

Learning Paths - Level 01

Building Applications

Session Breakdown

05 min	01	Introduction
05 min	02	Understanding Requirements
10 min	03	Modeling Data Structures
10 min	04	Implementing Business Logic
10 min	05	Designing User Interfaces



Part 01

Introduction and Session Scope



**Have you ever bought a subscription to a Software
or application that you had to Customize?**

What are the pain points around traditionally customizing a DXP?

Developing an Application



**Traditional
Development**



It takes time

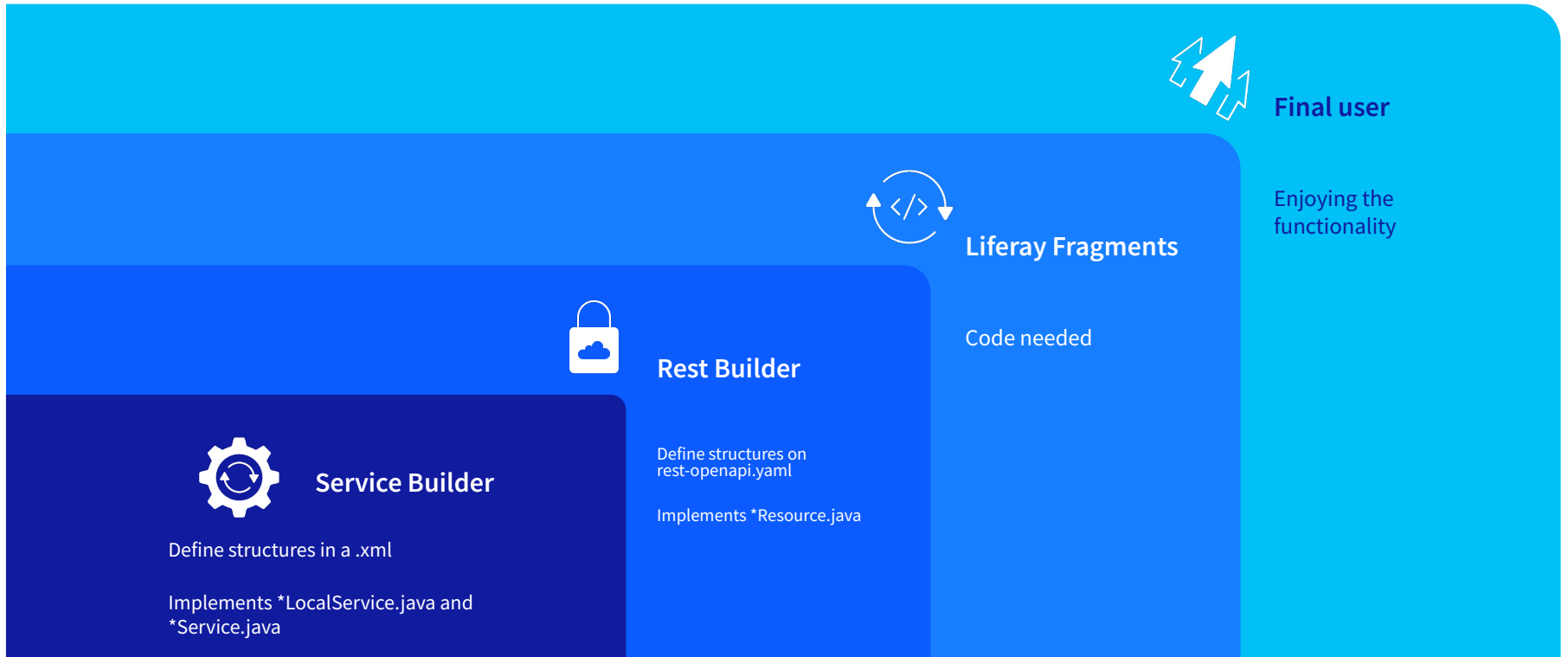


**Only developers can
do it**



**Changing OOTB behavior
may not be that easy**

Traditional Development



What if you could leverage OOTB functionalities of a Platform and even create new ones without touching a single line of code?

What's *Building Applications* and why is it important?

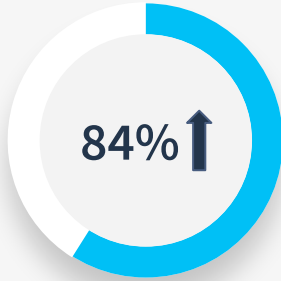
Introduction

- Liferay has been continuously investing in increasing its Low Code capabilities.
- “Building” is different from “Developing”.
- It is available in all of the Deployment Approaches (PaaS, SaaS and SH) - even to the Community Edition.



Low-Code

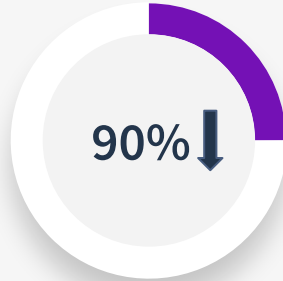
Low Code Statistics



Adoption

Enterprises are turning to Low/No code approach.

Source: Forrester Research



Development Time

By leveraging Developers experises.

Source: 451 Research / Advisory



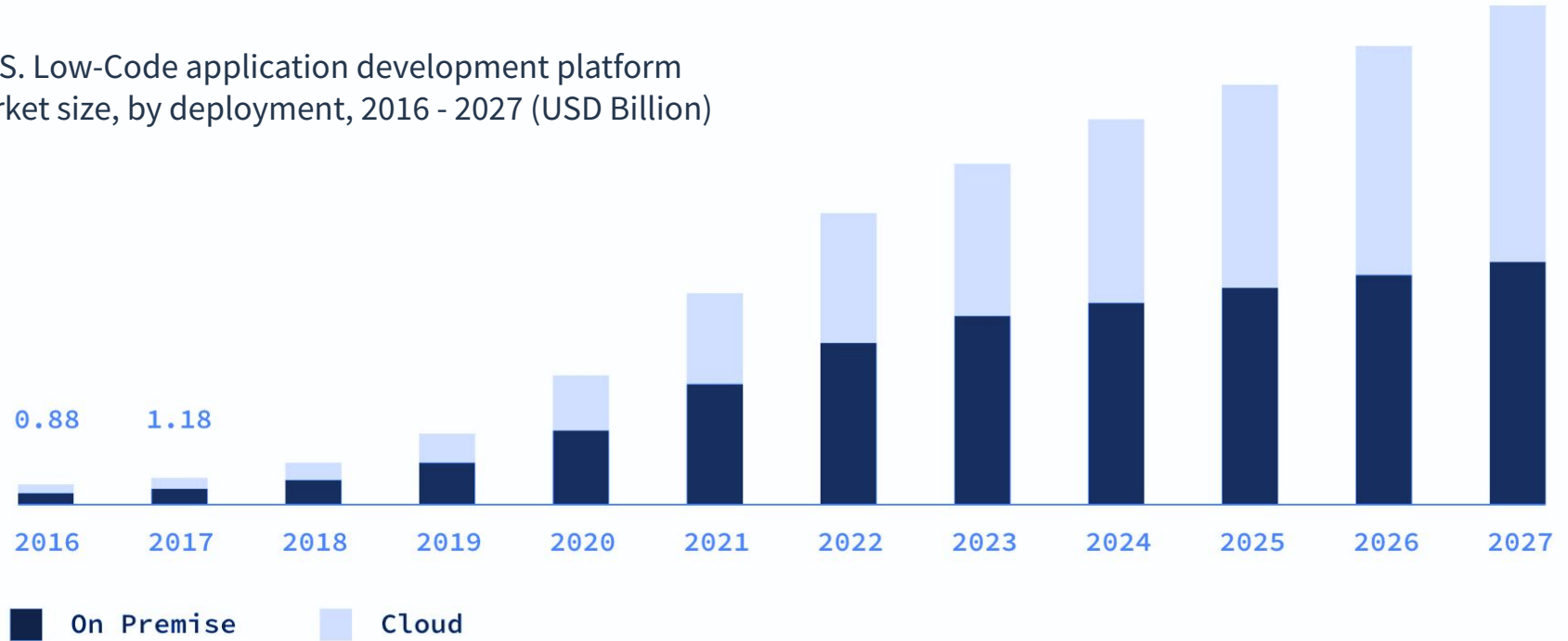
Development Velocity

By introducing other stakeholders

Source: 451 Research / Advisory

Low Code and Cloud

US. Low-Code application development platform market size, by deployment, 2016 - 2027 (USD Billion)



Source: www.grandviewresearch.com



What is covered in this session?

Session Scope

- Understand what's possible with low code applications in Liferay.
- Focus on Objects and other Low-Code frameworks.
- Provide knowledge about:
 - Modeling data structures.
 - Implementing business logic.
 - Designing user interfaces.
- Highlight how to integrate Model Data with Liferay's core frameworks.
- Client extensions as another option to interact with data.



Part 02

Understanding Requirements



Clarity Business Requirements

- Clarity's is a global leader in optical technology that has been drawing interest from a growing number of international distributors.
 - They need a custom solution for receiving and approving applications from B2B distributors.
- **Distributor Application**
 - Guest user's application request
 - Collect information to assess relative value of prospective distributor, e.g.: Applicant's Name, Title, Email...
 - **Applications Evaluations**
 - Application request assessment
 - Store notes and recommendations made during the review process of the distributor application, e.g.: decision, interview notes...
 - Notification is sent to the user when the request is evaluated.
 - One application can be evaluated by many reviewers.



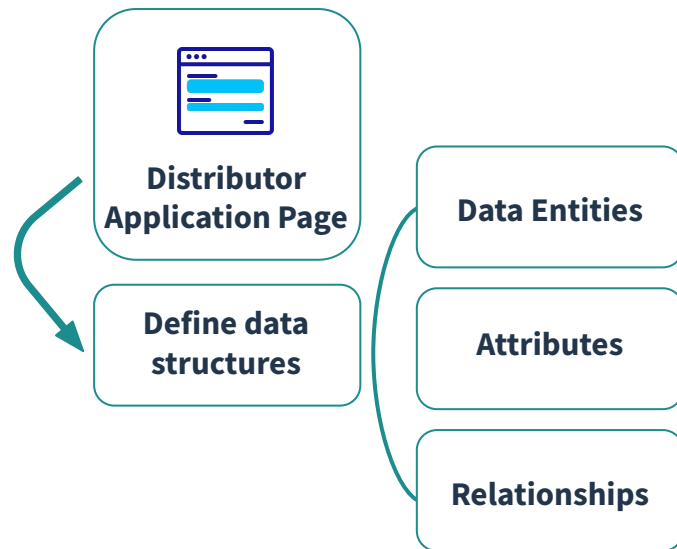
Part 03

Modeling Data Structures



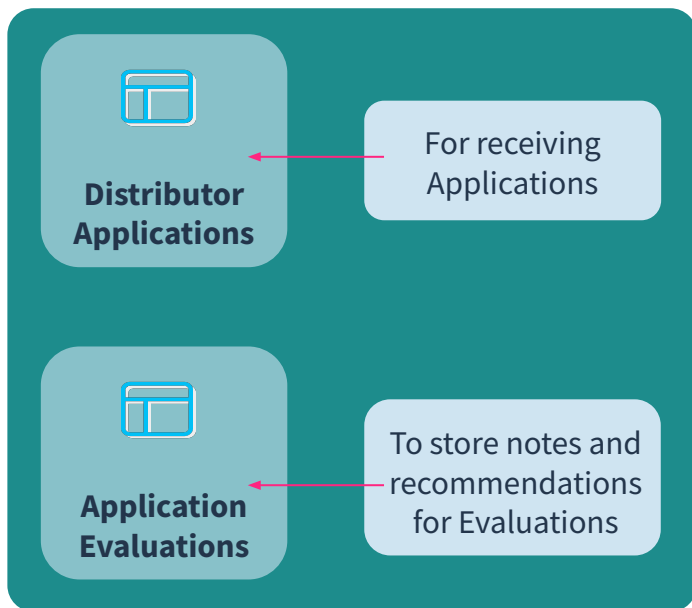
Liferay Objects

- Unify the experience across the platform and leverage all capabilities.
- Build fully integrated Liferay applications without writing any code or manually deploying modules.
 - *Object definitions* - represent types of data entities.
 - *Attributes* - represent database columns that store specific types of information for an application.
 - *Object relationships* - determine how data is connected in your application.



Identifying Data Entities

- Create object definitions that represent types of data entities:
 - A standard set of system fields.
 - Configuration for general details, behavior, scope/permissions, and available features.
 - Headless REST APIs for CRUD operations will be automatically generated.
 - Provides a basic user interface for objects and integration with Liferay Page Capabilities.
- Clarity must store and manage two types of data entities for the distributor application flow:
 - Distributor Applications
 - Application Evaluations



Welcome to Liferay

Enjoy using the best DXP on Earth!



Picklists

Creating an Object

Objects

OBJECT FOLDERS + ⋮

Default

Default :

ERC: **default** ⓘ

View in Model Builder

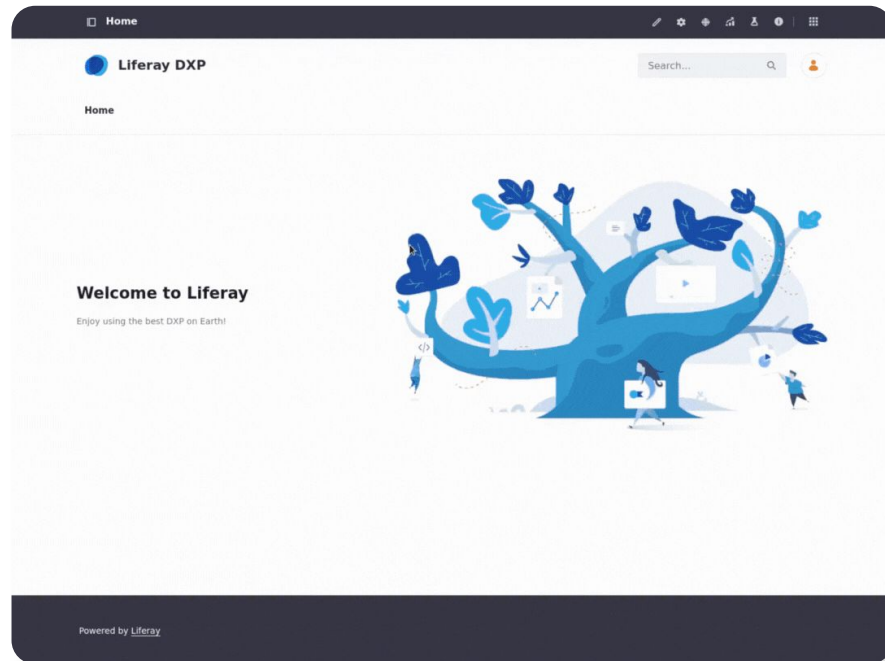
Search 🔍 +

Label ↑↓	Scope	System	Modified Date ↑↓	Status	⌵
Postal Address	company	Yes	Mar 19, 2024, 4:43:05 PM	APPROVED	⋮
Organization	company	Yes	Mar 19, 2024, 4:43:05 PM	APPROVED	⋮
Account	company	Yes	Mar 19, 2024, 4:43:05 PM	APPROVED	⋮
User	company	Yes	Mar 19, 2024, 4:43:05 PM	APPROVED	⋮
Commerce Product Group	company	Yes	Mar 19, 2024, 4:43:05 PM	APPROVED	⋮
Commerce Order	company	Yes	Mar 19, 2024, 4:43:11 PM	APPROVED	⋮
Commerce Product	company	Yes	Mar 19, 2024, 4:43:12 PM	APPROVED	⋮

20 Items ⌵ Showing 1 to 7 of 7 entries. < 1 >

Model Builder

- Objects Model Builder GUI was created for designing complex object structures.
- With it, you can:
 - Visualize object definitions and relationships.
 - Create, manage, and extend data models.
 - Configure attributes and relationships.



Creating a Relationship

The screenshot shows the Object Model Builder interface. At the top, it says "Object Model Builder" and "Default ERC: default". There is a "Publish" button in the top right. On the left, there is a sidebar with a "Create New Object" button and a search bar. Below the search bar, there is a list of objects under the "Default" folder, including "Postal Address", "Commerce Produc...", "Organization", "Account", "User", "Commerce Order", "Commerce Product", "Distributor Applica...", and "Application Evalua...". Below this list is a section for "OTHER FOLDERS".

In the center, there are two panels for objects. The left panel is titled "Distributo..." and has a "CUSTOM" and "APPROVED" status. It lists fields: "ID" (LONG INTEGER), "External Referenc..." (TEXT), "Applicant Name" (TEXT), "Application State" (PICKLIST), and "Author" (TEXT). Below the fields is a button "Add Field or Relationship" and a "Show All Fields" dropdown. The right panel is titled "Applicatio..." and also has "CUSTOM" and "APPROVED" status. It lists fields: "ID" (LONG INTEGER), "External Referenc..." (TEXT), "Author" (TEXT), "Create Date" (DATE), and "Modified Date" (DATE). Below the fields is a button "Add Field or Relationship" and a "Show All Fields" dropdown.

At the bottom left, there is a small box with a plus sign, a minus sign, and a refresh icon, and a larger box containing two small square icons, representing a relationship being created.

On the right side, there is a large circular graphic with a satellite and the text "Select an Object or Relationship" and "Select an Object or Relationship to activate this panel."

Resources

Objects

<https://learn.liferay.com/en/w/dxp/building-applications/objects>



Part 04

Implementing Business Logic



What does Business Logic mean?

Business logic comprises the rules and processes that **determine how an application behaves** within a system to meet business needs. Implementing business logic effectively can streamline operations, improve efficiency, and promote consistency across your organization.

Implementing business logic allows Clarity to onboard distributors quickly and safely:

Validations

Permissions

States

Workflows

Notifications

Implementing Business Logic

Validations

- So far, Clarity has no way to ensure applicants provide valid, consistent data in their distributor applications.
- Validations set rules to ensure user input meets your criteria.
- Built-in validation functions for email addresses, phone numbers, and website URLs.
- Capability to add validation rules directly to object definition fields, have them trigger on submission of an object entry, and display an error message for invalid input.

Basic Info | **Unique Composite Key**

Fields

i Info A unique composite key validation checks if the combination of two or more fields can be used to uniquely identify an object. If the combination cannot be created.

Search

Label	Type
Bar to Foos	Relationship
Integer Field	Integer

Error Message

Message *

The field values are already in use. Please choose unique values.

Output Validation Type ?

Full Validation (Form Summary)

Partial Validation (Inline Field)

< Edit Distributor Application ⌵ 👤

Distributor Application ID: 32832 Cancel Save

CUSTOM ERC: C_DISTRIBUTOR_APPLICATION ⌵ ✎

Details Fields Relationships Layouts Actions Views Validations State Manager

Basic Information

OBJECT DATA

Name *
DistributorApplication

Label *
Distributor Application 🇺🇸 en_US

Plural Label *
Distributor Applications 🇺🇸 en_US

Table Name
O_91359573117259_DistributorApplication

Activate Object

ENTRY DISPLAY ▾

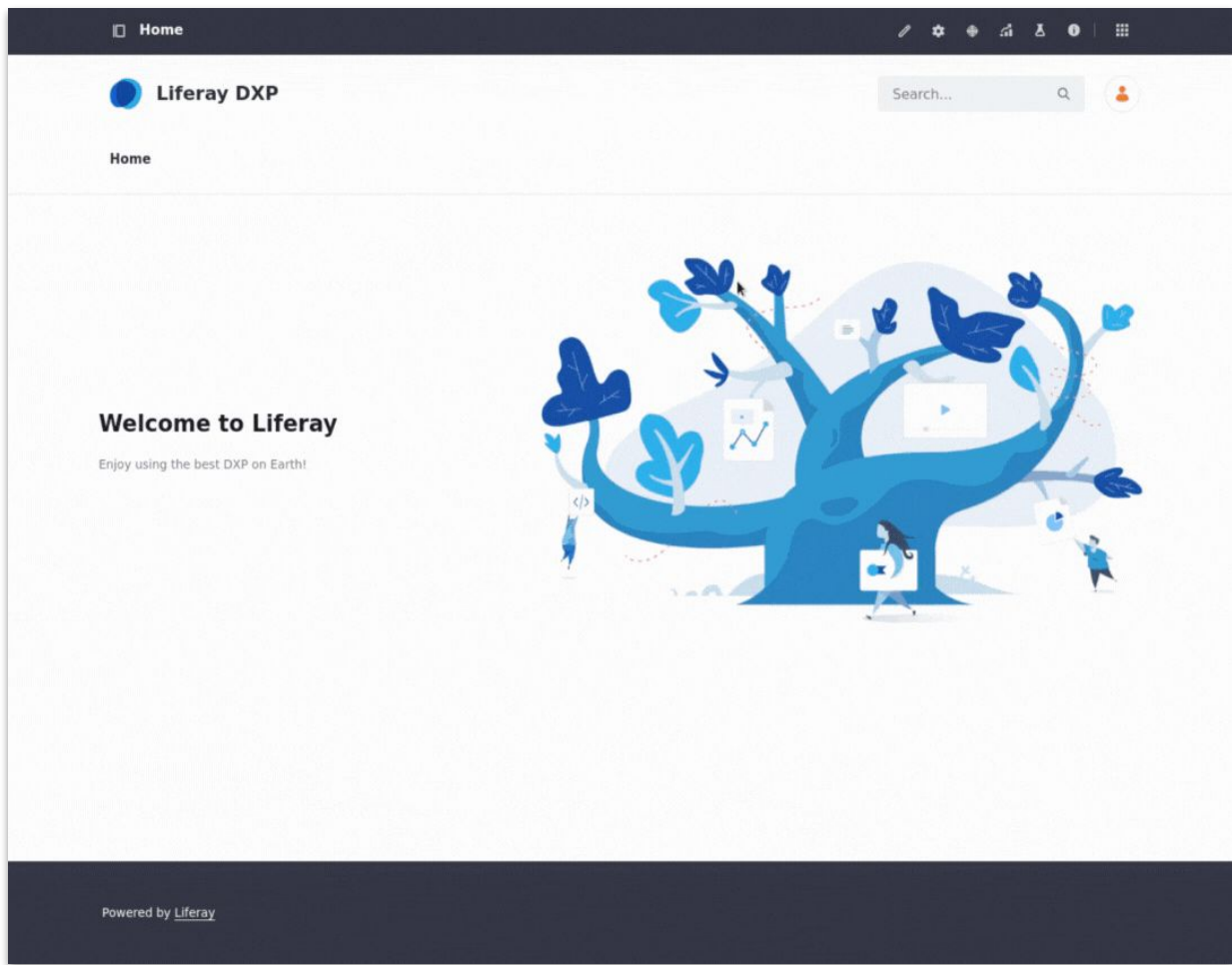
Entry Title Field
Business Name

SCOPE ▾

Scope
Company

Configuring Validations

Applying Validations



Implementing Business Logic

Permissions

- Clarity needs all, and only, authorized users can submit applications.
- Only business development team can view submitted applications and fill out evaluations.
- Modify User Roles to create, read, update, and delete object entries.
- Two roles: Business Development Specialist and Business Development Manager
- Use Widget configurations to fine tune the values based on business needs
- Manage Permissions and Entry Levels to access data with Account Membership.
 - Critical for data privacy and security.

The screenshot shows the 'OBJECT DEFINITIONS' interface. On the left, there is a list of actions with checkboxes: Action, Add Object Definition, Add Object Folder, Extend System Object Definition, Permissions, and Publish Object Definition. On the right, there is a context menu for 'Clarity' with options: Edit Label and ERC, Export Object Folder, Import Object Definition, Object Folder Permissions, and Delete Object Folder. Below the menu, there is a table with columns 'Label', 'Scope', and 'System'. The table contains two entries: 'Distributor Applications' and 'Application Evaluations', both with 'company' as the scope and 'No' as the system.

Label	Scope	System
Distributor Applications	company	No
Application Evaluations	company	No

The screenshot shows a table with columns: Label, Scope, System, Modified Date, and Status. The table contains one entry: 'Distributor Application' with scope 'company', system 'No', modified date 'Mar 20, 2024, 7:21:36 PM', and status 'APPROVED'. A context menu is open over the entry, showing options: View, Export as JSON, Permissions, and Delete. The 'Permissions' option is highlighted with a red box.

Label	Scope	System	Modified Date	Status
Distributor Application	company	No	Mar 20, 2024, 7:21:36 PM	APPROVED

Distributor Applications



ID ↑↓	Applicant Name ↑↓	Business Name ↑↓	Create Date ↑↓	Application State ↑↓	Status ↑↓	
33768	John Williams		Mar 15, 2024, 4:01 PM	Open	APPROVED	⋮

20 Items ▾ Showing 1 to 1 of 1 entries.

< 1 >

User Permissions

Implementing Business Logic

States

- Clarity now needs a way to track the progress of a distributor application and trigger additional business logic when application entries reach certain statuses.
- To do this, Clarity leveraged Liferay's custom state field capability.
- When users update the Application State field of a Distributor Application object entry, their picklist options are determined by the state flow table.

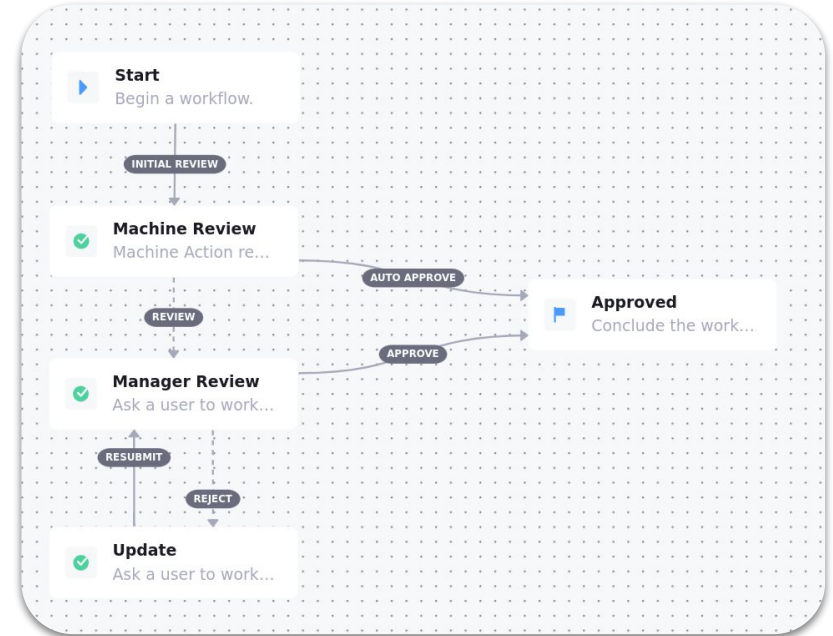
Application State Settings

Select the State Flow

State Name	Next Status
Open	Under Review <input type="checkbox"/> Withdrawn <input type="checkbox"/>
Under Review	Approved <input type="checkbox"/> Denied <input type="checkbox"/> Withdrawn <input type="checkbox"/> On Hold <input type="checkbox"/>
Approved	Under Review <input type="checkbox"/>
Denied	Under Review <input type="checkbox"/>
Withdrawn	Open <input type="checkbox"/>
On Hold	Open <input type="checkbox"/> Under Review <input type="checkbox"/>

Workflows

- Currently: Application State field updates approved automatically, regardless the state value.
- Aim: require final approval whenever Application State changes to Approved or Denied.
- Use Workflow and Client Extensions for approval processes to: improve task visibility; eliminate bottlenecks in business processes; reduce the time and resources required to complete tasks.



GENERAL DETAILS

Applicant Name *

John Williams

Applicant Email

john.williams@liferay.com

Products of Interest

Choose Options

Distribution Regions

Choose Options

Order Types of Interest

Choose Options

Product Labeling

Choose an Option

Estimated Annual Purchase Volume

Choose an Option

Comments

Application State *

Under Review

CONTACT INFORMATION

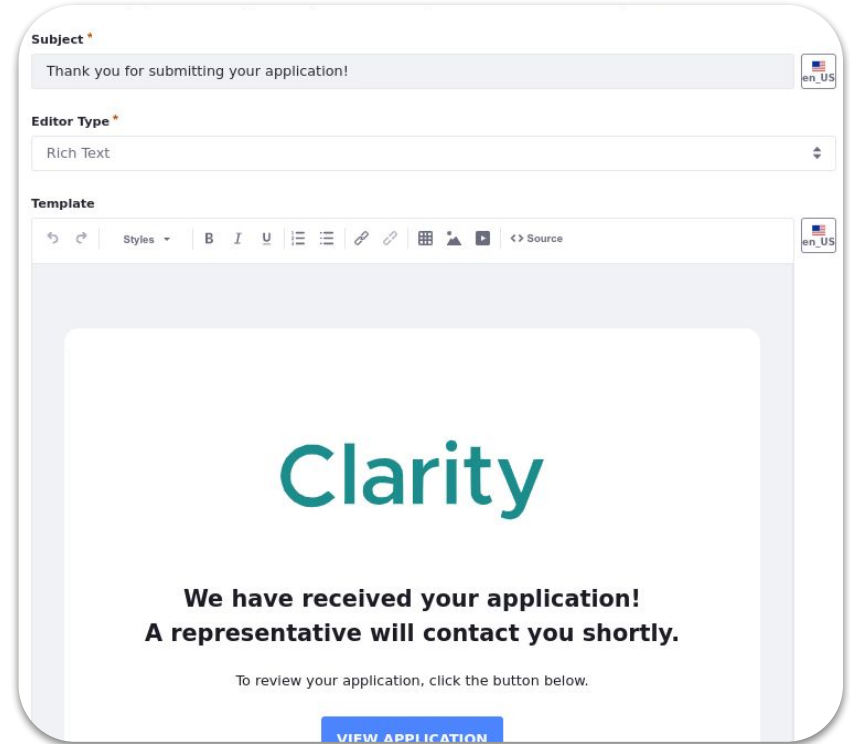
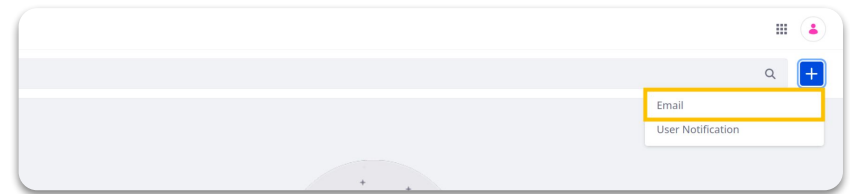
Primary Contact Name

Primary Contact Title

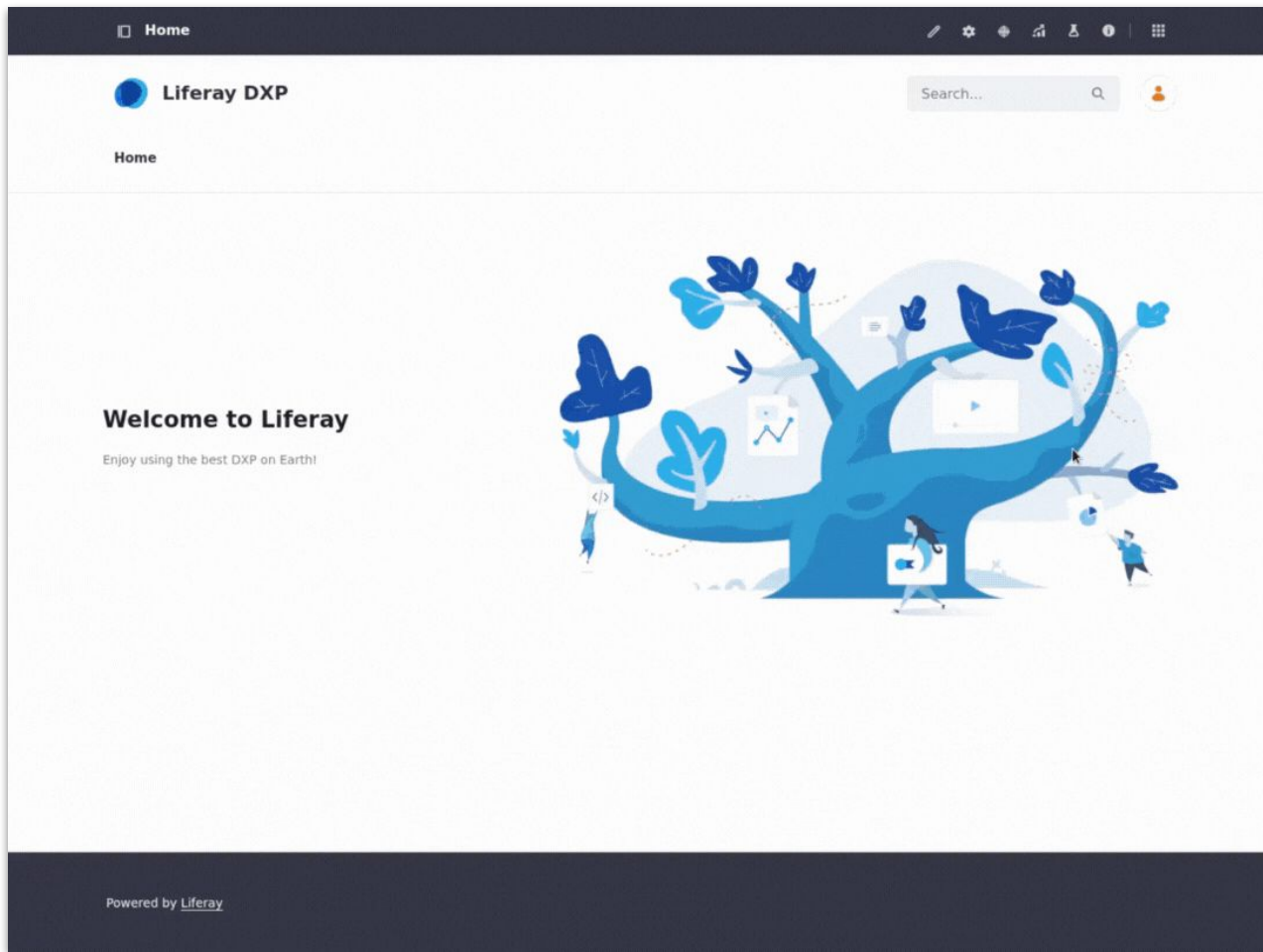
Workflows

Notifications

- Clarity's defined workflows around state changes have no automated notifications.
 - Business development team members have to manually check the Distributor Application object manually to see new application submissions.
 - Applicants only know their application status if a business development specialist or manager informs them directly.
- They need a solution that is scalable, human error free, has good user experience, and focuses on not missing opportunities.
 - Create notification templates and then apply them to object entry events (entry creation, entry update, etc.).
 - Templates provide notifications with content and design, while the object entry event determines the condition to trigger them.

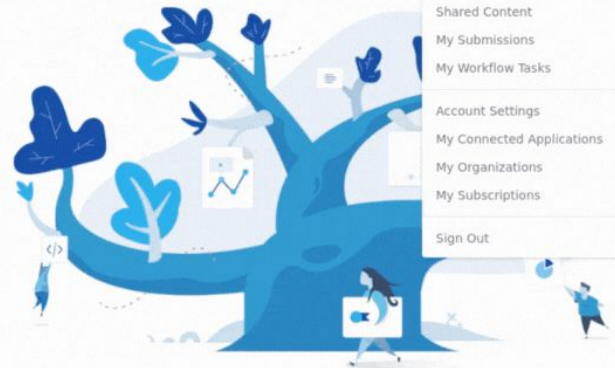


**Notification
Templates**



Welcome to Liferay

Enjoy using the best DXP on Earth!



JOHN DOE

My Profile

My Dashboard

Notifications

Shared Content

My Submissions

My Workflow Tasks

Account Settings

My Connected Applications

My Organizations

My Subscriptions

Sign Out

Applying Notification Templates

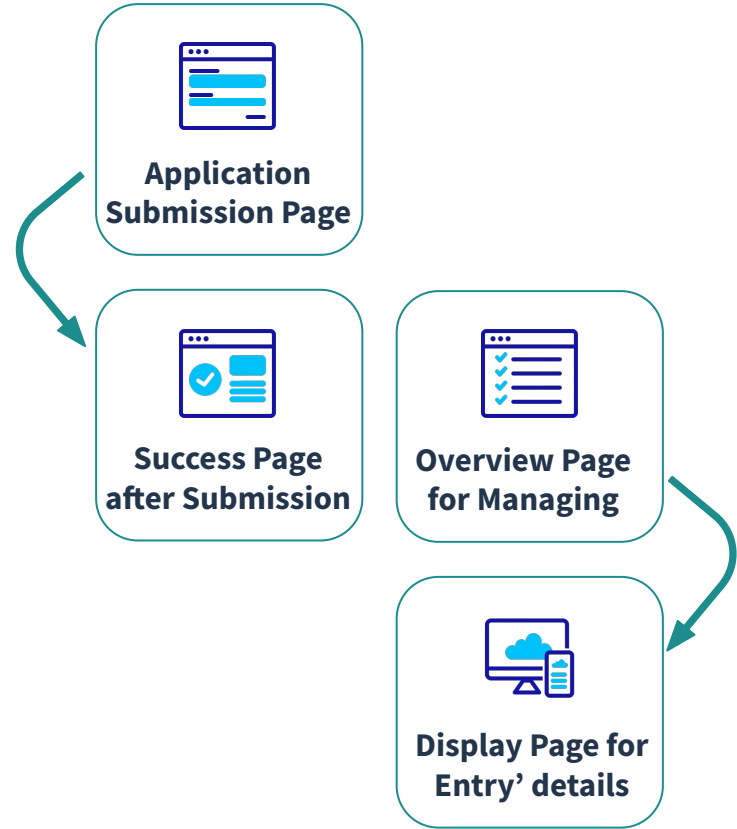
Part 05

Designing User Interfaces



Creating User Interfaces

- Liferay provides tools for creating dynamic and responsive user interfaces for custom applications.
 - To create seamless site experience there are page builder features such fragments and widgets for you to design forms, display object data, and more.
- Clarity wants to integrate the application with their enterprise marketing website.
 - As standard object layouts and views are serviceable for administrative users they have limited customization options.



Application Submission Page



Clarity Home My Tickets Resources Application

International Distributor Application

Step 1 Step 2 Step 3 Step 4 Step 5

Reference Name Phone Number

Address Line One

Address Line Two

City ZIP, Postal Code

State, Province, Region Country

Previous

Clarity Menu

International Distributor Application

1 2 3 4 5

General Details

Applicant Name*

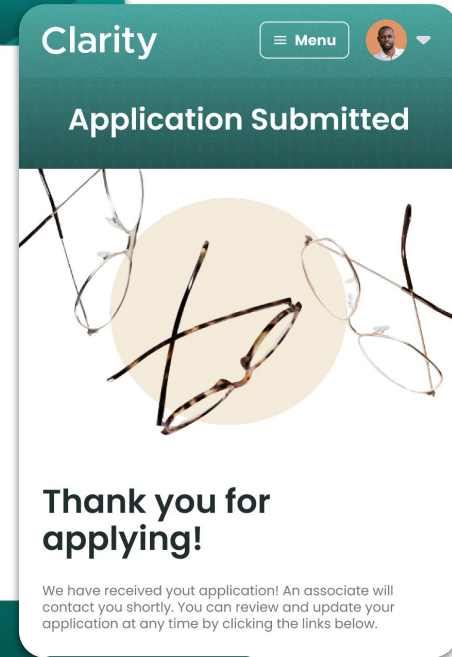
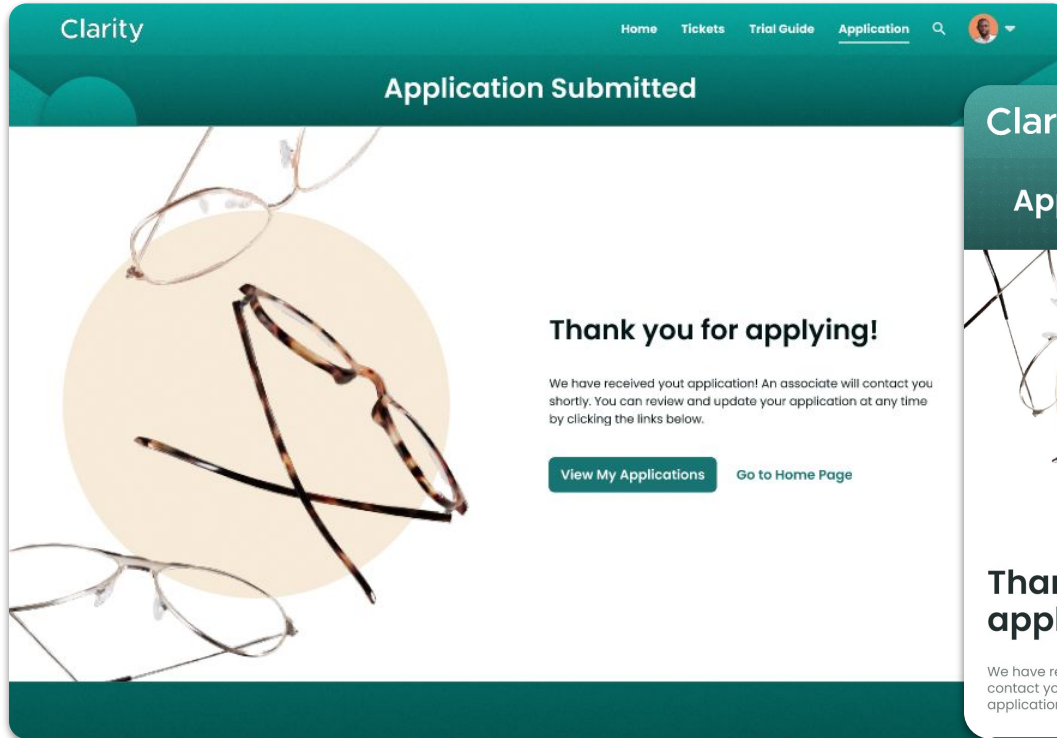
Applicant Email

Distribution Regions

Success Page after Submission



Success Page
after Submission



Overview Page for Managing



Overview Page
for Managing

The screenshot shows a web application interface for managing distributor applications. The header is teal with the brand name 'Clarity' on the left and navigation links 'Home', 'Tickets', 'Trial Guide', and 'Applications' on the right. A search icon and a user profile icon are also present. Below the header, the main title 'Distributor Applications' is centered. A filter dropdown and a search input field are located above a table. The table has two tabs, 'Open' and 'Resolved', with 'Open' selected. The table columns are 'Number', 'App Field', 'App Field', 'App Field', and 'Submitted On'. The data rows show application details such as '#10001', 'Applicant Name', 'Application #93879, description here', 'App Field value', and 'Mar 16, 2022'.

Number	App Field	App Field	App Field	Submitted On
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022
#10001	Applicant Name	Application #93879, description here	App Field value	Mar 16, 2022

Display Page for Entry' details



Clarity Home My Tickets Resources Application

Application / Application #10001

← Back to Applications

APPLICATION #10001 Create Evaluation Edit Application

General Details

Applicant Name*
Lorem Ipsum

Applicant Email
Lorem Ipsum

Distribution Regions
Select Regions

Product of Interest*
 Option Number One
 Two of Five
 Option Three
 Fourth Option

Order Types of Interest*
 Option Number One
 Two of Five
 Option Three
 Fourth Option

Clarity Menu

Application / Application #10001

APPLICATION #10001 Create Evaluation Edit

General Details

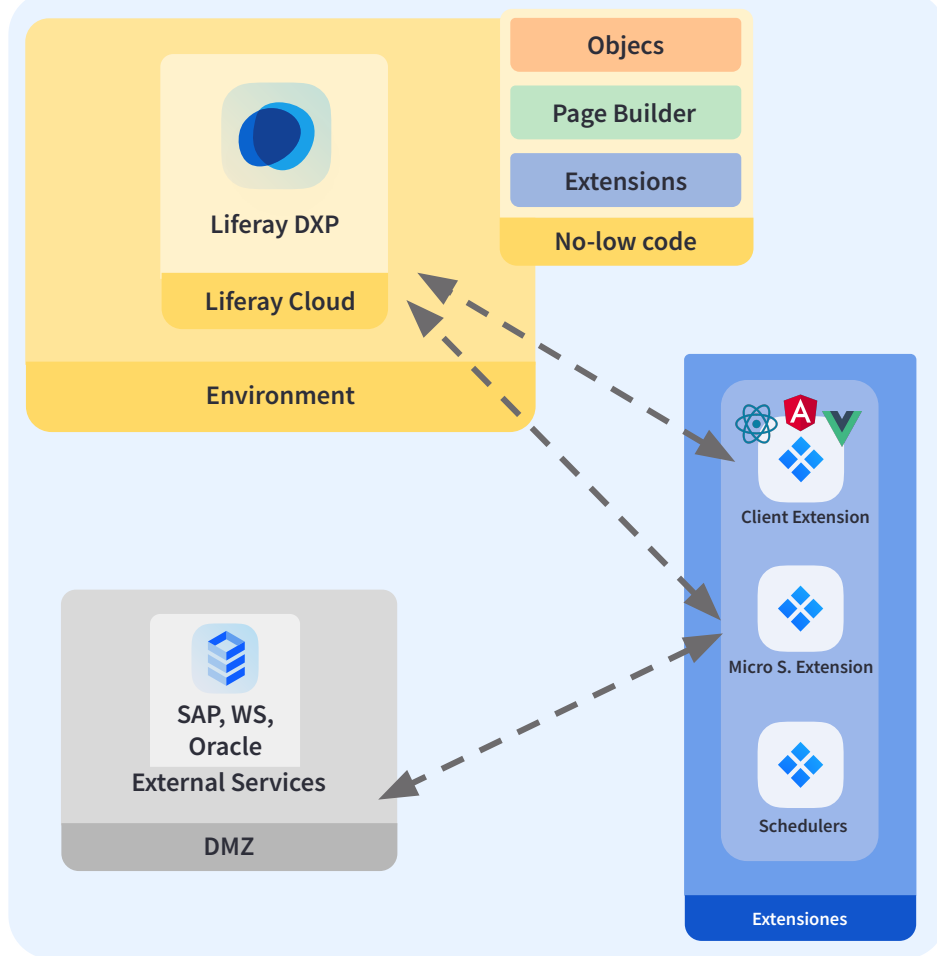
Applicant Name*
Lorem Ipsum

Applicant Email
Lorem Ipsum

Distribution Regions

Designing with Client Extensions

- Custom element client extensions uses Liferay's front-end infrastructure to integrate external applications with the platform and render them as page widgets.
- Custom elements allow web developers to define new HTML tags, extend existing ones, and create reusable web components.
- Applications from any domain accessible outside Liferay can be integrated in a Page.
- Developments based on frontend standards such as React, Vue, Angular or Custom Applications through external services.



One more thing!... Liferay Object APIs

Liferay provides APIs to create and manage Objects but, additionally, publishing an object creates and activates your new application. When activated, users can access it in the Liferay UI according to its scope and panel link but also a new Headless API is automatically created for CRUD operations.

- **Automatically generated REST APIs** when Liferay Objects get published
- Accessible via the `c/[pluralobjectlabel]` naming pattern
- Perform **CRUD operations**: Create, Read, Update and Delete Object entries
- Use **nestedFields** to query and submit related entries

- **Designed User Interfaces** are able to access Objects using their APIs (React, Angular, Vue, etc.)
- Access to Objects using **Fragments, ADTs, JavaScript, etc.**
- **Integration with 3rd party systems** with Objects.
- **Standalone trigger** for object actions via UI and APIs.

Object ^{v1.0} ^{OAS3}

http://localhost:8080/o/c/distributorapplications/openapi.json

Servers

http://localhost:8080/o/c/distributorapplications/

DistributorApplication

GET	/	
POST	/	
DELETE	/batch	deleteDistributorApplicationBatch
POST	/batch	postDistributorApplicationBatch
PUT	/batch	putDistributorApplicationBatch
DELETE	/by-external-reference-code/{externalReferenceCode}	deleteByExternalReferenceCode
GET	/by-external-reference-code/{externalReferenceCode}	getByExternalReferenceCode
PATCH	/by-external-reference-code/{externalReferenceCode}	patchByExternalReferenceCode
PUT	/by-external-reference-code/{externalReferenceCode}	putByExternalReferenceCode
POST	/export-batch	postDistributorApplicationsPageExportBatch
DELETE	/{distributorApplicationId}	deleteDistributorApplication
GET	/{distributorApplicationId}	getDistributorApplication
PATCH	/{distributorApplicationId}	patchDistributorApplication
PUT	/{distributorApplicationId}	putDistributorApplication
GET	/{distributorApplicationId}/permissions	getDistributorApplicationPermissionsPage
PUT	/{distributorApplicationId}/permissions	putDistributorApplicationPermissionsPage

- analytics-settings-res/v1.0
- batch-planner/v1.0
- bulk/v1.0
- c/distributorapplications**
- captcha/v1.0
- change-tracking-rest/v1.0
- data-engine/v2.0
- digital-signature-rest/v1.0
- dispatch-rest/v1.0
- frontend-view-state/v1.0
- headless-admin-address/v1.0
- headless-admin-content/v1.0
- headless-admin-list-type/v1.0

Generated Object API

Resources

Client Extensions

<https://learn.liferay.com/web/guest/w/dxp/building-applications/client-extensions>



Resources

Form Fragments

<https://learn.liferay.com/w/dxp/site-building/creating-pages/page-fragments-and-widgets/using-fragments/personalizing-custom-forms-using-form-fragments>



Wrapping Everything up

Liferay Objects

- OSGi Modules are great but let's move forward.
- Liferay Objects can provide you the necessary tooling to Build Applications without coding (but you still can).
- It incorporates both Service builder and Rest Builder
- It is well integrated with other Liferay frameworks and functionalities to ensure compatibility and a seamlessly experience
- Headless APIs available





Go out of the box building custom applications to tailor Liferay to your specific needs, and simplify their lifecycle leveraging maintainability and effortless upgrades in SaaS, PaaS and on-premises offerings.

Thank you