NSE Integration Architecture
(NSE Parivartan - Reimagined Journey)

Microservices Based Approach

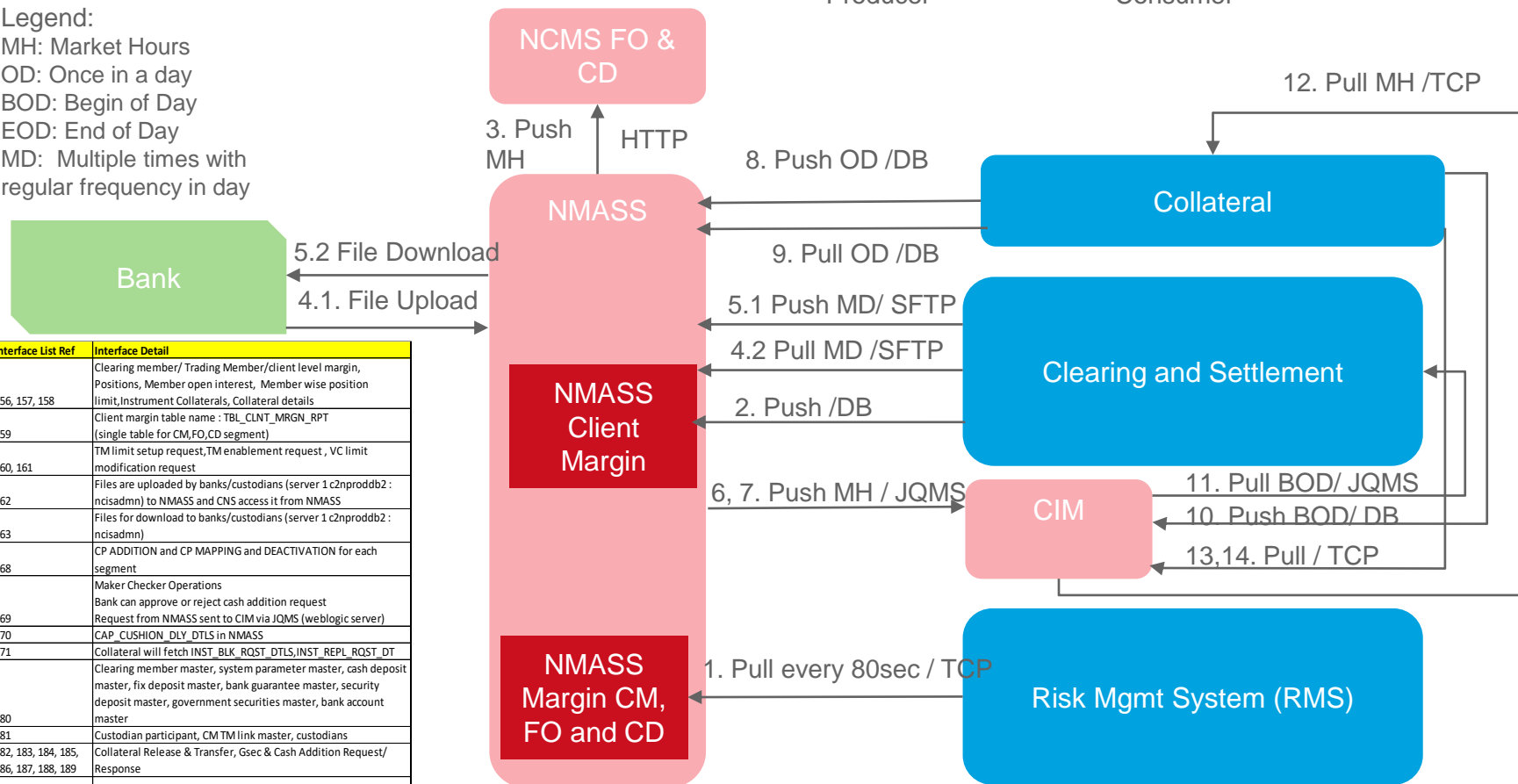**13 July 2020**

As-Is Integration

Collateral current interface:
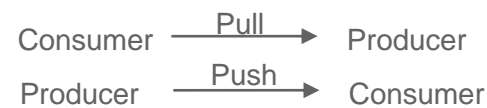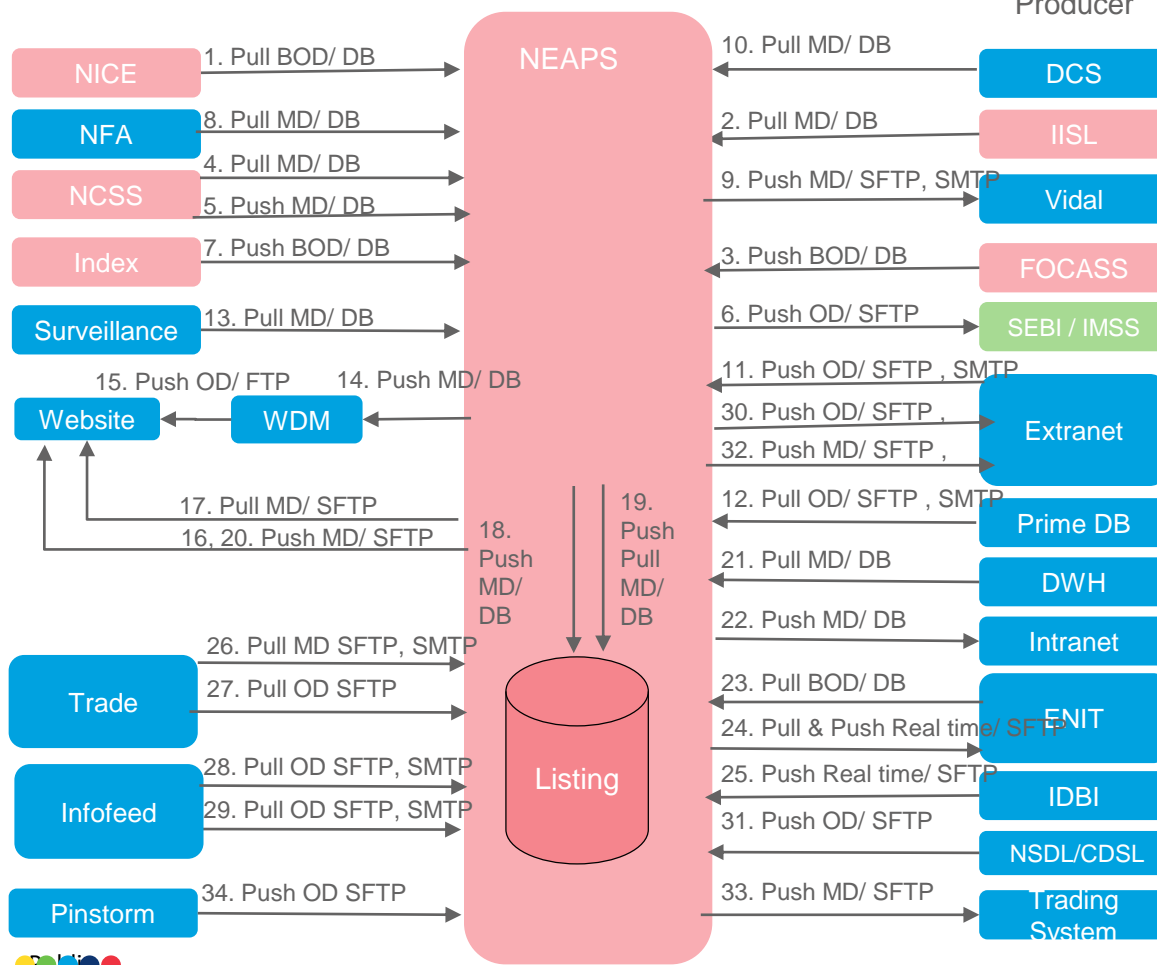
Consumer → Pull → Producer

Producer → Push → Consumer

Legend:
MH: Market Hours
OD: Once in a day
BOD: Begin of Day
EOD: End of Day
MD: Multiple times with regular frequency in day

NCMS FO & CD

3. Push MH   HTTP

NMASS

5.2 File Download

4.1. File Upload

Bank

12. Pull MH /TCP

8. Push OD /DB

Collateral

9. Pull OD /DB

5.1 Push MD/ SFTP

4.2 Pull MD /SFTP

2. Push /DB

Clearing and Settlement

NMASS Client Margin

6, 7. Push MH / JQMS

11. Pull BOD/ JQMS

CIM

10. Push BOD/ DB

13,14. Pull / TCP

1. Pull every 80sec / TCP

NMASS Margin CM, FO and CD

Risk Mgmt System (RMS)

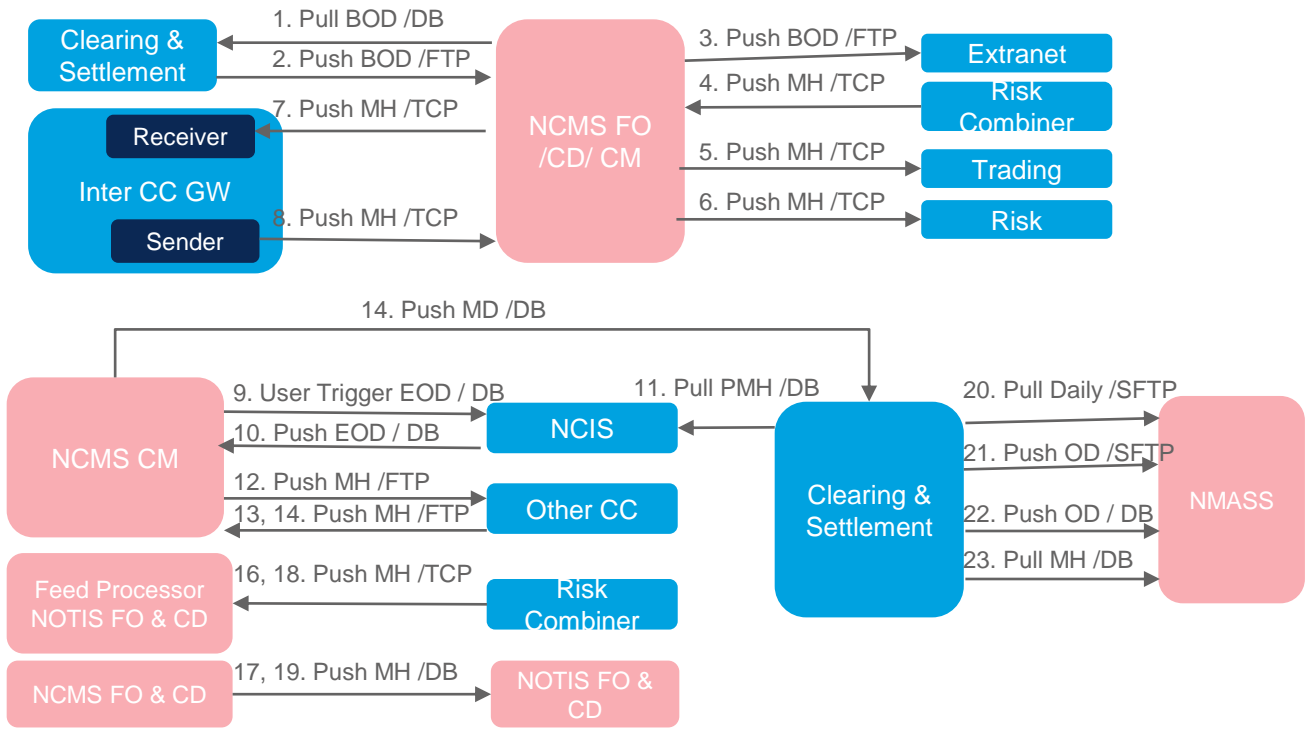| No.	Interface List Ref	Interface Detail
1	156, 157, 158	Clearing member/ Trading Member/client level margin, Positions, Member open interest, Member wise position limit,Instrument Collaterals, Collateral details
2	159	Client margin table name : TBL_CLNT_MRGN_RPT (single table for CM,FO,CD segment)
3	160, 161	TM limit setup request,TM enablement request , VC limit modification request
4	162	Files are uploaded by banks/custodians (server 1 c2nproddb2 : ncisadmn) to NMASS and CNS access it from NMASS
5	163	Files for download to banks/custodians (server 1 c2nproddb2 : ncisadmn)
6	168	CP ADDITION and CP MAPPING and DEACTIVATION for each segment
7	169	Maker Checker Operations Bank can approve or reject cash addition request Request from NMASS sent to CIM via JQMS (weblogic server)
8	170	CAP_CUSHION_DLY_DTLS in NMASS
9	171	Collateral will fetch INST_BLK_RQST_DTLS,INST_REPL_RQST_DT
10	180	Clearing member master, system parameter master, cash deposit master, fix deposit master, bank guarantee master, security deposit master, government securities master, bank account master
11	181	Custodian participant, CM TM link master, custodians
12	182, 183, 184, 185, 186, 187, 188, 189	Collateral Release & Transfer, Gsec & Cash Addition Request/ Response
13	150	MBR_RLS_RQST, MRGCASHDEPOSIT_MAKER to Collateral Sender
		MBR_RLS_RQST, MRGCASHDEPOSIT_MAKER to Collateral Feed Process

Listing current interface:

Consumer → Pull → Producer

Producer → Push → Consumer

NEAPS

Listing

- NICE — 1. Pull BOD/ DB
- NFA — 8. Pull MD/ DB
- NCSS — 4. Pull MD/ DB
- NCSS — 5. Push MD/ DB
- Index — 7. Push BOD/ DB
- Surveillance — 13. Pull MD/ DB
- 15. Push OD/ FTP
- 14. Push MD/ DB
- Website
- WDM
- 17. Pull MD/ SFTP
- 16, 20. Push MD/ SFTP
- Trade — 26. Pull MD SFTP, SMTP
- Trade — 27. Pull OD SFTP
- Infofeed — 28. Pull OD SFTP, SMTP
- Infofeed — 29. Pull OD SFTP, SMTP
- Pinstorm — 34. Push OD SFTP

- 10. Pull MD/ DB — DCS
- 2. Pull MD/ DB — IISL
- 9. Push MD/ SFTP, SMTP — Vidal
- 3. Push BOD/ DB — FOCASS
- 6. Push OD/ SFTP — SEBI / IMSS
- 11. Push OD/ SFTP , SMTP — Extranet
- 30. Push OD/ SFTP , — Extranet
- 32. Push MD/ SFTP , — Extranet
- 12. Pull OD/ SFTP , SMTP — Prime DB
- 21. Pull MD/ DB — DWH
- 22. Push MD/ DB — Intranet
- 23. Pull BOD/ DB — ENIT
- 24. Pull & Push Real time/ SFTP — ENIT
- 25. Push Real time/ SFTP — IDBI
- 31. Push OD/ SFTP — NSDL/CDSL
- 33. Push MD/ SFTP — Trading System

18. Push MD/ DB
19. Push Pull MD/ DB

No.	Interface List Ref	Interface Detail
1	32	1) Securities master, 2)- Symbol Master, 3) Series master, 4)Announcement of companies, 5) Corporate Action 6) Results 7) SHP 8) Takeover
2	33	1) Securities master, 2)- Symbol Master, 3) Series master, 4)Announcement of companies, 5) SME to EQ Migration data
3	34	Asset Master Data
4	35	Corporate Action Data
5	36	Bhav Copy, Expiry date in Corporate Action Data
6	37	1) Securities master 2) Announcements 3) Corporate Action 4) Results submission data, 5) Subscription 6) Promoter Directors 7) Board Meeting 8) SEBI Bulletin
7	38	Index Composition Data
8	39	Listing Fees Data
9	40	Announcements
10	41	Securities, Corporate Action
11	42	Disseminated Attachments
12	43	Security Master, Address Master,Announcement, Corporate Action, Results, SHP, Takeover, Pledge, Limited Review
13	44	Security Master, Symbol Master, Address Master, Announcement,Corporate Action, Results, SHP, Takeover data pulled by servialance
14	45	Security Master, Symbol , Address Master,Announcement, Corporate Action
15	46	CIBRICS, WDM Daily
16	47	Security Master,Address Master, Announcements, Corporate Action
17	48	Acknowledgement
18	49	Security Master- Address Master
19	50	Address Master, Announcement, Results, SHP, Corporate Governance
20	51	Pledge, Announcement, Takeover, SHP , Results
21	52	Security Master, Address Master, Announcement, Corporate Action, Results, SHP, Takeover
22	53	Security Data
23	54	Security Master
24	55	NEAPS sends PDF files to ENIT for Digital Signature and get signed files and response from ENIT
25	56	E-Payment Response, RTGS/Cheque Payment
26	57	Announcement, Corporate Action, Quick Results, SHP,Takeover, Security Master
27	58	Files sent to trade
28	59	Security Master
29	60	Announcement, Results, SHP, Takeover
30	61	New Listing for Interops
31	62	Promoter, Non-Promoter
32	63	Dessiminated Attachments
33	64	IPO/MF addition, ISIN change, Symbol change, Security enablement and others
34	65	Announcement Data

Clearing & Settlement current interface:

Clearing & Settlement

1. Pull BOD /DB
2. Push BOD /FTP
7. Push MH /TCP

Receiver
Inter CC GW
Sender
8. Push MH /TCP

NCMS FO /CD/ CM

3. Push BOD /FTP
4. Push MH /TCP
5. Push MH /TCP
6. Push MH /TCP

Extranet
Risk Combiner
Trading
Risk

14. Push MD /DB

9. User Trigger EOD / DB
10. Push EOD / DB

NCMS CM

NCIS

11. Pull PMH /DB

20. Pull Daily /SFTP
21. Push OD /SFTP
22. Push OD / DB
23. Pull MH /DB

Clearing & Settlement

NMASS

12. Push MH /FTP
13, 14. Push MH /FTP

Other CC

16, 18. Push MH /TCP

Feed Processor NOTIS FO & CD

Risk Combiner

17, 19. Push MH /DB

NCMS FO & CD

NOTIS FO & CD

No.	Interface List Ref	Interface Detail
1	119, 127, 135	Member master, Contract Master
2	120, 128, 136	Linkage Master
3	121, 129, 137	Entire Master Records which include a) Security Master, b) Participant Master
4	122, 130, 138	Around 15 entities including Original Trades, Auto approved trades, Broker master, Market status, Contract master, Participant master, Dealer master, Checksum master, Client modification, Trade cancellation approval, Trade cancellation rejection, Exercise request packet, Collateral request object, Voluntary Closeout Eligibility request object, Broker SSD request object
5	123, 131,139	CP trade confirmation CP trade rejection
6	124, 132, 140	CP trade confirmation CP trade rejection CP modification TM limit setting request TM enablement request VC limit setting
7	125, 133, 141	CP assignment CP removal CP trade confirmation CP trade rejection
8	126, 134, 142	CP assignment CP removal CP trade confirmation CP trade rejection
9	143	OTR data, CP trades Async request by user
10	144	OTR confirmation, OTR rejection
11	145	Allocation/Conf/Rejection of OTR, Conf/Rejection of CP trades
12	146	CP trades, Base OTR
13	147	CP trades, Base OTR
14	148	OTR allocation, OTR confirmation
15	149	OTR allocation, OTR confirmation
16	152	Original Trades, Auto-Approved trades, Checksum Master, Client Modification
17	153	CP Modification, Approved Trades, Rejected Trades, Contract Table, Party Table, Party Link Table
18	154	Original Trades, Auto-Approved trades, Checksum Master, Client Modification
19	155	CP Modification, Approved Trades, Rejected Trades, Contract Table, Party Table, Party Link Table
20	164	FPI/Cross margin/Client margin Files are uploaded by member
21	165	Return Files avalible for download to members
22	166	CTM_POSITIONS_VW in NMASS Table is pouplated in NMASS but getting utilized by CNS
23	167	clearing will fetch data from CTM_CONTRACTS_RQST table

Existing Journey wise system mapping:

Clearing

Clearing
- NCMS FO
- NCMS CD
- NCMS CM
- NOTIS FO& CD
- NMASS
- CIM
- NCIS
- FOCASS
- Trading
- Inter CC
- Feed Process
- Extranet
- Risk Combiner
- Clearing & Settlement

Collateral
- CIM
- NMASS
- NCMS FO
- NCMS CD
- Collateral
- Risk
- Clearing & Settlement

Member Compliance
- ENIT
- DWH

Settlement

Trading

Listing
- NICE
- NEAPS
- Listing
- ENIT
- IISL
- FOCASS
- NCSS
- Index
- Vidal
- DCS
- WDM
- Website
- Intranet
- Infofeed
- Pinstorm
- Extranet
- Trading System
- NFA
- Prime DB
- Surveillance
- DWH
- SEBI
- IDBI
- NSDL, CDSL

Member Services
- ENIT
- NEAPS
- Membership
- Old NICE
- Member Portal
- Website
- SIFY
- SMTP
- SMS
- DWH
- Trade
- Surveillance
- PSM C&S
- NCFM
- Inspection
- NFA
- SEBI

Microservices in Parivartan
Retained in Parivartan
Replaced with new system
Core System
External Systems

Domain wise Microservice

Domain: NSE Engagement System

Core Sub Domain:
i.   Clearing & Settlement
ii. Listing
iii. Exchange Compliance
iv. Clearing Compliance
v.   Inspection & Audit
vi. Risk Management

Supporting Sub Domain:
i.   Member Management /Maintenance
ii. Bank /SEBI /3rd Party Integration Management
iii. SEBI /Govt Agency Integration
iv. Member Helpdesk
v.   MIS / Reports/ Dashboard

Generic Sub Domain:
i.   Identity and Access Management
ii. Security and Legal Compliance Management
iii. Customer Support
iv. (email/SMS/ chatbot/phone)

Needs to
be finalized

Parivartan Integration Approach

Parivartan Integration Approach:

Major type of current integrations:
1. Journey specific NSE systems to External systems – like SEBI, IDBI, NSDL / CDSL
2. Within journey mapped system info exchange – like NICE to NEAPS, CIM to NMASS
3. Journey system integration to Core Systems (like Collateral, Clearing & Settlement) majorly through DB, SFTP, TCP
4. Journey system integration to existing non-journey specific systems like website, WDM, infofeed, FOCASS and others

Integration Approach:
1. Microservice to Microservice integration is through direct API call and/or event mechanism like CQRS pattern.
2. Internal communication among journey mapped system should be replaced with internal direct microservice api call.
3. Spring JPA will be used for microservice to internal DB.
4. DB Interface connectivity with NSE Systems apart from microservice will have two options:
    a. DB interface from Parivartan Microservice
    b. Apache camel with JDBC adapter
5. TCP Integration has two approaches:
    a. TCP socket → TCP adapter → Kafka → end microservice
6. SFTP integration approach:
    a. File transfer through apache camel.
7. 3rd party integration like payment, RPA, PAN validation through single microservice and REST API call to external world
8. Journey system integration to existing non-journey specific systems like website, WDM, infofeed, FOCASS and others
9. Integration with internal support system – BPM, Rule engine through apache camel/ API call only.
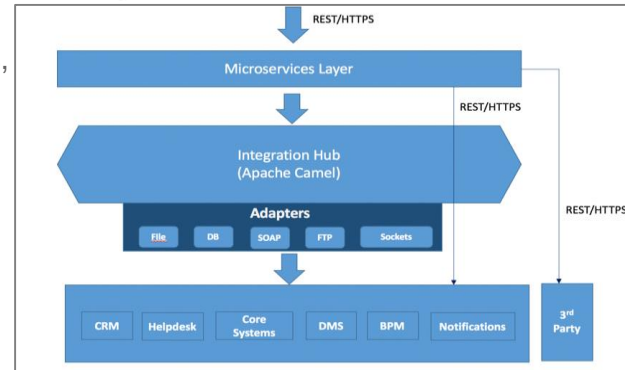
Parivartan Integration Architecture Phase-I:

Use of Kafka illustration for:
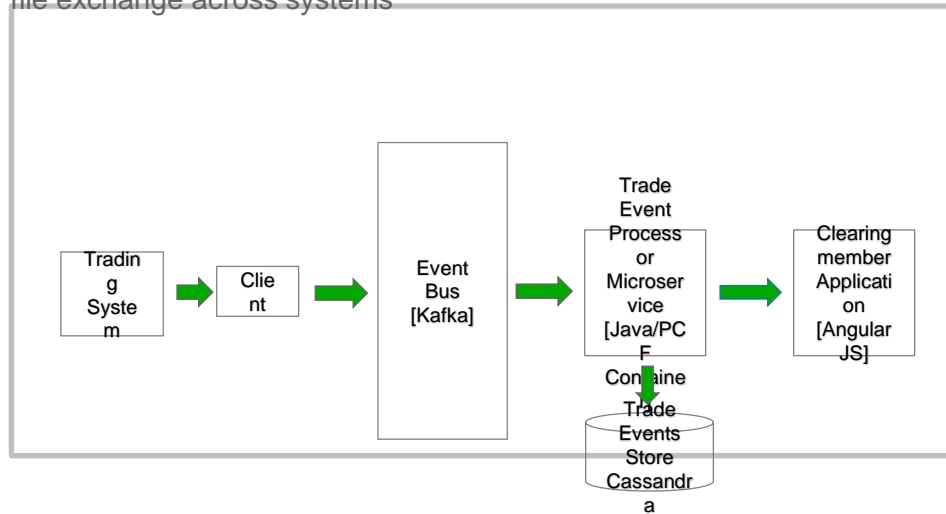
a. real time transmission of trade events,
b. file exchange across systems

Use of Microservice pattern:

a. Reactive architecture for event based responsive integration between core services and other backend support systems like BPM, DMS, CRM and others
b. circuit breaker pattern isolates points of access between the services, stopping cascading failures across them, and providing fallback options, all of which improve the system's overall resiliency.
c. API management for the necessary abstraction between channel apps, partner apps, devices and backend systems.

Use of Kafka illustration for:

a. real time transmission of trade events,
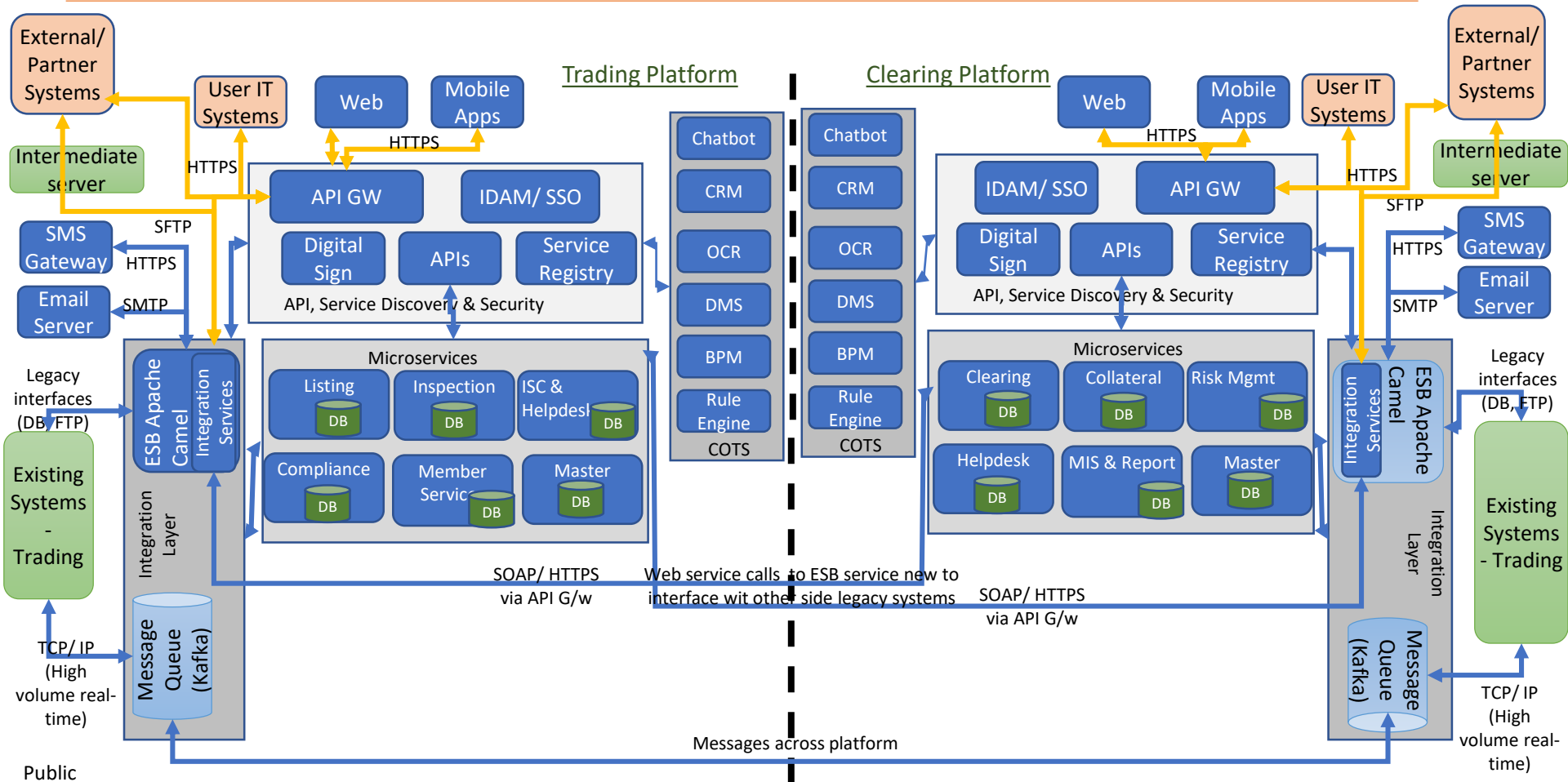b. file exchange across systems

External System Integration:
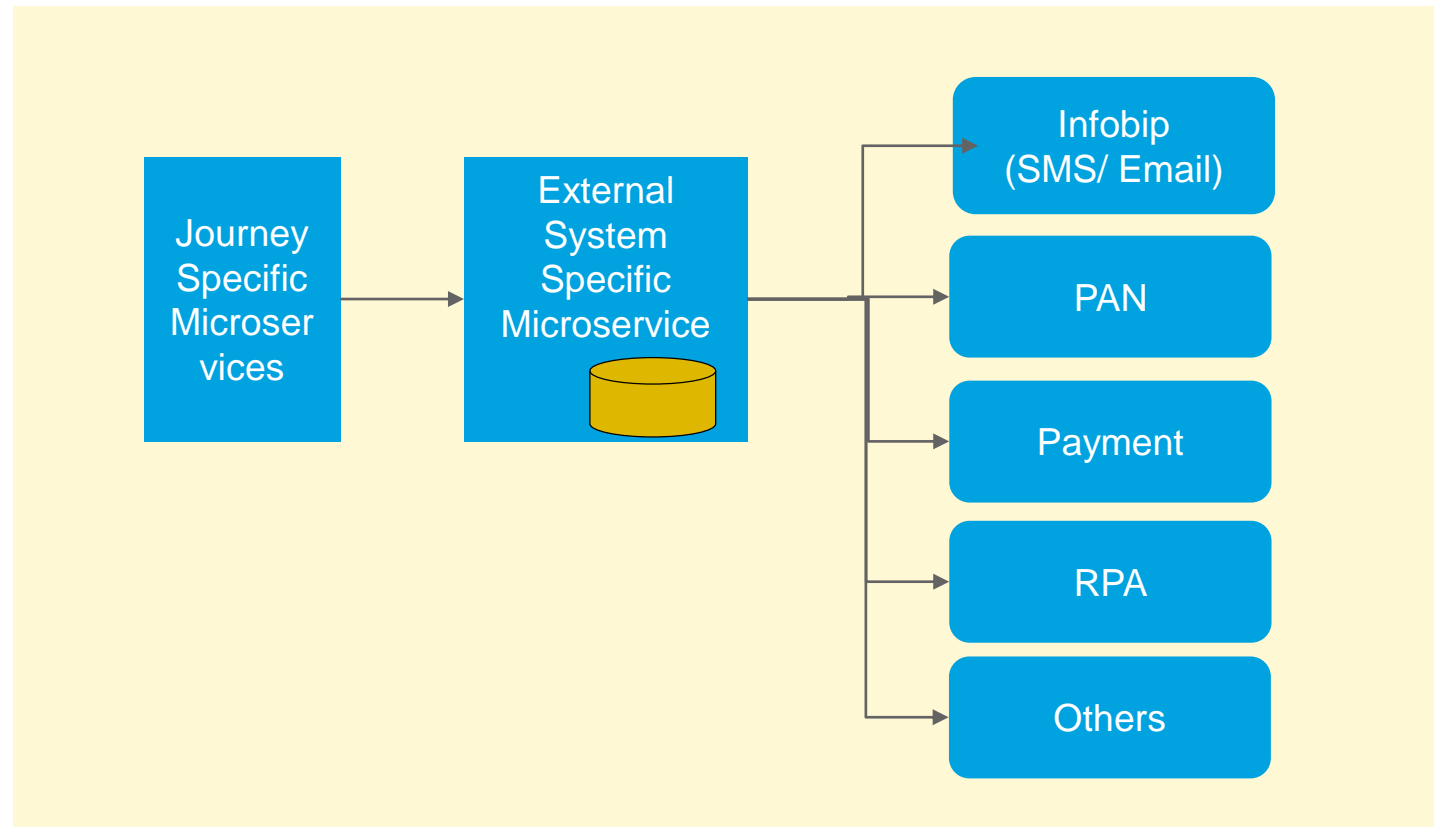
Integration Architecture points:

1. Integration Architecture proposition is to use:
   - Using APIs, managed & controlled by an API manager for handling external requests with similar purpose as the UI / Access components developed.
   - Fast event-driven message queuing interface to handle the high throughput interfaces
   - Light-weight Enterprise Service Bus (ESB) for converting the interfaces to standard protocols & formats as needed by the new age digital platform that is being targeted by the reimagined journeys.
2. As it was seen that there are many master & some transactional data either used by multiple applications (such as security/ company data) or hoping across applications (such as first to NOTIS application an then to NCMS), a master/ common data store is envisaged for both Trading and Clearing Platforms.
3. The data transfer between Trading legacy application and new Clearing platform and vice versa is envisaged to happen via the Integration layer components (ESB or message queue) over secured protocols
4. Similarly integration between the two new platforms will also happen via secured protocols and preferably via integration layer
5. The communication with the COTS products are envisaged to happen the out of the box connectivity (over standard protocols) enabled by these applications.
6. The custom solution components will follow the architectural patterns and designs as explained in earlier section.

Integration Architecture (in Final State):

Trading Platform | **Clearing Platform**

External/ Partner Systems

User IT Systems

Web | Mobile Apps

Intermediate server

HTTPS

HTTPS

SFTP

SMS Gateway

HTTPS

Email Server

SMTP

API GW | IDAM/ SSO

Digital Sign | APIs | Service Registry

API, Service Discovery & Security

Microservices

Listing | Inspection | ISC & Helpdesk

Compliance | Member Service | Master

ESB Apache Camel Integration Services

Integration Layer

Legacy interfaces (DB/FTP)

Existing Systems - Trading

TCP/ IP (High volume real-time)

Message Queue (Kafka)

Public

Chatbot | Chatbot
CRM | CRM
OCR | OCR
DMS | DMS
BPM | BPM
Rule Engine | Rule Engine
COTS | COTS

IDAM/ SSO | API GW

Digital Sign | APIs | Service Registry

API, Service Discovery & Security

Microservices

Clearing | Collateral | Risk Mgmt

Helpdesk | MIS & Report | Master

External/ Partner Systems

User IT Systems

Web | Mobile Apps

Intermediate server

HTTPS

SFTP

SMS Gateway

HTTPS

Email Server

SMTP

Integration Services ESB Apache Camel

Integration Layer

Legacy interfaces (DB, FTP)

Existing Systems - Trading

TCP/ IP (High volume real-time)

Message Queue (Kafka)

SOAP/ HTTPS via API G/w

Web service calls to ESB service new to interface wit other side legacy systems

SOAP/ HTTPS via API G/w

Messages across platform
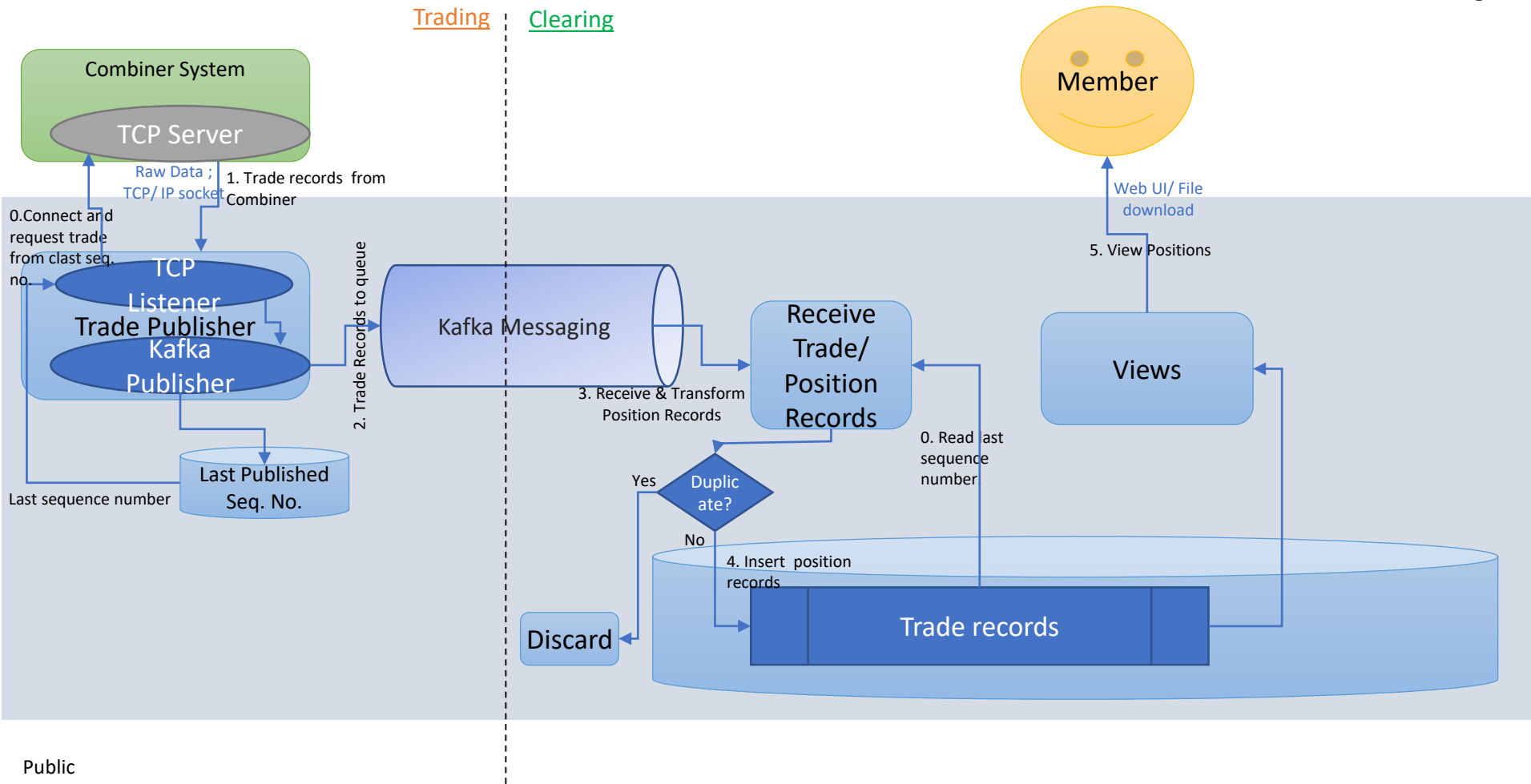
Additional Slides

Usage of Integration Layer
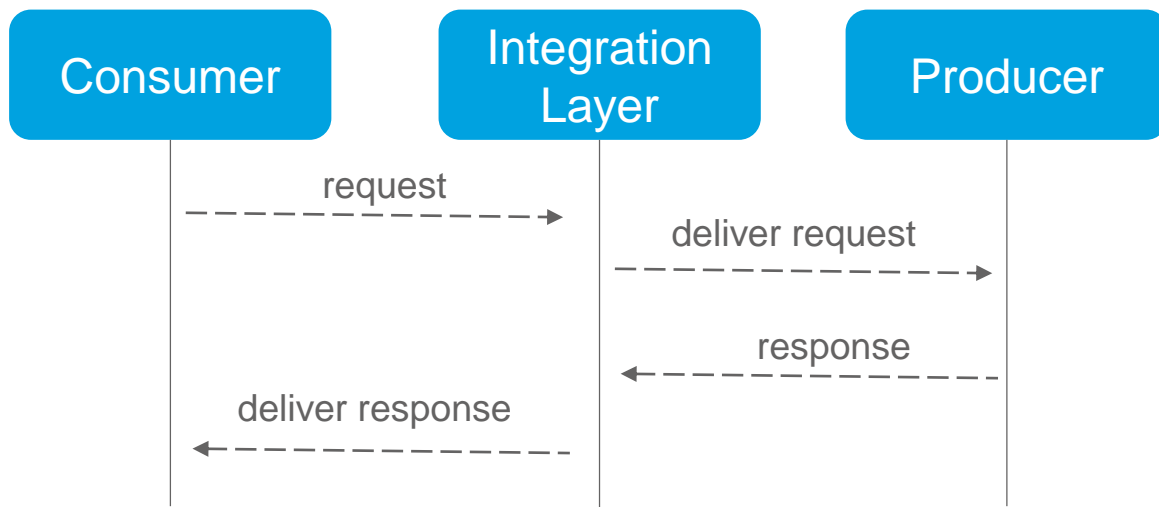
Senario1: Real-time interfaces From Trading to Clearing

Example: Trade/Positions from Risk Combiners to clearing

Trading | Clearing

Combiner System

TCP Server

Member

Raw Data ;
TCP/ IP socket

1. Trade records from Combiner

0.Connect and request trade from clast seq. no.

Web UI/ File download

TCP Listener

Trade Publisher

Kafka Publisher

2. Trade Records to queue

Kafka Messaging

3. Receive & Transform Position Records

Receive Trade/ Position Records

5. View Positions

Views

Last Published Seq. No.

Last sequence number

Duplicate?

Yes

No

0. Read last sequence number

4. Insert position records

Discard

Trade records

Public

Scenario2:Real-time interfaces Across Trading & Clearing

Example: Trade updates from clearing to Trading & Risk

Trading | **Clearing**