

# The Future of Strategy Technology Shift

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# Our new software development stack

## Goals

- Move to a modern web framework that supports a responsive UI that works on any device.
- Separate the business rules from the applications so can be used wherever the data is accessed (Strategy, API).
- Use an open API service layer for the Strategy applications.
- Improve release management to reduce release conflicts and speed up release cadence.
- Accelerate application migration of the existing Strategy applications.

# Web Framework Selection

Many to choose from

- Angular, React, Vue

And the winner is: Angular

- Full featured relative to other frameworks
- Opinionated but modular design allows flexibility
- Strong language support (TypeScript)
- Component architecture matches well with existing Strategy application
- Frequent and predictable upgrade cycle

# Application Demo

Logon

Dashboard overview

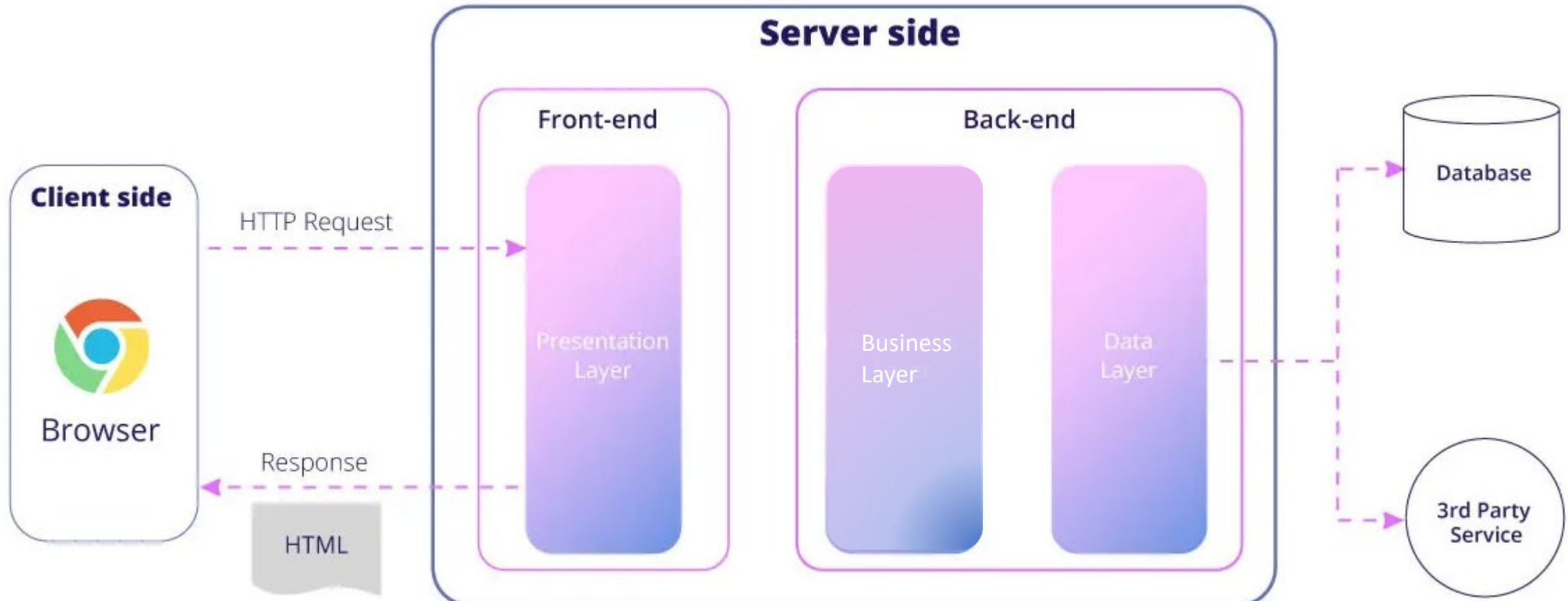
- Landing page made of components that can be customized to user preferences
  - Process/task queues, MRU lists, dashboard summaries
- Familiar navigation menu structure
  - Nest module navigation down the side
  - Standard menu bar at the top
- User profile flyout

# Angular – SPA

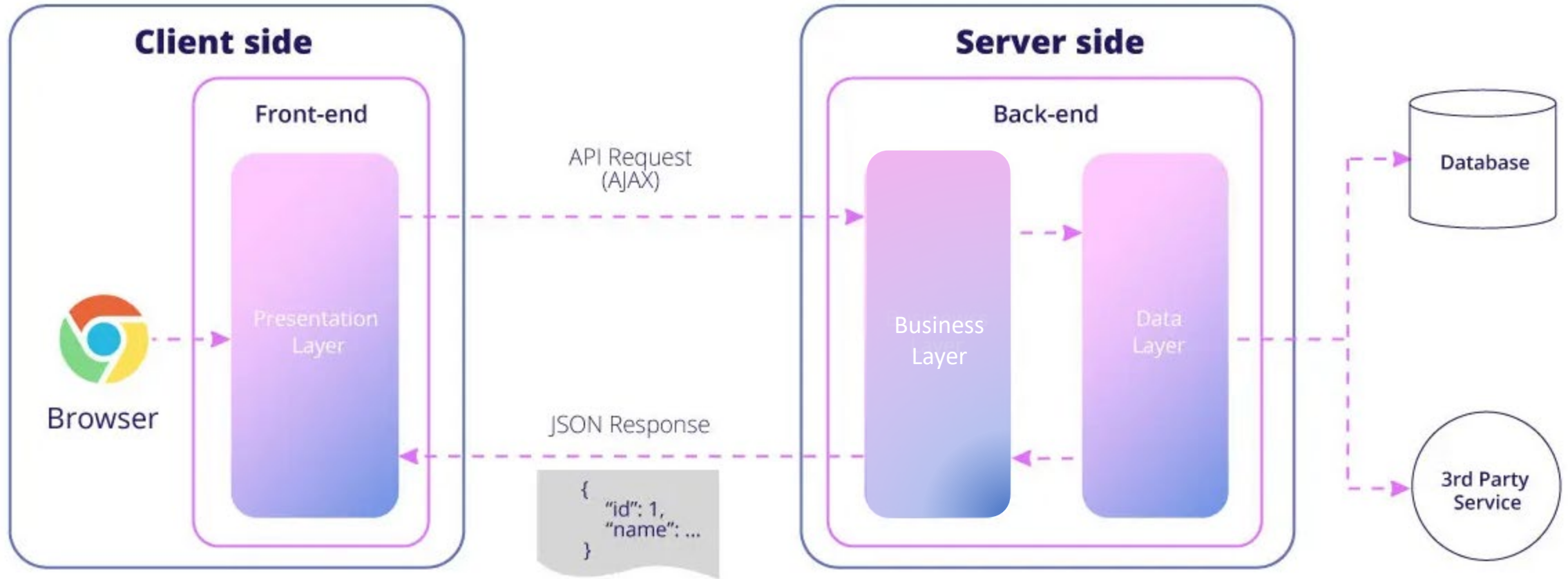
## What is a SPA framework?

- Single Page Application – Client/Server redux
- Server-side vs client-side
  - Server-side (traditional web server/MPA)
    - HTML page is composed on the server
    - Page is “submitted” to the server all at once with all the input fields and a new page is returned from the server (like green screen)
    - Reload on navigation
  - Client-side (SPA)
    - HTML page is composed on the client
    - Data is retrieved and updated via web API’s (like client/server)
    - Seamless user experience

# Traditional Web Applications



# Single Page Applications



# Angular UI

## Familiar UI

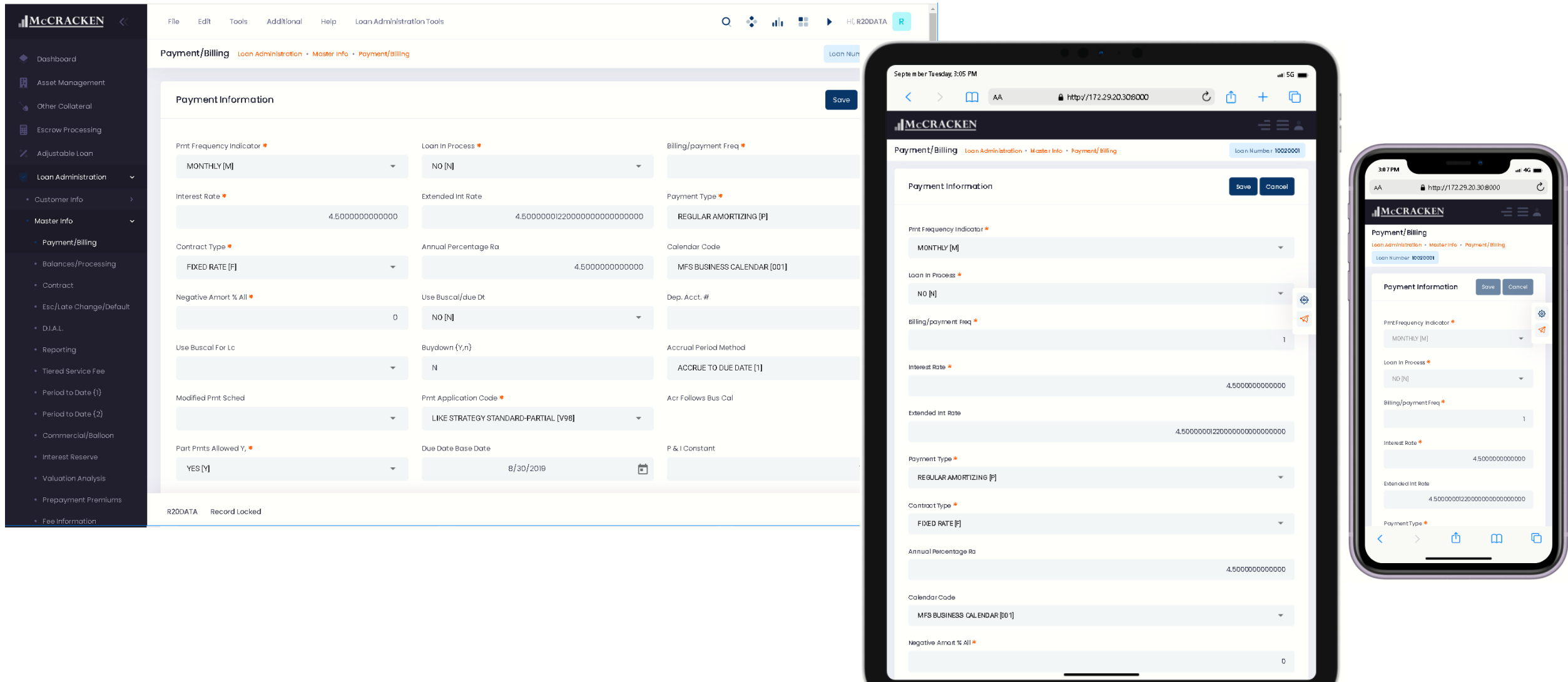
- Left hand navigation bar
- Page loaded right side based on navigation
- Top menu bar (File, Tools, Additional, module specific)

## Responsive UI

- Current portal apps optimized for FHD (1920x1080) screens
- A responsive UI automatically adapts to device specific characteristics
  - From mobile through large 4k monitors taking advantage of the available screen real estate
- Natively supported by Bootstrap framework requiring no additional programming effort



# Angular UI - Demo



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# Strategy Metadata

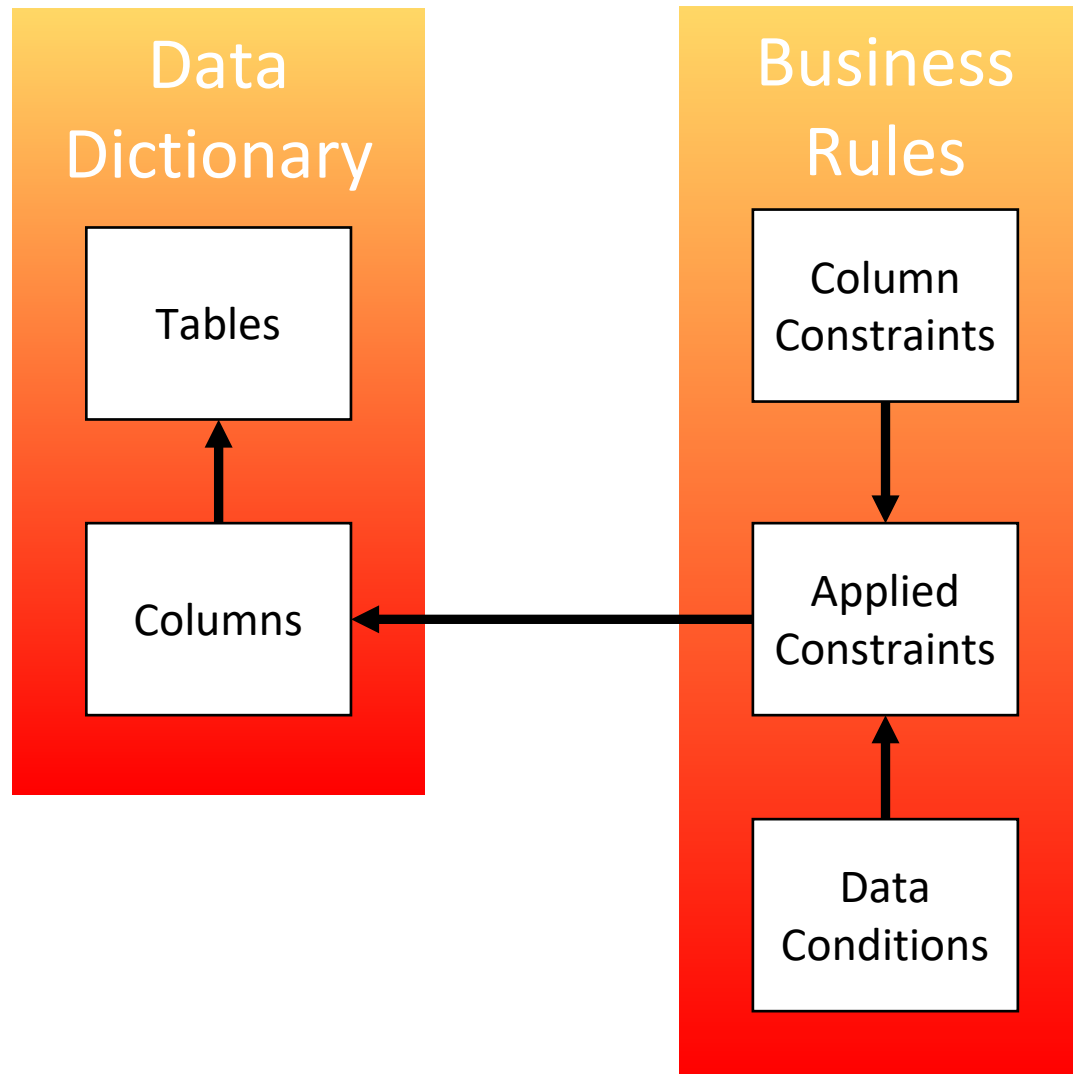
## Data Dictionary

- Documents Strategy database structure and elements
- Provides business definitions for all fields in the system
- Provides schema definition for reporting module

## Business Rules

- Defines data conditions when rules (constraints) are applied
- Constraints restrict available values for entry
- Used to validate entered data and control UI behaviors
- Provides business context on why constraints are applied

# Metadata Repository



# Business Rules

Most business rules are in fact not validations but rather situations where the acceptable values for a field are limited.

- When a data condition occurs
- Limit the acceptable values of one or more fields

## Example

- When the Payment Frequency Indicator is Daily (D)
- Then the Bill/Payment Frequency must be greater than 7

# Business Rule Constraints

## Available actions

- Filter drop down lists
- Constrain numeric/date values
- Dynamically apply required constraints
- Optionally make fields not applicable
- Default a field value

## Context sensitive guidance

- Immediate validation feedback on field entry
- Data dictionary provides business field definitions
- Any applied business rule descriptions are displayed

# Business Rules - Demo

McCRACKEN

Dashboard

Asset Management

Other Collateral

Escrow Processing

Adjustable Loan

Loan Administration

Customer Info

Master Info

Payment/Billing

Balances/Processing

Contract

Esc/Late Change/Default

D.I.A.L.

Reporting

Tiered Service Fee

Period to Date (1)

Period to Date (2)

Commercial/Balloon

Interest Reserve

Valuation Analysis

Prepayment Premiums

Fee Information

FileEditToolsAdditionalHelpLoan Administration Tools

Payment/BillingLoan AdministrationMaster InfoPayment/Billing

Loan Number: 10020001

SaveCancel

Payment Information

Pmt Frequency IndicatorDAILY [D]

Loan In ProcessNO [N]

Billing/payment Freq1

If Payment Frequency Indicator is D the Bill/Payment Frequency must be greater than 7

Interest Rate4.50000000000000

Extended Int Rate4.50000001220000000000000000

Payment TypeREGULAR AMORTIZING [F]

Contract TypeFIXED RATE [F]

Annual Percentage Ra4.50000000000000

Calendar CodeMFS BUSINESS CALENDAR [001]

Negative Amort % All0

Use Buscal/due DtNO [N]

Dep. Acct. #0

Use Buscal For Lc

Buydown (Y,n)N

Accrual Period MethodACCRUE TO DUE DATE [1]

Modified Pmt Sched

Pmt Application CodeLIKE STRATEGY STANDARD-PARTIAL [V98]

Acr Follows Bus Cal

Part Pmts Allowed Y.

Due Date Base Date

P & I Constant

R20DATARecord Locked

# Business Rules Definitions

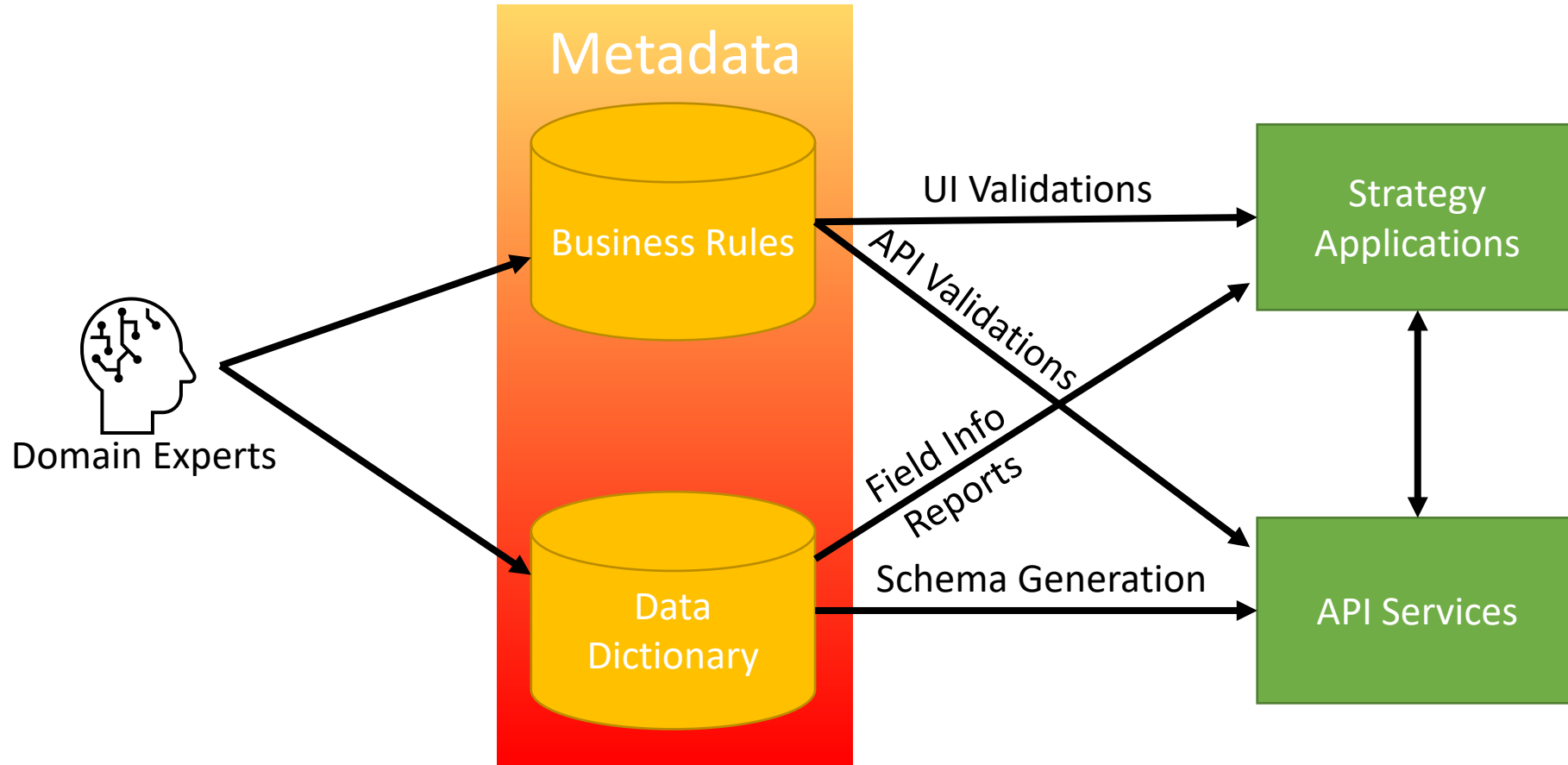
All business rules are stored in the database

- Data conditions represented using JsonLogic language
- Data constraints defined based on column type

Example:

- Condition
  - {"if" : [ {"==" : [{"var": "PMASTR.CMMORD"}, "D"] }, {"var": ""}, false ]}
- Constraint
  - Field: PMASTR.CMBPF
  - Type: ConstrainNumber
  - Constraint: setLower
  - Value: 8
  - Message: If Payment Frequency Indicator is D the Bill/Payment Frequency must be greater than 7

# Strategy Metadata





# API Services

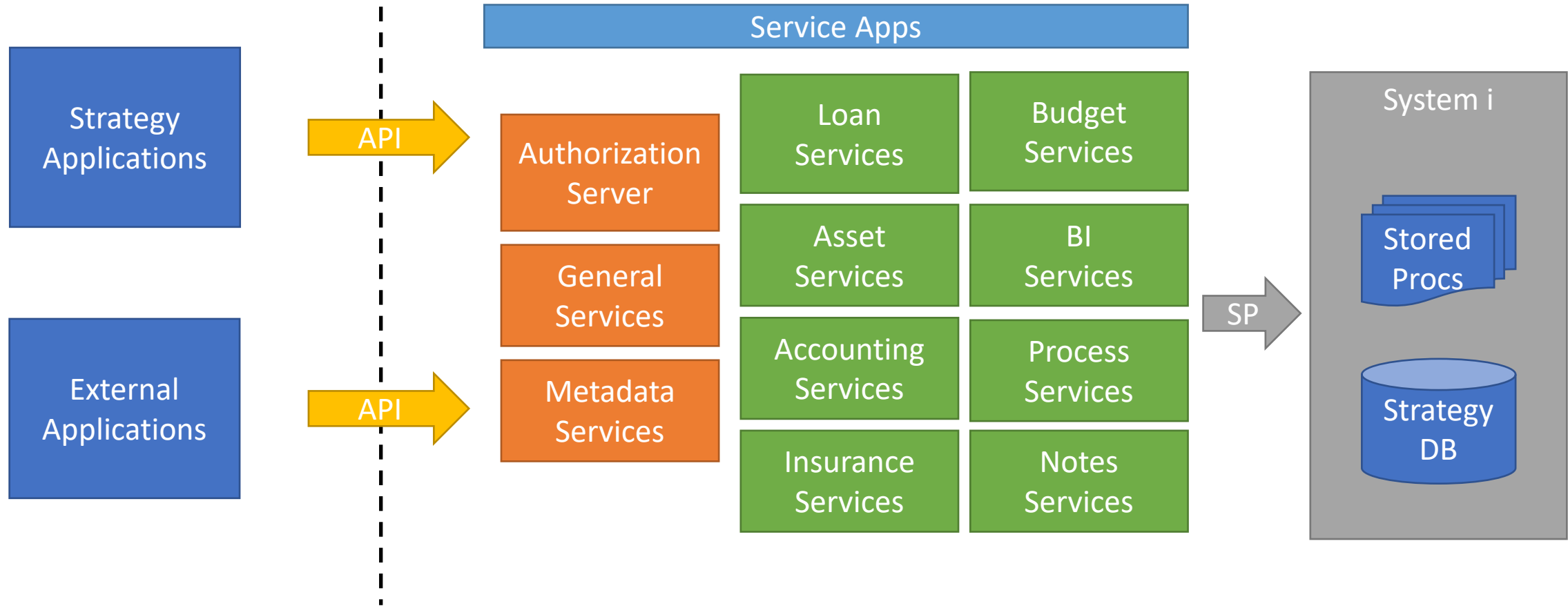
## API Service Layer

- Standardized access to the Strategy engine
  - OAuth 2.0 security
- Reduces the tight coupling between front-end and back-end
  - Can be updated at will as long as API contracts are maintained
- System API Services: organized by function
  - Authorization, metadata, general
- Business API Services: organized by business domains
  - Loan data, Asset data, Accounting data, Insurance data, etc.

## API Documentation

- API documentation generated when the service is built

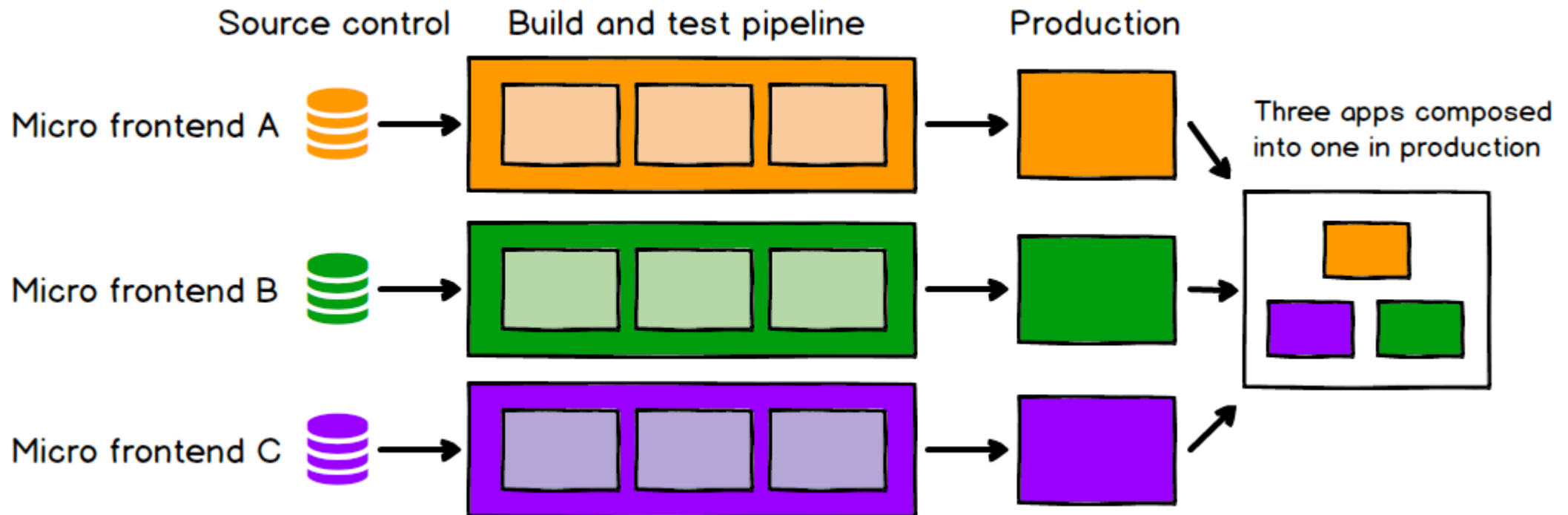
# API Services



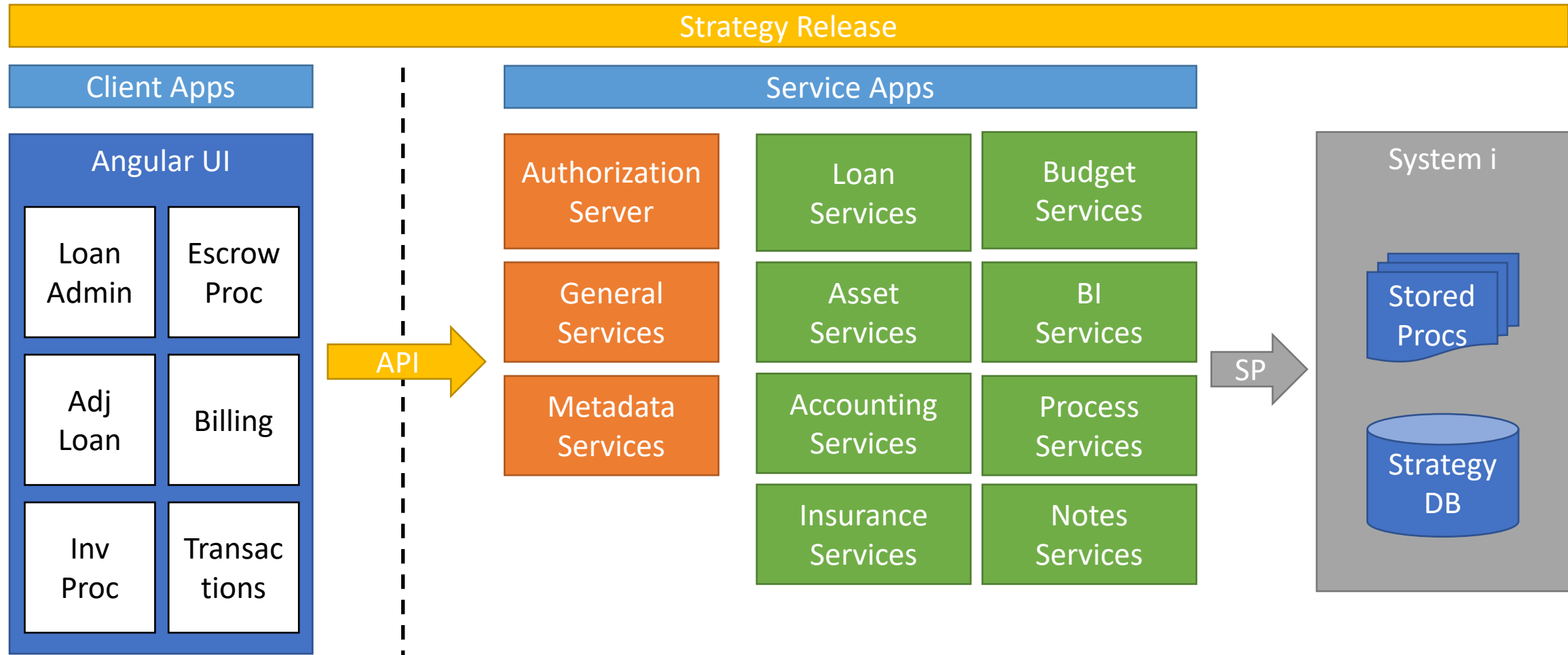
# Improve Release Management

## Micro Frontend

- Allow composition of individual SPA applications into a single user experience
- Loose coupling allows updating of individual applications



# Releases (Strategy, API Services, Client Apps)



# Releases (Strategy, API Services, Client Apps)

## Strategy Releases

- Same as today – database release along with all the supporting programs.

## API Service Releases

- Can be more frequent than the Strategy release but highly dependent on the specific Strategy release (e.g., stored proc names, stored proc parameters, etc.).

## Client Application Releases

- Can be more frequent than API Service releases and are much less dependent on the specific API Service release.
- As long as the API contracts are maintained, new versions of the API Services and/or Strategy can be released without updating the client applications.
- Conversely, client applications can be updated independent of the API Service layer, as long as the API Services support the API's required by the client applications.
- Angular release updates

# Improving software packaging/deployments

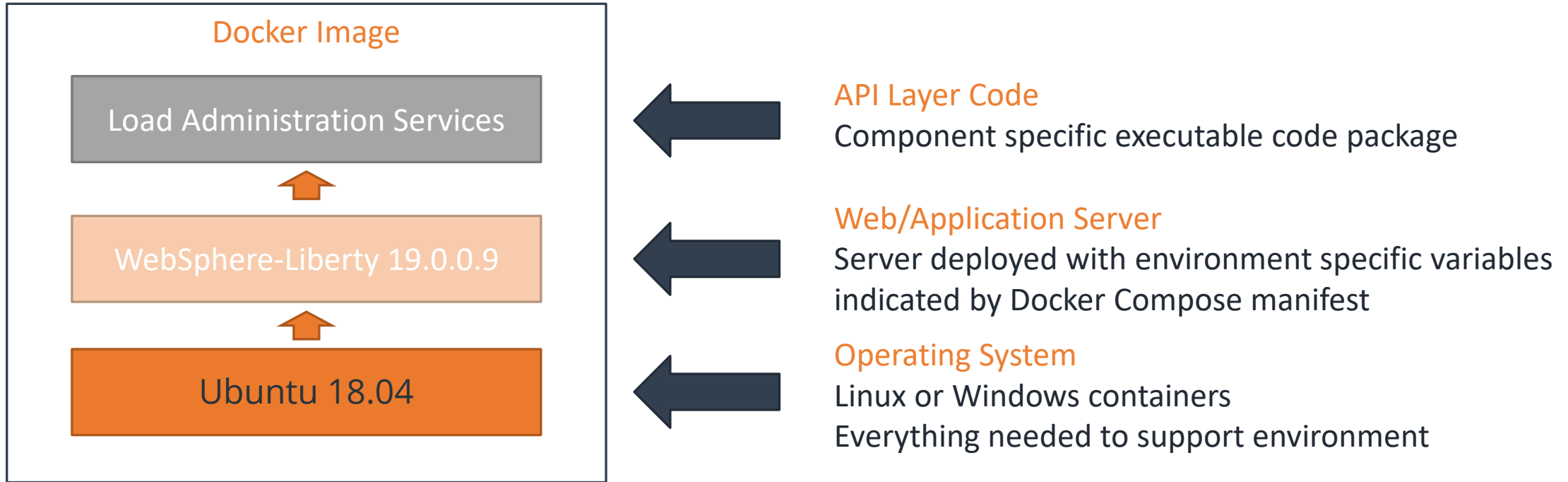
## Containerization

- Applies to API service layer and Client applications
- Packaging an entire software solution into a single image that can be deployed on any server.
  - operating system, runtime environment, configuration, application code –outside dependencies.
- Consistent Isolated Environment
  - Same image is used for test and production.

# Docker Container Benefits

- Continuous deployment and testing
  - Configurations and dependencies maintained internally
- Rapid Deployment
  - Docker instances can be deployed and rolled back in seconds
- Scalability
  - Fine grain control over resource operational load
  - Orchestration with Kubernetes
- Security
  - Isolation ensures each component has no access to running processes or data in use by other containers
- Multi-Cloud Platforms
  - Portable across cloud platforms (supported by Amazon Web Services, Google Compute Platform, Microsoft Azure, OpenStack, etc)

# Container Architecture



Docker Compose allows automatic deployment of multiple containers to construct complete environment  
Kubernetes facilitates distributed orchestration and scaling for loads exceeding single host limitations



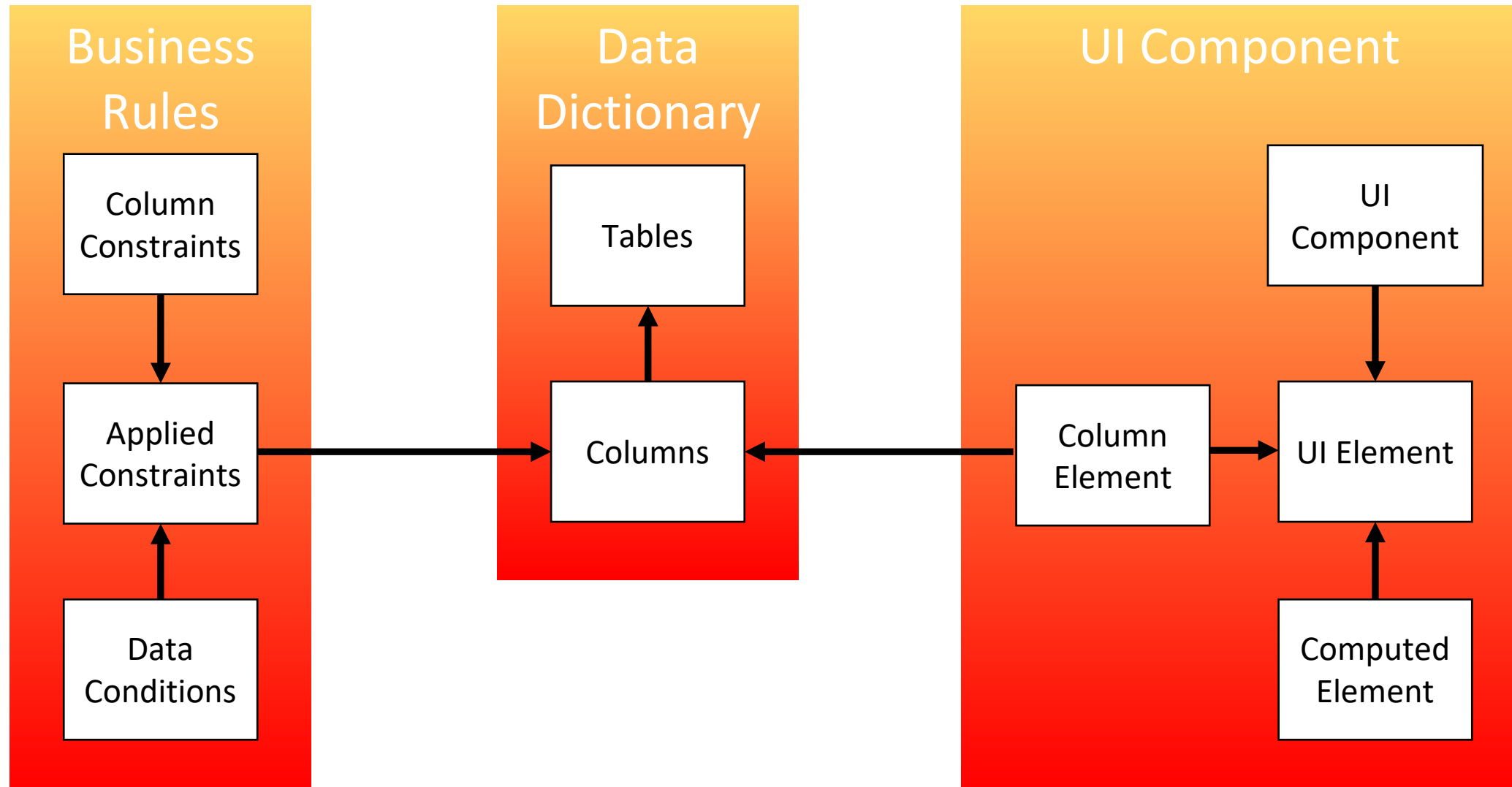
# Accelerate Application Migration

Really the culmination of previous items plus code generation.

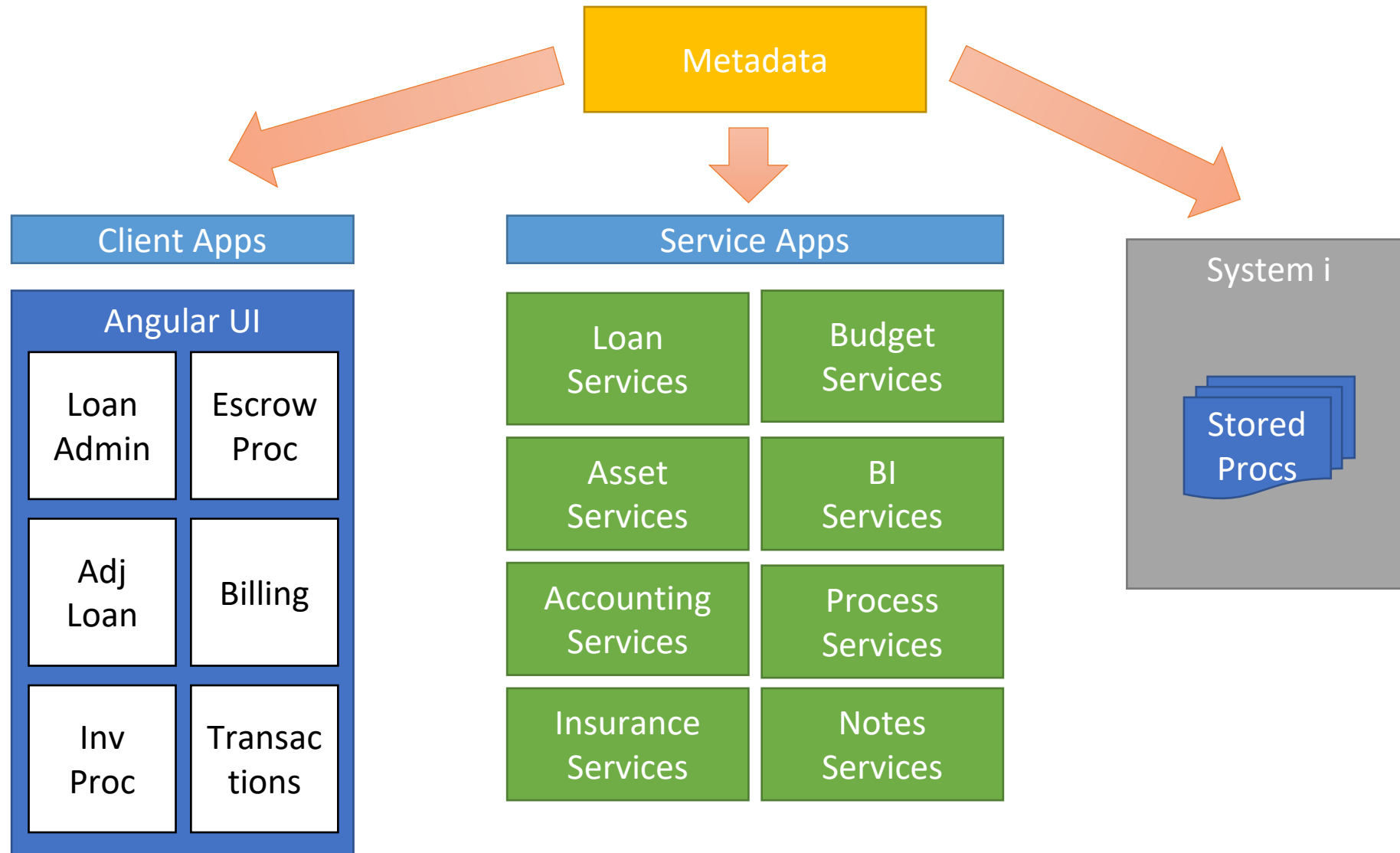
## Code generation for the easy stuff

- A lot of Strategy is simple table maintenance (CRUD)
- Currently most application complexity revolves around implementing business rules
  - Which are now managed in the database instead of in application code
- Metadata driven code generation based on UI design
  - Generate UI components, supporting API services and backend stored procedures
- Not everything can be automatically generated but much of it can be
- Lays the groundwork for future technology changes

# Code Generation Metadata



# Code Generation



# The Future of Strategy

## Angular SPA framework

- Modern web development with a responsive UI that works on any device
- Full featured for enterprise applications

## Metadata driven business rule engine

- Separates the business rules from the applications and API's
- Allows a rule to be developed independently

## API Services

- Open and well documented API standard
- Customers to leverage the same functionality as the Strategy applications

## Release management

- API layer reduces release dependency
- Micro frontend allows multiple applications to composed together in a single interface
- Container technologies ease deployment

## Metadata driven code generation

- Accelerates the migration of the existing Strategy applications

# The Future of Strategy

Questions?

### Payment Information

Save Cancel

Pmt Frequency Indicator

DAILY [D]

Loan In Process

NO [N]

Billing/payment Freq

1

If Payment Frequency Indicator is D the Bill/Payment Frequency must be greater than 7

Interest Rate

4.50000000000000

Extended Int Rate

4.5000000122000000000000000000

Contract Type

FIXED RATE [F]

Annual Percentage Ra

4.50000000000000

The frequency that payment is due; works in conjunction with the Payment Frequency Indicator

PMASTR.CMBPF  
Numeric (3, 0)

If Payment Frequency Indicator is D the Bill/Payment Frequency must be greater than 7  
Billing frequency is required if Payment Frequency Indicator is Monthly or Daily

Negative Amort % All

0

Use Buscal/due Dt

NO [N]

Dep. Acct. #

0

Use Buscal For Lc

Buydown (Y,n)

N

Accrual Period Method

ACCRUE TO DUE DATE [1]

Modified Pmt Sched

Pmt Application Code

LIKE STRATEGY STANDARD-PARTIAL [V98]

Acr Follows Bus Cal

- Dashboard
- Asset Management
- Other Collateral
- Escrow Processing
- Adjustable Loan
- Loan Administration
  - Customer Info
  - Master Info
    - Payment/Billing
    - Balances/Processing
    - Contract
    - Esc/Late Change/Default
    - D.I.A.L.
    - Reporting
    - Tiered Service Fee
    - Period to Date (1)
    - Period to Date (2)
    - Commercial/Balloon
    - Interest Reserve
    - Valuation Analysis
    - Prepayment Premiums
    - Fee Information

Payment Information

Save Cancel

Payment Frequency Indicator

MONTHLY (M )

Loan in Process

NO (N )

Bill/Payment Frequency

1

Interest Rate

4.5

Expanded Interest Rate

4.5000000122

Payment Type

REGULAR AMORTIZING (P )

Contract Type

FIXED RATE (F )

Annual Percentage Rate

4.5

Business Calendar

MFS BUSINESS CALENDAR (001 )

Neg Amortization Allowed

0

Use Business Cal for Due Date

NO (N )

Deposit Account #

0

Business Calendar Options

Subsidy

N

Accrual/Due Date Options

ACCRUE TO DUE DATE (1 )

Mod Payment Scheduled on File

NO (N )

Pmt App String

LIKE STRATEGY STANDARD-PARTIAL (V98 )

Accrual Follows Bus Cal Due Date

Allow Partial Payments

YES (Y )

Next Pmt Due Date w/o Bus Cal

8/30/2019

Principal & Interest Pmt

7795.5

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- Dashboard
- Asset Management
- Other Collateral
- Escrow Processing
- Adjustable Loan
- Loan Administration
- Customer Info
- Associated Names
- Customer Info
- Document Distribution
- Master Info
- Pending Changes Master/LIP
- Deferred Revenue
- Holdbacks
- Analysis and Reporting Info
- Billing
- Investor Processing
- Loan Entry
- Transactions

Associated Names Loan Administration Customer Info Associated Names

Loan Number 10020001

Associated Names

New Save Cancel

Inactive	Primary Borrower	Primary Contact	Name/Address 1	Name/Address 2	Name/Address 3	Name/Address 4	Name/Address 5	Name/Address 6	Tax ID	Language	Contact	Telephone #	Fax #	Ema
YES			Eastern Real Estate Properties, Inc.	25 Western Road	Billerica, MA 01821				99-9999999	ENGLISH				
	YES		Eastern Medical Practice, PC	25 Western Road	Billerica, MA 01821				00-0000000	ENGLISH				
			Premier Development	3501 N. Warren Street	Saint Louis, MO 63101				63-3314444	ENGLISH				

Items per page: 5 1 - 3 of 3

Name and Address

Name/Address ID

164

...

☒ Primary Borrower ☐ Primary Contact ☒ Primary Include in Acct Search ☐ Inative

Formatted Name/Address

Name/Address Details

R20DATA Record Locked