

Wind River Product Development Life Cycle

April 2020 V5

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*Wind River Product Development Life Cycle*

April 2020

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**Contents**

[1 Terminology 5](#_Toc37057467)

[2 Introduction 7](#_Toc37057468)

[3 Roles and Responsibilities 8](#_Toc37057469)

[4 Wind River Product Realization Process 10](#_Toc37057470)

[4.1 PDLC Process Overview 10](#_Toc37057471)

[4.2 Release Types 11](#_Toc37057472)

[4.2.1 PDLC Phases, Gates, and Milestones 11](#_Toc37057473)

[4.2.2 SDLC Overview 12](#_Toc37057474)

[4.3 Phase Exit Reviews and Transitions 13](#_Toc37057475)

[4.4 Plan-Program Phase 13](#_Toc37057476)

[4.5 Propose Program Phase 13](#_Toc37057477)

[4.6 Define Program Phase 13](#_Toc37057478)

[4.7 Test Program Phase 13](#_Toc37057479)

[4.8 Live Program Phase 14](#_Toc37057480)

[4.9 Plan Release Phase 14](#_Toc37057481)

[4.10 Propose Release Phase 14](#_Toc37057482)

[4.11 Define Release Phase 14](#_Toc37057483)

[4.12 Develop/Test Release Phase 15](#_Toc37057484)

[4.12.1 Develop/Test Phase Details 16](#_Toc37057485)

[4.12.2 SDLC RTO Checklist 16](#_Toc37057486)

[4.13 Launch Release Phase 16](#_Toc37057487)

[4.13.1 Release Criteria 17](#_Toc37057488)

[4.14 Sustain Phase 17](#_Toc37057489)

[5 Supporting Processes 19](#_Toc37057490)

[5.1 Wind River EOL Process 19](#_Toc37057491)

[5.2 Configuration Management 20](#_Toc37057492)

[5.3 Defect Management 20](#_Toc37057493)

[5.4 Program Reporting and Tracking 21](#_Toc37057494)

1. Terminology

| **Item** | **Definition** |
| --- | --- |
| BSP | Board Support Package |
| Bug board | A change control board (also referred to as a CCB) that reviews all defects and controls how defects are prioritized and handled within the program. |
| EOL | End of Life Indicates that the product is removed from the market. It is no longer sold, supported, repaired, or otherwise maintained unless extended support has been negotiated through Professional Services for an additional fee. |
| EOS | End of Support |
| FC | Feature Complete |
| GA | General Availability |
| GTM | Go to Market Indicates a state where the product is ready to be released to customers. The GTM team determines when this state is reached. |
| GTM Team | The GTM team is a fully cross functional product team that includes representatives for all key stakeholders. This team is responsible for identifying risks, developing mitigation plans, and escalating and triaging any issues which prevent GTM. Each GTM team member represents their functional or product area. GTM meetings are bi-weekly status meetings lead by the PMO that are used to track in-flight programs. |
| PDLC | Product Development Life Cycle |
| PER | Phase Exit Review Defines a point in time where a review establishes that a Program or Release may transition to the next phase. |
| PMO | Program Management Office |
| POI | Plan of Intent |
| POR | Plan of Record |
| PRD | Product Requirements Document |
| Program | Defines an executive-approved group of releases for a single product within one of Wind River’s product lines. For example, VxWorks 7. |
| PRT | Program Release Team Refers to a milestone in the development test phase. |
| Release Type | There are 4 Release Types, Major (Vw), Minor (Vw.x), Update Pack (Vw.x.y) and Service Pack (Vw.x.y.z). |
| RTO | Release to Operations Refers to a gate between the development test phase and the product launch phase. |
| SDLC | Software Development Life Cycle |
| SOW | Statement of Work |
| SQA | Software Quality Assurance |

1. Introduction

This document is part of Wind River’s commitment to providing device manufacturers in safety critical industries with the information they need to allow them to fully evaluate the suitability of Wind River embedded solutions for use in their application. This document provides information on Wind River’s internal development processes that include the Wind River Product Development Life Cycle (PDLC) and the Wind River Software Development Life Cycle (SDLC) as applied to our embedded operating systems programs.

This overview is limited to those areas that could affect the quality of the products developed as is appropriate for external consumption. This is not intended to be a full description of the Wind River PDLC and SDLC development processes, which are documented internally. Portions of the PDLC and SDLC solely related to sales and other financial aspects that do not affect the quality system in which the products are developed are not included.

For additional information, access the [PMO PDLC webpage](https://jive.windriver.com/community/marketing/marketing-operations/pmo-pdlc) from the internal Wind River network. User login is required.

1. Roles and Responsibilities

Table 1 describes the responsibilities of personnel with key roles related to Wind River product development and releases.

Table Roles and Responsibilities

| **Role** | **Responsibilities** |
| --- | --- |
| Program Management Office (PMO) | Manages the overall development effort ensuring programs follow the PDLC and the SDLC. The responsibilities are as follows:   * Plans and coordinates communication across functional groups. * Provides program status to executive management. * Generates the portfolio view and the program release calendar. * Builds metrics on product development effectiveness. |
| Executive Management | This group is ultimately responsible for approving, cancelling, or redirecting programs and providing adequate resources.  The Executive Management includes the general manager, vice presidents, senior vice presidents, and equivalents. |
| Product Management | Manages product requirements in a requirements management database. |
| Development Engineering | Creates the following:   * technical requirements * specifications * high level and detailed software designs * software to meet the requirements   Participates in the following:   * code reviews * testing * bug analysis * bug fixing * other software related tasks |
| Release Operations | Completes the Release to Operations (RTO) and General Availability (GA) checklist. |
| Marketing | Creates a Go To Market (GTM) plan. |
| Test Engineering | Responsible for the following:   * Plans system testing. * Conducts full product testing. * Performs use case testing. * Approves the bug list. * Ensures all identified defects are entered into the defect tracking system. * Defines the release criteria. |
| Information Development | Develops a documentation plan and executes the plan to produce product documentation for the program. |
| Customer Support | Provides customer support for the released product. |
| Wind River Support Network (WRSN) | Creates the WRSN readiness plan and updates the WRSN website and corresponding product Web pages. |
| Customer Education and Technical Training | Creates the following:   * Customer education strategy. * Technical and customer training plans. * Product training material. |
| Engineering Program Manager | Responsible for tracking and managing the engineering program aspects of a release. |
| Test Manager | Manages the testing of the release and responsible for the defect tracking system contents |

1. Wind River Product Realization Process

The Wind River product realization process consists of a high-level business Product Development Life Cycle (PDLC) and a more detailed Software Development Life Cycle. The overall life cycle consists of a series of sequential phases with defined gates at the end of selected phase transitions. The definitions are as follows:

* A phase is a logical set of tasks and activities with defined deliverables.
* Gates have defined criteria that allow the current status of the phase and the overall program to be assessed in a consistent manner.
* A deliverable provides evidence of the activities completed.
  1. PDLC Process Overview

The Wind River PDLC is a business-level framework for taking products from idea to retirement. The primary goals of the PDLC include:

* Develop the right products.
* Deliver those products with best-in-class quality, cost, and time to market.
* Maximize resources throughout the life cycle, from development through launch.

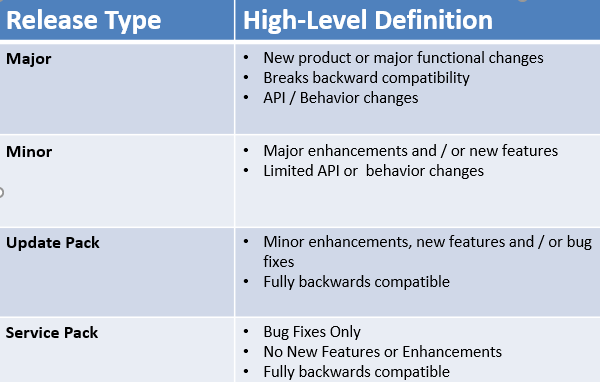
The Wind River PDLC process is responsible for implementing the Wind River committed roadmap which is defined by executive management for each product line. The committed roadmap identifies programs, high-level feature sets, timelines, and quality criteria. Commitments are approved by executive management and managed under an approval and change management process.

The Wind River PDLC process is broken into two levels. The first, the Program Level, defines the business justification and strategy for an upcoming group of releases. Programs are specific to Product Lines and there may be multiple programs within each product line. The second, the Release Level, contains all the releases that fall within the defined Program parameters.

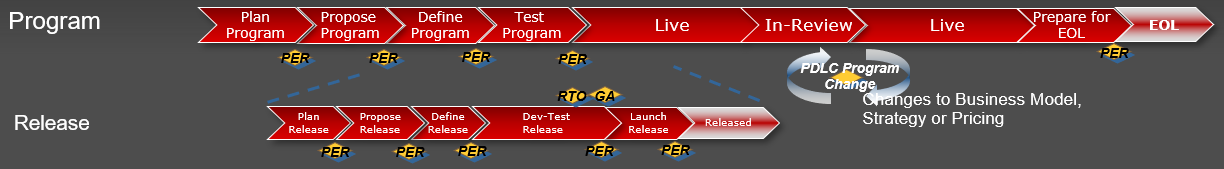
The Wind River PDLC process consists of the following phases:

* Program Level
  + Plan-Program: Determine the needs & business justification
  + Propose-Program: A commitment to the roadmap and release cadence
  + Define-Program: Business and strategy defined and approved
  + Test-Program: Prepare supporting functions and operations for the coming release sequence
  + Live: The release level is actively developing and posting release content
* Release Level
  + Plan: Involves due diligence on a product opportunity.
  + Propose: A commitment to investing in the product.
  + Define: A commitment to develop the product.
  + Develop/Test: The development and test of the product.
  + Launch: General availability of the product.
  + Sustain: End of life process for the product.
  1. Release Types

There are four release types. The process surrounding each release type is adjusted by the release tools when the release is created. For example, a Service Pack release, which is defect fixes only, has fewer milestones and checklist items created than a Major or Minor release.



The Wind River PDLC phases, gates, and software development milestones are as follows:



* + 1. PDLC Phases, Gates, and Milestones

PDLC phase transitions are controlled by a Phase Exit Review Checklist which is a defined set of criteria based on the Release Type, planned content and expectations of the Program and Release. Checklists are defined based on the release type and planned requirements of the release. These are referred to as PDLC Phase Exit Review checklists what are associated with activities and deliverables for each Go to Market (GTM) team member. Table 2 provides an overview of each PDLC phase.

Table PDLC Release Phases

| **Phase** | **Internal Gate** | **Exit Review Checklist** | **Milestones** |
| --- | --- | --- | --- |
| Plan Program |  | Plan Program Exit PER Checklist |  |
| Propose Program |  | Propose Program PER Checklist | * Business Plan Approved |
| Define Program |  | Define Program PER Checklist | * Business and internal operational aspects defined |
| Test Program |  | Test Program PER Checklist | * Internal operations established and tested |
| Live |  |  |  |
| In-Review |  | Modify Program Checklist |  |
| Plan Release |  | Plan Release PER Checklist | * Release Content Proposal |
| Propose Release |  | Propose Release PER Checklist | * Release Approved |
| Define Release | Plan of Record (POR) | Define Release PER Checklist | * Plan of Record (POR) defined in Engineering Requirements Tool |
| Develop/Test Release |  | Develop/Test PER Checklist | * Individual Feature Complete * Code Freeze * Release to Operations (RTO) |
| Launch Release | General Availability (GA) | Launch PER Checklist | * Customer Experience * General Availability (GA) |
| Releases / Sustain | End of Life (EOL) | Not applicable | Not applicable |

* + 1. SDLC Overview

The Software Development Life Cycle (SDLC) defines the process for software development as follows:

* initial planning
* development
* test
* release
* sustain

The SDLC is used for new development and maintenance updates and is supported by a number of additional processes including requirements and defect management.

* 1. Phase Exit Reviews and Transitions

Phase Exit Reviews (PERs) are used to approve program transitions throughout the PDLC life cycle. This includes committing adequate resources for the next set of activities, assessing the key risks involved with the program, and setting expectations between executive management and the product teams.

Each PDLC Phase Exit Review has an associated checklist. Meeting minutes, release status and action items are documented from the PDLC Review Meetings held bi-weekly. The PMO can grant a provisional transition to the next phase even if some non-critical exit review checklist items are not complete. This allows the program to progress to the next phase but still requires that any remaining items from the previous phase be closely tracked to completion. Action items are tracked by the PMO. All action items include an owner, status, and assigned dates.

* 1. Plan-Program Phase

The Program-Plan involves the due diligence performed by the product team to establish the business strategy and market needs of the product releases

At the end of the Plan-Program phase the product management team is ready to propose the releases and content to the executive team for approval.

* 1. Propose Program Phase

The Program-Propose involves the analysis of the business proposal and initial investment approval including resource allocation.

At the end of the Propose-Program phase the program is approved and ready for development to begin.

* 1. Define Program Phase

The general business, operational and marketing needs for the planned releases are established and communicated to all supporting functions. This includes initial notification of export, customer support and marketing.

At the end of Define-Program phase the business and strategy aspects of the planned releases are defined and approved.

* 1. Test Program Phase

The supporting functional teams establish and test all internal product operational functions such as order processing.

At the end of the Test-Program phase the business operations are in place to support the upcoming releases as defined at the program level.

* 1. Live Program Phase

The program is approved and in progress. PDLC monitoring moves to the Release Level.

* 1. Plan Release Phase

The Plan Release Phase involves due diligence performed by the product team and includes the following:

* Roadmap development
* Business/Investment Requirements
* Strategic Alignment
* High-Level Requirements

Approval at the Plan Phase means that the opportunity can move to the Proposal Phase.

* 1. Propose Release Phase

The purpose of the Propose Release Phase is to identify and define the product capabilities that are required to meet the needs of the customer and the identified market for the release.

At the end of this phase the release and content are approved are ready for final definition.

* 1. Define Release Phase

The purpose of the Define Release Phase is as follows:

* Create a detailed definition of the release.
* Reach agreement on product content.
* Develop plans to deliver the resulting product.

(including resource commitments to begin development of the product).

The Define Release Phase activities and deliverables are verified using the Define Phase Exit Review Checklist. The Define Phase Exit Review Checklist, configured based on the release type, may include such key items such as:

* Create an integrated Program Plan and GTM Plan.
* Update the program dashboard in the Release tracking tool
* Approve a Plan of Record (POR) that includes defined release criteria.
* Create product architecture and high-level design (HLD) documents as required
* Create a development plan and high-level product test plan based on requirements as defined in the engineering requirements tool (e.g. Jira-Agile)
* Define the documentation requirements for the release.

During this phase of the PDLC, the engineering organization commits to the release requirements. This is done as part of the SDLC process.

The SDLC activities and deliverables that take place during this PDLC phase include:

* Review, revise (as needed), and agree to the POR.
* Add detailed functional and design specifications to the documented requirements.
* Create product architecture and high-level design documents.
* Finalize the product dates and content in the release tracking tool
* Create the development plan.
* Create the high-level product test plan.

The POR defines the overall development scope and is not necessarily a single document or set of documents but rather a collection of items that address planning criteria. The POR can be organized into a single portal, can have links to other pages or processes, or can just document items to be addressed in the release. The POR includes a project schedule with committed resources and includes a Quality Statement identifying the quality objectives for the release. These items are most often documented in the checklist artifacts in the Release Checklists. The POR includes the defined release criteria for a release and is defined in the engineering requirements tool. Release Criteria can include identification of all requirements planned for a particular release, performance requirements, and all previously known bugs that are committed to be fixed in the program. Additional items, such as a Statement of Work (SOW), may also be part of the POR.

* 1. Develop/Test Release Phase

The purpose of the Develop/Test Release Phase is to develop and test the product in accordance with the POR, and to complete plans for launch activities. Testing is a combination of automated and manual test cases.

The Develop/Test Release Phase activities and deliverables are verified by the use of the Develop/Test Release Phase Exit Review Checklist. The checklist includes key items such as:

* Confirm feature complete status and product readiness (for example, review product features, workflows, use cases, and evaluation candidates).
* Conduct prototype and usability testing, as appropriate.
* Develop detailed designs.
* Develop and test code.
* Complete RTO gating criteria as per the RTO checklist.
* Hold the RTO Go/No-Go meeting or communicate readiness via email.
* Conduct system testing of the product and document testing as part of the verification process.
* Conduct bug analysis and fixing.
* Develop product documentation.
* Create technical and customer training plans.
* Conduct system test, full product test, and use case testing as needed for validation.
* Create the Wind River Support Network (WRSN) update plan.
* Hold the General Availability (GA) Go/No Go meeting or communicate readiness via email.
* Complete GA gating criteria as defined in the GA checklist.

The primary focus of the SDLC during this phase of the PDLC is the design, development, and testing of the individual features as well as the overall feature complete milestone. Testing activities include continuous testing such as functional testing of individual features which have passed their individual feature complete milestones. Achievement of the FC milestone indicates that design, code and testing is complete for all individual features and that all feature complete criteria have been met.

* + 1. Develop/Test Phase Details

The PRT milestone, if included, occurs during the Develop/Test Phase. This milestone allows early access to an upcoming release for training purposes. Following the FC milestone, the engineering software development life cycle includes verification (that is, system testing), formal defect review, and bug fixing. The RTO gate is achieved after the Code Freeze milestone.

As part of the development process, Wind River implements the following policies to ensure good development practices:

* A peer review policy for code reviews – Code reviews are held prior to code check-in and integration. Code review tools, such as Code Collaborator, may be used to facilitate code reviews. Technology line leads can define the use of peer reviews to verify the work produced for their technology line (for example, requirements, specifications, designs, code, tests, plans, and other artifacts). Peer Review activities are planned and recorded.
* Design reviews – Design reviews are held by senior development staff. Each technology line has an Architect to help review for consistency and maintainability across the overall product design.
* A static analysis policy – Technology line leads identify appropriate static analysis tools for use in analyzing their code. Static analysis activities are planned and allocated during this design phase.
* A testing policy – This policy requires a test plan for system and integration testing. The test plan covers all testing activities for a release and can include the testing strategy, requirements tracking, testing tools, and a definition for the test environment. The SDLC includes unit, integration, and system testing. Unit testing is the responsibility of the individual software developers while system and integration testing is performed by dedicated test teams. Testing can be traced to specific requirements and is part of the requirements management process. Traceability is supported by the requirements management tools and test management tools where used. When possible, test execution is automated to allow for consistent repeated execution.
  + 1. SDLC RTO Checklist

The engineering SDLC activities and deliverables are verified by the use of the RTO checklist in the Release tracking tool. The RTO checklist includes key items such as:

* All requirements committed for the release are implemented.
* All fixes committed for the release are fixed.
* Documents are present in the release per the documentation plan.
* All planned testing is complete.
* Bug reports are filed for all test failures in a defect tracking system such as Jira.
* Bug fix testing is complete.
* Testing of product bundles using files supplied by Release Operations is complete.
* Records exist in the defect tracking system for all known defects.
* All priority P1 defects have been fixed.
* All open priority P2 defects have been reviewed.
  1. Launch Release Phase

The purpose of the Launch Release Phase is to conduct a final review of the product release content to ensure that the functionality, documentation, order processing and customer experience of the release meet expectations. New product training for customer service and operations is also provided during this phase.

The Launch Phase activities and deliverables are verified by the use of the Launch Release Phase Exit Review Checklist. The Launch Release Phase Exit Review Checklist includes key items such as:

* Ensure product customer experience meets expectations.
* Review and publish defects to Online Support as needed.
* Ensure that Documentation Website and corresponding product Web pages are updated.
* Complete product documentation.

During this phase that includes Release to Manufacturing and “Box Opening” milestones, the SDLC focuses on transfer to the Release Team and process validation ending with the General Availability (GA) gate.

The SDLC activities and deliverables are verified by the use of the GA checklist. The GA checklist includes key items such as:

* Defect tracking system records exist for problems found.
* Product version and support pages are ready to be populated and made externally available.
* Known defects are published to the WRSN website.
* The GA checklists are complete.
  + 1. Release Criteria

The software release criteria consist of the PER release checklist and Go/No-Go meeting. Release templates are used as a part of the Wind River engineering SDLC for both RTO and for GA. The release criteria include key items such as:

* All planned testing is complete.
* Testing of any defect corrections and regression testing is complete.
* Defects are open in the defect tracking system for all unresolved anomalies.
* All Priority P1 defects are corrected.
* All Priority P2 defects are reviewed and addressed as needed.

Product release notes include a pointer to a list of known defects. Descriptions and tracking information for these issues are made available through the Wind River Support Network (WRSN) website.

Major product releases must be unanimously approved by an interdisciplinary team consisting of support, field engineering, development engineering, product management, engineering operations, documentation, and marketing representatives.

* 1. Sustain Phase

The purpose of the Sustain Phase is to support the released product from GA through EOL. During this phase, Wind River provides customer support, plans subsequent updates, provides ongoing training, and plans the EOL strategy.

The SDLC process provides customer support and maintenance releases ending with the transition to Legacy milestone managed in the Product Life Cycle site. During this phase, Wind River investigates reported issues and releases fixes as required.

1. Supporting Processes
   1. Wind River EOL Process

Wind River has a defined end of life (EOL) process. It can be applied to a single product, a product line, or a specific product version or release. This process supports the removal of any Wind River artifacts from the market. Once an artifact has reached EOL, it is no longer sold, supported, repaired, or otherwise maintained by Wind River unless other arrangements have been previously made by the customer.

Wind River EOL planning takes into account customer impact, upgrade paths or replacement, migration, and succession plans. Prior to any EOL, a formal assessment (such as business and customer analysis) takes place and a summary is presented to executive management. Table 3 lists the EOL states.

Table End of Life States

| **EOL State** | **Description** |
| --- | --- |
| Legacy | At this time, maintenance and support are available but the product is no longer orderable. It also marks the end of the sale of additional seats for the product. At this time, an end of service announcement is released. |
| End of life planning (EOLP) | In this period, the impact of EOL is analyzed. Approval for EOL is gained from executive management and key internal stakeholders. EOL is officially announced to the customer base and Wind River teams. An EOL announcement is released. |
| End of life (EOL) | This period marks the end of technical support, engineering support, phone and email support, and the end of customer training courses for the product. |
| Long term support (LTS) | Product support is available under an extended support program as needed. |

Typical timelines for the EOL process are as follows:

* Legacy and EOL dates are posted on the Product Lifecycle Page when the product is released.
* EOL announcements are sent to customers 6 months to one year prior to EOL. Specific notification arrangements may be made with the customer
* Additional licenses and seats are made available for purchase for the next 12 months following the EOL announcement.
* Product support is made available for a fixed period of time following the EOL announcement.

The Wind River Professional Services organization can provide long term support (LTS) after EOL, when needed and with prior arrangements.

* 1. Configuration Management

Configuration management for Wind River software is managed according to the Wind River Software Configuration Management Policy. Configuration management plans are created as needed. Standard configuration management tools are widely used throughout the life cycle to control documentation and code.

* 1. Defect Management

Wind River has a defect resolution process for managing defect reports from submission through resolution. The defect resolution process addresses the following items:

* Submitting a defect
* Triage of defects
* Assignment of defects
* Change Control Board (CCB) review
* Developing and integrating fixes
* Verifying fixes
* Publication of defects

All potential defects identified during testing are managed in the defect tracking system using Jira. Defects are continuously reviewed with EPM, Product manager, Development and Test leads. Defects are tracked to ensure resolution is provided. Defect priority can only be changed after agreement between all stakeholders including Product Management, Development, Test, the Architectural Lead and Engineering Program Management.

Priority cannot be modified by a lower authority. All actions and decisions made by the bug board are documented.

Priority is used to manage defect resolution. It is a subjective, summary, ranking of the urgency of fixing the defect which considers the following:

* Severity (impact)
* Frequency of occurrence
* Impact on affected engineering, sales, and marketing efforts
* Estimated effort to fix
* Technical risk
* Other relevant factors

Priority is initially set by the defect submitter. It can then be adjusted by the technology line lead. However, this change must be reviewed and endorsed prior to product release by a bug board which includes representatives from the customer support, marketing, and engineering organizations.

It is Wind River policy to correct all defects of priority P1 and to address all priority P2 defects (by marking as Fixed, Rejected, Withdrawn, or given special exemption by product management) prior to the GA release. The product is allowed to ship with priority P3 and P4 defects. Table 4 Lists the defect priorities.

Table Defect Priorities

| **Value** | **Definition** |
| --- | --- |
| 1-Urgent | The product usability is so degraded, **release or use of the product as-is is blocked** (that is, critical vulnerability or cause of the loss of data; foundational feature of the product does not work for which there is no workaround). |
| 2-High | The product is severely affected, but not so much as to prevent release or use because of this one defect. A combination of such defects **may block** a release or effective use (for example, severely degrades significant and critical product functionality). |
| 3-Medium | Will **not block** a release. Should be *fixed* in the next available release vehicle. |
| 4-Low | Will **not block** a release. Should be *considered* for fix in the next feature release. |

For information on the defect process, see the *Wind River VxWorks Publication Defect Process Overview* document available from Wind River.

* 1. Program Reporting and Tracking

PDLC meetings are status meetings attended by the GTM team and lead by the PMO. These meetings are held bi-weekly and are documented in meeting minutes. Action items are tracked. Meetings are used to track in-flight programs and releases. Summaries are provided to executive management in the form of program portfolio metrics when required, a program dashboard, and a higher-level overview in the form of a portfolio view and program release calendar.

Program dashboards provide a snapshot of overall program status including accomplishments since last PDLC meeting, upcoming milestones, program risks/mitigations and dependencies, and issues, including those that require escalation and/or need executive action and metrics. These are maintained on an individual release basis. Metrics can include schedule performance, product quality, and program scope. Table 5 lists the program dashboard status indicators.

Table Program Dashboard Status Indicators

| **Indicator Color** | **Definition** |
| --- | --- |
| Green | On-track to meet program goals. |
| Yellow | At risk for meeting program goals. |
| Red | Not meeting program goals, immediate action required. |
| Blue | Element completed. |
| Gray | Used on template for a program that is not fully defined. |