**TECHNICAL ARCHITECTURE**

**Eli Research India Pvt. Ltd**

**MYPHARMA THINKTANK**

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Approval of the Technical Architecture indicates an understanding of the purpose and content described in this deliverable. By signing this deliverable, each individual agrees with the content contained in this deliverable.

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# Section 1 DOCUMENT SCOPE

This document describes the Technical Architecture of the **myPharma Thinktank** System that satisfies business requirements, implements the functionality and satisfies technical, operational and transitional requirements.

The goal of this Technical Architecture is to define the technologies, components and techniques necessary to develop and support the system, and to ensure that the system components are compatible and comply with the enterprise-wide standards and direction defined by the management.

This document will also Identify and explain the risks inherent in this Technical Architecture,

Define baseline sizing, archiving and performance requirements, Identify the hardware and software specifications for the Development, Testing, QA and Production environments, Define procedures for both data and code migration among the environments.

# Section 2 OVERALL TECHNICAL ARCHITECTURE

## 2.1 System Architecture Context Diagram

The **System Architecture Context Diagram** provides the “big picture” view of the system’s architecture, and illustrating how the system’s hardware and software platforms fit into the existing environment.



## System Architecture Model

MyPharma Thinktank is comprises of several modules and these modules are explained in the section. TheSystem Architecture Model represents the various architecture components that comprise the system and shows their interrelationships.



* **Company:** Company module will have company specific information and this module is composed of several sub modules. In mypharma thinktank, Company module is the root module and all other modules like Products, Patents, and Deals etc., modules are linked to Company module.
* **Products:** Product module will have products specific information and this module is composed of several sub modules.
* **Patents:** Patent module will have patent specific information and this module is composed of several sub modules.
* **Deals:** Deal module will have different deal type’s information and this module is linked with Company and Product modules.
* **Regulatory:** Regulatory module will have regulatory authority’s specific information and this module is linked with Company and Product modules.
* **Sales:** Sales module will have product related sales specific information and this module is linked with Company and Product modules.
* **Financials:** Financials module will have company specific financial information and this module is linked with Company module.
* **News:** News module will have company specific news information and this module is linked with Company module.
* **Key Events:** Key Events module will have company specific milestone information and this module is linked with Company module.

### Overall Architectural Considerations

*The* ***Overall Architectural Considerations*** *section defines how additional technical requirements have been addressed by the architecture. Representative items in this section may include:*

* ***Security Strategy****:*

In this application, enough measures are taken to restrict unauthorized access to anonymous users. Application access is available to the validated users only. Each user will be given a User ID (email) and Password to access the application.

To avoid web site hacking, Password will be encrypted before sending it to the database for validation. For password encryption, SHA 512 algorithm is used in the application.

In addition to the password encryption, User ID will be a valid email id and this email domain should not be a public domain like Gmail, Hotmail. This domain name should be a company domain. While creating a new user in the application user email id will be validated with the Domain Names file integrated in the application.

* ***Database sizing:***

The primary database for this application is the Authoring tool database. In the Authoring tool database, data of size ~50 - ~100 MB of data will be added on a daily basis. Once the QA team verified and approved, newly entered/updated data will be moved to the myPharma Thinktank database. myPharma Thinktank application database will be on the Azure server which is of 128GB disk size. If the database size exceeds the max size, we can add additional disk space.

So, enough measures are taken to handle the database sizing.

* ***Data import and export:***

There will be no data import functionality available in this application. For exporting search data, there will be 2 options available Excel and Pdf export. User can export all the search results in the excel format. User can export single view (Company/Product/Deals) data in a pdf format.

* ***Data encryption and decryption:***

Encryption mechanism will be available for user password only. When new user credentials are created, user specific password will be generated in an encrypted format using SHA 512 algorithm and saved in the database.

While validating the password in the Login page, it will be encrypted using the same algorithm and send to the database for password validation.

* ***Disaster recovery:***

myPharma Thinktank database will be hosted on the Microsoft Azure server and in case of database crash, database will be recovered automatically from the mirror server. This process will be handled by Microsoft automatically.

As a secondary measure, database daily backups will be taken by implementing automated process and save the backup files in a separate server.

## 2.3 System Architecture Component Definitions

### System Hardware Configuration

The **Architecture Component Definitions** section provides narrative describing and explaining each architecture component in the System Architecture Model, and identifies specific elements that comprise that component in this system. The following are database and application server components and elements:

|  |  |
| --- | --- |
| **Architecture Component** | **Component Elements** |
| Database Server | Processor: Intel(R) Xenon ® CPU E5-2673 v3 @ 2.4GHz 2.39GHz  RAM: 14GB  System type: 64 bit Operating System, x64 based processor.  Windows Server: Windows Server 2012 R2 Datacenter  SqlServer 2016 Enterprise version |
| Application Server | Processor: Intel(R) Xenon ® CPU E5-2673 v3 @ 2.4GHz 2.39GHz  RAM: 14GB  System type: 64 bit Operating System, x64 based processor.  Windows Server: Windows Server 2012 R2 Datacenter. |

# Section 3 SYSTEM ARCHITECTURE DESIGN

*The* ***System Architecture Design*** *section provides detailed descriptions of each component in the application.*

MyPharma Thinktank application will have multiple functionalities and these are:

* **Search**
  + **Basic Search**
  + **Advanced Search**
* **Company Search**
* **Product Search**
* **Deal Search**
* **Patents Search**
* **Regulatory Search**
* **News Search**
* **Events Search**
* **Login**
* **Admin**
* **Request Demo**

## 3.1 System Architecture Component: Search

Once user logged successfully, user can perform basic search by clicking Search menu. Under Search Page, there are two search options Basic and Advanced Search.

### 3.1.1 Basic Search Component Functions

In basic search, there are multiple search option available. These search options are **Company Name, Ticker Symbol, Product Name, Active Ingredient and Therapeutic Indication**. Once user selects required search criteria and Starts with/Contains from the provided dropdown controls, selected field unique values will be retrieved for autofill. Enter Search value from the list of autofill values and click on OK, search query will be processed and results will be displayed to the user.

If the search is based on the Company, then there will be 5 tabs in the results and these are Companies, Pipeline, Facilities, Financials and R&D spend.

In the Companies tab, the result companies related basic info Company Name, Ticker Symbol, Stock Exchange, Country, Industry, Revenue, Net Income, R & D Spend and Market Cap info will the displayed in the grid.

In the Pipeline tab, the result companies related Total Products, PM, M, A, PA, Phase III, Phase II, Phase I, Preclinical, Research, Clinical Phase Unknown counts will be displayed in the grid.

In the Facilities tab, the result companies related Company Name, Ticker Symbol, Stock Exchage, Country, Facility Type, Address, City and State info will be displayed in the grid.

In the Financials tab, the result companies related Company Name, Ticker Symbol, Currency, Revenue, 1 Year Growth %, Net Income, I Year Net Income Growth %, Cash On Hand, EPS, Market Cap, and Enterprise Value info will be displayed in the grid.



### Advanced Search Component Functions

In Advanced search, user can perform combination search from multiple modules. User can select search criteria’s from Company, Product, Deals, Patents and Regulatory modules.



## System Architecture Component: Company

Company Module is comprises of several submodules. Company will have Facilities, People and Contacts, Patents, Products, Deals, News, Sales, Financials, Regulatory, Key Events and Partnering Opportunities submodules.



### 3.2.1 Company Component Functions:

In the Company module search, user can search the database based on the Company Name or Ticker Symbol or Stock Exchange or Industry or Therapy Area or Country or Partnering Opportunity or combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the Search results, there will be multiple result tabs:

* **Companies**: The Companies tab displays Result Company’s primary information in the grid view. The result table contains Company Name, Ticker Symbol, Stock Exchange, Country and Industry information.
* **Pipeline**: The Pipeline tab displays Company Name, Ticker Symbol, Stock Exchange. Total Products, PM, M, A, PA, Phase III, Phase II, Phase I, Preclinical, Research and Clinical Phase UnKnown counts information for each company. This tab provides company products overall information.
* **Facilities**: The Facilities tab displays Company Name, Ticker Symbol, Stock Exchange, Country, Facility Type, Address, City, State information for each company. We will display primary facility information in this tab.
* **Financials**: The Financials tab displays result companies financial related information Company Name, Ticker Symbol, Currency, Revenue (mn), 1 Year Revenue Growth %, Net Income (mn), 1 Year Net Income Growth %, Cash on Hand (mn), EPS, Market Cap (mn) and Enterporse Value (mn)
* **R&D Spend:** The R&D Spend tab displays Company Name, Ticker Symbol, Stock Exchange, Sales (mn), R&D Spend (mn), R&D Intensity %, Total Employees and R&D Spending per Employee.

The Refined Search results provides further filtering on the search results based on the below categories:

* **Industry:**

This section will display unique Industry types along with the counts for each Industry type.

* **Therapy Area:**

This section will display unique Therapy Area along with the counts for each Therapy Area.

* **Region:**

This section will display unique Regions along with the counts for each Region.

* **Company Type:**

This section will display unique Company Types along with the counts for each Company Type.

* **Category:**

This section will display unique Categories along with the counts for each Category.

* **Revenue:**

This section will display unique Revenue ranges along with the counts for each revenue range.

* **Market Cap:**

This section will display unique Market Cap ranges along with the counts for each market Cap range.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘Company Name’ in all the search results tabs. When user clicks on the Company Name hyperlink, user will be navigated to **‘Company Single View’** which provides complete details of that particular company.

The Company Single View provides **Company Overview, Facilities/Subsidiaries, Products, Patents, News, Sales, People & Contacts, Financials, Deals, Regulatory, Key Events and Partnering Opportunities** associated with the selected company.



## System Architecture Component: Product

Product Module will have Properties and Chemical Info, Development Details, Key Events, Pharmacology, Deals, News, Patents, Sales and Regulatory sub modules.



### 3.3.1 Product Component Functions:

In the Product module search, user can search the database based on the **Company Name or Product Name or AI or Therapeutic Indication or Phase Name or Highest Phase or Phase Status or Mechanism of Action or Mode of Action Chem.Biological Classification or ATC Classification or Route of Admin or Dosage Form or Country**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the Search results, there will be multiple result tabs

* **Companies**: The Companies tab displays Result Company’s primary information in the grid view. The result table contains Company Name, Ticker Symbol, Stock Exchange, Country and Industry information.

Under the Companies tab there will be multiple sub tabs. The results in these sub tabs are similar to Company search results explained in section 3.2.1.

* + **Snapshot**
  + **Pipeline**
  + **Facilities**
  + **Financials**
  + **R&D Spend**
* **Products**: The Products tab displays Product Name, Active Ingredient, Therapeutic Indication, Highest Phase, Phase Status, Mechanism of Action, Companies Roles information for each product. This tab provides product overall information.
* **Deals**: The Deals tab displays Deal Date, Deal Type, Sub-Category, Product/Technology Name, Therapeutic Indication, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value and Region/Country information for each product.
* **News**: The News tab displays result companies news related information News Release Date, Hews Headline, News Category, Company Names, News Summary information.
* **Regulatory:** The Regulatory tab displays result products specific regulatory information like Product Name, Active Ingredient, Approval Date, Company Name, Regulatory Indication, Application Type, Country and Regulatory Details information.
* **Patents:** The Patents tab displays result products specific Patents information like Product Name, Active Ingredient, Patent Number, Patent Type, Company Name, Estimated Expiry Date, Patent Term Extension, Extended Expiry Date and Pediatric Expiry Date.
* **Events:** The Events tab displays result products milestone specific information like Estimated Event Start Date, Estimated Event End Date, Country, Product Name, Therapeutic Indication, Phase Name, Category, Sub Category, Event Status, Company Names and Summary information.

The Refined Search results provides further filtering on the search results based on the below categories. These sections will display unique values from each category along with the count.

* **Company Name**

This section will display unique Industry types along with the counts.

* **Therapy Area:**

This section will display unique Therapy Areas along with the counts.

* **Therapeutic Indication:**

This section will display unique Therapeutic Indications along with the counts.

* **Phase Name:**

This section will display unique Phase Names along with the counts.

* **Mechanism of Action:**

This section will display unique Mechanism of Actions along with the counts.

* **Mode of Action:**

This section will display unique Mode of Actions along with the counts.

* **ATC Classification:**

This section will display unique ATC Classifications along with the counts.

* **Chemical &Biological. Classification:**

This section will display unique Chemical &Biological. Classification along with the counts.

* **Active Ingredients:**

This section will display unique Active Ingredients along with the counts.

* **Molecule Type:**

This section will display unique Molecule Types along with the counts.

* **Country**:

This section will display unique Countries along with the counts.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘Company Name’ in all the search results tabs. When user clicks on the Company Name hyperlink, user will be navigated to **‘Company Single View’** which provides complete details of that particular company.

The Company Single View provides **Company Overview, Facilities/Subsidiaries, Products, Patents, News, Sales, People & Contacts, Financials, Deals, Regulatory, Key Events and Partnering Opportunities** associated with the selected company.



## System Architecture Component: Deals

Deals modules will have different deal types as sub modules and these are **Partnership, Merger and Acquisitions, Venture Financing, Private Placements, Private Equity and Public Offerings**.



### 3.4.1 Deals Component Functions:

In the Deals module search, user can search the database based on the **Company Name or Ticker Symbol or Industry or Product Name or Deal Type or Deal Status or Country**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the Search results, there will be multiple result tabs:

* **Partnership**: The Partnership tab displays result companies partnership deals information in the grid view. The result table contains Deal Date, Sub-Category, Product/Technology Name, Therapeutic Indication, Development Phase Name at Deal Date, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value and Region/Country.
* **Merger & Acquisitions:** The Merger & Acquisitions tab displays result companies Merger and Acquisition deals information in the grid view. The result table contains Deal Date, Sub-Category, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value and Region/Country.
* **Venture Financing:** The Venture Financing tab displays result companies Venture finance deals information in the grid view. The result table contains Deal Date, Sub-Category, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value, Round of Financing and Region/Country.
* **Private Placements:** The Private Placements tab displays result companies private placement deals information in the grid view. The result table contains Deal Date, Sub-Category, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value and Region/Country.
* **Private Equity:** The Private Equity tab displays result companies private equity deals information in the grid view. The result table contains Deal Date, Sub-Category, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value and Region/Country.
* **Public Offerings:** The Public Offerings tab displays result companies public offering deals information in the grid view. The result table contains Deal Date, Sub-Category, Deal Headline, Deal Status, Source/Target, Acquirer/Partner, Deal Value, Issuer and Region/Country.

The Refined Search results provides further filtering on the search results based on the below categories.

* **Deal by Type:**

This section will display unique Deal types along with the counts for each deal type.

* **Deals by Status:**

This section will display unique Deal Status along with the counts for each Deal Status.

* **Deals by Industry:**

This section will display unique Industry along with the counts for each Industry.

* **Deals by Region:**

This section will display unique Regions along with the counts for each Region.

* **Deals by Payment Type:**

This section will display unique Payment Type along with the counts for each payment type.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘**Deal Headline**’ in all the search results tabs. When user clicks on the Company Name hyperlink, user will be navigated to **‘Deal Single View’** which provides complete details of that particular deal.

The Deal Single View provides **Deal Summary, Deal Details and Advisors** associated with the selected deal.



## System Architecture Component: Patents

Patent module will have Patent Family and Regulatory info sub modules.



### 3.5.1 Patents Component Functions:

In the Patents module search, user can search the database based on the **Patent No or Company Name or Active Ingredient or Patent Type or Therapeutic Indication or Country**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the search results Patent specific information will be displayed in the grid. The result table contains **Product Number, Active Ingredient, Patent No, Patent Type, Company Name, Estimated Expiry Date, Extended Expiry Date and Pediatric Expiry Date**.

The Refined Search results provides further filtering on the search results based on the below categories.

* **Country:**

This section will display unique countries along with the counts for each country.

* **Patent Type:**

This section will display unique Patent Types along with the counts for each patent type.

* **Therapy Area:**

This section will display unique Therapy Areas along with the counts for each Therapy Area.

* **Company Name:**

This section will display unique Company Names along with the counts for each company.

* **Patent Status:**

This section will display unique Patent Status along with the counts for each patent status.

* **Patent Term Extension Status:**

This section will display unique Patent Term Extension Status along with the counts.

* **Patent Expiry Date:**

This section will display unique Patent Expiry Dates along with the counts.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘**Patent Number** in the search results. When user clicks on the Company Name hyperlink, user will be navigated to **‘Patent Single View’** which provides complete details of that particular Patent No.

The Patent Single View provides **Patent Basic Info, Patent Family and Regulatory Information** associated with the Patent No.



## System Architecture Component: Regulatory

Regulatory Module will have Marketing Details, Approval Details and Patent & Exclusivity Details submodules.



### 3.6.1 Regulatory Component Functions:

In the Regulatory module search, user can search the database based on the **Company Name or Ticker Symbol or Product Name or AI or Therapeutic Indication or Application No or Approval Type of Country or Application Type**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the search results Regulatory specific information will be displayed in the grid. The result table contains **Product Number, Active Ingredient, Approval Date, Company Name, Regulatory Indications, Application Type, Country and Regulatory Details**.

The Refined Search results provides further filtering on the search results based on the below categories

* **Country:**

This section will display unique countries along with the counts for each country.

* **Therapy Area:**

This section will display unique Therapy Areas along with the counts for each Therapy Area.

* **Approval Type:**

This section will display unique Approval Types along with the counts for each approval type.

* **Molecule Type:**

This section will display unique Molecule Types along with the counts for each molecule type.

* **Approval Date:**

This section will display unique Approval Dates along with the counts.

* **Marketing Status:**

This section will display unique Marketing Status along with the counts.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘**Regulatory Details’** column in the search results. When user clicks on the Company Name hyperlink, user will be navigated to **‘Regulatory Single View’** which provides complete details of that particular Product.



## System Architecture Component: News



### 3.7.1 News Component Functions:

In the News module search, user can search the database based on the **Company Name or Industry or Product Name or Therapy Area**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the search results News specific information will be displayed in the grid. The result table contains **News Release Date, News Headline, News Category, Company Name and News Summary**.

The Refined Search results provides further filtering on the search results based on the below categories

* **Industry:**

This section will display unique Industry along with the counts for each industry.

* **News by Category:**

This section will display unique News Categories along with the counts for each News Category.

* **Companies:**

This section will display unique Companies along with the counts for each company.

* **Products:**

This section will display unique Products along with the counts for each product.

* **Therapy Area:**

This section will display unique Therapy Areas along with the counts.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘**News Headline’** column in the search results. When user clicks on the Company Name hyperlink, user will be navigated to **‘News Single View’** which provides complete details of that particular news headline.



## System Architecture Component: Key Events



### 3.8.1 Events Component Functions:

In the Key Events module search, user can search the database based on the **Event Status or Country or Product Name or Company Name or Therapy Area or Event Category**. User can also search by combination of these search fields. While selecting the multiple search criteria’s, all the search criteria’s will be appended the search query and executes as a single query in the database.

In the search results Events specific information will be displayed in the grid. The result table contains **Event Estimated Start Date, Event Estimated End Date, Country, Product Name, Therapeutic Indication, Phase Name, Category, Sub Category, Event Status, Company Name and Event Summary**.

The Refined Search results provides further filtering on the search results based on the below categories

* **Country/Region:**

This section will display unique Country/Region along with the counts.

* **Event Status:**

This section will display unique Event Status along with the counts.

* **Products:**

This section will display unique Products along with the counts.

* **Companies:**

This section will display unique Companies along with the counts.

* **Therapy Area:**

This section will display unique Therapy Areas along with the counts.

* **Events Estimated Start Date:**

This section will display unique date ranges along with the counts.

* **Events Category:**

This section will display unique Event Categories along with the counts.

User can have the options to **‘Modify the Search Query, ‘Save Search’, ‘Filter Search’ and ‘Export Results’** options in the search results view.

In addition, there will be a hyperlink on the ‘**Event Summary’** column in the search results. When user clicks on the Company Name hyperlink, user will be navigated to **‘Event Single View’** which provides complete details of that particular event.



# Section 4 System Construction Environment

*The* ***System Construction Environment*** *section details the various environments necessary to enable system construction and testing.*

## 4.1 Development Environment Configuration

* + Processor: Intel(R) Core™ i5-5200U CPU @ 2.20GHz 2.20GHz
  + RAM: 8GB
  + System type: 64 bit Operating System, x64 based processor.
  + Windows: Windows 10
  + Visual Studio 2015
  + .Net Framework 4.5
  + SqlServer 2014 Management Studio
  + ClosedXML
  + ELMAH v1.2
  + Entity Framework v6.0
  + iTextSharp 5.5
  + SendGrid SMTP API 5.1

## *4.2* QA Environment Configuration

* + Processor: Intel(R) Core™ i5-5200U CPU @ 2.20GHz 2.20GHz
  + RAM: 8GB
  + System type: 64 bit Operating System, x64 based processor.
  + Windows: Windows 10
  + .Net Framework 4.5
  + Selenium
  + JIRA
  + Redmine

## *4.3* Acceptance Environment Configuration

* + Processor: Intel(R) Core™ i5-5200U CPU @ 2.20GHz 2.20GHz
  + RAM: 8GB
  + System type: 64 bit Operating System, x64 based processor.
  + Windows: Windows 10
  + .Net Framework 4.5