National Shipbuilding Research Program

Project Final Report

Milestone 11

Automated Detail Planning and Integrated Shipyard Operations with Engineering Data

TASK ORDER #2019-483-011

ShipConstructor Software USA Inc. (SSI USA)

Huntington Ingalls Incorporated - Ingalls Shipbuilding

Fincantieri Marinette Marine

General Dynamics Bath Iron Works

Floorganise

JULY 30, 2025

Table of Contents

Table of Figures

1.0 Background

1.1 Synopsis

The objective of the project was to set up a pilot program at each participating shipyard to research how to improve the shipyard efficiencies for higher levels of competitiveness (cost-price and lead-time) through digitization in engineering, organizational, and physical shipbuilding processes using an integrated Shipyard Manufacturing Execution System (MES) platform. Breaking from the traditional trade-offs of early information needs for operations and the late availability of engineering data is bridged by capturing shipyard-specific value streams in a shipyard MES. This is accomplished using rolling-wave methods to include early released bill of materials (BOM) information data from the Product Lifecycle Management (PLM) system where direct data integrations with the engineering 3D detailed design model for sequencing, budgeting (hours/duration), resource allocation and production progress recognition occurs. This facilitates efficient closed feedback loops on operational performance and the recognition of production progress, consumed hours, load views, and risks by direct roll-ups to project controls.

1.2 The Problem

Several US shipyards use Enterprise Resource Planning (ERP) systems to help manage various aspects of the shipbuilding enterprise. The material acquisition process is often managed using an ERP system, and some shipyards also use the ERP system in the production planning process and to support generation of earned value management metrics. However, the ERP systems are often found to provide inadequate support to Operations with respect to user-friendliness, keeping up with the pace of production, and change management. The dynamics on the work floor in shipbuilding are too significant to be ignored and are frequently underestimated, and the inadequate control of planning and production processes leads to cost overruns and schedule delays on shipbuilding programs. The challenge for shipyard management is to integrate all operational processes and information requirements with available engineering data and shipyard specific value streams.

Examples of inefficiencies of the status quo include the following:

- Manual inputs and revisions of scheduling software
- Multiple homegrown systems managing discrete processes with little to no integration
- Limited availability and reliability of look ahead for work packages
- Difficulty in status reporting of work packages
- Engineering changes not reflected in work packages
- No real-time visibility of earned value management metrics
- Make or buy decisions made with inadequate data
- Difficulty in determining resource loading for upcoming weeks

1.3 The Solution

A potential solution to the inadequate control of planning and production processes is the adoption of an MES system. MES systems can be tailored to reflect the value stream at each shipyard to enable more discrete management of the multitude of production work packages used during a ship contract. The MES system can leverage the value stream to partially automate the development of work packages based on BOM information found in a shipyard PLM system. Using the MES in conjunction with a shipyard PLM system linked to the 3D product model will support more effective change management and reduce production rework associated with late design changes.

A description of the desired interfaces between the PLM, ERP, and MES systems at a shipyard can be found in Figure 1 below. It should be noted that MES integration with ERP systems was outside of the scope of this project.

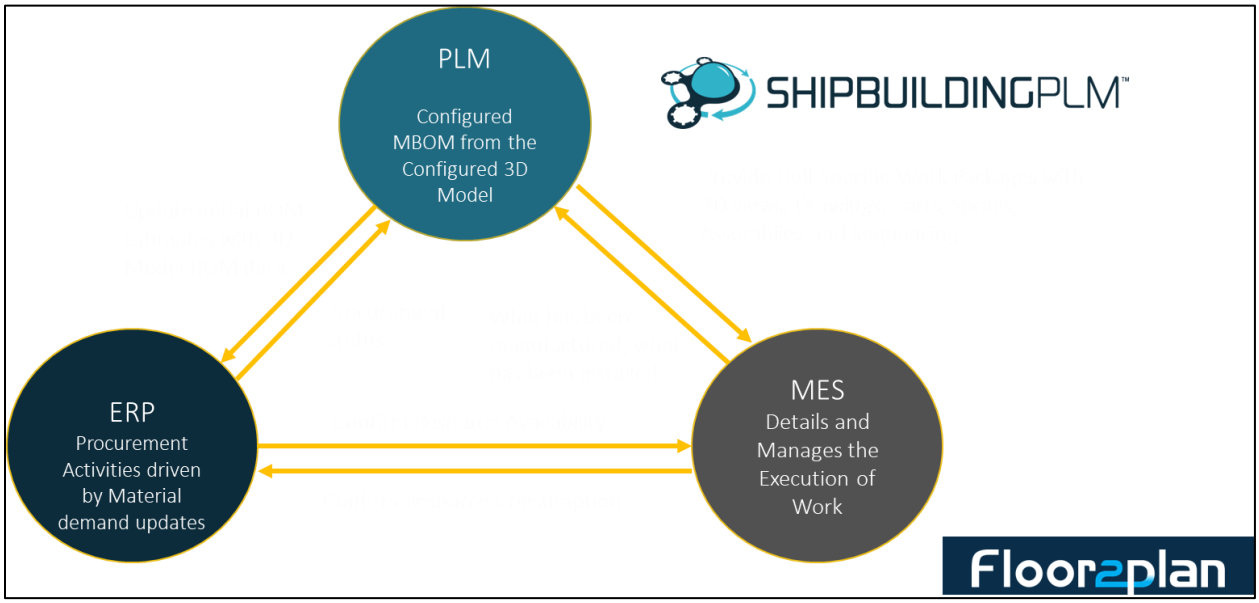


Figure 1. Desired interfaces between PLM, ERP, and MES systems

2.0 Approach

The project team's efforts fell into several distinct but related efforts, generally divided by the two phases of the project. During Phase 1, the team held value stream workshops at each participating shipyard to learn more about how the shipyards execute production efforts, how value is added to the end product, and which shipyard departments bring about the added value. The software partners on the team also developed interfaces between the ShipbuildingPLM system and the Floor2Plan MES to enable ship data transfer to the MES system. Phase 1 culminated with a workshop in February 2024, where the software interfaces between the aforementioned systems were demonstrated using a Platform Supply Vessel (PSV) ship design that SSI USA can access for software testing without being subject to International Traffic in Arms Regulations (ITAR) limitations. The

focus of Phase 2 was to enable an on-premises pilot environment for ShipbuildingPLM and Floor2Plan at each shipyard to allow software testing by key shipyard personnel on a unit or block of their choosing (which could be subject to ITAR).

2.1 Shipyard Value Stream Workshops

SSI USA and Floorganise personnel visited each team member shipyard early in Phase 1 of the project.

The first value stream workshop was held at HII Ingalls Shipbuilding (Ingalls) in September 2023. SSI USA and Floorganise gained valuable insights regarding the Ingalls value stream via discussions with personnel that supported engineering, planning, material procurement, and production control functions.

A second value stream workshop was held at Fincantieri Marinette Marine (FMM) in October 2023. This workshop primarily focused on engineering, planning, and production support functions.

The workshops provided critical insights into the operational and engineering practices at Ingalls and FMM. These findings directly informed the development of digital shipyard models and pilot blocks tailored to each shipyard's needs. The collaborative discussions with subject matter experts helped identify key areas for improvement, including data integration, change management, and progress tracking. This assisted the project team to implement Floor2Plan and ShipbuildingPLM solutions that enhanced efficiency and supported the broader goals of the NSRP project.

2.2 Software Interfaces

The Phase 1 software efforts were associated with enabling data transfer between ShipbuildingPLM and the Floor2Plan MES system. The ShipConstructor 3D product model has all the needed data to provide acceptable inputs to Floor2Plan, but it's more effective to query a structured PLM system rather than directly accessing the product model for the required data.

The initial integration efforts between ShipbuildingPLM and Floor2Plan were "cloud" based. The software providers on the project team were based in different continents, and the PSV design could be shared among the project team, allowing for storage of relevant ship data on a virtual machine (VM) cloud instance.

The software developers leveraged the open data protocol (OData) industry standard to facilitate data transfer between the software applications in addition to using their respective application protocol interfaces (APIs). SSI USA worked on updating the Product Hierarchy for the PSV design to improve data availability in Floor2Plan. This effort also leveraged concurrent software interface work between SSI USA and Floorganise on the NSRP Automated Detail Planning and Instant Earned Value Control Panel project (Task Order 2019-483-012), with the primary difference being that the Panel project focused on data extraction from the EnterprisePlatform software system to Floor2Plan for the specific

purpose of supporting earned value management metrics. The Panel project effort was simpler to achieve given the budget and schedule limitations of those projects. A description of the differences between the two projects is provided in Figure 2 below.

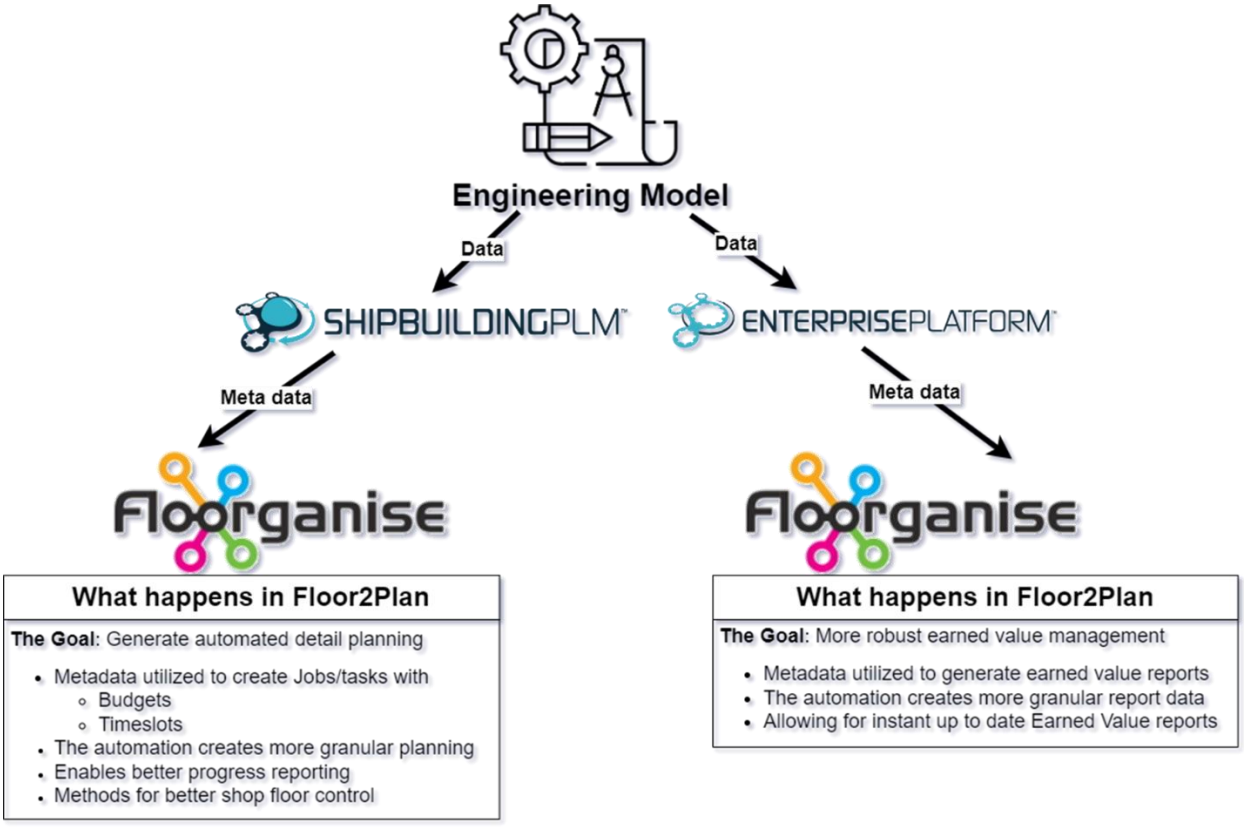


Figure 2. Description of the different goals of the two related projects

SSI USA imported a product hierarchy from the ShipConstructor product model for the PSV into ShipbuildingPLM to support downstream integration and testing tasks. The project team executed an initial data transfer test between ShipbuildingPLM and Floor2Plan based on the PSV design in December 2023. The team subsequently held an industry workshop in February 2024 to demonstrate the data transfer between ShipbuildingPLM and Floor2Plan to a larger audience. The successful outcome of the industry workshop served as evidence that the project was meeting its technical goals, leading to a "go" decision for Phase 2 of the project.

2.3 Support of On-premises Pilot Environments

Upon the approval of Phase 2 of the project, the project team shifted focus to enable each shipyard to set up pilot environments within their firewall. That said, there were some additional software enhancements that were accomplished during the Phase 2 effort. These included enabling transfer of ShipConstructor 3D images into Floor2Plan for shop floor use, enhancing status reporting of work packages. An example of the integration of

ShipbuildingPLM 3D images and Floor2Plan shop floor control functionality is shown in Figure 3 below.

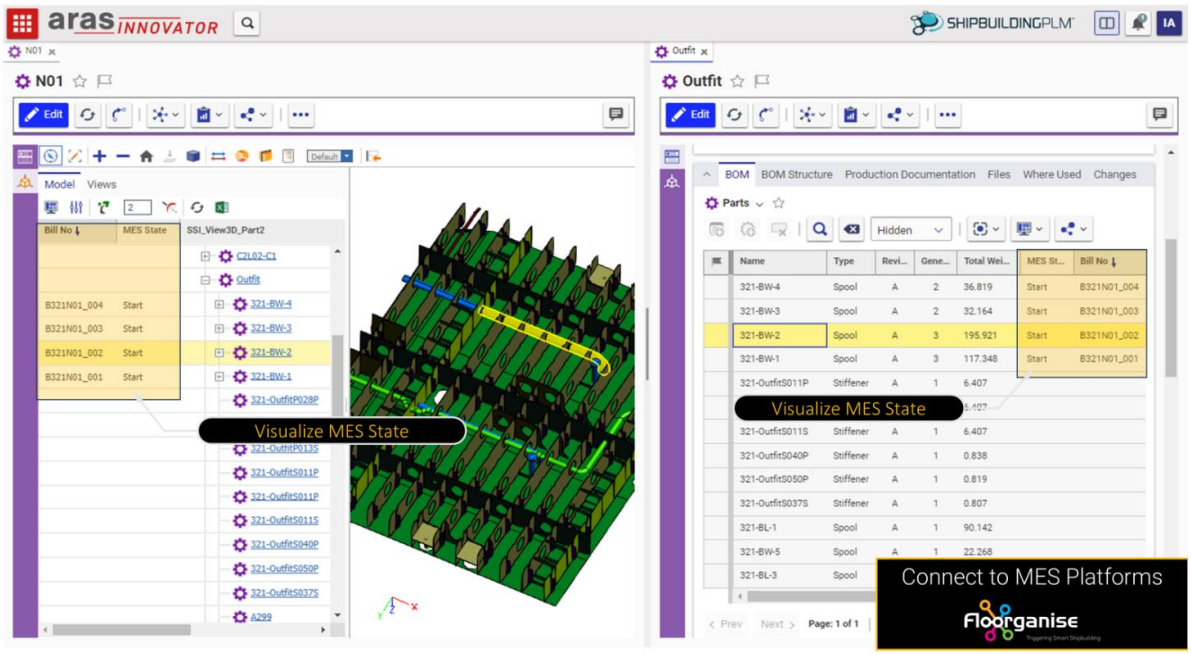


Figure 3. Example of 3D image integration with Floor2Plan

SSI USA also ensured that several ShipbuildingPLM properties (examples include BaseUrl, BaseRelativeUrl, and DatabaseName) were coordinated with Floor2Plan to support project synchronization via OData. For their part, Floorganise modified one of their JavaScript Object Notation (JSON) files using the OData API to support project synchronization. The modified JSON file is indicated in Figure 4 below.

Name	Type	Compressed size	Password ...	Size	Ratio	Date modified
zh-Hant	File folder					04/02/2025 15:16
.eslintrc.json	JSON Source File	1 KB	No	1 KB	41%	04/02/2025 15:10
Application.Service.deps.json	JSON Source File	31 KB	No	181 KB	84%	04/02/2025 15:16
Application.Service.dll	Application extension	669 KB	No	2.069 KB	68%	04/02/2025 15:16
Application.SystemActions.deps.js...	JSON Source File	26 KB	No	144 KB	83%	04/02/2025 15:16
Application.SystemActions.dll	Application extension	17 KB	No	49 KB	66%	04/02/2025 15:16
appsettings.json	JSON Source File	1 KB	No	3 KB	63%	04/02/2025 15:10
appsettings.Production.json	JSON Source File	1 KB	No	1 KB	61%	05/02/2025 13:13
Asp.Versioning.Abstractions.dll	Application extension	36 KB	No	74 KB	53%	26/03/2024 16:36
Asp.Versioning.Http.dll	Application extension	60 KB	No	130 KB	54%	26/03/2024 16:36
Asp.Versioning.Mvc.ApiExplorer.dll	Application extension	29 KB	No	56 KB	49%	26/03/2024 16:36
Asp.Versioning.Mvc.dll	Application extension	32 KB	No	63 KB	51%	26/03/2024 16:36
Aspose.Drawing.dll	Application extension	3.761 KB	No	7.637 KB	51%	05/05/2023 10:36
Aspose.Tasks.dll	Application extension	2.690 KB	No	5.771 KB	54%	22/10/2024 16:33
AsyncKeyedLock.dll	Application extension	40 KB	No	90 KB	57%	23/01/2024 10:02

Figure 4: Floor2Plan JSON file modified to support project synchronization

Floorganise also enhanced their capability to automate generation of work package templates to support the goals of the project. The overall process of using the engineering model data and the work package templates to perform detailed planning functions is explained at a high level in Figure 4 below.

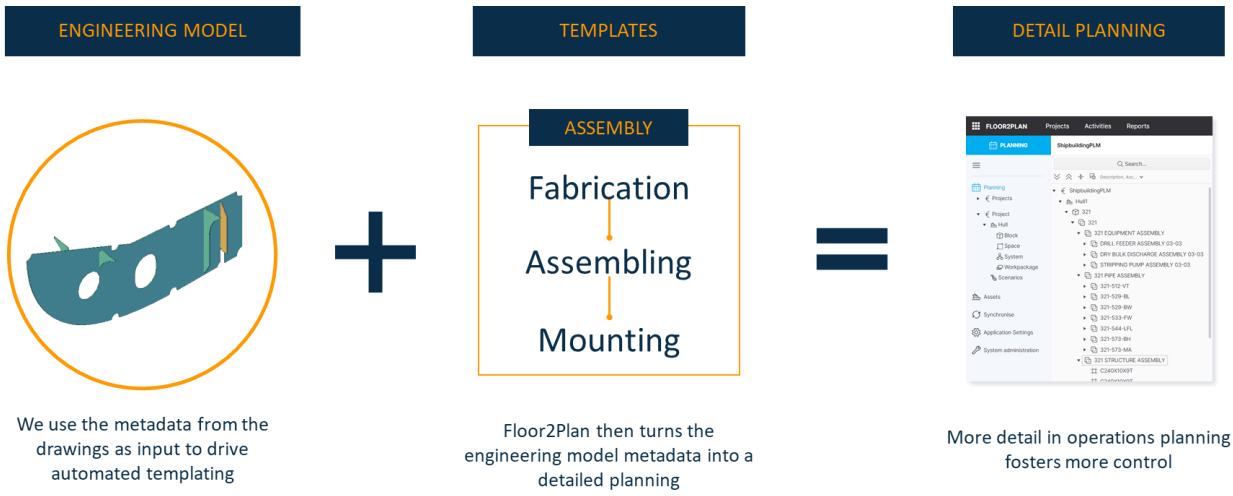


Figure 5. High level description of the process for generating detailed planning data

The ShipConstructor 3D product model allows for the inclusion of user defined attributes (UDAs) that can add information to specific parts to support downstream workflows. Different shipyards vary in their use of UDAs. Personnel in the Ingalls Industrial Engineering department developed a list of UDAs that support planning and production activities at Ingalls during Phase 2 and provided them to SSI USA to support their inclusion in ShipbuildingPLM for their pilot environment. Ingalls also provided a specific portion of the

3D product model for LHA 8 to SSI USA to support migration of the relevant data into ShipbuildingPLM. SSI migrated the relevant data into ShipbuildingPLM, tested the migration output, resolved issues, and provided the data in turn to Ingalls to support the pilot testing.

For their part, FMM elected to use a unit from their FFG 63 ship design as their test case for their pilot environment. FMM uses fewer UDAs in their product models than other shipyards. This made the process of UDA incorporation relatively simple when compared to the same process for Ingalls.

Each team member shipyard was required to install the various software products within their internal information systems environment. Given that ShipbuildingPLM depends on Aras PLM software, the shipyards were required to install Aras, ShipbuildingPLM, and Floor2Plan on a server. There is a required sequence of software installation. SSI USA and Floorganise provided a guidance document to both shipyards regarding the software installation, and SSI USA was available for consultation as the shipyards installed and tested the software installations.

3.0 CHALLENGES

The project encountered a few different challenges over the project timeframe. This section will highlight those challenges.

3.1 INFORMATION TECHNOLOGY ISSUES

The most significant challenge was encountered with respect to the software installation for the pilot environment at both shipyards. Both shipyards wanted to conduct their pilot testing with ship data from a current Navy shipbuilding program to create a realistic user scenario. A cloud computing solution would have allowed for quicker establishment of the pilot environment. However, that was considered too risky from a cybersecurity standpoint for shipyard pilot testing using ITAR-controlled technical data. As such, an on-premises software installation was pursued, which requires a server to host the various software products.

For Ingalls, there were significant delays in gaining access to a server to host the pilot environment. Further, although Ingalls currently uses Aras for their PLM system, they are using an earlier version of the software in production that is incompatible with the ShipbuildingPLM software. There was an approval process needed to allow use of the later version of Aras to support this project.

Ingalls was the first shipyard to provide relevant product model data from LHA 8, and the project team worked through the initial technical challenges for the software migration to ShipbuildingPLM and data validation using their data, thereby delaying their pilot environment software installation somewhat.

For FMM, their IT personnel were unable to support a discussion with the project team in Phase 1 to review system requirements. This set back their start of planning for setup of the pilot environment, which did not begin until Phase 2 of the project. They provided their

relevant product model data from FFG 63, but they were unable to get approval from the Navy ship program office to allow SSI personnel based in Canada to support data migration to ShipbuildingPLM and data validation. There were some delays in completing this process, but the issues were ultimately resolved.

3.2 Time Available for Pilot Testing

Closely related to the information technology issues noted above, the resultant delays left a relatively short time to execute user testing in the pilot environment. The project team requested and received a no-cost extension to the period of performance of approximately two months, but even with that, the time remaining was marginal for user testing.

FMM was able to execute some limited user testing and provide written feedback before the end of the project, and their findings are included in an appendix to this final report. Ingalls was able to complete standup of their pilot environment prior to the end of the project but did not provide written feedback.

The software providers on the project team allowed continued use of the software licenses for a limited time after the end of the project, and it is expected that additional user testing will be executed at both shipyards after the end of the period of performance using internal funding.

4.0 Results

Overall, the project had multiple successful outcomes.

Between this project and the aforementioned NSRP Panel project, the project team has been able to pass relevant ship data to Floor2Plan from both EnterprisePlatform and ShipbuildingPLM. This integration of the tools is a significant development in and of itself and allows the toolset to be more effective than either software operating independently. Further, Floorganise has leveraged user comments during the execution of the two projects to evolve their software suite to provide a more complete and robust solution to their customers.

The combined software system has been demonstrated to support semi-automated translation of large data sets from two Navy ship programs managed by different shipyards to the Floor2Plan MES system. There will be no need to manually enter large amounts of data to gain the potential benefits from use of an MES system. To the contrary, the MES system will facilitate the semi-automated development and management of discrete work packages to support production.

Ronald DeVries of Floorganise provided a summary evaluation of the project outcomes, which is transcribed below. This was his comprehensive reflection on the outcomes and future implications of the NSRP Automated Detail Planning Project. His remarks highlighted technical progress, collaborative value, and strategic direction for continued development. His key points include:

1. Project Impact and Tool Evolution

- Ronald emphasized that the Floorganise suite has significantly evolved over the past two years—from approximately 80% of its intended functionality to a more complete and robust solution.
- This growth was directly influenced by feedback and use cases provided by FMM and other project participants.
- He credited the collaborative nature of the project for generating valuable insights and practical enhancements to the toolset.

2. Integration Achievements

- A major milestone was the successful integration between Floorganise and ShipConstructor, which Ronald described as a novel and impactful development.
- This integration enabled the resolution of real-world shipbuilding challenges that previously could not be addressed by either system independently.
- He noted that this synergy has already begun to benefit approximately 30 shipyards currently using the integrated solution.

3. Organizational Growth and Sustainability

- Ronald shared that Floorganise has expanded its development team to around 20 full-time engineers, allowing for continued innovation beyond the NSRP framework.
- The company now operates with a sustainable budget model, enabling ongoing enhancements even without active NSRP funding.

4. Future Collaboration and Innovation

- He expressed optimism about the long-term collaboration between Floorganise and its partners, including SSI and FMM.
- Ronald introduced new development ideas, such as:
- Floor space planning: Using metadata from models to optimize production floor layout based on volume, dimensions, and weight of components.
- Change management: Referencing the upcoming panel project proposal focused on managing change in shipbuilding environments.

5. Acknowledgments and Closing Remarks

- Ronald acknowledged the dual-role contributions of participants who bridged IT and production domains, which he saw as essential to the project's success.
- He expressed gratitude for the dedication and engagement of the team, particularly during late-night development sessions across time zones.

Specific items accomplished are listed by project phase below.

- Phase 1
    - Project kickoff (June 30, 2023)
    - Ingalls and FMM value stream workshops (September and October 2023)

    - Cloud PSV demonstration and Go/No-Go Analysis (May 2024)
- Phase 2
    - Delivered pilot environments (Ingalls: LHA 8 "Go Live" Feb 14, 2025, validated July 2025; FMM: FFG 63 data, June 2025)
    - Implemented Floor2Plan templates, ShipConstructor 3D image integration, and OData API configuration
    - July 2025 workshop (FMM: 4/5) trained on Floor2Plan and reviewed metrics (50%, 45%, 5%, TRL 6 to 7).
    - July 31, 2025 review confirmed success via verbal validation

Significant technology transfer events were as follows:

- Presented at Shipbuilding & Lifecycle Technology 4.0 (January 2024)
- SSI World Shipbuilding Conference (September 2024)
- NSRP All Panel Meeting (February 2025)
- NSRP SDMT/BT Joint Panel Meeting (August 2025)

4.1 Metrics/Benefit Realization

In the initial project proposal, the benefits realization table had the following major sections:

- Planning Time Reduction
- Supervisor Time Savings
- Planning Capacity Increase
- Production Improvement

Quantitative metrics were limited due to pilot duration and FMM's visualization/hierarchy gaps. Ingalls verbally validated LHA 8 outcomes, and discussions with both shipyards confirmed that targets were met or exceeded, aligning with extrapolated metrics. The scale of the Ingalls pilot was at 20,000–30,000 work orders/ship. During the July 2025 final workshop, the project team documented progress as shown in Figure 6 below.

Metric	Target	Achieved	Notes
Planning Time Reduction	25–30%	30%	FMM: WBS templates; Ingalls LHA 8 validation (Jul 2025)
Supervisor Time Savings	50%	52%	FMM: 7+ hours/day shop floor; Ingalls validation (Jul 2025)
Planning Capacity Increase	45%	47%	FMM: Higher throughput; Ingalls validation (Jul 2025)

Production Improvement	5%	6%	FMM: Reduced rework; Ingalls LHA 8 hours/ton; verbal validation
TRL Advancement	6 to 7	7	Both shipyard pilots validated integration (Jul 2025)

Figure 6. Project metrics assessment

The project team anticipated that the existing Technology Readiness Level (TRL) of 6 (*System/subsystem model or prototype demonstration in a relevant environment*) would be increased to 7 (*System prototype demonstration in an operational environment*). The project team was able to achieve TRL 7 as expected.

4.2 OBJECTIVES

The project objective as stated in the initial proposal was to stand up a pilot program at each participating shipyard to research how to improve the shipyard efficiencies for higher levels of competitiveness (cost-price and lead-time) through digitization in engineering, organizational, and physical shipbuilding processes using an integrated Shipyard MES platform.

The project team has successfully met that stated objective. This was accomplished via successful integration and data sharing between ShipbuildingPLM and Floor2Plan.

4.3 IMPLEMENTATION

The benefit of integrating these software systems during this project is ready to be realized profitably by shipyards willing to implement the technology. A shipyard will be required to use current versions of the ShipConstructor software suite (including ShipbuildingPLM), Aras Innovator, and Floor2Plan to enable use of these capabilities. A guidance document has been prepared to facilitate implementation and data transfer to Floor2Plan. Shipyards will also need to identify any UDAs that planning and production support personnel will need to ensure that they are included in the data transfer. A presentation outlining the implementation process for Floor2Plan is included as an addendum to this report.

5.0 ADDENDUM

5.1 JULY 2025 FEEDBACK FROM FMM

The document below was provided by Brett Thode of the Methods Engineering department at FMM after their brief usage of the FMM pilot environment for the FFG 63 data. This was in response to a questionnaire developed by SSI USA.

FMM Feedback for ADP Project July 2025 Brett Thode

Workshop Experience *How helpful was the hands-on time with Floor2Plan and ShipConstructor during the workshop in getting you ready to use automated planning at your site?* **Please rate from 1 to 5** (1 = not helpful, 5 = very helpful) and share any examples of what worked well or what could be better.

> 4 – The workshop exposed us to most of the features available to us. It made understanding them easy and made the pilot process go quite a bit more smoothly. I do not believe we had time in the workshop to cover all of the features at the list of them is quite deep for Floor2Plan. I understand that the manufacturing features weren't necessarily the focus but I believe they are quintessential to show off in terms of the software's capability.

Using the Pilot Tools *In your test environment, how has using Floor2Plan (or other connected tools) changed the way your team creates digital work packages compared to the old way?* Please describe any benefits (like saving time or fewer mistakes) or challenges (like tech issues or needing more training).

Unfortunately, with the limited amount of time we had with the pilot, it was hard to gather the full list of benefits. It was able to show the vision of the final product that was good for our planning team to see as they were able to appreciate the potential that was there. In terms of creating digital work packages, it was agreed that the process would become easier, especially if FMM's work breakdown structure templates were implemented. I see it as able to save a significant amount of time across the board, especially in the manufacturing setting. It would also be a powerful tool to show during status update meetings that require easily digestible information.

Progress Toward Goals *Based on your experience so far, how close are you to meeting the project's goals (like cutting supervisor office time by 50%, increasing planning capacity by 45%, or improving production by 5%)?* Share any numbers or observations, and mention anything that may have slowed progress.

Truthfully, very little progress has been made towards the project goals based on lack of time. Realistically, I believe that many of the metrics can be improved from supervisor office time, higher planning capacity, and production improvements. I think we would most see this in having foreman on the shop floor 7+ hours a day rather than 2 or 3, planning capacity increases and a higher throughput of work orders. Production improvements especially in reduction of rework as response to change can happen more

efficiently. Although we did not physically see these benefits, what the software offers makes them extremely realistic.

Readiness to Roll Out *How ready is your team to fully start using Floor2Plan and automated planning in your day-to-day work?* **Please rate from 1 to 5** (1 = not ready, 5 = fully ready) and explain what's helping or holding things back (like tool setup, training, or team support).

1 – We had only a few team members participate in the workshop, these are the same few who were working on the Pilot. While we have a basic understanding of the workings, actually setting it up to function based on our product hierarchy would take some help. From there we would need training and some support until it is better understood.

Overall Impact *What's been the biggest impact—good or bad—of the ADP project on how your shipyard plans and builds?* Also, how could future workshops or support be improved to bring more value to your team?

I think it gave us a better idea of how we need to adapt our shipyard to the ever changing technological advancements that help the industry along. This tool is a way to modernize many of our process and increase efficiency overall. ADP itself did not change a lot of how we are planning and building but it did lay the groundwork in realizing that adapting new technology is necessary.

As far as workshops go, future ones could be more extensive and cover all features found in a software. I would not be upset if they were longer than 2 days to really be able to deep dive on a topic.

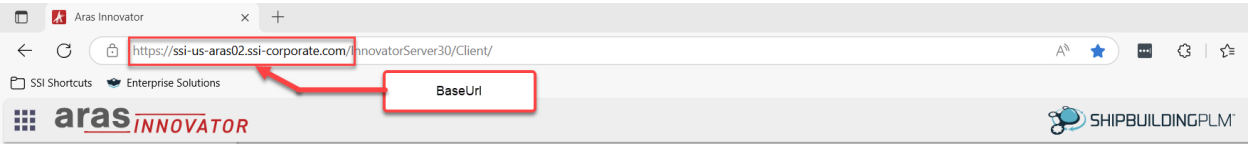
5.2 SHIPBUILDINGPLM AND FLOOR2PLAN INTEGRATION DOCUMENT

The following document was compiled by the project team to provide practical guidance regarding the steps required to implement the integration of ShipbuildingPLM and Floor2Plan.

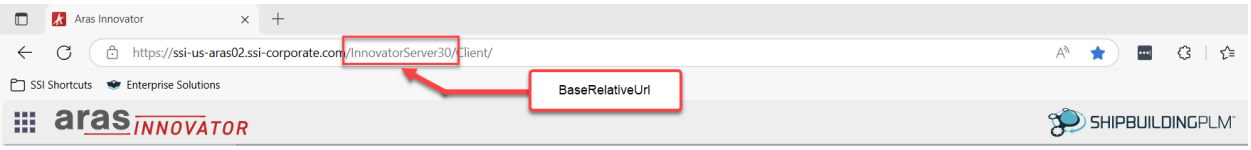
ShipbuildingPLM Properties

There are a few properties that were configured locally for ShipbuildingPLM that will need to be added to the Floor2Plan Configuration File in order for the integration to work.

First, you need to know your BaseUrl. Your BaseUrl is the uniform resource locator for the server of ShipbuildingPLM.

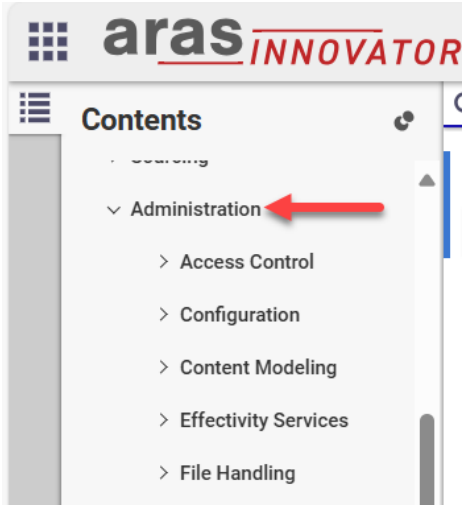


You also need your BaseRelativeUrl, which is your subpage instance for your ShipbuildingPLM.

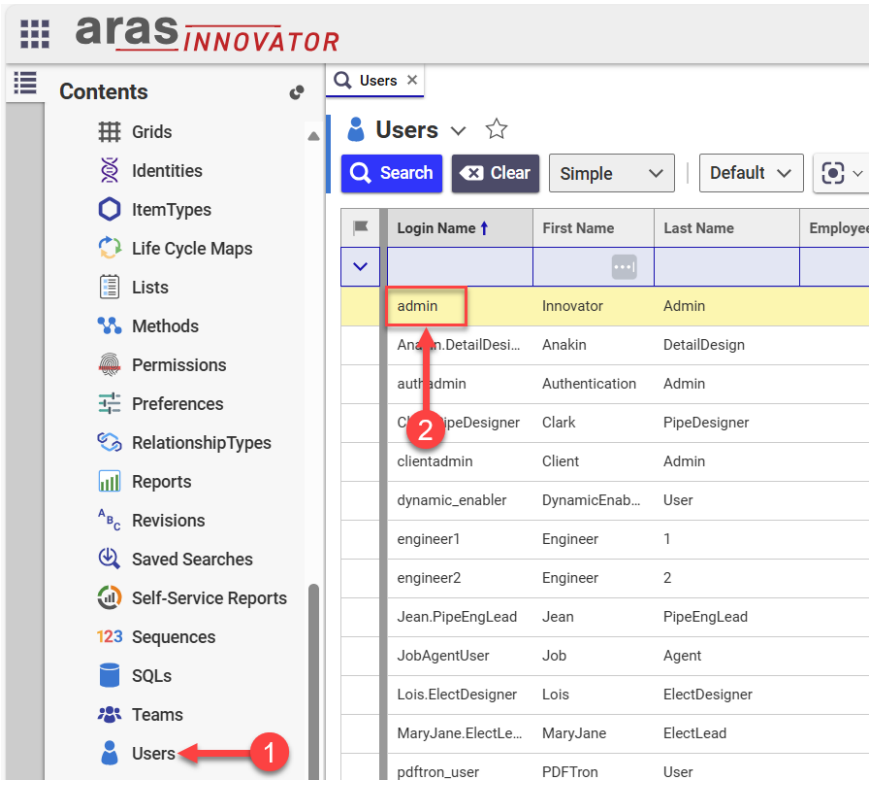


You'll need the admin user's login name and password if either have been changed from Out of the Box: admin & innovator.

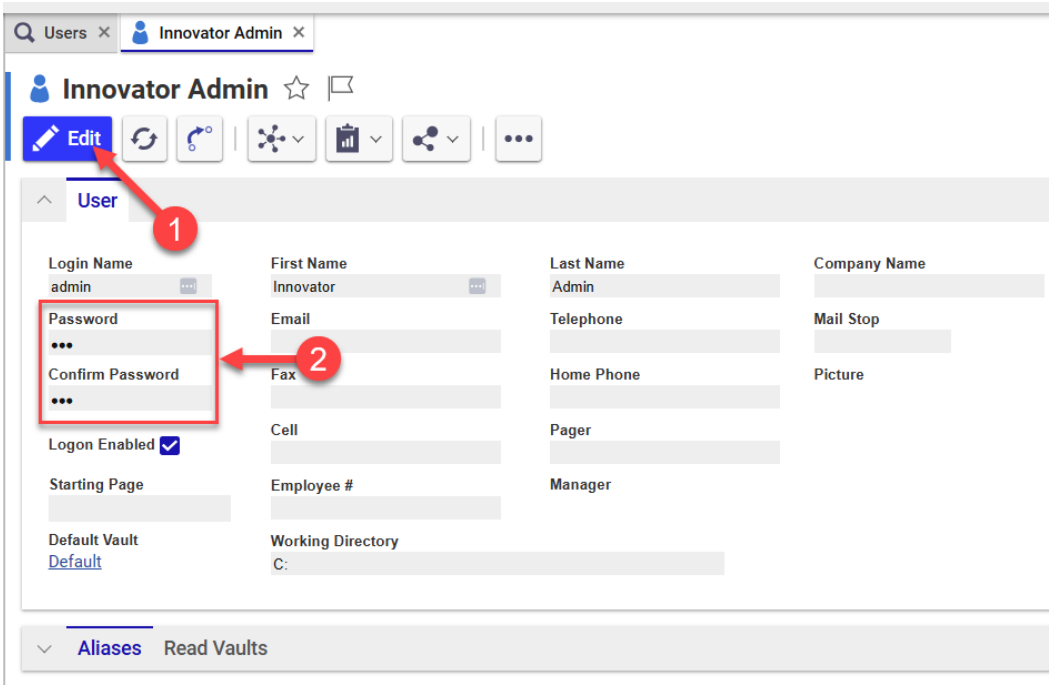
You can find Users in ShipbuildingPLM if you're logged in as an administrator by going to the administrator section in ShipbuildingPLM.



Then you can find Users and locate the admin user.

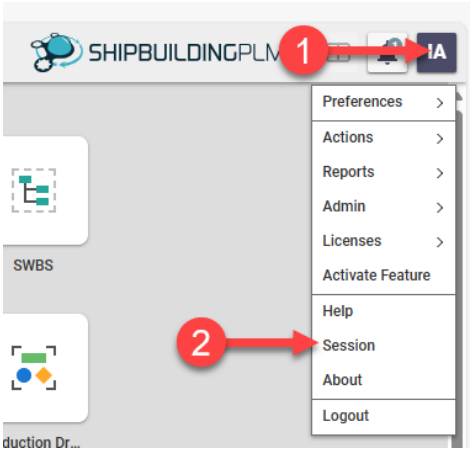


If you want to change the password to your admin user, you can open the User record to edit and change password.



The last thing you'll need is the Database name for when you add the DatabaseName Value into Floor2Plan.

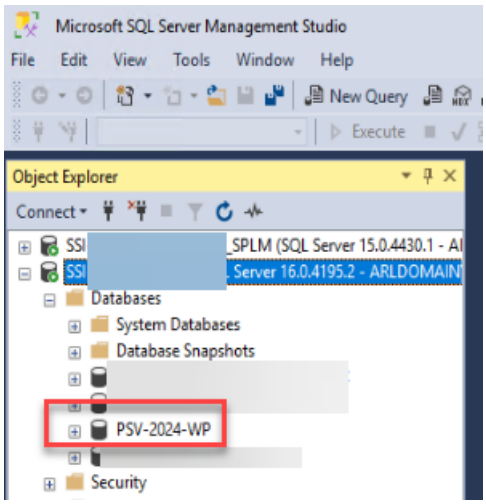
When you're logged into ShipbuildingPLM, you can see the database name by clicking your User Profile in the top right corner and selecting session.



The name under Database is what you're looking for.

You may also see it when you're logging in.

You may also see it in the SQL Server Management Studio where you restored it as a database and gave it its database name.



Floor2Plan Configuration File

Find the Floor2Plan configuration file *appsettings.Production.json*, in the Floor2Plan website installation folder:

Name	Type	Compressed size	Password ...	Size	Ratio	Date modified
zh-Hant	File folder					04/02/2025 15:16
.eslintrc.json	JSON Source File	1 KB	No	1 KB	41%	04/02/2025 15:10
Application.Service.deps.json	JSON Source File	31 KB	No	181 KB	84%	04/02/2025 15:16
Application.Service.dll	Application extension	669 KB	No	2.069 KB	68%	04/02/2025 15:16
Application.SystemActions.deps.js...	JSON Source File	26 KB	No	144 KB	83%	04/02/2025 15:16
Application.SystemActions.dll	Application extension	17 KB	No	49 KB	66%	04/02/2025 15:16
appsettings.json	JSON Source File	1 KB	No	3 KB	63%	04/02/2025 15:10
appsettings.Production.json	JSON Source File	1 KB	No	1 KB	61%	05/02/2025 13:13
Asp.Versioning.Abstractions.dll	Application extension	36 KB	No	74 KB	53%	26/03/2024 16:36
Asp.Versioning.Http.dll	Application extension	60 KB	No	130 KB	54%	26/03/2024 16:36
Asp.Versioning.Mvc.ApiExplorer.dll	Application extension	29 KB	No	56 KB	49%	26/03/2024 16:36
Asp.Versioning.Mvc.dll	Application extension	32 KB	No	63 KB	51%	26/03/2024 16:36
Aspose.Drawing.dll	Application extension	3.761 KB	No	7.637 KB	51%	05/05/2023 10:36
Aspose.Tasks.dll	Application extension	2.690 KB	No	5.771 KB	54%	22/10/2024 16:33
AsyncKeyedLock.dll	Application extension	40 KB	No	90 KB	57%	23/01/2024 10:02

Edit this file using Notepad++ and add the following code **inside** the first brace **{** and last brace **}**. Make sure that you add a comma **after** the "F2P" code block, example:

```
{
  "ConnectionStrings": {
    "InitialCatalog": ""
  },

  "F2P": {
    "Infrastructure": {
      "License": {
        "Client": "core"
      },
      "Client": {
        "SystemName": "core"
      },
      "KeyVault": {
        "TenantId": "",
        "Uri": ""
      }
    }
  },

  "ShipbuildingPlm": {
    "ODataApi": {
      "BaseUrl": "",
      "BaseRelativeUrl": "",
      "UrlBaseQuery": "",
      "TokenRelativeUrl": "",
      "ApiRelativeUrl": "",
      "Username": "",
      "Password": "",
      "Scope": "",
      "GrantType": "",
      "ClientId": ""
    }
  }
}
```

Added code in red.

Code to add to the settings file:

```
"ShipbuildingPlm": {
    "ODataApi": {
      "BaseUrl": "http://url-to-innovator-server/",
      "BaseRelativeUrl": "InnovatorServer/",
      "UrlBaseQuery": "?StartItem=",
      "TokenRelativeUrl": "oauthserver/connect/token",
      "ApiRelativeUrl": "server/odata/",
      "Username": "admin",
      "Password": "12345",
      "Scope": "Innovator",
      "GrantType": "password",
      "ClientId": "IOMApp"
}
```

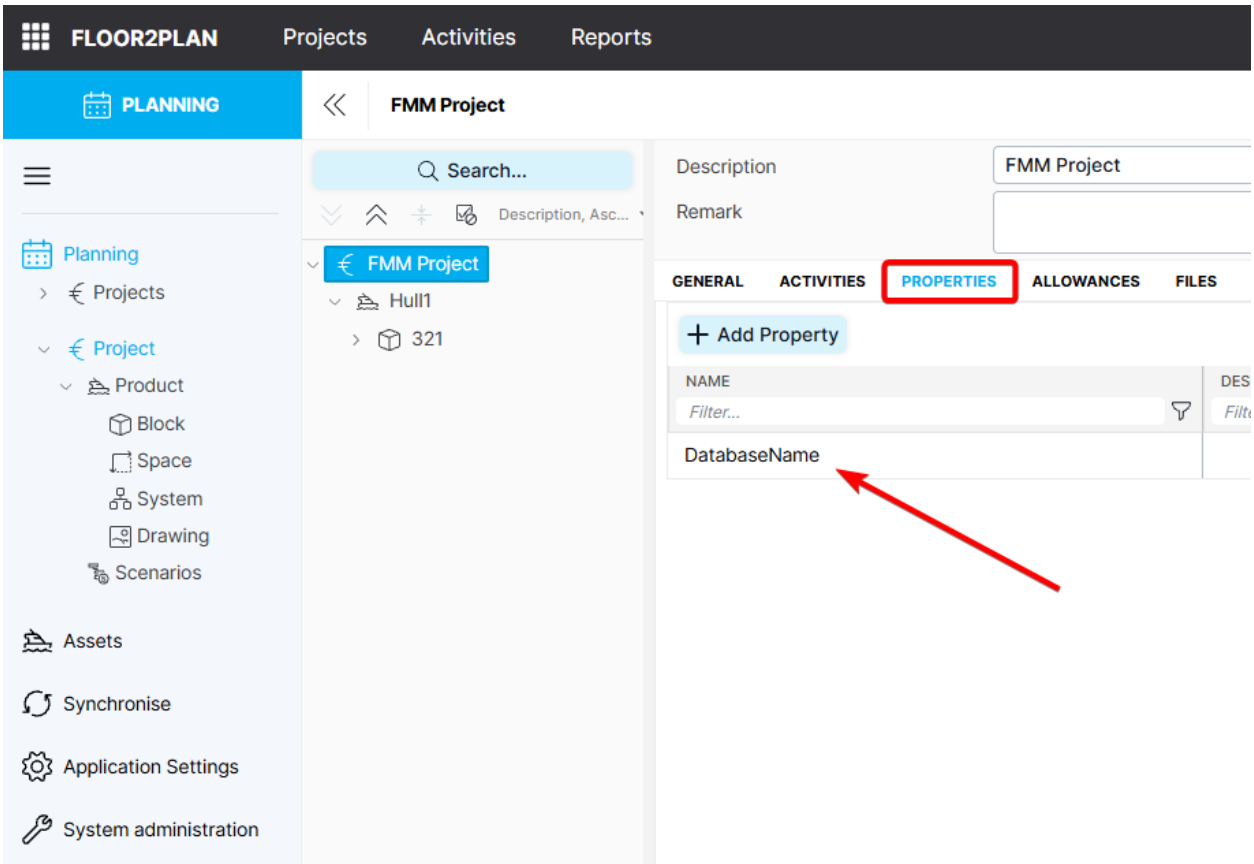
Edit the values of the red properties to reflect the current installation.

Save the file and **restart the Floor2Plan website in Internet Information Services**.

Test the configuration

Navigate to the Projects module and click on a project that needs to be synchronized. Only projects with a property called **DatabaseName** will be synchronized.

See below example:



Make sure this property has a valid database name as its value. If the project does not have this property, you can create it using the **Add Property** button:

Name: **DatabaseName**

Description: *Leave empty*

Type: **custom**

Type Option: *n/a*

Value: *<project name in Shipbuiling PLM>*

Next, navigate to Synchronise > Shipbuilding PLM and click **Synchronize** to start the synchronization process. This will update all projects with the **DatabaseName** property.

Acronyms & Definitions

SWBS: Ship Work Breakdown Structure
- A way ships are organized by categories and systems.

UOM: Unit of Measure
- A definite magnitude of a quantity, e.g. inches, meters, each, etc.

GUID: Globally-Unique ID
- A unique identifier rather than a name to ensure uniqueness.

PnID/P&ID: Piping & Instrumentation Diagram
- Functional Drawings as Diagrams or Schematics.

COTS: Commercial-Off-The-Shelf.
- Purchased Parts from Vendors.

CRB: Change Review Board
- A group of people from the project team that meets to consider changes to the project.

ILS: Integrated Logistics Support
- A management strategy for planning and developing efficient support for systems throughout their lifecycle.

VFI: Vendor-Furnished Information
- Documents and Guides provided by Vendors for Catalog, etc.

GFI: Government Furnished Information
- Documents and Guides provided by Government for Catalog, etc.

PLM: Product Lifecycle Management
- A way to manage your product through its entire lifecycle.

SPLM: ShipbuildingPLM
- A Product Lifecycle Management software designed specifically for shipbuilding.

BRO: Block Release Order
- A container to release full blocks (units) to set baselines, as well as open up blocks for change to come back through.

RCO: Release Change Order

- A container to release ShipConstructor parts by assembly or drawings through a workflow.

FCO: Functional Change Order
- A container to release functional items through a workflow.

CRO: Catalog Release Order
- A container to release catalog parts through a workflow.

DCO: Document Change Order
- A container to release catalog parts through a workflow.

OOTB: Out-of-the-box
- Part of the original software without additional coding.

DPN: Dynamic Product Navigation
- A 3D Viewer that allows part interaction.

AML: Adaptive Markup Language
- An XML variant.

DAC: Domain Access Control
- DAC is a method that grants users control over the permissions to their resources, enabling information system and data owners to decide who can access the respective resources and what level of access they can have.

SSR: Self-Service Report
- A Self-Service Reporting tool within ShipbuildingPLM through Release 30.

ECM: Engineering Change Management
- Engineering change that includes PRs, ECRs, and ECOs.

PR: Problem Report
- A way for users outside of Engineering to identify problems.

ECR: Engineering Change Request
- A requested change from the engineering department either from a PR or internally.

ECO: Engineering Change Order
- A Project Management container to manage scoped change through actual change.

SC: ShipConstructor
- A CAD/CAM system specifically designed for ship design.

EP: Enterprise Platform
- Connector that processes ShipConstructor data for exports.

PIL: Project Item List
- A list of modeling tasks in ShipConstructor, which can come from Functional Design and use ShipConstructor Catalog to place.

PH: Product Hierarchy
- A way to define build strategy and grouping within ShipConstructor.

DWI: Digital Work Instructions
- A smaller subset of drawings specific to a charge code with step-by-step instructions for completion.

VWI: Virtual Work Instructions

- A smaller subset of drawings specific to a charge code with step-by-step instructions for completion.

ERP: Enterprise Resource Planning

- A software to manage resources across the company, especially material and costing.

MES: Manufacturing Execution System

- A software to track and document the transformation of raw materials to finished goods, including the location and status of completion of parts.

MRP: Material Requirements Planning

- Software-based integrated inventory and supply management system designed for business.

MRO: Maintenance, Report, Operations

- Any activities and processes needed to run a business such as asset maintenance, accounting, customer service, and even administrative tasks like responding to emails and reception duties.

MIM: Marine Information Model

- This refers to the shipbuilding specific concepts and data organizational principles that pertain to our industry. Things like hulls, SWBS, blocks, parts, database structures and drawing principles behind those.

NSRP: National Shipbuilding Research Program

- A US Navy funding program that shipyards can access/collaborate on. We actively participate/contribute to this as a part of being industry leaders in the shipbuilding space.

Revisions

Revision Number	Revision Date	Nature of Revision	Version / Build	Updated By
1	07-09-2025	Initial Issue	SPLMR23-1661 / SPLMR30-3.0 / F2Pxxxx?	Craig Price Mark Connelly Yannick Kalter
2	07-10-2025	Add manual for configuring Floor2Plan/Shipbuilding PLM		Yannick Kalter
3	07-11-2025	Added screenshot for F2P appsettings file location		Yannick Kalter
4	07-15-2025	Added location of ShipbuildingPLM Database name to support F2P DatabaseName Value	SPLMR23-1661/SPLMR30	Craig Price

5.3 Value Stream Workshop Summary Notes

The document below summarizes the outcome of the two shipyard value stream workshops held in September and October 2023. The detailed observations are considered proprietary to the respective shipyards.

Value Stream Workshop Summary – NSRP RA_ADP Project

Overview

As part of Milestone 02A of the RA23 project, workshops were conducted at two participating shipyards—**HII Ingalls Shipbuilding** and **Fincantieri Marinette Marine (FMM)**—to map value streams and gather insights for implementing digital shipyard solutions using **Floorganise's Floor2Plan** software.

Workshop Highlights

HII Ingalls Shipbuilding (Sept 12–13, 2023)

- **Production & Engineering**: Explored current workflows, challenges with scheduling, material logistics, and integration of engineering data into planning. Noted issues with manual progress tracking and lack of visibility into engineering changes.
- **Foremen & Supervisors**: Discussed the need for automated progress tracking, better change management, and reducing KPI stress on shop floor personnel.
- **Planning & Production Control**: Identified disconnects between engineering and planning, manual data handling, and opportunities for improved sequencing and material tracking.
- **IT & Infrastructure**: Reviewed existing systems (Aras PLM, ERP, AutoCAD) and discussed integration possibilities with Floor2Plan and ShipbuildingPLM.

Fincantieri Marinette Marine (Oct 26–27, 2023)

- **Engineering & Planning**: Detailed their process from 2D functional design to 3D modeling and production drawings. Highlighted change management workflows and integration with MRP systems.
- **Production & Control**: Focused on work package creation, progress tracking, and challenges with material availability and change implementation.
- **Scheduling**: Reviewed use of P6 and ShipyardAI for capacity planning and lifecycle scheduling. Emphasized the need for better integration between departments.
- **IT**: Meeting was postponed, but preliminary discussions indicated a need for infrastructure assessment to support software deployment.

Conclusion

The workshops provided critical insights into the operational and engineering practices at HII and FMM. These findings will directly inform the development of digital shipyard models and pilot blocks tailored to each shipyard's needs. The collaborative discussions with subject matter experts helped identify key areas for improvement, including data integration, change management, and progress tracking. Moving forward, the project team is well-positioned to implement Floor2Plan and ShipbuildingPLM solutions that enhance efficiency and support the broader goals of the NSRP RA_ADP initiative.

5.4 Implementation Next Steps: Floor2Plan

Floorganise provided a notional roadmap for implementation of their Floor2Plan software during the final workshop. This presentation has been provided below for reference. Any queries related to Floorganise software should be directed to Ronald de Vries, +31(0)85 401 1824 or info@floorganise.com.

Prototype project timelines

Floorganise

Phase	Themes and topics	Deadline
1.0	Decision making from Customer - Start date project subject to joint decision making	Start of project Week 0
1.1	Capture context from the shipyard - Interviews and workshops - Understand major pain points from key roles - Understand local process logic and sequencing - Understand local IT-infrastructure and systems - Process mapping related to Floor2lan modules	Week 6
1.2	Technical preparation and functional validation - Setup new environment - Basic configuration to yard logic - Running standalone environment - Validation through initial project data exchange	Week 8
1.3	Functional delivery and validation - Create project data exchange routine - Verify training approach - Train key-users - Go Live in production with first users	Week 13
2.0	Hypercare to support users in production - Hypercare support to sustain proper usage - Enabling data exchanges/integratons where needed - Enabling small user additions and requests	Week 13-26 End of project
	Miscallenous - on site visits - Installation of Floor2Plan - Hardware for shop floor control (touch screens) - Hardware for punch in / out - Unlimited licensing and users for 3 months	all included

Prototype project timelines

Floorganise


Philly
Shipyard


Shipyard reduction forecast
Shipyard fundamentals:
1,000 workers in the shipyard
1 supervisor per 20 workers (50 in total)
20 planners / work preparation
1.750 hours worked per year
HR/Planner = $ 75 k salary costs annually
220 working days
Hourly rate is $ 60
Floorganise


Level 1
A paperless shop floor
Key: automate manual efforts
Set foundation
Level 2
Look ahead & beyond
Key: engage and reflect beyond your team and today
Accountability
Level 3
Intelligent planning and control
Key: optimize processes holistically
Deflate buffers
Level 4
Shipyard holistic control
Key: integrated control from deck plate to portfolio level and process to supply chain
Overall chain
Level 5
World class performance
Key: incorporate novelties through continuous improvement culture
Culture and novelties
Floorganise