

# Future of Nautical Charting at NOAA

## Nautical Chart System II

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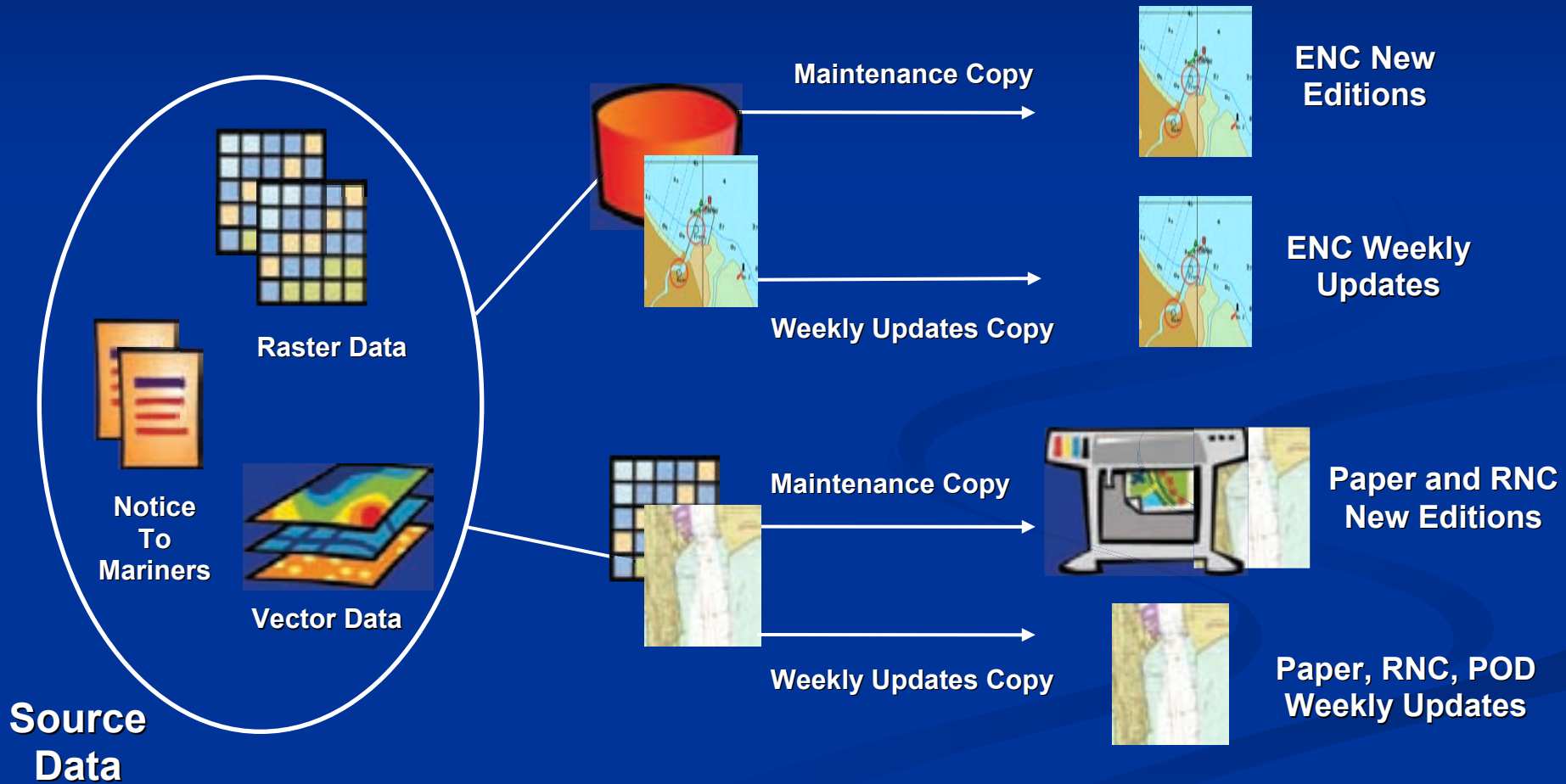
Marine Chart Division

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# Marine Chart Division (MCD)

- MCD resides in the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service, Office of Coast Survey
- Current system maintains two production lines
  - 1) Raster (+1,000)
    - Paper Charts
    - Raster Navigational Charts (RNC)
    - Print -on-Demand Charts (POD)
  - 2) Vector (+650)
    - Electronic Navigational Charts (ENC)
- Weekly Update Service

# Current Production System

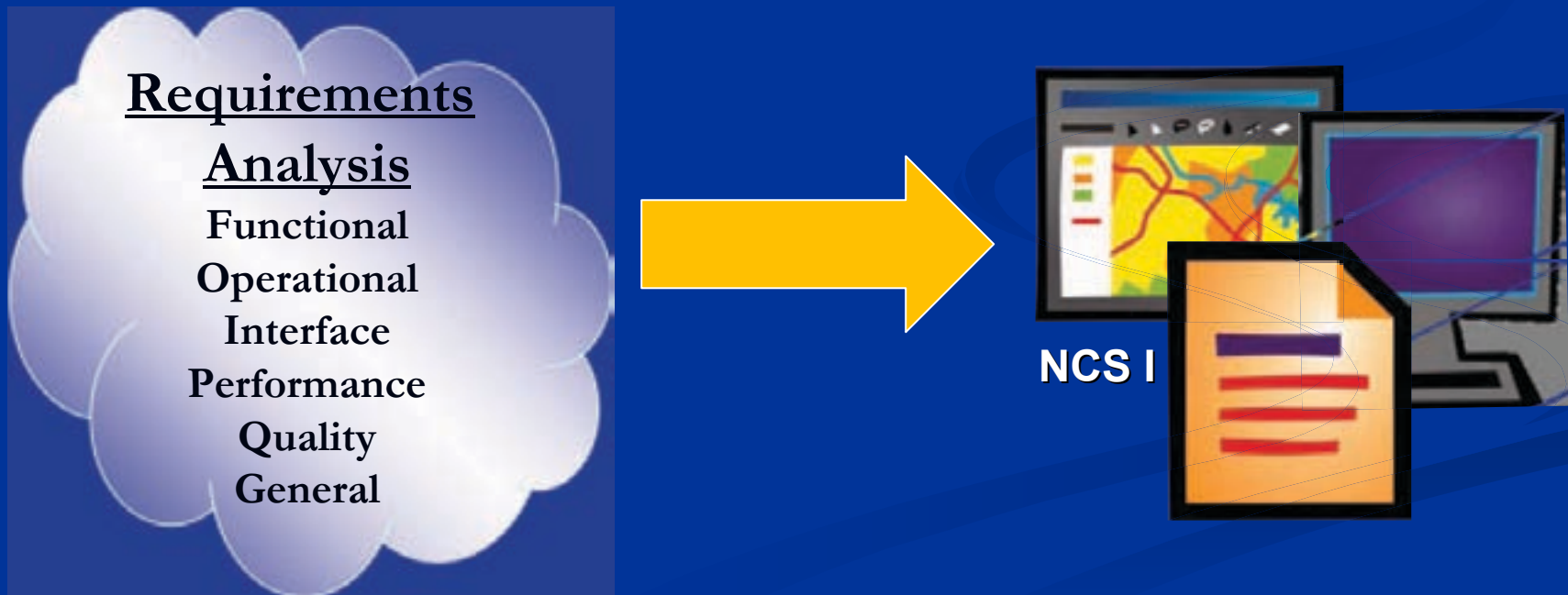


# McDonald Bradley, Inc. Contract

- Acquisition and integration of an end-to-end single production Commercial Off The Shelf (COTS) based solution
- Four phases of project
  - Requirements Analysis
  - Trade Study and System Test
  - System Integration
  - System Transition

# Phase 1: Requirements Analysis

- Examination of current system
- 443 system requirements were gathered
- Baseline for entire project

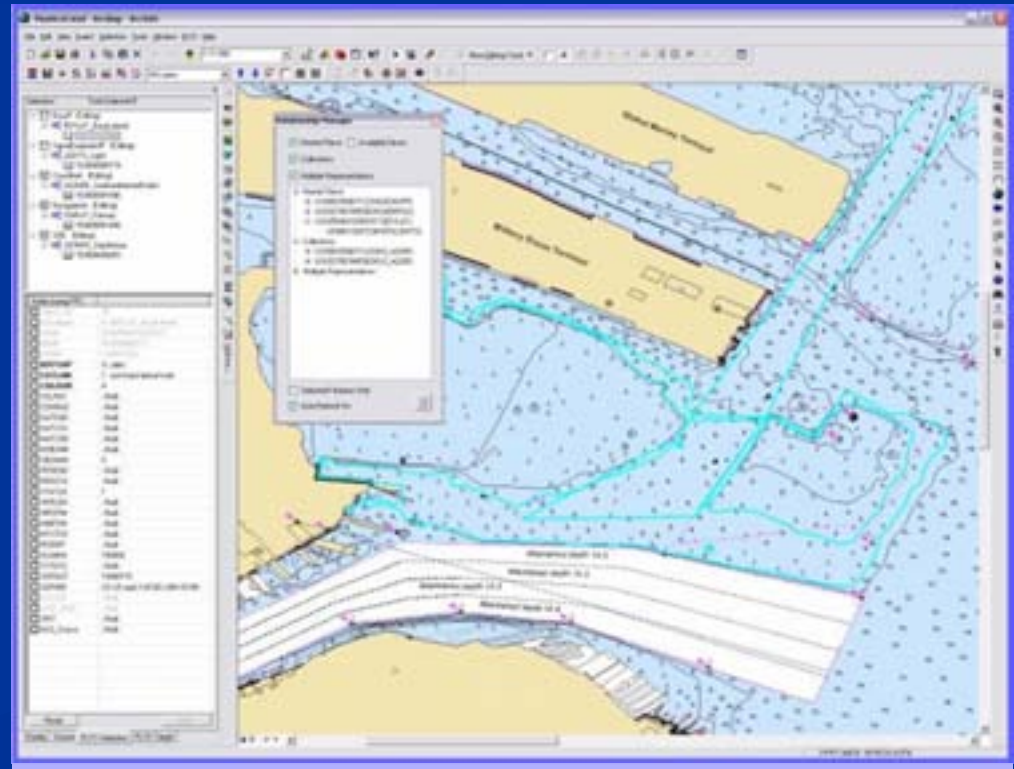


# Phase 2: Trade Study and System Test

- Invitations to vendors were issued
- Each vendor had a two week demonstration of their system
- Trade study revealed no COTS solution ready
- MBI selected the ESRI Nautical Solution

# ESRI Nautical Solution

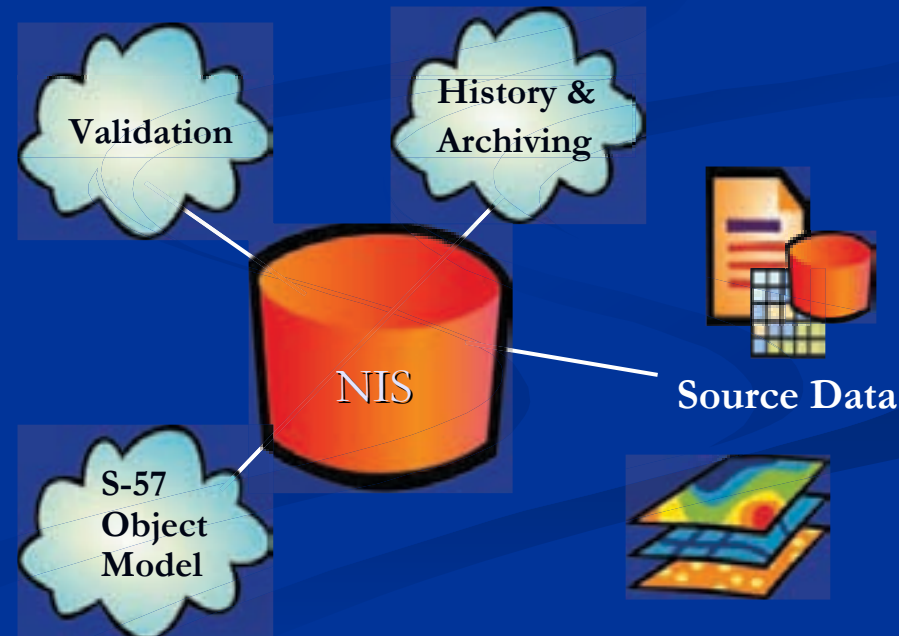
- Extension to ESRI ArcGIS software
- Includes an S-57 based data model
- Contains variety of specialized tools





# Nautical Information System (NIS)

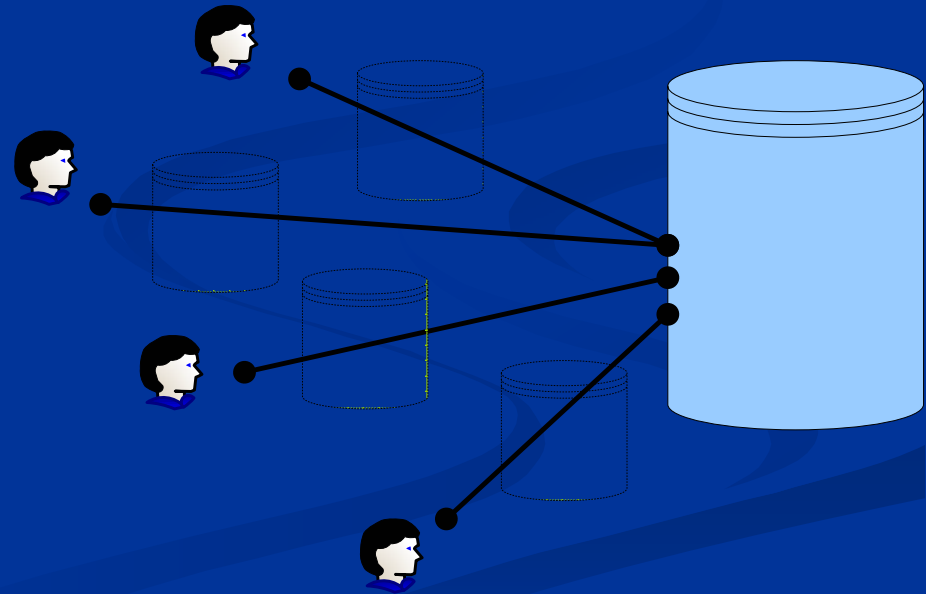
- Data centrally managed and edited in the NIS
- NOAA ENC's – initial data load into the NIS
- 22 scale bands – multiple representations of each feature
- Aids to navigation will exist one time
- Maintains spatial and non spatial data
- Product neutral





# Multi-User Editing

- NOAA's needs require multi-user editing environment
- Versioning allows multiple users editing same area, same time
- Each user works on an “Edit Version”
- Conflict resolution capability
- All changes posted to the NIS once they have been approved
- Provides versatility, efficiency, and productivity



# Quality Control

- Nautical Solution provides a quality control component
  - Automated attribute and spatial checks
  - Visual inspection
- Results of checks stored in a table
- Used both in the NIS and the products
- Will be integrated into the overall production workflow at NOAA

## Feature on Feature Checks

### Intersection on Geometry

#### Description

Finds features from one feature class that are within a specified tolerance of an intersection between two other features from either two feature classes or within the same feature class

#### Functionality from 9.1

Not Applicable

#### Comparison to Topology

Not Applicable

### Polyline/Polygon Sliver or Gaps

#### Description

Searches for slivers or gaps between polygons, between polylines, and between polygons and polylines

#### Functionality from 9.1

Not Applicable

#### Comparison to Topology

Polygon must not have gaps

### Geometry on Geometry

#### Description

Searches for features from two different feature classes or within the same feature class that spatially interact (e.g. intersect) or are within a tolerance of each other

#### Functionality from 9.1

- Duplicate Point
- Point on Poly
- Poly on Poly
- Validate simple Geometry

#### Comparison to Topology

Line—must not overlap, intersect, overlap with  
Polygon—must not overlap, contain point, overlap with

### Table to Feature Attribute

#### Description

Searches for features whose attributes match those of a table and/or comply with a user defined where clause comparing the attributes between the feature class and the table

#### Functionality from 9.1

Not Applicable

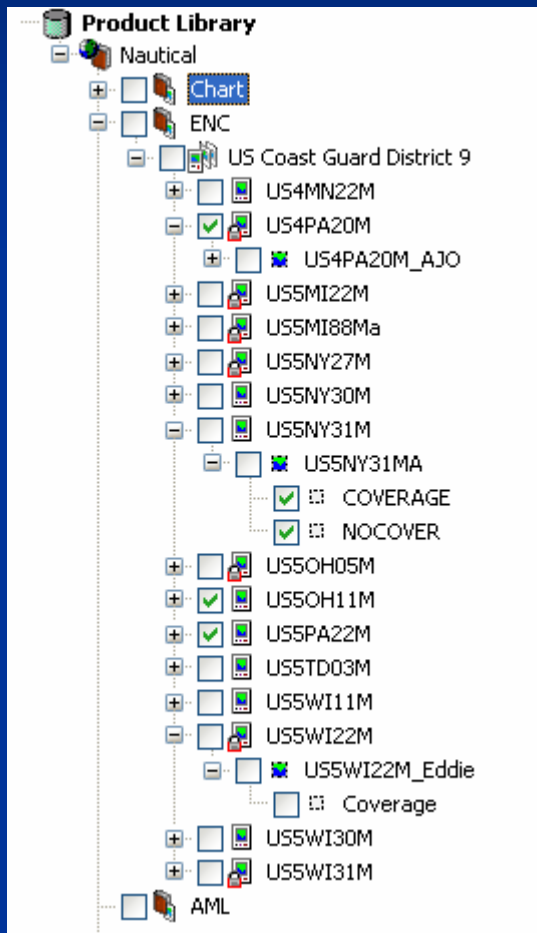
#### Comparison to Topology

Not Applicable

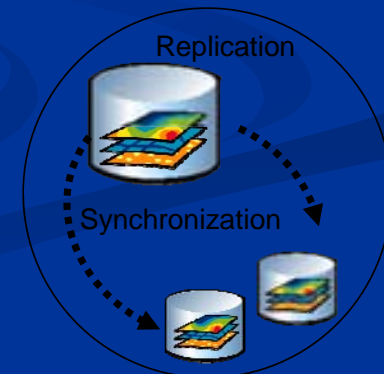
FEATURE CLASS		
OID	SCALE	
1	10,000	
2	20,000	
3	10,000	
4	30,000	

SCALE	
10,000	20,000
30,000	

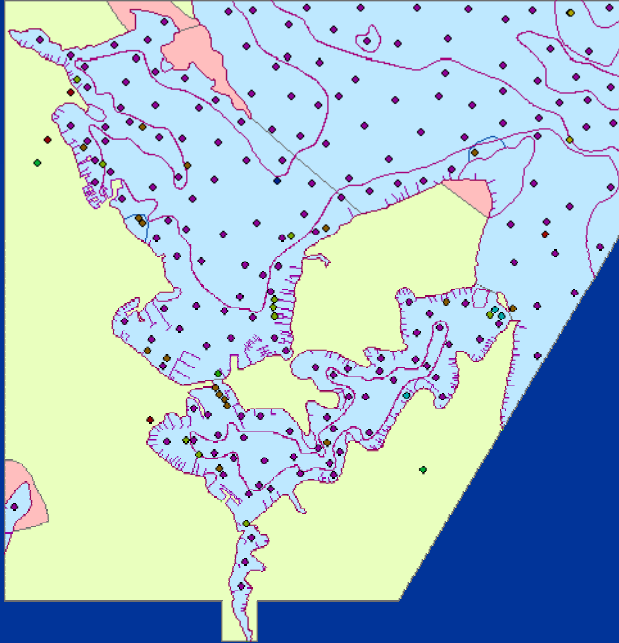
# Generating Products



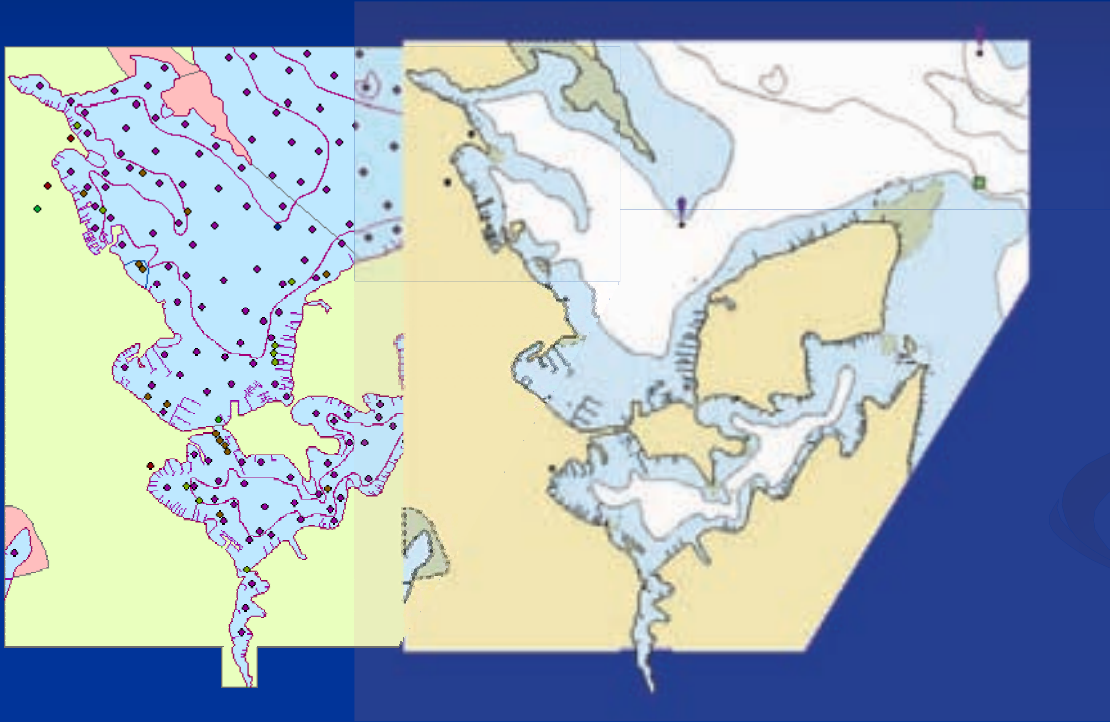
- ENC and RNC generated from the NIS
- Each product is a separate database
  - Replica from NIS
  - Based on product footprint and scale
- NIS updates sent to products
- Product level editing allowed for product finishing



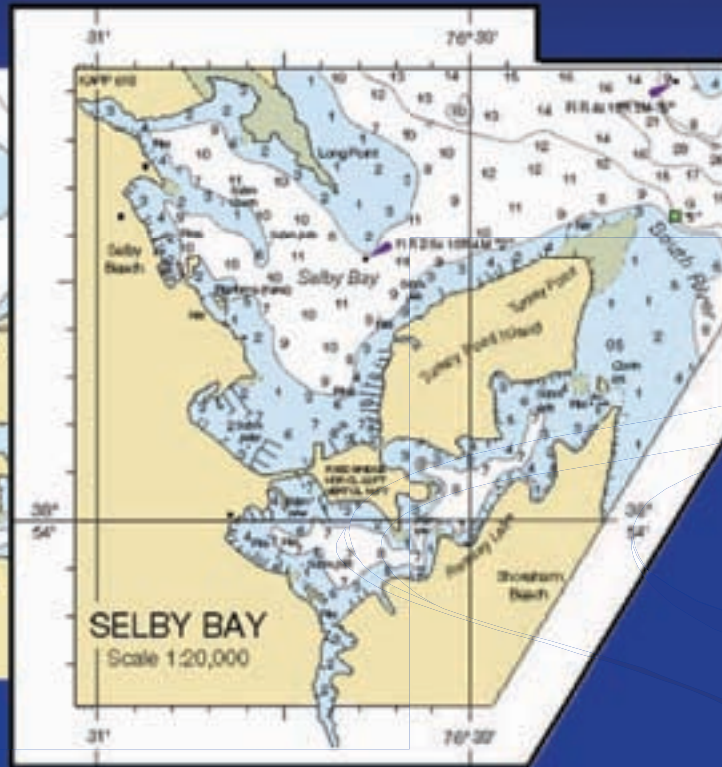
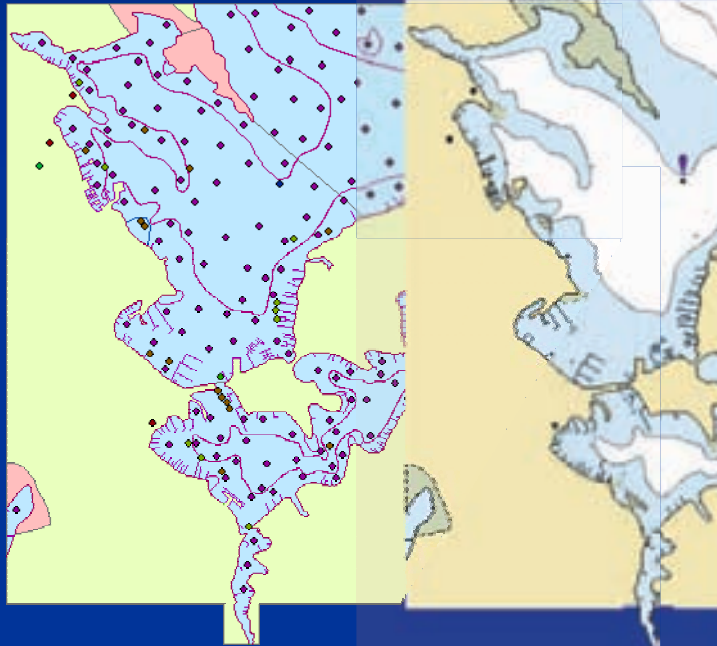
# Product Finishing



# Product Finishing

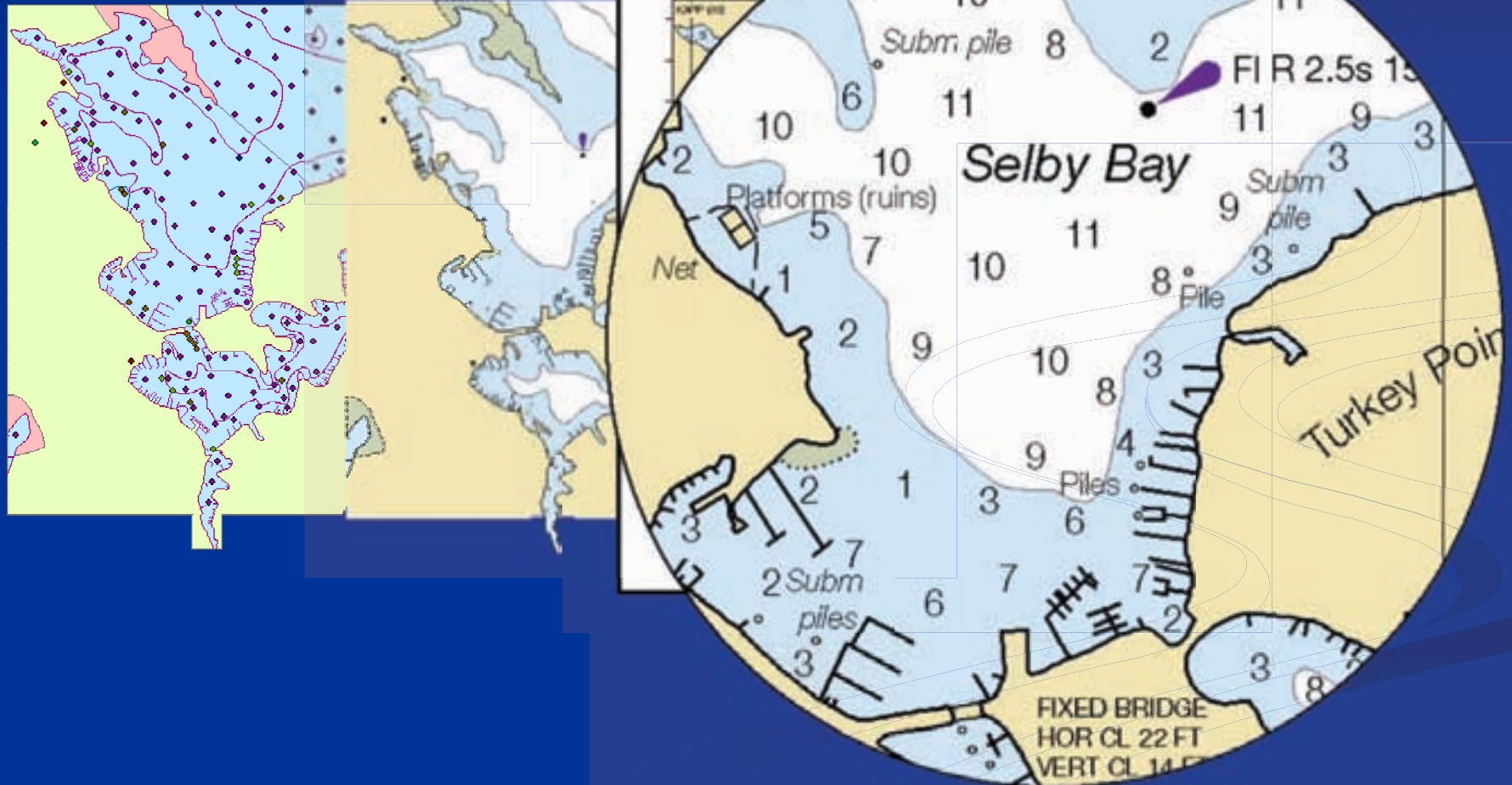


# Product Finishing





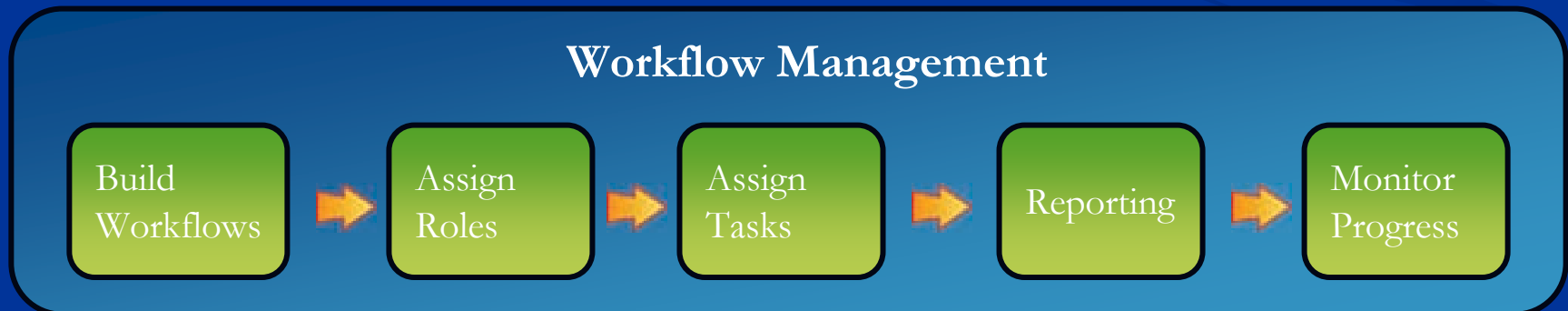
# Product Finishing



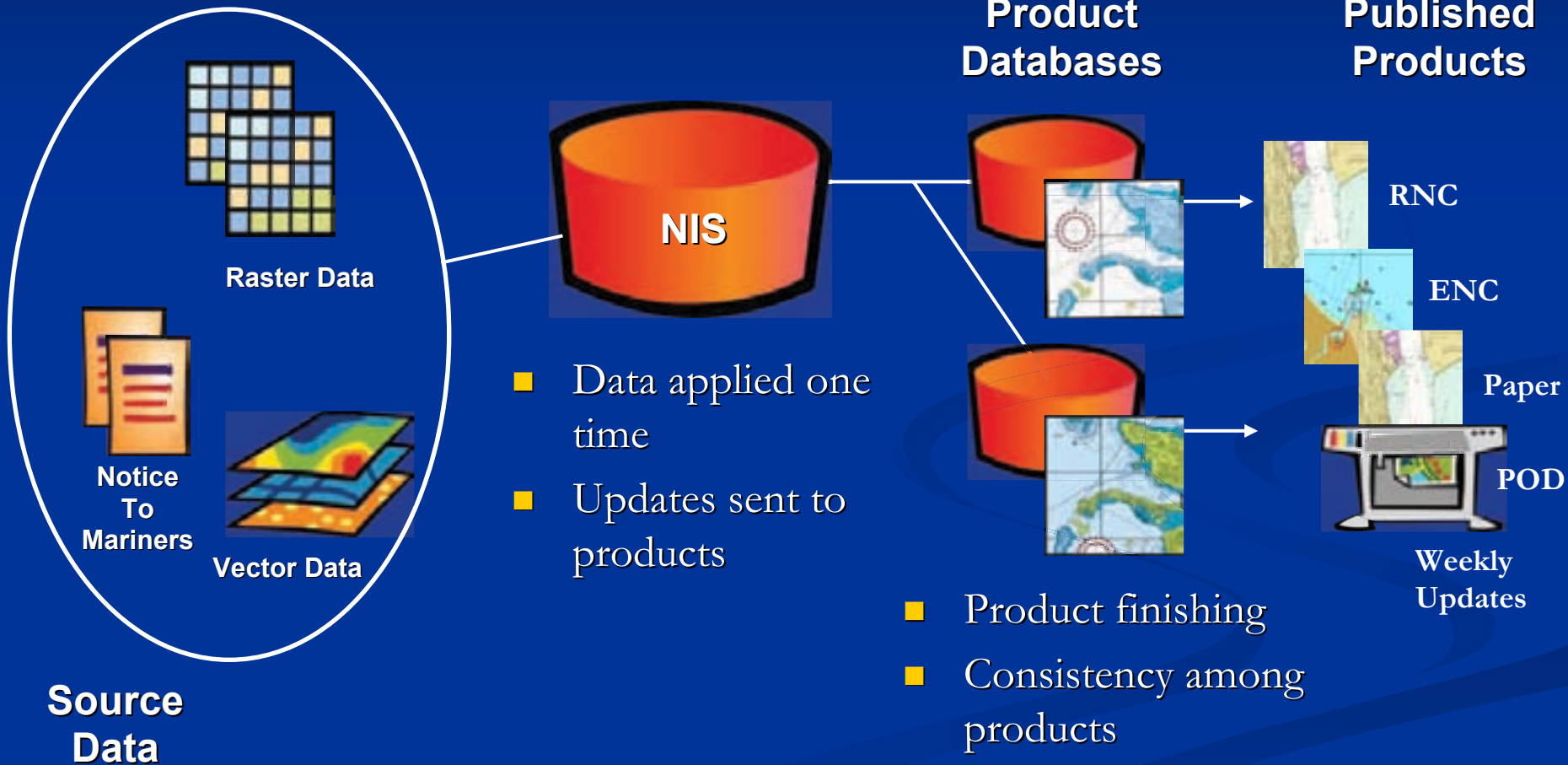


# Managing Workflows

- Nautical Solution provides a workflow management application
- Job actions are saved and archived
- Can be supplemented with comments and notes
- Workflows can be designed and configured to meet organizations needs

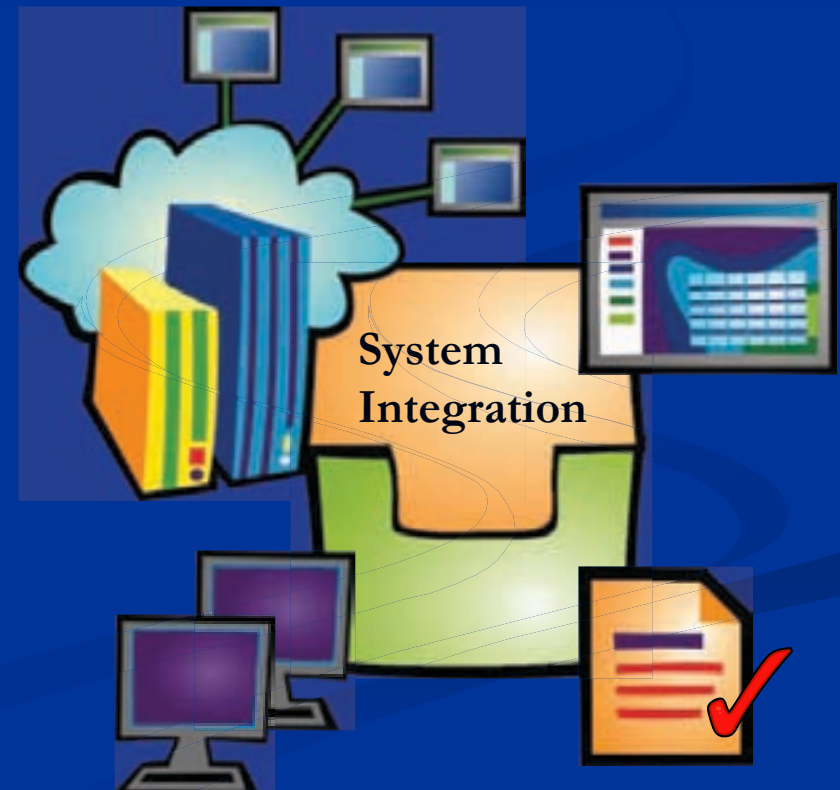


# Nautical Chart System II Implementation



# Phase 3: System Integration

- Integration of hardware and software to ensure that NCS II produces all products and services created by the existing systems
- Integration includes:
  - validating requirements
  - workflow development
  - interface development
  - system end-to-end test
  - acceptance test



# Phase 3: System Integration

- Workflow development
  - Acquire and apply source data to NIS
  - Create and manage product databases
  - Apply changes to ENC and RNC/paper products
  - Publish ENC and RNC/paper products
- Interface development required for NCS II
- Scheduled to complete development and integration by the end of summer 2008

# Phase 3: System Integration

- NCS II solution supported by COTS ESRI Milestone Builds (MB)
  - 7 MBs tested based on ArcGIS 9.1 and 9.2
  - 2 additional MBs planned based on ArcGIS 9.3
- System end-to-end test – Oct 08
- Acceptance test – Jan 09

# Phase 4: System Transition

## ■ Data Migration

- 60% of paper suite is covered by ENC data
- Data gaps need to be filled to support creation of RNC products
- ENC originally collected from RNC
  - Not all features collected for the ENC
  - Misaligned geometry along cell borders

# Phase 4: System Transition

- Customer Focus

- Opportunity for product improvement

- Training

- New skills for digital compilation and validation
  - New workflows

- Organizational Structure

- Revise organizational structure for NCS II



# Conclusion

- Increase efficiency of production system
  - One time source load, evaluation, and application
  - Variety of formats supported
  - Workforce trained on multiple products, versus product specialization
- Improved product for the mariner
  - Multiple products from single database provides consistency
  - Product synchronization
  - More up-to-date product
- Fully integrated end-to-end COTS solution