

## NOAA FISHERIES

### Fisheries Information System Program

The **Fisheries Information System** program is a state-regional-federal partnership that supports sound, science-based fisheries management. We do so by fostering cross-disciplinary collaboration and funding innovative projects to improve the quality of fisheries-dependent data.

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# Legacy Data Systems Workshop

## Background

NOAA Fisheries' data and information systems are a complex mishmash encompassing a wide array of both new and legacy systems, including web applications, desktop applications, mobile applications, databases, and sometimes ad hoc and innovative solutions in the field, all serving a diverse group of users with varying requirements. These systems support the collection, use, and management of NOAA Fisheries' data—our most valuable asset.

## Key Recommendations

- 1. Inventory and assess** fisheries-dependent data systems.
- 2. Develop best practices** for establishing product requirements, project management, and budgeting and contracting to create flexible, supportable products. Additionally, share best practices on methods for displacing legacy data systems while developing these modern systems. This includes developing cross-disciplinary teams.
- 3. Establish common forums** for fishery managers and IT professionals to communicate and collaborate.
- 4. Displace legacy systems** through regional prioritization and national integration.

Over time, these systems have faced numerous challenges stemming from organizational changes, regulatory and scientific pressure, as well as insufficient resourcing, staff turnover, expanding project scopes, resource limitations, and a lack of proper documentation. Consequently, many of these systems have accumulated a substantial amount of technical debt and have now reached the end of life. Furthermore, there are redundancies among some of these systems, both within and across different regions, and they often lack interoperability.

To add complexity, many of these systems are built with different technologies despite being closely dependent on one another, and are often maintained by individuals who are siloed from each other. Because these systems are tightly coupled, expensive modernization efforts may only partially succeed, or fail entirely.

In addition, when new functionality is required to meet new needs, often an entirely new system needs to be built. This cycle of creating more systems further makes sustained engineering and maintenance challenging—and support teams are spread thin. The 2023 Fisheries Information System program (FIS) Legacy Data Systems Workshop was the first step in developing a systematic approach to modernization that includes legacy data system displacement.

## Actionable goals and specific objectives

To begin the complex, intertwined, enterprise-level work necessary to displace legacy systems and retire technical debt, FIS convened a cross-disciplinary workshop on May 23-25, 2023, that brought together more than 50 individuals. Participants included representatives from NOAA Fisheries headquarters, each region and science center, and all of the regional Fisheries Information Networks (FINs). Software developers, information technology (IT) professionals, data managers, fisheries scientists and managers, and policymakers were all represented.

The overarching goal of the workshop was to leverage the expertise of the FIS community regarding the impact of legacy data and information systems and technical debt to develop actionable recommendations for NOAA Fisheries leadership to move aggressively forward with modernization efforts. The specific objectives were to:

- Identify and document the **persistent challenges** of NOAA Fisheries legacy fisheries-dependent data (FDD) systems and managing technical debt.
- Identify and document the **impact of legacy FDD systems and technical debt** on NOAA Fisheries' mission.

- Foster discussions with regards to **best practices and patterns for legacy displacement and/or modernization** among the FIS community and other experts.
- Provide an **FDD systems road map** detailing actionable steps for the challenges of both modernization and long-term operations and maintenance of FDD systems to avoid compounding technical debt in the future.

## Drivers and impacts

This Legacy Data Systems Workshop follows up on a continued effort from the FIS community to promote modernization and integration of our FDD systems. Most prominent among these was the 2019 NOAA Fisheries Information Management Modernization meeting, which, among many recommendations, led to the establishment of the Coder Professional Specialty Group. This community of practice, comprising software developers and designers, was instrumental in informing the design of the workshop, the initial outcomes of which are already helping to guide important elements of the NOAA Fisheries Data Strategy, Fisheries Modernization Strategy, and other initiatives. Convening the workshop also aligned with a key performance indicator in the current NOAA Fisheries Strategic Plan: Improve processes through the use of Lean principles.

## Assessing the problem

### Identifying strengths, challenges, and opportunities for sharing lessons learned

Prior to the workshop, the attendees participated in an FDD systems self-assessment exercise used to inform the scope of the workshop and directly address workshop objectives 1 and 2. The survey asked participants to:

- Inventory their FDD systems
- Assess the organizational and/or team readiness to develop, operate, and maintain FDD systems
- Assess individual FDD systems based on their perceived impact to the mission and their overall maturity

The major takeaway from the assessment is that different NOAA offices and FINs each have particular strengths and weaknesses in each area, but, generally speaking, there are not common strengths and weaknesses across all areas. This suggests there are significant opportunities for intra- and interagency collaboration for developing and instituting best practices.

For example, the Alaska Regional Office scored very high on the organizational maturity of its systems operations and maintenance and change control. At the workshop, this robust system was

of interest to participants and is a clear opportunity for sharing lessons learned.

Similarly, the Headquarters Office of Science and Technology and one of our FIN partners, the Atlantic Coastal Cooperative Statistics Program, scored high on the organizational maturity of their systems design, architecture, and technology. This raises the possibility that similar approaches could be shared across NOAA.

## Other barriers to modernization

The workshop also revealed significant challenges with respect to:

- Ineffective project management, which can lead to significant inefficiencies, duplication of efforts, bottlenecks, and project delays
- Ineffective contracting, which can lead to development of products that use proprietary software or are otherwise unsupported after a contract ends, or require a contract to extend past its initial terms

## Developing a Solutions Roadmap

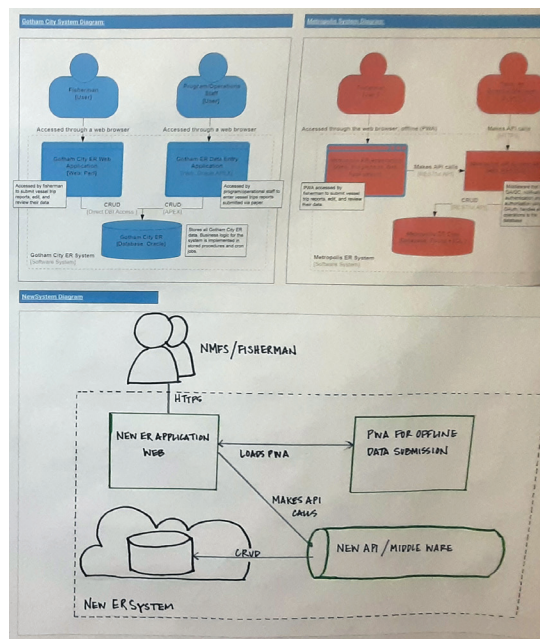
The challenges NOAA Fisheries faces with respect to legacy data systems and technical debt have been years in the making. While it is important to note that efforts are continually underway to retire high-priority legacy systems on an as-possible basis, arriving at the future state envisioned at the workshop—where mature systems are interoperable but not overly interdependent, and mature organizations collaborate internally and externally to share best practices and lessons learned—will require a consistent, efficient, stepwise process beginning with fundamental building blocks:

### Promote systemic culture change with respect to data system development

Legacy data systems do not get built in a vacuum. They are the result of decisions made and processes that exist across an organization that ripple throughout the development process. Culture change can seem to be an esoteric issue, but it is definable, and it is solvable.

## ACTION ITEM

- Develop best practices for establishing product requirements, project management, and budgeting and contracting to create flexible, supportable products. Additionally, share best practices on methods for displacing legacy data systems while developing these modern systems. This includes developing cross-disciplinary teams.



Credit: NOAA Fisheries

*At the workshop, breakout groups were tasked with the challenge of decommissioning and combining two mock legacy data systems into a single new system.*

## NEXT STEPS

- FIS will convene a team of software developers, IT professionals, data managers, and fisheries scientists and managers to create a clear, operable, actionable set of best practices. This “bottom-up” approach will facilitate socialization with and adoption by peers, and ultimately become part of the fabric of organizational culture.

## Establish guidelines for communication

Avoiding pitfalls that lead to legacy data systems in the first place requires frequent communications among developers, IT professionals, end users, and data customers throughout each phase of design and deployment. FIS provides a significant amount of funds for the development and modernization of data systems, and can leverage its request for proposals (RFP) process to instill best practices in these areas.

## ACTION ITEM

- Develop recommendations for team collaboration, transition planning, and the use of quality management and continuous improvement principles in the design of projects and the development of proposals. (These recommendations were established shortly after the workshop and incorporated into the FY 2024 RFP guidance document.)

## NEXT STEPS

- Promote transition planning and collaboration through joint FIS/Office of the Chief Information Officer (OCIO) forums.

## Displace legacy systems: Regional prioritization and national integration

Based on ongoing assessment and prioritization, begin a modernization effort across NOAA headquarters, regional offices and science centers, and FINs that includes legacy data systems displacement.

## ACTION ITEMS

- Prioritize existing systems, taking into consideration such factors as:
  - Number of dependencies
  - Alignment with strategic plans and mission
  - Regulatory, financial, and/or reputational impact
  - Risks (e.g., to the resource, politically, and/or litigation-related)
- Implement and support national or centralized solutions to support system rationalization efforts, such as headquarters-supported microservices.

## NEXT STEPS

- Through an RFP mechanism and leveraging funds made available from the Inflation Reduction Act, FIS will work with NOAA offices and FIN partners to conduct an evaluation and prioritization of legacy data systems and document which systems will be displaced when.
- The FIS community and OCIO will work through common forums to identify regional resource burdens that would benefit from centralization or national support.

## In summary

There is no one root cause of the challenges identified at the workshop, and there is no one-size-fits-all solution. However, by following the steps outlined in the Solutions Roadmap, we can work across disciplines, geographic regions, and teams to compile and develop best practices, create replicable models for communications and transition planning, implement appropriate support services, and ultimately displace these legacy systems that no longer serve—and indeed are significantly detrimental to—the data needs of NOAA Fisheries, our partners, and the resources we protect.



Credit: NOAA Fisheries