

REQUEST FOR PROPOSAL FOR REMINDER365 APPLICATION

CHAPTER 3: SPECIFICATIONS

1. INTRODUCTION

Currently the expiry dates for equipment in store and crafts, Staff's certificates such as work permit, safety certificates and contracts are tracked manually in spreadsheet. This is not productive and sometimes they might not be renewed in time. This lapse might result in failure to service jobs.

2. OBJECTIVE AND SCOPE

The objective of this project is to seek a complete proposal to develop a simple and interactive intranet web application that allows users to manage and monitor the expiry dates of equipment, certificates and contracts. When nearer to date, application should be smart enough to consolidate the expiring items of the same category and send an email to notify the respective stakeholders of that user group.

Vendors are invited to submit a complete proposal. Any proposal covering only parts of the requirements shall be considered incomplete and deemed invalid.

The Vendor shall include all the necessary software and services required for the above complete solution. For the detailed system requirement scope, please refer to Section 7 – System Requirements.

The scope of the tender shall include the interfaces to other systems (either internal or external systems), and any implicit functionality not stated within the requirements, but is required for proper functioning of the solution.

The Vendor shall base on his or her proposed solution to recommend the necessary virtual server specifications, configuration, and system software licenses (if applicable) which can satisfy the systems requirements.

The Vendor shall work with PSA to implement the solution on the following:

- a) Test Environment Site
- b) Production Site
- c) Disaster Recovery Site

The Vendor shall ensure that the solution works according to the requirements and specifications and to the reasonable satisfaction of PSA Project Manager. The PSA Project Manager may issue written

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instructions, directions or explanations in regard to:

- Variation, or modification of the application design or addition or omission or substitution of any works
- Any discrepancy in the specifications
- Amending and making good of any defects

PSA shall be responsible for the following:

- Ensure that appropriate personnel are available to meet with the Vendor as and when necessary and to provide responses to the Vendor's clarifications in a timely manner to meet the agreed project schedule
- Provide the liaison with external parties for the purpose of interfacing or integrating with other systems
- Manage change requests in accordance to the agreed change management plan
- Review or sign-off the key deliverables in a timely manner

3. GLOSSARY

Terms/Abbreviations	Definition
RFP	Request For Proposal
PSA	PSA Marine (Pte) Ltd
DR	Disaster Recovery
B9	Brani Base
WCB	West Coast Base
User	PSA Internal Staff
Crew	Staff working in Tug/Launch/Waterboat

4. SOFTWARE APPLICATION DELIVERABLES

- a) The Vendor's project manager shall review and endorse the deliverables before sending to PSA. PSA may review the deliverables and provide comments to be incorporated into the deliverables. The Vendor is still responsible for the quality of the entire project.
- b) The Vendor shall give PSA 5 working-days' notice of the date when the deliverables will be ready for PSA review/testing. The review/testing shall take place on a date and duration acceptable to

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PSA.

- c) The Vendor shall provide a GUI prototype based on the requirement described in Section 7 – System Requirements before commencement of application development. Vendor shall propose design and layout to enhance the usability and look-and-feel of the systems with consideration of the industry best practices.
- d) The Vendor shall perform the following necessary activities and minimally deliver the following, and any other deliverables necessary for the holistic solution:

Service	Description	Deliverables
Project Initiation & Management	<ul style="list-style-type: none">Vendor is responsible for the overall management of the project and will provide an overall plan for the implementation of the project	<ul style="list-style-type: none">Project Weekly Progress UpdateStatement of WorkProject Execution PlanDevelopment ScheduleQuality Management PlanCommunications Plan
User Requirements Analysis	<ul style="list-style-type: none">Vendor shall work with PSA to understand the User Requirements provided by PSA and update the document where necessary. The scope shall include any implicit functionality not stated within the requirements, but is required for proper functioning of the software	<ul style="list-style-type: none">User Requirement SpecificationsUse Case Specifications

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Service	Description	Deliverables
Design	<ul style="list-style-type: none">Based on the requirements, Vendor shall come up with a UI prototype to help PSA Business Users to visualize the new systemThe UI will be based on best practices of the technology selected and follow best practices of UXD (User Experience Design) and is expected to be intuitive and user friendlyVendor shall provide the new architecture and high level using the proposed platform, database and middlewareVendor will seek PSA approval for usage of any Component libraries or software packages/toolsVendor shall use the provided design guidelines and ER diagrams to come up with detailed design of the system for PSA's reviewVendor shall ensure common functionalities across the various systems shall be created as common componentsVendor shall ensure that components are packaged in re-usable libraries that can be cross-deployed across application e.g. Business Objects shall be re-usable by both front end and back end application	<ul style="list-style-type: none">UI PrototypeImplementation StrategyDesign SpecificationDatabase SchemaEntity Relationship DiagramInterface Specifications with other systemsDetailed Flowcharts and logicApplication Security and Design Specification

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Service	Description	Deliverables
Design	<ul style="list-style-type: none">• Since certain components will be developed internally, classes shall have the ability to be sub-classed to allow extensibility of functionalities (e.g. not final, not private)• Vendor shall ensure that performance requirements can be met on the specified hardware• Design for error messages to be consistent, adequate and meaningful to reduce diagnostic time• Vendor shall ensure that the Design will ensure Accuracy, Completeness, Scalability, Performance, Recovery, Resilience, Maintainability and Security. Components shall as far as possible be configurable and re-usable	

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Service	Description	Deliverables
Coding, Unit & Module Testing	<ul style="list-style-type: none"> • Vendor shall comply with PSA Quality Standards outlined under Section - Quality Management • Vendor shall obtain PSA's approval if there are deviations from the Quality Standards • Vendor shall develop applications based on agreed standards and guidelines • Appropriate comments, versioning and documentation in the source code • Vendor shall conduct unit/module testing which must include the testing of <ul style="list-style-type: none"> ○ Normal flow ○ Alternate flow ○ Exception flow (to be handled gracefully maintaining data and transactional integrity) ○ Data validation ○ Boundary conditions ○ Performance and Load tests • Since certain components of each system will be developed internally by PSA, Vendor shall provide libraries (upon completion of unit testing) for fundamental components e.g. Data Transfer Objects, Data Access Objects, Business Object to PSA. This will allow PSA to integrate these components with the internally developed functionalities 	<ul style="list-style-type: none"> • Development Standards and Guidelines • Source Codes with appropriate and clear comments complying to the agreed coding guidelines • Unit/Module Test Specifications and Results • Unit Test Inspection Records, Error Records and Test Incident Logs • 100% pass for unit and module testing • Periodic Source Code Dumps

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Service	Description	Deliverables
Test Plan	<ul style="list-style-type: none"> Vendor shall plan the testing approach and methodology Test planning to include Unit testing, Module testing, FAT SIT Test Coordination with other PSA systems will be carried out by PSA based on Test plan submitted by Vendor 	<ul style="list-style-type: none"> Test Plan High-level Test Specifications
Factory Acceptance Test (FAT)	<ul style="list-style-type: none"> FAT shall include the integration testing with other PSA Systems being developed as part of the tender Vendor shall conduct FAT in controlled environments in the premises of Vendor Vendor must make good any modules/functions that do not satisfy the User Requirement Specification or Design Specification Vendor must ensure that all possible exceptions are handled Vendor must rectify all bugs identified/surfaced during FAT FAT is to be conducted based on the test specifications (which covers all documented use cases) drafted by Vendor and reviewed by PSA FAT test results are to be signed off by Vendor's test manager prior to submission to PSA 	<ul style="list-style-type: none"> FAT Specifications and Results Test results (with screen captures) to be endorsed by Vendor PM FAT Test Error Records and Test Incident Logs. Evidence of review and acceptance of FAT Specifications and Results Reusable Test scripts with data sets that perform string tests and validations will be provided only for those critical functions identified under coding service above. Mandatory test cases and results 100% pass for FAT final round

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Service	Description	Deliverables
Factory Acceptance Test (FAT)	<ul style="list-style-type: none"> Create a set of reusable test cases, test data and test scripts/programs that can test functional requirements. The major test scenarios can be tested repeatedly via triggering of test scripts PSA and Vendor shall jointly identify the set of mandatory test cases that are necessary to prevent critical errors and potential 'show stoppers'. Regression testing shall be carried out for this set of mandatory test cases for all releases 	
Setup & Deployment in PSA environments	<ul style="list-style-type: none"> Vendor shall provide installation and setup manual, configuration guide, compilation and deployment scripts Vendor shall provide assistance in the areas of application installation and configuration, and solving of bugs that surfaced during deployment <p>The Vendor shall work with PSA to implement the Solution in Test, Production and DR environment.</p> <ul style="list-style-type: none"> The installation procedure shall be made as platform independent as possible to suit various environments – Test, Production Site and DR Site 	<ul style="list-style-type: none"> Implementation plan System Installation, Configuration and Setup Manual Compilation and deployment scripts Application Setup Guide Directory Structure, Log Files, Configuration Setting Files, System Linkages, Application installation and configuration guide, Compilation and deployment scripts Database Scripts, Tables, Views, Triggers, Defaults, Procedures, Functions and etc. if applicable.

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Service	Description	Deliverables
System Integration Test (SIT) at PSA Site	<ul style="list-style-type: none"> • Vendor shall conduct SIT based on the SIT test specifications at PSA site • Vendor shall provide assistance in the areas of application installation and configuration, and solving of bugs that surfaced during SIT • Vendor must make good any modules/functions that do not satisfy the User Requirement Specification or Design Specification • Vendor must ensure that all possible exceptions are handled. • Vendor must rectify all bugs identified/surfaced during SIT 	<ul style="list-style-type: none"> • SIT Specifications and Results • SIT Test Error Records and Test Incident Logs • 100% pass for SIT final round
Load, Performance and Stress Testing at PSA Site	<ul style="list-style-type: none"> • Vendor shall conduct load, performance, and stress testing to ensure system robustness, reliability and stability at PSA site • Vendor shall rectify the 'bottlenecks' identified during load testing and stress testing • Vendor shall deliver the system based on acceptable response time stipulated at a later stage • Performance and Load testing as per document with "Acceptable response" times stipulated for different modules in the non-functional requirements in the respective URS 	<ul style="list-style-type: none"> • Load Test Specifications and Results • Scripts will be created for those functions to generate load required to support performance and load testing. These scripts shall be re-usable in LIVE environment • Evidence of test specs and test results review and acceptance of Performance and load test cases and results

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Service	Description	Deliverables
PSA User Acceptance Test (UAT) at PSA Site	<ul style="list-style-type: none">PSA shall conduct UAT based on the UAT test specifications at PSA siteVendor shall provide assistance in the areas of application installation and configuration, and solving of bugs that surfaced during UATVendor must make good any modules/functions that do not satisfy the User Requirement Specification or Design SpecificationVendor must ensure that all possible exceptions are handledVendor must rectify all bugs identified/surfaced during UAT	<ul style="list-style-type: none">UAT Specifications and ResultsUAT Test Error Records and Test Incident Logs.100% pass for UAT
User Training	<ul style="list-style-type: none">Vendor shall provide user manual, training materials and conduct user training	<ul style="list-style-type: none">User Manual - shall be written from the perspective of users with screen capturesThree end user training sessions are required.

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Service	Description	Deliverables
Knowledge Sharing, Handover & Training	<ul style="list-style-type: none">• Vendor shall hand over to PSA appointed personnel with proper briefings and documentation• Vendor shall conduct on-site training sessions to PSA's technical personnel. This may include hands-on workshops for PSA personnel to achieve a reasonable standard of technical proficiency. In this training, the Vendor will impart all relevant knowledge that is necessary for PSA's team to conduct SIT, UAT, deployment test, implementation and carry out maintenance after the application is implemented. Topics shall include environment set-up, usage of application, design pattern/frameworks used, configuration of application, guides to carry out foreseen enhancements, tools and etc.	<ul style="list-style-type: none">• Administrator Guides that includes details such as trouble-shooting manual, installation steps, system manual, admin manual, configuration manual and other reference manuals for tools and libraries used.

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Service	Description	Deliverables
Warranty & Maintenance	<ul style="list-style-type: none">• Vendor shall provide 6 months warranty from the date that the systems are commissioned• During the warranty period, the Vendor must rectify all bugs identified/surfaced and shall provide technical training and all relevant technical documentation to PSA's system support staff as part of the system handover process at least 1 month before the expiry of warranty• The warranty shall be deemed completed upon PSA's acceptance of the following:<ul style="list-style-type: none">○ Rectification of all bugs identified/surfaced during Warranty period○ All documentation shall be updated whenever applicable• Resources must be made available to meet Variation Orders within 4 weeks upon activation.• Additional details can be found in the Warranty and Maintenance Section	

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Service	Description	Deliverables
Warranty & Maintenance	<ul style="list-style-type: none">• After the warranty period, Vendor shall provide 1 years of maintenance contract with an option to extend for another 2 year• During the warranty & maintenance period, the Vendor must provide knowledge services, bug fixes and change request/• Additional resources must be made available to meet peak demand or clear backlog of change request within 6 weeks upon activation.• Additional details can be found in the Warranty and Maintenance Section	

5. HARDWARE AND INFRASTRUCTURE DELIVERABLES

Service	Description	Deliverables
Recommendations on Hardware Specifications and Infrastructure Design	<ul style="list-style-type: none">• The Vendor shall recommend the required hardware for the server such as CPU, RAM, Storage/Hard-disk Space, virtualized machines' specifications and infrastructure based on the system requirements.	<ul style="list-style-type: none">• Infrastructure Requirement Design Specification (IRDS) which includes the required physical and virtualized hardware specification and the infrastructure design

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6. SYSTEM REQUIREMENTS

6.1. FUNCTIONAL REQUIREMENTS

6.1.1. AUTHENTICATION & AUTHORIZATION MODULE

6.1.1.1. Login and Logout

This feature shall allow Staff to login and logout the system based on the validity of his window active directory or LDAP account. User's login ID and password shall be encrypted when authenticating against PSA Window Active Directory or LDAP. Upon successful login, the authorized modules shall be made available to the user.

The Systems shall log out a user if there is no activity for a period that is to be defined by the System Administrator. Upon session expired, system logoff and/or whenever user click on the browser "back" button, they shall be re-directed to the login page for authentication

Module shall comply with PSA's Password Policy and PSA's User Account and Access Management Policy. The policy details shall be made available only to The Vendor.

Every transactional action shall be logged in the application log and database.

6.1.1.2. Manage User Group and Role

This feature shall allow overall administrator to manage (create, search via keywords, filter, sort, view, modify and delete) user groups and its corresponding user roles such as "Group Administrator", "Officer-in-Charge", "Read-only User", "User" and etc for that particular reminder module. The search via keyword function shall be enhanced by "search as you type" feature.

6.1.1.3. Manage User within User Group

This feature shall allow the group administrator to add, update, search, view, and remove the user from the group. In addition, the user group administrator shall also be able to grant the user the necessary role to access the records under the user group.

Below are the expected fields, but not limited to the following:

- User Login ID

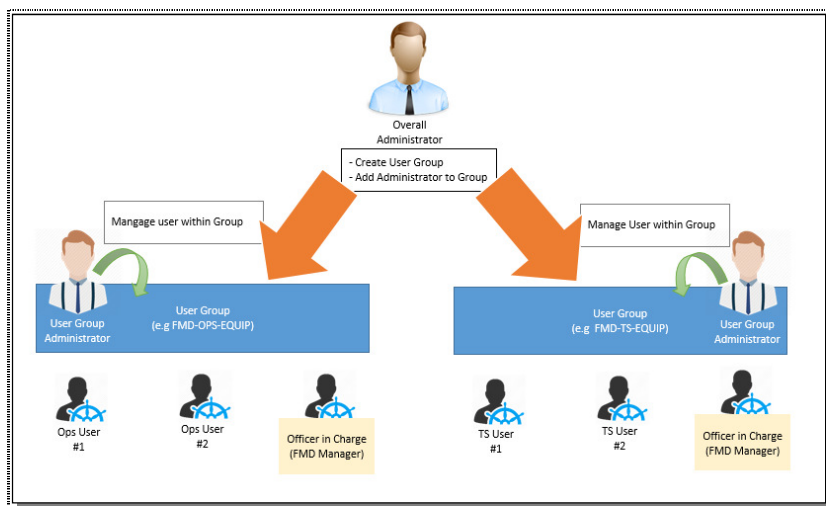
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- Reminder Module
- User Group
- User Role (Officer in charge, user, read-only user, administrator...etc)
- User Name
- User Email Address
- User Mobile Phone Number.
- Remarks
- Created By
- Created Date
- Last Modified By
- Last Modified Date

One user can have multiple module(s), user group(s) and user role(s) assigned to him.

Every transactional action shall be logged in the application log and database.



6.1.2.EQUIPMENT REMINDER MODULE (CRAFT & STORE)

This reminder module shall allow authorized users to create, search via keyword(s), filter, view, sort, modify and delete the equipment reminder records of their own group. The result of the search via keyword function shall be enhanced by “search as you type” feature.

There are 2 main group of users for this module, namely FMD-Operation and FMD-Technical Service. Each group of users have their own equipment to monitor and they cannot manage equipment of the other groups unless being granted the necessary roles necessary roles of that group.

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This module shall allow users to upload the soft copy (PDF) of the scanned certificates for safe-keeping and ease of reference in future. Below are the record's expected fields, but not limited to the following:

- Location [Can either be In Store or on-board Craft (Craft ID – Name)]
- Equipment ID
- Equipment Type
- Equipment Description
- Effective Start Date
- Effective Expiry Date
- Status
 - Red - Expired
 - Orange/Yellow - Expiring
 - Green - Expiry Date Outside Reminder Notice Periods
- Remarks
- Turn On/Off Reminder Indicator
- First Reminder Notice Period
- Second Reminder Notice Period
- Third Reminder Notice Period
- First Reminder Sent Indicator
- Second Reminder Sent Indicator
- Third Reminder Sent Indicator
- Created By
- Created Date
- Last Modified By
- Last Modified Date
- User Group

Other than the above features, user shall be provided the feature to download the search results into excel.

Note

Expiring items shall be send to the email address of the users indicated under that particular user group.

Each group of user can only view and manage their own equipment.

Reminder Notice Period can be in hours, days or months.

Every transactional action shall be logged in the application log and database.

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6.1.3.STAFF REMINDER MODULE

This reminder module shall allow authorized users to create, search via keyword(s), filter, view, sort, modify and delete the Staff reminder records of their own group. The results of the search via keyword function shall be enhanced by “search as you type” feature.

There are 3 main groups of users for this module, namely HR, FMD-Operation and FMD-Technical Service. Each group of user have their own staff records to monitor. Each group of users have their own records to monitor and they cannot manage records of the other groups unless being granted the necessary roles of that group.

This module shall allow users to upload the soft copy (PDF) of the scanned certificates for safe-keeping and ease of reference in future.

Below are the record's expected fields, but not limited to the following:

- Staff ID
- Staff Name
- Department (PSD, FMD, COSD, COMD...)
- Designation
- Date of Birth
- Record to Monitor (Dropdown List Selection) <<Configurable>>
 - Tugs' Statutory Certificates/Classification Survey Certificates
 - Work Permit
 - Certificate of Endorsement
 - Craft Monitoring
 - TS Safety Course and Certification
 - Birthday
 - etc
- Effective Start Date
- Effective Expiry Date
- Status
 - Red - Expired
 - Orange/Yellow - Expiring
 - Green - Expiry Date Outside Reminder Notice Periods
- Remarks

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- Turn On/Off Reminder Indicator
- First Reminder Notice Period
- Second Reminder Notice Period
- Third Reminder Notice Period
- First Reminder Sent Indicator
- Second Reminder Sent Indicator
- Third Reminder Sent Indicator
- Created By
- Created Date
- Last Modified By
- Last Modified Date
- User Group

Other than the above features, user shall be provided the feature to download the search results into excel.

Note

Expiring items shall be send to the email address of the users indicated under that particular user group.

Each group of user can only view and manage their own equipment.

Reminder Notice Period can be in hours, days or months.

Every transactional action shall be logged in the application log and database.

6.1.4.CONTRACTS REMINDER MODULE

This module shall allow authorized users for this module to create, search via keyword(s), filter, view, sort, modify and delete contracts under their own group. Contracts in this case can include procurement contracts, software license subscription and etc. The search via keyword function shall be enhanced by “search as you type” feature.

There are 3 main group of users for this module, namely FMD, Procurement and IT. Each group of users have their own contract records to monitor.

Below are the record's expected fields, but not limited to the following:

- Contract/Reference Number
- Description

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- Agreed Amount
- Effective Start Date
- Effective Expiry Date
- Status
 - Red - Expired
 - Orange/Yellow - Expiring
 - Green - Expiry Date Outside Reminder Notice Periods
- Supplier
- Officer-In-Charge
- Department
- Remarks
- Turn On/Off Reminder Indicator
- First Reminder Notice Period
- Second Reminder Notice Period
- Third Reminder Notice Period
- First Reminder Sent Indicator
- Second Reminder Sent Indicator
- Third Reminder Sent Indicator
- Created By
- Created Date
- Last Modified By
- Last Modified Date
- User Group

Other than the above features, user shall be provided the feature to download the search results into excel.

For this module, there must be a maker-checker workflow concept to prevent inaccurate data entry and hence leading to inaccurate reminder alerts.

Note

Expiring items shall be send to the email address of the users indicated under that particular user group.

Each group of user can only view and manage their own equipment.

Reminder Notice Period can be in hours, days or months.

Every transactional action shall be logged in the application log and database.

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6.1.5.REMINDER NOTIFICATION

This feature shall base on a schedule to periodically perform check on the expiring items. Those information of the expired and expiring items shall be generated into a spreadsheet and send to the users under the specified user group via email. Email shall be address to the Officer(s)-in Charge while the rest of the users such as Craft Masters, Procurement Officers, and Managers indicated in the respective user groups will be kept in the CC list.

6.1.6.REMINDER DASHBOARD(S)

This feature shall allow user to have an overall view of the status of the items that he is been assigned to monitor (i.e member of the user group for that particular module). The view can be in doughnut chart or other visual representations. When click on the expiring or expired area, application will zoom in to that list of expiring items.

If user is a member of 4 user groups of the various modules, he shall be able to see 4 doughnut charts in the dashboard page, which can also be the home page (the 1st page they will see when login). The detailed user interface shall be discussed with the awarded vendor.

6.1.7.ADMINISTRATIVE MODULE

This feature shall allow overall administrator to manage the list of static values for the following modules

A) Equipment Reminder Module

- Equipment location
- Equipment type

B) Staff Reminder Module

- Staff particulars
 - Staff ID
 - Staff Name
 - Department
 - Designation
 - Date of Birth
- Records to monitor
 - Tugs' Statutory Certificates/Classification Survey Certificates
 - Work Permit

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- Certificate of Endorsement
- Craft Monitoring
- TS Safety Course and Certification
- Birthday
- etc

6.2. NON-FUNCTIONAL REQUIREMENTS

6.2.1.SYSTEM RESPONSE AND PERFORMANCE

The online response time shall be measured as the elapsed time between the moment a user initiates a computer process by pressing a key or clicking a mouse or other input device and the moment the last display of the first screen of the resulting computer generated output is seen on the screen of the computer. A computer process can be a query or an update to a database, a request of an electronic document or any other logical unit of business transactions that involve interactive responses.

The systems shall meet the response times as stated below.

Feature	System Response Time
Enquiry	Shall not exceed <u>three (3) seconds</u>
Create/Update/Delete	Shall not exceed <u>three (3) seconds</u>
Report/Dashboard	Shall not exceed <u>three (3) seconds</u>

In the event that the response time cannot meet due to whatever reasons, the Vendor shall carry out all necessary remedial actions and remedial services at no extra cost to PSA.

The Vendor shall describe the methods and calculations used for computing the expected online response times subject to the above conditions.

The Vendor shall fine-tune the System when necessary, as requested by PSA to ensure the System meets the System Response Time as specified.

The Systems shall be able to handle a maximum number of 50 user accounts.

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The resource utilisation by this System shall not exceed 70% of the server's total capacity. The proposer shall propose a suitable server hardware specification to achieve the above target

6.2.2.SYSTEM SECURITY AND AUDIT

The Vendor shall ensure delivered setup is adequately protected against the following types of threats to ensure authenticity, confidentiality, integrity, availability, non-repudiation and accountability of data, service and access:

- Malware
- Denial-of-service
- Spoofing
- Replay, Interception and modification of data
- Insider attacks
- Password guessing attacks
- Web vulnerability attacks including OWASP top ten
- Weak encryption attacks

The Vendor shall ensure delivered setup adhere minimally to PSA IT Security Standards, with emphasis on following sections:

- Communications and Operations Management
- Access Control
- Information Systems Acquisition, Development and Maintenance
- Compliance

The Vendor shall ensure delivered setup adhere minimally to NIST SP800-82 Guide to ICS System Security.

The Vendor shall rectify any vulnerabilities identified resulting from vulnerability assessments and penetration tests during commissioning or future maintenance.

The Vendor shall put in place a Change Control process and/or mechanism:

- All changes shall be recorded and documented by re-producible versions from commissioning and throughout the products' entire service life
- Configuration or code changes shall be recorded as part of the audit trail
- Changes to configuration or code shall be recorded and assigned a version number

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- Ability to back up intermediate configuration or code and perform a rollback shall preferably be made available

A security risk assessment as well as vulnerability assessment and penetration testing will be conducted during design and testing phases respectively. Where security gaps are identified, the Vendor shall ensure that these gaps are appropriately rectified or mitigated prior to live deployment.

The System shall include audit trail and audit log capabilities for Systems and database operational activities. The audit trails shall not affect the Systems performance significantly where it impact users' experience.

Timeout and logout features shall be set for non-active session for web and client server access. The timeout period feature shall be configurable. As far as possible, the System shall warn the users of impending timeouts.

The System developed shall not contain any hidden functionalities which PSA is not aware of and PSA has the rights to perform security review to ensure the compliance of this clause and all the security requirements are met.

6.2.3.SYSTEM LOGGING AND HOUSEKEEPING

The Systems shall generate logs for the application errors, application status for communication, and the Systems incoming and outgoing messages. The Systems will create their respective log file everyday containing the date as part of the file name to record daily logs.

All message records shall be available in the systems as flat file (text file). Thereafter it shall be housekeep. All records shall be archived in a daily basis. The archived records shall be permanently deleted after 3 years.

The Systems' application log files which are more than one month old shall be permanently deleted at the end of every month.

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6.3. ARCHITECTURE AND TECHNOLOGY

Systems and Applications will be deployed on a Multi-Tier Setup comprising of:

Tier	Description
Web Tier	Hosting the Web Server
Application Tier	<p>To be segregated into Frontend and Backend Tier.</p> <ul style="list-style-type: none">▪ Frontend tier will be hosting the web applications and can be accessible directly by the users.▪ Backend tier will be hosting non-interactive background processes e.g. report generation, batch processes which do not require user interaction.
Database Tier	Hosting the database

The Vendor can propose modifications (subject to PSA Approval) to the above based on the best practices of the technology finally selected.

The architecture of the proposed solution must be scalable and must take into consideration of HA clusters such as Virtual Machine Clustering, Operating System Clustering and/or Application Clustering in future.

Vendor can propose a comprehensive solution which can includes the following middleware, platform, operation system and tools that PSA is using:

- JAVA 8 / Microsoft Framework (e.g .Net, C#)
- MySQL
- JBOSS Application Server
- Red Hat Enterprise Linux Operating System
- Microsoft Window Operating System and Server

The actual versions (major/minor) of the individual components will be agreed upon at the start of development (depending upon the versions available at that point of time).

If newer versions are subsequently released before completion of FAT, Vendor shall be responsible for ensuring that the applications work using the newer versions.

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6.4. PSA COMPONENTS

The Vendor is supposed to use PSA components and Architecture whenever applicable.

For instance,

- a) Vendor shall make use of PSA library or API Call to interface with PSA Active Directory or LDAP for Systems authentication and authorization whenever available and applicable.
- b) Vendor shall make use of PSA Library or API Call to interface with PSA SMS and Messaging System whenever available and applicable.

7. SYSTEM ACCEPTANCE

Deliverables will be accepted and approved by PSA when they are deemed to have met the requirements with an official acceptance in the form of email or acceptance letter.

7.1. USER ACCEPTANCE TEST PLAN

The Vendor shall submit a comprehensive test plan which includes the setting up of the UAT environment, the user acceptance testing (UAT) of the System(s) or for any other major enhancement, work order and software patch.

The actual scope of testing, the user acceptance criteria and detailed schedule of testing must be submitted by the Vendor at least two (2) weeks (unless otherwise mutually agreed date) prior to the actual conduct of the test.

The UAT sessions were to be conducted in the PSA UAT environment. The Vendor shall work with the PSA appointed Infrastructure Team to set up the entire UAT environment as stated in the required schedule. The Vendor shall ensure the setup is complete and in fully-functional condition for the UAT.

The Vendor shall be responsible for the preparation and refresh of base set of all needful test data required for the independent testing and UAT which include end to end flow testing at no additional cost to the PSA.

The Vendor shall provide on-site full-time qualified and competent personnel with relevant UAT hands-on experience to follow through all the testing required and to perform the necessary documentation of test results, particularly bugs detected, for discussion and resolution subject to agreement with the PSA. The Vendor shall provide advice and assistance to the PSA on the carrying out of the UAT, and solve any problems encountered during the UAT period promptly so that the UAT can be completed as planned, including clear/unambiguous criteria for abandoning an UAT.

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The Vendor is responsible for documenting all UAT defect logs and consolidating the defects into a summary with the required details on problem cause, propose resolution actions and timelines for agreement by the PSA, and thereafter, to facilitate monitoring of defects fixing, re-testing and proper closure within the agreed timelines.

The Vendor shall update the consolidated defect log daily and submit the updated consolidated defect log to the PSA by noon on the following day.

7.2. DELAY IN USER ACCEPTANCE TEST

If UATs are delayed due to Vendor's faults, the PSA may by notice in writing require the Vendor to conduct the tests within five (5) working days from the receipt of the notice. The Vendor shall conduct the tests on such date(s) within the said five (5) working days, and inform the PSA of the scheduled date(s).

7.3. SYSTEM TESTING

The Vendor shall ensure that comprehensive and relevant tests (unit, integration and system testing) are conducted as dictated by the system requirements. Test plan and test records shall be provided to the PSA for review at least two (2) weeks prior to the User Acceptance Testing (UAT), failing which the PSA reserves the right to hold back the UAT until the test plan and records are produced.

The Vendor shall propose the testing methodology to be used in the development of the application system in the tender proposal. The methodology or set of methodologies shall be reviewed and endorsed by the PSA prior to the development phase of the application system.

The Vendor shall ensure that its development team implements the error checks workflow correctly and consistently, with prior approval obtained from the PSA's Representative which shall validate that these are in accordance to best practice in this area.

The Vendor shall generate and simulate sufficient test data with the requisite level of complexity/details, and of acceptable quality and quantity by the PSA, to support the required testing and UATs at no additional cost to the PSA.

The Vendor shall perform end-to-end testing of the application system and ensure the application system is working correctly in accordance to the requirements specified by the users.

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The Vendor shall perform functional testing on the batch processing to ensure that all batch jobs are completed successfully within the 2 hours of batch window.

The Vendor shall submit system test report three (3) weeks prior to the commencement of UAT. The Vendor shall provide supporting evidence on code review, test coverage, tools used, test plan and test cases.

7.4. SYSTEM PERFORMANCE TESTING

The Vendor shall advise on all matters relating to the installation, configuration, operation and performance tuning of the System.

The Vendor is required to perform performance load and stress test before System commissioning to meet performance requirements of the System.

The Vendor must submit the performance load and stress test report two (2) days after the test is carried out to substantiate the ability of the System to meet the performance criteria and manage the number of users logging on at the same time.

In the event that the System utilizes more than the stated System resources, the Vendor is required to analyse the cause, advice and fine-tune the System at no cost to PSA.

7.5. SYSTEM COMMISSION

The Systems shall be commissioned upon the successful systems implementation in the production environment which includes the following pre-implementation activities:

- a) User Acceptance Test is completed successfully
- b) Performance Test is completed successfully
- c) Training sessions for users of the system are completed
- d) All documentations are completed.
- e) Live Trials are completed

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8. KNOWLEDGE TRANSFER

8.1. USER TRAINING SESSIONS

The Vendor shall provide 3 comprehensive on-site training on the usage of the application to end-users. User Manual Guide detailing the various screens and how the users can use them shall be provided. User manual shall be written in simple English with as much illustration as possible.

8.2. KNOWLEDGE SHARING, HANDOVER & TRAINING

The application shall be handed over to PSA with proper briefings and documentation. The handover, shall include and not limited to the following maintenance documents:

- Trouble-Shooting Guide
- Installation Guide
- User Manuals
- System Manuals
- Admin Manuals & Configuration Manuals
- Reference Manuals for any tools, libraries used
- Up-to-date Business Requirement Document

Handover shall be deemed completed upon PSA's acceptance of the above documents, in both hardcopy and softcopy.

9. PROJECT MANAGEMENT APPROACH

Vendor is responsible for the overall management of the project. Vendor shall provide weekly updates on project progress. Vendor shall present the project progress, and address all outstanding/follow-up issues in a regular monthly progress meeting at PSA's premises.

Vendor shall provide the following deliverables:

- Weekly written progress and status reports on what work has been completed and what work has been planned for the following week and to be done by whom.
- Weekly updated project schedule
- Weekly updated Risk Assessment Reports
- In the event that the project is not on schedule, the Vendor is to provide a recovery plan to ensure that project will not be delayed
- Outstanding list of Issues and Change Requests

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- Weekly on-site meetings to present the above project updates

The Vendor shall, in consultation with PSA, undertake the responsibility to define and implement appropriate Communication Plan for the various groups. The Communication Plan shall include:

- (a) General users
- (b) Senior management
- (c) Third party Vendors
- (d) Sub-Vendors

The Vendor shall anticipate possible interfacing issues and undertake to work with and ensure that the third-party Vendors are sufficiently briefed on the scope of services and that their roles and responsibilities are clearly defined.

10. PROJECT RESOURCE REQUIREMENT

The Vendor must clearly state the key project team members (PM, PL, Technical Lead) assigned to this project. Resumes of the project team must also be submitted.

The Vendor shall get PSA's concurrence before finalizing the key members of the project team and any subsequent changes to the key members.

The Vendor shall seek approval from PSA based on the suitability of the candidates before the change can be effected.

The Vendor shall ensure the availability of appropriate replacements with lead-time of one month to ensure minimal disruption to the ongoing project related activities.

The Vendor shall keep PSA informed about any changes in Project Team composition.

The project team individuals shall be equipped with the skills necessary to perform the job competently.

11. WARRANTY AND MAINTENANCE

The Vendor shall provide **6 months of warranty** from the date that the system go live. Warranty will comprises of knowledge services, software updates and bug fixes. During the warranty period, the Vendor must rectify all bugs identified/surfaced, provide technical training and all up-to-date functional and technical documentation to PSA's System support staff as part of the system handover process at least 2

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month before the expiry of warranty.

Since the Systems will be rolled out on incremental basis; not all warranty periods may be aligned. PSA shall be provided the option to re-align the warranty periods such that the later phase Systems warranty period is reduced and those in the earlier phase are extended without incurring any additional cost to PSA.

Maintenance will cover knowledge services, bug fixes, software updates and change requests. For maintenance, payments will be made on a Quarterly basis (once every 3 months) for services consumed.

The below sections document the expected service level for this project, including Warranty and Maintenance period. **Knowledge Services will comprise of:**

- a) Troubleshooting, excluding third party component internals
- b) Impact Analysis
- c) Seamless handover between incoming/outgoing personnel (knowledge base, parallel run)
- d) Preliminary Investigation
- e) Preliminary Impact Assessment
- f) Re-configure application where no source code changes are involved and with smoke testing only
- g) Application of new software patches of system software to the application systems to ensure that system can carry on its function with smoke test only (risk to be assessed by both PM
- h) Facilitate audit by PSA
- i) Keep the systems-related documents such as requirement specifications, design specifications, testing specification and installation guide up to date

Bugs are defined as

Functionality gaps between actual System and signed-off use cases. It will include all corresponding documentation updates but excludes third party components or performance gaps unless specified in the requirements.

11.1. RESPONSE TIME

Response Time is measured from the time PSA first engages (call or email) the Vendor and the Vendor acknowledges it. Service Recovery Time is when a remedy/workaround has been provided by Vendor to PSA to execute the fix.

Each incident will be classified with a severity as described in the table below. Response time and Service Recovery time will depend upon the Severity Level of the incident reported.

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Severity Level	Definition
Red (Critical)	A situation when System problems caused serious disruption to user operations. Examples : <ul style="list-style-type: none"> ▪ Applications are not available ▪ External systems unable to communicate with the Systems
Yellow (Serious)	A situation when System problems have a moderate impact on users. Performance is affected, and the prolonged effect of this will affect user operations and/or may escalate to a Severity Level Red situation.
Green (Moderate)	A situation when System problems have a minor impact on user operations. There is minimal loss in productivity and performance. However, if the problem is left unattended, it may escalate to a Severity Level Yellow situation within 2 days. Examples : <ul style="list-style-type: none"> ▪ Slow response while using applications ▪ Applications hang intermittently

11.2. SERVICE LEVEL

Support Level	2nd level support		
Coverage	Working Hours (Monday to Friday, 8.30am to 6pm)		
Response Time	15 min (contact by phone)		
Severity Level	Service Recovery Time	Root Cause Resolution Time	Root Cause Analysis
Severe Errors causing system to be inoperable or major errors requiring workaround (Red and Yellow)	2 hours	3 working days	3 working days

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Minor (Green)	3 hours	5 working days	3 working days
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11.3. ISSUE MANAGEMENT

For a project of this size, it is inevitable that issues will be encountered by the team. It is important that these issues are managed properly to ensure that the quality and schedule of the project are not affected. Issues raised can be requirement related or technology specific. They range in its impact to the project. Following shows the classification of the priority of the issue and its expected turnaround time:

Priority	Description	Example	Turnaround Time
High	Critical issue. Affects the progress for that phase of the development or the commencement of the next phase of development. Potentially is a “show stopper”.	Functional Specification sign-off outstanding	Within 3 working days
Medium	Important issue. Affects a few areas for that phase of development or other phases of development.	Exception handling sign-off is still outstanding	Within 5 working days or on an agreed target date
Low	Non-crucial issue. Does not require immediate attention or need not be resolved within this phase of development.	Handling of scenario to be included in the training material	Within 10 working days or on an agreed target date

11.4. DEFECT MANAGEMENT

All defects will be identified by a severity. The severity (Cat A, B, C) below refers to defects which both parties have assessed and confirmed as application bug.

Severity	Description	Target Turnaround Time
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Cat A	High impact error in major/critical functionality. No workaround possible	Within 1 working day
Cat B	Medium impact error in major/critical functionality. Workaround is possible Alternatively, Medium impact, non-cosmetic error in non-major functionality. No workaround is possible.	Within 3 working day
Cat C	Low impact, non-cosmetic error in non-major functionality, or cosmetic errors. Workaround is possible, or error does not prevent user from using application.	Within 5 working days

This does not include variation and unclear definition from the agreed requirement documents, design documents, newly raised change request, and any causes outside the scope of tender. For cases that are not mentioned in the documents, it will be discussed on case-by-case basis.

PSA shall decide the priority of tasks. With this, the target turn-around time for bugs with lower priority will be revised accordingly.

During the Warranty and Maintenance Period, PSA reserves the right to make changes to the application codes in the event that the Vendor is unable to resolve the defect within the stipulated duration specified above. Under this circumstance, the warranty shall remain in force, and PSA will not be in breach of the warranty clause.

11.5. CHANGE MANAGEMENT

Any modification / addition of requirements after the requirements have been signed off will be handled through a change control process that is described below. Changes arising due to clarifications during the User Requirement stage will not be chargeable.

PSA can propose changes to the project either in terms of scope, schedule or cost. Any changes proposed shall be communicated via an official memo and tracked in an issue tracking system such as JIRA. Any change request shall be deemed as QMS Improvement and Vendor will attach the System Change Request (SCR) form to issue and state the amount of man-effort required for the changes.

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Both PSA and Vendor will jointly discuss and analyse the proposed changes.

- Response time: 1 working day
- Impact analysis: The impact assessment and change adoption decision in general shall not take more than 1 week. Both teams would have to mutually agree on the working days if the assessment takes longer than 1 week.

Vendor will record all recommended changes and submit to PSA for approval. Upon confirmation of Change Requests, relevant documentation shall be updated based on approved Change Requests.

11.6. *TRANSITION MANAGEMENT*

The Vendor will be given two (2) months to hand over the existing Systems/Services to a new Vendor appointed by PSA upon the contract expiry or termination of the Vendor. The Vendor shall plan the transition accordingly to ensure that it will be completed before the expiry of the contract. Any additional cost incurred due to the delay in transition caused by the Vendor shall be borne by the Vendor.

The Vendor shall hand over all items owned by PSA to the new Vendor including but not limited to the following:

- a) Assets (hardware, software, data, media, documentations, licenses, storage media, office facilities and etc.);
- b) Full set of documents describing PSA's configuration, asset records, operating environment, operating manuals, accounts & passwords, contact information and etc.

The Vendor shall brief the new Vendor on the relevant operational requirement and allow the new Vendor to shadow during the transition period. However, the Vendor shall remain fully responsible and accountable for ensuring the smooth on-going and deliver all required services according to the contractual requirements stipulated in the Vendor.

11.7. *SLA REPORTING*

The Vendor shall submit a monthly SLA report to summarise the Change Requests, Bug Fixes, Incidents and Liquidated Damages. Vendor will also keep PSA updated of any staff changes in the team supporting the systems.

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12. LIQUIDATED DAMAGES

In the event the Vendor fails to meet the Project Stipulated Commissioning Date(s), PSA may by written notification to the Vendor impose liquidated damages at the rate of one tenth of a percent (0.1%) of the Contract Price for each day (including Sundays and Public Holidays) or part thereof up to a maximum of ten percent (10%); or

Liquidated damages imposed shall be paid to PSA in Singapore Dollars not later than thirty (30) calendar days from the date of issue of a PSA's written notification to the Vendor informing the Vendor of the liquidated damages payable.

If the Vendor fails to pay the said damages, PSA may deduct the amount due from any monies due or which may become due from PSA to the Vendor under the Contract and other contracts between the Parties or recover the same as a debt due from the Vendor in any court of competent jurisdiction.

Where the Vendor is required in the Implementation Plan to submit any plans, scripts, manuals and other documents for verification and review and the Vendor fails to meet the time schedule for submission of any such documentation, PSA shall be entitled to an extension of time for verification and review corresponding to the period of delay without prejudice to the Vendor's obligation to meet the Stipulated Commissioning Date(s).

During Warranty and Maintenance period where Vendor fails to meet the stipulated minimum Service Level requirements as stated in Section 14, Liquidated Damages of 3% of the Quarterly payment can be imposed. This is per incident with a maximum of 5 incidences per Quarter.

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13. QUALITY MANAGEMENT

13.1. *QUALITY MANAGEMENT PLAN*

The Vendor shall provide; as part of the tender, the quality management plan that describes the means to validate the major deliverables specified in this document is complete within an acceptable level of quality. The plan shall consist, but not limited to the following:

- Review and Approve activities of each deliverables
- Resource assigned to each activity
- Schedule of these activities

13.2. *QUALITY STANDARDS*

The Vendor shall comply with PSA internal QMS. Details shall be furnished upon award of contract.

13.3. *QUALITY TOOLS*

The Vendor may propose any quality-related tools this project will utilize.

13.4. *QUALITY ASSURANCE*

The Vendor may propose the quality assurance activities focus on the processes being used to manage and deliver the solution.

13.5. *QUALITY CONTROL*

Quality Records, not restricted to the following, shall be kept complete and available to PSA when requested:

- Test records and results
- Reviewed and approved deliverables
- Evident of review and approval

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14. TENDER SUBMISSION

The Vendor shall provide minimally the following submission for the tender (not including the documents stated in section 8 of Chapter 1 – Instructions to Tenderers):

- a) **Statement of Work** - shall clearly specify the service and deliverables being provided.
- b) **Project Execution Plan** - shall minimally include the following information:
 - Project Team Setup
 - Project Schedule comprising of major milestones' date of completion
 - Development Approach
 - Project Management and Communication Plan
 - Quality Management Plan
 - Change Management Plan
 - Risk Management Plan
 - Issue and Defect Management Plan

Note

For Project Team Setup, the Vendor shall provide the project team set up and resume of key team members.

- c) **High Level Architecture Design** - proposed high level architecture design based on the Vendor's understanding of the Requirement, the Proposed Platform and Database solution.
- d) **Variation Orders** - The Vendor shall propose a man-day rate(s) for Variation Orders to be used during the duration of this tender, the warranty period as well as the period of the maintenance contract.

15. EVALUATION CRITERIA

The Vendor's proposal to this RFP will be evaluated based on the following evaluation criteria:

- a) Quality and solution effectiveness of the proposed high level application architecture design and development approach
- b) Quality and thoroughness of the proposed project execution plan and quality management plan
- c) Team experience based on proposed solution
- d) Demonstrate very good understanding of PSA requirement and concerns
- e) Cost effectiveness of the proposed solution in meeting the requirement
- f) Realistic and acceptable effort estimation and development schedule

*** End of Chapter 3***