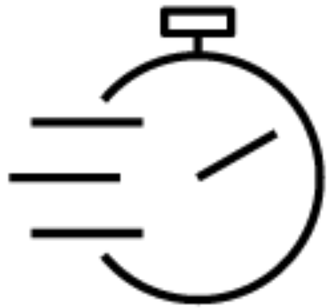
IBM Sterling Order Management

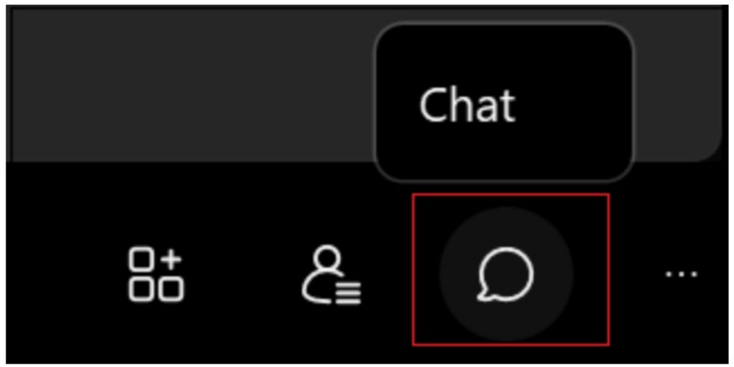
Holiday Readiness 2023

Peak Day Preparedness!



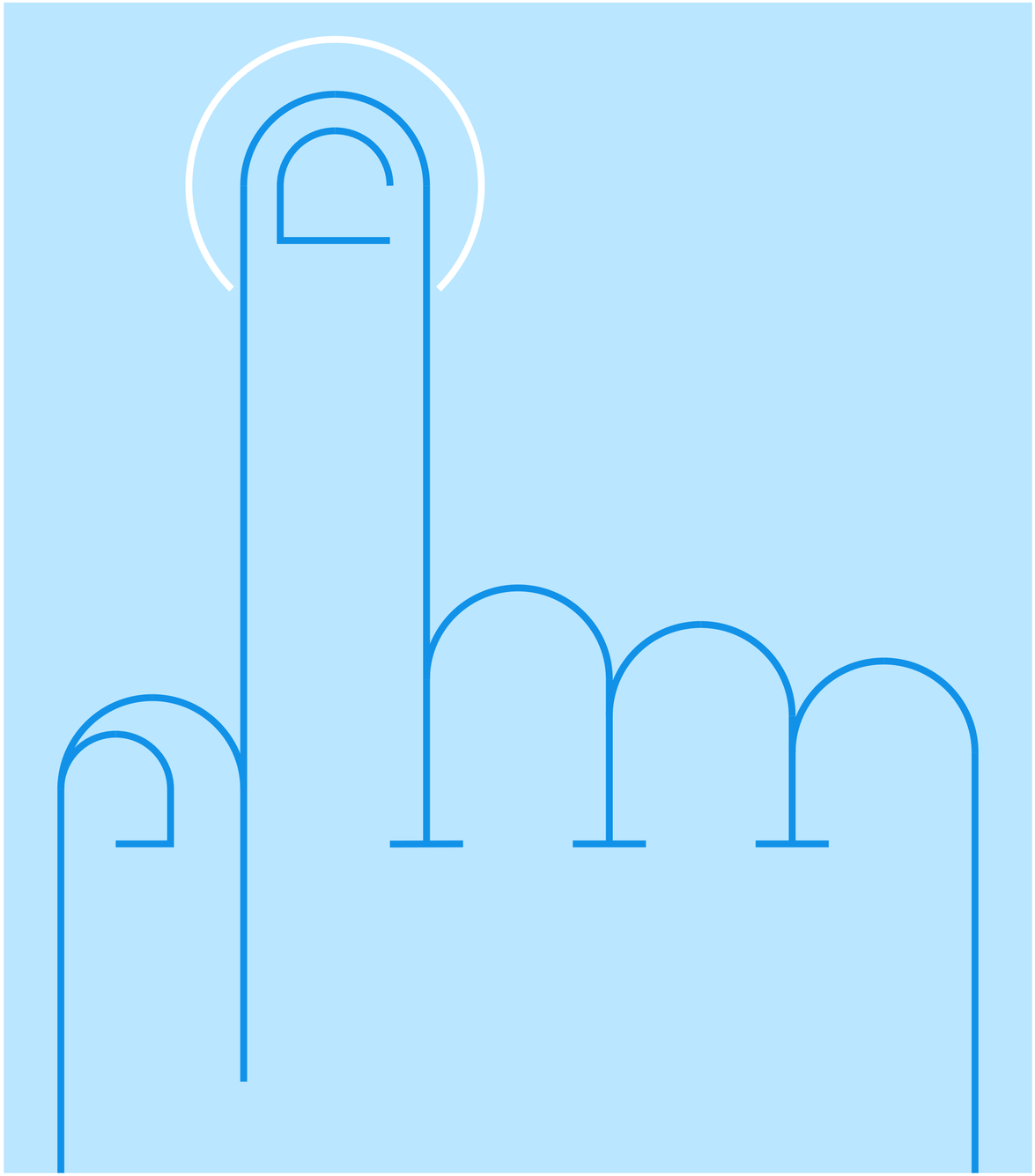
Have a Question(s)?

1. Open the Chat panel from the link in the lower right of the meeting window:



2. In the **To** drop-down list, select the recipient of the message.

3. Enter your message in the chat text box, then press **Enter** on your keyboard.



Your Holiday Readiness Team
... and today's speakers

Chris Burgess
Manager –
Americas & AP Support Experience Team

Mike Callaghan
Program Director –
WW Supply Chain Support

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Sterling order management

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Executive Technical Account
Manager – Expertise Connect

Abdul Shad
Technical Lead –
Order Management Support

Let’s Discuss

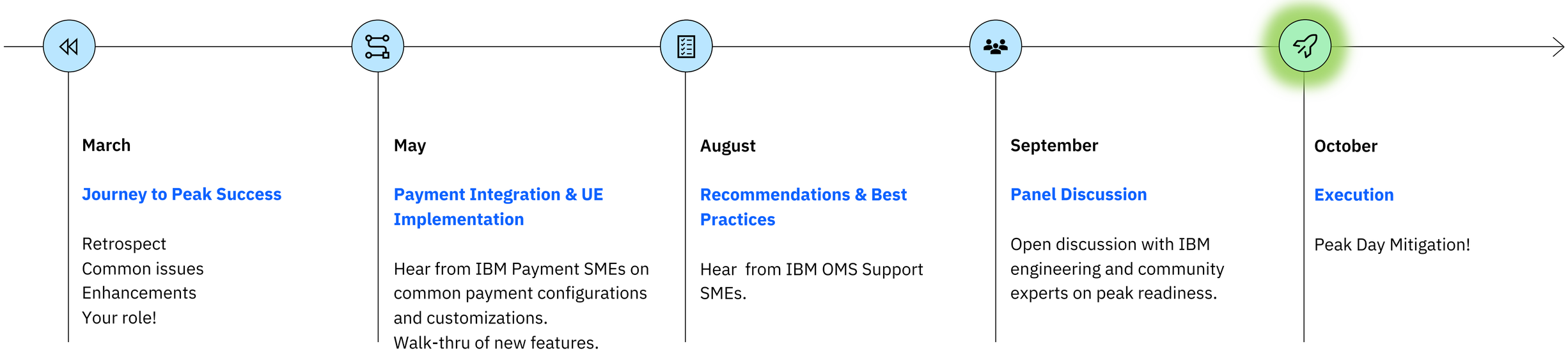
Our Journey to peak success

- Understanding the Problem
  - Problem / Timeline / Environment
- Mitigation/(Run)book Steps
  - Order Flow / Pipelines / Backlog
  - Common Scenarios & Mitigation Tips
  - Support Mustgather
- Self Service Performance Dashboard
  - Overview
  - DEMO
- Freeze Plan

The Path Ahead

Journey to Peak Success

The IBM OMS Support team are continuously expanding our technical best practices based on the observations and learnings over our supported launches and peak events!



March

Journey to Peak Success

Retrospect
Common issues
Enhancements
Your role!

May

Payment Integration & UE Implementation

Hear from IBM Payment SMEs on common payment configurations and customizations.
Walk-thru of new features.

August

Recommendations & Best Practices

Hear from IBM OMS Support SMEs.

September

Panel Discussion

Open discussion with IBM engineering and community experts on peak readiness.

October

Execution

Peak Day Mitigation!

IBM Holiday Readiness Preparation

IBM Order Management teams are focused year-round on ensuring stability during your peak season.

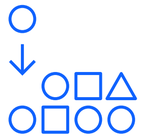
Performance Experts across Engineering, SRE, and Support collaborate to ensure the IBM platform, operations and support are ready.

The primary objective is to ensure stability and performance, and to quickly identify and mitigate any potential issues that do arise.

Platform Stability

Regular IBM cross-functional retrospectives drive continuous improvement, early identification and mitigation of potential risks

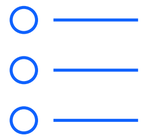
- Production performance and capacity reviews – comparison of current and projected peak workloads
- Internal Platform and application monitoring, alerts and runbooks
- Final major release (23.3) to address any remaining critical product issues
- Published Change Management and Operations freeze
- Internal Executive reviews to discuss status and action of key accounts
- Mobilization of cross-functional SWAT team with for rapid engagement 24x7



Best Practices

Publish critical updates to a robust collection of self-help focused on peak success

- Derived from Support and Engineering experiences with production operations and internal performance testing
- 5 external webinars complete in 2023, including this one!
  - Journey to Peak Success (March)
  - Payment Integration & UE Implementation (May)
  - Recommendations & Best Practices (August)
  - Panel Discussion (September)
  - Peak Day Mitigation (now)!
- Serve as basis for internal application configuration audits, proactive reviews



Prescriptive Guidance

Proactive ‘Event Readiness’ reviews in partnership with Expertise Connect for targeted client-specific recommendation

- Peak Questionnaire
- Production performance, alert review
- Application workload & config
- Database workload & config
- Integrations (MQ, IV)
- Housekeeping activities
- Close loop on prior incidents
- Runbooks, mitigation techniques

Understanding The Problem

What exactly is the issue?

A well-defined problem is easier to triage, quicker to mitigate and resolve

– How is the issue impacting business? In terms of order flow, where does this process/server fit in? Is it a critical process?

– How do you know that there is an issue? What is alerting condition? How is condition measured?

– What exactly is the problem? Is it performance or functional?

Performance

– Which workload is impacted?
– Performance of all APIs are slow only some? *Example: Inventory Lookup / Reservation vs. Order status updates / order lookup*

Functional

The following types of dashboards are available:

– Is this problem reproduceable?
– Can this be seen outside of the monitoring app?
– Is there an error? What's the frequency?

Timing/Timeline

– Which workload is impacted?
– When did issue started? Do servers exhibit issue under load only?
– Were there any change to the environment or data?
– Does problem mitigate itself? *Example: overnight, or after certain amount of time, etc.*
– Is there strict pattern? *Example: schedule event, jobs, etc.*
– Is problem continuing and worsens over time?

Impacted Components

– Are only certain servers affected? What is the differentiating factor?
– What are all dependent services/component for the servers. *Example: External system, MQ, SMTP, etc.*
– Does problem jump between servers? *Example: One app server to another, or from schedule agent to release agent, etc.*

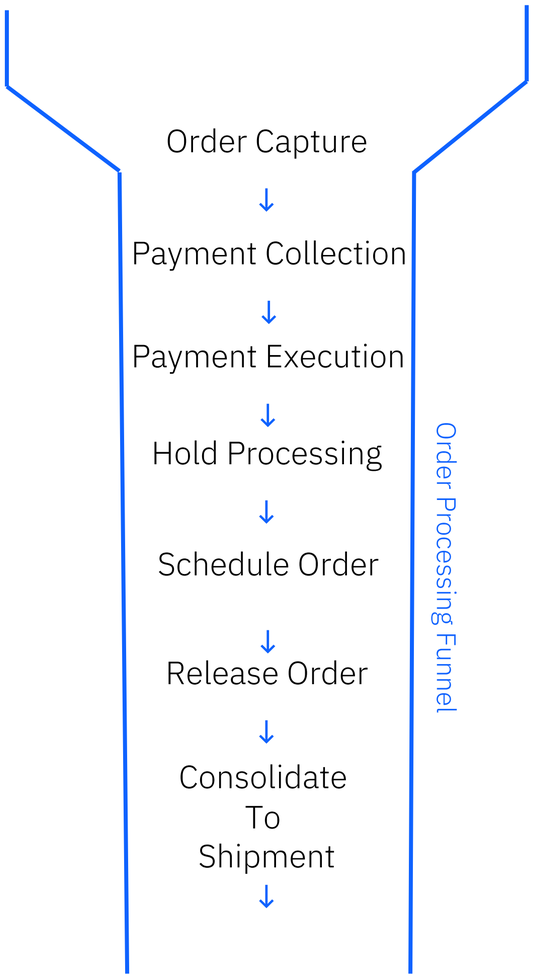
Recovery

– Does it recover on its own? How long did it take before it recovered?
– Was there a user intervention? *Example: Restart, or terminating dependent transaction like killing long running query*
– Before restarting the server did you take any diagnostics?

Understand the Environment

Order Flow

Mitigation/(Run)book Steps



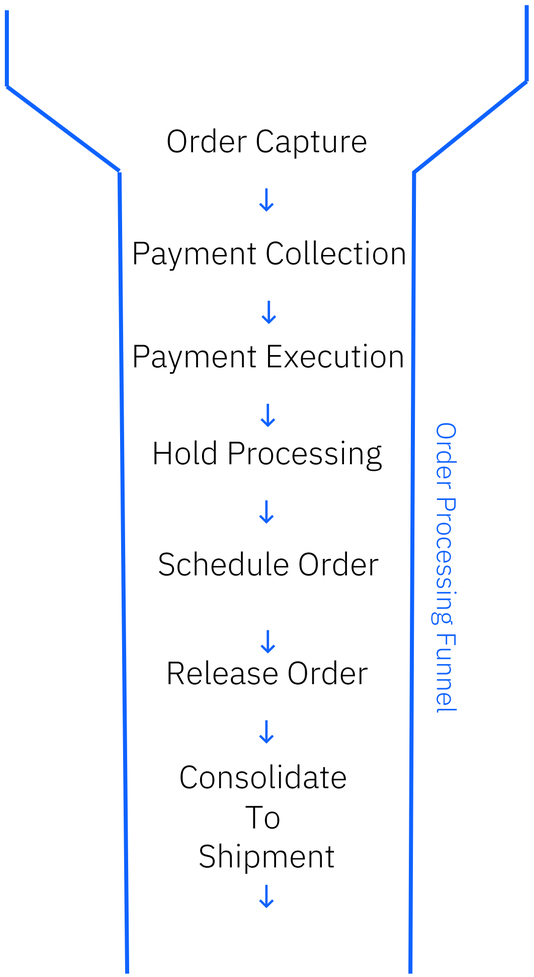
1 **Understand the backlog** by querying `YFS_TASK_Q` table, review queue depth, etc.

2 **Identify the contention point** causing the workload backlog whether it's on database due to queries, JVM resources due GC overhead, or other component slowness...

3 **Throttle the workloads** to avoid the contention and reduce the impact on peak days until the root cause is addressed...

Common Scenarios

Mitigation/(Run)book Steps



- When capacity check was enabled for a DC, Create, Schedule and Release agents were contending for YFS_RES_POOL_CAPCTY_CONSMPTN table and causing the slowness
  - » **Manage the workload** to run one after another to avoid the contention until DC capacity check can be disabled safely
- Schedule order agent server JVM is running on high heap and causing overall slowness. Upon further review, high heap / associated GC CPU was caused by number threads configured
  - » **Reduce the number of threads** (and increase JVM instances if needed) to avoid resource constraint slowness
- DB Server is running on high CPU and causing over slowness across all transactions as specific SQL queries are resource intensive
  - » These CPU heavy queries might be coming from non-critical workloads, where it can be **disabled or optimize** (i.e., adding index, RUNSTATS etc.,) to improve peak performances.
- Hiccup with external system, **reduce number of JVM instance** for the workload to reduce backpressure on external system.

Mitigation Tips Diagnostics, Mustgather

Mustgather	Symptoms	Diagnostics	Mitigate
Server unresponsive / JVM Crash →	– High queue depth alert – Real time calls result in `500, 502`, etc. errors. – Server down alerts – High thread utilization (`WebContainer, DefaultExecutor`, etc.) – High GC/Heap utilization. – OOM, Stack Overflow exceptions	❑ 3x `javacore`/ `threaddump`, 20 sec apart ❑ `heapdump`, and GC logs for OOM ❑ `linperf.sh` for high CPU ❑ Server logs ❑ `YFS_STATISTICS_DETAIL` export	✓ Restart the servers to mitigate the issue. ✓ Increase heap (`Xmx`) if server is going OOM.
Database Slowness → Latches/Contention/Locks Slow Queries	– High DB transaction log utilization – Excessive latches/contention – Excessive `YFC0006, YFC0003` errors – Excessive DB Connections, high wait time – High DB resources (CPU, Memory, IO) utilization	❑ `oms-db2collect.sh` ❑ `db2support` | AWR Report ❑ 3x `javacore`/ `threaddump`, 20 sec apart from application `JVM` ❑ `YFS_STATISTICS_DETAIL` export	✓ For locking terminate the connection holding the lock from DB side. ✓ For slow query, capture `EXPLAIN` an `ADVICE` and apply indices.
Application Slowness → API, Agent, Integration	– High queue depth alert – Real time calls result in `500, 502`, etc. errors. – Inventory/Order lookup calls failing – High transaction backlog for schedule, release, etc.	❑ 3x `javacore`/ `threaddump`, 20 sec apart ❑ `db2support` | AWR Report ❑ `TIMER` or `SQLDEBUG` trace for 5 minutes or single transaction. ❑ Application logs ❑ `YFS_STATISTICS_DETAIL` export	✓ Throttle workload ✓ Stop unnecessary workload/servers to reduce load on DB, JMS or External System. ✓ Scale up if response time doesn't degrade.
UI Slowness → Call Centre, Web Store OrderHub, etc.	– CSR unable to lookup orders – Store Associates unable to perform shipment action. – Browser hanging, or generic error message.	❑ Screen recording/capture ❑ `HAR` file (browser debug) ❑ Application and LB access logs	✓ Delete browser cache, cookies, and browser temporary files ✓ Verify network connectivity
OMS Container Issues →	– Container getting restarted frequently. – Health check failures	❑ Deployment details (`YAML`) | describe pod ❑ CPU/Memory request/limit ❑ Container CPU/Memory utilization metrics	✓ Restart the servers to mitigate the issue. ✓ Increase CPU/Memory requests

Being Ready... Diagnostics

JVM Profiling (low overhead diagnostic collection)

With thread dumps getting collected automatically, you can often restart without having to wait for Javacores to be taken. There are several tools and techniques to capture the thread-dump (w/ additional details like CPU, memory, garbage collection, etc.)

1. IBM Health Center for Java: Low overhead agent included with the WebSphere Application Server / Liberty Java SDK that collects Java configuration and performance data. The data collected includes CPU, native memory, method profiling, garbage collection, locks, threads and others.
   - Configure in headless mode with profiling turned off. IBM Health Center
2. Oracle: Running Java Flight Recorder (w/ JMC)
3. Script `Kill -3 PID` or `jstack -l PID | 3x at` 20 seconds interval or more.
4. Using monitoring tools like Instana, App Dynamics (collection on action), Dynatrace (CPU profiler), etc.
5. Programmatically using **ThreadMXBean** interface also you can generate thread dumps.

Note: Overhead should be assessed before hand.

Recommended JVM arguments for crash/OOM

✓ IBM Java: `Xdump` events must be configured to capture heap or system core.

```
-Xdump:system+heap
:events=systhrow,filter=java/lang/OutOfMemoryError,range=1..1
```

Generating System Cores on OutOfMemory Errors

✓ Oracle Java: Non-Standard JVM arguments

```
XX:+HeapDumpOnOutOfMemoryError  or -XX:OnOutOfMemoryError="gcore
%p"
```

Database (DB2)

1. Lock Waits — `MON_LOCKWAITS`
2. Current SQL — `MON_CURRENT_SQL`
3. Connections — `MON_GET_CONNECTION`
4. Workload — `MON_GET_WORKLOAD`
5. Transaction Logs — `MON_GET_TRANSACTION_LOG`
6. Package Cache Delta — `MON_GET_PKG_CACHE_STMT` (delta - 1 Hour)

Note: OMS Identify DB Connection `yfs.app.identifyconnection=Y`

Best Practices

Network

- ❑ One of the most overlooked area is the Network
- ❑ Network latency can impact overall site performance.
- ❑ Ensure proper Network monitoring is in place
- ❑ Firewalls are configured properly

Be Ready!

- ❑ Ensure that your environment is configured to capture the appropriate data the first time an issue occurs instead of waiting for another occurrence.
- ❑ Have scripts in place (WebSphere Mustgather scripts for performance issues)

  Performance, hang, or high CPU issues

Enhanced Observability

New Self-Service Performance Dashboards

You have an ongoing role in being proactive! *Maintain the health and performance of your OMS applications leveraging capabilities of the Self-Service Tool.*

Monitoring (Legacy) → Monitoring

The following types of dashboards are available:

- Database metrics
- API Performance
- Service Performance
- Business Performance
- JMS metrics
- Server Resource Utilization

The following types of dashboards are available:

- Agent and Integration Server Performance
- Application Server Performance
- Agent and Integration Server Performance details
- Application Server Performance details
- Application Server JVM metrics
- Agent and Integration Server JVM metrics

JB

Are You Ready?

As we lead into peak, take care of certain actions before and during peak to maintain a healthy performing system.

Recommended Best Practices

- Order/Shipment Monitoring: Explore the option of disabling non-critical Order Monitor rules.
- Configure and run Close Order agent before peak season to make orders eligible for purge
- Aggressively purge tables before peak to keep tables light weight.
- Use SST monitoring dashboard to periodically review system performance and take proactive actions to avoid any potential performance issues
- Pay closer attention to queue depth alerts and proactive cases and take it to closure
- Perform inventory sync during off hours to avoid overlapping with critical workload during busy hours.
- Halt the agents that perform complex order reallocations like IBA.
  - These agents have high contention profile, avoid running during peak.
- Shutdown purge and other non-critical agents during peak
  - This will reduce unnecessary contention and usage of resources
  - Ensure that essential purge agents continue to run through the holiday period, like the Inventory Purge (which is needed to purge expired reservations, cleanup demand, etc.)
- Stop disabling capacity by setting infinite threshold.
  - Setting higher threshold is not same as disabling it. Otherwise, the system still will continue to do capacity check with higher threshold and may cause severe contention.
- Pause any manual activity through API tester or DB query client tool
  - Heavy use of these tools during peak hours might cause contention with other key processes and cause a slowdown
- Suspend any manual reporting query execution, use Data Extract agent or Cognos reports instead.
  - DB client queries get executed against primary DB if CLOB columns are queried and might impact other critical processes.
- Avoid keeping verbose logging enabled for long time as it can have an impact on application performance.

Are You Ready?

Implement IBM 2023 Holiday Readiness recommendations. Real scenarios....

Top 2023 IBM OMoC Holiday Recommendations

– Implement IBM recommendations provided via various engagements and support cases

– Review proactive support cases and bring them to closure

– Perform end to end performance test with combination of peak workloads and scenarios

– Update to latest quarterly release, and pick pack prior to freeze

– Assemble components to reflect real time scenarios and run them in parallel to ensure adherence with NFR's.

– Inform IBM (CSM/ Expertise Connect Team)of load testing plans and timing

– Inform IBM (CSM/ Expertise Connect Team)of key Peak days and Hours

– Share any specific key dates or max burst times with IBM (CSM/ Expertise Connect Team), including code freezes, flash sales

Avoid Unforeseen Risks

– Ensure you have visibility into the performance of your own client side network components for all upstream channels, and ability to quickly diagnose and mitigate any system-wide or component slowdowns under heavy load

– Understand expected concurrent users on channels such as Store (Pick, Pack, Ship) or Call Center, and potential impact during peak load. Custom searches or ad-hoc activities can lead to intrusive, long running queries that impact overall system performance

– Enable a 'Kill-switch' on upstream web channels for any synchronous real-time inventory calls, and ensure graceful handling and recovery of the upstream web channels if these slow down or become non-responsive

– Leverage appropriate method to retrieve data from OMoC database during peak, understand the limitations – Event sourcing, DB Extract, APIs, DB Query Tool, Cognos, OrderHub, or Self-Serve Tool

– Be ready to consume latest fixpack from OMoC for any critical performance, stability fixes, or those any functional fix that has significant impact to your business processes

Working with Support

Effective collaboration can substantially increase Time-To-Resolution.

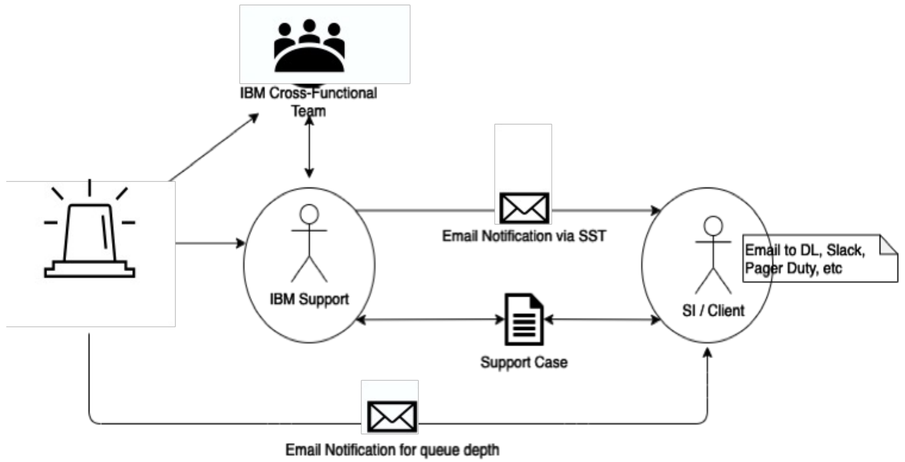
Proactive Support Model

✓ **IBM performs the following types of monitoring** for assessing the health of your production site and its services:

- System and infrastructure
- Application
- Synthetic
- Business KPIs

✓ **If a potentially impactful condition is detected**, IBM Support will proactively notify you, and inform if your action is required to mitigate.

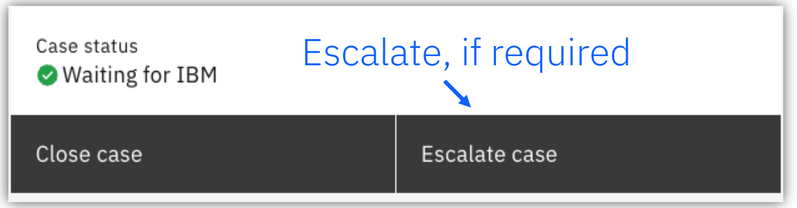
- **EMAIL** (✉) for issue with Multi-tenant shared infrastructure
- **SUPPORT CASE** (🏷) via IBM Support Portal for client-specific component



Engaging Support

– Open Severity 1 support case with well defined problem, with a realistic expectation of what can be done

Open a support case →



Immediate Actions

– Get your servers running (restart JVM - manually terminate the JVM processes if required, reboot the VM/System)
– Consider throttling to bring stability to overloaded servers.
  – Reduce # of JVM's
  – Reduce # of Thread's
  – Decouple workload, or stop non-critical workloads
– Capture logs that are already on the system, obtain `javacores` and `heapdump`.

Proactive Actions

– Confirm focals, update internal contact sheet for various teams (ESB, middleware, etc.)
– Define a support schedule (24x7 peak-hour support coverage)
– Setup a communication plan.
– Who is running the bridge? Who is keeping all responsible parties updated?
– Document escalation criteria and procedures.
– Ensure activities by the business, performance and operations are in sync.
– Ensure the Runbooks are kept up to date and have precise action.

OMoC Holiday Change Management

To ensure stability of OMoC environments during the peak season, IBM recommends the following change control process during the peak season.

Platform/Infrastructure Change Freeze dates

- All production updates for Order Management on Cloud application components will be frozen **November 7th, 2023 - January 1st, 2024.**
  - Order Management
  - Sterling Intelligent Promising (Incl. Inventory Visibility and Fulfillment Optimizer)
  - Order Hub
  - Store Inventory Management
  - Self Service

Major Upgrade Schedule →
Minor Upgrade Schedule →

Client-initiated infrastructure change requests Freeze dates

- Any such requests (e.g. network, access, etc.) for any/all environments submitted during the following holiday freeze windows will be delayed until after the following dates:
  - **Wed November 22nd, 2023 - Wed November 29th, 2023**
  - **Wed December 20th, 2023 - Wed December 27th, 2023**
    - » These are deferred across all environments out of an abundance of caution.

Database Maintenance Freeze dates

- IBM will be disabling database maintenance activities (RUNSTATS and REORG) between following dates:
  - **Wed November 22nd, 2023 - Wed November 29th, 2023**
  - **Wed December 20th, 2023 - Wed December 27th, 2023**

  This is to avoid any database contention and unforeseen performance issues with these maintenance jobs potentially interacting with your peak traffic. IBM will manage this effort and there is no action on your part.
    - » The full database backup schedule will remain unchanged.

Platform Maintenance

- Review your Event Calendar in IBM Self Service regularly for any/all upcoming maintenance events leading to the freeze date and share with your teams accordingly.

Security

- Critical vulnerabilities, however, will be reviewed on a case-by-case basis, and require IBM Executive approval if immediate action is required, with advance notification to clients, before proceeding.

How to Succeed

Plan

- ☑ Retrospective
- ☑ Latest product levels
- ☑ Detailed projections
- ☑ Catch prior webcasts
- ☑ Engage help as needed

Prepare

- ☑ Align to IBM schedule
- ☑ Representative testing
- ☑ Proactive housekeeping
- ☑ Clean up the noise
- ☑ Track risks

Execute

- ☑ Clear runbooks, RACI
- ☑ Quickly detect issues
- ☑ Throttle as necessary
- ☑ Quick mitigation

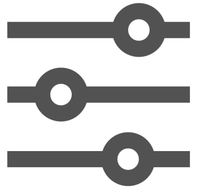
MC

Enhanced Event Readiness Offering

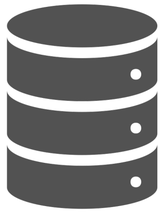
A proactive support-led services engagement leveraging a methodical approach to provide targeted, prescriptive guidance toward stability and success on IBM Order Management

Support Backlog Reviews, Prioritization

Best Practice Enablement, Consultation



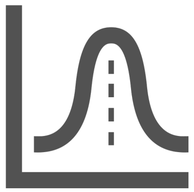
Application Configuration Audit



Database workload review

Application workload review

Production performance review



Peak Projection and Capacity validation

Peak Day Readiness Checklist

SWAT Peak Day Standby

IBM Event Readiness Team

OMS Performance Experts apply years of proactive preparation and support of worldwide clients for successful go-lives and peak events

- ✓ Identify, mitigate potential risks
- ✓ Align to proven best practices
- ✓ Peak day mitigation techniques

Support Experience Team prioritize Support workload, augment communication and escalation to help avoid blockers

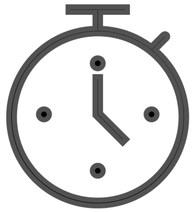
Expert Labs (optional) available to perform comprehensive reviews and health checks

Event Readiness** is modelled as 80-120 hour engagement over 4 months – partnering as you prepare, test, and execute go-live or peak event; **IBM Engagement should begin no later than 3 months before your peak season, ensuring ample time to proactively review, implement, and validate recommendations

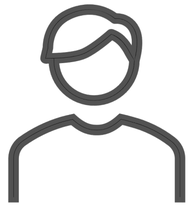
IBM Advanced Support **Offering**

An enhanced support experience on top of your active IBM support subscription, providing prioritized case handling and shorter response time objectives

NEW in 2Q23!



Enhanced Initial Response SLOs including <30 min for Severity 1



Named IBM Advanced Support Focal (ASF) within business hours

Priority access to Senior Technical Support for accelerated issue resolution

Monitor, manage, escalate critical cases and provide period case status reports and trends

Cases handled with higher ongoing prioritization within Severity level

7x24 coverage for mutually agreed Sev-2 requiring urgent attention

Are *you* ready?

Technical Best Practices

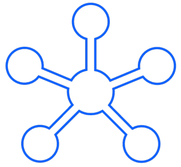
Best Practices

Apply Recommended Configuration

We leverage learnings from each go-live, peak event, all critical production issues to continuously improve our internal and external published Best Practices

Application

- ✓ Use Optimal API and optimize output template
- ✓ Fine tune entity cache, disable redundant.
- ✓ Use HOTSku & OLA configuration
- ✓ Enable capacity cache
- ✓ Set API isolation level based on the use case
- ✓ Use pagination for getter APIs



Integration

- ✓ Use JMS session pooling
- ✓ Avoid message selectors
- ✓ Enable service retry (transaction reprocessing)
- ✓ Have timeout’s for up/down stream synchronous calls
- ✓ Inventory Visibility (SIP)

Database

- ✓ Maintain transactional tables, Purge (set appropriate retentions)
- ✓ Serviceability & Monitoring
- ✓ Minimize contention, maximize concurrency
- ✓ Optimize long-running or expensive queries
- ✓ Enable *stmt_conc* (LITERALS)*

Application Performance 01

API Performance

- Network / Client Logic
- API Input
- Session Management
- Debug/Logging Statements
- Business Logic
- Database Operations
- Call to External System
  - Time to Establish Connection
  - Payload
  - Connect/Socket Timeout
- Change/On-Success Events
- JMS Operations
  - Message Size
- Output Template

Best Practices

- Validate API input before calling API, ensure required or filtrable attributes are passed (avoid open ended SQL).
- Limit the input size
- Tune `servlet.token.absolute.timeout` properties to prevent `YFS_USER_ACTIVITY` locking under heavy load.
- Select appropriate `SelectMethod` method for getter API's
  - Possible values are `NO_LOCK, NO_WAIT, WAIT`, etc
  - `-QueryTimeout="3" TimeoutLockedUpdates="Y"`
- Keep transaction boundary small when using update/modify API, this will ensure DB object (row) is locked for minimum duration.
- Use appropriate connect and read timeout for external calls, preferably less than 5 seconds, and make use of connection pool (cached/persistent connection, keep-alive).
- Use optimal API output template to limit unnecessary data reads.
- Remove always on `DEBUG` or `SystemOut` statements
- Eliminate frequent `SELECT` by enabling entity cache.
- Disable redundant cache (always miss or frequently evicted)
- Use pagination (`getPage`) for getter APIs.
- Use Timeout properties for DB calls, `yfs.agentserver.queryTimeout, yfs.ui.queryTimeout`

Application Performance

02

API Performance

- Business Logic (promising)
  - Sourcing Optimization
  - Inventory Update (HOTSku)
  - Capacity Update
  - User Exits

Best Practices

- Enable HOTSku, and OLA configuration.
- Use Capacity Cache
  - Enable node locking / threshold properties based on the business use case.
  - Reduce the lock contention in the YFS_RES_POOL_CAPCTY_CONSMPTN table by enabling yfs.capacity.useMassAdjustCapacityDriver & yfs.persitCapacityAdjustments properties. Refer to slide 9 for additional guidance.
- Aggerate reservation calls to IV, this improves performance of reserveAvailableInventory API `-yfs.UseAggregatedReservationsForIV property to “Y”`
- Cache configuration data using entity caching
  - Example: `YFS_REGION, YFS_REGION_DETAIL, YFS_ATTR_ALLOWED_VALUES, YFS_ATTR_ALLOWED_VAL_LOCALE`
  - Avoid using current timestamp value as part of query predicate (this makes caching redundant due to unique value)
- Remove unwanted attribute/items from the output
  - Example: Let’s say if you are correcting inventory using `YFSGetAvailabilityCorrectionsForItemListUE`, then make sure output of the UE excludes the items with ZERO supply quantity before passing the result to OOB API.
- Enable API interrupt properties to avoid runaway transactions
- Run Inventory purge

Application Performance

03

UI Performance

- Web Store (wsc/isf)
- Call Center
- Order Hub

Best Practices

- Apply recommended configuration around API performance
- Run purges prior to peak to ensure transaction tables such as `YFS_ORDER_RELEASE_STATUS, YFS_ORDER_HEADER, YFS_ORDER_LINE, YFS_SHIPMENT`, etc are lightweight.
- Cache critical configuration data using entity cache: `YFS_REGION, YFS_REGION_DETAIL, YFS_ATTR_ALLOWED_VALUES, YFS_ATTR_ALLOWED_VAL_LOCALE`
- Add the following indices to enhance the performance of the Batch Pick
  - Index on the `STORE_BATCH_KEY` column of the YFS_SHIPMENT_LINE table.
  - Index on the `SHIPNODE_KEY` and `INCLUDED_IN_BATCH` columns of the `YFS_SHIPMENT` table.
- Set the property `yfs.applyChildContainerQueryOptimization=Y` in DB properties to optimize the query on the shipment container table while fetching child containers.
- `closeManifest` API must be called asynchronously
- Control/Set polling interval of Store/CC dashboard widgets
- Call `GetStoreBatchList` with optimum values for `MaxNumberOfShipments, NoOfShipmentLinesForNewBatch`
- Purge `YFS_INBOX` table, identify and address root cause of the exception, keep exception to minimal

Application Performance 04

Order Flow

- Create Order
- Hold Processing
- Order Monitor
- Payment Server
- Schedule Order
- Release Order
- Create/Consolidate Shipment
- RTAM
- Purge

Best Practices

- Apply recommended JVM performance properties
- Review order and shipment monitors for redundancy, review and remove obsolete monitor rules.
  - Avoid reprocessing of order once condition evaluates to false.
    `yfs.yfs.monitor.stopprocessing.ifcondition.eval.false=Y`
- Tune next task queue interval of "Process order hold type" agent from 15 minutes to the customized value `yfs.omp.holdtype.reprocess.interval.delayminutes`
- Have dedicated schedule order server to process backorders using OrderFilter= N|B agent criteria flag.
- Separate out the processing of orders by one of the attributes (ex. Large order, etc) with workload separation feature.
- Apply and Tune OMoC default HOTSku and OLA configuration
- Enable Capacity cache and tune node locking properties based on business use case.
- Apply sourcing optimization (reduce DG size)
- When using `YFSGetAvailabilityCorrectionsForItemListUE`, make sure output of the UE excludes the items with ZERO supply quantity before passing the result to OOB API.
- Apply solver/sourcing interrupt properties to prevent runaway transactions
- If capacity is enabled, then make sure to double check the calendar setting (store hours, etc.) for peak.
- Disable capacity instead of setting it very high value.
- Control/Throttle use of createInventoryActivityList API when using capacity filled event.
- Run Inventory purge

Integration 05

JMS Performance

- Message **PUT** slowness
- Agent (`GetJobs`) slowness
- Consumer is slow

Best Practices

- Review `MessageBufferPutTime` relative to `ExecuteMessageCreated` statistic from YFS_STATISTICS_DETAIL table for any slowness
- Use non-persistent queues for internal agent queues
- User persistent queues for external integration or integration server processes.
- Avoid using message Selector, instead have dedicated internal/external queues
- Avoid longer transaction to prevent `MQRC_BACKED_OUT` error message
- Optimize output template to prevent `MQRC_MSG_TOO_BIG_FOR_Q` error while posting a message
- Enable JMS Session Pool
  `-yfs.yfs.jms.session.disable.pooling=N`
- Use anonymous reuse (requires JMS Session pooling to be enabled)
  `-yfs.jms.sender.anonymous.reuse`
- Enable multi-threaded PUT's
  `-yfs.yfs.jms.sender.multiThreaded=Y`
- Enable JMS connection retries
  - Retry Interval (milliseconds) 100 ms
  - Number of Retries – at least 3 retries.
- Enable agent bulk sender properties to POST message in batches.
  `-yfs.agent.bulk.sender.enabled`
  `-yfs.agent.bulk.sender.batch.size=5000` (increase as needed)

Integration 06

External System

- Sterling Intelligent Promising
  - Inventory Visibility
- Store Inventory Management
- Order Optimizer
- Order Service

Best Practices

- Use connection pool (cached/persistent connection, keep-alive) with appropriate connect and read timeouts.
- Cache authentication token for reuse, regenerate upon expiry, or 401, 403 status codes.
- Use
- Adhere to best practice when invoking Inventory Visibility APIs.
  - Use 100 item-node per payload when invoking APIs for multiple lines.
- Implement polling process to retrieve failed events.
- Space out the sync supply and snapshot calls, check with all stakeholders for ad-hoc execution or special requests during peak.
  - Avoid redundant calls to generate snapshot
- Avoid redundant Network availability recomputes
  - Recompute Network Availability API recomputes availability for existing DG.
  - Update DG API will recompute availability for newly created or modified DGs but not for existing DG.
  - Turning on/off existing nodes.
  - Make sure to review release notes and API documents.
  - Timely refactor the logic to avoid running into unforeseen risks of using deprecated or discontinued APIs.

Database 07

Database Performance

- High DB response time
- Contention
- Long running queries
- High DB CPU/IO
- DB Transaction logs
- Backup takes time
  - DB is too BIG!

Best Practices

- Enabling property `yfs.yfs.app.identifyconnection=Y` to identify the source of DB query / connection.
- Control database size
  - Compressing the CLOB data using entity compression feature
  - Execute order audit and order release status purge
  - Disable unwanted audits.
  - Do not use YFS_EXPORT table for debugging purpose.
- Enable *`stmt_conc`* `(LITERALS)*`
- Avoid full table scan with `ConsiderOracleDateTimeAsTimeStamp` attribute when using Oracle database.
- Identify the optimal cache sizing through your performance testing
- Monitor the frequently invalidated table caches and disable them if needed
- Ensure SQLs aren't formed with unique values at runtime, it impacts the cache reusability.
- Blank queries, one of the common use case when non optimal API input is passed in. Ensure APIs are invoked with key filtering attributes.
- Enable performance features and properties required for concurrent workload to avoid DB contentions (HOTSku, Capacity, etc.)
- Disable resource intensive database maintenance during peak period (such as offline reorg on critical table)
- Tune / Avoid ad-hoc queries used for reporting purpose, if possible, use standby or replica instances to query.
- Monitor database for long queriers and queries in lock-wait, and transaction logs usage.

OMS certified containers

Performance & Optimization

Objectives

– Scale seamlessly for peak workload.

Best Practices

– Update to latest quarterly release prior to freeze
  – New fixes will be available on top latest quarterly release i.e., September 2023 (10.0.2309.0)
  – Deployment strategy (blue / green, canary, etc.)
– Avoid automatic operator updates for production.
– Review and be prepared to captured diagnostics as per the Mustgather.
  » Mustgather for IBM Order Management Software Certified Containers: Performance Issues ➜
– Check for SSL certificate validity for all internal and external communications.
– Tune readiness / Liveness probes
– Monitor NFS IOPS for shared mounts used to store certs, catalog index, etc.
– Reduce redundant RMI calls; verify host ulimits (Open File/Socket)

Discussion Points

– Review CPU and memory resource requests and limits, define optimal profiles, and agent & integration threads.

```
serverProfiles:
- name: ""
  resources:
    limits:
      cpu: millicores
      memory: bytes
    requests:
      cpu: millicores
      memory: bytes
```

```
- name: agents-huge
  profile: ProfileHuge
  property:
    customerOverrides: AgentProperties
    envVars: EnvironmentVariables
    jvmArgs: BaseJVMArgs
  replicaCount: 1
  agentServer:
    names:[ScheduleLargeServer,ReleaseLargeOrderServer]
```

  » Watch for CPU throttling.

– Adjust Default Executor Threads, Data source pool size according to `serverProfile` you have defined for the Application Server.
– Separate traffic using `appServer.ingress.contextRoots`
  » `[smcfs, sbc, sma, icc, isf, adminCenter]`
– Pod/Cluster Autoscalers.
– Network monitoring, latency to Database and JMS server; have network utility to validate the connections.
– Understand & Tune Ingress/Egress request/response limits

Performance Testing & Optimization

Performance is a non-functional requirement, impacting the quality of the **user experience**

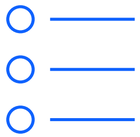
A strategy for a good performance test is to use a mixture of concurrent scenarios that involve read and write operations.

Plan

Establish and quantify goals and constraints

What business wants?

Identify KPI’s & NFR’s



Prepare

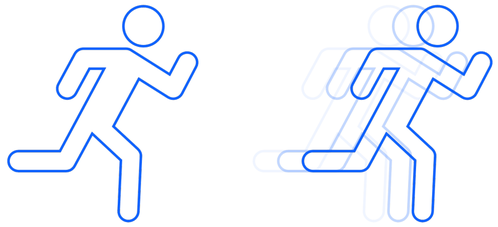
Populate the application with realistic data

Use a phased ‘stair-case’ model

Execute

Simulate workload

Tune!



Scale

Until it meets your NFRs!

Performance Testing Guidance

Performance testing is an art, but a mandatory one! It is imperative to vet out issues in advance on pre-production load testing, rather than wait for it to surface as a business-critical production issue!

1. **Projected peak volumes –** Ensure business and IT are in sync on expected peak loads to ensure planned tests are accurate.
2. **Representative Combination Tests** – Assemble components to reflect real time DATA, scenarios and run in parallel to ensure adherence with NFR; Stage data for various components and run them under full load (ie. Create + Schedule + Release+ Create Shipment + Confirm Shipment + Inventory Snapshot (IV))
3. **Agent and integration servers –** ensure asynchronous batch processing components are tested in isolation and in combination with broader workload; ensure to tune agents (processes, threads, profile) to meet expected peak SLAs/NFRs on throughput

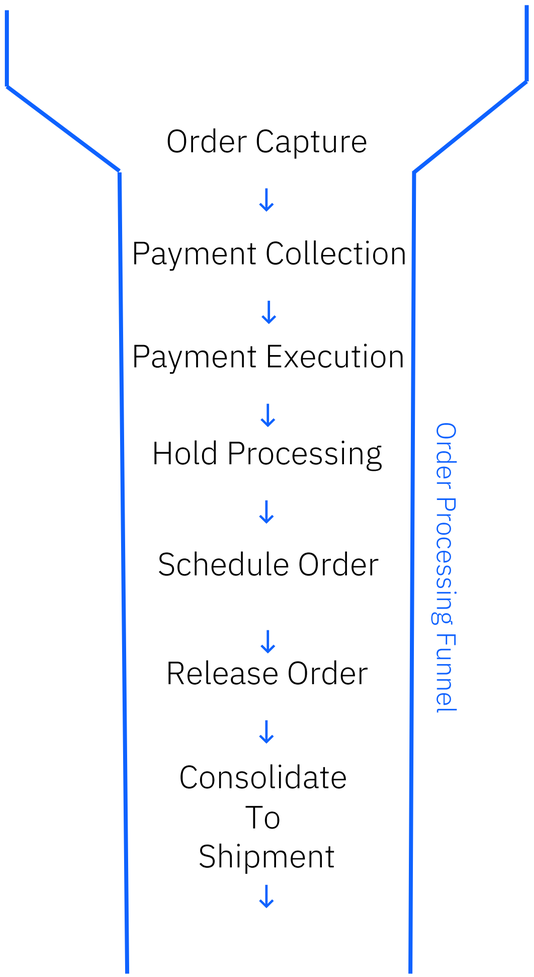
Metric	2022 Peak	2023 Projected Peak	2023 Load Test Peak
Orders / hour (max)	?	?	?
Orderlines / hour (max)	?	?	?
Get Inventory Availability	?	?	?
Reserve Inventory	?	?	?
Inventory Adjustment trickle	?	?	?
Inventory Adjustment burst	?	?	?
Concurrent Store/CC users	?	?	?

4. **Test Failure Scenarios** – validate resiliency of overall system and operations, ensuring graceful recovery if front-end channel (web, mobile, Call Center, Store, EDI, JMS), backend OMS, or external integration endpoints fail. Include ‘kill switches’ in any components that can be disabled to avoid magnifying an isolated issue into system wide one, especially for any synchronous calls.
5. **Confirm Peak days and Hours -** Share any specific key dates or max burst times with IBM Support, including code freezes, flash sales.
6. **Coordinate with IBM -** Inform IBM (CSM/Support) in advance when load tests are planned if any data or diagnostics (such as against Database) are needing to be captured; IBM can also then review internal metrics and response in parallel. ***➔ Inform IBM in advance of major configuration changes (sourcing rule: Increase in Ship from Store orders).***

Refer to Knowledge Center for detailed Tuning and performance guidance.

Performance Testing & Optimization

Server Profile



Select optimal performance profile

Select optimal server profile and thread configuration for agent processes and integration service to ensure service can scale w/ custom logic and configuration.

Example: Target to achieve 30k TPH for createOrder w/ 2.5 average lines

Approach:

Configure create order integration server in OMS

Initial Threads =1, Performance Profile = Balanced
Default # of JVM Instances = 1

Execute and **monitor** the server performance via **Self Service Tool**

Monitor KPI's: API Response time (ms), Invocations (rpm),
Container CPU Utilizations, GC CPU Utilizations,
JVM Heap Utilization, and Order Lines Throughput

Observe and **Adjust** the configuration until throughput is achieved

Increase the # of threads
Switch Performance Profile
Increase the # of JVM instance

NOTE: Below numbers represent OOB createOrder with some customization

Server Type	Integration		**Performance Profile**	Balanced			
Server Name	CreateOrderServer						
JVM Instances	No. of Threads Per JVM Instance	API Response (ms)	Invocations (rmp)	Container CPU %	GC CPU %	Heap Utilization	Order/Hour (2.5 average lines)
1	1	198	305	51.5	3	52.7	18760
1	2	285	420	85	7	57.8	25200
1	3	410	432	96	12	62.4	25920
2	4	580	804	99	19	70	47398

Server Type	Integration		**Performance Profile**	Compute			
Server Name	CreateOrderServer						
JVM Instances	No. of Threads Per JVM Instance	API Response (ms)	Invocations (rmp)	Container CPU %	GC CPU %	Heap Utilization	Order/Hour (2.5 average lines)
1	1	182	324	25.6	1.4	29.1	19440
1	2	196	612	47	3	35.5	36720
1	3	219	810	61	5.87	44.2	48600
1	4	230	1041	75	6.47	51.7	62100

Optimal Solution:
Threads = 3
Performance Profile = Compute
JVM Instances = 1

Recommendations:

- Spawning additional (untuned) instances of agent to try and improve throughput let to **exhaustion of resource** allocation available
- Review KC Guidelines to select performance profile | Review community article on Sterling OMS Performance Profiles

Plan and take necessary action to position y(our) solution for peak success, it is critical to *TAKE ACTION NOW!*

↓

01
Database Hygiene

- Mmaintaining healthy database can prevent disruption in production.
- Reduce the IBM Sterling Order Management database size with entity level compression and enhanced purges.

More details →

02
Slow Transactions

- Long running transaction can lead to DB contention, and resource problem on JMS (MQ Server).
- Limits your ability to (auto) scale based on KPIs.
- Achieve scalability with smaller lightweight transactions.

Y(our) actions

- ❑ Ensure all necessary **purges** are running to maintain healthy & lightweight database, which in-turn minimizes performance issues.
- ❑ **Disable** unnecessary transaction **audits** (Order Audits, General Audits, etc.)
- ❑ Implement **entity level database compression** for custom and OOB CLOB column types.
- ❑ Leverage Self-Service database dashboards; continuously review **top tables optimization opportunities.**
- ❑ Review and **consolidate agent and integration workload** to optimize resource allocation.
- ❑ Select **correct** JVM profile **(*OMoC NextGen)** based on analysis from verbose GC logs or your -Xmx/-Xms parameters (Legacy/On-Premise)
- ❑ Review and optimize long running transactions; average async transaction response time should be below 1 seconds.
- ❑ Review common configuration (RTAM, HotSku, JMS), based on the prior recommendations.
- ❑ Reduce message payload by optimizing API, event templates, pull only required data.
  - ❑ Restrict output by setting the `MaximumRecords` in the inputs to any list API calls; use pagination (link)
- ❑ Review reference data cache; catch redundancy by analyzing application logs for frequent cache drops (i.e., ‘Clearing cache’). Frequent refreshes of MCF reference data cache can lead to performance issues. (link)
- ❑ Review errors and ensure errors are addressed to avoid noise, if not address it could mislead during crunch time, also it could cost performance during elevated load, impacts our ability to monitor the system effectively.

Plan and take necessary action to position y(our) solution for success, it is critical to *TAKE ACTION NOW!*

↓

03
User Exit

- Make sure correct authorization IDs are stamped along with corresponding expiration dates.
- Records having the same authorization IDs should have the same authorization expiration date.
- Handle all the exceptions from the collection UE. Otherwise, charge and authorization transactions will get stuck in the 'invoked' user exit status.
- `RecalculateLineTaxUE` and `RecalculateHeaderTaxUE` output should include all necessary taxes to avoid wiping out previous existing taxes.

04
External Calls

- Periodically review the response time of the external calls to payment system.
- Implement both connect and socket read time to ensure external call does not wait in socket-read indefinitely.
- Long running transaction can lead to DB contention, and resource problem on JMS (MQ Server).
- Unforeseen performance issues and impact to other components.

Do's

- ❑ If Dynamic CTR feature is enabled, use `manageChargeTransaction` API and create separate authorizations for each release/shipment. If single line has multiple releases, then one CTR should be created for each release.
- ❑ Review the javadocs before implementing `processOrderPayments`, and use `RequestCollection, ExecuteCollection, RequestCollection.`
- ❑ Avoid redundant processing of orders by the payment agents. Use the `getJobs` query to verify eligible orders.

Dont's

- ❑ Do not take authorization as part of `createOrder` when Dynamic CTR Distribution is enabled.
- ❑ Do not call `processOrderPayments` as part of long transaction boundary. This API is intended for In-person scenarios e.g., carry lines.

  Note: This API cannot be used with any of the order modification APIs or any APIs that modify orders - either through events, `multiApi` calls or services.

  The `requestCollection()` API will be invoked in a new transaction boundary and with a special condition - each Charge and Authorization request created will have `UserExitStatus` set to `"ONLINE"`. When `requestCollection()` is complete, it will return to `processOrderPayments()` and execute a commit in the new transaction boundary then close it. Thus, even if an error is thrown after this point, the database will not rollback the changes made by `requestCollection()`. Javadoc →
- ❑ Do not `useUnlimitedCharges` on the payment method.

Position for Peak Success

To best position for success on the OMS platform, it is important to understand how your application handles various scenarios known to challenges performance or stability. Testing in pre-production with data/workloads representative of production enables ability identify and address issues without impact to production business and operations.

1. Resource/Hardware **sizing** based on segment profile, but is validated as OUTCOME of performance testing, not a replacement for it
2. **Database** is common bottleneck, not due to capacity, but untuned queries, missing indexes, competing processes, unqualified end-user searches
3. Underlying config **data** has significant impact on performance, including database query execution plans, inventory sourcing rule evaluation
4. Accumulation of **transactional data** over long periods of time (and failure to purge as possible), may degraded query performance
5. **Item distribution** and commonality must reflect realistic peak load; high-demand / hot items (free-gift) may significantly impact concurrent processes
6. Composition of a custom service (**Service definition framework**) can lead to inefficient execution or potential lock contention, reducing throughput
7. Understanding **queueing/**de-queueing rates to align with business SLA / expectation (ie. create order, confirm shipment); SI needs to know when there is an issue to intervene / troubleshoot (ie. particular queue depth)
8. Agent/integration server throughput must be sufficient, but remain below **max resource allocation**; varies on number of instances, server profile
9. Important to understand / validate impact to upstream application (eComm) if specific synchronous calls into OMS slow or become unavailable

Real Scenarios *(Real impact…)*

- Over the past few years order fulfillment has shifted to stores with BOPIS, which made DG significantly larger, which led to more time for synchronous inventory availability calls; similar scenarios where client had to split nodes in DG to improve throughput
- Rapid ramp up of **in-store associates** led to several unqualified searches in Store and Call Center apps which caused significant overall degradation
- multiAPI made 8 successive API calls led to poor response, needed to be refactored to **use asynchronous** requests (via MQ to drop message on queue)
- **Custom service call** to getOrderList API was missing OHK in input, each invocation caused fetch of 5K records which led to a crash, had to limit records
- Needed to **throttle down** instances/threads of agent to reduce concurrency contention issues (Create/Schedule/Release) and optimize throughput
- Gradual **memory leak** led to out-of-memory condition after a couple days; similarly, untuned heap led to excessive GC overhead, high CPU, slowness
- Daily manual processing of orders via java client against single JVM bypassed load balancer and overwhelmed JVM to OOM/crash
- Upstream eComm site was unable to gracefully handle a short period of unavailability from backend OMS and took hours to recover
- Unintentionally carrying capacity for high volume node during the peak. (Example: Popup /Temporary fulfilment warehouse)
- Avoid changes to DG in IV during peak time