Architectural Katas- PHARMACY FOOD

Team – SNAPSHOTKatas

Agenda

- Mission
- Requirements
- Architectural Characteristics
- Use Case , Work flows and Assumptions
- Topology
- Design Decisions

Mission

- Farmacy Food is a tech-enabled healthy food startup that takes the “Let food be thy medicine” quote literally and creates tasty meals around peoples’ dietary needs and active lifestyles to support their overall well-being.

- Mission - To make health and wellness radically affordable and accessible

Requirements

- A "ghost kitchen" needs a system to allow users to have visibility of what items are available, purchase, and pick up items at any one of their points of sale.
- **Requirements**
  - Must integrate with 3rd party smart fridges to obtain inventory and purchase activity
  - Smart Fridges Produce item inventory levels and purchases. The smart fridges have a cloud based management system that handles communication with the Smart Fridge so obtaining this data would be through an API.
  - Must integrate with point of sale system at kiosks
  - The Kiosk is a sublet space inside another business where we will sell our product but have an employee handle the transactions through a point of sale . The same data should be accessible through the POS systems API's.
  - Mobile and Web accessible
  - Support providing feedback on items of verified purchases and in app surveys
  - Accept coupons and promotional pricing
  - Send inventory updates to central kitchen

Long term Goals

- Long term would like to allow multiple vendors to offer items through points of sale
- Wants to harvest data to provide personalized recommendations based on users health goals, purchase history, and item ratings

Global Assumptions

- Kiosk and POS will be used interchangeably
- Central system / Farmacy Food central system is used interchangeably
- All the Central Kitchen Employees and Customers PI/SPI attributes will be taken care as per GDPR Law
- Farmacy user will have LDAP based authentication and oAuth2.0 based authentication for customer.
- Smart Fridge will be a vending machine to provide contactless delivery
- Notification gateway will have integration for sending SMS and email notifications
- Customers credit/debit card will be used as authentication mechanism on smart fridge
- Credit/debit card which is used for registration same card should be used at the time of online booking and pickup
- POS/Kiosk location is always attended location and Smart Fridge will be unattended
- In-hand delivery of meal coupon / food item is out of scope
- POS / SMART Fridge will have API exposed for data integration with middleware

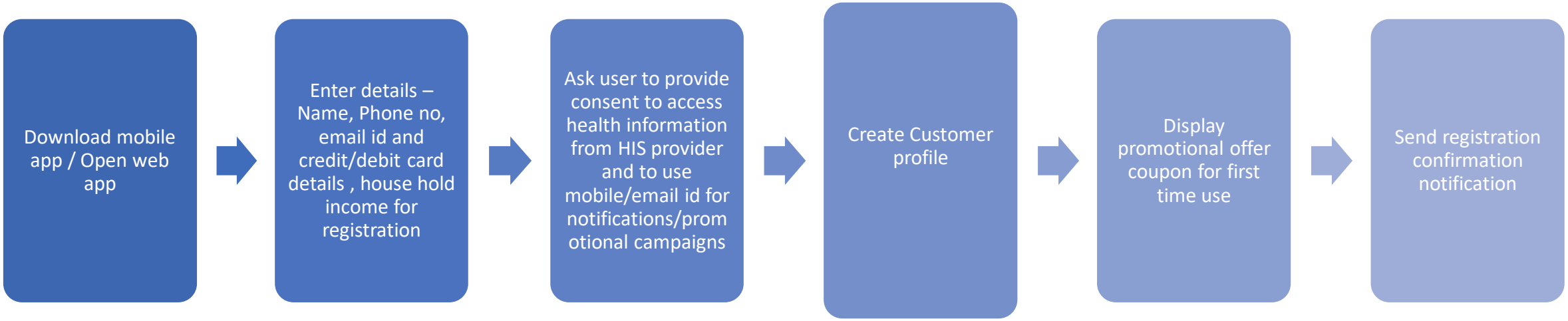
Architectural Characteristics

- Scalability
- Performance
- Security
- Availability
- Security
- Reliability

Use Cases / Workflow

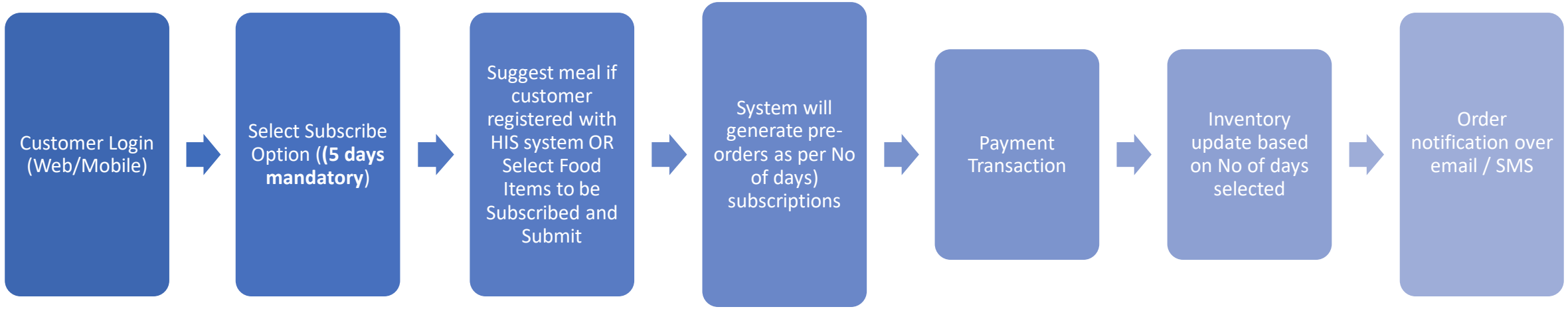
1. Customer - Registration
2. Customer - Subscribe
3. Customer - Order Food Item from Web/Mobile Application (online booking)
4. Customer - Buy Food Item at Kiosk
5. Customer - Buy Food Item at SMART Fridge
6. Customer - Pick up Food Item from Kiosk / SMART Fridge
7. Staff Kiosk/POS - Check Pre Order
8. Staff Kiosk/POS - Sale Transaction
9. Central Kitchen - SMART Fridge / Kiosk Registration
10. Central Kitchen - Refill food item in SMART Fridge / Kiosk
11. Central Kitchen - Notifications for Personalized Meal recommendations and offers to Customers
12. Central Kitchen - Analytics and insights
13. Central Kitchen - Backend integration for inventory update for Smart Fridge

Use Case 1– User Registration



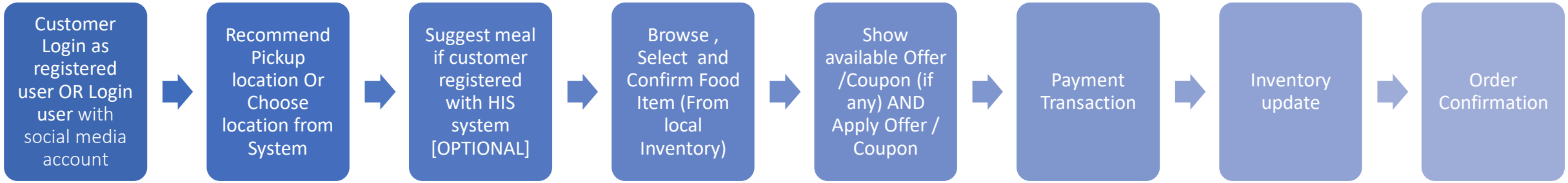
Assumptions
Customer consent is must for registration
Credit card used at registration time; the same card should be swiped when taking the items from Smartfridge / POS
Walk in customers can fetch items from Fridge/POS without registration
Discount / promotional coupons will be given only to registered customers
Household income to be considered for subscribed customers.

Use Case 2 - Subscribe Customer



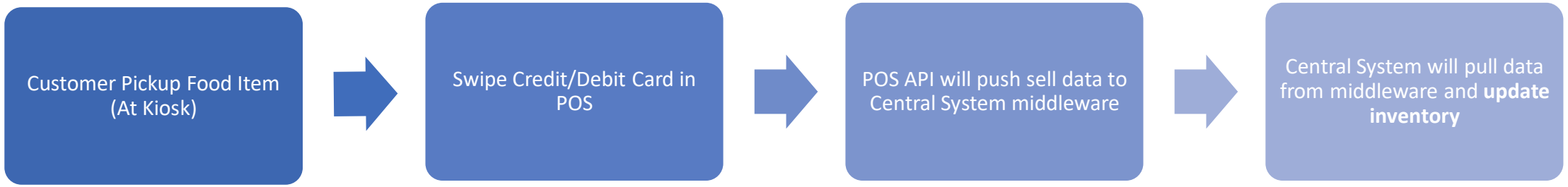
Assumptions
Customer can subscribed number of meals per day
Subscription can be configured for **minimum 5 days** and based on house hold income basis

Use Case 3 - Order Food Item from Web/Mobile Application (online booking)

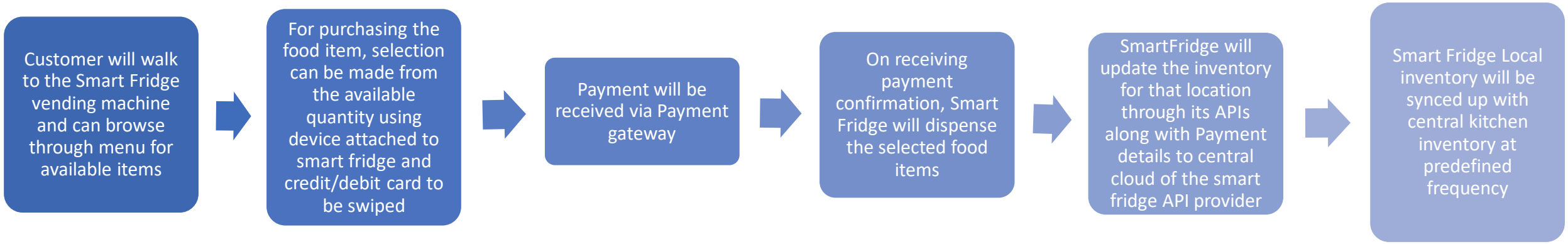


Assumptions
For nearest location recommendation – Third Party Location service to be used
For personalized food recommendation – Third party HIS service to be used which will have integration with multiple HIS system.
Inventory update will take care meal reservation.

Use Case 4- Buy Food Item at Kiosk

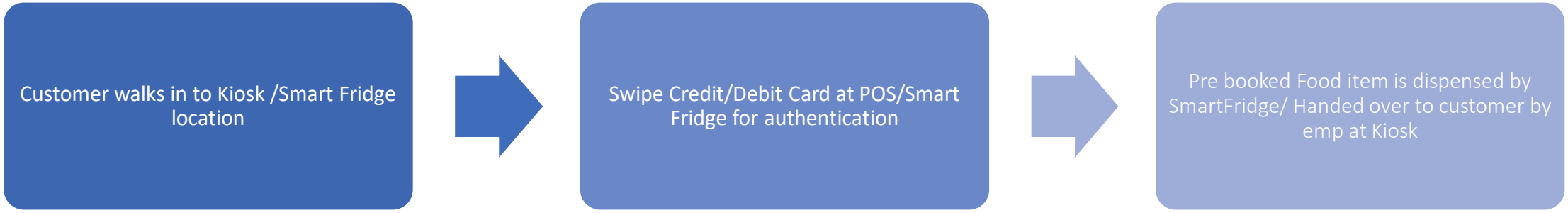


Use Case 5 – Buy Food Item at SMART Fridge

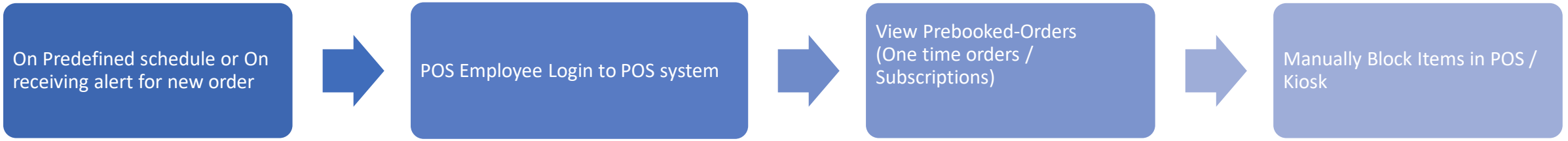


Assumptions
Payment gateway is integrated with Smart Fridge APIs to ensure payment is received before dispensing the food items which is out of scope
Inventory sync up to be done as per business requirement
Smart Fridge and Payment gateway are 3rd party APIs

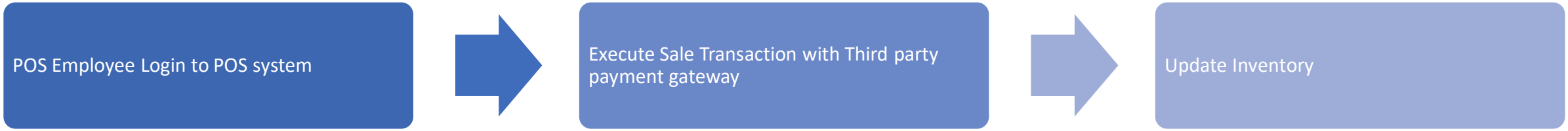
Use Case 6 – Pick up Pre Booked Food Item From Kiosk/SMART Fridge



Use Case 7 -POS Employee - Check Pre-Order

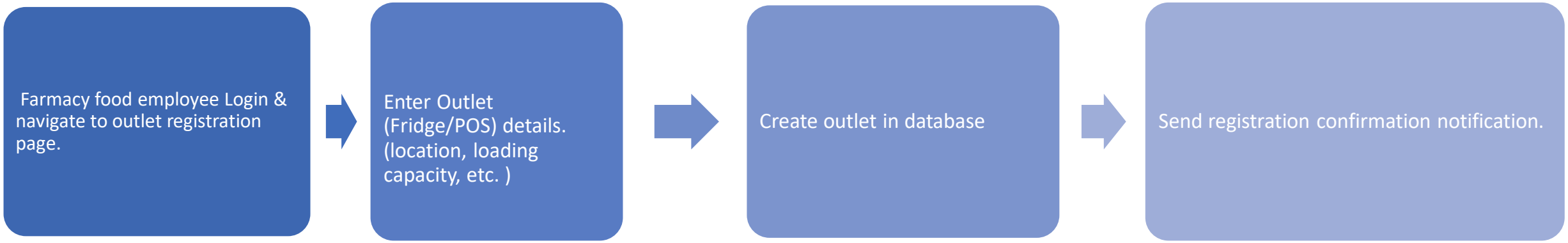


Use Case 8 -POS Employee – Sale transaction

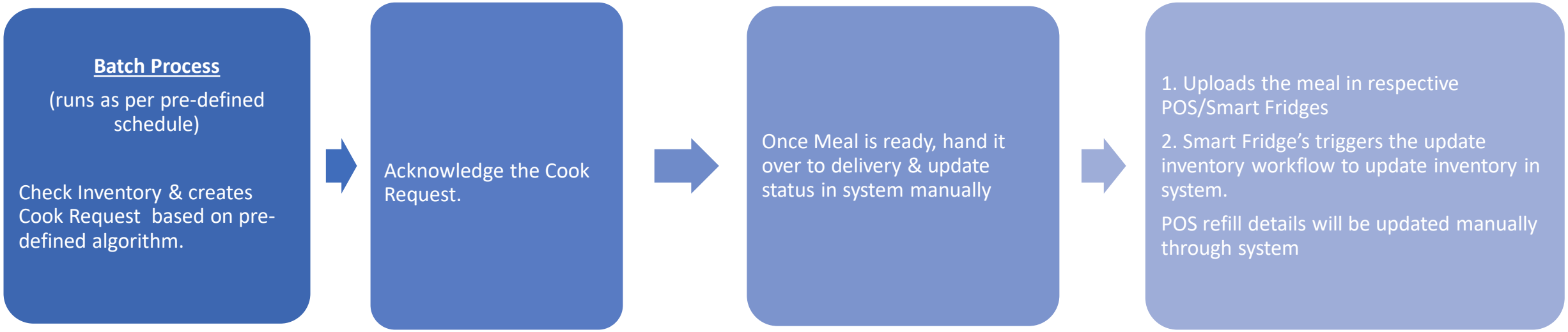


Assumptions
POS will always be manned
POS inventory refill will be carried out by the delivery agent of central kitchen
POS employee will check Pre-booked-Order on pre-defined schedule & on receiving notification of order.
POS system will update inventory automatically of central system upon sale via middleware
POS employee will manually update the inventory upon REFILL.

Use Case 9 – SMART Fridge / Kiosk Registration

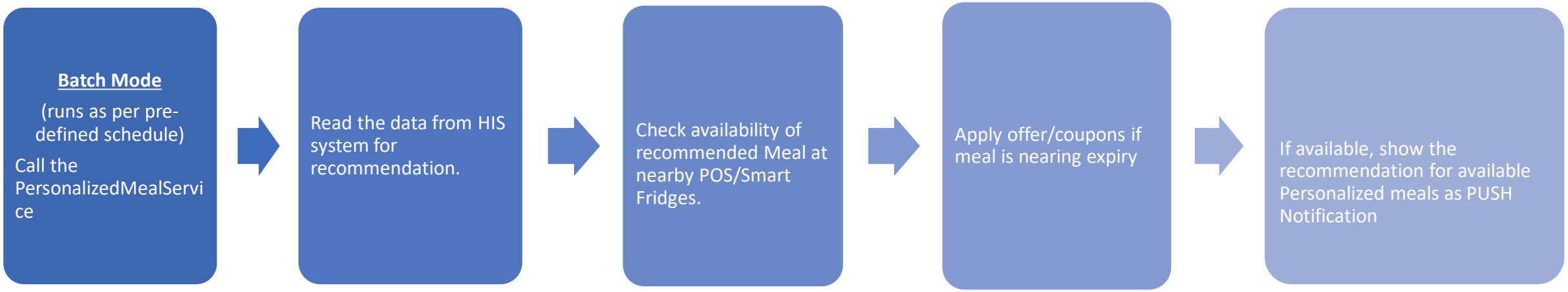


Use Case 10 - Refill food item in SMART Fridge / Kiosk



Assumptions
Every Kitchen will have a "Kitchen User Interface" to receive Cook Request Refill Alerts.
Cook Request will be generated based on pre-defined schedule and algorithm which will consider available inventory , subscription based pre orders and trends/insights generated from analytics.
We would have multiple Central Kitchen across geography. On basis of location, SmartFridges/POS will be mapped to closest Central Kitchen.
Delivery from Kitchen to POS or SmartFridge is out of scope. However, at POS / SmartFridge, update Inventory will be invoked.
Delivery Staff will be responsible to Upload the meal and remove stale meals from POS/Smart Fridges.

Use Case 11 : Notification for Personalized meals and offers to customer



Assumptions
PersonalizedMealService will run as per predefined schedule.
Once Customer gave the consent to use HIS data , Central system will fetch data at some interval and update in system.
Offers/Coupons can be applied on Meals which are nearing expiry to avoid wastage and increase sale.
Applying Offers/Coupons would be with manual intervention and can be done by marketing team.
PUSH Notifications will be sent to users VIA various mediums, like SMS, advertise windows on another apps, etc. (These integrations are out of scope)
Personalized Meals recommendation with offers will also be shown on customer login as app landing page.

Use Case 12 - Analytics & Insights for FarmacyFood staff

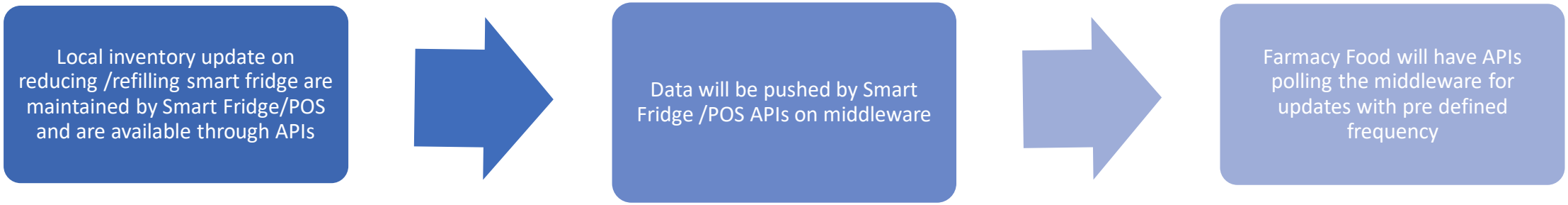
Staff

- **Reports** :
  - Meals ordered (Daily/Weekly/Monthly/Location Wise)
  - Subscription (Daily/Weekly/Monthly/Location Wise)
- **Alerts** :
  - Food items approaching expiry
  - Cook Request for Refill
- **Insights & Recommendation :**
  - Order Preferences (Day wise/Location Wise/User Wise)
  - Recommend promotional pricing based on inventory movement (demand / supply)

End User

- Recommendation :
  - Order Recommendations to the user

Use Case 13 – Backend integration for inventory update for Smart Fridge / POS



Assumptions
Middleware is owned by Farmacy Foods system
Same middleware will be used for all Smart Fridges and POS

Central System Component Details

Sr No	Use Case	Service	Description
1	Customer Registration	EnterCustomerDetails	UI to capture customer details
2	Customer Registration	TakeCustomerConsent	UI to capture customer consent to get details from HIS system and use mobile number and mail id for sending notifications
3	Customer Registration	CreateCustomerProfile	Create record in DB
4	Customer Registration	FetchPromotionalOffers	Fetch promotional offers from Farmacy Foods central system
5	Customer Registration , Subscribed Customer , Order food online - Online booking, Customer notifications for personalized meals	SendCustomerNotification	Integrates with **external notification gateway** to send SMS/Email to customer
6	Order food online - Online booking , subscribed customer	Login	Fetch customer details from DB and validate customer
7	Order food online - Online booking, subscribed customer	LoginUsingSocialAccount	Allows customer to login via social platform without registration but asking for credit card detail
8	Order food online - Online booking	LocationService	Integrates with **third party external location service** to fetch customer's location at time of booking a meal which will be used to suggest near by pickup points and availability of food items at near by pickup points

Central System Component Details – Cont…

Sr No	Use Case	Service	Description
9	Order food online - Online booking, Customer notifications for personalized meals, subscribed customer	SuggestMealPlan	Suggests meal plan to customers based on details available from **third party HIS system**
10	Order food online - Online booking, subscribed customer	ShowAvailableOffers	Available offers around selected food items will be displayed during selection
11	Order food online - Online booking, subscribed customer	CustomerPayment	Complete payment transaction using **third party payment gateway**
12	Order food online - Online booking, POSSale transaction, Buy food item at kiosk/POS, subscribed customer	InventoryUpdate	Booked quantity by customer should get reduced from the available quantity at selected location in central system as well as on the smart fridge APIs
13	Backend Integration For Inventory Updates	PollInventoryUpdate	Will poll the middleware for updates **asynchronously**
14	POS Employee Check PerOrder Meals	FetchPreOrderDetails	Fetches details of the orders booked on the logged in POS location
15	SMART Fridge / Kiosk Registration	LoginEmployee	Farmacy Food's employees login to central system will be managed with this service

Central System Component Details – Cont….

Sr No	Use Case	Service	Description
16	SMART Fridge / Kiosk Registration	EnterOutletDetails	UI to enter outlet details
17	SMART Fridge / Kiosk Registration	CreateOutlet	Update outlet details in DB
18	Refill food item in SMART Fridge / Kiosk	RefillAlertManager	Creates Cook Request for Kitchen and routed to the kitchen nearest to POS / SMART Fridge location.
19	Refill food item in SMART Fridge / Kiosk	CentralKitchenManager	Acknowledge the Cook Request. Update the Cook Request Status.
20	Personalized meals notifications	CheckInventoryService	Check availability of recommended Meal at nearby POS/Smart Fridges. This service will use HIS data to create personalized meals.

Send Customer notifications and Poll Inventory updates will be called in **asynchronous** manner , rest all service calls will be **synchronous**

External System Component details

Sr No	Third Party Service	Communication Type	Description
1	Notification Gateway	Asynchronous	To send notifications to customers and to Farmacy Food's central kitchen staff via SMS/Email
2	Payment Gateway	Synchronous	To process payment via mobile/web app, Smart fridge,POS
3	HIS service	Asynchronous	To fetch health information of the registered user for recommending personalized meals
4	Location service	Synchronous	To fetch customers current location

Every third party service will be invoked by service in central system which will take care of **Fault Tolerance**.

Architecture Style

Architectural Style	Quanta	Scalability	Availability	Performance	Simplicity	Modularity	Reliability	Testability
Layered Architecture	1	2	1	2	5	1	1	1
MicroService	1 to M	5	3	3	3	5	4	5
Service Based Architecture	1 or M	4	5	5	4	4	4	4

Score suggested based on requirements (Affordability and Accessibility), assumptions and various tradeoffs.

Recommended Architectural Style/Topology – Service Based

Design Decision – 1 (API Based real time integration of SMART Fridge / POS with Central System)

- **Title :** API Based real time integration with SMART Fridge / POS with Central System

- **Status** – Rejected

- **Context** – POS / SMART Fridge API will directly connect with the API exposed by Central System (Real Time) for inventory and payment updates and take subsequent decisions.

- **Decision** – Rejected direct communication approach due to high dependency on availability / scalability of central system. Possible data loss in the case central system unavailability which will have high negative impact on business.

- **Consequences** – This will have huge number of point to point connections between every SMART Fridge/POS to central system.

Design Decision – 2 (Near Real Time Inventory updates)

- **Title :** Near Real Time Inventory Updates from Kiosk/POS and SMART Fridge via Middleware (**Queue based Model**)

- **Status** – Proposed

- **Context** – POS / SMART Fridge API will publish inventory and payment details to Central System middleware (Real Time) and Central System will pull details upon receiving updates and take subsequent decisions.

- **Decision** – Selected queue based model to support high throughput transactions , assuring no data loss (High Availability) and can be affordable for implementations

- **Consequences** – Multiple queues needs to be implemented for each SMART Fridge / POS

Design Decision – 3 (Asynchronous Service Communication)

❖ **Title :** Asynchronous Service Communication For Sending Notifications and Inventory updates.

❖ **Status** – Proposed

❖ **Context**

1. Sending Notifications (SMS/Email) should not hold user transactions.
2. Inventory updates from SMART Fridge / POS to Central system middleware will be real time and from Middleware to Central System will be near real time.

❖ **Decision** –

1. For Non Tech Savvy user , Notification gateway with capabilities to send notifications using SMS/email to be chosen
2. Inventory updates from SMART Fridge to middleware will be synchronous (real time). But customer transaction should not wait for completing updates to central system.

❖ **Consequences** – Backend monitoring mechanism to ensure data integrity should be in place.

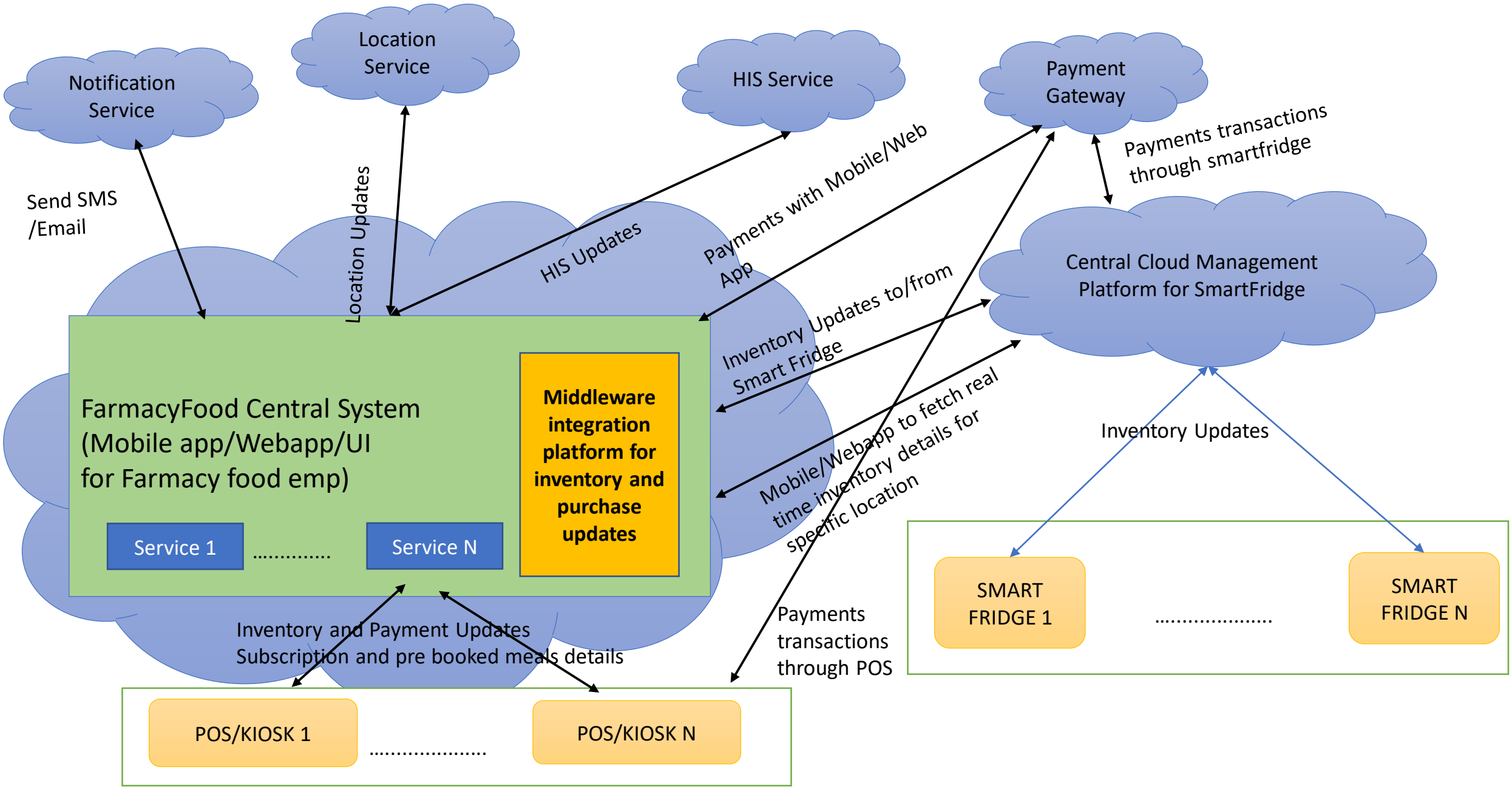
Design Decision – 4 (Use of Service Based Architecture)

- **Title :** Use of **Service Based Architecture**
- **Status** – Proposed
- **Context –** Requirement to have system which is affordable and accessible. The future plan of Farmacy foods to expand across multiple locations. The system should be able to integrate with third party systems for example payment gateway , SMART Fridge APIs , POS APIs etc..
- **Decision** – The decision is suggested to use **Service Based Architecture** based on requirements (Affordability and Accessibility), assumptions and various tradeoffs with other architecture styles. Recommending the solution to be **deployed on cloud platform to make the solution highly affordable and scalable**.

Architectural Style	Quanta	Scalability	Availability	Performance	Simplicity	Modularity	Reliability	Testability
Layered Architecture	1	2	1	2	5	1	1	1
MicroService	1 to M	5	3	3	3	5	4	5
Service Based Architecture	1 or M	4	5	5	4	4	4	4

- **Consequences** – Affordable solution which can be scaled as per business need.

Overall System Communication Architecture



Thank you!

Team – SNAPSHOTKatas

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