Autonomous Customer Engagement

Implementing AI that is capable of autonomous human-like customer engagement

plumb5 ai

INTRODUCTION

Autonomous Customer Engagement

Autonomous Customer Engagement can be defined as an engagement (either interactions or conversation) between a customer (human) and a machine. The machine is capable of engaging the customer, just how human agents did. They have memories and hence can remember past events and co-relate it with current events. They can learn, decide, predict and recommend just like the way human do. And like all sales agents, ensure customer satisfaction, offer better deals and ensure purchases, with an objective to achieve higher revenue per customer.

The deck covers the steps and its functions in implementing such a learning system over your data to ensure greater customer satisfaction and increased revenue, at a fraction of the cost spent today.

INTRODUCTION

Plumb5 for Autonomous Customer Engagement

Plumb5 is a Unified Data Platform that is built using the concepts of Real-time Decision processes, which on a broad level helps businesses to automate decisions ranging from recommendations to a customer to real-time dynamic pricing to serving personalized data across touchpoints.

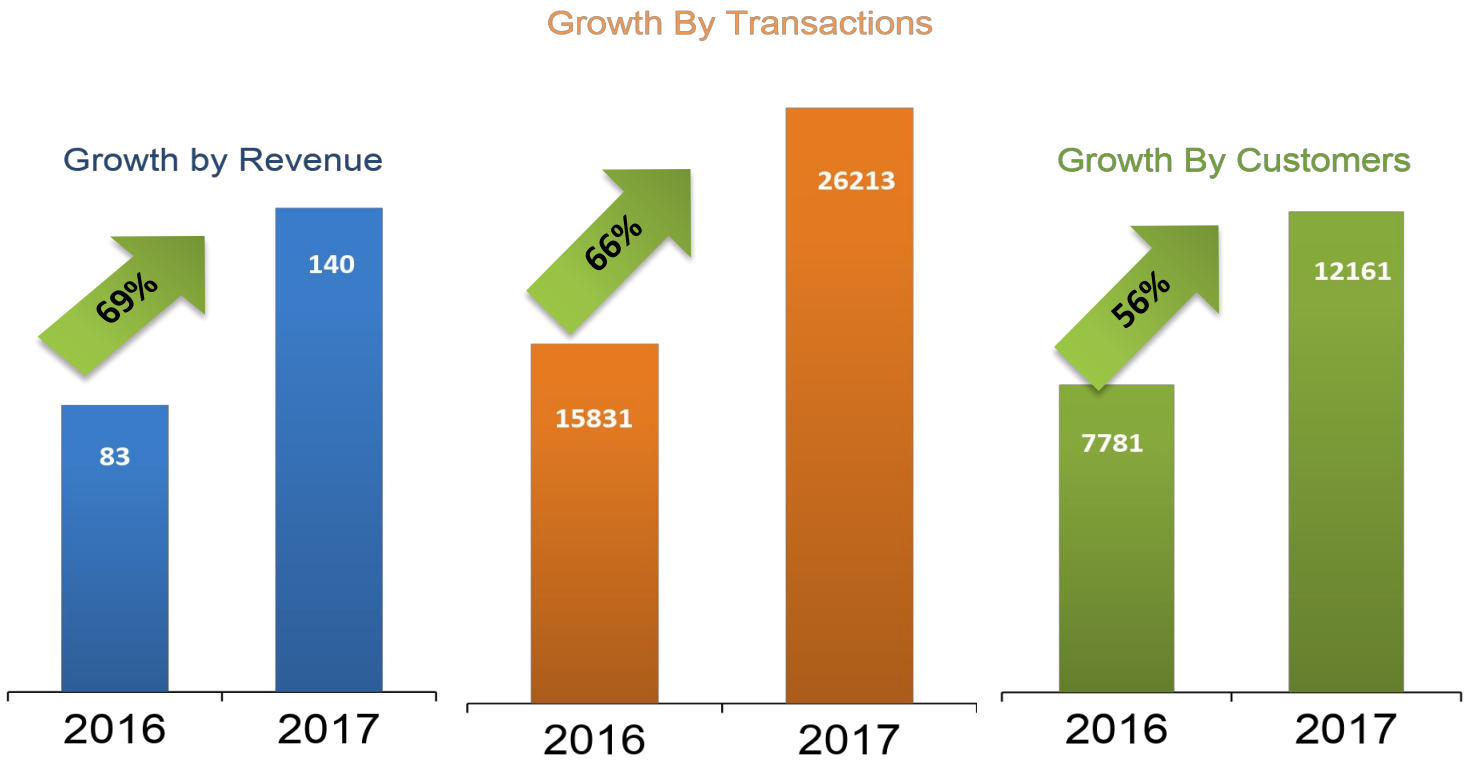
The Data Platform comes integrated with point applications to render seamless engagement between touch-points like web, mobile, email, SMS, social notifications, push notifications, browser notifications and other channels of communication

This allows the platform to quickly connect customer data, run models over incoming data to understand the behavior of the customer, which computes a score based on past and present behavior, to which a state is identified and based on that state, an appropriate engagement is fired.

This allows the machine to learn to decide which engagement to trigger to entice the customer to the next best goal.

BUSINESS ADVANTAGE

More Customers, More Purchases, More Sales



Quarterly KPI Comparison: Q3 Jul – Sep'17- Q3 : Jul – Sep'16

Steps to Implement

Step 0
Infrastructure

Step 1
Data Preparation

Step 2
Machine Learning Workflow

Step 3
Engagement Automation

Step 4
Measuring AI Effectiveness

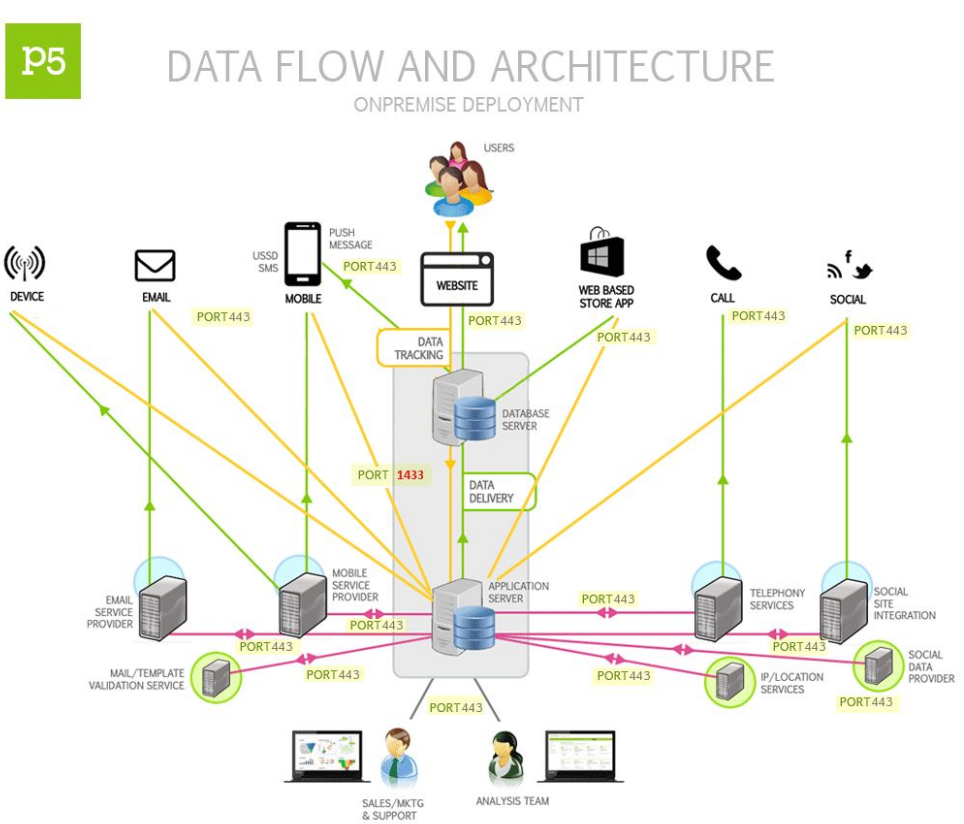
Step 0

Infrastructure

Step o

Infrastructure - Systems Architecture

This architecture is proposed to run real-time customer engagement using runtime analytics



SFTP Port Num 22
HTTPS Port Num 443
Database SQL 1433

APPLICATION SERVER

OPERATING SYSTEM WINDOWS SERVER 2012 STANDARD

PROCESSOR INTEL CORE I5-3.10 GHZ

RAM 32 GB

DISK SPACE 500 GB

SOFTWARE ASP.NET FRAMEWORK 4.5

DATABASE SERVER

OPERATING SYSTEM WINDOWS SERVER 2012 STANDARD

PROCESSOR INTEL CORE I5-3.10 GHZ

RAM 32 GB

DISK SPACE 500 GB

SOFTWARE SQL 2014 STANDARD EDITION

Step 1

Data Preparation

Step 1

Data Preparation

The core objective of the data preparation exercise is to organize customer data by each individual customer. Doing that will allow us easily learn patterns of each individual customer and allows in quickly collaborating with other patterns to arrive at predictions, recommendations and next best actions.

THE BIGGEST CHALLENGE

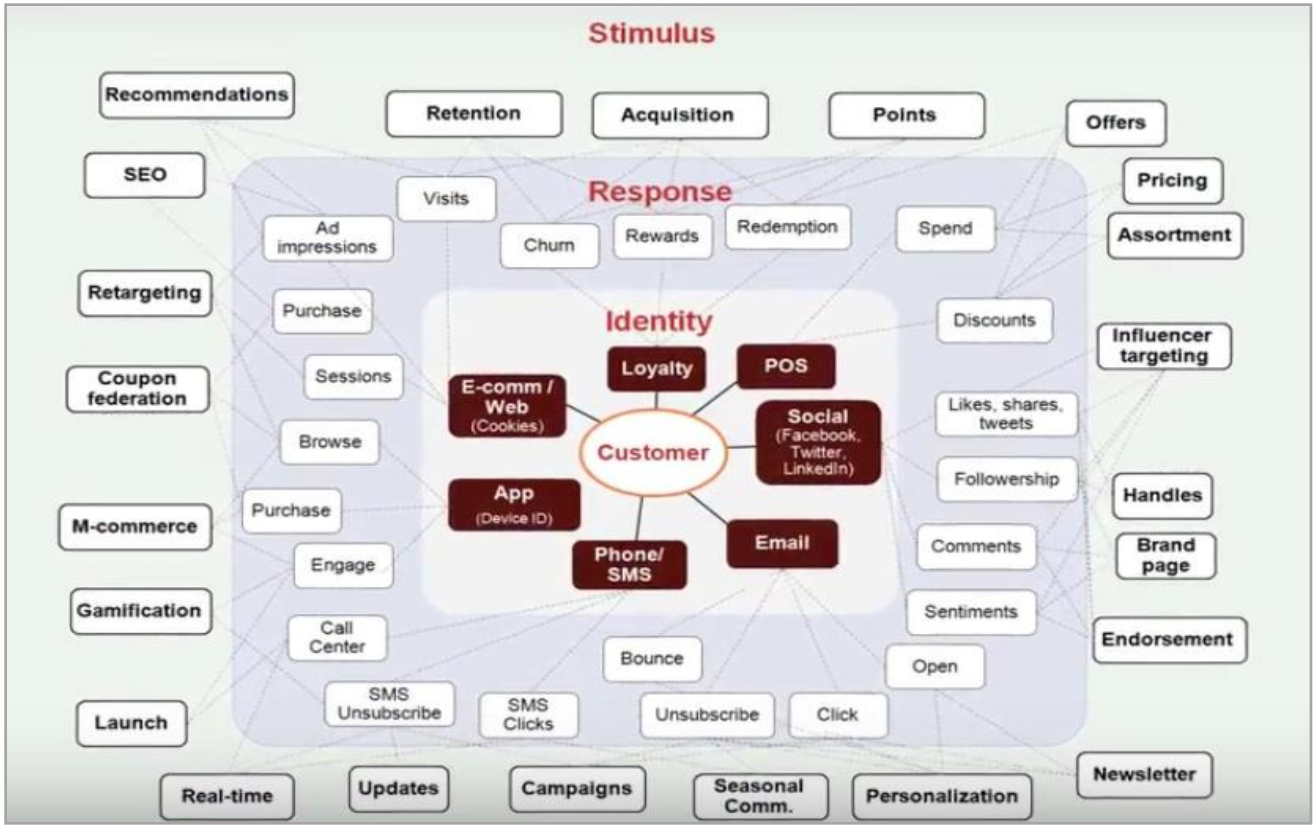
The biggest challenge unsolved in most business environment is that customer data, which is classified as Structured and Unstructured cannot be connected, as they don't have a common unique Id to merge, in order to bring customer data together. In other words, structured data where data can be merged either with a unique id like an email or phone number.

However, the unstructured data, which consists of web behavior data or advertising traffic data stores user information by IP or some unique ID, which cannot be mapped to the unique IDs of the structured data.

This problem exists in all data environments using multiple tools without a unification strategy.

The Challenge seems overwhelming

The amount of customer data across various sources and interactions can be huge. But you can get an absolute view of the customer, only if every related data source is combined .



Step 1

Data Preparation

LIMITATIONS

Because of structured and unstructured data in silos, customer data remains incomplete. These data-sets when used for analysis or machine learning, presents limited or inaccurate insights leading to ineffective customer strategies.

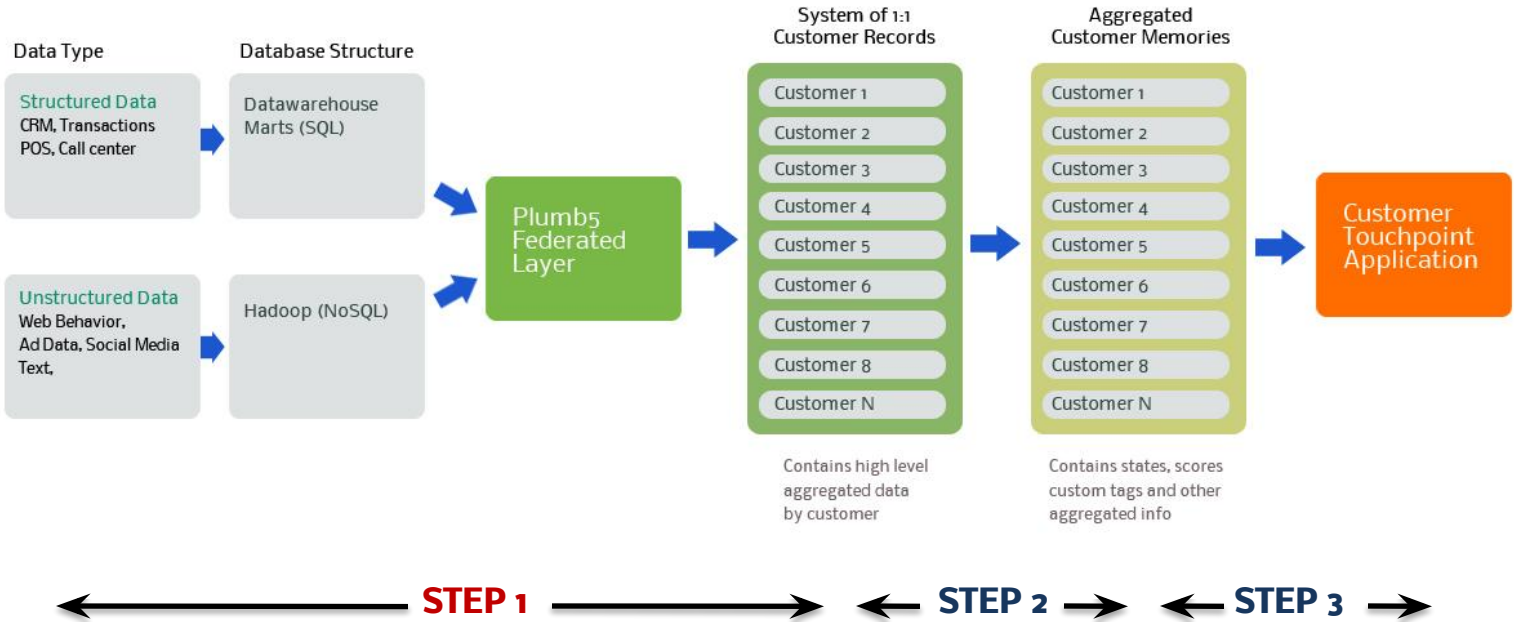
You may notice that data from the CRM might reveal multiple data parameters about the customer like transactions, email/phone conversations, product purchased etc but lacks information on products browsed, active channels, and other behavioral parameters.

This missing data not only takes out the relevance in subsequent communication but also might not detect the opportunities to convert.

Step 1

How do we need data to be organized?

Connect all data sources containing customer data to Plumb5 Federated Layer to organize data by individual customer. These individual sets are parsed through machine learning workflows to output customer memories, which can be consumed for contextual personalization by any customer touch-point



Step 1

Steps to merge

4 essential steps on how Plumb5 is used to merge structured data and unstructured data

PLUMB5 SCRIPTS AND SDK

Get started by adding Plumb5 trackers to collect behavior of both website/store or mobile app interactions. Plumb5 creates a unique ID for each user(machine) and stacks data based on the unique ID.

INTEGRATING CHANNEL TAGS

Pass these IDs across other touch-points like Email, SMS, USSD, and other touch-points to be able to track and merge user data based on the ID. Plumb5 Engagement Layer comes with embedded tags and saves time on integration

TRACKING DMP/DSP DATA

Integrate DMP/DSP platforms to collect audience profile data which again is merged with a common identifier between DSP platform and Plumb5 generated URLs

MERGING OTHER STRUCTURED DATA

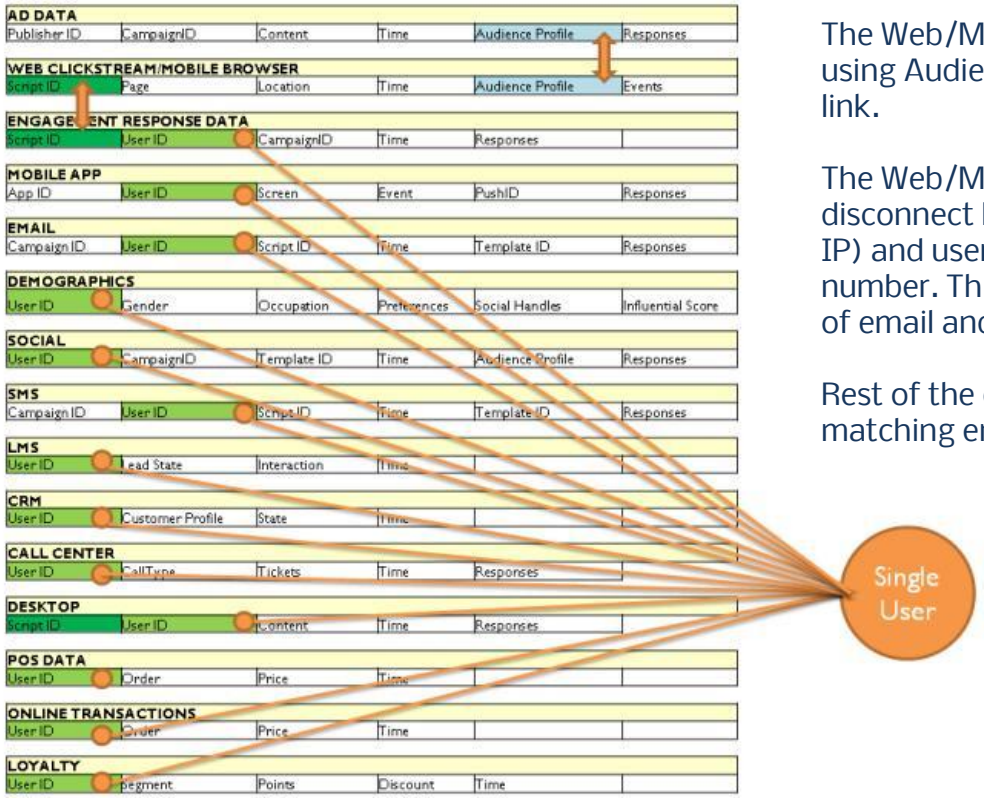
Using the email or phone number, import and merge data based on email or phone number match.

With these steps, customer data across silos can be easily merged due to the availability of a unique ID of an user

Step 1

Unification Technique

The following tagging map shows how IDs are merged to create single customer data



The Web/Mobile tracking resolves the Ad visitor using Audience Profile ID embedded in the web link.

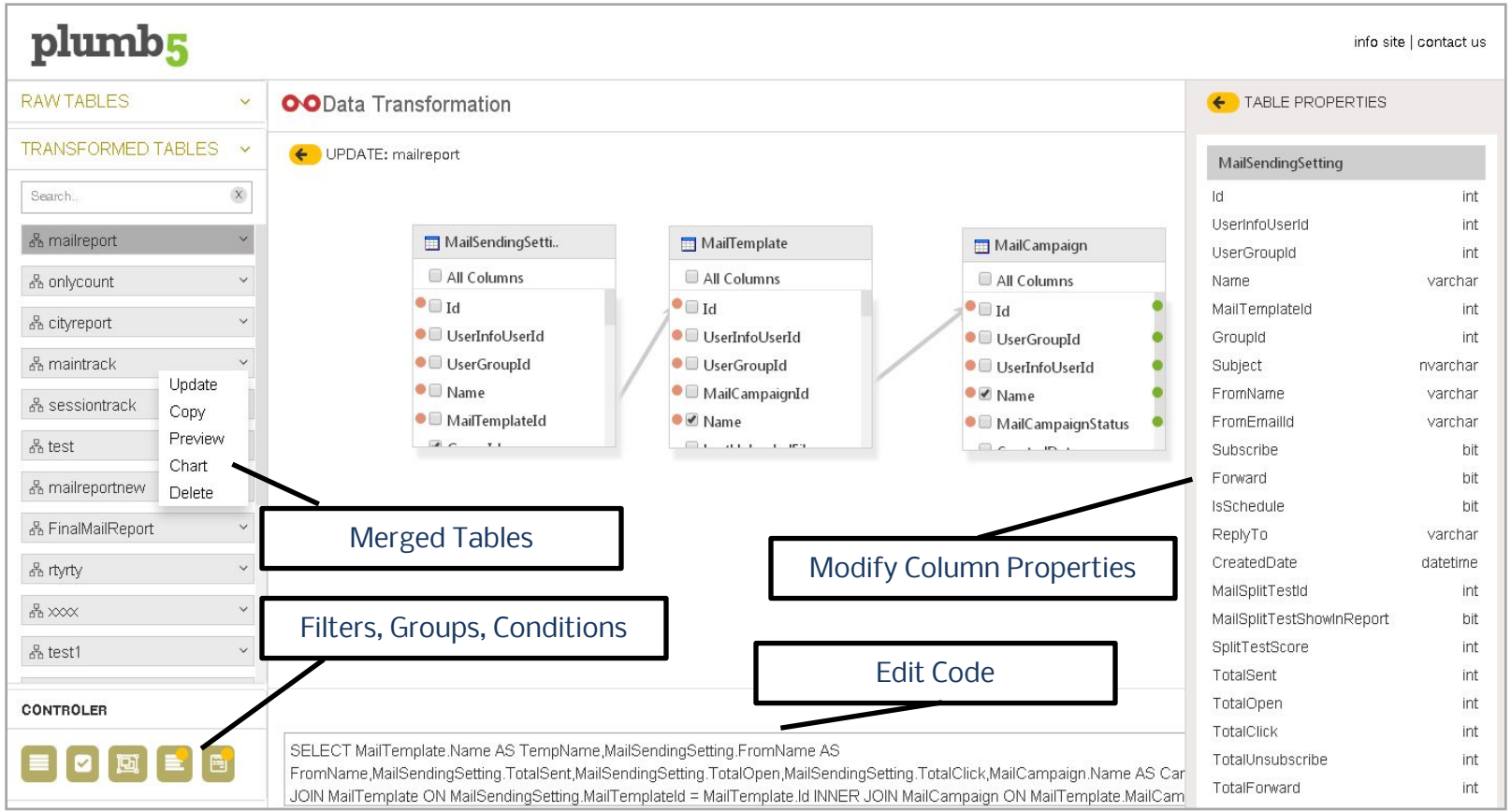
The Web/Mobile tracking also resolves the disconnect between anonymous user (defined by IP) and user identifiable by email or phone number. This is done by passing a tag in the link of email and SMS templates.

Rest of the other structured data is resolved by matching email addresses or phone numbers

Step 1

Managing Schema

Plumb5 Data Management interface allows the user to edit the existing schema or add new data sources using a simple editor.

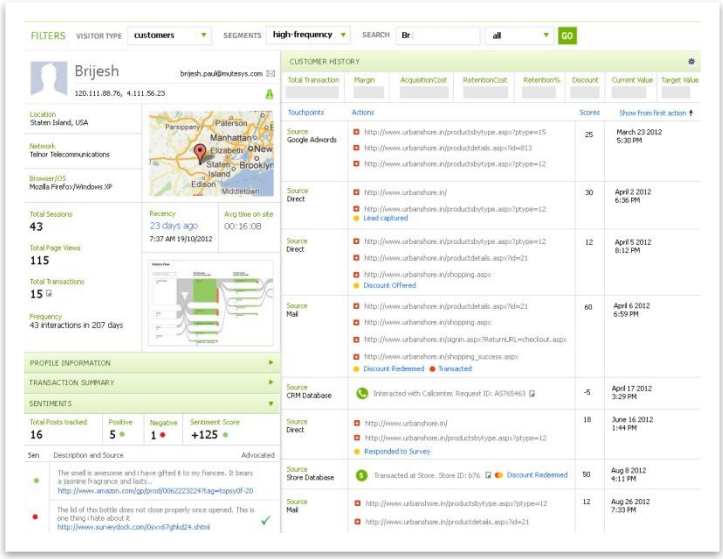


Step 1

Generate Data by Customer

Unified Data generated can be viewed in Plumb5 Analytics Module. Developers can make API calls to get the complete unified data of a single user

FOR MARKETERS



FOR DEVELOPERS

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 ▼<Visitors>
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    <Email>NA</Email>
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    <Score>95</Score>
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  </Visitors>
 ▼<Visitors>
    <AvgTime>5</AvgTime>
    <City>DUBAI</City>
    <Email>NA</Email>
    <LastInteraction>10/20/2015 10:29:03 PM</LastInte
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    <Score>0</Score>
    <Sessions>1</Sessions>
    <VisitorIP>2.50.27.160 (m-0639)</VisitorIP>
  </Visitors>
```

Step 1

Subsequent Data Streams

Plumb5 Scripts / SDK streams data continuously in order to analyze behavior data in real-time. The scripts take in all the dynamic information from websites, ecommerce stores or mobile application, where many interactions are recorded in a single session.

Using API calls, other touch-point application data are updated as and when the interaction or response is captured

Other Offline data is integrated using either API calls or by using periodic schedulers

All these data are extracted, ranked in real-time as soon as it is collected, keeping memory files updated at all time.

KEEPING IT SMART

Most streaming systems are dependent on data collection sources

Current data infrastructure are redundant with number of systems and data has to hop to different systems before an insight is generated

This creates latency and cannot serve real-time decisions required to keep up the context

The other problem also arises from the fact that the streaming systems are clueless of data relationships and hence simply used to push data into the centralized system.

This creates various hurdles in creating a singular memory of a customer required for autonomous customer engagement

SUMMARIZING THE STEPS

- Use Plumb5 scripts and mobile SDks to collect data directly into the federated layer
- Implement Tags to touch-point communication or use the pre-integrated Plumb5 engagement Layer to connect data from all customer channels.
- Integrate Ad platforms to connect audience profiles and website/mobile visitor data.
- Connect other customer data from CRM, ECOM platforms, Call Center applications, Point of Sale Apps, using API or schedulers
- Visualize Single Customer Data

KEEPING IT SMART

Planning for Single Customer Data

Plumb5 which is designed to be customer centric, stores data by unique customers. This allows the platform to directly store data by customer and integrate data from other sources and organize it by mapping unique IDs.

This saves the enterprise of creating a different system just to merge to arrive at a unique customer table.

The data organization in Plumb5 is designed to primarily carry out AutoML, where decisions and predictions are automated using a machine learning workflow, explained in the next section.

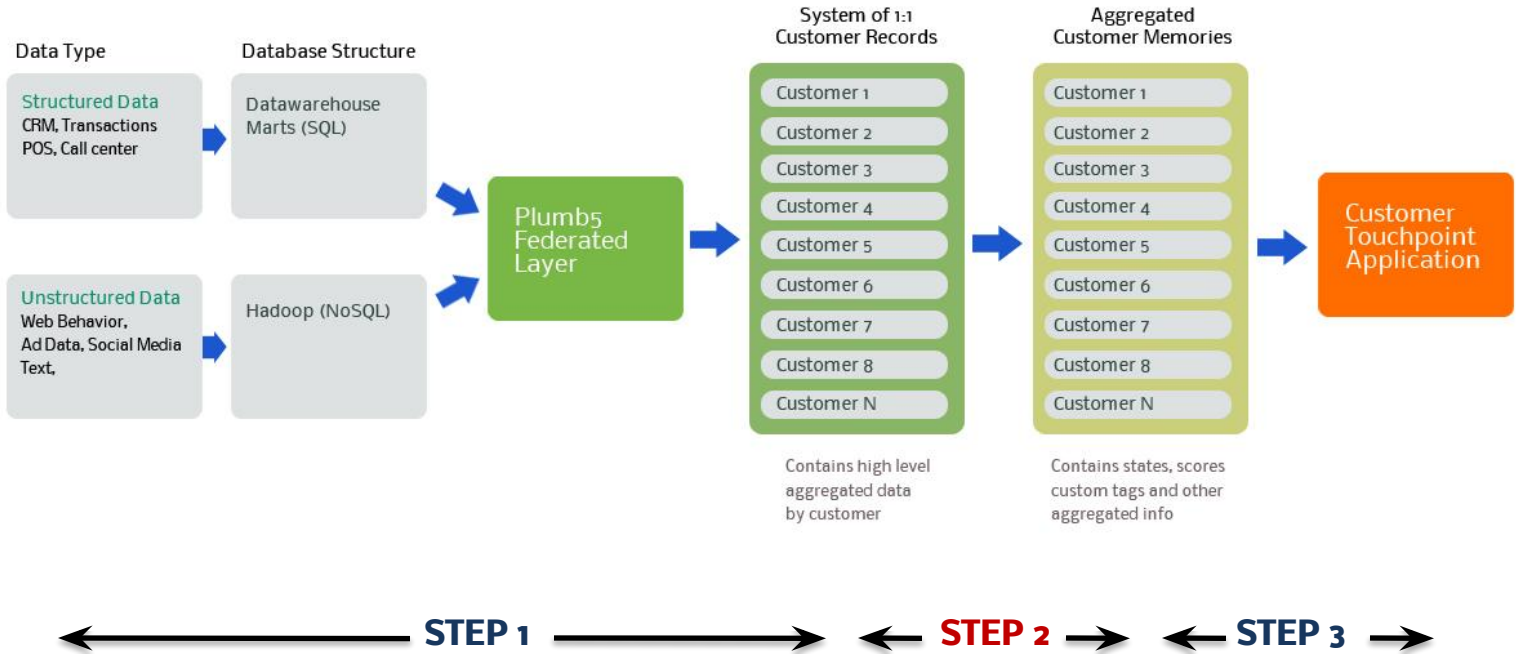
Step 2

Machine Learning Workflow

Step 2

Machine Learning Workflow

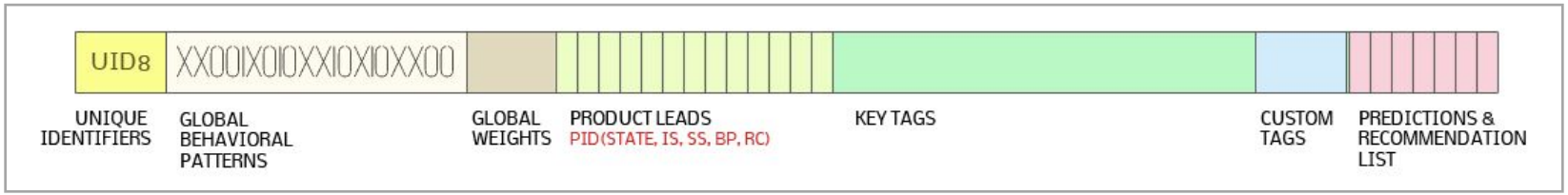
The second step involves transforming the single customer files to memories, which can be consumed for contextual personalization by any customer touch-point. Though this step is more machine driven, it also allows the user to supervise scores, in order to make learning faster.



Step 2

What are memories?

Forming memories in runtime allows the machine to stay relevant and contextual at all times. Memories are consolidated data files (JSON), which holds key information like patterns, states, aggregated weights and other identifiers to quickly detect and match against user behavior in the current session.



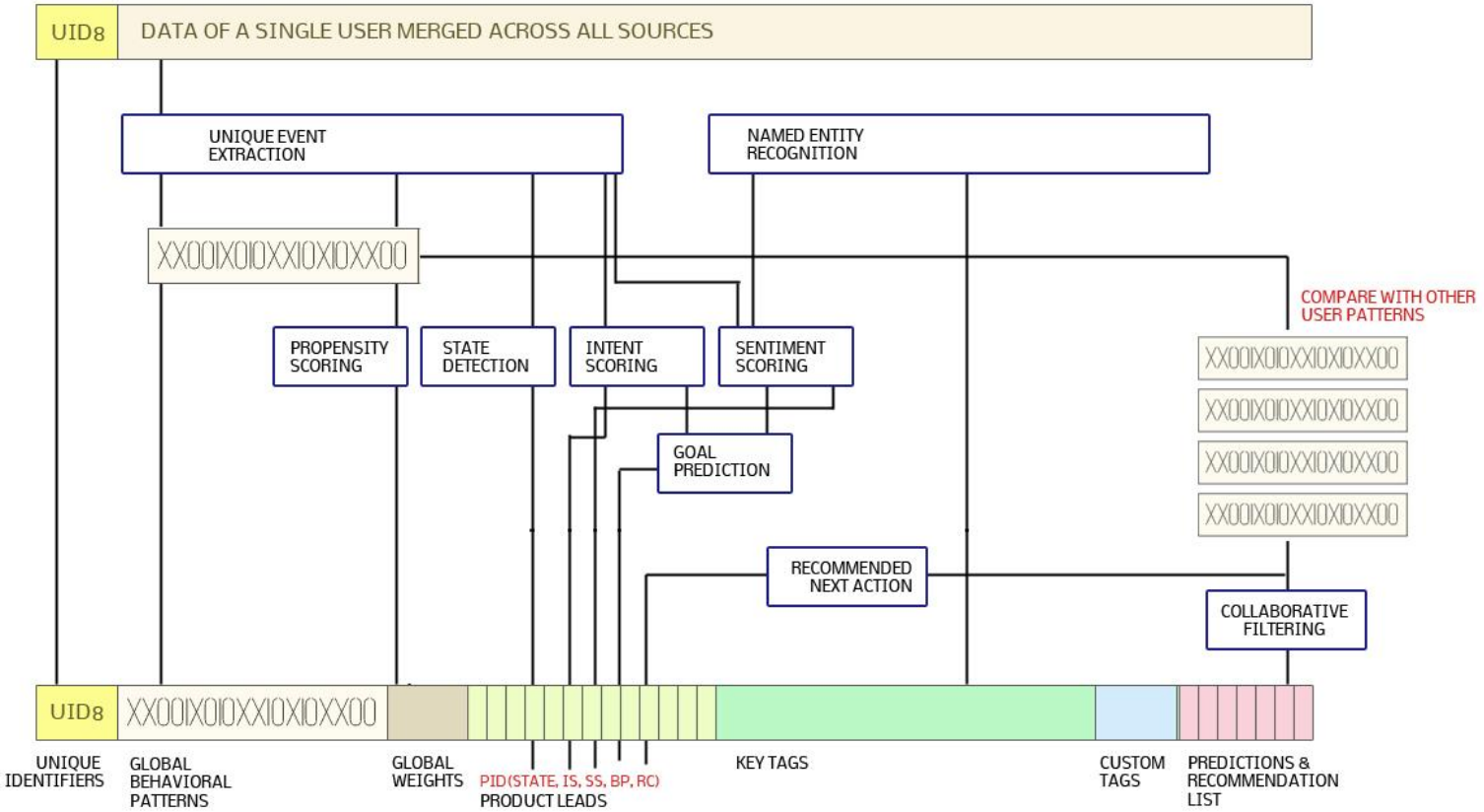
INFORMATION IN MEMORY FILES

- **User Identifiers** - to match and identify the user
- **User Pattern** - A string pattern depicting all interactions of the user stacked by time
- **Global Weights** refer to aggregated net weight (overall score of the user)
- **Product Leads** refers to product customer relationships. Each product, where some interaction is detected, is added to the memory with state, intent, sentiment, buying prediction and recommended next action
- **Key tags** are keywords extracted from demographic data, preferences, conversations and other keyword data
- **Custom Tags** are slots to add any custom user defined states that may have channel or source information
- **Predictions & Recommendation lists** carry information that is generated after comparing other user patterns to predict a product or an event. Since they do not have past relationship with the customer, they are stacked distinctly.

Step 2

How are memories created?

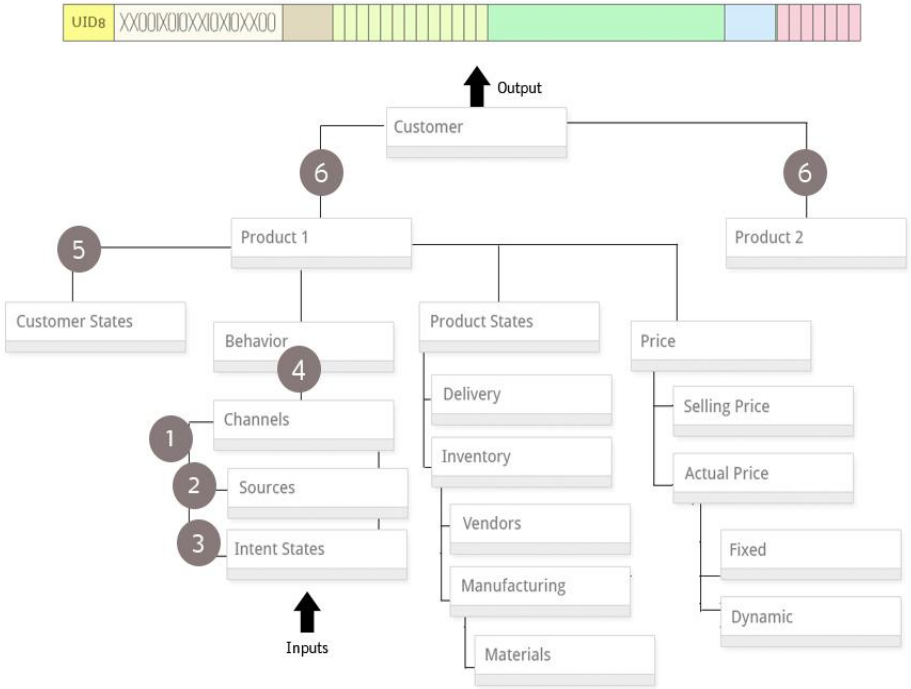
The machine learning workflow employs several extraction techniques, scoring algorithms and matching techniques to create memories from 1:1 customer data



Step 2

How the hierarchical model contributes?

The hierarchy in the model behaves like a network, in the sense, that as data is organized, extraction and scoring happens in runtime, which helps in updating the memory files instantly where the latest weights are available for personalizing next action

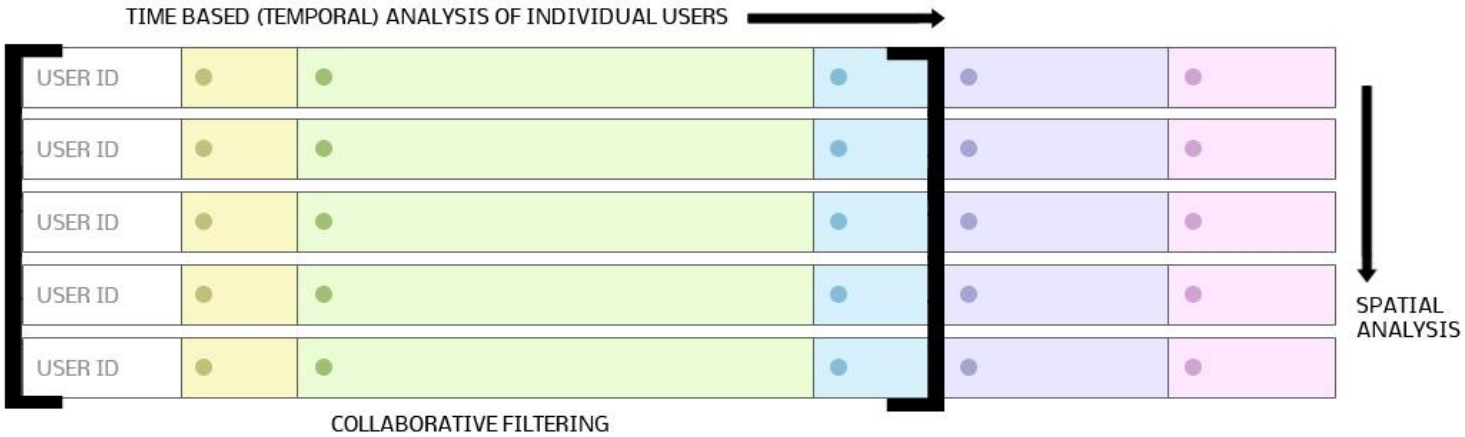


1. Data Input are organized based on channels and is stacked by time stamp.
2. With tags given to the unique event interaction, the interaction data is converted to a tag string to form a temporal sequence, with interaction source as markers
3. The scoring technique scores the tags to deduce the intent score. Notice that the relationship hierarchy takes each relationship between the single user and all related products independently. So it first extracts the intent score for a particular product and then sums it up with all associated product to arrive at overall customer score.
4. From these channel data, states are extracted and updated against each product
5. Notice that the customer state for each product is independently extracted
6. This happens for each related product

Step 2

Analysis in runtime

Memories when organized together gives us the opportunity to analyze both by individual users as well as their associated users. The individual memory units hold the individual pattern and behavior of a user over time and when each of these units are stacked together, they allow in auto-segmentation by common attributes, or extraction of 2 occurring users in a common namespace or apply collaborative filtering to predict next actions or products

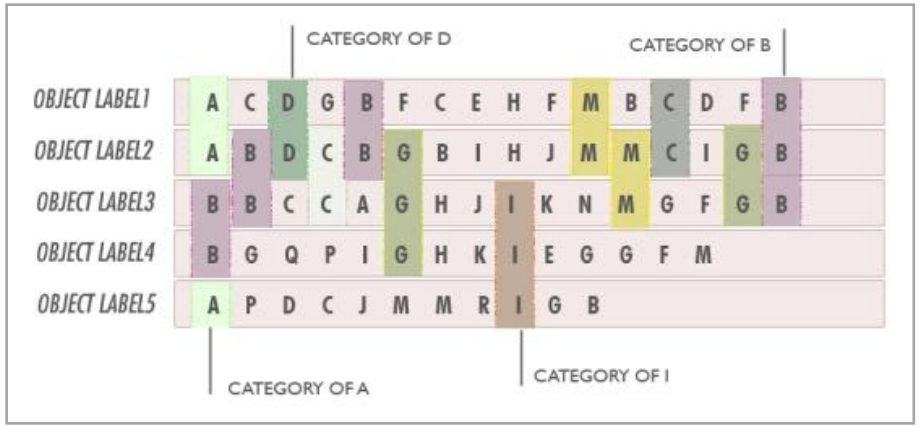


Step 2

Analysis in runtime

Examples on how patterns help in auto-segmentation work in real-time

AUTOSEGMENTATION



The Auto-segmentation workflow takes the unsupervised approach. For every unique difference of a string, it creates a new reference and auto-labels this unique combination. For every similarity of an attribute within the patterns, the machine groups similar attributes to create a category. This allows the machine to classify at every stage and maintain clusters of similar attributes.

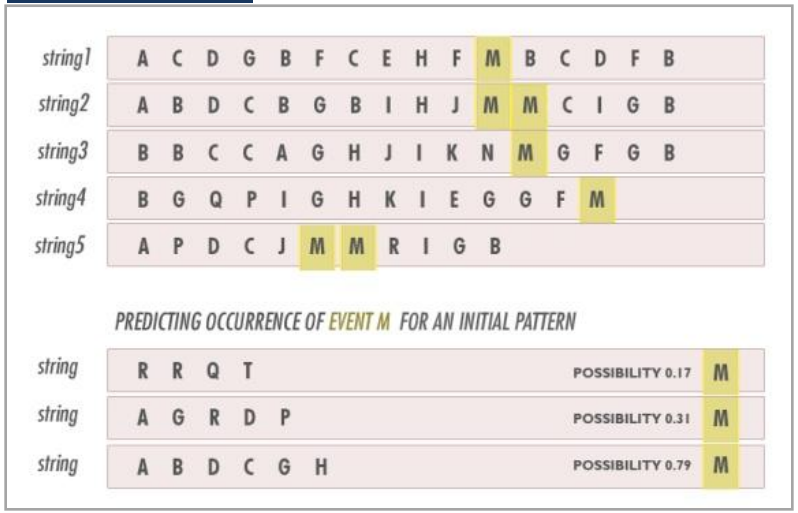
This helps in finding related users quickly so that the patterns of these users can be filtered to run predictions and recommendations

Step 2

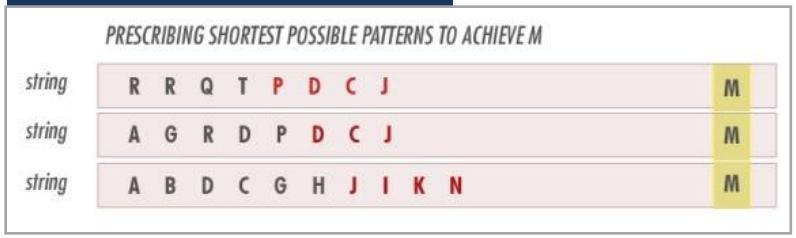
Analysis in runtime

Examples on how patterns help in predicting or recommending in real-time

PREDICTIONS



RECOMMENDATION



The patterns presents the entire sequence of unique labels that denote interactions. Detecting the goal and arranging all interactions leading to the goal is key.

For example, a purchase interaction is possibly labeled “M” as in the diagram. Notice when a random string is presented, it compares with the patterns available to predict the occurrence of the label’ M”. So when a user interaction look like any of the random string, it predicts the possibility of the purchase by comparing with related patterns where the interaction is common.

By checking other patterns that contain “M”, it can also recommend the shortest path of interaction to achieve M. Notice in the diagram that the random strings presented are recommended with next best interaction to achieve M. So when a user is dropping off or deviating from the goal path, the machine can detect and recommend to bring back the user to the goal path.

Step 2

Workflow Components

A brief overview on the components employed within the workflow

Component	What does it do?
Unique Event Extraction	The component lists all events (which has a time-stamp)and outputs all the unique events present. Converts the unique event information to tags (three digit alphanumeric string). The tags are arranged by time stamp, which forms a long pattern of tags
Propensity Scoring	The propensity scoring logic is capable of both unsupervised as well as supervised learning. The supervised allows the data scientists to set scores for the unique event. The unsupervised technique uses reverse goal technique to understand the related events which are closer/farther from a given goal and allocates three staged scores based on their distance. These scores are used to calculate the net current weight of the user

Step 2

Workflow Components

A brief overview on the components employed within the workflow

Component	Function
State Detection	Based on pre-set rules, these algorithms look for matches within the stack. For example, if the data contains just an email but no associated transactions then it would tag it as P (for Prospect). In case it finds a linked transaction, it would update the state to C (for Customer). Likewise, it detects product states, response states, sentiment states to add up to customer memory.
Intent Scoring	Intent Score of a customer against a particular product is calculated from total unique events, total sessions, scores of the unique events, which is further computed with negative scores assigned to recency to get the final intent score
Sentiment Scoring	Customer Conversations, Replies recorded as text or voice (converted to text) are extracted and ranked to generate sentiment states (positive, negative, neutral, ambiguous)which is tagged to the customer against a related product

Step 2

Workflow Components

A brief overview on the components employed within the workflow

Component	Function
Goal Prediction	As explained in Slide 25, pattern matching is done to understand the probability of achieving a goal
Named Entity recognition	Named-entity recognition technique seeks to locate and classify named entities in text into pre-defined categories such as the names of persons, organizations, locations, expressions of times, quantities, monetary values percentages, etc.
Collaborative Filtering	As explained in Slide 25, pattern matching is done to identity similar users and extract products that can be recommended
Recommended Next Action	As explained in Slide 25, pattern matching is done to understand the most probable next action that leads to a goal
Auto-segmentation	As explained in Slide 24, pattern matching is done to extract common attributes within matching pattern to arrive at segments
Custom Tags	These are user defined states, that can be added to memories so that the machine can initiate a trigger if the user defined condition is true.

Step 3

Engagement Automation

Step 3

Engagement Automation

Now that the machine is aware of customer stages, states, behavioral weights, product affinity lists and preference tags, all it needs is to fire a communication, when a certain state is achieved by the user.

Based on customer responses to these messages, the ML workflow scores and readjusts its decision states, enabling continuous learning and decision fine-tuning for best results

Technically , data collected as responses is immediately fed back to the Plumb5 federated layer for scoring by the ML workflow. This allows the machine to learn continuously in real-time.

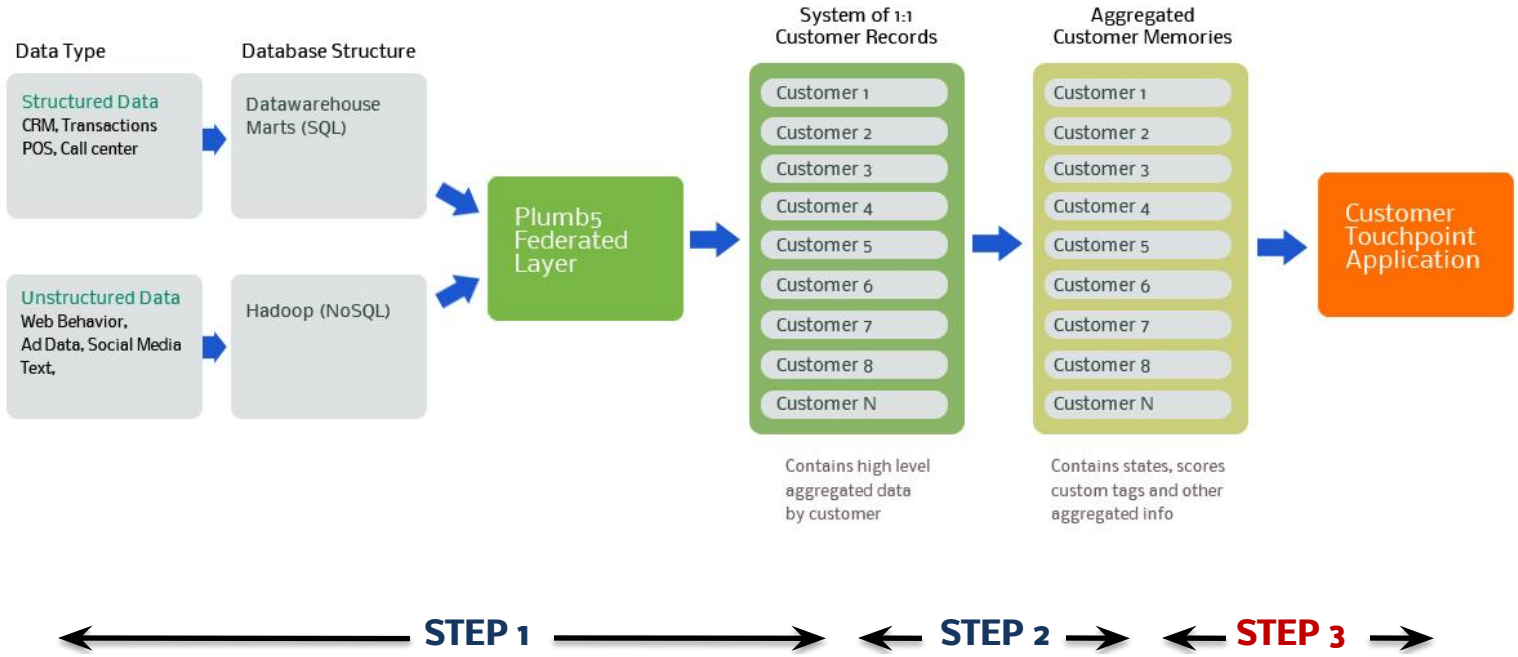
MANUAL SUPERVISION

The manual task in this process is to assign dynamic templates to state definitions so that engagement can be fired when the state of a particular user is true.

Step 3

Engagement Automation

The second step involves transforming the single customer files to memories, which can be consumed for contextual personalization by any customer touch-point. Though this step is more machine driven, it also allows the user to supervise scores, in order to make learning faster.



Step 3

Engagement Automation

This implementation step has 4 main aspects

1. OMNICHANNEL INTEGRATION

Plumb5 Engagement Layer comes pre-integrated with all available touch-points. Users can plug it to their chosen touch-point vendors like Email, SMS or Click2Call service providers

2. WORKFLOW EDITOR

An easy drag-and-drop workflow editor to edit or create workflows that trigger based on custom tags or states available in the system

3. DYNAMIC TEMPLATES

Users can easily embed tag labels to their communication templates so that content can be dynamically generated based on user parameters

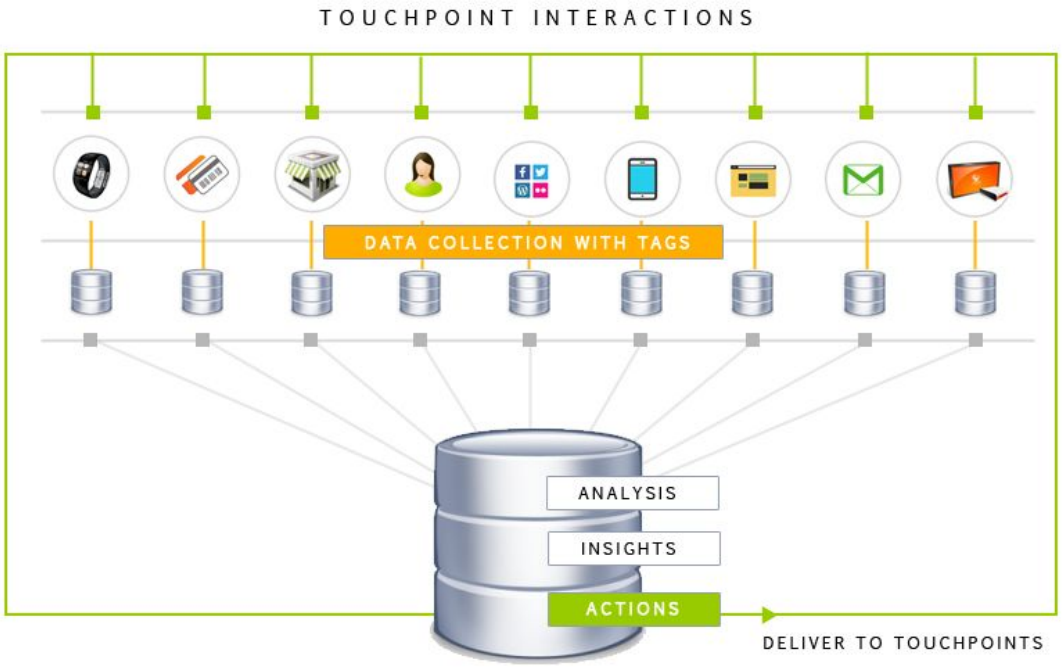
4. RESPONSE DATA INTEGRATION

After a communication is triggered, it is important to collect back data into the user stack to close loop responses and integrate it back to the learner.

Step 3

Omni-channel Integration

Plumb5 Engagement Layer is tightly integrated with customer touch-points to deliver messages. Based on past responses to communication, the machine prioritizes the most active channel for a particular customer, to ensure higher effectiveness.



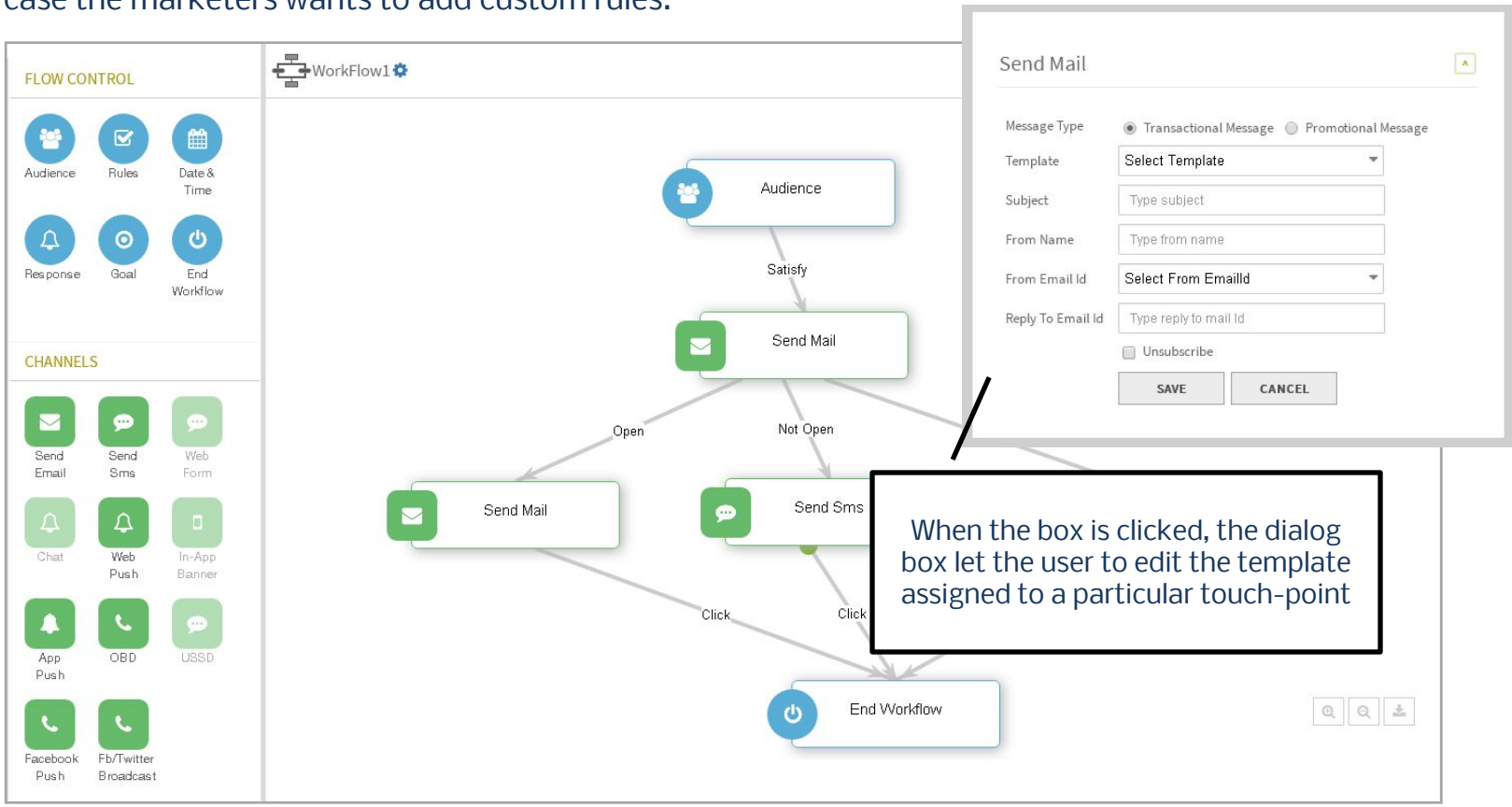
The Engagement Layer is integrated or has connectors to (1) Advertising Data (2) Website, Store and Mobile Channels (3) Social Sites (4) Email (5) SMS, USSD (6) Browser Notifications (7) OBD and Click2Call APIs (8) CRM / Lead Management System (9) Site Chat and Bots, (10) POS Systems, (11) Customer Service Robots

The Developer can choose to integrate any desired touch-points as per the company's marketing strategy

Step 3

Workflow Editor

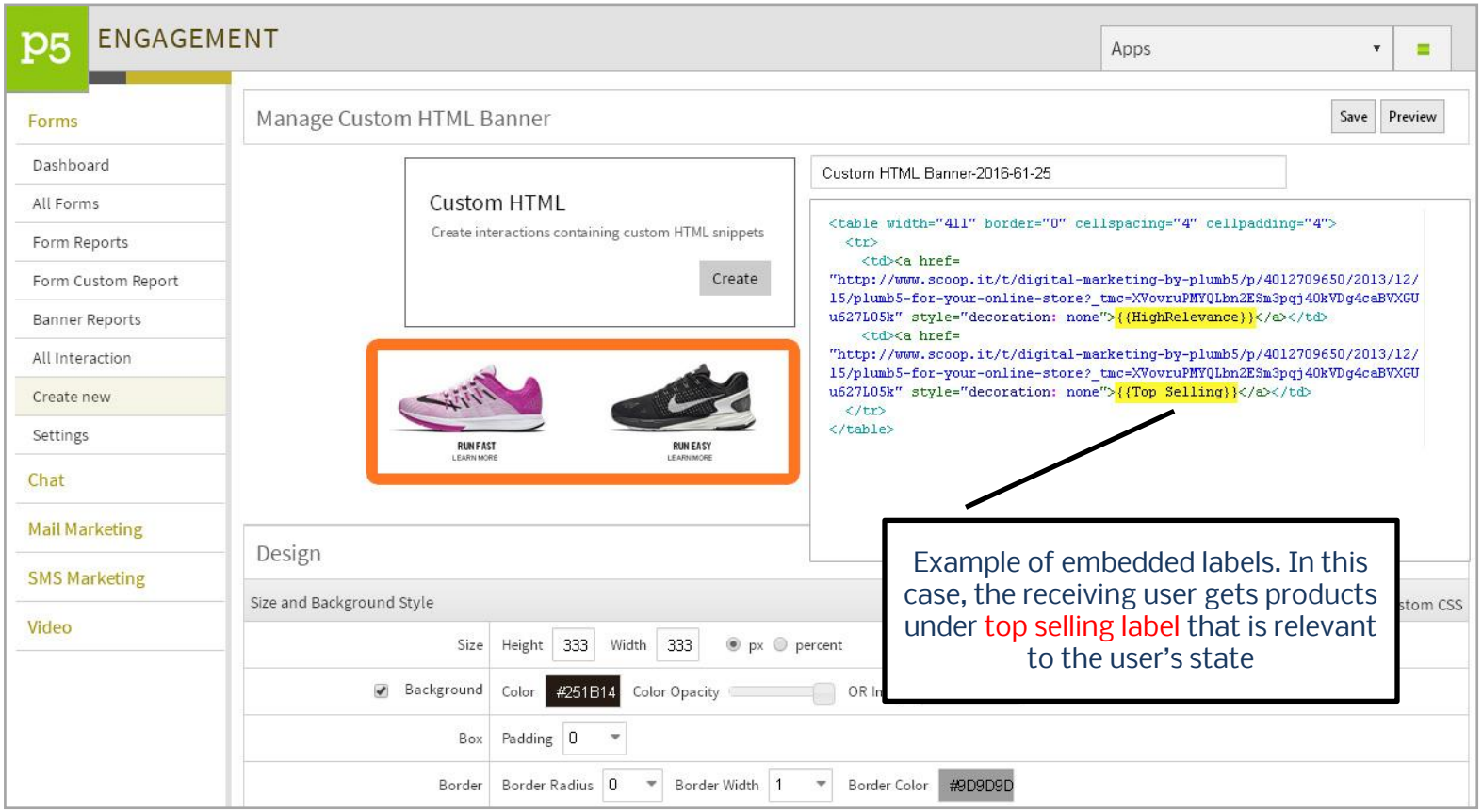
Once the data sources are connected, the machine is ready to fire personalized engagements based on internal decision states. You can tweak the workflows by using the drag-and-drop flow editor in case the marketers wants to add custom rules.



Step 3

Dynamic Templates

For dynamic personalization of messages, labels or tags can be directly embedded into the template so content can be loaded based on conditions or states



Step 3

Response Data

Collecting Responses of each interactions and updating it back to the ML workflow, allows in seamless continuous learning. This allows the machine to update the memory which might change the predictions based on the new responses.

Plumb5 uses the following techniques to collect and update memories on the fly

1. Web Engagement - The Web Trackers also track for Engagement events
2. Mobile Engagement - Mobile SDK tracks Engagements on the mobile
3. Email Engagement - Plumb5 tracks opens and clicks and collects delivery messages, bounces and other failure errors from the provider
4. SMS Engagement - Plumb5 tracks the clicks using ShortURLs and the delivery message from the provider
5. Browser Notification - Plumb5 tags collect browser notification responses
6. Social Notification - Plumb5 tracks responses through custom URLs
7. USSD Engagement - Plumb5 collects response data from the service provider
8. Beacon Data - Plumb5 collects data from beacons like Estimote

SUMMARIZING THE STEPS

- One-time Integration of all Customer Touch-points
- Template Tagging to State-based Customer Segments
- Embedding Labels into Dynamic Templates
- Response Data Integration for continuous learning

KEEPING IT SMART

Reducing intelligence workload on the engagement layer.

The engagement layer requires only minimal data parameters to perform as all the intelligence is computed in the ML stack. The key primary parameters that needs to be passed to the engagement layer are

(a) **Who** should the message be delivered to?

(b) **Which** message should be delivered?

(c) **When** should it be delivered?

Along with other state information for conditional check.

This ensures that all learning activities are performed in a single place, and help avoid redundancies

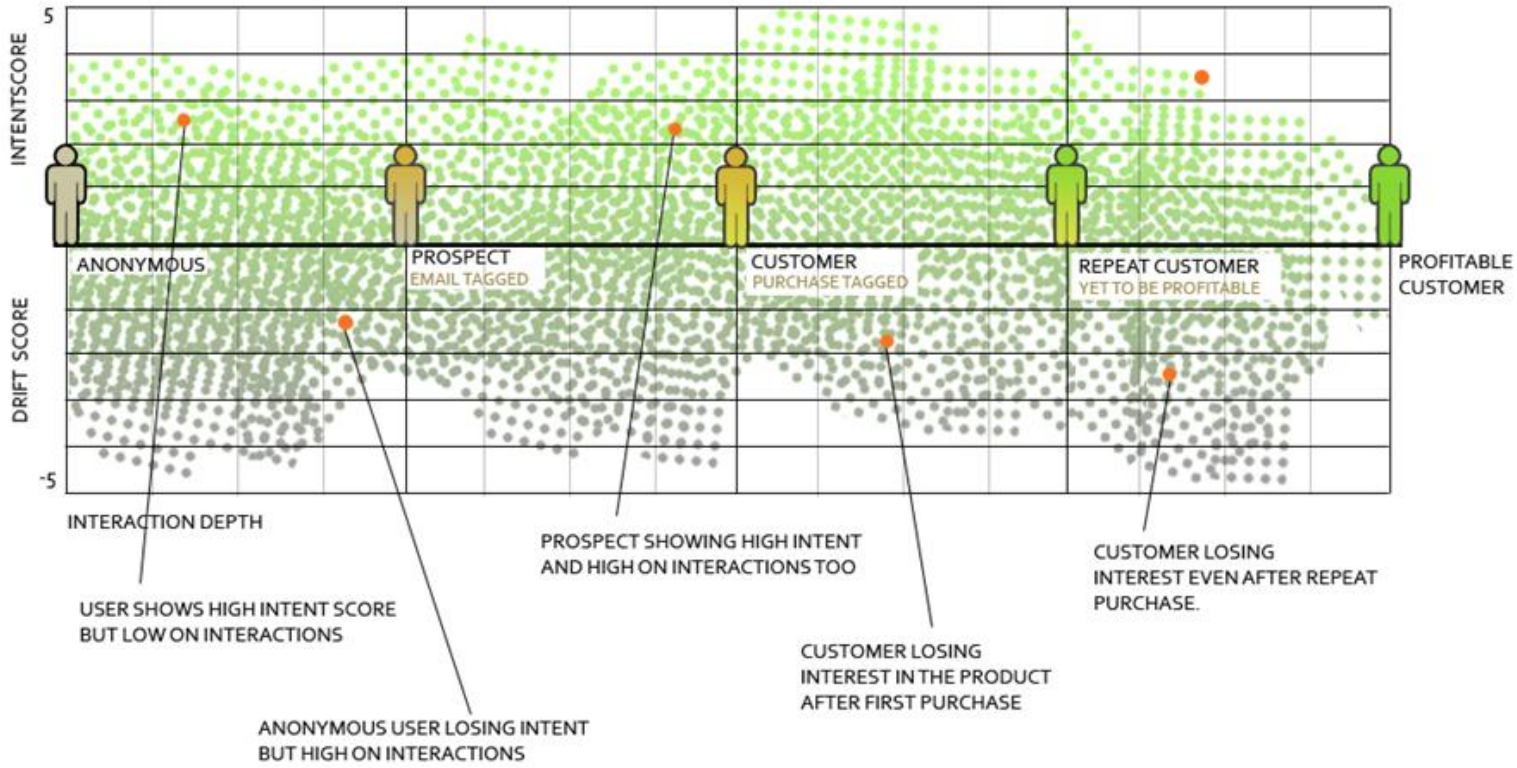
Step 4

Measuring AI Effectiveness

Step 4

Measuring AI effectiveness

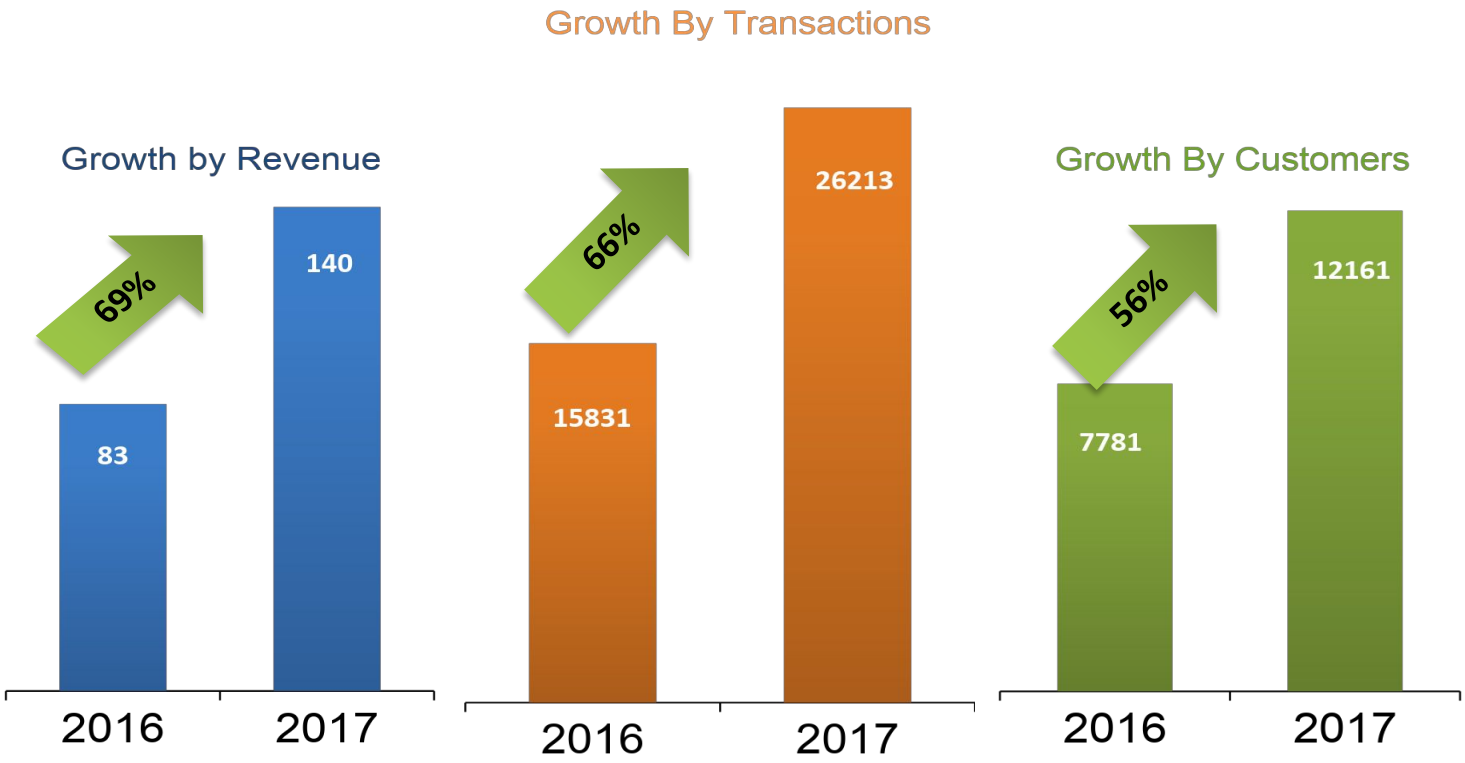
Users can plot the stages and states to understand the progress of the users towards the goal and monitor the progression of these users.



Actual Results

Global Retail Brand

World's largest retailer engaging customers both in online and offline channels.



Quarterly KPI Comparison: Q3 Jul – Sep'17- Q3 : Jul – Sep'16

Summary

Autonomous Customer Engagement

Implementing Autonomous Customer Engagement using Machine Learning can be easy with Plumb5 and can be achieved in three steps

1. Unify all customer data sources and create a system of individual customer records
2. Run these customer records through machine learning workflows to create customer memories
3. Integrate engagement layer and initiate relevant customer conversation or engagement

Once implemented, users can measure and monitor how machines are conducting themselves with customers and manage their learning programs to fine-tune machine learning for greater results.

Get in touch

Get started with a POC

If interested, email
pavank@plumb5.com or veer@plumb5.com

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