



Shipyard AI[®]

Advanced Shipyard Planning and
Scheduling Application



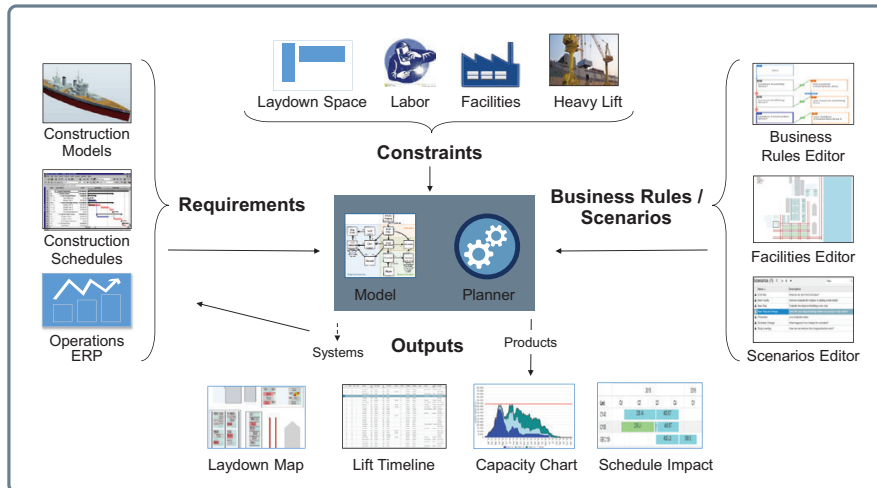
Background and Introduction

Shipbuilding is a long and highly complex process, presenting shipyards with multiple challenges including:

- Multiple hull configurations/multiple vessels under construction simultaneously
- Limited space greatly impacted by changes in schedules and fabrication plans
- Labor intensive planning activities
- Need to reduce operational expenses

Solution Brief. [➤](#)

To help shipyards with these challenges we launched Shipyard AI, a multi-user, “web” enabled application (limited by roles and rights) that uses an **optimization-based automated capacity planner** to create and publish **laydown maps** and a **schedule** indicating where items are to be located over time.



Shipyard AI:

Provides shipyards with unrivaled flexibility and planning capability, enabling management and key stakeholders to visualize multiple production scenarios, analyze potential results and optimize decision making.

- Maximize Throughput to Improve Bottom Line Results
- Automated Foot-Printing
- Built-In, Optimization-Based Decision Making
- Extensive Map Editor
- Automated Data Updates
- Dynamic Continuous Capacity Planning
- Intuitive Multi-User Distributed Environment
- Direct Interactive Access Through Mobile Devices



Measurable Impact on Yard Performance

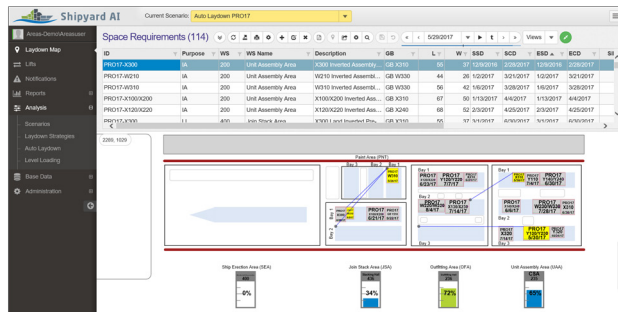
“The new tool has taken a process that historically took 10 weeks to complete and can now finish the scheduling activity in less than an hour.

Following project completion and full system implementation, Ingalls expects to reduce 'real estate' allocation processing time by 30% and place 20 more units 'under cover' annually, with an estimated cost savings of over \$990K per year."

— Article from theSignal

Shipyards AI projects work-center utilization over time and helps identify and eliminate **bottlenecks** of key resources like labor, cranes, transporters and space across multiple facilities.

Shipyards AI includes a robust capability to **import, validate, interpret and display data from external systems**, including: master scheduling systems, ship construction applications, facility data, work order detail, Excel® or any legacy data source.



Shipyards AI's scenario runner provides an **extensive “what-If” capability sandbox to experiment** with any facility, resource or schedule probabilities in a risk free virtual environment.

Shipyards AI's output **report module provides unlimited multiple-scenario comparisons across any Key Performance Indicator** which empowers users to make rapid quantifiable decisions.



Shipyard AI Out of the Box Capabilities:

- Integrates disparate data sources into one Enterprise Planning System that provides a single view of production activities
- Applies rule and constraints-based schedule and process simulation to forecast outcomes and facilitate continuous planning
- Provides online, on-demand access to capacity planning data, analytic visualizations and reports
- Provides a “sandbox” for rapid “what-if” analysis to better quantify the impact of “good ideas”
- Machine learning optimization engine which autonomously explores alternative plans, in search of highest payoff
- Automatically lays out yard activities for planning horizon used by organization
- Facilitates planning/scheduling of production at multiple levels
 - Raw material-plates-units-grand blocks
 - Shows collisions and conflicts
 - Allows for capacity and demand analysis in short/ medium/long term perspectives
 - Built-in business rules allow for automatic solving of issues
- Allows for injection of additional demand and analysis of effect on future production efforts

Time Savings

Weeks of Effort -> Days

- Analysis of the capacity related impact of new ships, ship designs, yard changes

Days of Effort -> Hours

- Development of alternative plans and their impacts across the yard

Weekly Activities -> Nearly Instant

- Capture and communicate schedule and capacity changes
- Analysis of the impact of schedule and capacity changes



Quantitative:

- Improves automated process of scheduling and assignment of build unit lay-down locations resulting in significant savings
- Lowers ship to ship fabrication costs
- Reduces schedule risk
- Speeds up operational decisions

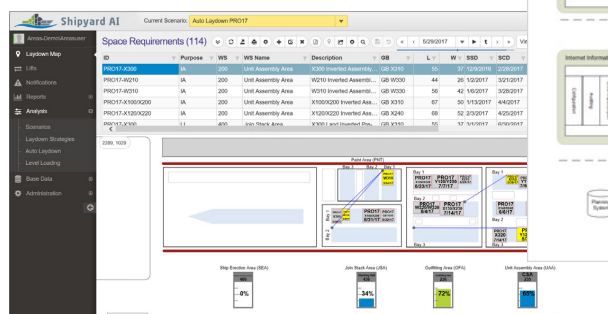
Qualitative:

- Focus of effort shifted to improving situations not just fire fighting issues
- Production plans are more stable providing a more predictable environment
- Helps shipyards meet regulatory requirements
- Enables planning for repeatable work stations
- More rapid and agile response to “What-If” requests

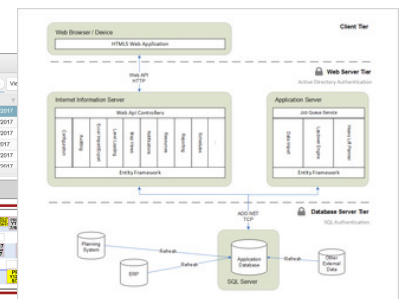
Application Features of Shipyard AI:

Automated Construction Space Allocation over Time

Auto lay-down map over time & lift schedule. Saves time and cost associated with manual footprinting

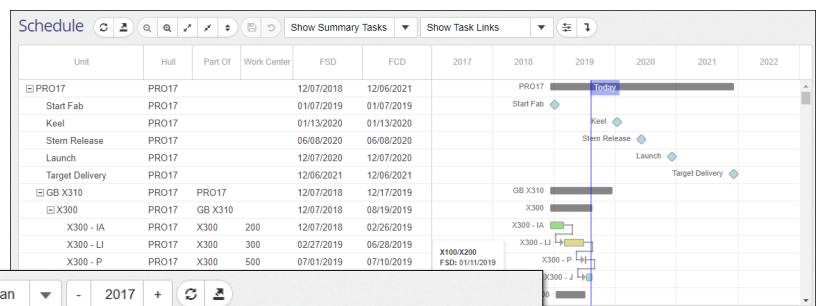


Modern Distributed Architecture



Reporting

System reporting data is available to personnel in whatever form is most useful. Centralized access control ensures live access only to information appropriate to each role



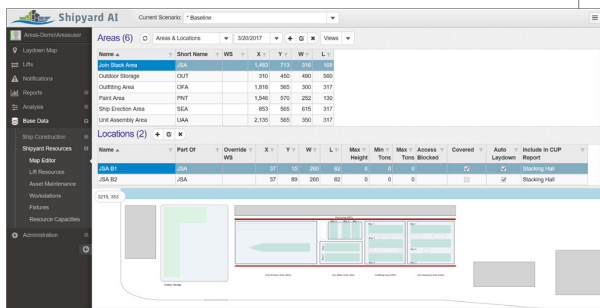
Census (1/1/2017-4/1/2017)									
Facility	Workstations	Unit Of Measure	Census Weight	Average Capacity	Average Demand	Average Utilization	Weighted Average	Peak Utilization	Min Utilization
Bulkhead Line	215/217	BHD / Week	0.0899	5	4.51	90.28 %	8.12 %	133.12 %	51.35 %
Panel Line	220/221	Weld Ft / Week	0.0899	2,500	1,919.49	76.78 %	6.90 %	118.19 %	40.33 %
Panel Shop	225	Sq Ft	0.0899	0	0	0 %	0 %	0 %	0 %
CSA	235	Sq Ft	0.0899	50,000	15,927.47	31.85 %	2.86 %	77.63 %	4.80 %
Outfitting Hall	236	Sq Ft	0.0899	40,000	0	0 %	0 %	0 %	0 %
Stacking Hall	436	Sq Ft	0.0899	30,000	1,069.62	3.57 %	0.32 %	21.76 %	0 %

Sandbox “What If” Analysis

Test capacity for potential future ships | Change facilities | New ship designs

Ship Construction Data

Ship construction data includes dependencies, sequencing, resources required and other relevant properties imported directly from other systems or via Excel

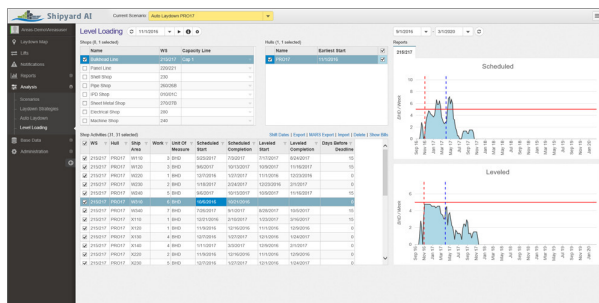


Facility Data

- Import from CAD and customize in the tool
- Construction space is marked up within the tool along with relevant construction space properties

Shop Schedule Optimization

The shop scheduling “level loading” algorithm seeks to load the shops at full capacity and decrease or eliminate overtime costs to ensure unit construction schedule compliance



Schedule Slip Impact and Mitigation

- Data from integrated systems or analysts provides information to the system when unit construction may be running late
- The system will alert and visualize schedule slips and their downstream impact
- Various mitigation options are available to the analyst (in coordination with operations) by:
 - Hand-editing locations and timings, or
 - Allowing system to suggest mitigations

Crane and Transporter Planning

Unit locations over time drive crane and transporter planning.

- List of required unit lifts
- Visualization of each move
- Crane and transporter assignment and tracking
- Supports misc. lifts

