS Qimera

Project Source Layer Scene Tools Dynamic Surface Export Window Help

IHO Order 1 Surface's Files Inside Selection 2.50s

EM2040C-Brest Wrecks - Online

Project Sources

- Raw Sonar Files
 - 20130614_0801_em2040C_wreck_300 - 0001.db
 - 20130614_0807_em2040C_wreck_300 - 0001.db
 - 20130614_0809_em2040C_wreck_300 - 0001.db
 - 20130614_0812_em2040C_wreck_300 - 0001.db
 - 20130614_0815_em2040C_wreck_300 - 0001.db
 - 20130614_0818_em2040C_wreck_400 - 0001.db
 - 20130614_0821_em2040C_wreck_400 - 0001.db
 - 20130614_0823_em2040C_wreck_400 - 0001.db
 - 20130614_0825_em2040C_wreck_400 - 0001.db
 - 20130614_0827_em2040C_wreck_400 - 0001.db
 - 20130614_0829_em2040C_wreck_400 - 0001.db
- Processed Point Files
- Position & Motion Files
- Tides
 - Stations
 - Strategies
- Sound Velocity Profiles
 - SVP_00001.bsvp

Job Activity

ID	Name	Progress	Core Progress
14:23:53	Start	Rescan Metadata	11 lines
14:23:53	End	Rescan Metadata	00:00:00.10
14:34:08	Start	Extract Information	1 line
14:34:08	End	Extract Information	00:00:00.20

00:00:00 00:00:00

Project Layers

Vertical Exaggeration: 2x

- Dynamic Surfaces
 - DynamicSurface
- Static Surfaces
- Sd Objects
 - surface_object

Depth Layer: Shallow

Color by: Height

Colormap: [Color Scale]

Highlight by:

Rendering: Shaded Surface

Shading: Parameters...

Opacity: 100%

Offset: 0.00

Update: Always

Time Series Editor

Octans Attitude

2013-06-14 08:08:17.268, Roll -0.695°

Auto Import: OFF

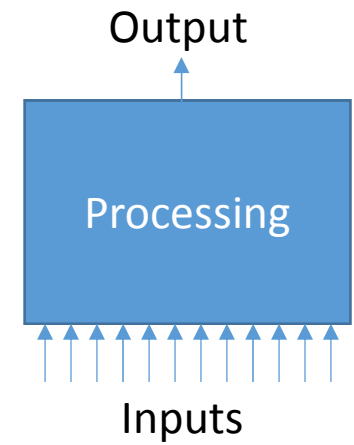
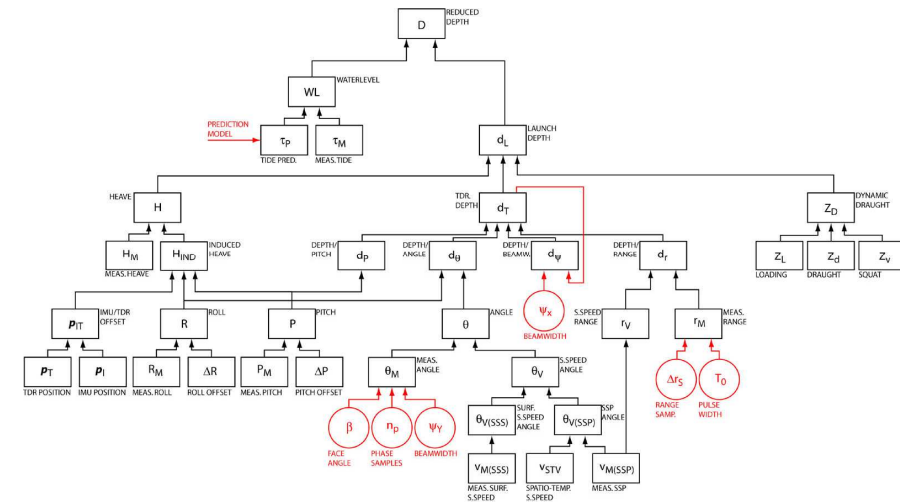
Tiles Loading: 0 0000000000 647.9 MB

SAAB Defence and Security



Dynamic Workflow

- “Live” processing state management
- It is easy to make processing configuration adjustments or to perform data validation and to immediately assess the impacts of changes
- Near immediate feedback shortens time between cause and effect
- This promotes causal reasoning, a key ingredient for natural human learning processes
- It allows users to train themselves





Demo #4: Dynamic Workflow

QPS Qimera

Project Source Layer Scene Tools Dynamic Surface Export Window Help

IHO Order 1 Surface's Files Inside Selection 2.50s

EM2040C-Brest Wrecks - Online

Project Sources

- Raw Sonar Files
 - 20130614_0801_em2040C_wreck_300 - 0001.db
 - 20130614_0807_em2040C_wreck_300 - 0001.db
 - 20130614_0809_em2040C_wreck_300 - 0001.db
 - 20130614_0812_em2040C_wreck_300 - 0001.db
 - 20130614_0815_em2040C_wreck_300 - 0001.db
 - 20130614_0818_em2040C_wreck_400 - 0001.db
 - 20130614_0821_em2040C_wreck_400 - 0001.db
 - 20130614_0823_em2040C_wreck_400 - 0001.db
 - 20130614_0825_em2040C_wreck_400 - 0001.db
 - 20130614_0827_em2040C_wreck_400 - 0001.db
 - 20130614_0829_em2040C_wreck_400 - 0001.db
- Processed Point Files
- Position & Motion Files
- Tides
 - Stations
 - Brest
 - Brest Tide data 2013.csv
 - Strategies
- Sound Velocity Profiles
 - SVP_00001.bsvp

Project Layers

- Dynamic Surfaces
 - DynamicSurface
- Static Surfaces
- Sd Objects
 - surface_object

Vertical Exaggeration: 2x

Surface Edit Overview

Slice Editor

Auto Edit

Depth (m)

Slice Across Track (m)

Surface Edit Overview Job Activity Properties

Selection: 34.5m x 1.3m Soundings: 23496

Slice Editor Time Series Editor Time Series Multiplot Water Column Process History

Auto Import: OFF

Tiles Loading: 0 000000000 732.7 MB

The screenshot displays the QPS Qimera software interface. At the top, there is a menu bar with options like Project, Source, Layer, Scene, Tools, Dynamic Surface, Export, Window, and Help. Below the menu is a toolbar with various icons for navigation and editing. The main window is titled 'EM2040C-Brest Wrecks - Online' and shows a 3D bathymetric map of a wreck site. The map is color-coded by depth, with shallower areas in yellow and orange, and deeper areas in green and blue. A yellow line indicates the track of the sonar system. A blue and white line represents the wreck site. On the left, there is a 'Project Sources' panel with a tree view showing various data files. On the right, there is a 'Project Layers' panel with checkboxes for 'Dynamic Surfaces', 'Static Surfaces', and 'Sd Objects'. Below the main map, there is a 'Surface Edit Overview' panel with a small 3D view of the map. At the bottom, there is a 'Slice Editor' panel with a graph showing 'Depth (m)' on the y-axis (ranging from 5.5 to 7.5) and 'Slice Across Track (m)' on the x-axis (ranging from -17 to 17). The graph shows a depth profile with a significant depression in the center. At the very bottom, there is a status bar with information about the selection (34.5m x 1.3m, 23496 soundings), auto import settings, and tile loading progress.



Bringing Post-Processing to a Real-Time Environment

- If much of post-processing can be automated, there is benefit to it being done in near real-time, or “just-in-time”
- Qimera Live gives you a 2nd opinion on your data quality during acquisition
- You can get to work on validation if you want
- Why wait to get to the office to be surprised by a misconfiguration of your acquisition system?



Demo #5: Qimera Live

The screenshot displays the Qimera Live software interface. The main window shows a 3D visualization of a sonar scan of a wreck, with a blue background and a grid overlay. The wreck is rendered in green and yellow, indicating depth variations. A red line traces the path of the scan. The interface includes a menu bar (Project, Source, Layer, Scene, Tools, Dynamic Surface, Export, Window, Help), a toolbar with various icons, and a status bar at the bottom.

Project Sources:

- Raw Sonar Files
 - 20130614_0801_em2040C_wreck_300 - 0001...
- Processed Point Files
- Position & Motion Files
- Tides
 - Stations
 - Strategies
- Sound Velocity Profiles
 - SVP_00001.bsvp

Project Layers:

- Dynamic Surfaces
 - DynamicSurface
- Static Surfaces
- Sd Objects

Job Activity:

ID	Name	Progress	Core I
14:45:08	Start		Index Watercolumn
14:45:08	End		Index Watercolumn
14:45:13	Start		Create Dynamic Sur
Info:	Updating Surface Values		
Info:	Illuminating Surface		
Success	DynamicSurface.sd		
14:45:14	End		Create Dynamic Sur

Depth Profile Graph:

The graph shows Depth (m) on the y-axis (ranging from 5.5 to 7.5) and Slice Across Track (m) on the x-axis (ranging from -17 to 17). The data points are plotted as a series of connected lines, showing a deep, narrow channel.

Bottom Bar:

Surface Edit Overview | Job Activ... | Properties | Slice Editor | Time Series Editor | Time Series Multiplot | Water Column | Process History

Information not available. Auto Import: OFF Tiles Loading: 0 000000000 740.6 MB



Dynamic Workflow for Validation



For data validation to be effective, you need immediate feedback on what you're doing. Dynamic Workflow connects validation to grids and lets you validate with confidence.



Demo #6: Dynamic Workflow for Validation

The screenshot displays the QPS Qimera software interface. The main window shows a 3D bathymetry plot titled "Online_to_Offline_Rapidly". The plot is color-coded by depth, with blue representing deeper areas and green/yellow representing shallower areas. The plot is viewed from an oblique perspective.

On the left side, there are two panels: "Project Sources" and "Job Activity".

Project Sources:

- Raw Sonar Files:
 - 0009 - as.db
 - 0010 - as (20).db
 - 0011 - as (40).db
- Processed Point Files:
 - 0001 - as (-170).qpd
 - 0002 - as (-150).qpd
 - 0003 - as (-130).qpd
 - 0004 - as (-110).qpd
 - 0005 - as (-90).qpd
 - 0006 - as (-70).qpd
 - 0007 - as (-50).qpd
 - 0008 - as (-30).qpd
 - 0012 - as (60).qpd
 - 0013 - as (80).qpd
 - 0014 - as (100).qpd
 - 0015 - as (100).qpd
 - 0016 - as (120).qpd
 - 0017 - as (140).qpd
 - 0018 - as (160).qpd

Job Activity:

ID	Name	Progress	Core Progres
08:12:15	Start		Rescan Metadata
08:12:15	End		Rescan Metadata
08:12:15	Start		Trackline from File
08:12:15	End		Trackline from File

Below the Job Activity table, there are two time indicators: "00:00:00" and "00:00:00".

At the bottom of the interface, there are several tabs: "Surface Edit Over...", "Job Ac...", "Prop...", "Swath E...", "Slice Editor", "Time Series Editor", "Time Series Multiplot", "Water Column", and "Process History". The "Slice Editor" tab is currently active.

The "Slice Editor" window shows a graph with "Depth (m)" on the y-axis (ranging from -0.1 to 1.1) and "Slice Across Track (m)" on the x-axis (ranging from 0 to 1000). The graph area is currently empty.

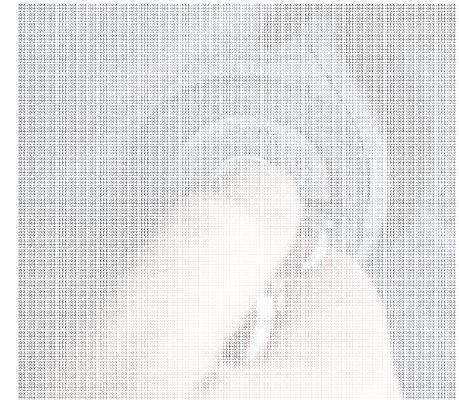
The status bar at the bottom of the window displays: "Geo Coords (x,y,z) -> (71115.7 441272.1 -15.77) (lat,lon) -> (51°57'16.24"N, 4°10'01.79"E) Auto Import: OFF Tiles Loading: 0 ██████████ 837.0 MB

At the bottom right corner, there is a logo for "SAAB Defence and Security".



Summary

- Qimera provides an innovative user experience through several key design features:
 - Guided Workflow
 - Transcription Automation
 - Processing State Management
 - Dynamic Workflow for Processing
 - Real-Time QA
 - Dynamic Workflow for Validation
- Qimera Reduces
 - Human Error
 - QA burden
 - Knowledge barrier to entry
 - Training costs
- Qimera Improves
 - Processing Outcomes
 - Post-Processing Times
 - Data Validation Results





Questions?

Software Solutions for the Maritime Community



QINSy

hydrographic survey and positioning system



Qimera

hydrographic data processing



Fledermaus

visualisation and analysis



Qarto

ENC production



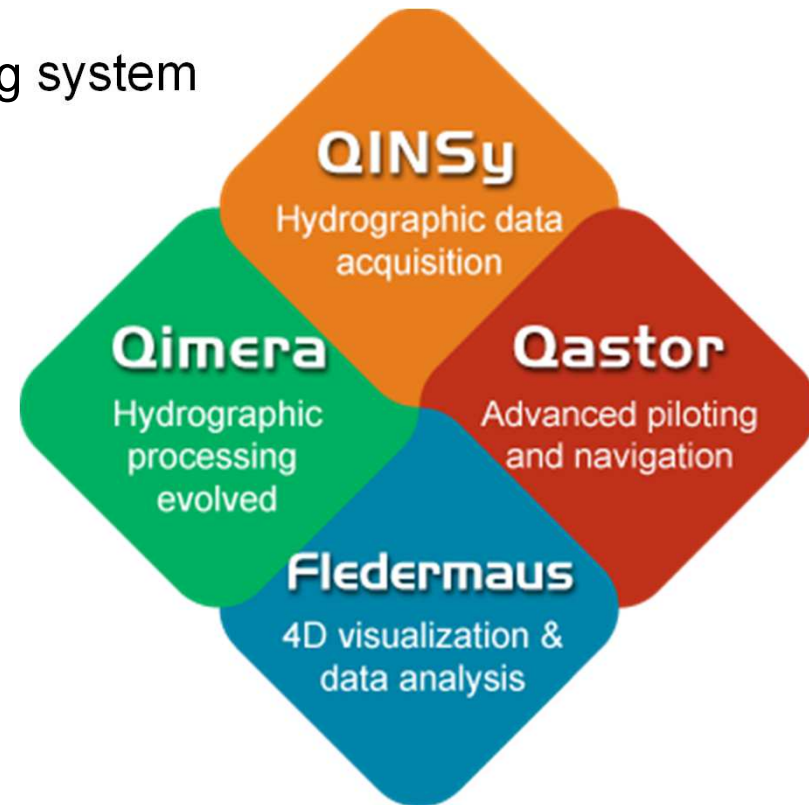
Qastor

navigation and docking system



Connect

maritime data distribution system



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