

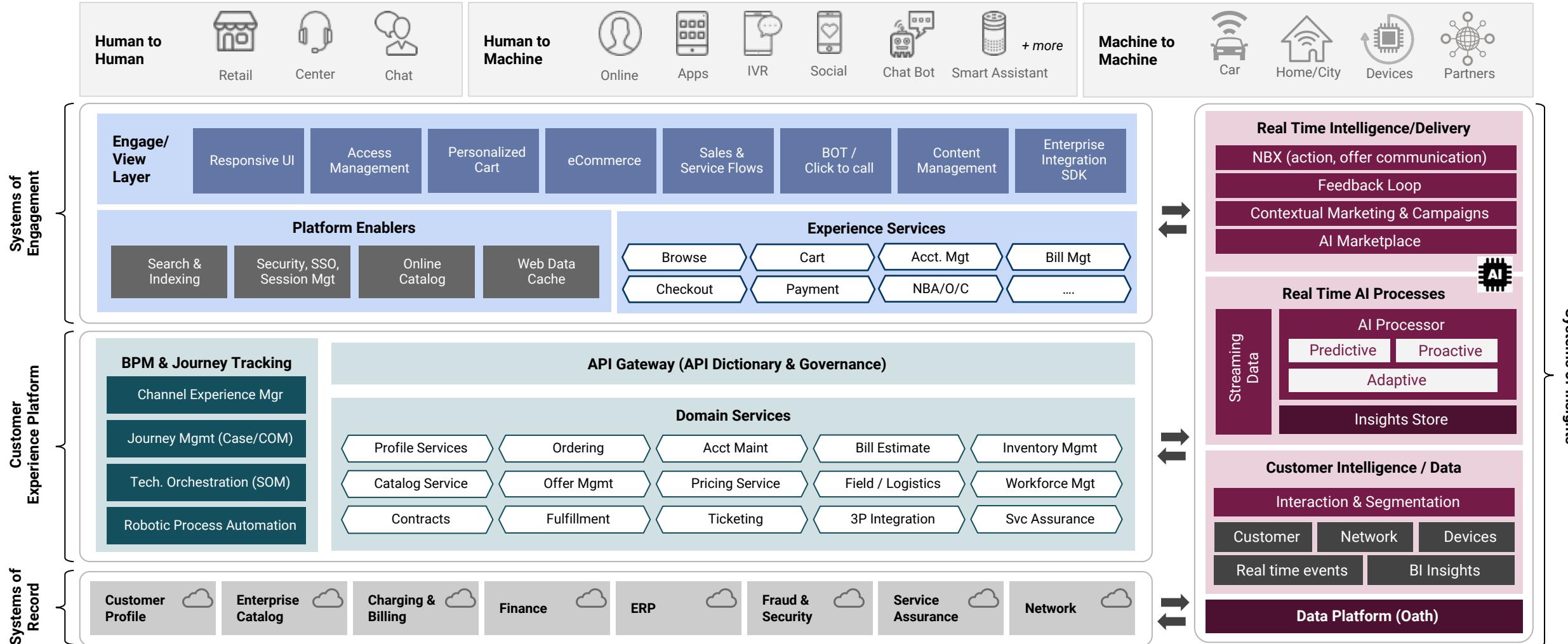
Consumer Reference Architecture

Level 2 - Systems of Engagement

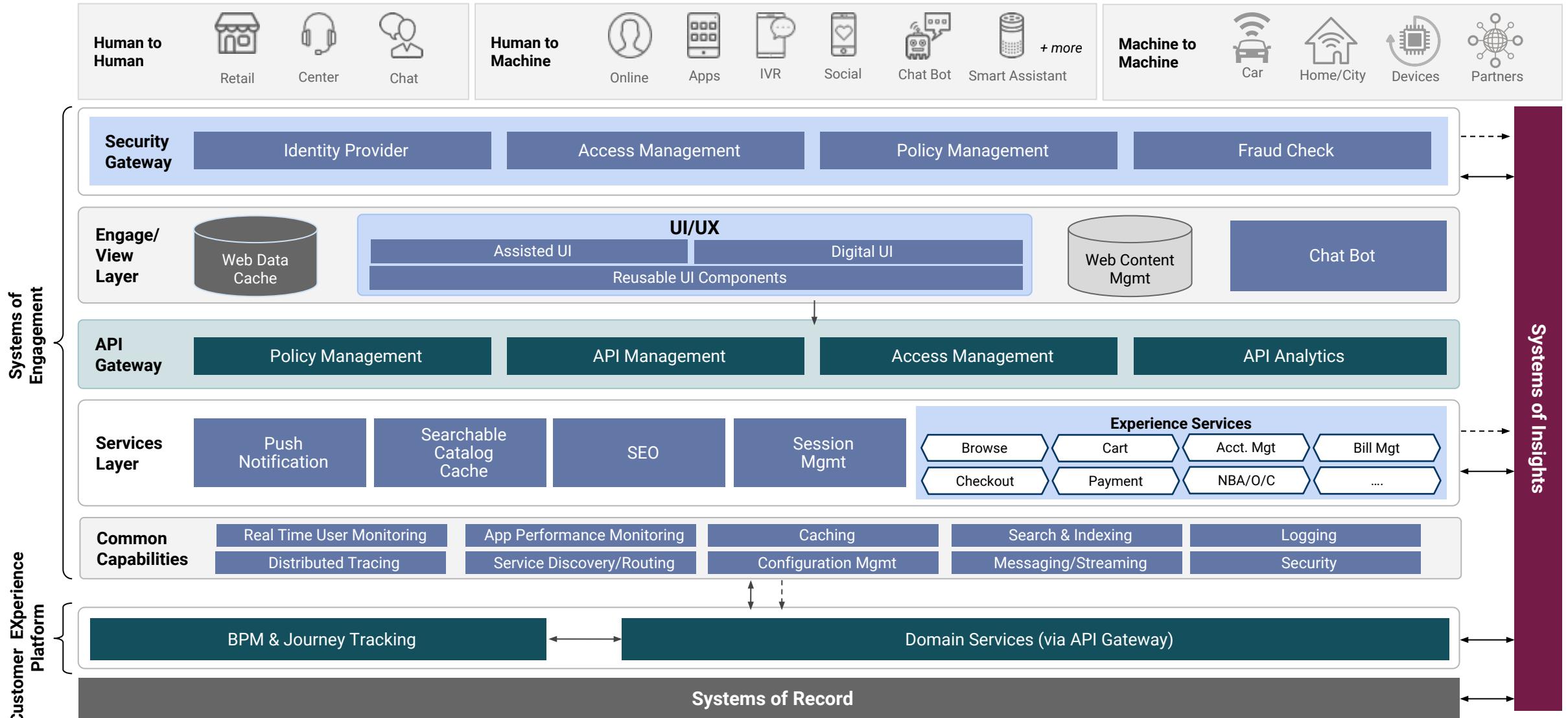
Reference Architecture Guiding Principles

- ★ *Architecture Foundational Areas*  *Systems of Engagement, Insights & Records*
- ★ *Common Digital Experience Platform*  *Uniform engagement & BPM processes across SOE & SOR*
- ★ *Customer-centric over Channel-centric*  *Consistent experience across all touchpoints*
- ★ *Common SOI tier across all channels*  *Oath/VCG grid baseline, enabling a 1:1 customer experience*
- ★ *Enable consistent, reusable services*  *API first approach, with reusable design patterns*
- ★ *Efficient use of resources*  *Standard technology stack to create a interchangeable resource pool*

North Star: End State Reference Architecture

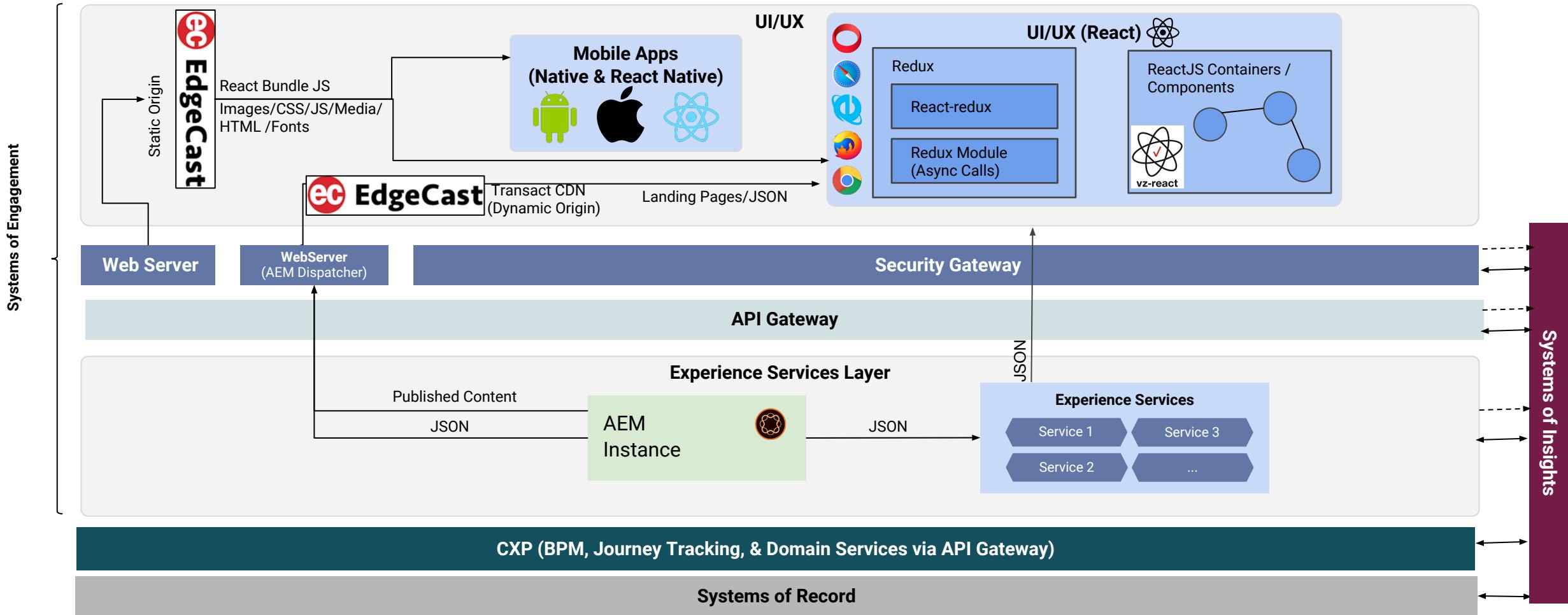
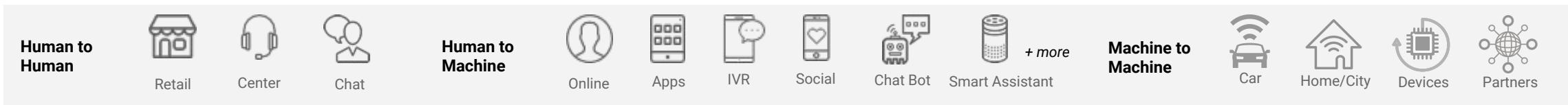


Systems of Engagement (Level 1 Architecture)

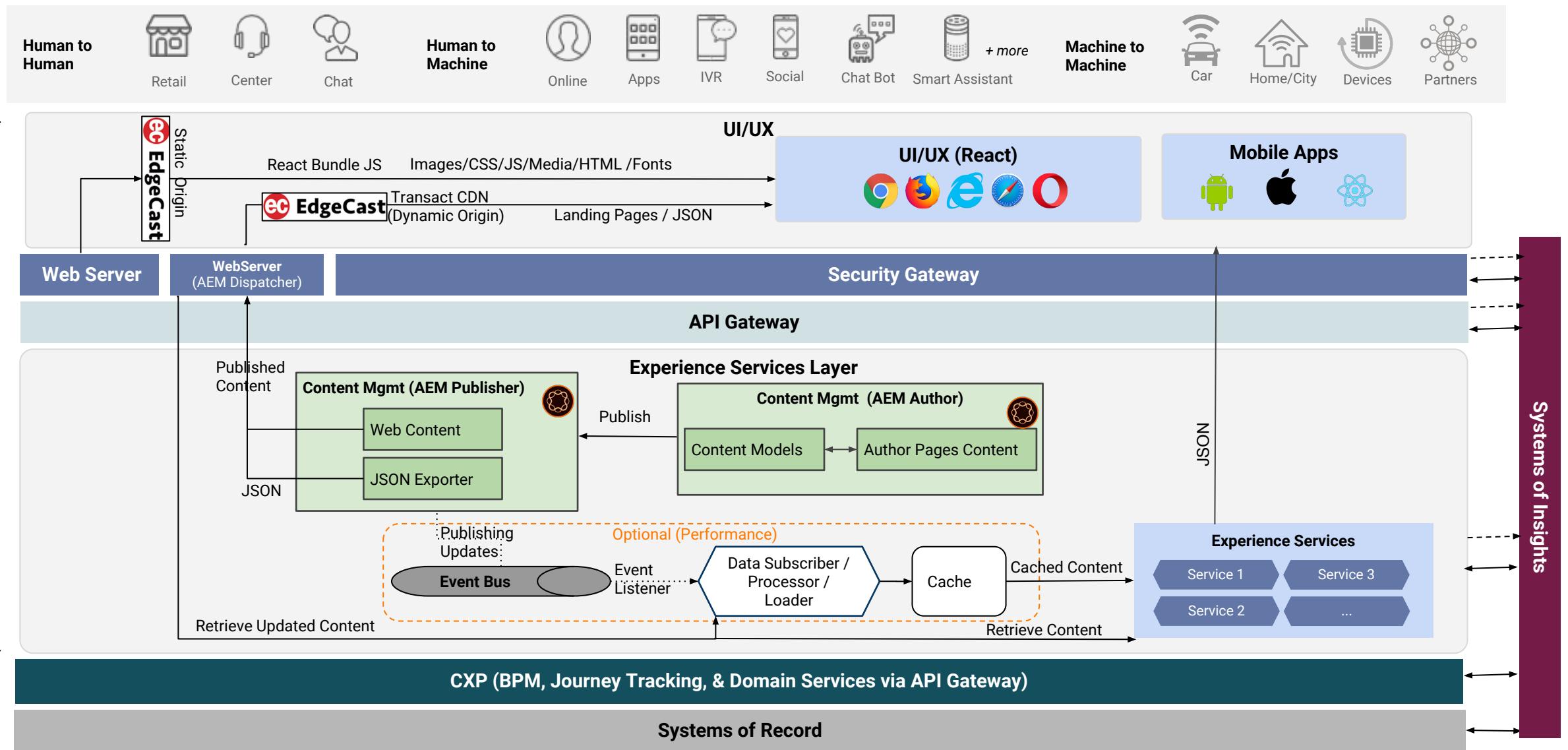


SoE Front-End Ref. Arch.

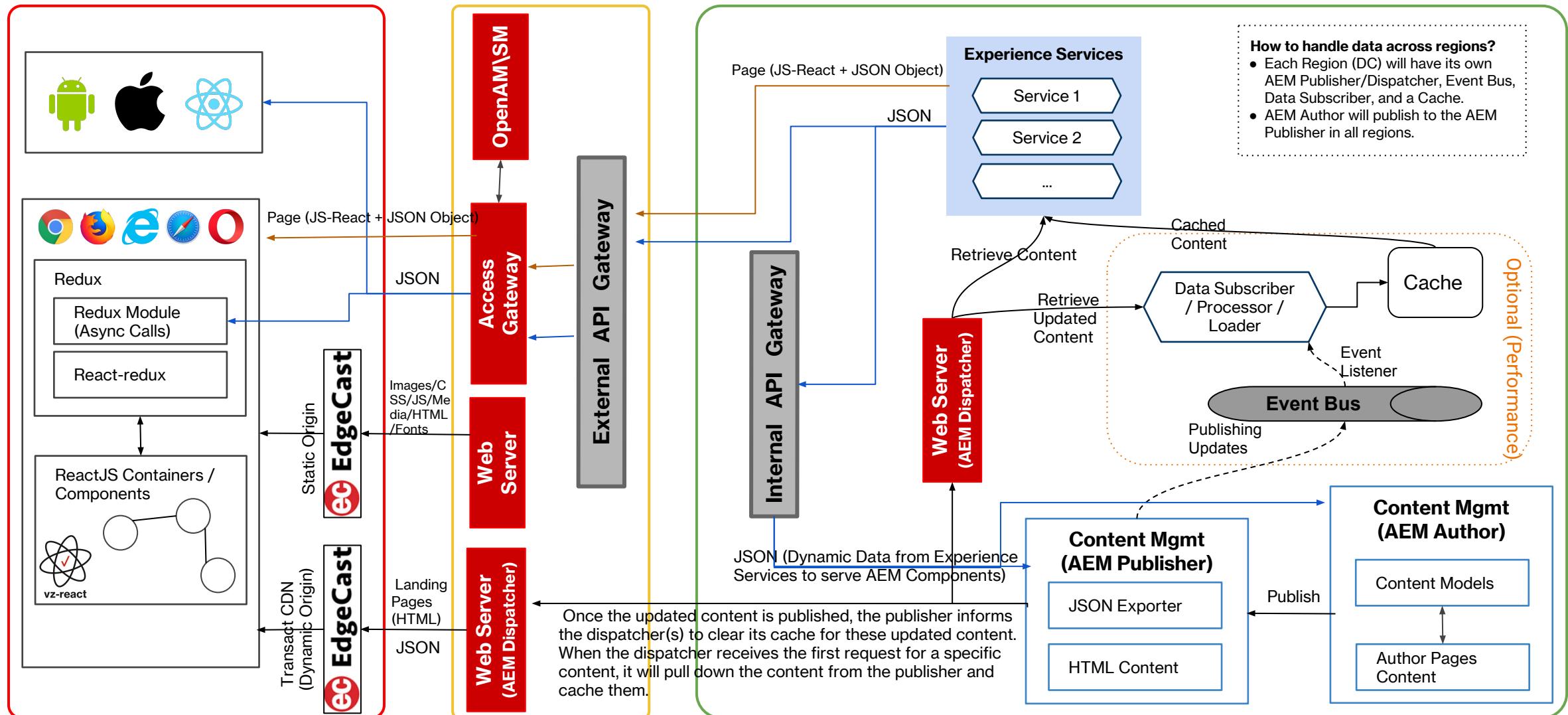
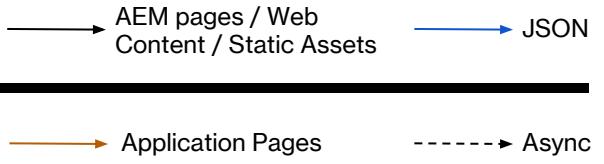
SoE Front-End Architecture



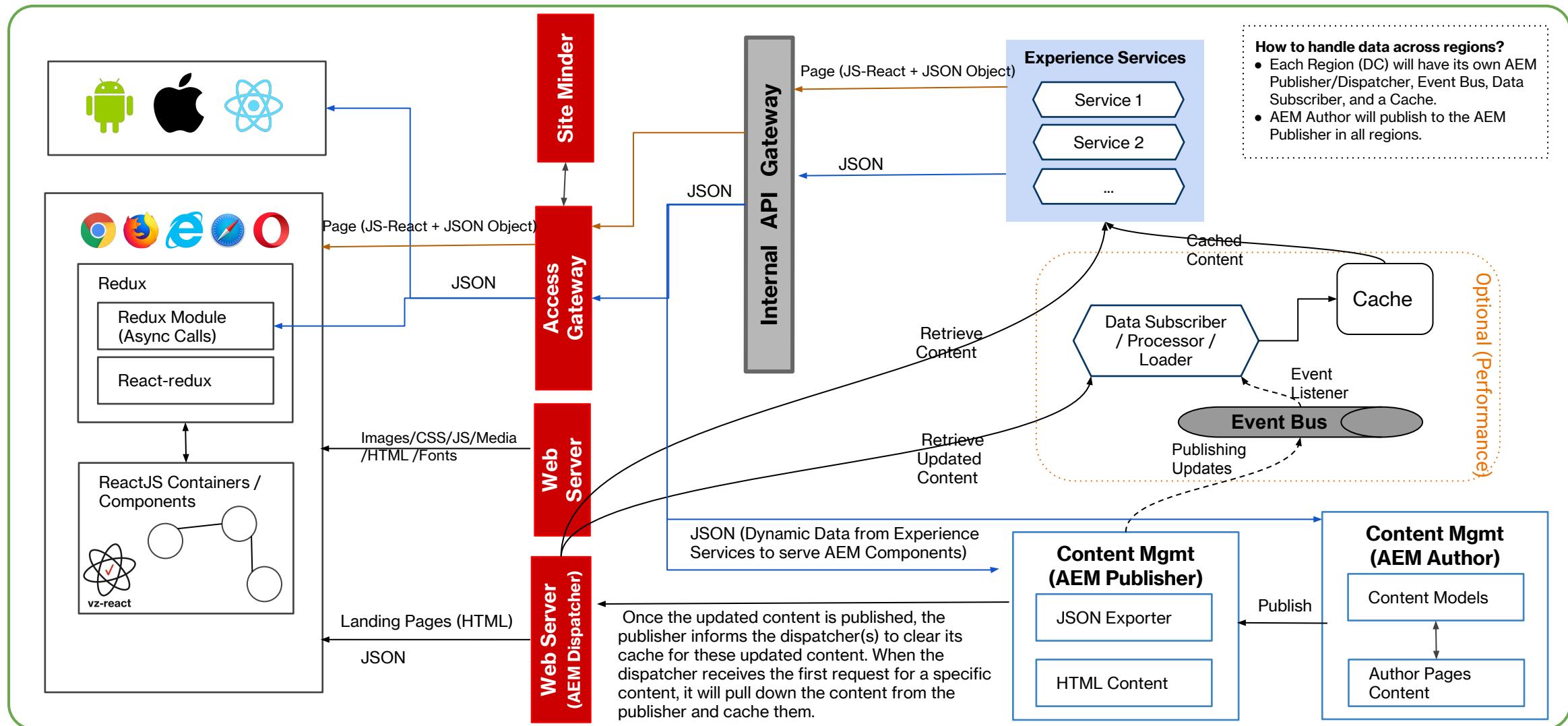
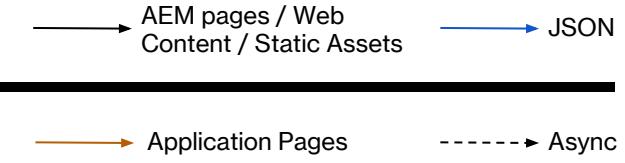
SoE Static Web Content Architecture



SoE Front-End Architecture - Internet Apps



SoE Front-End Architecture - Green Zone Apps



SoE Front-End Architecture - Target

SPA denotes Single Page Application

MPA denotes Multiple Page Application

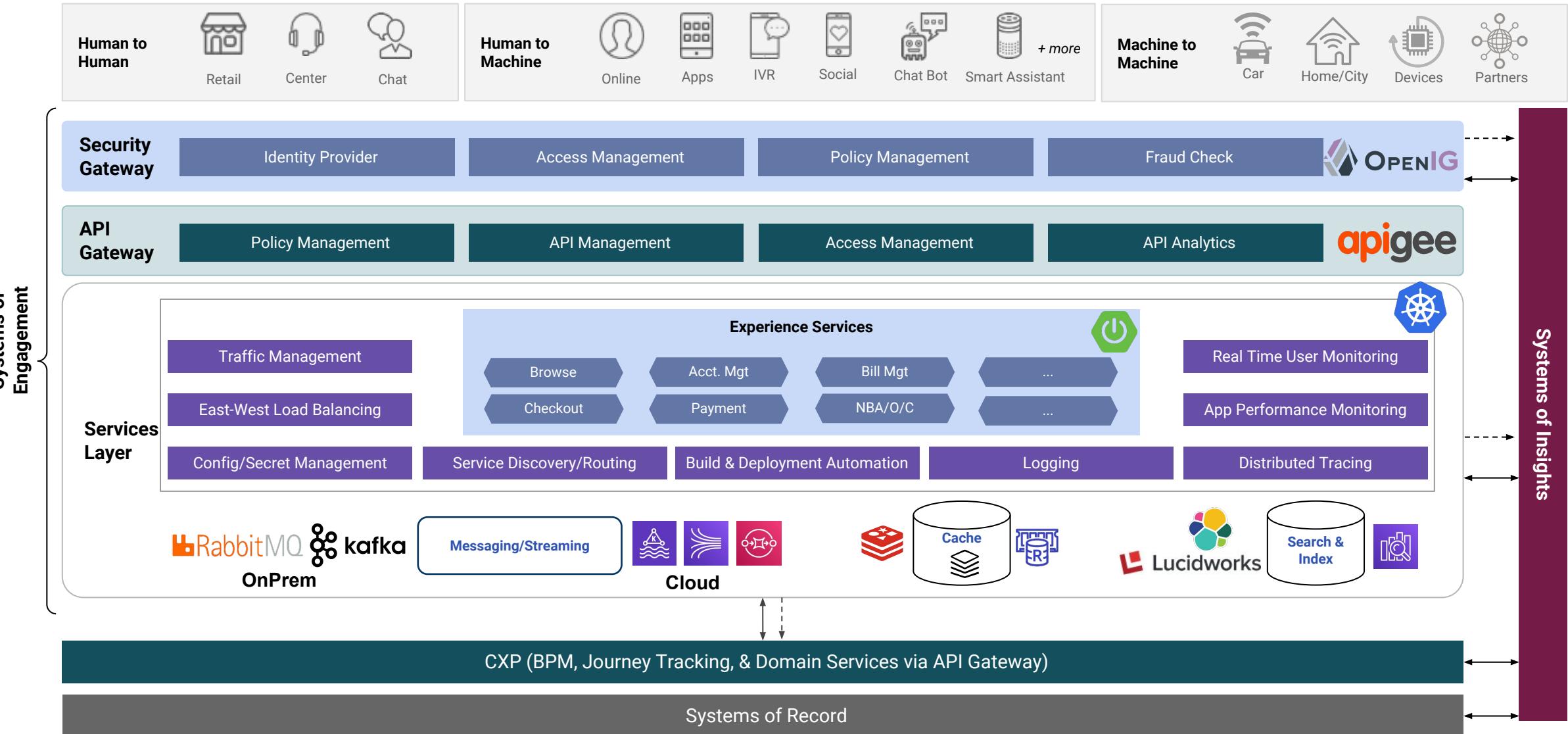
Capabilities	SoE Web Target	SoE Mobile App Target
UI Framework	ReactJS	Native / React Native*
Rendering	Client-Side	Client-Side
Architecture	Multiple SPAs	Multiple SPAs
WCM - Web Content Mgmt	AEM 6.4	AEM 6.4
SEO	Multiple Landing Pages for SEO purposes	N/A

*React Native is NOT a silver bullet and will not address all your needs. Please evaluate based on your app requirements. RN is quickly evolving

SoE Experience Services Ref. Arch.

SoE Experience Services Architecture

Outer Architecture



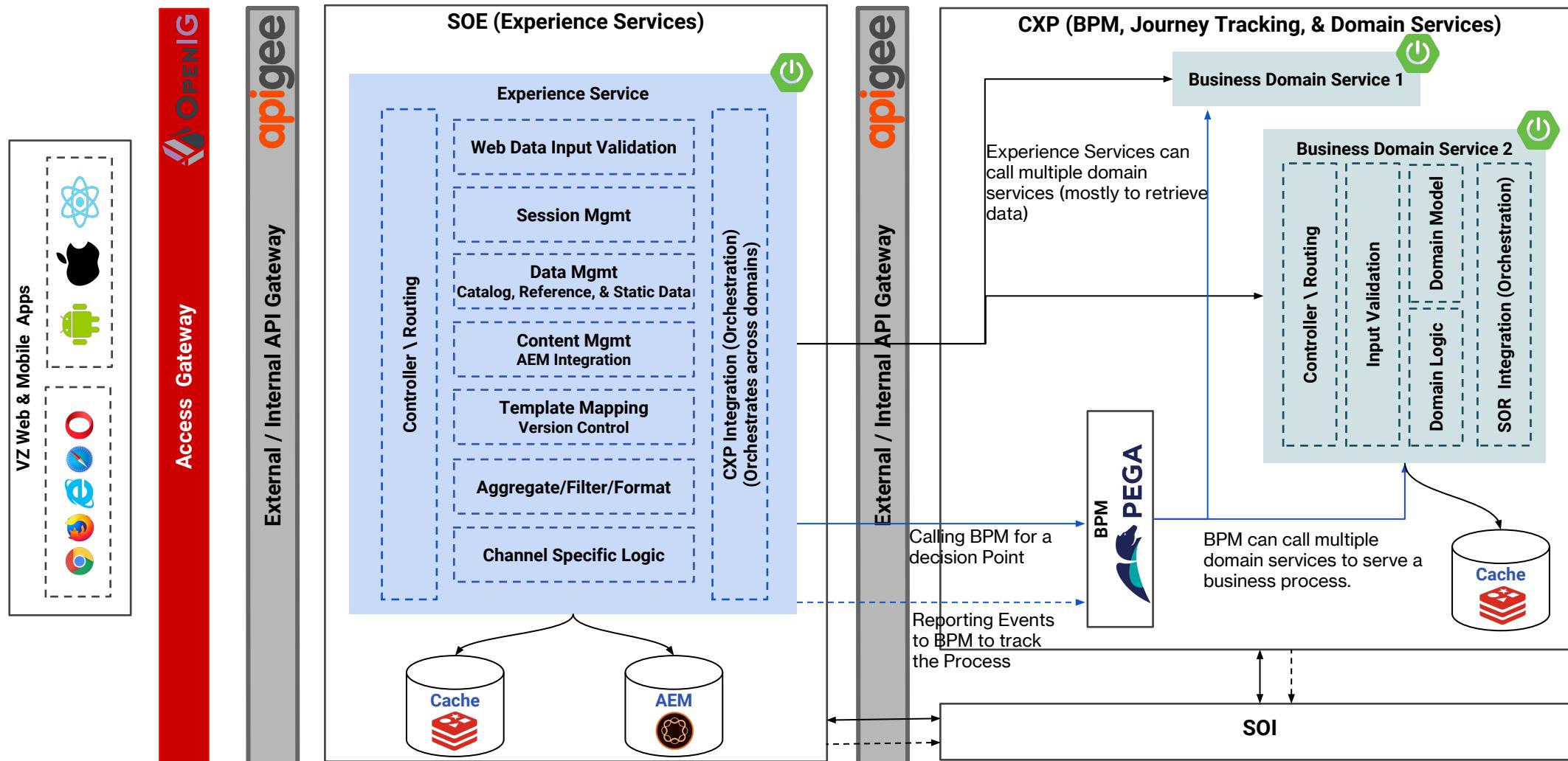
SOE-CXP-SOI Integration Use Cases

- **Experience Services → Domain Services:** Experience Services can orchestrate calls to multiple domain services mainly to retrieve data.
- **Experience Services → BPM:** For Business Processes, Experience Services will integrate with BPM in two patterns:
 - **Async:** Experience Services will asynchronously update the BPM process if there isn't a decision to be made (Tracking the Process)
 - **Sync:** Experience Services will synchronously call the BPM process for a decision point (Managing the Process)
- **Experience Services → SOI:** Experience Services will call SOI to determine the NBX and to determine the pending cases.
- **BPM → Domain Services:** BPM will call domain services synchronously to retrieve/update domain data.
- **BPM → SOI:** Pending discussion with Rahul's teams

→ BPM Traffic → Non-BPM Traffic

→ Sync → Async

SOE/CXP Integration



SoE - Access & Session Mgmt

Access Management Use Cases & User Types

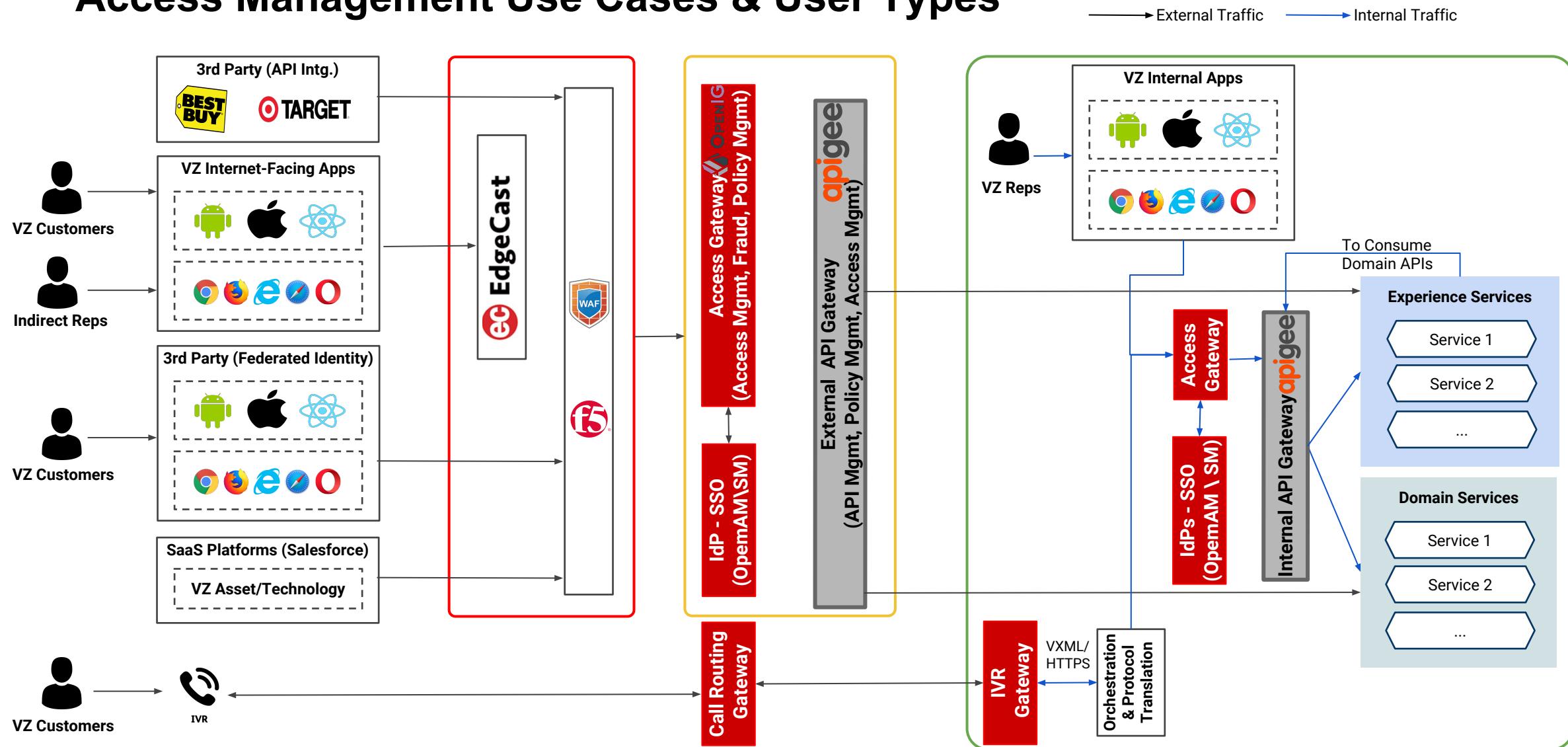
AuthN/AuthZ use cases:

- **VZ Applications that are internet facing (Internet - Yellow Zone - Green Zone):**
 - Digital Web Applications
 - Digital Mobile Applications
 - Assisted - Indirect Reps (e.g. Costco)
- **VZ applications within the Green Zone**
 - Assisted - VZ Reps (including ACSS)
- **External APIs - 3rd Party Integrations (External API Gateway) (Internet - Yellow Zone - Green Zone):** e.g. Target & BestBuy
- **Internal APIs (Internal API Gateway)**
 - Experience APIs consumed by Internal VZ Application
 - Domain APIs consumed by Experience Services
- **Federated Identity - VZ Customers authenticating thru 3rd party websites/apps (bestbuy.com)**
- **VZ-managed application/technology outside of the VZ network in a SaaS model (salesforce).**
- **IVR**
- **Citrix - External Telesales**
- **VPN Access - M2M/IoT**

User Types:

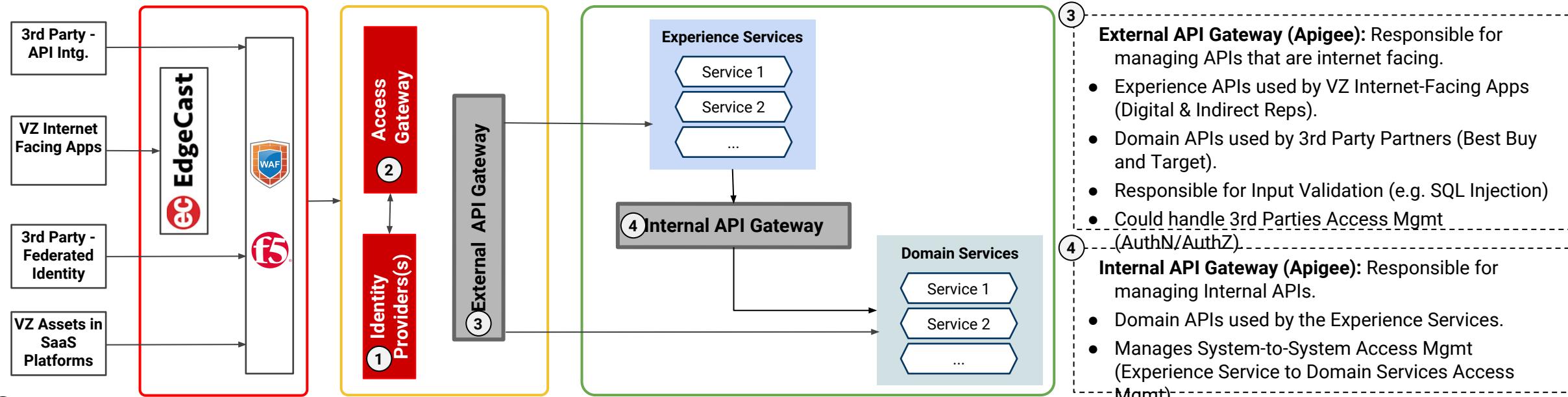
- Customers
- VZ Reps (Employees)
- Indirect Reps (3rd party reps utilizing Verizon front-end assets and authenticating against SiteMinder)
- 3rd party partners (3rd party systems consuming verizon APIs)

Access Management Use Cases & User Types



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Access Management - Functional Capabilities - External Traffic



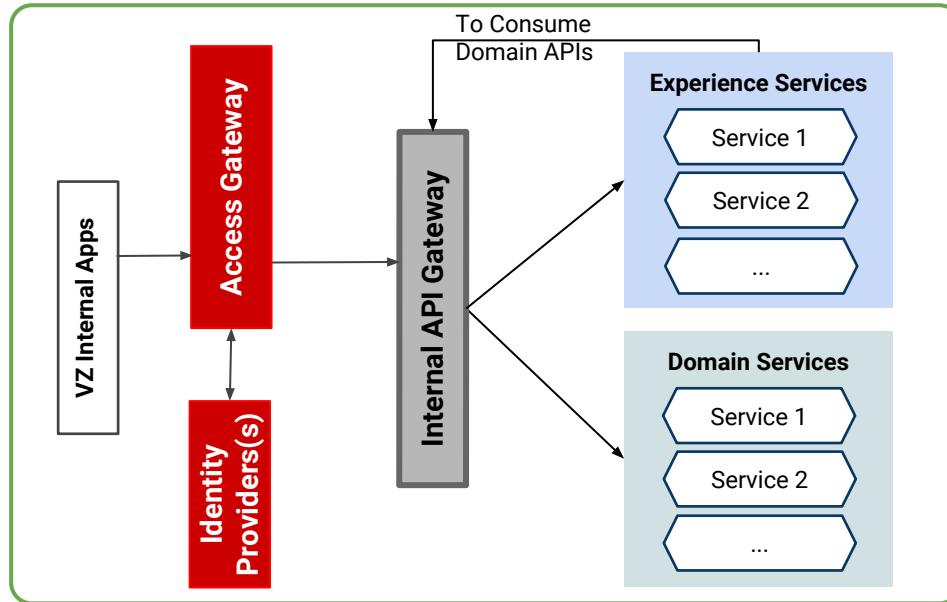
1 **Identity Provider (e.g. OpenAM/SiteMinder):** Responsible for Authenticating users and generating/validating Access Tokens (AT).

1. Client App has been setup in the Identity Provider and assigned a client id (application id).
2. Client App redirects its users to the Identity Provider for authentication.
3. Users authenticate by entering their usernames/passwords.
4. Once Successfully authenticated (with risk check/step-up authentication if needed), Identity Provider redirects the user to the App with an AT (Access token).

2 **Access Gateway:** All traffic (Anonymous & Authenticated flows) goes thru the Access Gateway. Responsible for Authorization, Policy Mgmt, Session Mgmt, Risk Scoring, Step-up Authentication, Adaptive Authentication (device registration, IP checks, geolocation, behavioral analysis), and Fraud detection (thru integration with Fraud & Risk Services).

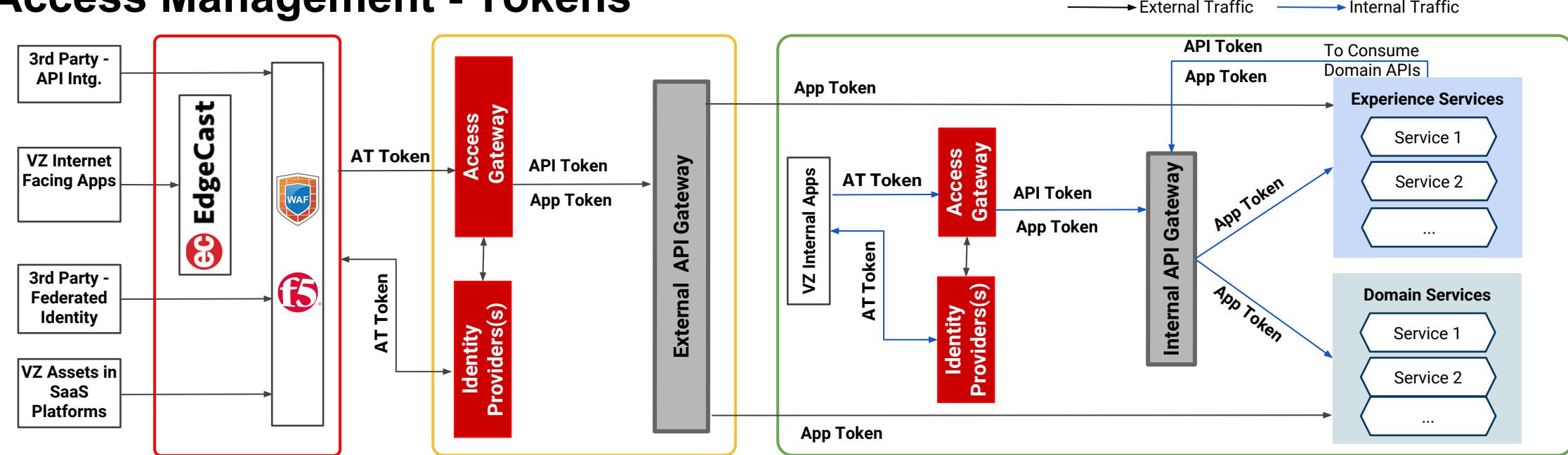
- Anonymous Flows:** All traffic are routed via the security gateway except for static content/assets.
- Authenticated Flows:** Security Gateway redirects traffic to secured APIs to the Identity Provider for authentication. Once authenticated, an AT is created and passed in all subsequent calls for validation.

Access Management - Functional Capabilities - Internal Traffic



- Just like Internet-facing Traffic, similar capabilities are needed for Internal traffic (Green-Zone Apps).
- Internal API Gateway exposes Experience APIs and Domain APIs.
 - Experience APIs are consumed by the VZ Internal Apps.
 - Domain APIs are consumed by the Experience Services.

Access Management - Tokens



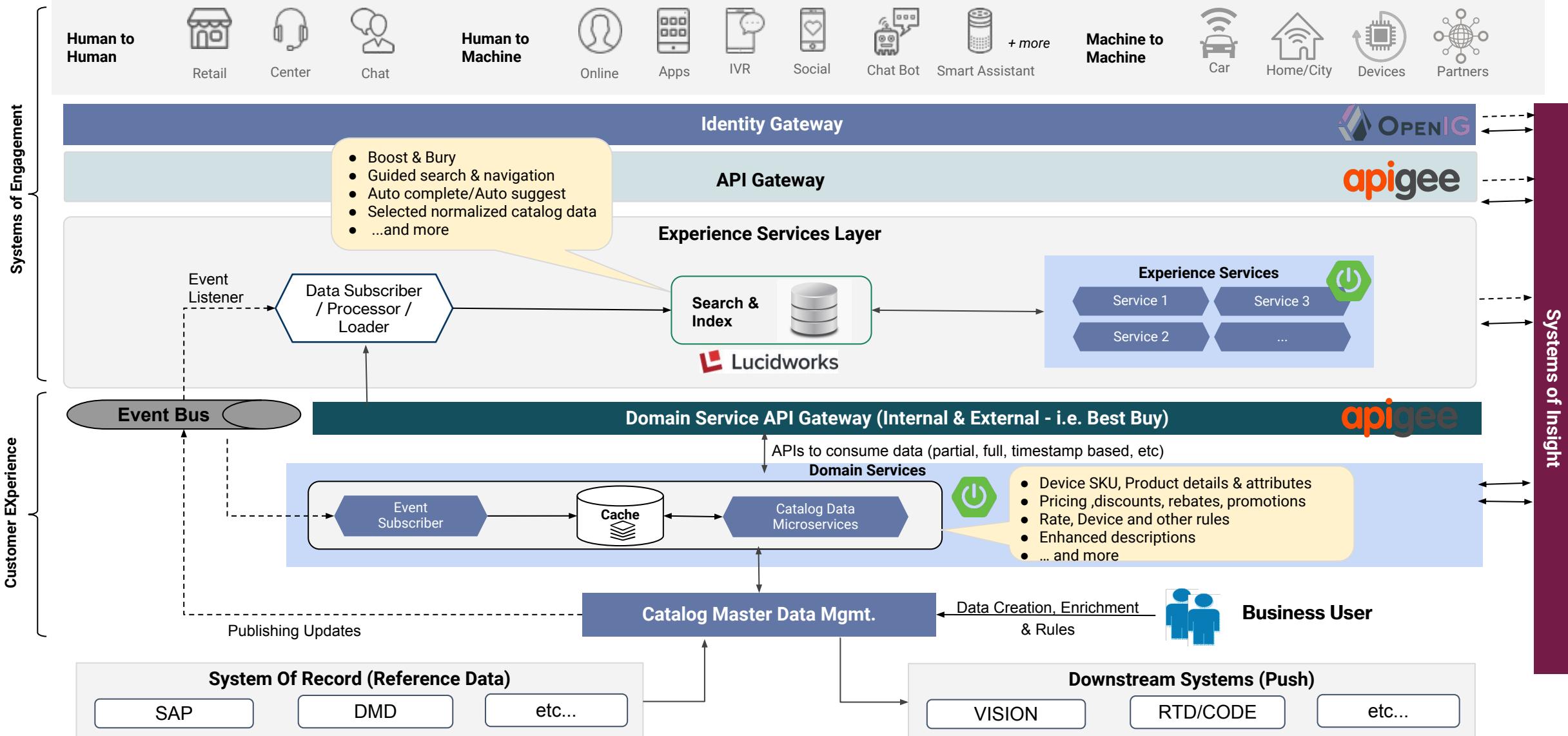
- **Access Token (AT):** Once a user is authenticated, IdP (OpenAM or SM) will generate an Access Token linked to the user account. Two Types:
 - **Opaque Token:** Opaque Tokens contain some identifier (GUID) to information in a server's persistent storage. To validate an opaque token, the recipient of the token needs to call the server that issued the token. For Authorization, the identifier (GUID) has to be passed to the IdP (OpenAM or SM) for validation and to retrieve any required user related data elements.
 - **JWT Token:** The JWT token contains encrypted user-related data elements and is signed by the IdP. For Authorization, the token signature can be verified (utilizing the IdP public key) and the data elements can be decrypted (what type of key is used for data elements encryption/decryption?)
- **Refresh Token (RT)** is used to refresh the Access Token (AT).
- **API Token:** A token generated by the API Gateway (utilizing Apigee's Client ID and Secrets) for a specific API consumer (system/application not a user) and is used to authorize API calls within the API Gateway. API Tokens are used for Access Gateway → API Gateway integration and for Experience Services → Domain Services integration.
 - **Access Gateway → API Gateway:** Both Access Gateway and API Gateway are federated platforms so each application onboarded to the Access Gateway should get its own API token in order achieve fine grained control on the list of APIs that each app can consume. (This way not all apps configured within the AG have access to the same set of APIs in the API Gateway)
- **App Token:** Access Gateway packages the needed data elements (e.g. account, name, user id, rep id, or user role) into an App Token (signed by Access Gateway) so it can be passed all the way down to all the needed systems (experience and domain services) to securely carry forward the business context. App tokens are validated at the API Gateway.

SoE - Catalog Mgmt, Search & Indexing

Search & Cache Architecture for Dynamic “Catalog” Data

Architecture Benefits:

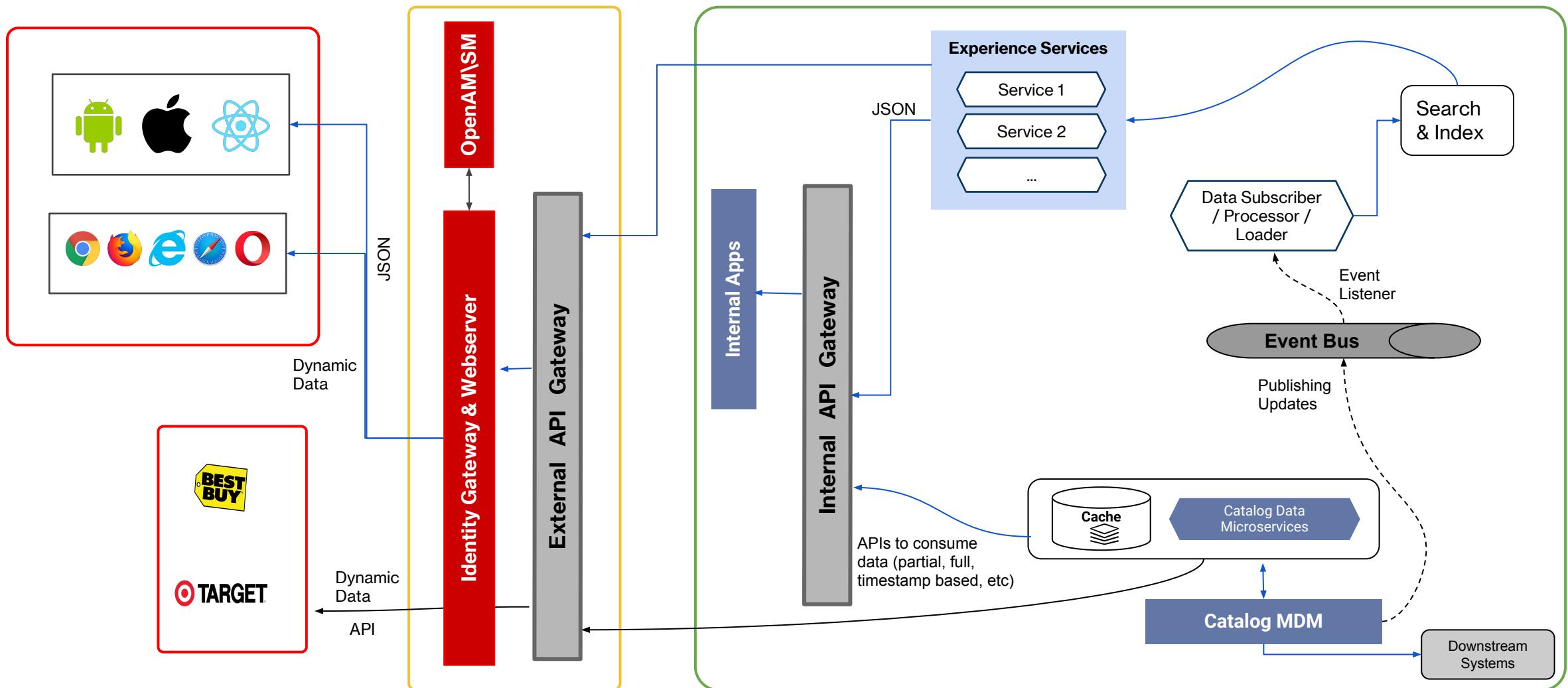
1. Full Reload / Refresh - May involve scheduler
2. Event Based / Partial Updates
3. Business Data Entry & Enrichment
4. Full Access to Source Data via API
5. Performance at the Core (Domain API Cache)
6. Mapping to push data to SOR systems as required



SoE Front-End Architecture - Dynamic Data

→ External → Async

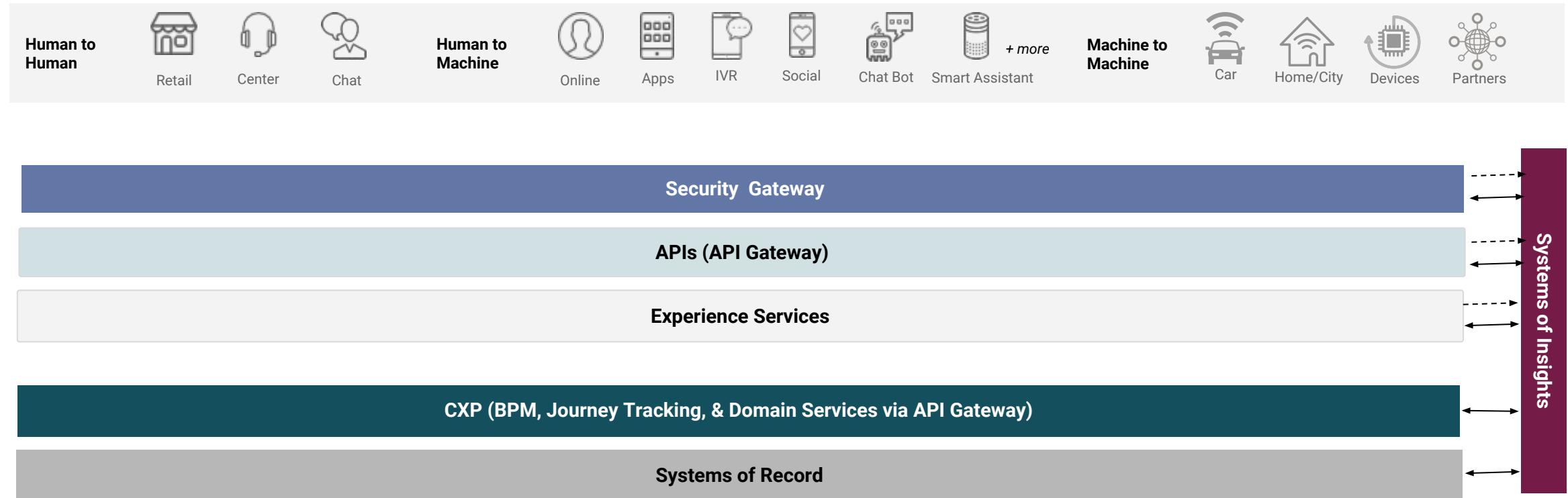
→ VZ Apps



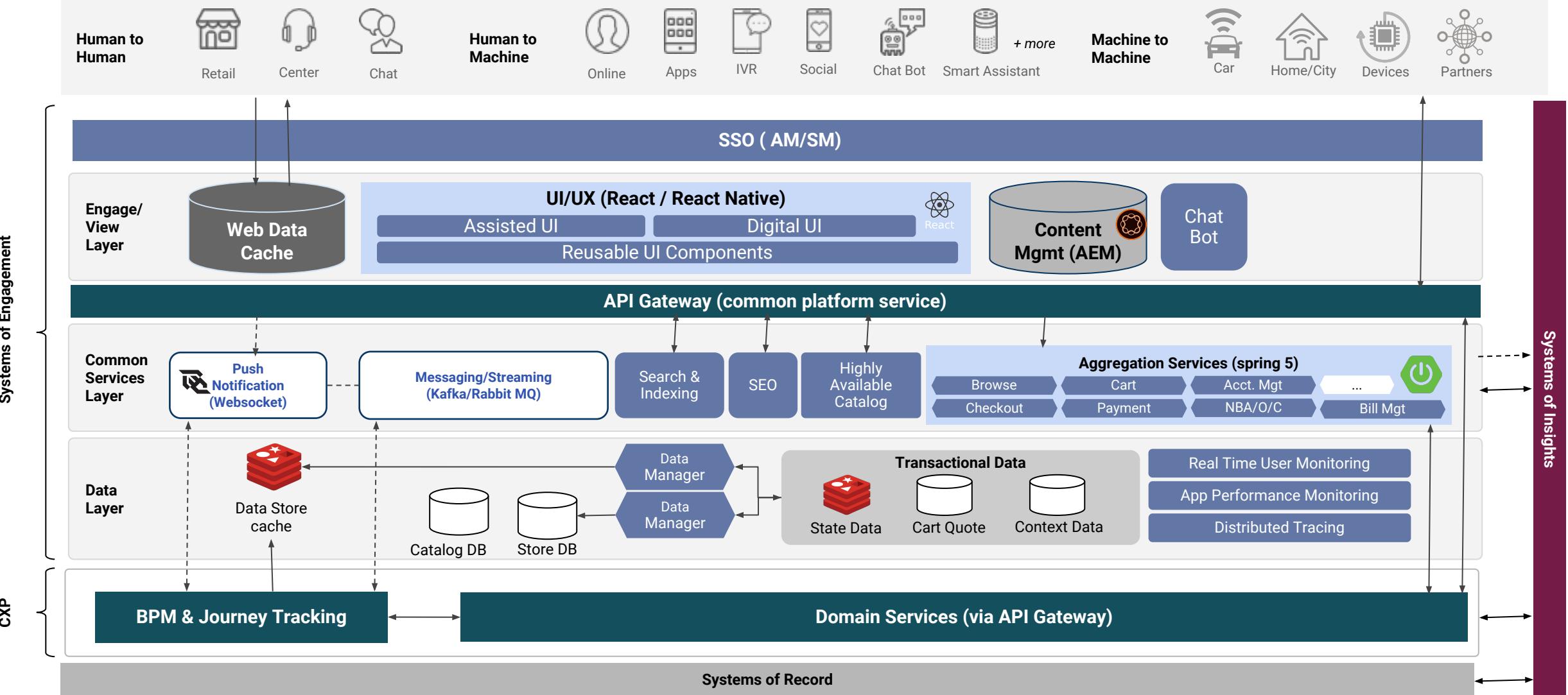
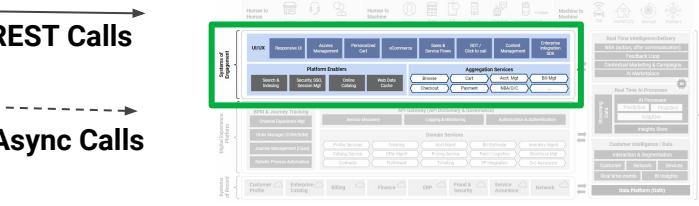
Thank You

Appendix

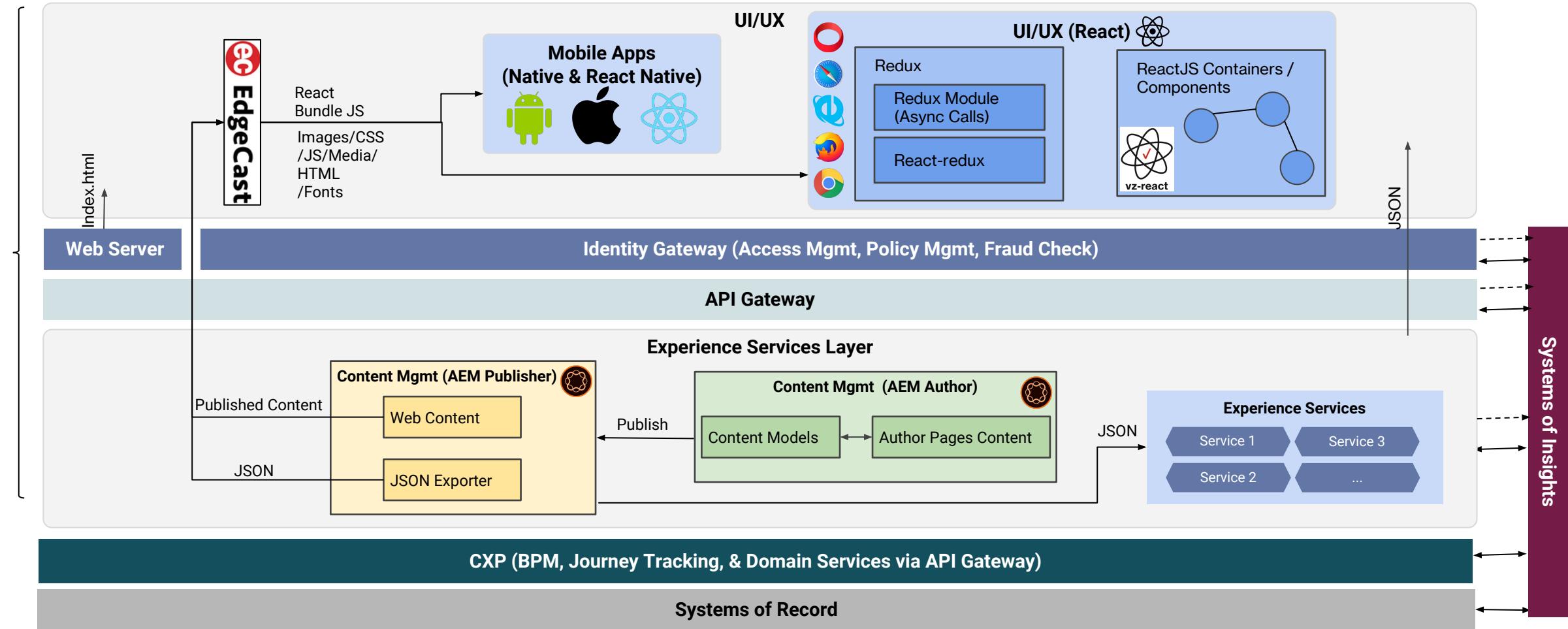
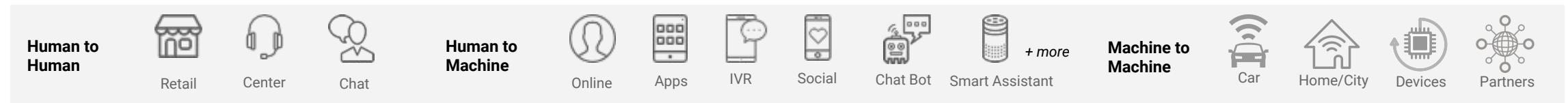
SoE Service Architecture



TO BE UPDATED - Systems of Engagement (Level)

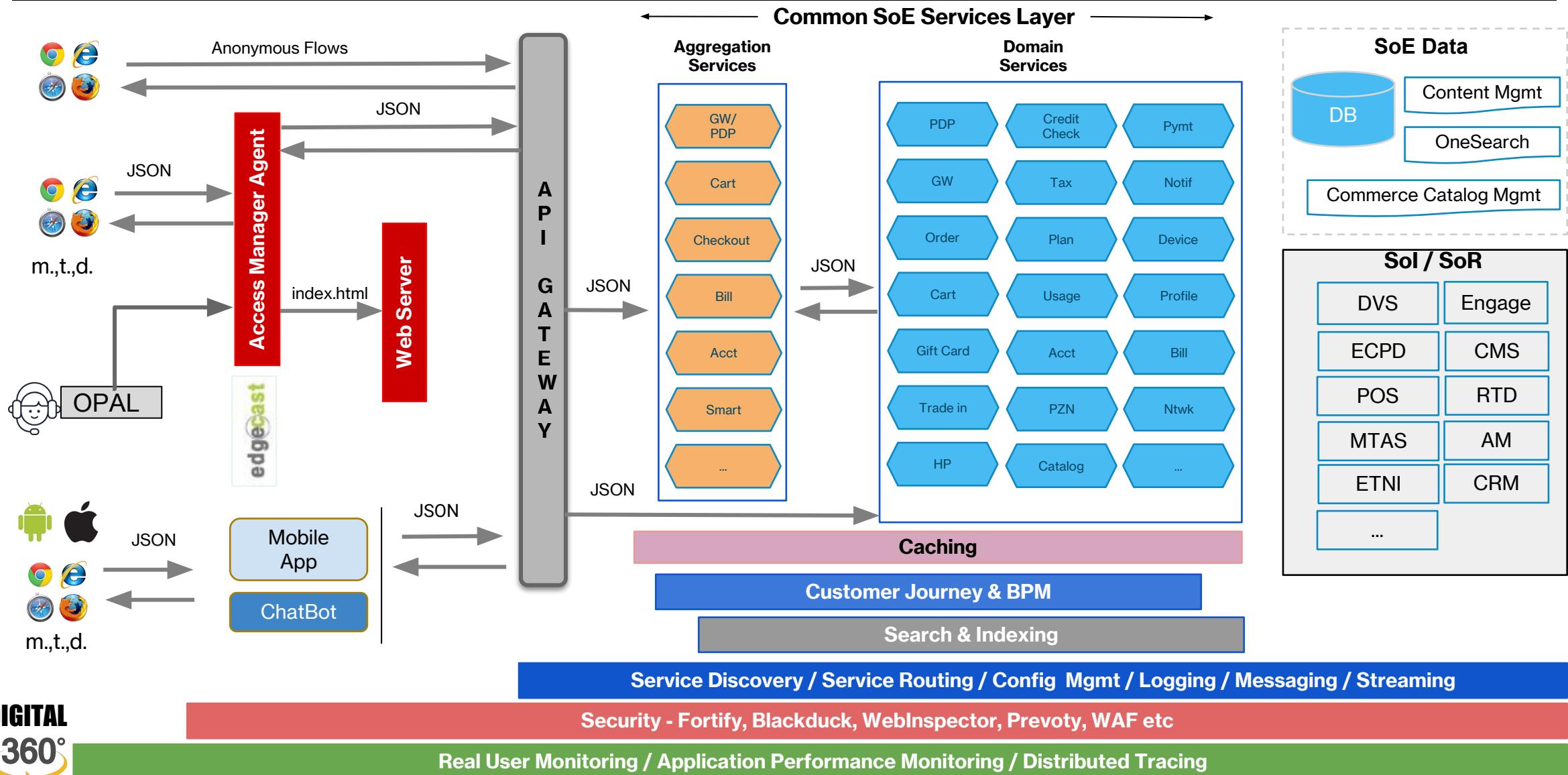


SoE Front-End Architecture

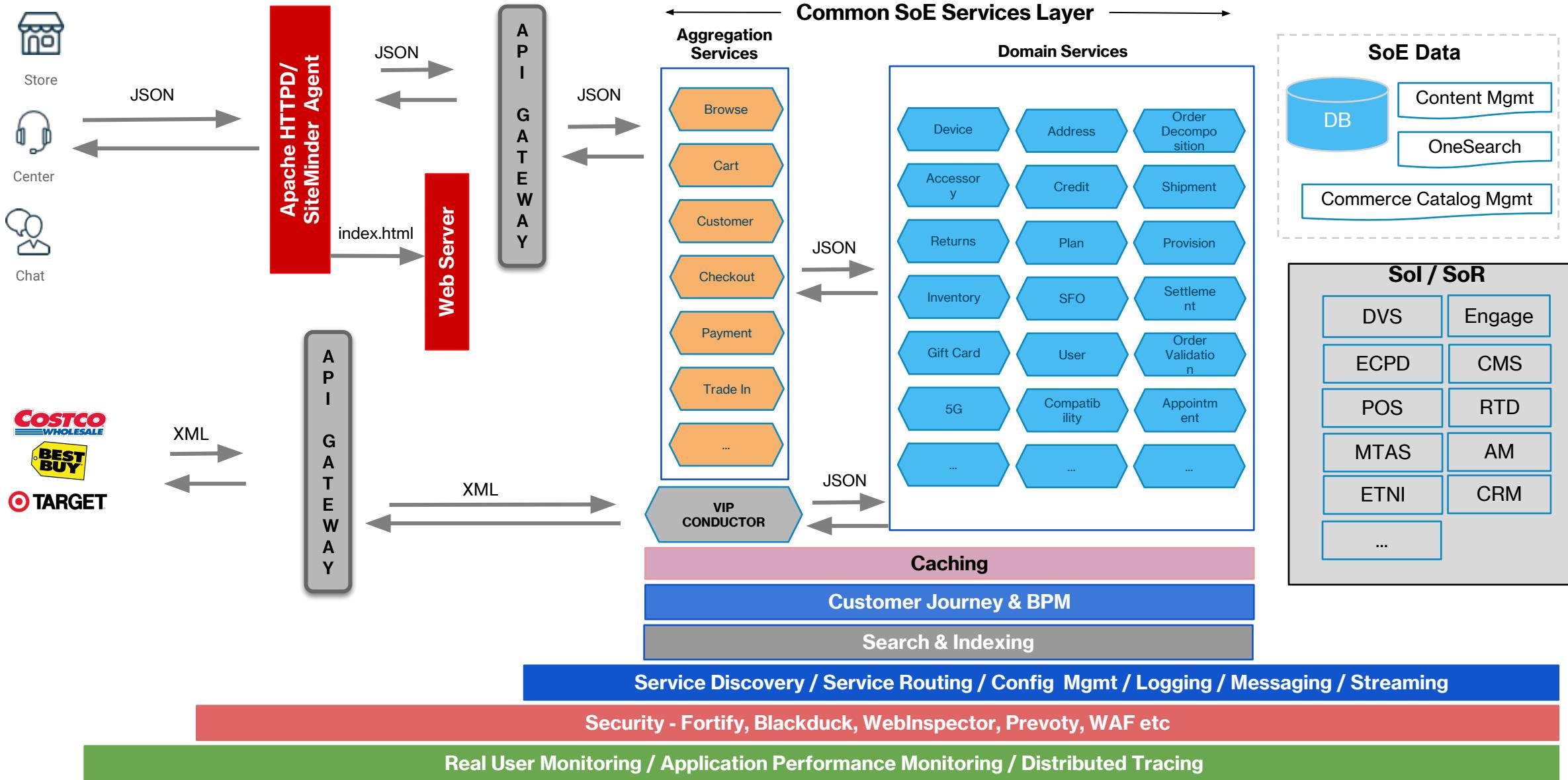


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Target State SoE Digital Architecture - Interactions (Sales & Service)



Target State SoE Assisted Architecture - Interactions (Sales & Service)



React Native Deployment

Your React Native application may still need an app store update. The following are guidelines of changes to the app that can be supported over the air and those that will require app store updates.

Over-the-air (OTA)

When to use:

- Changes within the same code directory
- Changes to the Javascript code
- Changes to assets like images
- Minor bug fixes and improvements

Tools:



App Store Update

When to use:

- Major code changes
- Changes to the Native code
- Adding a 3rd party package
- Upgrades to the React Native package



React Native - Recommendation

React Native is NOT a silver bullet and will not address all your needs. Please evaluate based on your app requirements. React Native is quickly evolving

Development of a NEW Mobile App:

1. Evaluate the Mobile App Requirements
2. Confirm that at least 80% of the App features can be successfully implemented in React Native
3. Develop with React Native and use Native development for components that are not supported by RN yet.

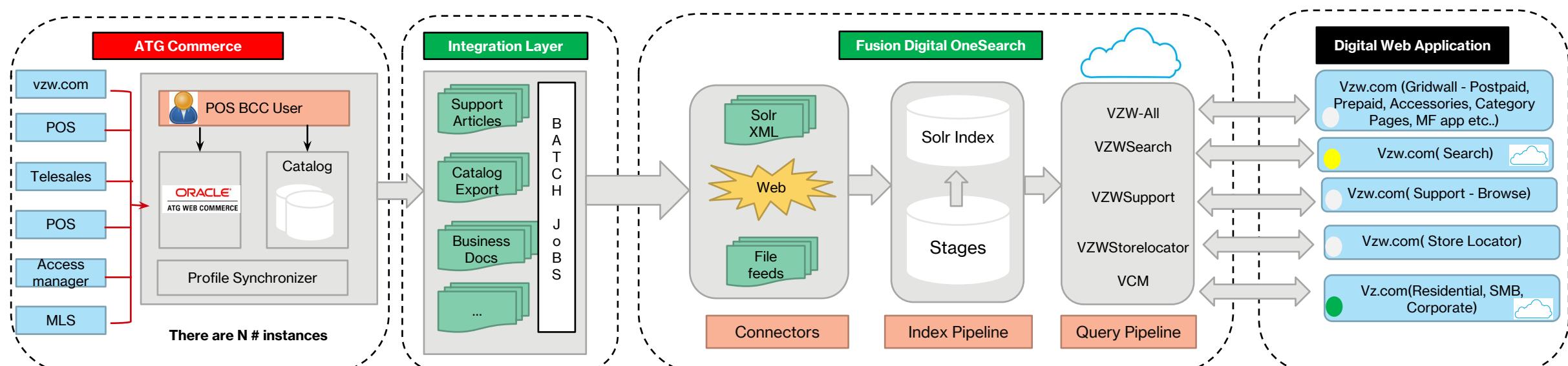
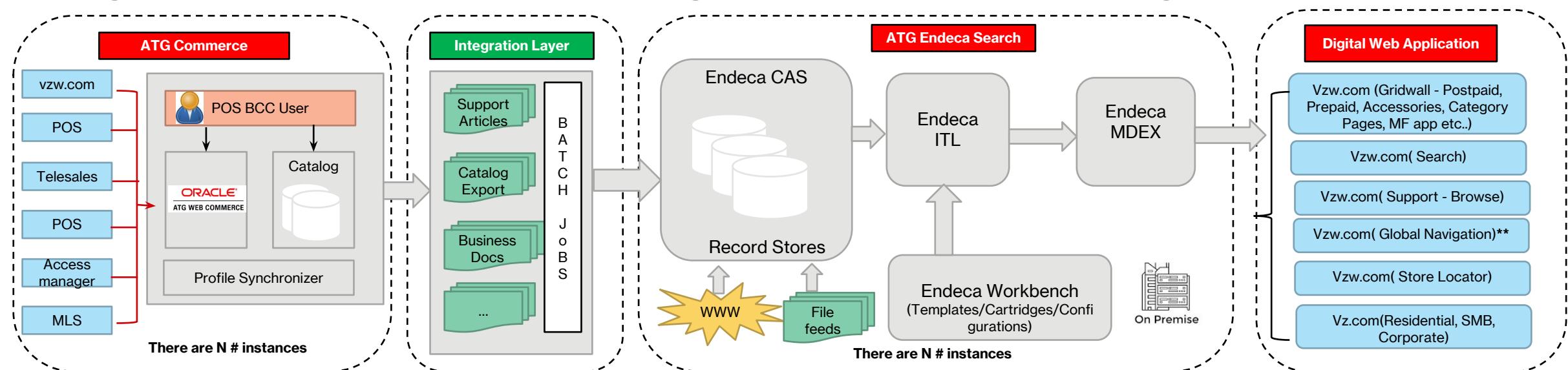
Development of NEW pages or flows in the existing App:

1. Use React Native unless it requires a component that is not supported with RN yet

Changes to existing features or pages:

1. Use Native App development until a redesign/refactor is needed.

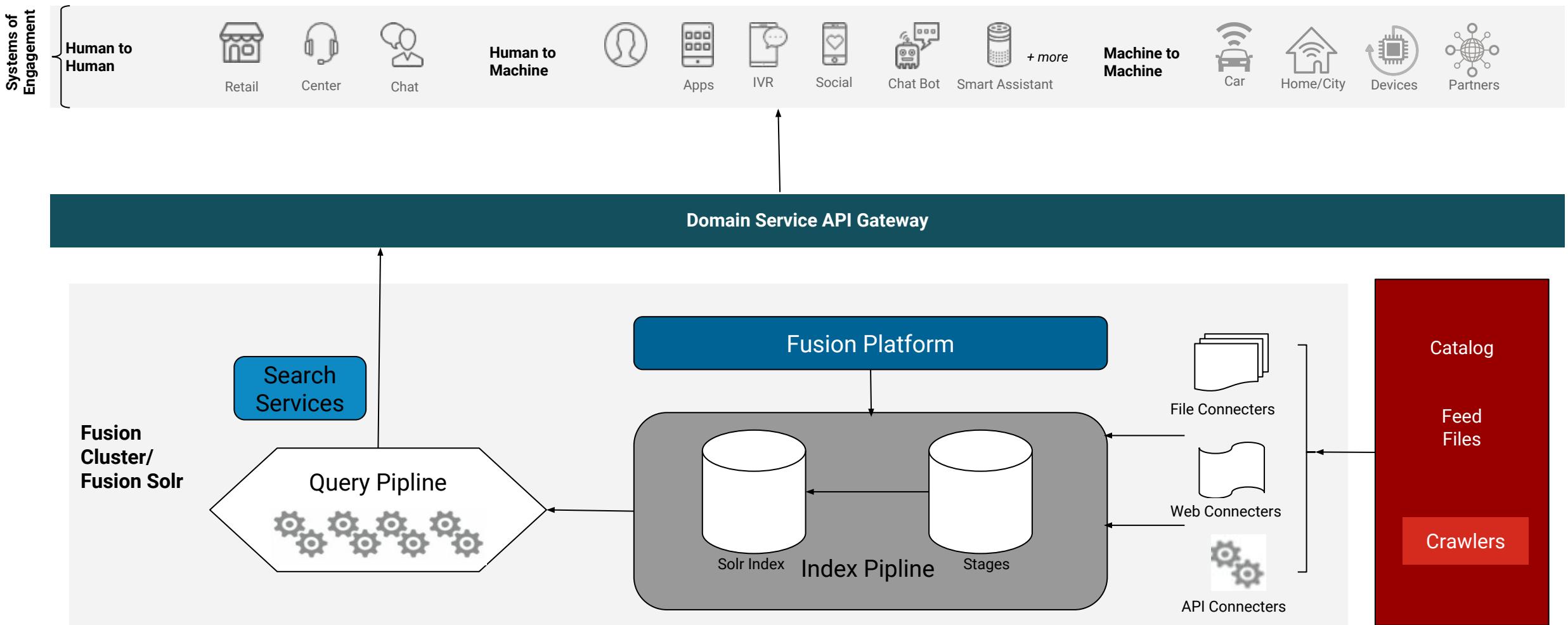
Digital Endeca to OneSearch Migration Architecture Diagram



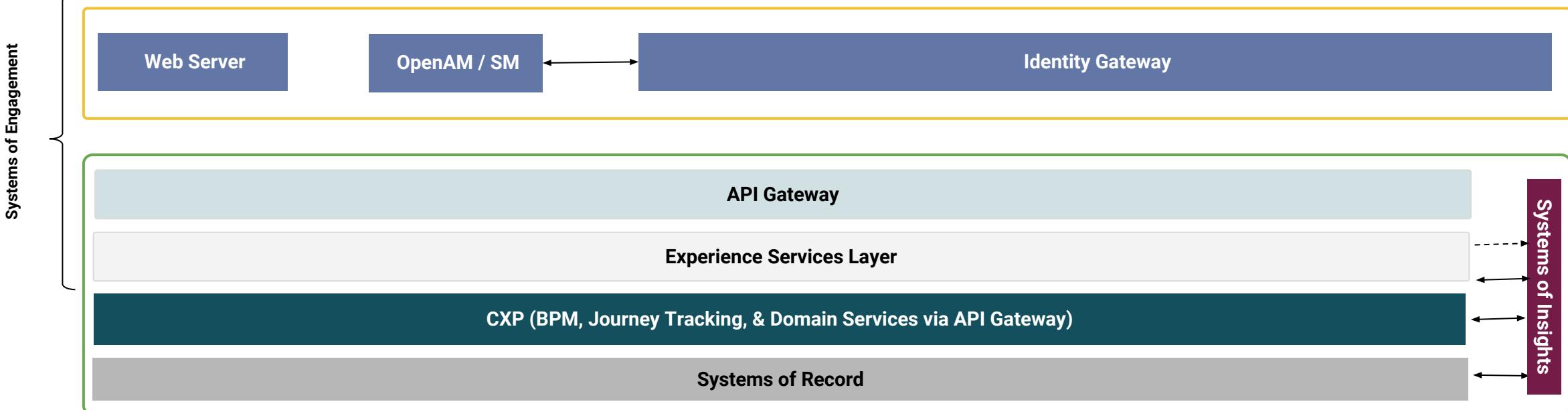
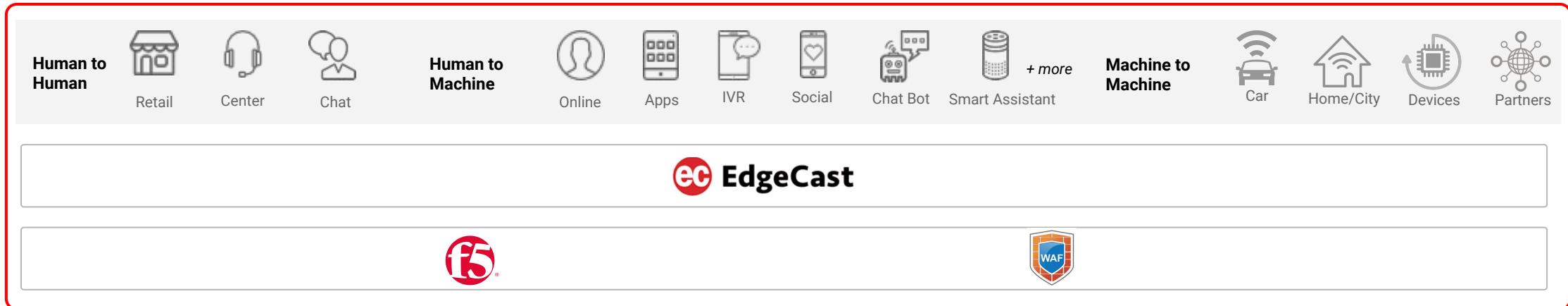
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** Migrated to Adobe Experience Manager

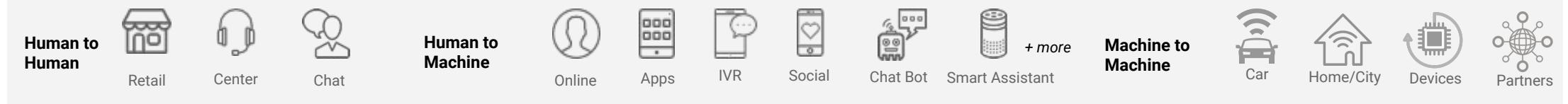
Search (Level 2 Architecture)



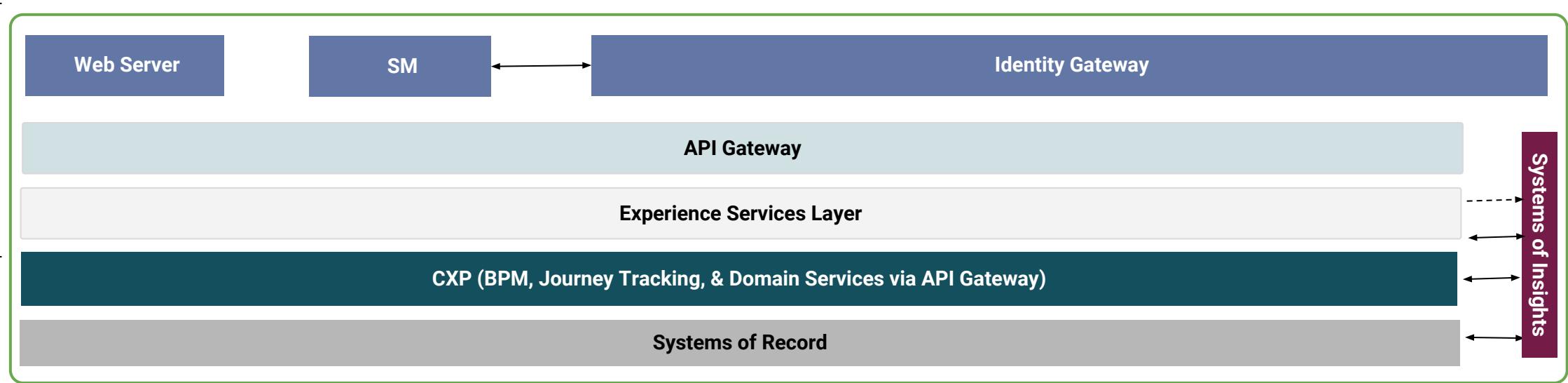
SoE Access Mgmt - Digital & Indirect Reps



SoE Access Mgmt - VZ Reps



Systems of Engagement



Access Mgmt - 3rd Party Integrations



API Gateway (API Dictionary & Governance)

CXP (BPM, Journey Tracking, & Domain Services)

Systems of Record

Systems of Insights