Intuit Craft Demo

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5. Craft Demo
    - Assumptions
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    - High Level Design
    - Handling Data at Scale
    - Developer Platform APIs
    - Team, Bandwidth, Efforts and Delivery plan
    - Engg and Opr Excellence Metrics
    - Pricing Strategy (Bonus)
    - Monetization Model (Bonus)
6. Questions?

Total Experience: 12+ years of experience in building highly available distributed systems for large scale.

Managerial Experience: Managing product, people and processes since last 6 years.

Skills: System Design, Java, Python, Golang, Angular, React, Postgres, MongoDB, Elastic Search, DynamoDB, Redis, CI/CD, kubernetes, SaaS, and AWS

Values:

- Problem Solving Mindset
- People Oriented
- Delegate & trust
- Customer obsession
- Lead by example
- Data driven decision making

Youtube Channel: https://www.youtube.com/@15minutesystemdesign

Team size: 36 people (18 SDE1/2/3, 8 WDE1/2, 6 QA, 2 Tech Lead, 2 EM)

Scale of Traffic: 80K Req per sec (Serving suitable Ads to a user based on Age/Gender/location)

Working Style: CRAFTSMANSHIP
C - Customer Issues (P0 Ad Hoc tasks) to be handled by dev-on-call
R - Review HLD, LLD, infra, code and logs every sprint
A - Automate stuff to save bandwidth and speedup releases
F - Frequent and smaller release cycles
T - Test plans, health check audits and Alerts
S - Set why, what, how, priority and success criteria
M - Monitor and improve upon system health KPIs
A - Allocate time for code reviews and documentation
N - Negotiate scope with product manager
S - Standup, sprint planning and sprint retrospectives
H - Hire top notch engineers
I - Incremental controlled rollout and feature flag
P - Performance Appraisal & Individual Career Roadmap

Engg Manager II @ Phonepe

- Building Ad platform for brands to get better reach and engagement

Director of Engg @ Oyo

- Building Self Serve Platform for Hotel Property Owners to manage inventory

Senior Engg Manager @ Coinswitch

- Building Crypto Buy/Sell Platform for College Students

Engg Manager @ Redbus

- Building One Stop Solution for Bus operators to Manage Bus Services

Tech Cofounder @ Awesummly

- Building Realtime News Summary Product on Subscription Model

Tech Lead @ Neuron

- Building User Segmentation and Re-targeting Product for SMEs

Software Engg @ TCS Research Labs

- Building NLP and Computer Vision based intellectual properties and prototypes

Achievements

- AWS Mobility Award of the Year 2017
- Winner of The Vault Show 2016 (Indian Version of Shark tank)
- Graduate Aptitude Test in Engineering 2010 (96 percentile)
- Sun Certified Java Programmer 2009
- Robotics Finalist, IIT Kharagpur, KSHITIJ 2008

Research Papers

Two Approaches for Mobile Phone Image Insignia Identification,Advances in Signal Processing and Intelligent Recognition Systems, Advances in Intelligent Systems and Computing

Robust Printed Devanagari Document Recognition using Hybrid Approach of Shirorekha Chopping, Fuzzy Directional Features and Support Vector Machine. International Journal of Computer Applications, New York, USA [link]

Shirorekha Chopping Integrated Tesseract OCR Engine for Enhanced Hindi Language Recognition. International Journal of Computer Applications, New York, USA

Google Scholar Link: https://scholar.google.com/citations?user=VSicDsIAAAAJ&hl=en

Initiatives

- Defined Component level Ownership
- Crafted framework for better effort estimation
- Ensured teammates share pre and post Sequence Diagram before development
- Discussed Product, Engg and Business related OKR in Quarterly planning
- Introduced feature flag, Kill switch and Canary deployment

Impacts

- Reduced 4xx/5xx errors by 60%
- Reduced Sprint Spillover by 50% for every sprint
- Brought number of Dev-QA cycles below 2 per sprint
- Brought number of sev1/sev2 calls under 3 per quarter
- Reduced Customer Support tickets by 60%

Learnings

- Monetization Model is more important than building a great tech product to survive in market
- Having a plan is better than having no plan when Ambiguities. Asking more questions help
- Building long term relationships with peers is highly underrated
- Micromanagement is toxic for organizations
- Being humble, patient and calm helps handling tough situations better

Assumptions (Product MyBooks Already exists):

1. Merchant Service, Customer Service, Product Service, Pricing Service, Search Service, Cart Service, Order Service, Invoicing Service, Notification Service, Payment Collection Service, Payment Settlement Service, Ledger Service, Reporting Service exist
2. Merchant can be onboarded via Merchant Service.
3. Customer can be onboarded on a Merchant shop via Customer Service.
4. Merchant can add/view/update/delete new products (or services) and their categories via Product Service
5. Merchant can setup products' one time purchase fee, cancellation fee, tax % etc. via Pricing Service
6. Customer can search Merchant listed products via Search Service, update quantities and add them into cart via Cart Service
7. Customer can place an order via Order Service and can track order status (created/approved/rejected/fulfilled/cancelled)
8. Once an order is placed, Order service triggers Notification service via msg queue so that merchant could be notified to approve
9. Once an order is approved by Merchant, Order Service notifies Invoicing Service via msg queue to generate appropriate invoice
10. Once Invoice is generated, Invoicing Service triggers notification service via msg queue so that customer could be notified to verify the invoice
11. Customer clicks "Accept and pay", which requests payment collection service to initiate the transaction
12. Payment Collection service generates a unique payment link (with help of gateway provided token) and returns it to Customer
13. Customer can choose preferred payment method to make the payment. Once payment is approved, Payment collection service updates payment status as "success" and notifies Ledger Service via msg queue to update the entry. Payment collection service also triggers Notification Service via msg queue so that Merchant could be notified to fulfill order
14. Payment Settlement service transfers total due amount minus commission on the next settlement cycle to Merchant. It also notifies Ledger service to reset due amount and triggers Notification Service so that Merchant gets notified about the settlement
15. Also, Merchant can query total payment collected, Amount settled, Amount due via Reporting Service for date range

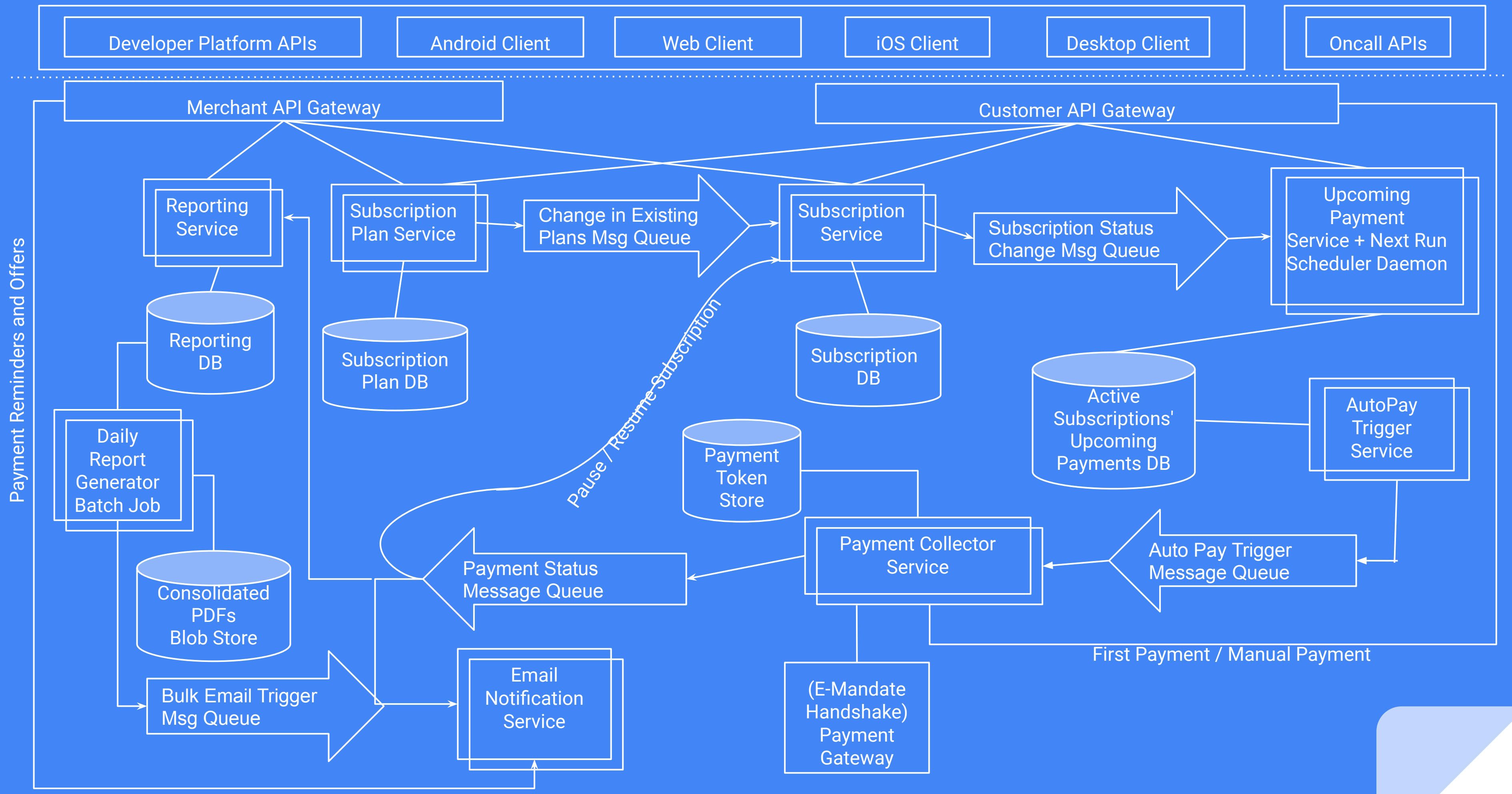
Goal: To design MyBooks Advanced (A cross platform recurring payment collection software as a service for merchants)

Functional Requirements:
1. Merchant should be able to set Recurring fee, Recurring schedule and expiry for subscription plans
2. Customer can see available subscriptions plans listed by Merchant and subscribe/pause/unsubscribe at any point of time
3. A Subscription will have status (New/Active/Cancelled/Paused).
4. Subscription Status changes from New to Active once customer makes first successful payment manually via CC
5. Every Payment will notify customer via Email keeping merchant in CC. Failure Notification will attach Manual Payment link
6. Merchant will receive daily report for status of customer payments (Success and Failed both) for the day next morning
7. System auto triggers to deduct recurring fee on next schedule for Active Subscriptions via e-mandate handshake with bank
8. Cancelling an Active Subscription would mean there would be no payment deduction from next cycle onwards
9. If recurring payment fails, the subscription would get paused.
10. Manual Payment and update in CC info would be required by Customer to resume the Subscription
11. Merchant should be able to view, generate and download On-Demand reports

Bonus Product Features:
1. Merchant should be able to create customized subscription payment link for Manual payment purpose
2. Merchant should be able to offer credit points as trial period
3. Customer should be able to see all upcoming payments
4. Merchant can see customers having Active/Cancelled subscriptions and choose to send reminders/offers

Non Functional Requirements: High Availability, Low Latency, Scalable, Fault tolerance

Out of Scope: Ledger, Order fulfillment, Merchant Payout Settlement, Cross border payments, Disputes, Reconcilation


Developer Platform APIs
Android Client
Web Client
iOS Client
Desktop Client
Oncall APIs
Merchant API Gateway
Customer API Gateway
Reporting Service
Subscription Plan Service
Change in Existing Plans Msg Queue
Subscription Service
Subscription Status Change Msg Queue
Upcoming Payment Service + Next Run Scheduler Daemon
Reporting DB
Subscription Plan DB
Subscription DB
Active Subscriptions' Upcoming Payments DB
AutoPay Trigger Service
Payment Reminders and Offers
Daily Report Generator Batch Job
Pause / Resume Subscription
Payment Token Store
Consolidated PDFs Blob Store
Payment Collector Service
Payment Status Message Queue
Auto Pay Trigger Message Queue
First Payment / Manual Payment
Bulk Email Trigger Msg Queue
Email Notification Service
(E-Mandate Handshake) Payment Gateway

Subscription Plan ID (Partition Key) (PK)
Merchant ID (Sort Key)
Promo Credits (default 0)
Product ID
Recurring Fee
Currency
Recurring Schedule <Cron format>
Plan Status <Active/Inactive>
Manual Payment Link
Subscription Plan Expiry Epoch

Subscription Plan Service

Subscription ID (Partition Key) (PK)
Subscription Plan ID
Customer ID (Sort Key)
Recurring Schedule <Cron format>
Quantity
Total Amount
Currency
Credits Balance (default 0)
Subscription Status <New/Active/Canceled/Paused>
Manual Payment Link
Subscription Plan Expiry Epoch

Subscription Service

Upcoming Trigger Epoch (Partition Key) (PK)
Active Subscription ID (Sort Key)
Customer ID
Amount Due Next Cycle
Currency
CC Info
Is Subscription Active (default False)
Is Triggered <True/False>
Manual Payment link
Is Plan Expired (default False)
Last Updated At

Upcoming Payment Scheduler Service

Subscription ID (Partition Key) (PK)
Payment Trigger Epoch (Sort Key)
Merchant ID
Customer ID
Subscription Plan ID
Subscription Status
Payment Status <Success/Failed>
Transaction ID
Manual Payment Link
Last Payment Collected At

Reporting Service

Data Replication Strategy: Single Leader Semi Synchronous (atleast 2 nodes being consistent)
Partitioning: Partitioning and Sort keys mentioned above
Tech stack: Java Springboot, Kafka, ELK, Prometheus, Grafana, AWS Cloud
Choice of DB:

- Reporting - Druid (Real time ingestion, Fast query performance)
- Consolidated PDF - S3 (Blob Store)
- Subscription Plan - Postgres (Relational data, Need joins)
- Subscription - Postgres (Relational data, Need of joins)
- Upcoming Payments Scheduler - DynamoDB (in-memory and persistence)
- Payment token and status - Redis (Single threaded, Fast lookup, Low volume of Data)

Subscription Plan Service

- GET /v1/plan/:id
- POST /v1/plan/
- POST /v1/plan/:id
- GET /v1/plan/:id/status
- POST /v1/plan/:id/status
- GET /v1/plan/merchant/:id

Subscription Service

- GET /v1/subscription/:id
- POST /v1/subscription/:id/quantity
- POST /v1/subscription/plan/:id/subscribe
- GET /v1/subscription/plan/:id/customers
- POST /v1/subscription/:id/unsubscribe
- GET /v1/subscription/:id/status
- GET /v1/subscription/customer/:id

Upcoming Payment Scheduler Service

- GET /v1/payschedule/customer/:id
- GET /v1/payschedule/subscription/:id

Reporting Service

- POST /v1/report/merchant/:id/generate
- GET /v1/report/subscription/:id/recent?offset=<O>&count=<C>

Email Service

- POST /v1/email/customer/:id/

200 - OK	Everything worked as expected.
400 - Bad Request	Missing a required parameter.
401 - Unauthorized	Invalid API key provided
402 - Request Failed	Expired API key, Please renew
403 - Forbidden	API key doesn't have permissions
404 - Not Found	The requested resource doesn't exist.
409 - Conflict	Multiple request with same idempotent key
429 - Too Many Requests	Too many requests hit the API too quickly
500, 502, 503, 504	Something went wrong on Server end

Third Party Developers Onboarding Service

- POST /v1/devplatform/auth/apikey
- GET /v1/devplatform/auth/sendotp?mobile=<phone_number>
- POST /v1/devplatform/auth/verifyotp
- POST /v1/devplatform/auth/user/:id/generate_api_key
- POST /v1/devplatform/auth//role/:id/user/:id/assign
- POST /v1/devplatform/auth//role/:id/user/:id/revoke
- POST /v1/devplatform/auth/role/

Role, Permissions and Data Visibility Controls

- Super Admin
- Merchant
- Customer
- Developer
- Oncall
- Tech Support
- Sales

Team

- 8 Backend Developers (Plan, Subscription, Upcoming Payments, Payment Trigger, Payment Collector, Reporting, Daily Mail, APIs)
- 2 Frontend Developers (Web SDK)
- 1 Android Developer (Android SDK)
- 1 iOS developer (iOS SDK)
- 2 Manual Testing QA (Backend side Edge cases and Frontend side User Experience)
- 1 Automation Testing QA (End to End Automation)

Bandwidth Estimation (Top Down)

- Total Bandwidth after Leaves/Holidays = 15 Man * 12 Week (OND) = 180 MW
- Bandwidth Available after Ad-hoc = 180 - (20% of 180) = 144 MW
- Bandwidth Available after On-Call = 144 - (20% of 180) = 108 MW (60 % of Total Bandwidth)

Efforts and Delivery Plan (Bottom Up)

- Discussion on User Story Prioritization and contribution in OKR		6MW	(OND Quarterly Planning)	2 Oct - 6 Oct
- User Story Grooming + PRD Sign-Off + TRD Signoff + QA Checklist		9MW	(Team level consensus)	9 Oct - 13 Oct
- Dev Completion Time + Unit Testing		54MW	(Individual Contribution)	16 Oct - 24 Nov
- Bug Fixing + QA Approvals		18MW	(Dev - QA cycles)	27 Nov - 8 Dec
- Code Reviews + Optimizations		9MW	(L1 and L2 code Reviews)	11 Dec - 15 Dec
- Backend Stage Release		9MW	(Team Level Feedback)	18 Dec - 22 Dec
- Dev Platform API SDK Stage Release + Monitoring		2MW	(Closed Group Feedback)	25 Dec - 27 Dec
- Production Release (Incremental Rollout)		1MW	(Thursday Live)	28 Dec
- Celebration!	**Total**	**108MW**	(Friday Team Party)	29 Dec

Engineering Excellence Metrics (seeking continuous improvement)

- Code Coverage and Code Quality
- # of post production bugs
- # of Dev-QA cycles
- Services Uptime (SLA)
- p75, p99 latencies of customer facing APIs
- Avg. bug resolution time

Operational Excellence Metrics

- Churn and Retention
- LTV CAC ratio
- Avg. # of transactions per month
- Avg. Ticket size
- Customer NPS

People Management

- Develop a positive culture (No Matter what happens always be positive)
- Encourage Innovation (Fostering new ideas is key to success)
- Offer flexible schedule (Better Work life balance increases productivity)
- Discuss Career Roadmap (Learning individual drivers helps Managers to plan clear path to make peers succeed)
- Foster recognition (Appreciating people more and mentioning opportunity areas less helps in building trust)
- Seek Collaboration and Set Team level Measurable goals (Being a Team player is better than being a solo ninja)

Processes

- On-Call Roster and Weekly Oncall-handover to discuss alerts, bugs, resolution and pending RCAs (if any)
- Weekly Intra-team level updates on Slack
- Monthly Stakeholder level updates on Email

MyBooks

Pricing - $0

Features

- Free Invoicing with custom templates
- Free Customer Onboarding
- Free One-click payment collections
- Free Report Generation
- 24X7 Email Support
- No limit on max number of customers to be onboarded
- No limit on max numbers of Products / Services to be offered

MyBooks Advanced

Pricing - $15

Features

- Unlimited Recurring Payments
- No limit on max number of Active Subscriptions
- Dedicated Call support
- Daily Report
- Custom Email Templates
- Custom Payment Link
- Payment Reminders, Promo offers and Trial period for your customers

Monthly Fixed Cost

Employees Salary	$ 170000
Office Rent	$ 50000
IT Assets	$ 40000
office Supplies	$ 10000
Maintenance	$ 10000
Taxes	$ 20000
Total	**$ 300000**

Monthly Variable Cost Per Merchant

Cost of goods sold	$ 0	We don't produce anything
Cloud Infra cost	$ 2	$ 10K monthly bill to handle 5K merchants and 500K customers over cloud
SaaS Tech Support	$ 1	$ 5K monthly bill to handle 5K merchants over Voice call and Video call
Marketing	$ 5	$ 25K monthly bill to onboard 5K merchants using Online Marketing
Payment Gateway Charges	$ 1	$5k (2% transaction fee) to move $ 250K ($500 Monthly to 10% Merchant)
Total	**$ 9**	

MyBooks Advanced Monthly Subscription charges	**$ 15**
Profit per Merchant per Month	$15 - $9 = **$6**

Revenue Projections

Operating Month	MyBooks Advanced Active Merchants	Total Variable Cost	Total Fixed Cost	Total Cost	Total Sales(Rev)	Gross Profit	Net Profit
Jan 2024	5000	$ 45000	$ 300000	$ 345000	$ 75000	$ 30000	(-) $ 270000
Feb 2024	10000	$ 90000	$ 300000	$ 390000	$ 150000	$ 60000	(-) $ 240000
Mar 2024	50000	$ 450000	$ 300000	$ 750000	$ 750000	$ 300000	$ 0
Apr 2024	100000	$ 900000	$ 300000	$ 1200000	$ 1500000	$ 600000	$ 300000
May 2024	150000	$ 1350000	$ 300000	$ 1650000	$ 2250000	$ 900000	$ 600000