COMPLETE PHARMACY ROBOTICS INTEROPERABILITY SOLUTION

NIPAROBOTICA

Manage complex Robot Clusters.
Multiple Robot Adapters.
Based on HL7, FHIR R4, and IRIS for Health.
Centralized Inventory and Stock Control Modules

www.NiPaRobotica.com

INTRODUCTION

NiPaRobotica has developed a suite of modules to support the integration of Pharmacy Applications with Pharmacy Dispensing Robots. NiPaRobotica is a Cloud/Docker/Server-based solution that is both a message transport and transformation interface as well as a Medication Inventory and Stock Management Application. It provides Stock Level and Stock Movement Analysis in real-time across multiple Robot configurations for Pharmacy Managers and the Pharmacy Applications that manage Prescription Capture, Medication Interactions, Dispensing Requests, Label Printing, Accounting, and Stock Ordering. At its heart is an interoperability solution that connects Pharmacy Dispensing Applications with complex clusters of Robots and the Message Dialogue Protocols implemented by the Robot Manufacturers.

NiPaRobotica Profile.docx

FEATURES

DASHBOARDS

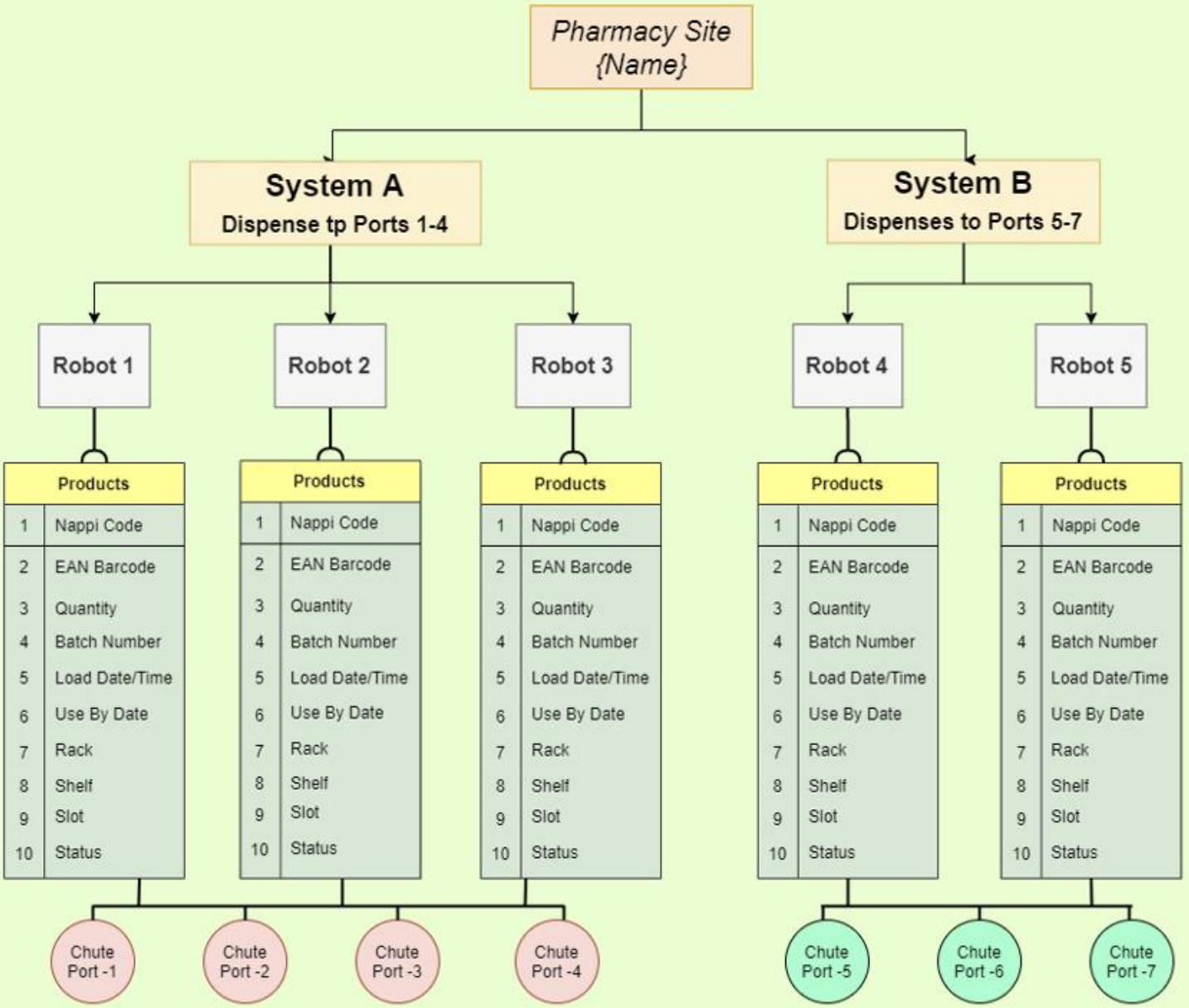
- Monitor the status of the source Pharmacy Applications
- Monitor the status of the Robots
- Monitor Message flows, and Product flows managed by the Interface
- Warnings of failed Robot Dispenses
- Alert notifications of Communication Link failures
- Alert notifications of Robots in a Failed State
- Alerts on Fast Moving Stock Items Running Low

The Dashboard leads to several more detailed forms.

STOCK AND INVENTORY MANAGEMENT

NiPaRobotica can be configured to reflect groups of Robots that dispense products to one area or set of pharmacist counters and another group of Robots that dispense medications to a separate area or group of pharmacist counters as shown in the following diagram.

NiPaRobotica Pharmacy Robot Organization based on the Dispense Ports they Service



- Supports a centralized customizable Inventory Module based on localized Medication Naming Systems, Barcoding Systems, and Manufacturer
- The Inventory is linked to the Stock Management Module that provides Real-Time Stock Levels across all products, Robots, and
- The Dispensing Module uses ML to implement optimized dispense workflows based on Stock Availability, Robot Availability, and Medication
- The Stock Management Module maintains an audit trail of Goods In Deliveries, Stock Loading Events, Stock Dispense Events, Stock Rejection
- Broken Pack Management.
- The Robot Interface implements the Manufacturer Proprietary Dialogue Messaging using a customizable Message Dialogue Module that allows you to define the different Robot Instruction Dialogues (Request and Response).
- The System Dashboard displays the Dialogue flow between the interface and the Robot. Identifies Errors.
- Audit logs of the Robot Communications are maintained and are viewable through the User Interface or can be exported to File and optionally emailed to selected
- Errors reported by the Robots are identified and Alert Notifications are sent to on-site system Administrators and the Robot Manufacturer or Local Support

The Stock Module supports Broken Pack Management where a Pharmacy Dispense might request a Box and ½ of a Medication. The Robot will dispense 2 packs and instructs the Pharmacist to remove ½ of the contents of one Pack which is then stored at the Pharmacists' Workbench.

When another prescription is received that requests 1 and ½ boxes of the same Medication, the Dispense Module will request 1 box of the Medication from a Robot, and in the Instructions that are sent back to the Pharmacist will instruct them to use the dispensed pack and the Broken Pack that was leftover from the previous Broken Pack Dispense.

The stock Master is aware of the position of products within the Robot, Sell by Dates, Batch Information. Stock that has passed its sell-by date can be removed from the Robot. Batch Recalls are supported.

Stock Dispense Rates are monitored. Based on known Stock Levels, Products Loaded, Products Removed, it is possible to determine the dispense rate for each product.

Using this information, NiPaRobotica can make recommendations about increasing or decreasing the stock allocations in the Robots, ensuring that the Robots maintain an optimal stock profile that aims to ensure stock requirements are anticipated. The Pharmacy Application is notified that replacement stock is required, and the Pharmacy application will generate Stock Orders for those products.

The system can predict stock requirements based on an analysis of stock movement for a specified time frame. Stock replenishment orders can be generated to the Central Stock Repository typically found in large hospitals. Stock Orders from Manufacturers are handled by the Pharmacy Applications.

It can also create Stock Orders from Stock Suppliers alternatively predicted Stock Requirement Reports can be sent to the Pharmacy Ordering Department.

When Stock Is Delivered, NiPaRobotica will register the Stock Goods Received Note (GRN) as well as all of the Line items on the GRN. When Stock needs to be loaded, the User will enter the GRN Number on the Robot and when Stock is loaded into the Robots against that GRN, the GRN is updated to reflect that N Items of GRN Line Item X have been loaded into the Robot.

The updated GRN is sent back to the Pharmacy Application so that it can update its Stock Level availability.

When stock Items are dispensed, where the original GRN can be identified, the GRN will be updated to reflect these dispenses. If the GRN cannot be identified, the system will locate an open GRN and allocate the dispenses to that GRN instead. If no GRN is found, an Overflow Batch is updated to record the excess, and when a new GRN arrives, any Overflow Items present on the GRN will be offset against that GRN.

Once all items on a GRN are dispensed the GRN is flagged as finished a final GRN update is sent to the Pharmacy Application.

Stock Level Reports are generated nightly and sent to the Pharmacy Manager so that work orders for the stock loaders can be created based on the likely daily stock movement.

Monthly statistical Stock reports are generated displaying Initial Stock Levels, Sum of Products Loaded, Sum of Products Dispensed, and Final Stock Balances. This report can be compared with any stock reports available from the Robot and the Pharmacy Applications can verify the report against their Stock Levels. This is very useful for monthly stock checks.

TECHNOLOGIES

NIPAPROBOTICA ON INTERSYSTEMS ENSEMBLE

NiPaRobotica can be deployed on InterSystems Ensemble if required however there is a restriction in that there is no support for FHIR.

NIPAROBOTICA ON IRIS FOR HEALTH

On IRIS for Health, NiPaRobotica makes full use of the 'InterSystems IRIS® FHIR Accelerator Service (FHIRaaS)' NiPaRobotica supports an HL7 EndPoint and any number of FHIR EndPoints. NiPaRobotica supports FHIR STU3 and FHIR R4.

Pharmacy Applications can send Medication Requests to NiPaRobotica FHIR Server. The Requests are persisted in the FHIR Repository (as are the Medication Inventory, Pharmacy and Medication Code Tables along with Patient, Episode of Care, Encounter, Bundle, and other Resources.

The Medication Request is analyzed by the NiPaRobotica Dispense Controller, which uses ML to determine the optimal Dispense Profile. The Dispense Instructions are sent to the Robots, and the response messages that are sent back are converted into FHIR Medication Response messages.

The Response Message provides information to the Pharmacist about those dispensed items and those that were not. If NiPaRobotica connects to a Drug Interaction Provider such as SNOMED, the FDA, and other such authorities, further information may be added to the Response.

Finally, Patient Medication Statements can be requested and sent to the Pharmacy Application or Mobile Devices for authorized Users. They can also be converted into Human Readable Documents in various formats, including Text, XSLT, HTML, PDF.

The NiPaRobotica User Interface was based on HTML, JS and CSS. The latest version supports a set of RESTful API's which provide access to the Authentication module and the various modules that handle the Robot functions. The REST APIs will support any JavaScript Framework such as Angular, React, Vue, and Bootstrap. ODBC and JDBC connectors provide support for 3rd Party applications for Reporting and Analytics.

The NiPaRobotica engine uses IRIS ObjectScript and Python with JSON used for the majority of messages. Python is also used for Robots that run Python programs to control the Robot components and Robot functions.

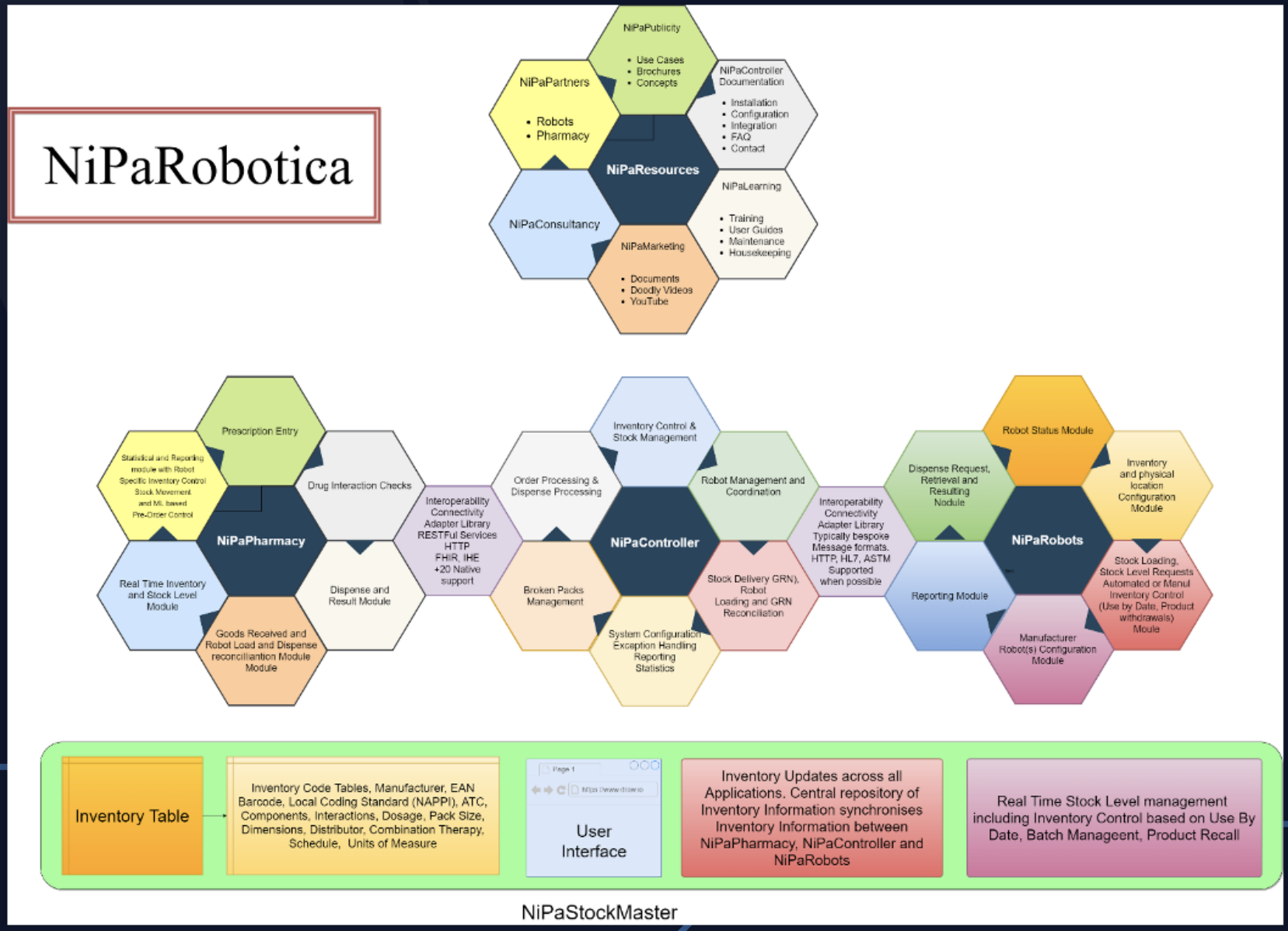
NiPaRobotica supports API Key, OAuth, and OpenId Authentication.

ARCHITECTURE

NIPAROBOTICA CONSISTS OF SEVERAL MODULES INCLUDING:

- NiPaController
- NiPaHL7Server
- NiPaFHIRServer
- NiPaPharmacy Connectors
- NiPaPharmacy Script Capture
- NiPaSimulator
- NiPaCloud
- NiPaMultiSitePatchManager
- NiPaDashboards
- NiPaReports
- NiPaInventory
- NiPaStockManager

THE FOLLOWING DIAGRAM SHOWS THE RELATIONSHIP BETWEEN THESE MODULES



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PRODUCTIVITY BEGINS TODAY!

The secret of getting ahead is getting started.

- MARK TWAIN